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A cross-sectional examination of general aches and pains in Scottish working populations: psychosocial and work factors in relation to pain experience and responses.

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Summary

The literature on the relationship between work and pain has focused on pain in relation to specific sites or pathologies or that is of a substantial duration. In addition, previous literature has focused on pain that was disruptive enough to require medical attention or self-medication. Consequently, there is very little known about non-serious general aches and pains that occur outwith the supervision of a health care professional, and the actions individuals take in their daily working lives to deal with them. In response to the lack of literature in this area, this study takes a generic approach to pain by examining general aches and pains outwith site- or duration- specific criteria. As such, the aim of this study is to gain a comprehensive illustration of the experience non-serious, non-chronic, general aches and pains, and their associated risk factors in the workplace.

A cross-sectional questionnaire survey was carried out in 23 different workplaces in Scotland, inviting individuals to comment on their pain prevalence, pain responses, and pain experience in relation to the Glasgow Pain Questionnaire (GPQ; Thomas et al., 1996). The GPQ provides an index of total pain experience, Pain Frequency, Pain Intensity, Ability to Cope with Pain, Pain Emotion and Pain impact.

Although response rates were low (24%), 1888 workers participated in the final study, representing a variety of ten different industry groups.

Results showed that the prevalence of general aches and pains was high (70%), for which workers were most likely to either present to a primary care professional (doctor or dentist), or to take a medication that they had close at hand. One third of those suffering for general aches and pains did not act on them at all.

Prevalence of non-troublesome general aches and pains varied marginally in relation to risk factors, although an adjusted association was found between the likelihood of pain and some demographic groups (female sex, having a chronic condition). An association was also found between pain prevalence and higher work stress.

Adjusted responses to pain differed in relation to pain site and pain cause, although demographic and work variables show little association, after adjustment, with the decision to act on or consult for pain. The more negative the pain experience, the more likely workers were to act or consult, although 'Ability to Cope with Pain' showed no association with either acting or consulting.

The experience of general aches and pains was relatively non-troublesome, with scores on all pain experience sub-scales amounting to less than four out of ten. Pain experience differed substantially in relation to demographic factors, such that, after adjustment, pain was a more negative experience for women, some age groups, those more than three children and/or a chronic condition. In relation to work factors, after adjustment pain was a more negative experience in some industry groups (Emergency Services and Media), and in more restrictive or demanding work environments (higher stress, greater physical load; lower skill requirements; and lower job satisfaction).

After adjustment for age and gender, the experience of pain was relatively similar across pain sites, although it was more negative in long-term conditions, or where medical intervention was required.

This study is the first to record a comprehensive illustration of the nature of general aches and pains in a working population, and confirms non-serious, non-chronic pain as a legitimate public health issue. Despite methodological limitations, these findings suggest that the well established relationships between physical and psychosocial factors and more troublesome pain in the workplace are also observable in non-troublesome pain.

These findings have implications for current understanding of the relationship between pain and work, and suggest that the relationship between non-serious, non-chronic pain and work is more complex than has previously been thought. In addition, these findings have implications for research on pain in the workplace, and suggest that examination of pain experience is an additional and informative adjunct to traditional prevalence studies.

"The least pain our little finger gives us more concern and uneasiness than the destruction of millions of our fellow-beings."

William Hazlitt (1778-1830). British essayist. Edinburgh Review (Oct, 1829).

"Who apart from the gods is without pain for his whole lifetime's length?"

Aeschylus (525-456 B.C.). Agamemnon, 1.553.

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Glossary

Bias	"The systematic variation of measurements from the 'true' values, refer(ring) to the features of the study design or execution that result in an incorrect answer" (Williams, 2001)
Selection bias	"Systematic differences in the groups that are compared" (Bandolier, 2001)
Performance bias	"Systematic differences in exposure to other factors apart from the effect of interest" (Bandolier, 2001)
Attrition bias	"Systematic differences in withdrawals or exclusions of people entered into the study" (Bandolier, 2001)
Detection bias	"Systematic differences in how outcomes are assessed." (Bandolier, 2001)
Confounding	"Results from an internal factor in the (participant) that distorts risk rather than from a factor of study design" (Williams, 2001)
Troublesome pain	Pain that has an impact on the sufferer on a physical or emotional level, regardless of specific site, duration or cause. In relation to GPQ scores, troublesome pain refers to pain items given in the Methods Section - Figure 3.4.
Non-troublesome pain	Pain that is bearable to the sufferer on a physical or emotional level, regardless of specific site, duration or cause. In relation to GPQ scores, non-troublesome pain refers to pain items given in Methods Section - Figure 3.4.
NSAID	Non-steroidal-anti-inflammatory-drug
MPQ	McGill Pain Questionnaire (Melzack & Wall, 1975)
GPQ	Glasgow Pain Questionnaire (Thomas et al., 1996)
OR	Odds ratio
CI	Confidence interval
Adj OR	Adjusted odds ratio

1. Introduction

(a) The cost of pain at work

Pain in the workplace is of great concern to many individuals and to industry. A recent systematic review of the back pain literature published by the Royal College of Physicians estimates the U.K. prevalence of back pain alone to be between 60 and 80% (Waddell & Burton, 2000), citing strong evidence to support that:

> *"...most adults experience low back pain at some time and it is often persistent or recurrent. It is one of the most common reasons for seeking health care and it is now one of the commonest health reasons given for work loss"*
>
> p.1 Chap 3(A); Waddell & Burton (2000)

The personal cost of back pain at work is well documented. Back pain can lead to considerable psychosocial and lifestyle changes that are often associated with poor physical and psychological health (Skevington, 1995; Gatchel & Turk, 1996; Waddell, 1998; Mandiakis & Gray, 2000; Main & Spanswick, 2000) and research continues to reinforce the importance of examining the role of an individual's work and psychosocial environment in chronic pain rehabilitation and management (Kendall, Linton & Main, 1997; Morley, Eccleston & Williams, 1999).

Back pain is one of the most common reasons for taking sick-leave from work in the U.K. (CSAG, 1994), and has been reported to account for 116 million lost working days per annum (Moffett et al, 1995). In a recent study, Mandiakis and Gray describe the direct economic cost of back pain in one year to be up to £1632 million, and the indirect costs (associated with caring for pain patients in the community and work loss) to be approximately £10 668 million. Indeed, back pain costs industry dearly, with some authors suggesting that five million working days are lost to back pain every year (Watson et al, 1998; Watson, 2001). Clearly, therefore, back pain is a widespread problem leading to personal and economic cost on an individual and societal level.

This problem is not limited to just back pain, however, as there is growing evidence of a high cost in relation to other pain types. The recent government Green Paper, "Pathways to Work: Helping people into employment" (Department of Work and Pensions, 2002), states that of all individuals unable to work for health reasons, 22% attribute their incapacity to musculoskeletal pain (of which back pain may or may not be a subset). In addition, a recent report on Chronic Pain (of which back pain may also be a subset) estimates prevalence to be between 14 and 18% in Scotland (Smith et al, 2001; Elliott et al, 1999; Haetzman et al, 2003; Woolf et al, 2004), which is a substantial burden on both public and private healthcare resources (McEwen, 2004). Chronic pain leads sufferers to take approximately two weeks off work every year (Smith et al, 2001; Elliott et al, 1999). One study examining the epidemiology of pain in eight different European countries reports that 26% of sufferers stated that pain impacted on their work, 16% had altered their work as a result of pain, and 19% of chronic pain sufferers had lost their jobs as a result of their pain (Woolf et al, 2004).

(b) The literature associating demographic and work variables with pain

There is a vast literature on the relationship between demographic variables, work factors and pain. The current thesis reviews a selection of this literature, and illustrates that it is inconsistent in measures applied, pain types and populations studies, and consequently in published findings.

(c) Evaluating the literature associating demographic and work variables with pain

The current study argues that the inconsistency of the literature associating demographic and work variables has served to confuse the understanding of pain at work, and has made recommendations for intervention difficult. The current study argues that one way of progressing research from this point is to challenge several key assumptions that are often made in this literature. Specifically these are:

- the focus previous literature on musculoskeletal pain (and back pain specifically);
- the focus on chronic and troublesome pain; and
- the adherence to site- and duration-specific definitions of pain based on clinical criteria.

It is argued that viewing pain from a general perspective (that is pain outwith clinical terms and definitions) enables the study of pain as a *general human experience*, rather than as an ache in a body part, or an indicator of a specific disease or underlying pathology. This is distinct from *generalised* pain, in that this refers to the approach taken by the researcher, rather than the description given by the sufferer. This approach has the potential to include all pain, which can be generalised or specific to a site or pain type.

Consequently, the current study sets out to provide a commentary on non-serious pain at work from a general perspective. From this, an illustration of the experience of general aches and pains, how people respond to them, and how each of these variables interacts with demographic and work factors can be generated.

There are therefore two main aims to the current thesis:

1. **To provide comprehensive information on general aches and pains in a working population.**

2. **To generate a preliminary profile of work and life risk factors for general pain.**

2. Literature Review

2.1 Methods of literature review

(a) Literature search

The preliminary literature review was carried out in October 1998 to explore the relationship between pain and work by entering the key words "pain" and "work" into MEDLINE and PsychINFO databases. This yielded 3430 titles from a variety of disciplines including: medicine, pharmacy, epidemiology, occupational health, physiotherapy, psychology, nursing, occupational therapy, and ergonomics. Exclusion criteria for titles are given in Table 2.1.

Table 2.1
Preliminary exclusion criteria for literature review

1. Pain studies that made no specific reference to work, work disability, or work injury.	
Rationale for exclusion	Doesn't refer to relationship between pain and work specifically. *Exceptions:* Studies examining psychosocial issues in general populations (e.g. psychological factors, demographics) and pain, assuming that their interaction with work variables may be of interest
2. Issues relating to current or ongoing NHS or equivalent healthcare provision for pain patients	
Rationale for exclusion	NHS or equivalent healthcare provision issues were not always relevant. *Exceptions:* Studies examining healthcare issues related to work variables (e.g. occupational health), work disability, or work injury.
3. Anatomical and pharmacological mechanisms underlying pain perception or pain interventions	
Rationale for exclusion	Beyond the scope of the current study.
4. Studies examining pain in illness populations where pain was a secondary issue or symptom	
Rationale for exclusion	Analysis of co-morbid symptoms was beyond the scope of this study.
5. Studies relating to in-patient healthcare procedural issues	
Rationale for exclusion	Beyond the scope of the current study.

In total, 323 relevant titles examining any pain and any work variable (physical or psychosocial) were identified, and abstracts from all of these titles were reviewed and categorised in relation to their subject area or research aim (Table 2.2 overleaf).

Table 2.2
Literature between 1980 and 1998 categorised by research aim and population type

	General population (with ref. to work risks)		General working sample		Specific occupation group or job title		Comparing specific occupation groups		(Total abstracts reviewed) Total full papers retrieved	
(a) Back pain only										
Physical risks only	*(3)*	0	*(5)*	0	*(20)*	1	*(5)*	0	*(33)*	**1**
Psychosocial risks only	*(2)*	1	*(1)*	1	*(0)*	0	*(2)*	2	*(5)*	**4**
Not specifically physical risks or psychosocial risks only, or both	*(13)*	12	*(13)*	12	*(15)*	15	*(7)*	7	*(48)*	**46**
(Total abstracts reviewed) **Total full papers retrieved**	*(18)*	**13**	*(19)*	**13**	*(35)*	**16**	*(14)*	**9**	*(86)*	**51**
(b) Musculoskeletal pain										
Physical risks only	*(3)*	0	*(5)*	0	*(12)*	0	*(1)*	0	*(21)*	**0**
Psychosocial only	*(1)*	1	*(0)*	0	*(1)*	1	*(1)*	1	*(3)*	**3**
Not specifically physical risks or psychosocial risks only, or both	*(7)*	7	*(7)*	7	*(12)*	12	*(11)*	11	*(37)*	**37**
(Total abstracts reviewed) **Total full papers retrieved**	*(11)*	**8**	*(12)*	**7**	*(25)*	**13**	*(13)*	**12**	*(61)*	**40**
(c) Other specific pain										
Physical risks	*(2)*	0	*(1)*	0	*(0)*	0	*(0)*	0	*(3)*	**0**
Psychosocial risks	*(2)*	2	*(0)*	0	*(0)*	0	*(0)*	0	*(2)*	**2**
Not specifically physical risks or psychosocial risks only, or both	*(6)*	6	*(2)*	2	*(0)*	0	*(0)*	0	*(8)*	**8**
(Total abstracts reviewed) **Total full papers retrieved**	*(10)*	**8**	*(3)*	**2**	*(0)*	**0**	*(0)*	**0**	*(13)*	**10**
(d) General aches and pains										
Physical risks	*(0)*	0	*(0)*	0	*(0)*	0	*(0)*	0	*(0)*	**0**
Psychosocial risks	*(0)*	0	*(0)*	0	*(0)*	0	*(0)*	0	*(0)*	**0**
Not specifically physical risks or psychosocial risks only, or both	*(1)*	1	*(0)*	0	*(1)*	1	*(0)*	0	*(2)*	**2**
(Total abstracts reviewed) **Total full papers retrieved**	*(1)*	**1**	*(0)*	**0**	*(1)*	**1**	*(0)*	**0**	*(2)*	**2**

	(Total abstracts reviewed)	Total full papers retrieved
(e) Predicting return to work after work loss, injury or disability		
(Total abstracts reviewed) **Total full papers retrieved**	*(28)*	**2**
(f) Other articles of interest		
Consulting for pain in relation to work	*(4)*	**4**
Discursive commentaries on preventing musculoskeletal pain	*(2)*	**0**
Discursive commentaries on reducing chronicity	*(7)*	**3**
Discursive commentaries on risks for back pain	*(20)*	**11**
Discursive commentaries on social aspects of pain	*(7)*	**3**
Discussing the cost of pain to industry and healthcare	*(14)*	**1**
Importance of and difficulties with operationalising work environment	*(4)*	**0**
Importance of health promotion interventions	*(3)*	**0**
Importance of operationalising pain	*(4)*	**3**
Observing pain behaviour	*(1)*	**0**
Observing physical load	*(12)*	**0**
On risks for musculoskeletal disability	*(8)*	**0**
Pain questionnaires	*(8)*	**1**
Pre-employment physical testing	*(2)*	**0**
Psychological (non-work) risks for pain alone	*(11)*	**3**
Systematic reviews of relationship between back pain and work risks	*(2)*	**2**
Systematic reviews of relationship between musculoskeletal pain and work risks	*(2)*	**2**
Systematic reviews of relationship between neck pain and work risks	*(1)*	**1**
The role of compensation in work risks for pain	*(12)*	**0**
Work hardening	*(9)*	**0**
(Total abstracts reviewed) **Total full papers retrieved**	*(133)*	**34**

(b) Categorising literature

Previous research on the work risks for pain is varied, complex and difficult to synthesise. There were several problems with categorising previous research, some of which will be discussed in more detail (see Section 2.3). One problem was the potential for overlap between the different types of pain examined. For example, it was often difficult to draw a distinction between studies examining musculoskeletal pain and those examining back pain. For the purposes of this literature review, where there was any ambiguity, articles were categorised by the terms used by their authors. Thus: authors studying risk factors for back pain only were categorised as "Back pain" (Table 2.2a); studies that referred specifically to musculoskeletal pain, which included a variety of pains, sometimes including back pain, were categorised as "Musculoskeletal pain" (Table 2.2b); and studies that named a pain type that was neither back nor general musculoskeletal were categorised as "Other specific pain" (Table 2.2c). Studies that examined pain as a general concept, that is pain that was not defined in terms of site, or underlying pathology or by time and/or intensity were classified as "General aches and pains" (for a discussion of this approach to pain, see Section 2.4).

Studies that did not discuss the work risks for pain but referred to a relevant issue (for example those developing a pain measure, or examining general health in a working population) were categorised as, "Other articles and reviews of interest" (see Table 2.2f).

It became clear as the review progressed that the studies reported in Table 2.2 were by no means a comprehensive record of literature in this area, and often articles cited several papers that were not identified by the current literature search. It is likely therefore, that the "true" magnitude of literature in this area is greater than it appears in Table 2.2. In an attempt to manage this voluminous literature, the decision was taken to limit review of full papers to those identified in the current literature search, acknowledging that the intention was to provide a valid indication of the literature in this area, and not a full systematic review.

(c) Observations about the literature

Table 2.2 permits three observations to be made about research into work risks and pain:

(a) The majority of previous studies focus on back and musculoskeletal pain, accounting for just under half of all studies in Table 2.2, and 91% of those examining risk factors for all pain types. A small proportion of studies examining risk factors (8%) examined other specific pain types that were not specifically referred to by the authors as back or musculoskeletal, and only 1% addressed "general aches and pains".

(b) The majority of studies examining all pain risks in working samples compare pain in specific working populations to general or non-working controls. Only 17% of those examining physical and/or psychosocial risk factors compared one working sample with another.

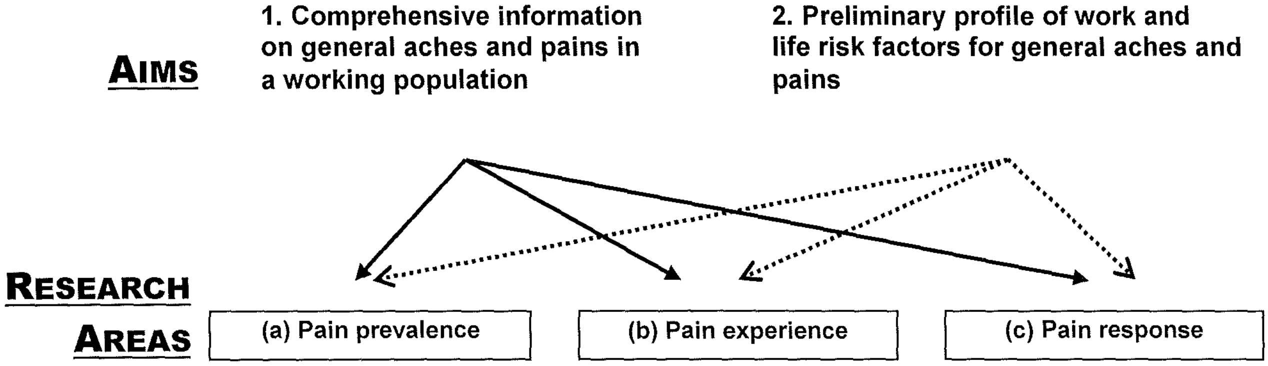
(c) Very few studies examine individual responses to pain in the workplace. Although some studies refer to medication use, or take consultation rates for pain as an outcome measure (see Section 2.5) the primary aim of most studies is to identify the work risk factors for pain.

The aim of the current study was to address these three gaps in pain research, by:

1. Providing more comprehensive information on general aches and pains in a working population.
2. Providing a preliminary profile of work and life risk factors for general aches and pains.

These two aims will addressed in relation to three main areas of research: pain prevalence (Section 2.3), pain experience (Section 2.4), and responses to pain (Section 2.5), as illustrated in Figure 2.1 below.

Figure 2.1
Summary of current study's Aims in relation to Research Areas



The main focus of the current thesis was to examine pain in relation to psychosocial factors at work, therefore two further exclusion criteria were applied: (a) excluding papers that did not include or discuss psychosocial variables and pain at work; and (b) excluding papers that referred to individuals not currently working. This led to the exclusion of a further 139 abstracts, namely all papers relating to physical risks only, the majority of papers related to return-to-work, and many other articles thought to be of interest on first review (see Table 2.2). In total, 113 full papers were retrieved, of which a further 5 met with exclusion criteria and were therefore omitted from full review. The remaining 103 studies are included, where appropriate, in Tables 2.4-2.26 in the forthcoming Sections. In addition to this preliminary literature search, some citations from published papers were accessed. This resulted in the inclusion of papers that were not identified in the original literature review, and were identified by another paper of interest by peripheral reading around the subject area. Additional empirical papers were minimal, however, representing less than ten percent of literature reviewed.

(d) *Systematic Reviews of Literature published between 1980 and 1998*

The literature search revealed five systematic reviews concerning pain and work between 1980 and 1998 (see Table 2.2f). These were retrieved and reviewed in full. Although there was some overlap between papers, there were a number of studies incorporated in these reviews that were not identified in the current search. Only those papers that were not accessed by the current search but which were relevant are included in Tables 2.4-2.26 and are indicated by italics where they occur. Where studies were taken from systematic reviews, information about adjustment and statistical analysis was not always available. Conclusions of the systematic reviews are discussed in more detail in Section 2.3e below.

The contribution of a general approach to pain will be discussed (Section 2.4), and the value of examining responses to pain at work will be explored in detail (Section 2.5). First, however, it is important to establish an overall depiction of what this literature tells us, that is, the nature of the relationship between work-related risk factors and pain.

(e) Assessing the quality of studies

Although the current review was not planned as a systematic review, critical appraisal of the literature on risk factors for the occurrence of pain at work is discussed below in relation to assessment of study quality guidelines published in the Cochrane Handbook for Systematic Reviews of Interventions 4.2.5 (Higgins & Green, 2005). These were developed in relation to intervention studies, and recommendations for the review of non-experimental, non-randomised studies are not yet available (Reeves, 2006; on behalf of the Non-randomised Studies Methods Group, personal communication). Current published guidelines, therefore, are limited in the extent to which they can be applied to all studies in the current review. It is generally accepted, however, that many of the sources of bias discussed in the Cochrane Handbook can and should be used to inform judgements on the quality of non-experimental studies (Reeves, 2006; on behalf of the Non-randomised Studies Methods Group, personal communication). Specifically, the handbook summarises their applicability to different observational designs (see Table 2.3 below).

Table 2.3
Summary of potential for bias in non-experimental studies, taken from Higgins & Green (2005): Section 6.8 of the Cochrane Handbook. Column (b) bias definitions added from Bandolier (2001).

Source of bias	(b) Defined as	Study design	
		Cohort studies	*Case-control studies*
Selection bias	Systematic differences in the groups that are compared	Control for confounders	Matching
Performance bias	Systematic differences in exposure to other factors apart from the effect of interest	Measurement of exposure	Measurement of exposure
Attrition bias	Systematic differences in withdrawals or exclusions of people entered into the study	Completeness of follow-up	Completeness of follow-up
Detection bias	Systematic differences in how outcomes are assessed	Blinding	Case-definition

Where evidence in the current review is generated by cohort or case-control design, the effects of these sources of bias will be discussed in detail (see Sections 2.2 below). However, many of the studies identified by the current literature search were neither cohort nor case-control in design, for which no Cochrane review recommendations can be easily applied. As discussed earlier, the decision had been taken at the outset taken to include as much evidence as possible, in order to gain the richest, most informative picture of the relationship between a variety of workplaces and a variety of pains. To facilitate the critical appraisal of studies with a combination of designs, it was decided that the recommendation in the Cochrane Handbook that, "[reviewers] must make judgements about what confounders are important and the extent to which these were appropriately measured and controlled for [in studies reviewed]" be applied. Consequently, studies were judged against the following three criteria, as applied by Bongers and colleagues in their systematic review of similar studies (1995; see Section 2.3 below for a detailed discussion of this review).

(a) Study included a measure of physical load at work *(reducing the likelihood of selection bias, performance bias and detection bias; as well as the ability to evaluate the impact of the potential confounding effect of physical work)*

(b) Study included a measure of symptom or pain history *(reducing the likelihood of selection bias, performance bias and detection bias; as well as the ability to evaluate the impact of the potential confounding effect of previous medical and pain history)*

(c) Study adjusted for other confounders *(reducing the likelihood of selection bias, performance bias and detection bias, and as well as the ability to evaluate the impact of potential confounders)*

In addition, to enable critical appraisal of sample size and representativeness in a variety of designs, studies were judged against two further criteria, as detailed below.

(d) Study included the final sample of 1000 individuals or more *(one way in which representativeness of the study sample can be approximated in relation to the population as a whole)*

(e) Study included a reasonable response rate defined as 80% or over *(reducing the likelihood of attrition bias[†])*

Every study in Tables 2.4-2.26 was rated against these five criteria, and these are annotated after every author and date in tables, where the presence of an annotated letter ([a], [b], [c] [d], or [e]) denotes that the study fulfilled this criterion, and the absence of an annotated letter denotes that the study did not fulfil this criterion.

Studies included in Tables 2.4-2.26 that were taken from Bongers et al's systematic review (1993) were also rated in this way, although it is important to point out that the ratings for (a), (b) and (c) were those assigned by Bongers and colleagues, and not by the current reviewer. The extent to which authors adjusted for confounders was not always made clear in the studies taken from Bongers et al. As such, some of these studies may have included adjustment for confounders that were not reported by Bongers et al. Where information on adjustment processes was not available, relevant studies were annotated by an '[x]' as opposed to the absence of the criterion '[c]'. In other words, it is not that these studies did not adjust for confounders, only that, from the information on studies given in Bongers et al's review, it is unclear if and/or for what findings were adjusted. Similarly, information regarding the additional criterion referring to sample size was available in the Bongers et al study, although response rate was not. For this reason, studies taken from Bongers et al (1993) for which no response rate information was available are denoted by a '[y]' as opposed to the absence of the criterion '[e]', which would have been misleading.

It was impossible to rate the studies included in Tables 2.8-2.15 that were taken from other systematic reviews (Leboeuf-Yde et al., 1996). For this reason, the reader is cautioned in making any substantial conclusions regarding these findings, in the absence of more information about these specific studies.

[†] The utility of response rate as a quality criterion was in estimating the likelihood of attrition bias. This is not to say studies with lower response rates were automatically considered to be biased; as some non-responder analyses where response rates were low showed that biases were minimal (these will be discussed in the main text). This quality criterion was used nonetheless, as an illustration of the problems with non-response in studies. Where levying this criticism was "unfair" (for example, if study design meant that attrition bias was not a serious issue; or if the authors made an attempt to quantify the level or nature of attrition bias using non-responder analyses), the relative potential for attrition bias is discussed more fully.

It is important to point out that although these descriptions of quality are given here as "criteria" they do not provide any grounds for the inclusion or exclusion of studies in the review. However, these criteria do provide a reasonable assessment as to whether each study was likely to have been open to specific biases or to confounding. Studies in which all, or the majority of these criteria were "met" should be seen as providing the strongest evidence for associations between psychosocial factors and the occurrence of pain, particularly where these are prospective or case-control designs. Studies in this review meeting four out of the five criteria are described as being of "reasonable quality". Finally, studies in which only one or two of these criteria were "met" should be seen as reporting "weaker" associations between psychosocial factors and the occurrence of pain, and it is likely that their observations were affected more seriously by specific biases.

The extent to which all studies were open to specific biases, the extent to which confounding was explored in studies, and the implications these may have is discussed in detail below.

2.2 Risk factors for pain prevalence and incidence at work

(a) Pain at work: the extent of the problem

Previous research has attempted to quantify the extent of pain in the workplace, using a wide variety of measures, populations and designs. As a result, there is a great deal of inconsistency across reported prevalence and incidence rates (see Table 2.4-2.7).

Table 2.4
Observed pain in cross-sectional studies examining psychosocial risks for pain at work in a general population, given by pain type*

[a]inc. measure of physical load; [b]inc. measure of symptom or pain history; [c]adjusted for confounders; [d]N=1000 or more in final sample; [e]response rate 80% or more

(a) <u>Back pain</u>	<u>Prevalence (% unless otherwise stated)</u>
Croft & Rigby (1994) [BP] [acde]	18.9
Deyo & Tsui-wu (1987) [LBP] [acd]	16.9
Ebeltoft et al. (1996) [LBP]	*1 yr retrospective: 54; Lifetime prevalence: 64*
Linton Hellsing & Hallden (1998) [BP] [acde]	66.3
Rafnsson et al. (1989) [LBP]	*65*
Xu et al. (1996) [LBP] [acde]	43
(b) <u>Other pain</u>	**<u>Prevalence (% unless otherwise stated)</u>**
Andersson et al. (1993) [MSK] [cde]	55.2
Bergenudd & Nilsson (1994) [MSK] [bce]	By pain type: back(29); shoulder(14); hip(4); knee(10); joints(11)
Pryse-Phillips (1992) [Headache] [de]	60
Westerling & Jonsson (1980) [NSP] [acde]	18.2;(257 neck only (10); 155 shoulder only(6); both(2))
Hasvold & Johnsen (1993) [NSP & Headache] [cde]	By pain type, gender and duration: Headache: Seldom/never (males(72.5), females(49.2)); monthly or more often (males(21.4), females(37.6)); weekly or more often (males(4.9), females(10.9)); daily (males(1.2), females(2.2)) Neck/shoulder: Seldom/never (males(63.5), females(46.1)); monthly or more often (males(21.1), females(29)); weekly or more often (males(7.6), females(12.4)); daily (males(7.8), females(12.5))
Sternbach (1985) [General pain] [cd]	By pain type: head(73);back(56); musculoskeletal(53);joint(51); stomach(46); menstrual(50); dental(27); other(6)

Some studies were excluded as a result of unclear prevalence data or did not give an indication of prevalence
Pain types: BP = Back Pain; LBP = Low Back Pain; MSK= Musculoskeletal Pain; NP = Neck Pain; SP = Shoulder Pain; NSP = Neck/Shoulder Pain
Studies in italics were taken from subsequent systematic reviews, and are not from the current literature review (see Section 2.3h below)

In an attempt to draw some conclusions regarding prevalence, the studies were grouped by design, pain type and population type (see Tables 2.4-2.7). The resulting pattern of literature shows large discrepancies between observed pain prevalence and incidence, as large as 70% in some cases (see Tables 2.4-2.7). Despite these discrepancies, however, some tentative conclusions about the extent of pain in general and working populations can be drawn.

First, it can be concluded that at any given time, at least 5% of individuals in any population will be experiencing pain of some description, either as a new or recurring problem. However, this is a highly conservative estimate, as the study that reports this figure refers to back pain of a chronic and disabling nature, and the authors also report the prevalence of back pain "quite often" to be 27% (Hildebrandt et al., 1995). It is likely, therefore, that the "true" extent of pain will be higher than 5%. This illustrates the problems with the many different approaches to pain that previous studies have taken, and this issue will be discussed in Section 2.4.

Second, many studies report lifetime prevalence of pain to be very high, in the region of 60-90% of individuals (see Table 2.6 and 2.7). This is the case for back pain as well as shoulder and upper-limb pain. These figures suggest that most individuals can expect to experience pain of some description at these sites within their lifetime. The universality and inevitability of pain as a human experience (as opposed to pain as a clinical condition) will be discussed in Section 2.4.

A third observation that can be made about the studies summarised in Tables 2.4-2.7 is that of all pains experienced, back pain is the most commonly reported in some studies (Bergenudd & Nilsson, 1994; Brulin et al., 1998; Burdorf et al., 1998); over time (Fjellman-Wikund et al., 1998) and for men in (Skov et al., 1996). This is not the case in all studies, however (Ahlberg-Hulten et al., 1995; Birger-Hagen et al., 1998; Chavalitsakulchai & Shahnavaz, 1991; Lemasters et al., 1998; Sternbach, 1985). Back pain has received more research attention overall (see Table 2.2), and by its study is often assumed to be of greater importance than other pains in the workplace (Waddell, 1998).

Table 2.5

Observed pain in cross-sectional studies examining psychosocial risks for pain at work in a working population, given by pain type*

[a]inc. measure of physical load; [b]inc. measure of symptom or pain history; [c]adjusted for confounders; [d]N=1000 or more in final sample; [e]response rate 80% or more

(a) Back pain	Prevalence (% unless otherwise stated)
Brown et al., 1998 [abde]	By severity & sick leave: chronic or recurring (76.2); severe enough to take leave (24.7); severe enough to take leave but worked nonetheless (60.7)
Burdorf et al., 1998 [abce]	By work group: crane operators(50); straddle-car drivers (44); office workers (34)
Chiou & Wong, 1992 [abcde]	13.9; Retrospective: 4wks(24), 6mths(42), 1yr (69.7); Lifetime prevalence (77.9)
Coggan et al., 1994[ade]	By gender: females(11.6), males(10.7); 1 yr retrospective: females(37.6), males(28.4); Lifetime prevalence: females(61.4), males(55.1)
Feyer et al., 1992[abc]	By work group: 26 for both; 1 yr retrospective: nurses(67); postal workers(56); Lifetime prevalence: nurses(77); postal workers(73)
Foppa & Noack, 1996 [abce]	By gender: men(32.2); women(44.1)
Fujimura et al., 1995 [abce]	64.1; Lifetime prevalence (%): 88.5
Hemsley et al., 1998[ab]	Lifetime prevalence (%): 73
Hildebrandt et al., 1995 [acd]	Quite often (26.6); Chronic & disabling (4.5)
Masset et al., 1994 [abcd]	18; 1 yr retrospective: 32; Lifetime prevalence: 32
Moens et al., 1993 [bcde]	18; 1 yr retrospective: 63; Lifetime prevalence: 73
Rotgoltz et al., 1992 [abc]	66.3
Suadicani et al., 1994 [abce]	1 yr retrospective: 51; Lifetime prevalence: 61
Toroptsova et al., 1995 [ae]	1 yr retrospective: 31.5; Lifetime prevalence: 48.2
Videman, 1984 [abc]	By work group: qualified nurses(79); nursing aides(85)

(b) Other pain	Prevalence (% unless otherwise stated)
Ahlberg-Hulten et al., 1995 [MSK pain] [ac]	By pain type: back (59); neck (61); shoulder (74)
Hagen et al., 1998 [NS & LB disorders] [acd]	Low back pain (23.6); Neck/ shoulder pain (27.7)
Brulin et al., 1998 [ace]	By pain type: neck (44); shoulder (47); arm (10); hand (20); upper back (30); lower back (40); hip (18); knee (21); foot (21)
Harber et al., 1985 [LBP][a]	6 mths retrospective by work group: nurses(52), nurse unit-service co-ordinators(20)
Helliwell et al., 1992 [WRULD]] [abc]	30; Lifetime prevalence (%): 81
Herberts et al., 1984 [SP] [ac]	By work groups at baseline: welders (27); plate workers (32); office workers (2)
Holmstrom et al., 1992b [NSP] [acd]	1 yr retrospective: 56; By work group: machine operators (63); insulators (71); crane operators (74) [of which considerable (12%)]
Holmstrom, Lindell & Moritz, 1992 [NSP] [acd]	1 yr retrospective: 56
Lemasters et al., 1998 [MSK disorders] [bc]	By pain type: neck (9.2); shoulders (18.4); elbows (18.8); hand or wrist (18.8); back (15.7); hip (6.9); knee (15.3); ankle(4.3)
Niedhammer, 1998 [S disorders] [abce]	51.4
Skov et al., 1996 [MSK] [acde]	By gender and pain type: males(lower back (63), shoulder (35); neck (54)); females(lower back(64); shoulder (35); neck (76))
Westgaard & Jansen, 1992 [MSK] [abc]	95
Westgaard et al., 1992 [MSK complaints] [abc]	By work type: production workers (77) and office workers (74)
Westgaard et al., 1992 [MSK] [abc]	By work group and pain type: office workers: neck/shoulder(48); head (30); manual workers: neck/shoulder(50); head (35)

Some studies were excluded as a result of unclear prevalence data or did not give an indication of prevalence
Pain types: BP = Back Pain; LBP = Low Back Pain; MSK= Musculoskeletal Pain; NSP = Neck/shoulder Pain; SP = Shoulder Pain;
Studies in italics were taken from subsequent systematic reviews, and not from the current literature review (see Section 2.3(h) below)

Table 2.6

Pain observed by cross-sectional studies, given population and pain type (point prevalence (%) unless otherwise stated)

General population		
(a) Back pain	5-66%	Behrens et al., 1994; Bergenudd & Nilsson, 1994; Thorbjornsson et al., 1998; Croft & Rigby, 1994; Deyo & Tsui-wu, 1987; *Ebeltoft et al., 1996*; Jacobsson et al., 1992; Linton Hellsing & Hallden, 1998; Manninen et al.,1995; *Rafnsson et al., 1989*; Sternbach, 1985; Williams et al., 1998; Xu et al., 1996
	Life-time prevalence 61-64%	Biering-Sorensen & Thomsen., 1986; *Ebeltoft et al., 1996.*
(b) General musculoskeletal pain	55.2%	Andersson et al., 1993
(c) Shoulder and upper-limb pain	8-64%	Bergenudd & Nilsson, 1994; Hasvold & Johnsen, 1993; Jacobsson et al., 1992; Westerling & Jonsson, 1980
(d) Specfied pain *(exc. back or shoulder pain)*	Abdominal pain (46%)	Sternbach, 1985
	Dental pain (27%)	Sternbach, 1985
	Headache (1-73%)	Pryse-Phillips et al., 1992; Hasvold & Johnsen, 1993; Sternbach, 1985
	Hip pain (4%)	Bergenudd & Nilsson, 1994
	Joints (11-51%)	Bergenudd & Nilsson, 1994; Sternbach, 1985
	Knee pain (10%)	Bergenudd & Nilsson, 1994
	Menstrual pain (50%)	Sternbach, 1985
	Neck pain (10%)	Jacobsson et al., 1992; Westerling & Jonsson (1980)
Working population		
(e) Back pain	11- 80%	Ahlberg-Hulten et al.,1995; Anderson, 1992; Hagen et al.,1998; Brown et al., 1998; Brulin et al., 1998; Burdorf et al., 1998; Burdorf et al., 1998; Chavalitsakulchai & Shahnavaz, 1991; Chiou & Wong, 1992; Coggan et al., 1994; Engels et al., 1996; Feyer et al.,1992; Fjellman-Wikund et al., 1998[a], 1998[b]; Foppa & Noack, 1996; Fujimura et al., 1995; Harber et al., 1985; Harreby et al., 1996; Hildebrandt et al., 1995; Lemasters et al., 1998; Masset et al., 1994; Moens et al., 1993; Rotgoltz et al., 1992;Suadicani et al., 1994; Skov et al., 1996; Starr, 1983; Toroptsova et al., 1995; Videman, 1984; Wickstrom et al., 1998
	Lifetime prevalence 32-89%	Chiou & Wong,1992; Coggan et al., 1994; Fujimura et al., 1995; Harreby et al., 1996; Hemsley et al., 1998; Masset et al., 1994; Moens et al., 1993; Suadicani et al., 1994; Toroptsova et al., 1995
(f) General musculoskeletal pain	74-95%	Westgaard et al., 1992; Westgaard & Jansen, 1992.
(g) Shoulder and upper-limb pain	10-74%	Ahlberg-Hulten et al.,1995; Hagen et al.,1998; Burdorf et al., 1998; Chavalitsakulchai & Shahnavaz, 1991; Engels et al., 1996; Fjellman-Wikund et al., 1998[a], 1998[b]; Helliwell et al., 1992; Herberts et al., 1984; Holmstrom et al., 1992; Holmstrom, Lindell & Moritz, 1992; Lemasters et al., 1998; Niedhammer, 1998; Skov et al., 1996; Starr, 1983; Westgaard et al. 1992
	Lifetime prevalence (%): 81	Helliwell et al., 1992
(h) Specfied pain *(exc. back or shoulder pain)*	Abdominal (25-58%)	Starr, 1983
	Ankle/foot (4%)	Engels et al., 1996
	Arm (13-30%)	Engels et al., 1996; Starr, 1983
	Buttocks/thighs 57-69	Starr, 1983
	Elbow (2-11%)	Engels et al., 1996; Starr, 1983
	Foot/ankle pain (4-21%)	Brulin et al., 1998; Burdorf et al., 1998; Fjellman-Wikund et al., 1998[a], 1998[b]
	Hand or wrist pain (6-20%)	Hagen et al.,1998; Brulin et al., 1998; Burdorf et al., 1998; Engels et al., 1996; Lemasters et al., 1998
	Headache (30-76%)	Starr, 1983; Westgaard et al. (1992) [MSK]
	Hip pain (7-18%)	Brulin et al., 1998; Engels et al., 1996; Fjellman-Wikund et al., 1998[a], 1998[b]; Lemasters et al., 1998
	Knee pain (8-32%)	Burdorf et al., 1998; Engels et al., 1996; Fjellman-Wikund et al., 1998[a], 1998[b]; Lemasters et al., 1998
	Leg pain (16-31%)	Engels et al., 1996
	Neck pain (9-76%)	Ahlberg-Hulten et al.,1995; Hagen et al.,1998; Brulin et al., 1998; Burdorf et al., 1998; Chavalitsakulchai & Shahnavaz, 1991; Engels et al., 1996; Fjellman-Wikund et al., 1998[a], 1998[b]; Holmstrom et al., 1992; Holmstrom, Lindell & Moritz, 1992; Lemasters et al., 1998; Skov et al., 1996; Starr, 1983; Westgaard et al. 1992
	Waist pain (53%)	Chavalitsakulchai & Shahnavaz (1991) [MSK]
	Wrist pain (10-14%)	Starr, 1983

* Some studies were excluded as a result of unclear prevalence data or did not give an indication of prevalence. *Studies in italics were taken from subsequent systematic reviews, and not from the current literature review (see Section 2.3h below)*

Table 2.7

Pain observed in studies of mixed design examining psychosocial risks for pain at work given by working population and pain type *(where appropriate)**

[a]inc. measure of physical load; [b]inc. measure of symptom or pain history; [c]adjusted for confounders; [d]N=1000 or more in final sample; [e]response rate 80% or more

General population	Design	Prevalence (% unless otherwise stated)
(a) Back pain		
Thorbjornsson et al. (1998) [abc]	Cross-sectional baseline repeated at T2 after 34 years, and retrospective (T1-T2) on same cohort	By gender: T1: females (34); males (24); T2 - females (44); males (39) ; Cumulative incidence (%) T1-T2 females (38); males (42)
Papageorgiou et al. (1997) & (1998) [abc]	Cross-sectional baseline with cohort followed up for 12 months	Incidence (%) 39.5
Biering-Sorensen & Thomsen (1986) [bce]	Cross-sectional baseline, repeated on same cohort at T2 after 12 months	By gender at T1: (combined lifetime and current prevalence): males(63); females(61) 1 yr retrospective: males(45); females (45); 1 year prospective incidence (%): males(17); females (16)
Harreby et al. (1996) [abce]	Cross-sectional baseline, repeated on same cohort at T2 after 25 years, same cohort	By gender at T2: males(16), females(21); 1 yr retrospective: males(60), females(65); Lifetime prevalence: males(68), females(71)

Working population	Design	Prevalence (% unless otherwise stated)
(b) Back pain		
Anderson (1992) [abe]	Case-control, based on cross-sectional data	By work group (cases): drivers(80.5); non-drivers (50.7)
Bigos et al. (1991) [abce]	Pain free cohort followed up for 3 years	Incidence (%): 17.8
Leino et al. (1995) [ac]	Cross-sectional baseline repeated on same cohort at T2 after 10 years	Prevalence rates not given
Miedema et al. (1998) [abc]	Cross-sectional retrospective 3-4 years, plus 3 yrs prospective follow-up on same cohort	28; Incidence (%) 27
Moffett et al. (1993) [abc]	Pain free cohort followed up every 3 months up to 20 months	Incidence (%) 64
Van Poppel et al. (1998) [abce]	Cross-sectional baseline repeated 7 times (T2-8) on the same cohort within 12 months	31
Wickstrom et al. (1998) [acde]	Cross-sectional baseline repeated on same cohort at T2 after 2 years	By job type at T1: white-collar workers (27); blue-collar workers (34); By job type at T2: white-collar workers (31); blue-collar workers (49)
(c) Other pain		
Engels et al. (1996) [MSK] [ace]	Case-control, based on cross-sectional data	By pain type (cases): back(36), arm(30), neck(23), shoulder(20), elbow(2), wrist/ hand(6) leg(16), hip(7), knee(10), ankle/foot(4)
Fjellman-Wikund et al. (1998) [MSK Disorders][abc]	Cross-sectional baseline repeated on same cohort at T2 after 8 years	By pain type T1: N(39); S(30); elbows(11); hands(56); B(75); hips(14); knees(8); feet(6); By pain type T2: N(44); S(56); elbows(22); hands(22); B(76); hips(8); knees(14); feet(6)
Manninen et al. (1995) [LBP & NSP] [abcde]	Cross-sectional baseline repeated on inception cohort or original sample at T2, 12 years later	By gender and type at T2 only: sciatica ()males(10.4), females(8.8)); unspecified LBP(males(17.1), females(8.8)).
Starr (1983) [MSK] [abc]	Case-control, based on cross-sectional data (no info on matching)	By case (control): head75(76); sore eyes65(54); neck65(48)*; shoudlers48(37); upper back 59(48); lower back63(59); abdominal 25(27); wrists10(14); elbows 9(11); upper arms 14(13); buttocks/thighs69(57)

Some studies were excluded as a result of unclear prevalence data or did not give an indication of prevalence
Pain types: LBP = Low Back Pain; MSK= Musculoskeletal Pain; NSP = Neck/Shoulder Pain

The prevalence of other pain differs between studies, although neck and shoulder pain appear to be common in working populations (Herberts et al., 1984; Ahlberg-Hulten et al., 1995; Brulin et al., 1998; Hagen et al., 1998; Niedhammer, 1998). Again, however, there are inconsistencies between these observations, with some authors reporting hand (Lemasters et al., 1998) or elbow pain (Fjellman-Wikund et al., 1998) to be more common than neck and shoulder pain, and others reporting headache to be the most common pain of all (Sternbach, 1985).

It would be misleading to make a comparison between reported prevalence rates without taking account of the differing methodologies of the studies in Tables 2.5-2.8. Considering the judgements made in relation to the five methodological criteria detailed above (see Section 2.1(f)), it is clear that not all studies in Table 2.5-2.8 can be viewed as unbiased. For example, where Herberts et al. (1984) report shoulder pain to be prevalent in only 2% of office workers in their baseline cross-sectional survey, it is unclear the extent to which this finding is reflective of the prevalence rate of all workers in their target population. Office workers in their sample were very much in the minority (for office workers, N = 57; for welders, N =131; for plate-workers, N = 188). It is unclear whether this may have led to biases in individuals selecting to take part, or to the under-reporting of pain in some groups, and/or the over-reporting of pain in others. Therefore, it is unclear whether the lower pain prevalence in office workers that these authors report is reflective of the "true" pain rate in office workers, and is not affected by selection bias or attrition bias.

One observation that may shed some light on the prevalence of shoulder pain elsewhere is that of Niedhammer and colleagues (1998), who report shoulder pain to be much higher in their cross-sectional sample (51.4%) of supermarket cashiers in France. This figure is likely to be nearer to the "actual" prevalence of shoulder pain in the target population, given that the authors included several controls in an attempt to limit the potential effects of several biases. Selection bias was reduced by the focus on one job-type, and both selection bias and performance bias may have been reduced by checking for the presence of previous musculoskeletal symptoms and/or pain in a physical examination. In addition, these authors quantified the physical exposure of work tasks by categorising workers in relation to duration of employment (exclusion of those working less than six months as a cashier; number of years worked previously; and number of hours worked regularly).

While there may have been selection bias, it is unlikely, given the strict inclusion criteria employed. In addition, the focus on the frequency of specific physical work tasks (stooping, working with arms above shoulder level, pushing heavy loads, holding heavy loads in position) allowed these authors to explore the extent to which exposure took place in the workplace in finer detail (hence reducing the potential effect of performance bias and detection bias) as well as allowing for possible adjustment for the confounding effect of various aspects of physical load.

The studies published by Herberts et al. (1984) and Niedhammer et al. (1998) illustrate a large discrepancy between prevalence rates of shoulder pain that can be partially understood in terms of differing methodologies. However, despite the relative "strength" of the latter study over the former, both can still be criticised regarding the extent to which they are representative of their target populations. Both Herberts et al. (1984) and Niedhammer and colleagues (1998) report prevalence rates from small samples (N = 376; and N = 238 respectively). However, only Niedhammer et al provide information regarding the extent to which their sample can be seen to be representative of supermarket cashiers in France (reported as N = 106 379 in 1993). It is likely that both of these samples represent only a fraction of the workforce they are targeting, making it difficult to generalise between both sets of findings and the working population as a whole.

The two studies discussed above also illustrate two very important points regarding this literature as a whole. First, the extent to which these prevalence rates are comparable with one another is questionable in that both studies record the pain prevalence in two very different populations. As a result, the discrepancy in prevalence rates between their samples may be because prevalence rates *are different* in each sample. It is highly possible that shoulder pain is more prevalent in supermarket cashiers than it is in shipyard workers (manual or non-manual). It is essential, therefore that actual population differences are considered when interpreting the prevalence rates in Table 2.4-2.7.

Second, the extent to which these prevalence rates are comparable with one another is questionable in that it could be argued that they record two very different phenomena. Herberts and colleagues take a measure of shoulder pain defined as, "pain, stiffness in the shoulder, (excluding effects originating from the neck)", whereas Niedhammer and colleagues take a measure of "shoulder disorder", defined as, "any pain, stiffness or discomfort in any of four shaded areas on a diagram in the last 6 months". These definitions differ in that: there is use of a diagram in one and not the other; they describe pain in different ways ("pain" in one case, "disorder" in the other); as well as in the nature of the prevalence they record. Niedhammer et al report on period prevalence of six months retrospectively, whereas Herberts et al give no details on the time interval to which individuals should attend when reporting shoulder pain. This lack of precision in pain outcome could be described as leaving findings open to detection bias, however, more importantly, when one attempts to compare both prevalence rates, the extent to which they can be seen as the same outcome is limited, and could lead to under- or over-reporting of pain in either group.

The difficulties with comparing between different pain measures are endemic within this literature. Although differences between the pain outcomes applied in these two studies discussed above have been focussed upon, in the comparison to other literature available in this area they present two reasonably similar descriptions of shoulder pain (in wording at least). Other authors have applied very different definitions of "shoulder pain". For example, Holmstrom Lindell & Moritz (1992) define shoulder pain as, "neck/shoulder trouble within last year"; whereas Andersen & Gaardboe (1993) asked individual to describe "a continuous pain episode in your shoulder lasting for a month or more in any period after (they) started (their) career." This issue is discussed in more detail in Section 2.4, however it is important to point out here that although Tables 2.4-2.7 present prevalence and incidence rates of pain, it could be argued that they are not always presenting rates *of the same phenomena.*

The difficulty in comparing occurrence of pain between definitions is further complicated by the various designs used by different authors. Comparing cross-sectional studies in Table 2.4-2.7 with the non-cross-sectional studies in Table 2.7, cross-sectional studies may be more open to the effects of bias and their analyses complicated by confounding variables. They can however provide information on the prevalence of various pain types in a given sample at a given time. Prospective studies, on the other hand, have the benefit of better controlling for bias as well as minimising (or at least quantifying) confounders. In attempting to gain an overall picture of a variety of pains occurring in a variety of workplaces, both approaches have their strengths and weaknesses. It is important, therefore, in interpreting the rates of pain given in Tables 2.4-2.7 that consideration is given to the fact that some studies are reporting prevalence, and others incidence.

Clearly it is difficult to generate an overall picture or idea of the occurrence of pain at work, due to differences between studies in the quality of methodologies, the populations studied, the populations examined, and the designs used.

There are however, some overall observations that can be made. According to the evidence above, on the whole, pain prevalence appears to be more elevated in working populations than in general populations. The majority of studies cited in Table 2.2 report a preponderance of pain in more manual occupations, leading to a great deal of debate surrounding the determinants of pain in the workplace (Frymoyer & Cats-Baril, 1987; Frymoyer, 1992). Some researchers attribute elevated levels of pain in manual labour to physical load at work and others to psychosocial load. However, most authors would agree that it is likely to be a combination of both (for a detailed discussion of this literature, see Sections 2.3 and 2.4 below). The preponderance of pain in working samples is not always consistent, however, as some researchers predicting pain to be higher in a specific working population have found pain levels to be comparable with the general population (Brown et al., 1998; Videman, 1984). In addition, other studies report non-work factors to be just as predictive of pain as work factors (Papageorgiou et al., 1998).

In summary, then, it is clear that pain in general and working populations is common, and research shows it to be commonly experienced in a variety of sites. Observations of prevalence and incidence are, on the whole, inconsistent, most probably due to differing methodologies and populations included.

2.3 Evidence for risk factors for pain at work

Previous research relating work factors to pain is heterogeneous in its approach to pain, pain type, design and populations measured. As a result, there is marked inconsistency between findings. Indeed, this inconsistency is to be expected given the major differences in methodologies, designs, working populations, and pain type examined. Nonetheless, some patterns have emerged, relating physical and psychosocial aspects of work to pain. Each of these will be discussed in turn.

(a) The influence of physical factors on pain at work

As illustrated in Tables 2.4-2.7, it is generally accepted within the field of occupational health that individuals working in manual labour are at greater risk of suffering pain or experiencing an injury at work (Burdorf et al., 1998; Hildebrandt et al., 1995). This effect of manual labour is often attributed to physical activity at work, for instance, increased postural load has been found to increase the risk of a variety of pains in a variety of working populations (Gyntelberg, 1974; Herberts et al., 1984; Burdorf et al., 1998; Behrens, 1994; Fujimura, 1995; Heistaro, 1998, amongst others). This increased risk of pain has been related to various physical movements, including: repetitive movements in musculoskeletal disorders (Herberts et al., 1984; Lemasters et al., 1998); heavy lifting and back pain (Lau et al. 1995, Macfarlane et al., 1997); transfer of heavy loads and back pain (Fujimura, 1985); and bending and twisting at work in relation to various injury and pain risks (Keyserling et al., 1988, Videman et al. 1989), to name but a few.

However, findings in working populations are not always consistent, with several researchers finding levels of physical activity or workload to be unrelated to increased risk of musculoskeletal problems or pain (Bigos et al., 1991; Deyo & Tsui-wu, 1987; Fjellman-Wiklund & Sundelin, 1998; Papageorgiou et al., 1998; Wickstrom et al., 1998). The study by Bigos et al (1991) is particularly interesting, as it involved a large sample (N = 1569), representing at least three-quarters of the target population. Bigos and colleagues (1991) prospectively measured the incidence of back pain in a group of aircraft engineers, from which were identified a large pain-free cohort (N=1569), followed for up to three years after baseline. To generate this cohort, extensive screening for concurrent illness took place, and participants were excluded if they had back symptoms at baseline, or had experienced work-disabling back pain in the last six months. All of these reduce the possibility of selection and performance bias in Bigos et al's findings, and provide the information with which to estimate the potential confounding influences of physical load at work, and previous musculoskeletal symptoms. The fact then, that no physical factor was related to back pain in Bigos et al's data is a somewhat powerful finding, and has led to the general belief that the role of physical work factors in determining pain is not a straightforward mapping between physical load and physical symptoms.

The diversity of measures used in various studies does not always help to clarify the nature of the relationship between physical workload and pain. For example, researchers have employed a variety of measures, ranging from workplace observation (for example: Anderson, 1984; Herberts et al., 1984; Burdorf, Naaktgeboren & de Groot, 1993), to self-report of own workload (for example: Gatchel et al., 1995; Bovenzi & Zadini, 1992; Foppa & Noack, 1996; van Poppel et al., 1998; Schwartz et al., 1998; Pope et al., 1998), as well as physical examination (for example: Biering-Sørensen, 1986; Battié et al., 1990; Bigos et al., 1991; Anderson, 1992; Leino & Hänninen, 1995). Had there been more uniformity between physical measures, it may be that a more concrete and consistent profile of associations between specific physical tasks and pain would emerge from research. This is not to say that patterns do not exist, merely that they can only be approximated. Thus the extent to which different measures can be compared across populations is restricted. However, even where the same measure is used, differing associations are reported. For example, nine studies administered the Nordic questionnaire to assess various pain types (Kuorinka et al., 1987) in various populations (Hagen et al., 1998; Brulin et al., 1998; Burdorf et al., 1998; Fjellman-Wikund et al., 1998; Harreby et al., 1996; Moens et al., 1993; Skov et al., 1996; Suadicani et al., 1994; Westerling & Jonsson, 1980). Of those that examine low back pain in a working population with this measure, prevalence rates differed considerably: 24% in one study (Hagen et al., 1998); 40% in another (Brulin et al., 1998); 50% in another (Burdorf et al., 1998), and over 60% in yet another (Moens et al., 1993).

The most obvious explanation for this inconsistency is that these findings are reflective of actual population differences. However, an alternative suggestion has been proposed, that physical factors contribute not in terms of physical work, but in terms of the other factors that accompany physical and manual labour. Manual workers, for example, may experience poorer working and living conditions than their non-manual counterparts (Davey-Smith, Hart & Watt, 1998; Marks et al., 2000). As a result, research in the last twenty years has shifted from the examination of physical factors to include the examination of psychosocial factors, either in combination with physical factors, or on their own.

(b) The influence of psychosocial factors on pain at work

The literature surrounding psychosocial risk factors for pain is also heterogeneous, relating a myriad of psychosocial variables to many different types of pain and musculoskeletal symptoms. Psychosocial factors are not limited to those experienced directly or indirectly in relation to work, but have included variables such as leisure time activities (Papageorgiou et al., 1998), or the effect of not being in work (Harreby et al., 1996). Table 2.2 shows that the current literature search revealed over 100 articles relating psychosocial risks to pain between 1980 and 1998. When the potential for different psychosocial measures is taken into consideration, as well as the different types of pain, and the variety of working populations, this becomes a very complex literature to synthesise. The articles relating firstly to evidence for lifestyle risks for pain in working populations, and secondly for work risks for working populations are summarised in Tables 2.8-2.26 in forthcoming sections. As already mentioned, these papers are not intended to be a comprehensive list, but are merely indicative of the variety and magnitude of literature available in this area, and the various approaches that have been applied.

(c) Associations between demographic factors and pain at work

Throughout the literature, several different lifestyle factors have been related to increased risk for pain at work. Tables 2.8-2.11 summarise the evidence for the associations between these factors and a variety of different pains. As can be seen, individuals in certain demographic groups have been reported to be more at risk of work-related pain. These effects are discussed below.

(i) Age and pain risk

Pain prevalence has been shown to vary across different age groups using a variety of different pain measures in a variety of different populations (see Tables 2.8-2.11 below). The pattern of this variability is not uniform across age groups. In some cases, pain prevalence or incidence is higher in older age groups (Westerling & Jonsson, 1980; Herberts et al., 1984; Videman et al., 1984; Deyo & Tsui-wu, 1987; Helliwell et al., 1992; Westgaard & Jansen, 1992; Andersson et al., 1993; Moens et al., 1993; Masset et al., 1994; Suadicani et al., 1994; Toroptsova et al., 1995; Hagen et al., 1998; Niedhammer, 1998), while in others reported pain is higher in younger age groups (Sternbach, 1985 ; Westgaard et al., 1993; Fujimura et al., 1995). In addition, the strength of this association varies, with some authors reporting a crude association between age groups and pain prevalence or incidence, but no adjusted association (Bigos et al., 1991; Bergenudd & Nilsson, 1994); while other authors report the converse (Ahlberg-Hulten et al., 1995).

Many authors do not actually report adjusted associations between age and pain prevalence or incidence, but assume age to be an important confounder, adjusting for it in multivariate analyses, or presenting data stratified by age group (Hasvold & Johnsen, 1993; Croft & Rigby, 1994; Engels et al., 1996; Skov et al., 1996; Thorbjornsson et al., 1998; Wickstrom & Pentti, 1998). Clearly, therefore, the association between age and pain is complex, and at times has not even been observed at all (Rafnsson et al., 1989; Anderson, 1992; Manninen et al., 1995; Ebeltoft et al., 1996; Lemasters et al., 1998; Van Poppel et al., 1998).

In interpreting the relationship between age and pain, it is important to consider the methods used in different studies. Although many studies in Table 2.8-2.11 report an association between age group and pain, very few do so on the basis of what might be considered "strong" evidence. In a reasonably large sample (N=1573) of Canadians randomly selected in a cross-sectional study for telephone interview, Pryse-Phillips and colleagues (1992), for example, report headache to be more common in individuals aged between 25 and 44 than in other age groups. However, it is possible that the final study sample could be described as somewhat biased, given the attrition rate reported by these authors. Of over 24 000 households randomly selected and approached for interview, the authors were unable to contact over 16 000, and a further 983 households were described as "ineligible" calls. Of the 6502 households with whom contact could be established, more than half (3597; 55.3% of those contactable) refused to participate in the interview. It is unclear why this was the case, and the authors offer little insight as to why the refusal rate was so high. It is possible that those who were interviewed were biased in a particular direction regarding their reporting of headache, although the nature of this is difficult to surmise given the lack of information provided by authors. An analysis of non-responder data might have helped to clarify whether those responding were (for whatever reason) different from those who did not. At the very least, it is unclear to what extent the 2905 who agreed to be interviewed were representative of the age groups found in the 24 159 target population.

The sampling technique used by Pryse-Phillips and colleagues prevented them from gaining background information on non-responders. Although these authors were able to establish demographic characteristics of their cross-sectional sample, very little information was recorded in relation physical or psychosocial workload, with questions being focussed on capacity to continue "daily activities". It is on the assumption that these "daily activities" would include work that the study by Pryse-Phillips and colleagues is included in the current review, although the authors do not discuss physical or psychosocial work factors specifically. The lack of specification of outcomes (potential detection bias) leads to difficulties in interpreting Pryse-Phillips et al's results, both internally, and externally in relation other studies.

There is one final criticism of Pryse-Phillips et al's study that deserves mention. These authors provide only univariate analysis of the associations between all psychosocial factors and headache. Without adjustment for potential confounders, it is unclear whether the "age association" they report is in fact between age and headache, or whether this was the observation of the influence of another confounding factor, or indeed an interaction between age and another factor. Given that Pryse-Phillips et al also report a gender-difference in the prevalence of headache, it is possible that these two were interacting with one another. Without adjustment for confounders, it cannot be gauged to what extent the influence of age can be separated from that of other factors.

One does not have to look far in the literature to find evidence of the effect of age interacting with other demographic factors in relation to the prevalence of pain. Many authors report an interaction between age and gender. For example, some authors report variation in pain prevalence or incidence in older age groups, but only in men (Hildebrandt et al., 1995; Foppa & Noack, 1996; Westgaard & Jansen, 1992; Heistaro et al., 1998), while other authors report highest prevalence in men aged 55-59, and in women aged 50-55 (Andersson et al., 1993). Other demographic variables appear also to interact with age, as Bergenudd & Nilsson report the risk of musculoskeletal pain to be higher in older individuals with lower levels of education (1994). For example, examining low back pain in nursing aides, Fujimura and colleagues (1995) report an association between age and low back pain, such that prevalence rates are higher in younger age groups. Multivariate analysis showed middle-age (in this case the mean age) to be the second highest predictor of back pain in their population (Fujimura et al., 1995). Videman et al. (1984) also report an association between low back pain and age in nursing aides, however they report pain prevalence to *increase* with age.

These differing findings are likely to be related to methodological differences in studies. Both studies assume physical load from job titles, which, assuming standardised measures were adopted, may limit the potential influence of selection bias. In addition, both adjust for confounders such as gender through multivariate analysis and/or stratification, and both present data from at least two-thirds of their target populations. However, Fujimura and colleagues provide details of previous pain symptoms in their questionnaire, whereas Videman et al (1984) make no such provision. Fujimura et al are therefore able to adjust for the potential effects of previous symptoms on the association between age and low back pain, whereas for Videman and colleagues (1984) this is not possible. Therefore it is unclear whether the association between back pain and age reported by Videman et al is related to age *per se*, and is not a combined effect of age and previous pain history. This may explain the increase in age, as one might expect that the older an individual is, the longer a medical history they have, and the more likely they are to have had a previous pain symptom within this history.

It is important to draw some sort of conclusion as to whether there is an association between age and pain, and this can best be done in relation by examining methodological criteria on which the studies in Table 2.8-2.11 were judged. Of the thirty-two studies reporting an adjusted or unadjusted association between age and pain (nineteen an unadjusted association only; three an adjusted association only; and ten an association before and after adjustment), ten met with four or more quality criteria discussed in Section 2.1(e) above (Westerling & Jonsson, 1980 ; Bigos et al., 1991; Chiou & Wong, 1992; Moens et al., 1993; Masset & Maclaire, 1994; Fujimura et al., 1995; Manninen et al.,1995; Foppa & Noack, 1996; Suadicani et al., 1994; Niedhammer et al., 1998), and two of which met with all five criteria (Chiou & Wong, 1992; Manninen et al.,1995).

Findings from studies meeting with all five criteria directly contradicted each other, with one reporting an unadjusted and adjusted association between age and back pain (Chiou & Wong, 1992); and the other no such association before or after adjustment (Manninen et al, 1995). Both of these studies focussed on specific working groups participating in manual labour, with Chiou & Wong focusing on nurses, and Manninen and colleagues studying farmers. Both studies used respective job titles as indicators of physical load, both take measures of previous pain, and both adjusted for confounders using regression analysis. One striking difference between samples is that the mean age in Manninen et al's sample was much higher (49.3 years in men, and 49.5 years in women) than in Chiou & Wong's sample (25.2 years). It may be then that this discrepancy between findings is the result of these age differences (thus over-population of certain age groups in their respective samples).

Clearly the relationship between age and pain is a complex one. Given the variety of populations addressed, different types of pain examined, different methods and designs used in exploring the relationship between age and pain, it is perhaps not remarkable that the effect of age is not uniform across studies. An important observation to make about all the studies in Tables 2.8-2.11, is that the inclusion of age in analyses, even if it is just as a confounder, appears to alter the effects of other variables on pain. As such, it is likely that age-specific variability between pain prevalence does exist, either directly or indirectly, although the nature of this variability is not easy to predict.

(ii) Gender and pain risk

Tables 2.8-2.11 also summarise observed relationships between gender and a variety of pains in a variety of populations. An association between gender and pain prevalence is common in the literature (see Tables 2.8-2.11 below), and the majority of authors report higher prevalence or incidence in women (Westerling & Jonsson, 1980; Sternbach, 1985; Deyo & Tsui-wu, 1987; Biering-Sorensen & Thomsen, 1986; Pryse-Phillips, 1992; Andersson et al., 1993; Hasvold & Johnsen,1993; Croft & Rigby, 1994; Hildebrandt et al., 1995; Leino et al, 1995; Foppa & Noack, 1996; Harreby et al., 1996; Heistaro et al., 1998). Moreover, this gender effect appears to be stable over time, and has been observed in the same cohorts: one (Biering-Sorensen & Thomsen, 1986); ten (Leino et al., 1995) and twenty-five (Harreby et al., 1996) years apart.

Tables 2.8-2.11 show that sixteen studies report an association with gender, eleven of which report an association after adjustment for other factors. Only four of the studies reporting an adjusted association between gender and pain meet four or more of the "quality criteria" described in Section 2.1(e) above (Westerling & Jonsson, 1980; Bergenudd & Nilssson, 1994; Harreby et al., 1996; Foppa & Noack, 1996; Skov et al, 1996). As such, it is difficult to draw any conclusions regarding studies (other than the four discussed above), without taking account of the fact that they were not all of the same quality of design, and many have some important elements missing.

Leino and colleagues (1995), for example, report a relationship between gender and musculoskeletal pain both before and after adjustment for confounders. These authors measure physical load in their sample in detail and their self-report measure of "musculoskeletal morbidity" is comprehensively verified by a physical examination. However, despite these advantages in reducing bias, their findings may be affected by attrition bias, as only 901 of the 2653 individuals (35%) that were originally approached were included in the final cohort. In addition, follow-up of individuals who remained "occupationally active" was complete for only half (N = 411) of this cohort ten years later. This means that the resulting sample represented less than one fifth of those first approached for participation. Leino and colleagues report some descriptive differences between non-responders and responders, although these are not formally analysed. It is unclear, therefore, the extent to which Leino et al's resulting cohort can be seen to be representative of the original sample, or whether it can only be seen to be representative of those who were willing to participate, responded, and who were still able to work and interested in responding ten years later. Moreover, the possibility of attrition bias means that the extent to which characteristics potentially affecting outcomes differed between responders and non-responders cannot be estimated.

Just as difficulties can be highlighted regarding studies that present a relationship between gender and pain, so issues can be raised with regard to studies that *do not* present a relationship between gender and pain. Toroptsova and colleagues (1995), for example, report no gender difference in the prevalence of lower back pain (LBP), focusing on employees of a machine-building factory in order to adjust for the influence of physical load. These authors include a physical examination in their design, but do not report taking a history of previous pain or medical problems, thus not allowing for adjustment for ongoing medical conditions or previous pain problems. Moreover, as they present only univariate and bivariate analyses of associations, there is no way to assess whether the lack of an association between gender and LBP in their study is "real" or the result of the gender association being disguised or altered by the influence of another factor.

Indeed, an interaction between gender and other factors is common in the literature, and has been reported by many authors (Bergenudd & Nilsson, 1994; Papageorgiou et al., 1998; Thorbjornsson et al., 1998). It would appear that the potential for interaction with gender extends beyond other demographic factors, as some authors report an interaction between gender and pain type. Skov and colleagues (1996), for example, report neck and shoulder pain to be more prevalent in women than in men, but do not find the same association in back pain.

Gender specific variation in the perception of pain is not a new finding in pain research, as over recent decades it has become generally accepted that both women and men tend to experience pain, report pain, and be affected by it in different ways (Unruh, 1996). It is therefore not surprising that interaction between gender and work factors in relation to pain prevalence has been reported. What is surprising, however, is the extent to which there is evidence of *no gender effect* in studies of reasonable quality. Three studies report no gender difference in pain prevalence after adjustment for other factors (Bigos et al., 1991; Rotgoltz et al., 1992, Suadicani et al., 1994), two of which meet four of the five methodological criteria discussed in Section 2.1(d). However, in every case these authors placed gender into their adjustment models as a single factor, rather than analyse each gender separately. Indeed, where genders are analysed separately, different pain risk profiles emerge (Bergenudd & Nilsson, 1994; Papageorgiou et al., 1998; Thorbjornsson et al., 1998). This can be seen clearly in the discussion of Papageorgiou et al's findings for the interaction between work factors and gender below (see Section 2.3(e)). It can be argued that the lack of association between gender and pain in the studies above (Bigos et al, 1991; Rotgotlz et al, 1992; and Suadicani et al, 1994) have been "hidden" in the type of analyses these authors carried out. Had both genders been analysed separately, perhaps (and only perhaps) gender variation would have been more observable.

There have been several explanations proposed in relation to the gender differences found in pain. It has been suggested, for example, that gender differences in reporting pain are the result of a diminished pain threshold in females, and hence an increased sensitivity to painful stimuli (Theorell, 1992). Theorell and colleagues provide evidence for a gender difference in pain perception, suggesting that pain threshold may provide the key to understanding gender differences in pain experience. This would suggest that gender effects are due less to differences in the occurrence of pain, but more to the propensity to experience it, or to report it (Theorell et al., 1992). Indeed, most authors would agree with the observation that gender-related variability in pain is related to a combination of biological, psychological and social factors (Unruh, 1996).

Leino and colleagues compared subjective pain symptoms with the results of physical examinations by physiotherapists, in relation to a number of different pains and different occupations (1995). Although perceived symptoms tended towards agreement with clinical pain indices for many factors (for example occupation type) there was a gender-related difference between subjective symptoms and clinical findings. Specifically, in their one-year follow-up study, women were significantly more likely to report pain in the shoulders, neck, back and limbs. Clinical observations of these body sites showed no gender differences, suggesting a discrepancy between the perceptions of pain, and the actual clinical evidence of pain. Although Leino et al.'s study sample was likely to be prey to bias (see above), this finding points to the potential importance of studying pain perceptions as well as pain prevalence, an issue that will be discussed in more detail in Section 2.5. For the moment, however, it is important to note this finding as indicative of the complexity of the relationship between gender and pain, and the potential for gender-related inconsistencies in pain reporting, dependent on the measure taken.

In relation to previous research, therefore, it is clear that there are observable gender differences in the prevalence of pain at work. It is not always the case that pain is more prevalent in one gender than the other, but that pain appears to be *different* in relation to gender, such that some factors are more associated with pain in men and others with pain in women. For now, it can be concluded that there appears to be gender-specific variation in the prevalence of pain in the workplace, although the nature of this relationship is not always consistent between studies.

(iii) Other demographic variables and pain risk

Tables 2.8- 2.11 show that other relationships between other demographic variables (family circumstances, smoking, socioeconomic group, education and previous symptoms) and pain prevalence have been reported, although these factors tend to have received less research attention than age and gender overall. Each of these factors will be discussed below in turn.

Ten studies report an association between socioeconomic circumstances and pain prevalence, five as a crude association before adjustment (Westerling & Jonsson, 1980; Deyo & Tsui-wu, 1987; Andersson et al., 1993; Bergenudd & Nilsson, 1994; Xu et al., 1996; Hagen et al., 1998) and five as an adjusted association when other factors are taken into consideration (Westerling & Jonsson, 1980; Biering-Sorensen & Thomsen, 1986; Croft & Rigby, 1994; Harreby et al., 1996; Heistaro et al., 1998 Biering). Limited support can be seen for an adjusted association where studies are of reasonable quality (Westerling & Jonsson, 1980; Croft & Rigby, 1994; Harreby et al., 1996; Heistaro et al., 1998); some of which are reported after long-term follow-up. Harreby and colleagues (1996), for example, followed up a cohort of Danish school children examined twenty-five years earlier (in 1965) for musculoskeletal health. Individual physical load at work was examined in the follow-up cross-sectional questionnaire, and history of previous low back pain symptoms were approximated by results of physical examinations carried out in 1965. Although this represented a somewhat small sample (N = 578) they represented the majority of the original 1965 cohort (90.3%). Cross-sectional data from 83% of this cohort revealed that lower social group (as defined by a standardised classification system and occupational titles) was the most important risk factor for the development of severe LBP men. No such association was found for women. Not only does this finding provide a reasonable illustration of the relationship between socioeconomic circumstances and increased risk of pain, but it also shows the potential for interaction between gender and other factors as discussed above. This interaction between socioeconomic circumstances and gender is also noted in other cross-sectional studies of reasonable quality (Croft & Rigby, 1994).

Individuals in less privileged socioeconomic circumstances have also been shown to be more at risk of neck/shoulder pain in studies of reasonable quality (Westerling & Jonsson, 1980). This relationship is not always observed, however, with some authors reporting no association between socioeconomic factors and back pain in prospective studies that met four out of the five "quality criteria" discussed in Section 2.1(e) above (Bigos et al., 1991; Masset et al., 1994; Foppa & Noack, 1996).

One of the greatest difficulties in interpreting socioeconomic data lies in the variety of measures that are applied. The studies in Tables 2.8-2.11 range from classifying individual occupations by standardised systems (Biering-Sorensen & Thomsen, 1986; Croft & Rigby, 1994; Hildebrandt et al., 1995; Xu et al., 1996; Papageorgiou et al., 1998), to more vague classifications such as "white" versus "blue" collared workers (for example, Heistaro et al., 1998). As such studies may be prone to selection and detection bias, and researchers should be cautious when drawing conclusions, given that one can never be sure that the measures of socioeconomic circumstances in one study correspond with the measures used in another. However, even where the measures used to classify socioeconomic status are similar, findings are inconsistent. For example, Biering-Sorensen and Thomsen (1986) report a relationship between lower socioeconomic status (and back pain in a general population, whereas Croft & Rigby (1994) report no such relation using the same classification system in examining back pain in a general population. Although both authors report on general populations, the extent to which these two findings can be compared, however, is questionable. For instance, whereas Croft and Rigby discuss prevalence of "any problems with a bad back" (1994), Biering–Sorensen & Thomsen discuss recurrence or first time experience of "pain or other trouble in the lower part of [one's] back" (1986). This issue is discussed in more detail below in Section 2.4, however it suffices to say here that the differences in definitions of pain outcome used in studies make comparison between studies problematic, and prevent overall conclusions being made.

Another difference that may partially account for the discrepancy between these two findings is that Biering–Sorensen & Thomsen provide longitudinal evidence from two cross-sectional studies twelve months apart, whereas Croft and Rigby present only cross-sectional evidence from one time period. In this way Croft and Rigby report an association between socioeconomic status and (recalled) pain prevalence within the last month, whereas Biering–Sorensen & Thomsen report an association between socioeconomic group (SEG) and recurrence or first time experience of low back pain within their twelve-month follow-up. Taking these observations into consideration, it may be that although the same measure of socioeconomic circumstances was being applied in similar population, both sets of authors were in fact measuring *different phenomenon* within different time intervals.

In terms of the validity of the socioeconomic group classification system (SEG) applied by Croft and Rigby (1994) and Biering-Sorensen and Thomsen (1986), it is not clear whether SEG can be seen as a valid approximation of a relationship between pain and deprivation (or not). For example, there were observed differences between measures of deprivation taken *within* Croft and Rigby's study, such that an association was reported between income and back pain, but no association between SEG and back pain (Croft & Rigby, 1994). In addition, this was the case for women, and not for men, again reaffirming the potential for interaction between gender and other demographic factors. It can be concluded, therefore, that there appears to be an association between socioeconomic circumstances and work-related pain, however the magnitude of this relationship differs in relation to design, measure of socioeconomic status applied, and most likely in relation other demographic factors.

There is some evidence to suggest that prevalence of back pain is higher in those with lower levels of education in general populations (Bergenudd & Nilsson, 1994; Croft & Rigby, 1994; Deyo & Tsui-wu, 1987; Heistaro et al., 1998) and in working populations (Chiou & Wong, 1992; Foppa & Noack, 1996; Harreby et al., 1996; Toroptsova et al., 1995). Once again, however, only some of these studies report relationships after adjustment, and many of these in studies that were of "better quality" than others (Croft & Rigby, 1994; Foppa & Noack, 1996; Heistaro et al., 1998; see Table 2.8-2.11). Contradictory evidence is published in a study of reasonable quality (Bigos et al., 1991; see above for more details of this study). However, to view these studies as "contradictory" at "face-value" is somewhat misleading, as there is substantial variety in the measures of "educational level" used within studies. For example, those studies reporting an association between pain and "educational level" do so in terms of: "highest qualification achieved" (Croft & Rigby, 1994); "basic education" versus "higher education" (no further details reported; Foppa & Noack, 1996); or "number of school years" (Heistaro et al., 1998). Moreover, the study reporting *no* association between pain and "educational level" did so as "highest level of education" (five points of exit ranging from "Grade school" to "Graduate or Professional School"; Bigos et al., 1991). It may be, therefore, that the lack of association between education and pain in Bigos et al.'s study was related to the way it was categorised in analysis. As such, the variable of level of education may be less clearly associated with pain prevalence when split into more discrete qualitative categories, as opposed to using the dichotomous or continuous indexes of education used by Croft and Rigby (1994), Foppa & Noack (1996), and Heistaro et al. (1998) discussed above.

Very little research has been done relating levels of education to other (non-back) pain, but in that which has been done, it would appear that, as with back pain, higher levels of education are associated with a lower risk of various musculoskeletal pains in younger individuals (Bergenudd & Nilsson, 1994). It is likely, therefore, given this and the evidence in Table 2.8-2.11, that the level of education achieved is associated with pain prevalence. Given the variety of differing measures of educational level between studies, however, any overall conclusions should be made with caution, and with full consideration of the methodological differences between studies.

Previous research explores the potential links between family circumstances (such as marital status and family size) and different types of pain. Being married has been related to an increased risk of back pain in studies of reasonable quality (Chiou & Wong, 1992), although this association was shown to disappear after adjustment. There is also evidence that marital status presents no increased risk for a variety of pains including back pain (Deyo & Tsui-wu, 1987; Westgaard & Jansen, 1992; Bergenudd & Nilsson, 1994; Masset et al., 1994; Suadicani et al., 1994; Ahlberg-Hulten et al., 1995; Manninen et al., 1995; Foppa & Noack, 1996), although only of one these studies meets with all five methodological criteria discussed in Section 2.1(e) above (Manninen et al., 1995). It is possible that marital status interacts with perceived support, and there is a growing literature linking pain with support at work (see Section 2.3(d) below); as well as that linking social support with health in general (Ornstein & Sobel, 1986; Berkman et al., 2000). However this evidence suggests that pain and other negative health outcomes are *more* likely where social support is *less*, which would appear to conflict with some marital status findings. Of course any explanations within the literature are dependent on the extent to which marital status can be seen as a valid measure of support, about which there is considerable debate (Schwarzer, Knoll & Rieckmann, 2003). It is reasonable to conclude, therefore, that there may be a relationship between marital status and pain. However this relationship is not always consistent within the literature, and across designs and populations.

Table 2.8

Cross-sectional studies examining demographic and lifestyle risks for pain at work, as measured in a general or clinical population, sorted by pain type

Findings: + crude association or univariate effect; ++ association or effect after adjustment; O not tested or not reported; X specific effect not reported, but variable adjusted for through multivariate analysis or stratification;

- no crude association or effect found; - - no association or effect found after adjustment.

- [a]inc. measure of physical load; [b]inc. measure of symptom or pain history; [c]adjusted for confounders; [d]N=1000 or more in final sample; [e]response rate 80% or more

Back pain	Age	Gender	Socioeconomic group/Income	Education	Marital status	Family size	Smoking	Previous pain
Croft & Rigby, 1994 [acde]	X	X, ++	++	++	O	O	++	O
Deyo & Tsui-wu, 1987 [acd]	+, X	++	+	++	-	O	O	O
Ebeltoft et al., 1996	-	-	O	O	O	O	O	O
Rafnsson et al., 1989	-	-	-	O	O	O	O	O
Xu et al., 1996 [acde]	O	O	+	O	O	O	O	O
Other pain	**Age**	**Gender**	**Socioeconomic group/Income**	**Education**	**Marital status**	**Family size**	**Smoking**	**Previous pain**
Andersson et al., 1993 [MSK] [cde]	+	+	+	O	O	O	O	O
Bergenudd & Nilsson, 1994 [MSK] [bce]	+, - -	+, ++	+, - -	-, ++	-, - -	O	+, - -	O
Hasvold & Johnsen,1993 [NSP & Headache] [cde]	X	+	O	O	O	O	O	O
Pryse-Phillips, 1992 [Headache] [de]	+	+	O	O	O	O	O	O
Sternbach, 1985 [General pain] [cd]	+	+	-	O	O	O	O	O
Westerling & Jonsson, 1980 [NSP] [acde]	+, ++	+, ++	-, ++	O	O	O	O	O

*adjusted association between pain and income, but not with socioeconomic group

Pain types: MSK= Musculoskeletal Pain; NSP = Neck/Shoulder Pain

Studies in italics were taken from subsequent systematic reviews, and not from the current literature review (see Section 2.3(h) below)

Table 2.9

Studies of mixed design examining demographic and lifestyle risks for pain at work, as measured in a general or clinical population, sorted by pain type & design

Findings: + crude association or univariate effect; ++ association or effect after adjustment; O not tested or not reported; X specific effect not reported, but variable adjusted for through multivariate analysis or stratification;

- no crude association or effect found; - - no association or effect found after adjustment.

[a]inc. measure of physical load; [b]inc. measure of symptom or pain history; [c]adjusted for confounders; [d]N=1000 or more in final sample; [e]response rate 80% or more

Authors [Pain type]	Study design	Age	Gender	Socioeconomic group/Income	Education	Marital status	Family size	Smoking	Previous pain
Biering-Sorensen & Thomsen, 1986 [LB trouble] [bce]	Cross-sectional baseline, repeated on same cohort at T2 after 12 months	+, ++	+, ++	++	O	+; ++	O	+; ++	O
Harreby et al., 1996 [LBP] [abce]	Cross-sectional at T1 with cross-sectional follow-up 25 years later, same cohort	O	+, ++	+,++	+	-	O	+, - -	O
Heistaro et al., 1998 [BP] [cde]	Cross-sectional baseline repeated 4 times (T2,-5) on different cohorts every 5 years	+, X	+, ++	+, ++	+, ++	O	O	+, ++	O
Thorbjornsson et al., 1998 [LBP] [abc]	Cross-sectional baseline repeated at T2 after 34 years, and retrospective (between T1&T2) on same cohort	X	+, ++ split	O	O	O	O	O	+,++

Pain types: BP = Back Pain; LBP = Low Back Pain

Table 2.10

Cross-sectional studies examining demographic and lifestyle risks for pain at work, as measured in a working population or comparing working populations, sorted by pain type

Findings: + crude association or univariate effect; ++ association or effect after adjustment; o not tested or not reported; x specific effect not reported, but variable adjusted for through multivariate analysis or stratification; - no crude association or effect found; - - no association or effect found after adjustment.

[a]inc. measure of physical load; [b]inc. measure of symptom or pain history; [c]adjusted for confounders; [d]N=1000 or more in final sample; [e]response rate 80% or more

Back pain	Age	Gender	Socioeconomic group/Income	Education	Marital status	Family size	Smoking	Previous pain
Anderson, 1992 [abe]	-	-	o	o	o	o	o	o
Chiou & Wong, 1992 [abcde]	+, ++	o	o	+, - -	+, - -	o	o	o
Foppa & Noack, 1996 [abce]	+, ++	+, ++	-, - -	+, ++	-, - -	-, - -	+, ++	o
Fujimura et al., 1995 [abce]	+; ++	o	o	o	o	o	o	o
Hildebrandt et al., 1995 [acd]	+	+	-	o	o	o	o	o
Masset et al., 1994 [abcd]	+	-	-	-	-	-	-	o
Moens et al., 1993 [bcde]	+	o	o	o	+	o	o	o
Rotgoltz et al., 1992 [abc]	o	-, - -	o	o	o	o	o	o
Suadicani et al., 1994 [abce]	+, ++	-, - -	o	-	-	o	-, - -	o
Toroptsova et al., 1995 [ae]	+	-	-	+	+	o	-, +	o
Videman et al., 1984 [abc]	+	o	o	o	o	+, ++	o	o
Other pain	Age	Gender	Socioeconomic group/Income	Education	Marital status	Family size	Smoking	Previous pain
Ahlberg-Hulten et al., 1995 [MSK pain][ac]	-, ++	o	o	o	-	-	o	o
Brulin et al., 1998 [MSK symptoms] [ace]	+; x	o	o	o	o	+; ++	o	o
Hagen et al., 1998 [NS & LB disorders] [acd]	+	o	+	o	o	o	o	o
Helliwell et al., 1992 [WRULD] [abc]	+	o	o	o	o	o	o	+
Herberts et al. ,1984 [S pain] [ac]	+	o	o	o	o	o	o	o
Holmstrom, Lindell & Moritz, 1992 [NSP] [acd]	+, x	o	o	o	o	o	+	o
Lemasters et al., 1998 [MSK disorders] [bc]	-; - -	o	o	o	o	o	+, ++	-; ++
Niedhammer, 1998 [S disorders] [abce]	+; ++	o	o	o	o	o	o	o
Skov et al., 1996 [MSK] [acde]	x	++	o	o	o	o	++	o
Westgaard & Jansen, 1992 [MSK complaints][abc]	+, ++	o	o	o	-	+, ++	o	+,++
Westgaard et al., 1993(a&b) [MSK complaints] [abc]	+, ++	o	o	o	o	o	o	+; ++

Pain types: MSK= Musculoskeletal; NSP =Neck/shoulder pain; S = Shoulder; WRULD = Work-Related Upper Limb Disorder

Table 2.11

Studies of mixed design examining demographic and lifestyle risks for pain at work, as measured in a working population or comparing working populations, sorted by pain type & design

Findings: + crude association or univariate effect; **++** association or effect after adjustment; **o** not tested or not reported; **x** specific effect not reported, but variable adjusted for through multivariate analysis or stratification; **-** no crude association or effect found; **- -** no association or effect found after adjustment.

[a]inc. measure of physical load; [b]inc. measure of symptom or pain history; [c]adjusted for confounders; [d]N=1000 or more in final sample; [e]response rate 80% or more

Authors [Pain type]	Study design	Age	Gender	Socioeconomic group/Income	Education	Marital status	Family size	Smoking	Previous pain
Back pain									
Bigos et al., 1991 [B injury] [abce]	Prospective longitudinal, inception cohort followed up for 3 years	+, - -	-,- -	-, - -	-, - -	o	o	o	+; ++
Klaber-Moffett et al., 1993 [abc]	Prospective longitudinal: inception cohort, followed up every 3 months up to 20 months	o	o	o	o	o	o	-	-, - -
Leino et al, 1995 [B & limb disorders] [ac]	Cross-sectional baseline repeated on same cohort at T2 after 10 years	+; ++	+; x	+; ++	o	o	o	o	o
Papageorgiou et al.,1998 [abc]	Cross-sectional baseline with inception cohort followed up for 12 months	+	+	+, x/++*	o	o	o	o	+, ++
Van Poppel et al., 1998 [abce]	Cross-sectional baseline repeated 7 times (T2-8) on the same cohort within 12 months	-; - -	o	o	o	o	o	-; - -	+;++
Wickstrom & Pentti, 1998 [acde]	Cross-sectional baseline repeated on same cohort at T2 after 2 years	x	o	o	o	o	o	o	o
Other pain	**Study design**	**Age**	**Gender**	**Socioeconomic group/Income**	**Education**	**Marital status**	**Family size**	**Smoking**	**Previous pain**
Andersen & Gaardboe, 1993 [N & limb pain] [abc]	Case-control (matched age and sex)	++	o	- -	o	o	++	-	o
Sairanen et al.,1981 [LBP & OA]	Case-control, cross-sectional (matched for age) office workers and mill (lower back strain classes)	++	o						
Engels et al., 1996 [MSK pain] [ace]	Case-control, cross-sectional	+; x	-, x	o	o	o	o	o	-
Vasseljen et al., 1995 [NSP] [abce]	Case-control, prospective	o	-	o	o	o	o	o	o
Manninen et al., 1995 [LBP & NS] [abcde]	Cross-sectional with c-s follow-up at 12 years some of same cohort (pain-free)	-, - -	+, ++	o	o	-, - -	o	+, ++	o

* adjusted for socioeconomic group and found an adjusted association between pain and lower income

Pain types: B = Back; LB = Low Back Pain; NSP = Neck/Shoulder pain; S = Shoulder; MSK= Musculoskeletal pain; OA = Osteoarthritis

Studies in italics were taken from subsequent systematic reviews, and not from the current literature review (see Section 2.3(h) below)

Of the few authors examining the effect of having a family on pain risk, Brulin and colleagues (1998) report an increased risk of back pain in women with children at home, whereas Westgaard & Jansen (1992) report an association between *not* having children and low back pain. In interpreting these findings, it is important to consider that neither of these findings met with all five criteria for "strong" evidence in the current review. Although both adjusted for relevant confounders, neither drew conclusions from very large samples (N = 361; and N = 210) respectively) and only Westgaard & Janssen (1992) adjusted for previous musculoskeletal pain. It is difficult to interpret these findings, therefore, particularly in light of the lack of association between family size and pain published in studies of reasonable quality elsewhere (Masset et al., 1994; Ahlberg-Hulten et al., 1995; Foppa & Noack, 1996). It can be concluded that there is some, if inconsistent, effect of family circumstances on pain prevalence.

Several of the studies summarised in Tables 2.9-2.12 show smokers to have an increased likelihood of back pain (Biering-Sorensen & Thomsen, 1986; Croft & Rigby, 1994; Foppa & Noack, 1996; Harreby et al., 1996; Heistaro et al., 1998; Manninen et al., 1995; Toroptsova et al., 1995) while others find no such relationship (Masset et al., 1994; Klaber-Moffett et al., 1993; Suadicani et al., 1994; Van Poppel et al., 1998). This discrepancy between findings is only marginally diminished when the quality of studies is taken into consideration, with several of the studies reporting associations between smoking and pain (Croft & Rigby, 1994; Foppa & Noack, 1996; Harreby et al., 1996; Manninen et al., 1995); as well as several of the studies reporting *no* association between smoking and pain (Masset et al., 1994; Suadicani et al., 1994; Van Poppel et al., 1998). All of these studies meet four out of the five criteria discussed above (see Section 2.1(f)).

There also appears to be some interaction between smoking and other factors such as pain type. Skov and colleagues found smoking to be a predictor of shoulder pain, but not neck pain (Skov et al., 1996). Moreover, interactions between smoking and gender have also been noted. Manninen et al. (1995) report smoking to be predictive of, neck, shoulder, and lower back pain, but only in men. Clearly the effect of smoking on pain risk is a complex phenomenon, and as with most other demographic variables, many authors have sought to interpret it in both biological and psychosocial terms. One important feature of this relationship is the observed relationship between smoking and socioeconomic status, whereby it has been argued that smoking is one of several co-existing factors that contribute to poor health and deprivation (Reijneveld, 1998; Macintyre, Maciver & Sooman, 1993; de Vries, 1995; Townsend, Roderick & Cooper, 1994).

One final variable that is included in Tables 2.8-2.11 is the influence of previous pain. The importance of this variable has already been raised in relation to potential sources of bias discussed in Section 2.1(e) above. This variable can be seen as a demographic variable in that: it describes an invariant aspect of a population at the given time or period of study and as such it may be conceptualised as an individual factor. Indeed many authors including previous pain in their design treat it as a risk factor and/or a confounder.

Research shows that the effect of previous pain appears to be relatively consistent, with several authors reporting significantly higher pain prevalence in those with a history of pain. This is the case for back pain (Bigos et al., 1991; Papageorgiou et al., 1998; Thorbjornsson et al., 1998; Van Poppel et al., 1998) as well as other musculoskeletal complaints (Helliwell et al., 1992; Lemasters et al., 1998; Westgaard & Jansen, 1992; Westgaard et al., 1992). Moreover, in prospective data, previous pain appears to be a significant predictor of incident pain in several cases (Bigos et al., 1991; Lemasters et al., 1998; Westgaard & Jansen, 1992; Westgaard et al., 1992; Westgaard et al., 1993; Papageorgiou et al., 1998; Van Poppel et al., 1998).

It is logical that previous pain would predict subsequent pain, therefore at "face-value", this finding is perhaps not remarkable. It has been argued that a predisposition to experience pain is indicative of medical factors such as a chronic condition or previous musculoskeletal injury (Bongers et al., 1993). However, several of the studies presenting adjusted associations between previous and subsequent pain account for other musculoskeletal symptoms; adjust for physical workload; and/or adjust for other confounders (Papageorgiou et al., 1998; Van Poppel et al., 1998). In this way, previous pain may be significantly related to subsequent pain, even where the effects of physical load or co-morbid musculoskeletal illness were taken out. In addition, Bigos and colleagues (1991) report previous pain to be predictive of *new* back injury in a working cohort where no previous pain problem was apparent.

It is possible that the report of previous pain is indicative of a dispositional tendency to perceive or attend to pain when it happens, rather than of a predisposition to a medical or work-related musculoskeletal disorder. Although there is some evidence to suggest that dispositional (rather than medical or work-related) factors may also be related to pain (Bigos et al., 1991; Klaber-Moffett et al., 1993; Gatchel et al., 1995; Karoly et al., 1996), in most of the studies in Tables 2-9-2.12 the distinction between dispositional and physical factors is impossible to make. Indeed, the fact that there is cross-sectional (Fujimura et al., 1995) and prospective (Klaber-Moffett et al., 1993) evidence of reasonable quality *against* an association between previous pain and subsequent back pain reports suggests that this effect is more complex than it would seem. As with many of the factors already discussed, it seems likely that the prevalence of pain is the result of a combination of biological and dispositional factors.

One issue with research measuring previous pain is that these studies tend to focus on pain that is troublesome or problematic in nature, presumably on the assumption that controlling for or excluding a "troublesome or problematic" musculoskeletal disorder will enable examination of a cohort that was previously "pain-free", or for whom previous pain can be quantified (for a detailed discussion of this issue, see Methods Section 3.1). This would seem to be sensible and achievable where the focus of study is site-specific pain of a specific intensity. It may be that these individuals are indeed free of specific troublesome pain, however this approach does not take into consideration all of the pain that occurs on a daily basis, nor does it consider pain that occurs for reasons not related to musculoskeletal disorders. Pain is commonly observed in a variety of serious and non-serious conditions (Ogden, 1998; Main & Spanswick, 2000), the experience of which could be described as "previous pain". An individual participating in a back pain study, for example, may have experienced pain of reasonable intensity due to an uncharacteristic kidney infection in the previous twelve months, and may therefore report previous back pain. This bears no relation to a musculoskeletal disorder, nor does it relate to an ongoing chronic condition. However, it is "previous pain" in the back nonetheless. It is essential, therefore that the cause of pain is recorded, and although it does take place in some studies measuring previous pain, often the cause of specific pain in specific sites is assumed.

In taking a general approach to pain, the extent to which previous pain can be is problematic, and it is perhaps more meaningful to record whether the individual has a chronic condition or not. This, combined with a measure of pain cause, can be used to gauge the extent which pain experienced might be expected as a result of a musculoskeletal disorder, chronic condition, or anything else for that matter. Moreover, this may reduce performance bias, so that researchers can be clearer as to whether the pain reported in a study is the result of the exposure to the variable they wish to study (in most cases, work) as opposed to any other variable (for example, genetics). Finally, inclusion of a measure of concurrent illness enables evaluation of the extent to which concurrent illness may have a confounding influence on the propensity to report pain which reported pain (if indeed it does).

(d) Interpreting the effects of demographic variables on pain risk

There is a great deal of inconsistency within the literature surrounding demographic and lifestyle risks for pain. Where a risk for pain is reported, there tends also to be evidence to support no elevated risk for that variable. This is the case for every risk factor reported in Tables 2.8-2.11. It is important to remember however, that not all of this evidence is equal, and while many observations come from studies of reasonable quality, others do not measure key variables, do not adjust for confounders and/or report on small samples with high attrition rates.

As discussed above, several authors have proposed a variety of explanations for associations between demographic variables and pain, ranging from physical to psychosocial mechanisms. Given that many of the effects discussed above represent interactions between different factors such as gender and age, age and socioeconomic status and so on, it is likely that a combination of different risk factors, rather than of single risk factors alone affects pain risk. Indeed, whether the influences of socioeconomic opportunity, manual labour, smoking and poor health can be separated from one another at all is debateable and it is likely that their combined influence contributes to ill-health and deprivation. It may be then that these indices of *less healthy* *psychosocial circumstances* combine to intensify the experience of pain. Section 2.2 above discusses the possible elevated risk of pain in manual workers, and suggests that physical load may be only one of the contributory factors. Many authors have suggested a link between the fact that manual labour is often accompanied by poor pay, and the fact that it is usually done by those with lower levels of educational achievement (Marks et al., 2000). It is unclear whether this is due to the physical factors (for example diet; physical work) or psychosocial factors (for example restricted opportunities; low self-esteem), and is likely to be a combination of both. In addition, the discussion of the influence of previous pain above (Section 2.3(c)) suggests that the effects of demographic factors are difficult to separate from dispositional factors, and the report of pain is likely to be influenced by both (Horn & Munafo, 1997; Skevington, 1995).

The current thesis argues for the importance of pain perceptions, and seeks to highlight the psychosocial accounts of lifestyle factors and their influence on pain. It will be argued that the pain experience is as important to document as the occurrence (prevalence or incidence) of pain, and therefore the influence of psychosocial factors on the pain experience merits study. In relation to this perspective, the current study questions whether manual labour or poor lifestyle predict pain specifically, or whether when pain occurs, these factors contribute to an unhealthy environment in which to experience pain. As such, specific lifestyle variables may contribute to a psychosocial environment that influences an individual's experience of pain, as well as their propensity to report it. As will be argued later (Section 2.4) aspects of the psychosocial environment in relation to the experience of chronic pain is well-discussed in the literature, however, few researchers have explored its influence on the pain experience, from a generic epidemiological perspective.

Regardless of whether previous pain is indicative of biological or dispositional factors (or both), there is a clear observation to be made here. Put simply, it would appear that some people experience pain more regularly, and are troubled by it more or less than others over time. Very little is recorded about the pain *experience* in the studies reviewed here, an issue that the current study aims to address (see Section 2.4).

The current study will examine a selection of the demographic factors discussed above (age, gender, marital status, family size, chronic condition as a proxy of previous pain) and their relation to pain prevalence. Based on previous literature, some of the differences between demographic groups can be predicted while others cannot.

The rationale for examining pain as a general concept will be discussed in detail in Section 2.4. For now, however, in relation to the demographic literature discussed above, it is expected that:

- the prevalence of general pain in a working population will be high (H_1)
- pain prevalence will differ in relation to pain type (H_2)
- pain prevalence will be higher in women, in older age groups, and in less privileged socioeconomic groups, and where individuals have a chronic condition (H_3)
- pain prevalence will differ in relation to marital status and family size (H_4)
- demographic factors will be associated with pain prevalence after adjustment for other factors (H_5)

Before any further predictions can be made in relation to work factors and their associations with pain at work, it is important to establish the extent to which work factors that have been reported are contributors to pain risk.

(e) Work-related psychosocial risk factors for pain

A substantial body of evidence is available in relation to psychosocial work factors and pain. There is a wide variety of factors addressed, and the current review aims to summarise only some of these factors. Tables 2.12-2.15 below show that there is relative consensus in the variables of interest across studies, with many authors investigating the association between pain and: duration of employment; working conditions and work group; perceived control and workload demands; perceptions about relationships at work and work stress; as well as job satisfaction. The relationship between pain prevalence and each of these factors will be discussed in turn.

(i) Duration of Employment

Research reports a link between duration of employment and back pain in both general (Deyo & Tsui-wu, 1987; Xu et al., 1996) and in working samples (Anderson, 1992; Chiou & Wong, 1992; Rotgoltz et al., 1992). In the majority of cases, the longer an individual has been working in a particular job, the more likely they are to report pain. This association appears to be of reasonable strength, as it is reported (after adjustment for confounders) by three studies that meet four or more of the "quality criteria" discussed in Section 2.1(e) above (Chiou & Wong, 1992; Xu et al., 1996; Niedhammer, 1998).

In general, where studies include duration of employment as a potential risk factor, it is seen as separate from physical load at work. In other words, where physical load is seen as one risk factor, time exposed to this physical load is seen as another. In these studies, therefore, duration of employment is probably most easily interpreted as a proxy measure for the length of time an individual has been exposed to a particular type of job (of which a component will be level of physical load). As such, it is not surprising that an interaction between duration of exposure and job title has been noted. Xu, Bach and Ørhede (1996) report an interesting interaction between duration of employment and a variety of titles, such that: some job titles were less at risk of Lower Back Pain (LBP) where job duration was less than ten years (financial work, secretarial work, military service); and some job titles were less at risk of LBP where job duration was more than ten years (managerial work, administrative work). However for many job titles, there was a clear association between longer durations in particular work (construction, medical and nursing work, social work, child day-care work, psychological work, engineering and structural metal work) and increased risk of LBP (Xu et al., 1996). The benefit of these findings is an ability to compare the risk profiles across job titles, as it could be argued that studies focusing on specific job titles or job types perceived to be "at risk" may be subject to selection bias, and therefore over-reporting of pain in jobs where pain may "be expected" (or indeed where individuals reporting pain are expecting or attending to pain more readily). As such, the fact that Chiou and Wong studied LBP in nurses, and Niedhammer et al shoulder pain in supermarket cashiers, might make the observed association between years of work in these "more manual" jobs in these studies no remarkable finding. However, without comparisons against other populations and/or job titles, it is unclear whether these findings are particular to the samples studies or to these job titles specifically. Given Xu et al's findings, it is possible that duration (that is, length of exposure to particular job tasks) is associated with pain in some job titles and not others. In this way, the reported association between duration of employment and pain reflects the fact that Chiou and Wong, and Niedhammer et al focused on the types of job titles that Xu et al found to be related to increased risk of pain.

It is necessary to mention that most of the evidence discussed above regarding an association between duration of employment and pain prevalence was yielded by cross-sectional studies (Chiou & Wong, 1992; Xu et al., 1996; Niedhammer, 1998). As such, the nature of associations is limited to one point in time, and may not be reflective of the relationship between duration of employment and pain over time. To estimate the effect of this approach, it is important to explore the nature of the measure applied. The source of "duration of employment" information is not always made clear in these three studies (Chiou & Wong, 1992; Xu et al., 1996; Niedhammer, 1998), although one can surmise from the information given that it was generated either by questionnaire (Chiou & Wong, 1992; Niedhammer, 1998); or by interview of workers (Xu et al., 1996). As this information was not verified by an objective measure (for example Human Resources or National Insurance/Tax records) it is unclear whether or not this information may have been subject to recall bias. Therefore, although the retrospective nature of "duration of employment" addresses some of the time-specific short-comings of the cross-sectional method, the drawback to a retrospective approach is that researchers are dependent on individual recall, which could have led to inaccurate estimates of duration of employment.

It is also important to point out the *lack* of association reported between duration of employment and pain in studies of reasonable quality (Burdorf et al., 1998; Suadicani et al., 1994). These two studies focused on individuals in manual jobs, specifically steel workers (Suadicani et al., 1994; Burdorf et al., 1998). If, as implied above, duration of employment in a more manual job presents an increased risk for pain, one might expect the samples examined by Burdorf et al. and Suadicani et al. to be more at risk of pain. Given that this was *not* found, it might be that steel-workers are one of the job titles for which duration of employment does not present as a risk factor. However, given the level of physical load known to be required in steel-work, this seems somewhat unlikely.

One explanation might be that the differences in findings reflect differences in the outcome measures employed. Studies reporting an association between duration of employment and pain did so using outcomes related to pain specifically (Chiou & Wong, 1992; Xu et al., 1996; Niedhammer, 1998); whereas Burdorf et al focused on "musculoskeletal sickness absence", and Suadicani described their study as an exploration of "whether subjects exposed to metal fumes and dust had decreased central nervous system and lung function". These differences in outcome and explicit focus may have led to a level of detection bias in results, such that individuals may have been less likely to attend to and/or report pain in terms of the instructions they were given. Therefore, the reason these studies present differing results is that they were looking at different outcomes. The issue of bias in relation to pain outcomes in all studies is discussed in more detail in Section 2.4 below.

Another explanation for the discrepancy between studies of reasonable quality reporting an association between duration of employment and those not, is that duration of employment might not reflect exposure to physical factors alone. After all, long-term exposure to a particular work environment means exposure to both the physical *and* psychosocial aspects of that work environment. Therefore, could the pain risk associated with length of psychosocial exposure in one job title be different to that associated with length of psychosocial aspects in another? If so, it is important to explore the evidence for associations between psychosocial aspects of work and pain, which is done in detail forthcoming sections.

For now, it is prudent to conclude that there appears to be some relationship between employment duration and pain at work, although the studies presenting evidence for these observations may have been affected by a variety of biases. It also appears that the nature and magnitude of the association between employment duration and pain at work may differ in relation to job title, although the extent to which this can be attributed to research design or other factors is not always clear. Therefore, it should be concluded that *some* relationship between duration of employment, job tasks and pain has been reported. Whether these risks are related to exposure to physical or psychosocial factors remains to be seen, and the likelihood is that these effects relate to exposure to both.

(ii) Working conditions

The category "working conditions" in Tables 2.12-2.15 refers to different aspects of work that have been measured by various researchers. A distinction is drawn between these "factual" characteristics of working life (for example: weekly working hours; whether an individual works part-time or full-time; shift work; physical load and so on) and perceptions or feelings about work, which are referred to elsewhere in Tables 2.12-2.15. It should be noted that these do not refer to the nature of the outcome taken in studies, nor the research design in which it was this outcome was recorded. As such the possibility of a subjective measure reflecting an objective characteristic may have taken place in some of these studies. The only distinction drawn here is between "working conditions" as work factors that have the potential to be verified from other sources (whether specific authors did so or not), and work factors that are entirely subjective, and can only be verified by the individual themselves. It should also be noted that these effects are grouped together in this way for ease of discussion, and not for any other reason.

Overall, there is some, if limited, evidence for the effects of working conditions on pain prevalence. One consistent result is that shift-work appears to be related to increased prevalence of back pain in studies of reasonable quality (Xu et al., 1996; Harreby et al., 1996; see Tables 2.12-2.15). There is surprising consistency in findings for full-time work, with Josephson & Vingaard (1998) showing *part-time* work to be predictive of back pain in nurses, and Thorbjornsson and colleagues (1998) reporting full-time work to be predictive of *less* back pain. Although Thorbjornsson and colleagues report from a relatively small sample (N = 484) in which there was a high attrition rate (38% of those eligible at cross-sectional baseline were lost at follow-up), their data are prospective (24 years) and represent just under two-thirds of those in the original baseline survey. The length of follow-up and quality of inclusion criteria should be considered when interpreting sample size and response rate. The very fact that Thorbjornsson and colleagues were able to contact and re-examine 484 of the original sample after 24 years is remarkable, given known practical issues with follow-up, especially over such a long period of time, and where (it would appear) that follow-up was not planned at first contact with individuals in 1969. Inclusion criteria were of reasonable quality, focussing on one age group (42-58 years) and including only those "with lower back symptoms of a severity leading not to a serious musculoskeletal diagnoses" at cross-sectional baseline. It could be argued, therefore, that the level of bias potentially precipitated by the short-comings of sample size and attrition rate are somewhat compensated for (or are at least to be expected) given the length of follow-up and level of precision in inclusion criteria.

Josephson and Vingård (1998) present an association between part-time work and pain in a case-control study, including 694 cases defined as health-care seekers for LBP within a three year period; and 1423 controls, randomly sampled from a population register. One might argue that these groups may be prone to selection bias, given that individuals were accessed via two different sources. As such, the cases were those who had LBP *and* consulted, and the controls were those who may (or may not) have had LBP and those who or may (or may not) have consulted for it. It could be argued, therefore, that there were two sources of variability between groups (LBP and consultation), in contrast to the desired one source of variability (LBP only) between groups. A more useful control might have been to randomly select controls from attenders of the same primary healthcare providers, thus controlling for the variable of consultation. Admittedly, no study is likely to ever be completely free of bias, and it is possible that the effect of such a "consultation bias" would affect the magnitude of a relationship rather than negate it altogether (Silman & Macfarlane, 2002).

Taking these aspects of design into consideration, it is possible that both Thorbjornsson and colleagues (1998) and Josephson and Vingård (1998) are reporting a real, if approximated, relationship between part-time work and increased pain prevalence. Indeed this is likely, as research of reasonable quality elsewhere does support a similar relationship (Manninen et al., 1995; Moens et al., 1993). Moreover, Moens et al. (1993) report back pain as *less* prevalent where individuals were working for *more* than thirty-six hours every week; and significantly *higher* in groups where weekly working hours were *lower.*

A relationship between part-time work and pain are somewhat counter-intuitive to the dose-response hypothesis. Indeed, it seems anomalous that an individual would experience *less* pain when exposed to risk factors for *longer* hours. However, this effect is consistent and has been observed in other working groups, such as police officers (Brown et al., 1998), forklift truck drivers (Van Poppel et al., 1998) and other drivers (Anderson, 1992). Two of these studies meet four out of the five quality criteria described in Section 2.1(e) above (Brown et al., 1998; Van Poppel et al., 1998; see Tables 2.12-2.15). Therefore, the existence of this relationship can be inferred with some confidence. Particular caution should be exercised when interpreting the findings of Anderson (1992), however, as unlike all the other studies mentioned in relation to working conditions, (Xu et al., 1996; Harreby et al., 1996; Josephson & Vingaard 1998; Thorbjornsson et al.,1998; Manninen et al., 1995; Moens et al., 1993; Brown et al., 1998; Van Poppel et al., 1998), this author did not adjust for confounders such as age and gender in his analysis.

It is difficult to interpret this counter-intuitive finding. One explanation might be that the relationship between less exposure to work (part-time work; short-term hours; temporary contracts) and pain is related to the tasks actually performed in the workplace. In this way, it may be that it is not the part-time work that is the risk factor per se, but that part-time work in a particular job increases risk. The majority of studies reporting an association between part-time work and pain do so with reference to individuals in more manual jobs (Xu et al., 1996; Harreby et al., 1996; Josephson & Vingaard 1998; Thorbjornsson et al.,1998; Manninen et al., 1995; Moens et al., 1993; Brown et al., 1998; Van Poppel et al., 1998; Anderson, 1992) presenting the possibility that, as with observations regarding duration of manual employment above (see Section 2.2) and indeed membership of a manual workgroup (below), it is exposure to manual tasks part-time that presents the risk.

However, without comparison with the effects of part-time work in non-manual occupations on pain, this interpretation should be made with caution.

It can be concluded, then, that there appears to be some relationship between working conditions and pain risk. Working in shifts and working part-time have all been associated with increased risk of pain. In particular, based on the research evidence given here, the relationship between part-time work and pain in more manual jobs appears to be relatively strong. Most authors would agree that it is not just the actual workload or time spent at work, but what is actually done when one gets there that affects pain. As a result, many authors have compared differences in pain prevalence between specific work groups.

(iii) Workgroup comparison

Tables 2.12- 2.15 show a summary of evidence for "workgroup comparison". This refers to studies that examine the risks for pain associated with different workgroups or work titles. The discussions concerning duration of employment and working conditions above show a differentiation of effects between job titles within studies, therefore it is not surprising that an adjusted association between different work groups and differing pain risks has been reported by eleven studies (Videman, 1984; Deyo & Tsui-wu, 1987; Helliwell et al., 1992; Holmstrom, Lindell & Moritz, 1992; Rotgoltz et al., 1992; Andersen & Gaardboe, 1993; Foppa & Noack, 1996; Xu et al., 1996; Hagen et al., 1998; Westgaard et al., 1992). In general, workgroup comparisons refer to analyses of pain risk profiles in contrasting occupational groups, and are most frequently made between sedentary and non-sedentary work groups, the definition of which varies between authors. Where some authors compare general manual groups to general non-manual groups (Hagen et al., 1998; Croft & Rigby, 1994; Holmstrom, Lindell & Moritz, 1992; Vasseljen et al., 1995; Westgaard et al., 1992); others refer to white-collar versus to blue-collar workers (Andersen & Gaardboe, 1993; Foppa & Noack, 1996; Hultman et al., 1995; Leino et al., 1995; Wickstrom & Pentti, 1998). Other studies compare different job titles (Anderson, 1992; Harber et al. 1985; Heistaro et al., 1998; Herberts et al., 1984; Hildebrandt et al., 1995; Josephson & Vingaard, 1998; Videman, 1984), whilst one study compares regional groups (Moens et al., 1993). As such, it is difficult to deduce whether resulting associations are affected by the groups that are chosen and the decisions made regarding membership of those groups (selection bias).

Unfortunately only two of the eleven studies reporting a relationship between workgroup and pain risk can be described as presenting evidence of "reasonable quality" (Foppa & Noack, 1996; Xu et al., 1996). Between these studies the ways in which workgroups are approximated differ. For example, Xu et al. (1996) provide evidence for risk of LBP in large variety of groups, such that the likelihood of LBP was significantly less for those working in some occupations (technical, scientific, judicial, humanistic, artistic, managerial and clerical) and was significantly higher for those in other occupational categories (healthcare and social work; mining; quarrying and construction; manufacturing and machine operation). As such, a distinction appears to be made between lower risk of pain in less manual job types, and higher risk of pain in more manual job types.

As suggested above in relation to physical factors, duration of employment and working conditions, it may be that the risk of pain is related to the physical tasks incorporated in jobs. In support of this observation, it may be that workgroup comparisons serve as a useful proxy measure with which to explore these differences. However, in the other study providing "reasonable" evidence for an association between workgroups and pain risk, Foppa & Noack (1996) suggest that physical tasks alone may not be the only explanation of the differences between workgroups. Foppa & Noack (1996) do report back pain to be more prevalent in "blue collar" workers than "white collar" workers, although details as to how the dichotomy of "blue" versus "white" collar workers is related to the specific occupations that they include (unqualified/qualified manual/qualified non-manual/professionals/executives/others) are not made explicit in their 1996 publication. Not only does this leave these authors open to criticism regarding the unknown potential effect of selection bias, it also means the extent to which the finding that back pain was more prevalent in "blue collar" workers than "white collar workers" is attributable to physical job tasks is unclear. One important findings, however, is that in Foppa & Noack's final multivariate model, only psychosocial aspects of individual jobs remained related to an increased risk of pain (1996). In other words, regardless of the extent to which physical factors are related to different pain risks, it is clear that differences between workgroups extend beyond actual physical tasks to include psychosocial workload.

All in all, in relation to the evidence reviewed here in relation to physical tasks, duration of employment, working conditions, and workgroup comparisons; it appears that the case for the predominance of pain in manual work is compelling. Indeed this view has been widely accepted by researchers and laypersons alike, and has served to fuel the considerable research into physical and psychosocial causes of pain at work of which the studies in Tables 2.12-2.15 are only an example.

Table 2.12

Cross-sectional studies examining work risks for pain, as measured in a general or clinical population, sorted by pain type

Findings: + crude association or univariate effect; ++ association or effect after adjustment; **O** not tested or not reported; **X** specific effect not reported, but variable adjusted for through multivariate analysis or stratification; - no crude association or effect found; - - no association or effect found after adjustment.

[a]inc. measure of physical load; [b]inc. measure of symptom or pain history; [c]adjusted for confounders; [d]N=1000 or more in final sample; [e]response rate 80% or more

Back pain	Duration of employment	Working conditions/ work tasks	Workgroup comparison	Control	Demands	Relationships at work	Stress	Job satisfaction
Deyo & Tsui-wu, 1987 [acd]	+	O	++	O	O	O	O	O
Gilchrist, 1976 [xdy]	O	O	O	O	O	O	+	O
Haenen, 1984 [xdy]	O	O	O	O	O	O	+	O
Nagi, 1973 [xdy]	O	O	O	O	O	O	+	O
Xu et al., 1996 [acde]	++	++	++	O	O	O	O	O
Other pain	**Duration of employment**	**Conditions (hours/ FT)**	**Workgroup comparison**	**Control**	**Demands**	**Relationships at work**	**Stress**	**Job satisfaction**
Bergenudd & Nilsson, 1994 [MSK] [bce]	O	O	O	O	O	++	O	+,++
Sternbach, 1985 [General pain] [cd]	O	O	O	O	O	O	+	O
Westerling & Jonsson, 1980 [NSP] [acde]	O	O	O	O	+,++	O	O	O

Pain types: NSP = Neck & Shoulder pain; S = Shoulder; MSK= Musculoskeletal pain

Studies in italics were taken from subsequent systematic reviews, and not from the current literature review (see Section 2.3(h) below)

Table 2.13

Studies of mixed design examining work risks for pain, as measured in a general or clinical population, sorted by research design and pain type

Findings: + crude association or univariate effect; ++ association or effect after adjustment; **O** not tested or not reported; **X** specific effect not reported, but variable adjusted for through multivariate analysis or stratification; - no crude association or effect found; - - no association or effect found after adjustment.

[a]inc. measure of physical load; [b]inc. measure of symptom or pain history; [c]adjusted for confounders; [d]N=1000 or more in final sample; [e]response rate 80% or more

Back pain	Design	Duration of employment	Working conditions/ work tasks	Work group comparison	Control	Demands	Relationships at work	Stress	Job satisfaction
Biering-Sorensen & Thomsen, 1986 [bce]	Cross-sectional baseline, repeated on same cohort at T2 after 12 months	O	O	O	O	O	O	O	+, ++
Harber et al., 1985 [a]	Cross-sectional with retrospective at 2 weeks and 6 months	O	O	+	O	O	O	O	O
Huang et al., 1998 [abc]	Case-control	O	O	O	O	O	O	++	O
Josephson & Vingaard, 1998 [abcd]	case-control	O	+,++	-	+, ++	-, - -	+, ++	O	O
Thorbjornsson et al., 1998 [abc]	Cross-sectional baseline repeated at T2 after 34 years, and retrospective (between T1&T2) on same cohort	O	+, ++	O	O	O	+, ++	O	O

Studies in italics were taken from subsequent systematic reviews, and not from the current literature review (see Section 2e and Table 2.1X below)

Table 2.14

Cross-sectional studies examining work risks for pain, as measured in a working population, or comparing working populations, sorted by pain type

Findings: + crude association or univariate effect; ++ association or effect after adjustment; **o** not tested or not reported; **x** specific effect not reported, but variable adjusted for through multivariate analysis or stratification; - no crude association or effect found; - - no association or effect found after adjustment.

[a]inc. measure of physical load; [b]inc. measure of symptom or pain history; [c]adjusted for confounders; [d]N=1000 or more in final sample; [e]response rate 80% or more

Back pain	Duration of employment	Working conditions/ work tasks	Work group comparison	Control	Demands	Relationships at work	Stress	Job satisfaction
Anderson, 1992 [abe]	+	-	+	o	o	o	o	o
Brown et al., 1998 [abde]	-	-	o	o	o	o	o	o
Burdorf et al., 1998 [abce]	-, - -	o	o	o	o	o	++	o
Chiou & Wong, 1992 [abcde]	+, ++	o	o	o	o	o	o	o
Dehlin & Berg , 1977 [xy]	o	o	o	o	o	+	+	o
Foppa & Noack, 1996 [abce]	o	o	+, ++	+, ++	+; ++	o	+, - -	+, ++
Fujimura et al., 1995 [abce]	-	-	o	o	o	o	o	o
Hildebrandt et al., 1995 [acd]	o	o	+	o	o	o	o	o
Kartilainen,1978 [xdy]	o	o	o	o	o	+	+	o
Linton & Kamewendo,1989 [xy]	o	o	o	o	o	+	o	o
Linton, 1990 [xdy]	o	o	o	o	o	+	o	o
Moens et al., 1993 [bcde]	o	+	+	o	+	o	+	o
Rotgoltz et al., 1992 [abc]	+, ++	o	+, ++	o	o	o	o	o
Ryden et al. , 1989	o	o	o	o	o	o	+	o
Suadicani et al., 1994 [abce]	-,--	+	o	o	+, ++	o	o	o
Videman, 1984 [abc]	o	o	+,++	o	o	o	o	o

Studies in italics were taken from subsequent systematic reviews, and not from the current literature review (see Section 2.3(h) below)

Table 2.14 (contd.)

Cross-sectional studies examining work risks for pain, as measured in a working population, or comparing working populations, sorted by pain type

Findings: + crude association or univariate effect; ++ association or effect after adjustment; o not tested or not reported; x specific effect not reported, but variable adjusted for through multivariate analysis or stratification; - no crude association or effect found; - - no association or effect found after adjustment.

[a]inc. measure of physical load; [b]inc. measure of symptom or pain history; [c]adjusted for confounders; [d]N=1000 or more in final sample; [e]response rate 80% or more

Other pain	Duration of employment	Working conditions/ work tasks	Work group comparison	Control	Demands	Relationships at work	Stress	Job satisfaction
Ahlberg-Hulten et al., 1995 [MSK pain][ac]	+,- -	o	o	+, - -	+, ++	-	-	o
Brulin et al., 1998 [MSK symptoms][ace]	o	+,++	o	+, ++	o	+, - -	o	o
Hagen et al., 1998 [NS & LB disorders][acd]	o	o	+, ++	+, ++	+, ++	o	o	o
Helliwell et al., 1992 [WRULD][abc]	+	o	++	o	o	o	o	o
Herberts et al. ,1984 [S pain][ac]	+	o	+	o	o	o	o	o
Holmstrom, Lindell & Moritz, 1992 [NSP][acd]	o	x	+, ++	+, ++	+, ++	o	+, ++	+, ++
Hopkins, 1990 CS [MSK][xy]	o	o	o	o	o	+	o	o
Kompler, 1988 CS [MSK][acy]	o	o	o	o	o	++	o	o
Lemasters et al., 1998 [MSK disorders][bc]	+,++	o	+	++	o	o	o	o
Makela & Heliovaara, 1991 [NP][xdy]	o	o	o	o	o	++	++	o
Niedhammer, 1998 [S disorders][abce]	+,++	o	-, --	+, ++	o	o	o	o
Pot et al., 1986 CS [MSK][xy]	o	-	o	o	o	+	o	o
Skov et al., 1996 [MSK][acde]	o	o	o	++	++	++	o	o
Smulders, 1990 [MSK][acdy]	o	o	o	o	o	-	o	o
Toomingas et al., 1992 [NP][xy]	o	o	o	+	+	+	o	o
Westgaard & Jansen, 1992 [MSK complaints][abc]	o	+,++	o	o	o	o	o	o
Westgaard et al., 1992 [MSK complaints][abc]	-	+,++	++	o	+, ++	o	+, ++	o

Pain types: LBP= Low back pain; NSP = Neck & Shoulder pain; NP= Neck Pain; SP= Shoulder; MSK= Musculoskeletal pain; WRULD = Work-Related Upper Limb Disorder

Studies in italics were taken from subsequent systematic reviews, and not from the current literature review (see Section 2.3(h) below)

Table 2.15

Studies of mixed design examining work risks for pain at work, as measured in a working population, or comparing working populations, sorted by study design and pain type

Findings: **+** crude association or univariate effect; **++** association or effect after adjustment; **o** not tested or not reported; **x** specific effect not reported, but variable adjusted for through multivariate analysis or stratification; **-** no crude association or effect found; **- -** no association or effect found after adjustment.

[a]inc. measure of physical load; [b]inc. measure of symptom or pain history; [c]adjusted for confounders; [d]N=1000 or more in final sample; [e]response rate 80% or more

Back pain	Design	Duration of employ.t	Working conditions/ work tasks	Work group comparison	Control	Demands	Relationships at work	Stress	Job satisfaction
Bigos et al., 1991 [B injury] [abce]	Prospective longitudinal, inception cohort followed up for 3 years	o	-, - -	o	o	o	+, ++	o	+, ++
Hultman et al., 1995 [abe]	Case-control, cross-sectional	o	o	+	+	+	-	o	o
Klaber-Moffett et al., 1993 [abc]	Prospective longitudinal: inception cohort, followed up every 3 months up to 20 months	o	o	o	o	o	o	o	o
Manninen et al., 1995 [abcde]	Cross-sectional with c-s follow-up at 12 years some of same cohort (pain-free)	+, o	+, ++	o	o	o	o	-, - -	o
Miedema et al., 1998 [abc]	Cross-sectional retrospective 3-4 years, plus 3 yrs prospective cohort	o	o	o	o	-, - -	o	-, - -	o
Papageorgiou et al.,1998 [abc]	Cross-sectional baseline with inception cohort followed up for 12 months	o	o	o	o	o	+, ++	o	+, ++
Van Poppel et al., 1998 [abce]	Cross-sectional baseline repeated 7 times (T2-8) on the same cohort within 12 months	o	+, ++	o	o	o	o	o	+, ++
Wickstrom & Pentti, 1998 [acde]	Cross-sectional baseline repeated on same cohort at T2 after 2 years	o	o	+	+	+	+	+,++	o
Other pain	Design	Duration of employ.t	Working conditions/ work tasks	Work group comparison	Control	Demands	Relationships at work	Stress	Job satisfaction
Andersen & Gaardboe, 1993 [N & limb pain] [abe]	Case-control	++	o	++	o	o	o	o	o
Engels et al., 1996 [MSK pain] [ace]	Case-control, cross-sectional	-	-	-	o	o	o	-, ++	o
Leino et al, 1995 [B & limb disorders] [ac]	Cross-sectional baseline repeated on same cohort at T2 after 10 years	o	+	+, x	+	+	+	o	o
Sairanen et al.,1981 [LBP and OA]	Case-control, cross-sectional matched for age) office workers and mill (lower back strain classes)	+, --	o	o	o	o	o	o	o
Takala et al., 1991 [NP] [bcy]	Longitudinal	o	o	o	o	o	++	++	o
Vasseljen et al., 1995 [NSP] [abce]	Case-control, prospective	o	o	x	+, ++	o	-	-, - -	+
Veirsted & Westgaard, 1992 [NP] [bcy]	Longitudinal	o	o	o	o	o	++	o	o

Pain types: B= Back; LBP= Low Back Pain; NSP = Neck/Shoulder Pain; NP= Neck Pain; MSK= Musculoskeletal; OA = Osteoarthritis

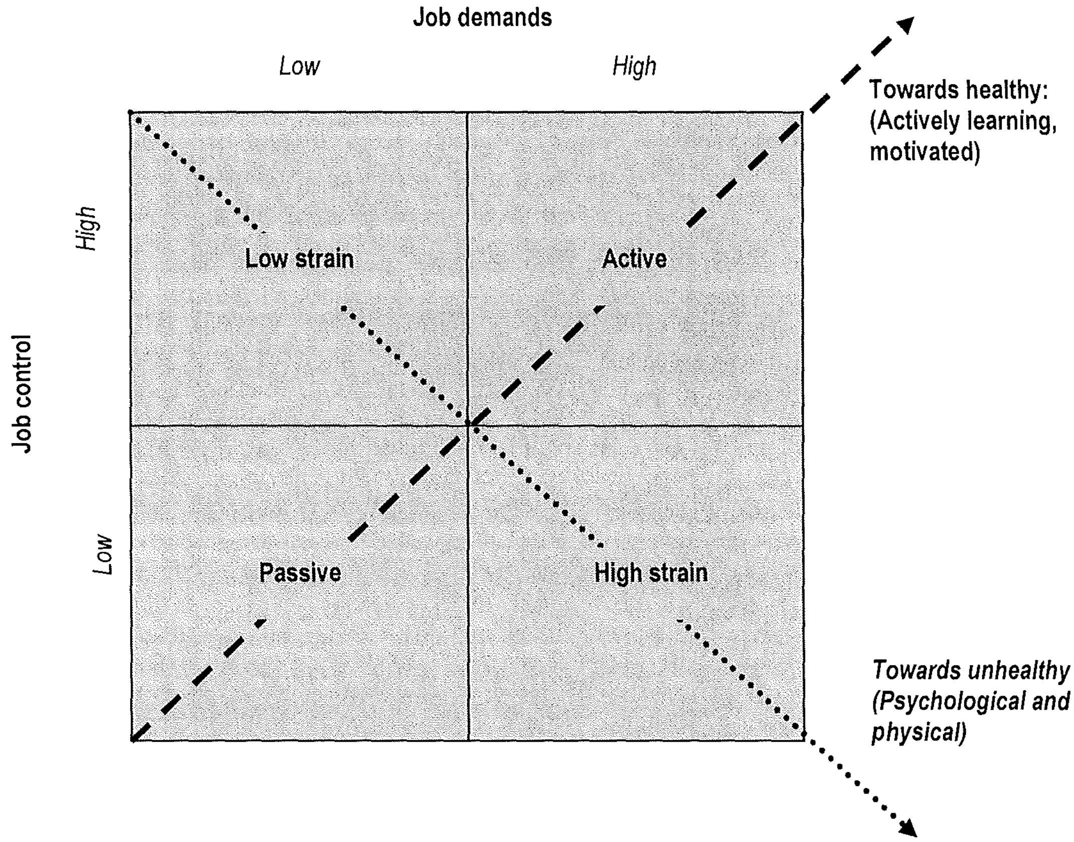
Studies in italics were taken from subsequent systematic reviews, and not from the current literature review (see Section 2.3(h) below)

(iv) Perceived workload control and demands

A large proportion of the literature has explored the relationship between pain and perceived workload control and demands. Many studies have focussed on Karasek's Demand-Control model (Karasek, 1979; Karasek et al., 1981; Schwartz, Pieper & Karasek, 1988; Karasek & Theorell, 1990; Schnall, Landbergis & Baker, 1994), where occupational strain is conceptualised along two axes: Job Demands (perceived psychological demands of the job task or workload); and Job Control (perceived authority over decisions within the job or about the workload, see Figure 2.2 below). Although originally developed and applied in individuals suffering from chronic cardiovascular disease (Karasek, 1981; Schnall Landbergis & Baker, 1994), this model has been successfully applied by various authors in relation to pain at work (see Tables 2.12-2.15). Demand-Control Theory predicts that an individual's job falls into one of four quadrants:

- Active work (high control and high psychological demands);
- Passive work (high control and low psychological demands);
- Low strain (low control and high demands); and
- High strain (low control and low demands)

Figure 2.2
The Demand- Control Model (Karasek, 1979)



Where demands are high and control is low, it is suggested that individuals are at risk of experiencing job strain, and are more susceptible to physical and psychological illness (Karasek, 1981; Schnall et al., 1994; others). One of the main benefits of this theory is its focus on purely the psychological aspects of work roles, beyond traditional income or job title classifications commonly implemented by researchers interested in psychosocial factors (Schnall et al., 1994). In this way it accesses how an individual subjectively *feels* about their job, rather than how it would appear to an objective observer.

Tables 2.12-2.15 below show that an association between perceived workload demands, workload control and pain has been successfully demonstrated. Research in relation to control has a high level of consensus, such that the likelihood of various pain types is higher where control is low. Of the fourteen studies reporting either an adjusted or unadjusted association between lower control and higher pain prevalence, six are studies that meet four out of the five quality criteria described in Section 2.1(d), and all present an association before and after adjustment for a variety of confounders (Josephson & Vingaard, 1998; Foppa & Noack, 1996; Brulin et al., 1998; Niedhammer, 1998; Vasseljen et al., 1995; Skov et al., 1996). Consequently, these studies present reasonable evidence for a relationship between perceived low job control and increased pain prevalence or incidence.

The evidence for an association between high work demands and elevated pain prevalence is equally convincing. Of the thirteen studies reporting an association between high demands and higher level of pain in the current review, four report on adjusted data of reasonable quality (Westerling & Jonsson, 1980; Foppa & Noack, 1996; Suadicani et al., 1994; Skov et al., 1996).

Evidence for a relationship between workload demands/control and pain risk is not without its inconsistencies, however. For example, Miedema and colleagues (1998) and Josephson & Vingård (1998) report that workload demands were *not* related to likelihood of pain. However, Miedema et al (1998) were only able to follow up 58% of their original cross-sectional cohort after three years, and in non-responder analysis found that participants lost to follow-up were more likely to be middle-aged, were less likely to have a paying job at baseline, and were more likely to have a lower level of education. In this way age, job-type or education (or all three) could have biased responses, and may have influenced reported levels of pain. In addition, reflections on the potential for selection bias in Josephson and Vingård's case study discussed above lead the reviewer to interpret findings of no association between workload control and demands with caution. It is without doubt (see Tables 2.12-2.15) that the body of evidence, and in particular, of "good" evidence, is in favour of an association between (low) workload control, (high) workload demands, and increased risk of pain in the workplace.

(v) Relationships at work

In later versions of his Demand-Control model, Karasek published evidence for the role of support at work (Karasek, Triantis & Chaudry; 1982), suggesting that the relationship between control and demands is also related to the extent to which an individual feels they are supported in their work environment. Karasek then added this construct to the model, conceptualising his amended construct of job strain along three axes, and his theory has now become known as the Demand-Control-Support model (Karasek & Theorell, 1990). Therefore, not only are individuals are at risk of poor physical and psychological health where workload control is low and demands are high, but also where perceived support at work is low (Karasek & Theorell, 1990).

As with evidence for demands and control, there is only marginal doubt in the research evidence regarding an association between support at work and pain risk. An association has been shown after adjustment for confounders in four cross-sectional studies (Kompler, 1988; Makela & Heliovaara, 1991; Bergenudd & Nilsson, 1994; Skov et al., 1996), including one study that met with four of the five quality criteria applied in the current review (Skov et al., 1996), and two studies that were taken from Bongers et al's review (Kompler, 1988; Makela & Heliovaara, 1991), for which information on study design was not readily available (see Section 2.2 above).

An adjusted association between relationships at work and increased pain risk has also been reported in six *non*-cross-sectional studies of varied designs, two of which met four out of the five quality criteria (Bigos et al., 1991; Josephson & Vingård, 1998) and two of which met three out of the five quality criteria, but in smaller samples, and with notable loss to follow-up (Papageorgiou et al., 1998; Thorbjornsson et al., 1998). The relative merits of Thorbjornsson and colleagues' design were discussed above, where it was suggested that the issues of small sample size and high attrition rate could be seen to be less serious given their strict inclusion criteria and length of follow-up. A similar observation can be made for the study carried out by Papageorgiou and colleagues (1997; 1998). From an original cross-sectional sample of 7669 individuals, 1412 individuals were identified as being free of "any (back)ache or pain lasting more than twenty-four hours" and "currently employed either part-time or full-time" (Papageorgiou et al, 1998). This cohort were followed-up for twelve months, and consultation for new LBP in this time was noted both objectively (through routine recording by primary healthcare providers) and through self–report (a questionnaire was sent to all those in the cohort who did not present for treatment for LBP in these twelve months). It was in response to this questionnaire that the attrition rate was somewhat higher than might have been desired, which amounted 42% of the entire cohort (consulters and those given the questionnaire) not responding. It could be argued therefore, that losing 42% of individuals during follow up may bring into question the extent to which responders were representative of the entire cohort, and of the target population. For example, some authors have argued that certain individuals are more likely to respond to questionnaires than others (Silman & Macfarlane, 2002) which could have led these individuals to be over-populated in the resulting responders, and giving a bias in the reporting of pain. To assess the extent of this potential attrition bias, Papageorgiou and colleagues (1998) carried out a comparison of baseline data between responders and non-responders, and report no significant differences in perceptions of job (job satisfaction; perceived adequacy of income) at baseline. When response data for women and men were analysed separately, responders were significantly more likely to report pain during follow up, and to be in more privileged, less manual, social groups. Therefore, although the criticism of attrition bias can be levied at the data for women in this follow–up data, as the authors made attempts to quantify the nature of its impact, its potential effects can be interpreted or estimated with greater ease. As such, attrition bias may have been having an effect, but the nature and magnitude of this effect can be estimated.

In relation to support at work, therefore, clearly there is reasonable evidence for an association between perceived support at work and lower pain risk. Even where issues with studies presenting evidence from designs that do not appear to meet the quality criteria at first glance, further consideration of these designs show that their potential for bias can be reduced, or at least quantified by analysis.

It is important to note the observed interaction between social support, gender and pain in working populations. By analysing women and men separately, Papageorgiou and colleagues (1998) observe an interaction between gender, relationships at work, and consulting for pain, such that in their cross-sectional data, there was a trend towards an increased risk for LBP where relationships at work were problematic for women, but not for men. An interaction between gender, "few and unsatisfactory social contacts" (within work and/or elsewhere) was also reported by Thorbjornsson et al. (1998), such that women with lower social support at baseline were more likely to report LBP at baseline. This did not occur in data for men. Although some unadjusted associations between social support and incident pain were reported in both sexes, none of these reached significance after adjustment for other factors.

It is also important to note that the potential for social support interacting with factors other than gender has also been noted. Thorbjornsson and colleagues (1998) note substantial interactions between "few and unsatisfactory social contacts" (within work and/or elsewhere) and various work factors in both cross-sectional and prospective data. Here, gender-specific differences were also apparent, such that interactions between work factors differed in relation to gender, and although interactions were found between certain work factors and social support amongst women in both cross-sectional and prospective data, interactions between certain work factors and social support were reported in only prospective data for men. These findings suggest gender variation not only on the influence of perceived social support in the workplace on pain, but also that the influence of social support is often related to perceptions of other aspects of work, and the influence of perceived social support may be available across time. In addition, these findings highlight the potential of perceived social support to interact with other variables, and the crucial importance of estimating the level of this interaction through adjustment for confounders and interaction analysis.

Although the protective influence of support at work against pain has come to be accepted by many researching in this area, the mechanisms by which this association emerges and is maintained are less well understood (Leppin & Schwarzer, 1990, in Schmidt et al., 1990). In the field of Health Psychology, it has been suggested that social support reflects an improved mood, which makes illness or stressors easier to bear (Ganster and Victor, 1988). In this way, social support could be acting as a buffer against pain, and enabling individuals to cope with it more readily when it occurs (Cartwright & Cooper, 1997). Other authors, however, have suggested that social support exerts its influence over individual health experiences, such that illness symptoms are actually perceived as less negative where support occurs (Cartwright & Cooper, 1997; Ogden, 1998). In this way pain would actually be perceived as less negative in a supportive environment. Either of these explanations makes sense, and fit well with observations made about pain behaviours (Fordyce, 1967; Fordyce et al., 1984; Fordyce, Roberts & Sternbach, 1985) on the one hand, and cognitive modulation of the pain perception (Melzack & Wall, 1965) on the other.

One point worthy of note is that the extent to which observations about social support in general can be compared to support at work is questionable, as there are many differences between social environments and working acquaintances. For example, most of the time social acquaintances are chosen and maintained by ourselves, rather than anyone else, and often we are not in competition with our social acquaintances, or dependent on them to carry out a task. There may be exceptions to these observations (such as raising children with a partner or spouse), however one thing that cannot be overlooked is that the distribution of power in working relationships is very different from that in non-working relationships. Regardless of the extent and nature of a relationship with a supervisor, there is a dependency therein that is not often reflected in relationships that are purely social. The findings by Thorbjornsson et al (1998) discussed above require some reflection in light of this observation. In their study, Thorbjornsson and colleagues (1998) included the measure "few and unsatisfactory social contacts outside work"; and "poor social support from supervisor", and it is in relation to the former measure that the interactions above were noted. It is unclear therefore, the extent to which these authors' measures can be seen as specific measures of relationships at work, as the former refers to social contacts outside work (which could presumably include work colleagues) and the latter measure refers to relationships with superiors (which could exclude the analysis of relationship with colleagues, and could also include relationship outside work). Thorbjornsson and colleagues' findings should be interpreted with this lack of precision of measures in mind, and in the knowledge that this may lead findings to be affected by bias.

In conclusion, then, there is reasonable evidence for an association between perceived support at work and lower pain risk. It would appear that the magnitude of this association differs in relation to gender, and/or other aspects of work. In interpreting this association, it is important to reflect upon the extent to which measures applied can be seen to approximate social relationships at work versus social relationships in general, so as to ensure that resultant observations can be interpreted accordingly.

(vi) Stress

No discussion of workplace factors would be complete without some mention of work stress. Tables 2.12-2.15 show that there is evidence to suggest that a highly stressful work environment increases an individual's risk of experiencing various types of pain. Of the seventeen studies reporting an unadjusted or adjusted relationship between higher stress and increased risk of various types of pain (see Tables 2.12-2.15), eight report an association after adjustment for confounders (Makela & Heliovaara, 1991; Takala et al., 1991; Holmstrom, Lindell & Moritz, 1992; Westgaard et al., 1992; Burdorf et al., 1998; Vasseljen et al., 1995; Engels et al., 1996; Huang et al., 1998; Wickstrom & Pentti, 1998), four of which were in *non*-cross-sectional studies (Takala et al., 1991; Engels et al., 1996; Vasseljen et al., 1995; Wickstrom & Pentti, 1998). Analysis of ratings against quality criteria discussed in Section 2.1(e) above shows that of adjusted associations between high stress and greater risk of pain in *non*-cross-sectional data, only one study (Wickstrom & Pentti, 1998) reports this association in evidence of reasonable quality (meeting four out of this review's five criteria). Therefore although there appears to be a lot of evidence in support of an association between stress and pain, it is important to consider potential for bias in these designs, and their implications on observed findings. This is not to say that authors other than Wickstrom and Pentti (1998) reporting an association are *wrong*, only that the magnitude of their reported associations may be affected by bias. Caution in interpretation should therefore be applied.

As with most of the psychosocial factors discussed in this review, it is important to explore the extent to which the association between stress and the occurrence of pain has been shown to interact with other factors. In relation to an interaction with gender, Wickstrom and Pentti (1998) provide data from men only, preventing any gender comparisons from being done. However, in a cross-sectional study of "reasonable quality" carried out by Foppa & Noack (1996), an association is reported between stress and increased risk of pain in women, but not in men, suggesting some gender variability. This association disappeared after adjustment for other factors, however, therefore it is not clear whether this was an effect of stress as such, or of the combined influence of stress and another factor.

An interaction between age, stress and LBP was noted by Wickstrom & Pentti, such that incident LBP was more likely where individuals were over forty years old, and experiencing stress. In addition, an interaction between job stress, job type and pain was also noted Burdorf et al. (1998) observing the association between job stress and pain to be more pronounced in drivers than in office workers. This study was of reasonable quality; meeting four of the five criteria for quality of design (see Section 2.1(d)). However, as with Foppa and Noack's study (1996), Burdorf et al's observations were based on cross-sectional data, and therefore the extent to which these associations would persist over time is unclear.

As with much of the evidence for other psychosocial influences on pain, the association between stress and pain should be reflected upon in the light of contradictory evidence. Three studies present longitudinal and prospective evidence for there being *no* association between stress and pain both before and after adjustment for confounders (Manninen et al., 1995; Vasseljen et al., 1995; Miedema et al., 1998). One of these studies met four of the five quality criteria described in Section 2.1(e) above (Vasseljen et al., 1995), and one met all five quality criteria (Manninen et al., 1995). In their comparison of cases (those with "continuous shoulder and neck pain for at least two weeks in [the year prior to the cross-sectional investigation]") with controls (those with no shoulder and neck pain in the same survey), Vasseljen et al (1995) report no association between job stress and shoulder/neck pain. This was the case regardless of job type, as they also report that job stress did not distinguish between cases and controls in either manual or office workers (1998).

Similarly, Manninen and colleagues (1995) report no association between their variable of stress and either sciatic or low back pain in male or female farm workers. It is unclear why the discrepancy between these two studies and those reporting a relationship above exists. One explanation may be the measures used to quantify stress. Manninen et al. (1995) give no details of their measure of "mental stress", making the extent to which the effect of this measure is open to bias, or even reliability and validity of this measure difficult to assess.

Vasseljen et al. (1995) included in their battery a measure of "general tension" and of "job stress", whereby "general tension" (but not "job stress") was reported to be associated with shoulder/neck pain (such that cases were more likely to have higher general tension than controls). This was the case in two different working groups, but more pronounced in manual workers than in office workers (Vasseljen et al., 1995). It is possible, then that the lack of association between "job stress" and pain in Vasseljen and et al's study was related to the measure of job stress that was used. It is useful to explore the measures of stress adopted in order to interpret this finding in more detail. Where Vasseljen et al. (1995) measured job stress using a standardised job stress questionnaire (approximating five factors of job stress; Cooper et al, 1981); "general tension" was assessed as a single variable, using a visual analogue scale (VAS). Most researchers would recommend the multi-factorial standardised measure over the VAS, given that reliability and validity of a standardised measure is likely to be greater than a VAS (Coolican, 1998). However, it is interesting to note that when Wickstrom and Pentti (1998) report a relationship between stress and pain (see above), they do so on the strength of a similar VAS as that used by Vasseljen et al.'s measure of general of "general tension". Wickstrom and Pentti (1998) ask individuals whether they "(had) experienced stress" in general, rather than in relation to their job. It may be therefore, that the distinction (or rather lack thereof) between general stress and job-related stress in studies can explain the discrepancies in findings. In this way, it may be that where job stress is approximated using a general, simplistic measure it can be seen to be related to pain risk, whereas if job stress is approximated it a different way, its association with pain is not so obvious. However, the extent to which Manninen et al's poorly defined measure of "mental stress" falls into either of these categories remains to be seen.

One further issue with these studies that is related the measurement of job stress discussed above, is the extent to which the distinction between job stress and job demands is made explicit in a number of studies. For workload demands as discussed by Karasek et al. (1979; see Section 2.3e (iii) above) the inference is that "demands" relate to work tasks placed on the individual. As such, job stress can be inferred to be a more generic concept, where individual factors such as life demands or pressure to succeed are potential stressors. With this in mind, it is possible that studies measuring job stress are accessing job demands, and those measuring "job stress" as a uni-dimensional construct are measuring "life stress" (such as Vasseljen et al's measure of "general tension"). One way to decipher the difference contribution of stress versus demands would be to analyse both as separate constructs. Unfortunately, no study of reasonable quality distinguishes between stress *and* demands, and therefore the extent to which this distinction (or lack thereof) affects findings is impossible to tell.

In summary, it should be concluded that there is some evidence for an association between stress and increased risk for pain in some working populations. Whether this is related to perceptions of job stress and/or perceptions of general life stress, however, is not always clear. Given the differing findings for job stress and general stress, and indeed the multitude of measure applied to approximate stress in this literature, it is essential that researchers reduce the potential for detection bias by making it explicit to participants whether they are approximating work stress specifically, or general stress.

(vii) Job satisfaction

A relationship between job satisfaction or enjoyment of work and different pain types is reported by eight studies in Tables 2.12-2.15. Of these studies, six report an association before and after adjustment for confounders (Biering-Sorensen & Thomsen, 1986; Bigos et al., 1991; Holmstrom, Lindell & Moritz, 1992; Bergenudd & Nilsson, 1994; Foppa & Noack, 1996; Papageorgiou et al., 1997; Van Poppel et al., 1998). Three studies of these six report adjusted associations from evidence that meets four out of the five quality criteria (see Section 2.1(d)); one of which is cross-sectional (Foppa & Noack, 1996); and two that are not (Bigos et al., 1991; Van Poppel et al., 1998).

The relative merits of the study carried out by Bigos et al (1991) in including measures to reduce the risk of various biases are discussed above. Moreover, given that Bigos et al found job enjoyment to be more associated with incident back injury than *any* other work (physical or psychosocial) or individual factors, this evidence is particularly compelling.

In addition to the two studies discussed above, the benefits of the quantification of attrition bias in Papageorgiou et al's study (discussed above) mean that these authors' observations of a relationship between job satisfaction and pain should be considered in the category of "reasonable evidence". In all cases, these studies show that where job satisfaction was higher, the prevalence of a variety of pains is lower. It can be concluded, therefore, that low job satisfaction or minimal job enjoyment is associated with an increased risk of a variety of pains.

Van Poppel et al (1998) report a relationship between job satisfaction and incident back pain, both where those with previous back pain were included in analyses, and where they were excluded. This suggests that the influence of job satisfaction on incident pain may be independent of previous pain. This is not to suggest that job satisfaction does not have any relationship at all with other variables, however. Papageorgiou and colleagues (1998) showed "satisfaction with work" to be equally associated with incident lower back pain in both sexes. However, the gender specific work risk profiles (perceived inadequacy of income in men; and relationships with colleagues in women) were more pronounced for those who were less satisfied with their jobs. In other words, although job satisfaction may not interact specifically with gender or other demographic variables, when poor job satisfaction is experienced, it may modify the relationships between demographic and work factors.

In summary, unlike many of the other psychosocial factors discussed in this review, there is little evidence *against* an association between job satisfaction and musculoskeletal pain; therefore this conclusion can be made with relative confidence. Moreover, the extent to which individual experience job satisfaction may modify the associations between other psychosocial work factors and pain.

(f) Conclusions of systematic reviews and non-empirical papers

(i) Systematic reviews of empirical studies

Five papers in the current literature review were systematic reviews: two examining musculoskeletal pain (Bongers et al., 1993; Zaza et al., 1998); two examining back pain (Burdorf, 1992, Leboeuf-Yde et al., 1996); and one examining neck pain (Borghouts, Koes & Bouter, 1998). These papers are summarised in Table 2.16 below. Where papers also included a systematic review of pain intervention studies, only the data regarding risk factors for pain is included. Data from two of the systematic reviews (Bongers et al., 1993, Leboeuf-Yde et al., 1996) were incorporated into Tables 2.4-2.26 in this chapter.

(ii) Including articles cited in systematic reviews in the current review

There was a notable difference between the papers identified in systematic reviews and those identified in the current review (see Table 2.16 below, as well as Limitations - Section 5.4). Comparing published systematic reviews with the current review shows that most of the systematic reviews sought to quantify the risk factors in specific pain types, rather than the general view of pain adopted by the current study. The benefit of a general approach is discussed later in Section 2.4, however at this point it is important to note the discrepancy between the studies identified, as an illustration of the amount of varied literature available on this topic. The omission of other relevant articles (see Table 2.16; and Limitations - Section 5.4) could be regarded as a weakness of the current literature review. The current review acknowledges this weakness, and attempts to address it by including studies from systematic reviews in the discussion of literature above, where appropriate. Moreover a post-hoc appraisal of the search terms applied to the literature between 1980 and 1998 was carried out, and is discussed in detail in Section 5.4 (Limitations)

It is also important to point out, however, that the omission of articles in the published systematic reviews could also be regarded as a weakness of these systematic reviews themselves. Clearly they do not include all the literature that the current review includes. It is likely that the lack of agreement between the studies used in this review and those included in published systematic reviews reflects the strict criteria employed in these systematic reviews.

To illustrate the specialisation of systematic reviews, take, for example Zaza et al (1998), who included only "cross-sectional surveys and cohort studies whose primary outcome was the incidence or prevalence of [pain-related-musculoskeletal-disorders] in classically trained musicians". As such, articles included were highly specialised and related to one type of work only. The authors report using the following search terms: "music," "musician," "instrumentalist," "pain," "disability," "overuse," "musculoskeletal diseases" and "musculoskeletal system.". Such terms are very different from those used in the current review (see Table 2.3 above) therefore it is not surprising that searches should yield very different results. Zaza et al's approach is beneficial in that it allows the researcher to have greater specificity in the literature reviewed, however this is at the expense of other studies which may have been relevant, but were not indexed by the search terms used.

Bongers and colleagues (1993) included only studies that reported on the development of musculoskeletal disorders, therefore studies reporting on recovery from a musculoskeletal disorder were excluded. Moreover, studies that did not include a "non- or less-exposed" control group were also excluded, to ensure that included studies published observations where exposure to variables could be interpreted with adequate comparisons. These criteria ensured that Bongers et al's focus was on data from studies relevant to the objectives of their review. Interestingly, to enable the inclusion of a variety of studies, Bongers et al did not apply any other quality inclusion or exclusion criteria, but commented on the quality of studies included (the extent to which they adjusted for: musculoskeletal symptoms; physical load and confounders) in their presentation of the literature. This was the approach also adopted by the current review. However, it also means that any associations reported in Bongers et al's review (see below) are derived from studies with differing levels of quality. As such, any conclusions should be interpreted with this in mind.

Bongers and colleagues do not report their specific search strategy, however they do report the databases accessed, and these differ from the current literature search in that Bongers et al (1993) searched seven additional databases. This may explain the discrepancy of papers between this review and Bongers et al's review.

Table 2.16
Summary of systematic reviews of empirical studies reviewing risk factors for a variety of pains in a variety of populations

Author[pain]	Papers in systematic review	Papers included by authors not in current review	Findings	Conclusions
Bongers et al., 1993 [MSK]	BP (29) NP (15) MSK (15)	BP (20) NP (12) MSK (14)	Included in Tables 2.17: BP (Dehlin & Berg, 1977; Gilchrist, 1976; Haenen, 1984; Kartilainen,1978; Linton & Kamewendo, 1989; Linton, 1990; Nagi, 1973; Riihimaki,1989; Ryden et al., 1989); NP (Kvarnstrom & Halden, 1983; Makela & Heliovaara., 1991; Takala et al., 1991; Toomingas et al., 1992); MSK (Hopkins, 1990; Kompler, 1988; Pot et al., 1986; Smulders, 1990)	Controlling for confounding factors is lacking in the literature, and should be addressed. Also stress the importance of addressing perceptions of workers.
Borghouts et al., 1998 [NSP]	3 observational studies	3	Incidence 41% in 3 years non-workers (Berg et al., 1988) Recurrence of symptoms in work disabled cohort – 38.5% (Rossignol et al., 1998, Abenheim et al., 1998) Only reported as prognostic factors No differences between manual retired men and non-manual retired men (Berg et al., 1988). Affect on attendance at work (Rossignol et al., 1998, Abenheim et al., 1998). Remaining work data reported as prognostic factors.	That more observational studies focussing on risk factors for neck pain should be done
Burdorf, 1992 [BP]	24	24	Not published – focus on exposure assessment only.	Systematic quantitative measure of exposure to work risks is required.
Leboeuf-Yde et al., 1996 [LBP]	4	2	Included in Tables 2.14-17 (Rafnsson et al., 1985; Ebeltoft et al., 1996)	
Zaza et al. , 1998 [MSK]	18	18	34%-62% (Fry et al., 1998; Grieco et al., 1989; Lockwood et al., 1989; Zaza & Farewell, 1997). 5.5 -11.5 episodes/yr (Manchester, 1988; 1991). Case/control comparisons showed: predominance of in musicians over non-musicians (Fry et al., 1998) no difference (Roach et al., 1994); and predominance in non-musicians over musicians (Pratt et al., 1992)	Research is inconclusive, and methodological issues in previous research should be addressed.

Pain types: BP= Back Pain; LBP = Low Back Pain; MSK= Musculoskeletal pain; N SP=Neck/shoulder Pain; NP= Neck Pain

It was not always possible to include articles cited in systematic reviews in the current review. The review carried out by Bongers et al. (1993) illustrates this problem. Firstly, studies examining workload demands and workload control could not be included with the studies above, as they were categorised together by Bongers et al. (1993). These are therefore reported separately below (Table 2.17).

Table 2.17
Studies reporting the effects of demands/control as given by Bongers et al. (1993)
Findings: + = uni- or bivariate effect; ++= multivariate effect; o = not tested; *effect varies between subcategories

Author [pain type]	Design	Population type	Sample (no further information given)	Control/ Demands
Magora, 1973 [BP]	Cross-sectional	Working	3316	+/-
Astrand, 1987 [BP]	Cross-sectional	Working	273	-
Lundberg et al., 1989 [BP]	Cross-sectional	Working	20	+/-
Linton & Kamewendo, 1989 [BP]	Cross-sectional	Working	420	+
Linton, 1990 [BP]	Cross-sectional	Working	22180	+
Kartilainen, 1978, [BP]	Cross-sectional	Working	4167	+
Astrand & Isaacson, 1988 [BP]	Longitudinal (follow-up for 22 years)	General	391	-
Ohara et al., 1976 [NSP]	Cross-sectional	Working	848	+
Dehlin & Berg, 1977 [NSP]	Cross-sectional	Working	273	-
Linton & Kamewendo, 1989 [NSP]	Cross-sectional	Working	420	+
Linton, 1990 [NSP]	Cross-sectional	Working	22180	+
Makela & Heliovaara, 1991 [NP]	Cross-sectional	Unknown	7217	++
Toomingas et al., 1992 [NP]	Cross-sectional	Unknown	358	+
Veiersted & Westgaard, 1992 [NSP]	Longitudinal (follow-up for 0.5-1 year)	Unknown	30	++
Sauter et al., 1983 [MSK]	Cross-sectional	Working	248	++
Karasek et al., 1987 [MSK]	Cross-sectional	Working	8700	+
Pot et al., 1986 [MSK]	Cross-sectional	Working	222	+/-
Kompler, 1988 [MSK]	Cross-sectional	Working	158	++
Hopkins, 1990 [MSK]	Cross-sectional	Unknown	291	+
Smulders, 1990 [MSK]	Cross-sectional	Working	9000	++
Theorell et al., 1990 [MSK]	Cross-sectional	Unknown	207	++

Pain types: BP= Back Pain; MSK= Musculoskeletal pain; N SP=Neck/shoulder Pain; NP= Neck Pain

Bongers and colleagues point to a general effect of control/demands being related to pain (Kartilainen, 1978; Linton, 1990; and Linton & Kamewendo, 1989 for back pain; Ohara et al., 1976; Linton & Kamewendo, 1989; Linton, 1990; and Toomingas et al., 1992 for neck/shoulder pain; Hopkins, 1990; and Karasek et al., 1987 for general musculoskeletal pain), and in some cases predictive of pain (Makela & Heliovaara, 1991; Veiersted & Westgaard, 1992 of neck/shoulder pain; and Kompler, 1988; Sauter et al., 1983; Smulders, 1990; Theorell et al., 1990 of general musculoskeletal pain). This is not the case for all studies, however, as some show no effect of control and demands (Astrand, 1987; Astrand & Isaacson, 1988; Dehlin & Berg, 1977).

Bongers and colleagues discuss the inconsistency of findings, suggesting that lack of uniformity in measures of demands and control may contribute to the contradictions in findings. There is little information given on the measure used for control/demands in each study, nor about the nature of the effect within. For example, the nature of the risk is described to aid interpretation, therefore one might want to know whether it was low or high demands, or low or high control that contributed in each study. Moreover, without any further information, when results are given such that demands and control are assimilated onto one dimension, this provides no evidence about the extent to which demands versus control were contributing to the effects in each study. Indeed, given that some authors are described as reporting "contradictory findings" (Lundberg et al., 1989; Magora, 1973; Pot et al., 1986) one might speculate that control was important in some cases, and demands were important in others.

Finally, Bongers et al. published a number of findings from research papers on individual factors and physical health outcomes in general. These were deemed to be beyond the scope of the current study and were therefore excluded from further evaluation (6 back pain studies, 4 neck pain studies, 1 study on non-specific musculoskeletal pain).

(iii) Synthesising findings of systematic reviews of empirical studies

In general, the findings of the systematic reviews offer little new information on the nature of pain risks in the workplace. Where prevalence or incidence data are given (Borghouts et al.,1998; Zaza et al., 1998), they fall within the ranges previously reported in Table 2.7. Data for demographic risk factors is not reviewed in any great depth, and most focus is placed on work risk factors. Two papers review evidence for the physical aspects of work on pain, both concluding that findings are inconsistent and that further research in this area is required (Burdorf, 1992; Zaza et al., 1998). Two papers review the evidence for psychosocial work risk factors, and their conclusions are discussed below.

Bongers et al. (1993) provide evidence for workload demands/control as a risk factor for a variety of pains, reporting many unadjusted effects of demands/control (Linton & Kamewendo, 1989; Linton, 1990; Karasek et al., 1987; Hopkins, 1990; Tola et al., 1988; Toomingas et al., 1992). In addition, Bongers et al. report high demands/control to be predictive of pain in a number of studies (Theorell et al., 1991; Veirsted & Westgaard, 1992; Sauter et al., 1983; Kompler, 1988; Smulders, 1990). However, Bongers and colleagues also cite two studies reporting no relationship between workload demands/control and back pain (Boshuizen et al., 1993; Astrand & Isaacson, 1988). It was discussed earlier that an effect of workload demands and control can generally be concluded, but given that there is also evidence against an effect, and that all evidence comes from studies with differing levels of quality of design, this conclusion should be made with caution. Bongers et al.'s conclusions would support these observations.

Bongers et al. (1993) also report conflicting evidence for a number of risk factors: demands/control (Magora et al., 1973; Lundberg et al., 1989; Pot et al., 1986); stress (Boshuizen, 1993; Ursin et al., 1988); and social support (Karasek et al., 1987; Theorell et al., 1991). Although little evidence is given on the nature of these conflicts, they reaffirm the prudence required when concluding demands/control as a risk factor for pain, as well the recurring inconsistencies and variety of designs previously noted within this literature. In general, then, it would appear that the systematic reviews offer similar conclusions on the relationships between certain risk factors for pain, and would support the observation that consensus in the research is not always easy to find.

It was argued earlier (Section 2.2 above) that the current discussion seeks to be illustrative of previous literature, rather than a systematic review. As such there is no pretence that the current review is exhaustive, only indicative of the voluminous research evidence available. Indeed, it may be that some important and key papers were missing; however, it is not clear whether their inclusion would have further informed the current hypotheses or not. Indeed, the conclusions about the literature are likely to have been very similar, that is, that relationships between psychosocial factors and pain have been found in a variety of pains, some in research of good or reasonable quality, and some not. In addition, interactions between psychosocial factors have also been reported, which have served to illustrate the complexities of psychosocial factors and their effects on pain. As a result, it is hypothesised that many of the associations between psychosocial factors and pain prevalence will be found (see Section 2.3), although their magnitude and direction in specific populations may not always predictable.

(iv) Non-empirical papers on risk factors for pain

The current literature review also revealed eleven non-empirical papers commenting on the risk factors for different pain types. The majority of articles discuss issues that have already been raised, or those that are irrelevant to the current study. These included issues such as schedules of clinical treatment (Nachemson, 1985) or recommendations for physical adjustments as prevention measures (Troup, 1984). Consequently, these studies will not be evaluated any further.

One paper, however, is worthy of mention, presenting a list of risk factors for back pain. Frymoyer & Cats-Baril (1987) publish a list of risk factors for low-back-pain-disability, which are weighted by a "panel of experts". Top of the list are "job factors" (physical requirements, occupation, job satisfaction, self-employment, work history, employer's attitude towards limited duty, work preference) which are reported to account for to one fifth of the risk for low-back-pain-disability. A further fifth of risk for disability is attributed "psychosocial factors" (psychological symptoms, self-efficacy, personality type, daily hassles). Injury factors such as compensability, perception of fault and involvement of a lawyer are the next most important factors, accounting for just under one fifth of the risk for disability. The final two-fifths of risk is attributed to a number of different factors such as diagnosis, demographics, medical history, health behaviours (including smoking) and anthropometric measures.

The reader is given little information on how the "panel of experts" derived these risks, except that they "attempted to reach a consensus to assign various possible weights to each of the variables" (Frymoyer & Cats-Baril, 1987). This process is said to be informed by a thorough review of the literature, although little information on the type or source of this literature or the search strategies used is given. While the experience and knowledge of the authors (and indeed the experts) is in no doubt, it may have been more appropriate to give further details of this process, in order that the relative strengths and weaknesses of these conclusions could be assessed, and the potential effect of bias be estimated. Indeed, in light of the omission of primary evidence underpinning these conclusions (or at least some reference to other publications where this evidence was available), one might argue that these observations may have been so affected by observer bias that they constituted little more than observer bias.

As is stands, the list published by Frymoyer and Cats-Baril (1987) highlights the potential perils of a non-systematic approach to this complex literature, given the considerable discrepancy between the set of risk factors derived by a "panel of experts" and those generated by research evidence.

For example, there are differences between the variables included under the umbrella of "job" and "psychosocial" factors and the evidence summarised in Tables 2.4-2.15.

There is little mention of the psychosocial aspects of work such as perceived demands, perceived control, or stress, for which substantial research evidence has been reported. In addition, job satisfaction is reported, as is the employer's attitude, however, this is only "employer's attitude to limited duty", as opposed to the concept of social support discussed by so many authors (see Section 2.3(e)). Finally, demographic factors were estimated to account for only 8.2% of the risk, despite the substantial evidence for their effect reported in Tables 2.4-2.15, and the fact that most authors treat them as *known* confounders in their analysis. As such, one might have expected their influence to be greater. Equally, the authors attribute just 2.4% of the risk to smoking, despite the evidence for smoking as a risk factor for pain at work (see Section 2.3(c) above). In a later paper, Frymoyer himself publishes evidence in support of the discrepancy between what he refers to as the "expert model" versus an "empirical model" generated from data collected in a chronic pain clinic. Frymoyer reports the empirical model to be more predictive of long-term disability than the list of factors provided by the experts. In the empirical model, demographic factors were observed to be of more importance than job factors, and injury factors were seen to be the most important overall. Therefore, the list of *empirically* derived risks published by Frymoyer (1992) appears to be closer to the risks concluded in the current review.

Regardless of the approach to evaluating risk factors for pain, be it empirical study, systematic review, or focus group discussion, clearly the risks for pain are multifactorial, their observed nature inconsistent, and the observed contribution of variables not as straight-forward as may be desired. Indeed, almost every article cited in this thesis concludes with a discussion of the inconclusive nature of this literature, and a recommendation for further systematic research in the area.

The current study will examine a selection of the psychosocial work factors addressed by previous research (duration of employment; workgroup comparison; working conditions; control; workload demands; stress; job satisfaction;) and their relation to pain prevalence. Based on previous literature, some of the differences between work factors can be predicted while others cannot (see below).

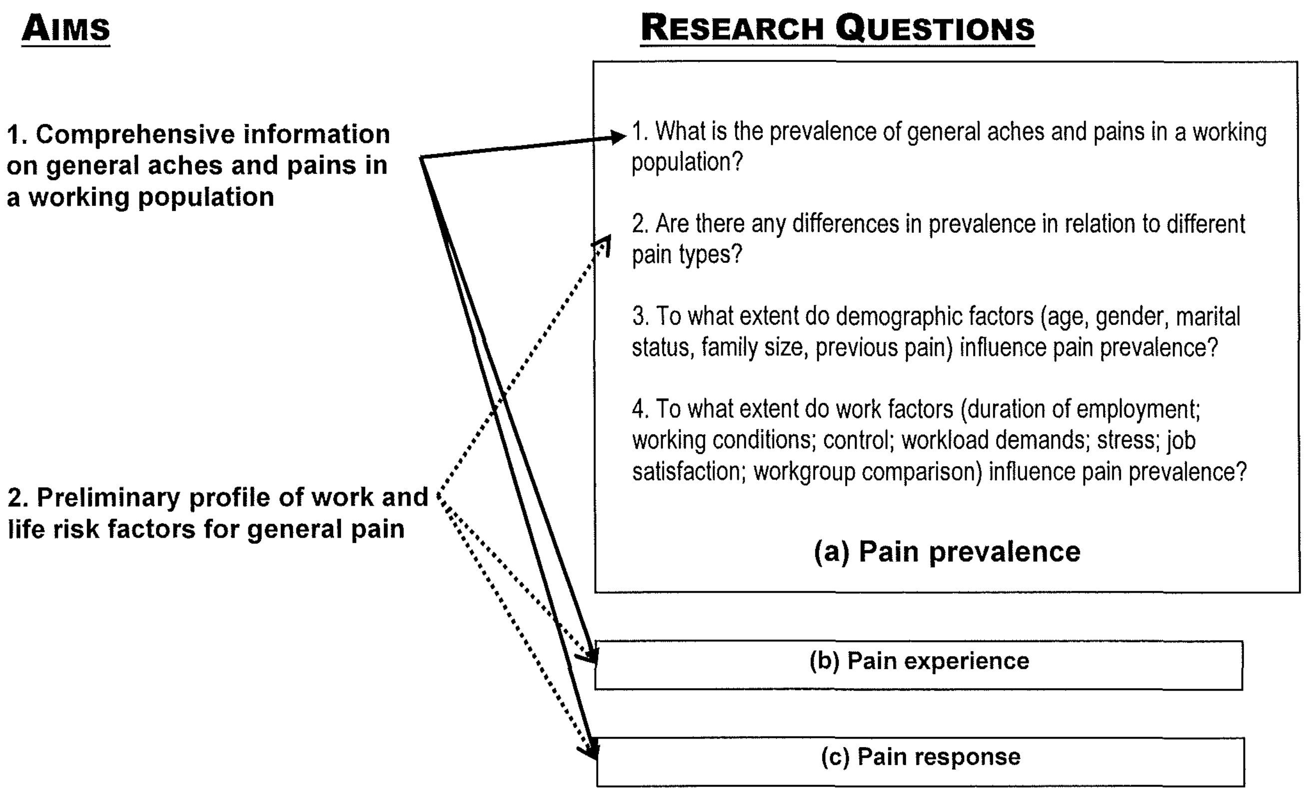
(g) Evaluating evidence surrounding work risk factors for pain

This section has acknowledged the evidence for and against physical risk factors for pain at work, and has discussed some of the research surrounding the psychosocial work variables and their relationship with different types of pain.

There is evidence to suggest that when an individual is under a great deal of pressure or stress in the workplace, or where they have little control over their workload or little support, their tendency to report pain is higher. As with the demographic evidence, there is no way of knowing whether this is the result of them actually experiencing more pain, or perhaps they are more likely to report it. Indeed, it is possible that pain is less easy to cope with when the work environment is less favourable (Hadler, 2005). For example, observations between workgroups would suggest that pain is experienced differently depending on the tasks that are carried out. Putting this with the evidence for potential disproportional influences on pain (see Section 2.3 above) the importance of examining the pain experience in pain research is reinforced (see Section 2.4 below).

Aside from highlighting the importance of experience in pain, the inconsistencies between designs in previous research make it frustratingly difficult to make sense of the results. Consequently, for every demographic or psychosocial effect reported here, there is a conflicting finding or alternative hypothesis. In addition, the differences in findings between studies reflects the very nature of this type of research, that is, the difficulty faced when attempting to quantify a variety of different pains in an environment as diverse as the workplace. Throughout this review several potential mechanisms for the development and maintenance of pain conditions in the workplace were discussed: physical, demographic and psychosocial. None of these can be observed to be concrete, consistent, *causes* of pain, their influences are not exclusive of one another, and often interact with one another. For example, pain may be associated with high psychosocial demands, but it is unclear the extent to which "psychosocial demands" are the result of demands on self, demands from others, actual physical effort, *perceived* physical effort, sex differences, gender roles, age of body, exposure of body, prolonged exposure, or perception of exposure (amongst many others). There is a resounding "we don't know" from every camp, even where large samples are examined meticulously, followed up extensively, and analysed appropriately. Clearly previous research has furnished us with a greater understanding of the complexity of the relationship between pain at work, and to some extent it has *helped* to explain this relationship further, but has not accounted for it *conclusively*. Indeed, some have argued that attempting to find an epidemiological *cause* for pain at work is a fruitless endeavour (Hadler, 2005). While this is a somewhat extreme viewpoint, after review of this voluminous and inconsistent literature, clearly a different approach may be useful. Indeed, the forthcoming sections are intended to be a critical reflection on the literature exploring the relationship between psychosocial factors and pain; an opportunity to "think outside the box" as it were. The current study will attempt to apply a novel approach to this well-argued problem, building on the perceived gaps in the literature. This is illustrated in Figure 2.3 below, where aims are projected on to findings for previous research on risk factors for pain prevalence and incidence cited in the previous discussion.

Figure 2.3
Summary of research aims in relation to research questions generated from previous research on pain prevalence



Operationalising the aims summarised in Figure 2.3 above, in relation to the literature discussed on the associations between various work factors and pain, it is expected that:

- pain prevalence will be higher where: duration of employment is longer; control is lower; work demands are higher; stress is more common; and job satisfaction is lower (H_6);
- pain prevalence will differ in relation to different working conditions and between workgroups (H_7); and that
- psychosocial work factors will be associated with pain prevalence after adjustment (H_8).

The case for taking a general approach to pain will now be argued, specifically in relation to examining pain and the workplace:

- outwith clinical terms and definitions;
- outwith measures of prevalence only, and more in terms of pain experience;
- in relation to those who remain at work; and
- in terms of the actions individual take in order to deal with it and remain in work.

Sections 2.4 and 2.5 will discuss each of these issues, and the critical basis for their investigation in turn.

2.4 Examining pain

There were two salient issues highlighted throughout the discussion of the literature on pain and work given in Tables 2.4-2.16. First, it was argued that the differences between pain outcomes in literature make deduction of conclusions difficult. This leads to reflection on the outcome measures used in studies.

Second, it was argued that not only is it difficult to draw conclusions regarding findings due to differences in previous study design, but the conclusions are hindered by the complexity of psychosocial influences on the occurrence of pain. As a result, conclusive, causal inferences from previous literature are impossible, even where studies have attempted to decrease bias and control for or quantify confounders.

In an attempt to take a different perspective on these issues, the current study suggests two possible remedies to these findings: by examination of pain outwith clinical terms and definitions; and exploration of pain measures that are additional to pain prevalence or incidence. The relevance and utility of these approaches are discussed below.

2.4.1 Examining pain outwith clinical terms and definitions

The studies in Tables 2.4-2.15 take a variety of different approaches to pain, from including outcomes that focus on chronic pain (for example, Von Korff, 1998) to outcomes that focus on general pain (for example, Sternbach, 1985). Table 2.19 overleaf summarises some of the different approaches to pain taken by previous research. The discrepancy between outcomes is a matter of researcher preference, and although some are more precise than others, all relate the research questions being tackled. The differences between outcomes make findings difficult to synthesise, but it is not for this reason alone that the previous pain outcomes are being criticised here. Reflection on the approaches to pain is also required.

Previous researchers have focused on pain as a clinical phenomenon, relying on clinical indicators of pain such a physical measurement, and self-report. As such, pain is normally defined in terms of clinical syndromes or areas, namely:

- pain as articulated in terms of site (e.g. back pain; neckache; shoulder pain and so on);
- pain as articulated in terms of underlying pathology (e.g. musculoskeletal disorder; osteoarthritis and so on); and/or
- pain as articulated in terms of time and intensity (e.g. acute pain; chronic pain)

Each of these approaches has a number of strengths and weaknesses, and these are discussed below.

(a) Pain as articulated in terms of site or by underlying pathology

(i)The focus on site- or type-specific pain

Within the literature there is a tendency to focus on one type of pain, as defined by area (for example, back pain, neck pain, shoulder pain and so on) or underlying pathology (for example Work-related upper-limb disorder). This approach has led to a voluminous literature on each pain topic, a selection of which has been reviewed here.

The utility of approaching pain by pain site or pathology is clear. As the experience of pain is so variable and subjective, it is useful, and clinically meaningful, to establish boundaries around pain types. The approach assumes that the reason neck pain has a different set of influences from back pain is because neck pain is *different* from back pain, and disease-specific observations facilitate disease-specific recommendations. This perspective also allows the researcher to compare the effects of risk factors between types, and many authors have grouped studies by type or site (Bongers et al., 1993). In addition, limiting research to a particular pain-type enables the researcher to focus on one area of literature, and also limits the potential for variability and bias between pain types. Should the current researcher have limited this study to back pain, for example, this would have required a review of fewer studies in more depth. The current study does not seek to undermine the type- or site-specific approach that previous research has applied to pain.

However, it is important to point out that a site-specific approach adds to the difficulty in synthesising the findings of literature, and therefore this approach has not always led to consensus. For example, Helme & Gibson (1999) point out the variety of site-specific prevalence rates between studies, and the difficulties with attempting to deduce the effects of variables such as age on pain sites and conditions. Although a set of obvious and consistent site- or condition-specific risk factors has been alluded to by previous research, to say that they are conclusive, or provide enough systematic evidence with which to plan and/or recommend an intervention is somewhat ambitious. Therefore, to understand the nature of the relationship between pain and psychosocial factors it might be important to use an alternative approach, one that focuses less on site-specific aspects of pain (the differences between pains), and more on pain as a general experience (the *similarities* across all pains).

Table 2.18

Studies examining psychosocial risks for serious pain given by population, design, [pain type] and measure or definition of pain

General population	Design	Self-report measure or definition of pain
Andersson et al.,1993 [MSK]	Cross-sectional	BP of more than 3mths duration; lifetime retrospectively.
Behrens et al., 1994 [BP]	Cross-sectional	Defined as pain in any region of the back occurring every day for a week; 12 mths retrospectively.
Deyo & Tsui-wu, 1987 [LBP]	Cross-sectional	BP on most days for at least 2 weeks; lifetime retrospectively.
Fifield et al., 1996 [RA]	Cross-sectional and T1, and then T2 3 years later	Pain of sufficient severity to present to a rheumatology clinic
Guo et al., 1995 [BP]	Cross-sectional	BP every day for more than a week or more; 12 mths retrospectively
Harreby et al., 1996 [LBP]	Cross-sectional at T1 with cross-sectional follow-up 25 years later, same cohort	Nordic Questionnaire (see Westerling & Jonsson, 1980); with a specific focus on LBP of more than 30 days duration
Jacobsson et al., 1992 [Rheumatic pain]	Case- control, cross-sectional	Cases: individuals who presented to GP with LBP
Josephson & Vingaard, 1998 [LBP]	Case-control	Cases: individuals who sought healthcare for LBP
Karoly et al., 1996 {General pain]	Cross-sectional	Troublesome pain of 6 or more mths duration (lifetime); or pain that reoccurs on a regular basis.
Von Korff et al..1989 [Chronic pain]	Cross-sectional	Instructions to exclude pains that were "fleeting or minor such as a brief headache or sore muscles after exercise."
Westerling & Jonsson, 1980 [NSP]	Cross-sectional	Nordic Questionnaire: LBP & N/SP of more than 30 days duration; 12 mths retrospectively.
Williams et al., 1998 [LBP]	Cross-sectional	LBP present on a daily basis for 8(+/- 2) weeks of the last year.

Working population	Design	Measure or definition of pain
Andersen & Gaardboe, 1993 [BP]	Case-control	Continuous SP for a month's duration or more; lifetime retrospectively. Total days of SP; 12 mths retrospectively (0; 1-7; 8-30; 30+).
Bigos et al., 1991 [B injury]	Prospective longitudinal, inception cohort followed up for 3 years	Pain of sufficient severity to present to primary care or occupational health services.
Brown et al., 1998 [BP]	Cross-sectional	Focus on chronic BP.
Brulin et al., 1998 [MSK symptoms]	Cross-sectional	Nordic Questionnaire (see Westerling & Jonsson, 1980).
Burdorf et al., 1993 [LBP]	Cross-sectional	Nordic Questionnaire (see Westerling & Jonsson, 1980).
Engels et al., 1996 [MSK]	Case-control	Case: Regular from back complaints; lifetime retrospectively.
Fjellman-Wikund et al., 1998 [MSK]	Cross-sectional baseline repeated on same cohort at T2 after 8 years	Nordic Questionnaire (see Westerling & Jonsson, 1980).
Hagen & Thune, 1998 [LBP]	Cross-sectional baseline? With 1 year prospective follow-up	LBP and at least 2 weeks compensated absence from work.
Hagen et al., 1998 [NSP & LBP]	Cross-sectional	Nordic Questionnaire (see Westerling & Jonsson, 1980).
Helliwell et al., 1992 [WRULD]	Cross-sectional	Stanford Health Assessment Questionnaire (Kirwan & Reeback, 1986). Pain history with emphasis on pain that required treatment.
Hildebrandt et al., 1995 [BP]	Cross-sectional	Trouble with the back quite often.
Hultman et al., 1995 [LBP]	Cross-sectional	Focus on chronic BP.
Miedema et al., 1998 [BP]	Cross-sectional retrospective 3-4 years, plus 3 yrs prospective	Pain of sufficient severity to present to primary care services.
Moens et al., 1993 [BP]	Cross-sectional	Nordic Questionnaire (see Westerling & Jonsson, 1980).
Skov et al., 1996 [MSK]	Cross-sectional	Nordic Questionnaire (see Westerling & Jonsson, 1980).
Stang et al., 1998 [BP and headache]	Cross-sectional with follow-up at T2 1yr; T3 2yrs	Pain of sufficient severity to present to primary care services.
Suadicani et al.,1994 [BP]	Cross-sectional (I think)	Nordic Questionnaire (see Westerling & Jonsson, 1980).
Van Poppel et al., 1998 [BP]	Cross-sectional baseline repeated 7 times (T2-8) on the same cohort within 12 mth	New incidences of troublesome back pain and days of back pain at different intervals
Vasseljen et al., 1995 [NSP]	Case-control, prospective	Continuous SP or NP of mid- high intensity for at least 2 weeks (12 mths retrospectively).
Westgaard & Jansen, 1992 [MSK]	Cross-sectional	Various symptoms of troublesome pain and discomfort
Wickstrom & Pentti, 1998 [LBP]	Cross-sectional baseline repeated on same cohort at T2 after 2 years	Recurrent LBP; 12 mths retrospectively.

Pain types: BP = Back Pain; LBP = Low Back Pain; MSK= Musculoskeletal pain; NSP =Neck/shoulder Pain;; WRULD = Work-Related Upper Limb Disorder; RA = Rheumatoid Arthritis *(ii)The focus on work factors in relation to musculoskeletal pain*

The utility of examining pain from a site-specific perspective can also be brought into question with particular reference to pain at work. Previous literature in relation to pain and work has tended to focus on musculoskeletal pain, and back pain in particular (see Table 2.2). Research has evolved in this way as the result of previous observations that work-related pain is related to musculoskeletal activity or physical load at work (Hadler, 2005). It has been argued that this focus on the relationship between musculoskeletal pain and work is somewhat limited in outlook, given the lack of evidence linking physical interventions to pain prevention and reduction (Hadler, 2005). As research has evolved beyond a physical paradigm, so the potential for extension beyond the musculoskeletal paradigm has increased. However, research on non-musculoskeletal pain is still much less common, although it is possible that this type pain could be just as affected by work and psychosocial factors as musculoskeletal pain.

There is some literature reviewing the epidemiology of pain that may or may not be categorised as musculoskeletal such as: migraine and headache (Scher, Stewart & Lipton, 1999), fibromyalgia (Macfarlane, 1999); facial pain (Zakrezewska, 1999); pain at different ages (McGrath, 1999); amongst others. However, where risk studies are reviewed this research tends to focus on the influences of demographic variables (Macfarlane, 1999; Scher, Stewart & Lipton, 1999) and not work factors. In addition, the focus tends to be on clinical (Macfarlane, 1999; Zakrezewska, 1999) or school (McGrath, 1999) samples rather than working samples.

The effects of psychological variables are reviewed in some studies, however these tend to relate to psychological problems and/or disorders, rather than *occupational* psychological variables. One author does review literature suggesting an increased risk of fibromyalgia in relation to occupational variables, specifically lack of employment (Wolfe et al., 1995), psychological stress (Leino et al., 1989) and physical stress (Makela & Heliovaara, 1991). However, the reviewer points to the associative nature of these relationships and their resultant lack of predictive utility as risk factors (Macfarlane, 1999). For example, it is unclear whether lack of unemployment is a cause or consequence of fibromyalgia, or both, or indeed, neither.

At this point, therefore, research on the relationship between work factors similar to those included in the studies given in Tables 2.4-2.15 and "non-musculoskeletal pain" is rare. The current study intends to take a generic view of pain, therefore it extends the research focus beyond musculoskeletal pain and work factors to include the potential for measuring the effects of psychosocial and work factors on non-musculoskeletal pain.

(iii) Pain as a general concept

The current study has deliberately discussed pain as a general concept, acknowledging boundaries where they exist, but also acknowledging the overlap in risk factors between pain types. Indeed there is substantial overlap between psychosocial influences on different pain types. Almost every psychosocial and work variable reviewed in Section 2.3 is observed as being a risk factor for a number of pain types, and is not specific to back pain, neck pain or any other type of pain. This shows that when the site- and type-specific boundaries are removed, there is a great deal of overlap between psychosocial and work influences on all pain. This is not to suggest that neck pain and back pain are the same, or have the same causes. This merely raises the possibility that when a human being experiences pain, no matter where or for whatever reason, it appears to be influenced by a number of demographic and psychosocial factors, and is sometimes magnified by a negative work situation. Indeed, given the differences in findings from studies reporting on various pain types and working populations already highlighted in establishing risk factors for pain at work, this would seem to be a sensible, conservative conclusion to make.

Studies examining pain in the absence of site- or type-specific criteria are rare, as most studies that examine only "pain" (from a general viewpoint) go on to categorise it n terms of site, or ask questions in relation to site or type. This lack of research into pain as a general concept is itself a sufficient reason to warrant further investigation. It may be important to ask whether there are any similarities in the epidemiology of pain as a general human experience, regardless of site or type. This could provide an illustration of pain not only as a precursor for chronic pain, but it may also give an insight into the nature and magnitude of general pain in the community as a public health problem. The current study aims to view pain as a general human experience, rather than an ache in a body part, or an indicator of a specific disease or underlying pathology. Pain will be seen simply as pain – any pain.

It is important here to draw a distinction between general pain and *generalised* pain. General pain refers to pain – *any* pain *in general*, as opposed to a condition and syndrome such as rheumatoid arthritis that can be experienced generally, or in a number of sites simultaneously. As such, the term *general pain* reflects the current researcher categorising pains from a generic perspective. The category of general pain therefore has the potential to include all pain, which can be generalised or specific to a site or pain type.

In summary then, previous research tends to focus on musculoskeletal pain, or pain in relation to specific sites or underlying pathologies. This might suggest a consistent approach to pain, however, reflection on the pain measures applied show that authors are far from uniform in their methods of assessing pain. This is discussed below.

(b) Inconsistency in pain measures

There is a great deal of debate surrounding the objective measurement of pain, and this is discussed in detail in Section 2.4 below. However, it is important to note here the inconsistency with which some previous studies have approached pain. Table 2.19 overleaf shows that some studies have not focused specifically on pain, or have included sensations additional to pain. Some authors discuss pain along with other sensations such as "stiffness" (Thorbjornsson et al., 1998; Herberts et al., 1984; Leino et al., 1995; Niedhammer, 1998); "aching" (Thorbjornsson et al., 1998; Leino et al, 1995); "discomfort" (Niedhammer, 1998); "weakness" (Herberts et al. ,1984); "numbness or sensitivity to movement" (Leino et al, 1995); and even "other trouble" (Biering-Sorensen & Thomsen, 1983). As such, it is unclear where prevalence rates refer to pain specifically, and where they refer to other sensations. Indeed, some authors fail to mention pain to their participants at all, referring to vague terms such as "musculoskeletal discomfort" (Starr, 1983); "lower back trouble" (Xu et al., 1996); or "any problem in the lower back" (Masset et al., 1994). It is not totally implausible that these authors are indirectly measuring pain, and is probably likely. However, without a specific measure or definition of pain presented to the individual participants it is unclear the extent to which these studies are influenced by detection bias, and therefore these results cannot always be interpreted as being indicative of pain prevalence. They can only be said to illustrate prevalence of musculoskeletal "discomfort" (Starr, 1983); "lower back trouble" (Xu et al., 1996); and "problems in the lower back" (Masset et al., 1994).

One rather extreme example of this assumption is the study that infers the presence of musculoskeletal pain from observations of chronic fatigue syndrome (Chavalitsakulchai & Shahnavaz, 1991). While the evidence for the co-morbidity of pain and chronic fatigue is undeniable, the fact remains that these authors report pain prevalence rates that are in fact a projection of fatigue to stiffness and/or pain in various body parts. Therefore they infer the presence of pain in relation to fatigue, rather than take a measure of pain itself. These studies illustrate the assumptions made by researchers regarding what constitutes a measure of pain and what does not, and as a result, findings therein may be open to bias.

The lack of consistency in pain outcomes, lack of rationale in applying these measures, and basic ambiguity serve to complicate the generation of an overall picture of pain at work further. These studies highlight the need for an approach to pain that makes no assumptions about the nature of the pain experience, but also measures pain specifically. One example of the assumptions made about the measurement of pain is in previous authors' assumptions about what is "important" pain, particularly in terms of time and intensity. This is discussed in detail below.

Table 2.19

Studies examining psychosocial risks for pain that do not focus specifically on pain, or include sensations additional to pain

General population	Design	Self-report measure or definition of pain
Biering-Sorensen & Thomsen, 1983 [LB trouble]	Cross-sectional baseline, repeated on same cohort at T2 after 12 months	Pain or other trouble with the LB; 12 mths and lifetime retrospectively
Thorbjornsson et al., 1998 [LBP]	Cross-sectional baseline repeated at T2 after 34 years, and retrospective (between T1&T2) on same cohort	Pain, stiffness or aching in the LB.
Xu et al., 1996 [LBP]	Cross-sectional	LB trouble; 12 mths retrospectively.
Working population	**Design**	**Self-report measure or definition of pain**
Chavalitsakulchai & Shahnavaz, 1991[MSK]	Cross-sectional comparison nurse and industrial workers +	MSK pain assumed from observed fatigue, not actual pain measure.
Herberts et al. ,1984 [SP]	Cross-sectional	SP, weakness and stiffness in the shoulder, excluding effects originating from the neck, e.g. pain extending into one arm or both arms below the elbow.
Leino et al, 1995 [B & limb disorders]	Cross-sectional baseline repeated on same cohort at T2 after 10 years	Ache, stiffness, sensitivity to movement, numbness, or pain in joints or muscles in various locations, and how often, 12 mth retrospectively
Masset et al., 1994 [BP]	Cross-sectional	Any problem in the LB (Life, 12 mths, 7 days retrospectively)
Niedhammer, 1998 [S disorders]	Cross-sectional	Pain, stiffness or discomfort in any area; 6 mths retrospectively
Starr, 1983 [MSK]	Cross-sectional case-control case= VDU users, control = on paper no info on matching	Daily discomfort and when; lifetime retrospectively.

Pain types: B = Back; C= Chronic; HLID= Herniated lumbar intervertebral disc; LB = Low back; MSK= Musculoskeletal; N =Neck; S = Shoulder; WRULD = Work-Related Upper Limb Disorder

Table 2.20

Studies examining psychosocial risks for pain that do not focus specifically on troublesome pain

General population	Design	Self-report measure or definition of pain
Bergenudd & Nilsson, 1994 [MSK]	Cross-sectional	Pain of more than 24 hours duration 1 mth retrospectively
Coste et al., 1994 [LBP]	Inception cohort study; all cases prospective for 5 months	Pain less of than 72 hours duration without radiation.
Croft & Rigby, 1994 [BP]	Cross-sectional	Any problems with a bad back; 1 mth retrospectively.
Hasvold & Johnsen, 1993 [NSP & HA]	Cross-sectional	How often do you have headache? (Seldom/never; monthly or more often/weekly or more often/ daily) How often do you have N/SP? (Seldom/never; monthly or more often/weekly or more often/ daily)
Heistaro et al., 1998 [BP]	Cross-sectional baseline repeated 4 times (T2,-5) on different cohorts every 5 yrs	BP 1 mth retrospectively.
Linton Hellsing & Hallden, 1998 [Spinal P]	Cross-sectional	Any BP or NP; 12 mths retrospectively.
Papageorgiou et al.,1997 & 1998 [LBP]	Cross-sectional baseline with inception cohort followed up for 12 months	Any ache or pain lasting for more than 24 hours; 1 mth retrospectively.
Pryse-Phillips et al.,1992 [Headache]	Cross-sectional	Headache checklist pre-interview and then at interview.
Sternbach, 1985 [General pain]	Cross-sectional	Pain of 1 or more day's duration.
Working population	**Design**	**Self-report measure or definition of pain**
Burdorf et al., 1993 [LB pain]	Cross-sectional	Questions derived from Nordic questionnaire, but pain persisting for a least a few hours; 12 mths retrospectively.
Estlander et al., 1998 [MSK pain]	Cross-sectional baseline, repeated on same cohort at T2, 3 and 4 within 5 years	Questions derived from Nordic Questionnaire, but pain for less than 30 days included in the analysis.
Foppa & Noack, 1996 [BP]	Cross-sectional	BP or LBP 1 mth retrospectively.
Harber et al., 1985 [LBP]	Cross-sectional with retrospective at 2 weeks and 6 months	BP 6 mths retrospectively, excluding menstrual pain and musculoskeletal symptoms
Hemsley et al., 1998 [LBP]	Cross-sectional	Self-reported back pain and extent to which it interfered with their work on a visual analogue scale.
Holmstrom et al., 1992b [NSP]	Cross-sectional	Pain, ache or discomfort from the neck and shoulder area, sometimes, often or very often; 12 mths retrospectively
Holmstrom, Lindell & Moritz, 1992 [NSP]	Cross-sectional, retrospective (12mths)	Pain, ache or discomfort in the neck and shoulder area, sometimes, often or very often; 12 mths retrospectively
Manninen et al.,1995 [LBP & NS]	Cross-sectional with c-s follow-up at 12 years some of same cohort (pain-free)	At T1: LBP & N/SP currently; and, at T2: LBP 12 mths retrospectively.
Moffett et al., 1993 [LBP]	Prospective longitudinal inception cohort, followed up every 3 months up to 20 months	Pain of 1 or more day's duration on a VAS ("No pain"-"Pain so bad that I had to take sick leave"); further focus on LBP for more than 3 consecutive days, and 21 days of LBP or 1 day off sick with BP.
Toroptsova et al., 1995 [LBP]	Cross-sectional	Pain lasting more than 24 hours in the area below the 12th rib and the gluteal folds

Pain types: B = Back; C= Chronic; HLID= Herniated lumbar intervertebral disc; LB = Low back; MSK= Musculoskeletal; N =Neck; S = Shoulder; WRULD = Work-Related Upper Limb Disorder

(c) Pain as articulated in terms of time and intensity

(i) The focus on "important" pain

Historically and clinically, chronic pain is defined as pain of substantial intensity that is more than three months in duration (IASP, 1986; Merskey & Bogduk, 1994). According to this definition, three of the studies in Table 2.19 examine chronic pain specifically (Andersson et al., 1993; Karoly et al., 1996; Von Korff, 1989). The rationale for most of these studies is to identify the risk factors for chronic pain, therefore it seems sensible to examine pain that is at least three months in duration. Tables 2.18-2.20 show that although the majority of studies examine what might "officially" be termed as acute pain, many of them tend to focus on more troublesome acute pain, placing further restrictions on the pain included for study. The assumption across all studies is that more troublesome acute pain is deemed to be worthy of note or "important".

(ii) Defining "important" pain

"Important" pain is not a term commonly used by researchers, as many tend to discuss pain in terms of pain type, and very few give a rationale for the type of pain that they have studied. For the purposes of this discussion "important" pain is a term used here to refer to the pain that the researchers believe to be worthy of study.

There is some inconsistency between what researchers define as "important" pain. Some authors define "important" pain as that which is either regular or has occurred for substantial period of time, or both (Andersen & Gaardboe, 1993; Andersson et al.,1993; Behrens et al., 1994; Hagen et al., 1998; Brulin et al., 1998; Burdorf et al., 1993; Deyo & Tsui-wu, 1987; Engels et al., 1996; Fjellman-Wikund et al., 1998; Guo et al., 1995; Hagen & Thune, 1998; Harreby et al., 1996; Helliwell et al., 1992; Hildebrandt et al., 1995; Karoly et al., 1996; Moens et al., 1993; Skov et al., 1996; Vasseljen et al., 1995; Westerling & Jonsson, 1980; Wickstrom & Pentti, 1998; Williams et al., 1998). Other authors focus their investigations on pain that is more troublesome or of a troublesome level of intensity (Brown et al., 1998; Hultman et al., 1995; Suadicani et al., 1994; Von Korff et al., 1989; Westgaard & Jansen, 1992). Finally, some authors have focussed on pain that is of significant intensity or impact to prompt presentation to health care systems for help (Bigos et al., 1991; Fifield et al., 1996; Fjellman-

Wikund et al., 1998; Jacobsson et al., 1992; Josephson & Vingaard, 1998; Miedema et al., 1998; Stang et al., 1998; Wickstrom & Pentti, 1998).

The inconsistency between what is defined as "important" pain or otherwise makes comparison between studies difficult, even where other factors are controlled for. For example, two studies measure back pain in nurses (Harber et al., 1985; Videman, 1984) and report two different prevalence rates (52% and 79% respectively). In relation to the quality criteria described in Section 2.1(e), neither of these studies constitute what would be described as evidence of "reasonable quality" although, the study by Harber et al could be seen as substantially more open to bias than that of Videman et al (see Tables 2.4-2.15). As such, it is unclear whether the differences in prevalence are the result of differing designs, or of actual population differences. One further difference between these studies is that the pain measures applied in each study were very different. Harber et al. (1985) examine *any* back pain in the past six months, and instruct their participants to exclude menstrual pain and musculoskeletal symptoms. On the other hand, Videman and colleagues examine all types of back pain, and go on to enquire about pain in relation to several daily activities: waking up; changing posture; lying in bed; exercising; and coughing/sneezing. Therefore, although these authors are addressing similar pain types in similar populations, they are focussing on two very different aspects of pain. This could be one explanation for the fact that they are yielding very different prevalence rates.

Although it is not always made explicit in the literature, it is assumed that the rationale behind this focus on more serious or "important" pain is that this pain that will have the most impact on the individual, and will have the greatest potential to become chronic. However, the lack of agreement between what constitutes "important" pain renders this logic problematic. With different definitions of what pain is "important" and what pain is not, researchers are attempting to establish risk factors of chronic pain from a variety of different pain indicators and baselines that are difficult to synthesise.

Not only does the previous focus on "important" pain convey the assumption that only noteworthy pain will become chronic, but it also implies the converse: that pain that is "non-important" will not become chronic. Limiting research to only "important" pain is to omit all the "non-important" pain that is also occurring in the community and the workplace.

Mayer and Gatchel (1988) state that only 10% of spinal pain becomes chronic. To speculate that perhaps half of the remaining 90% of pain experienced is troublesome or "important" to sufferers still does not account for 45% of pain taking place. It is impossible to tell whether "non-important" pain leads to chronic pain, and indeed it may not. However, given that previous research has been unable to identify risk factors for chronic pain from "important" pain consistently across the literature, it is relatively impossible to tell whether "important" pain leads to chronic pain either.

Yet many researchers continue to investigate on this end of pain, and this focuses research towards the more "troublesome" end of pain. The current study does not seek to diminish the clinical importance of looking at more troublesome pain, but asks whether the focus on more frequent, long-term "important" pain is necessary for the identification of risk factors for chronic pain. The next logical step from this perspective is whether there is another way to approach pain, that is, to question the assumption that only "important" acute pain will lead to chronic pain.

(iii) When is pain not "important"?

A further criticism of the research summarised in the Tables above is that the definitions of "important" pain are established and defined by researchers, rather than pain sufferers or participants themselves. Individuals are explicitly instructed to focus on what the researchers believe to be "important" pain. For example, Von Korff and colleagues (1989) ask individuals to "exclude pains that are fleeting or minor such as a brief headache or sore muscles after exercise". Who is to say that brief headache or sore muscles after exercise are not important, or have little impact? Moreover, who is to say that brief headache or sore muscles after exercise do not lead to work incapacity, or are not affected by psychosocial work factors? Finally, who is to say that brief headache or sore muscles after exercise are not precursors of chronic pain? As such, it might be important to focus on the pain that individuals *themselves* find to be noteworthy, rather than to place a set of criteria on what pain is "important" or not. Again, the current study acknowledges the importance of looking at pain within clinical criteria, but also seeks to harness the subjectivity and experiential aspect of pain by not placing any criteria on the type of pain that is included. In this way, the influence of observer bias may be reduced, and if an individual believes themselves to have suffered from pain, any pain of note, they will report it.

(d) Pain outwith clinical terms and definitions

It has been argued so far that the lack of consensus on risk factors for chronic pain at work has not been helped by the previous focus on: site-specific pain; musculoskeletal pain in relation to work; as well as the inconsistencies between the importance of certain types, durations or intensities of pain, and whether these are worthy of study or not. This has not included a summary of the literature examining pain outwith the clinical criteria or definitions described above, and this is discussed below.

(i) Studies examining pain of short duration

Some studies allow for the inclusion of "important and "non-important" pain, providing some illustration of the nature of "non-important" pain in populations. Table 2.20 shows those studies indexed in the current literature review that focus on the less troublesome acute pain, in both general and working populations. All of these studies include a measure of pain within the last month. Technically, therefore, they are focusing on acute, non-chronic pain. As with the majority of literature in this area, there is little consistency between measures applied. For example, some authors do not take any actual measure of prevalence in their studies, but instead report outcome measures that combine pain prevalence and frequency (Hasvold & Johnsen, 1993; Holmstrom et al., 1992b); or prevalence and impact (Hemsley et al., 1998). Others, however, apply standardised instruments used elsewhere (see Table 2.17) but allow for the inclusion of pain of a shorter duration (Burdorf et al., 1993; Estlander et al., 1998; Toroptsova et al., 1995).

Some authors define pain in terms of the length of episode, focusing only on pain that is more than twenty-four hours in duration (Bergenudd & Nilsson, 1994; Moffett et al., 1993; Papageorgiou et al., 1997 & 1998; Sternbach, 1985; Toroptsova et al., 1995). This approach is useful and relevant to the current study in that it identifies pain of a reasonably short duration, and shows that pain of this duration can lead to substantial limitations to work practices. However, just as the studies in Table 2.18 can be criticised for omitting less troublesome pain, so these studies can be criticised for omitting short-term pain. As argued earlier, it may be that short-term pain does have minimal impact on the individual, but even though it might not be of clinical significance, it may still be of experiential significance to the sufferer.

One author takes a different approach, and rather than limit the minimum pain duration for inclusion, measures only pain of less than seventy-two hours in length (Coste et al., 1994). This approach ensures that pain of only a short duration is included, but also makes no predictions or preconceptions about its impact. As very little rationale for this focus is given in the study, one can only assume that the authors presuppose that pain of more than seventy-two hours duration is not of interest to their study, therefore omitting the precursors of chronic pain that is the focus of so many other studies. Although these authors focus on less troublesome pain, it could also be argued that placing limitations on the pain duration at all, even though they are a matter of hours, *still* excludes pain that might be of interest to study. The current study aims to examine pain in the absence of any preconceptions about duration or intensity, and to ask individuals themselves to give information on these aspects of pain (see Section 2.4).

(ii) Pain outwith clinical terms and definitions

There is a group of studies that examine pain without any conditions of time or intensity in their design. In these cases no assumptions of which pain might or might not be "important" are made. These incorporate a variety of measures including: point prevalence (Hemsley et al., 1998; Burdorf et al., 1993; Manninen et al., 1995); and retrospective questions ranging from one month (Foppa & Noack, 1996; Heistaro et al., 1998), six months (Harber et al., 1985) to one year (Linton Hellsing & Hallden, 1998; Manninen et al., 1995).

These studies show the prevalence and incidence of pain to be considerable when no criteria are placed on pain duration or intensity. Specifically, research shows that:

- point prevalence of back pain is substantial in general populations (18% in one study (Croft & Rigby, 1994); 66% in another (Linton Hellsing & Hallden, 1998));
- lifetime prevalence of lower back pain is also high (73%; Hemsley et al., 1998);
- one-year prevalence of back pain is higher in manual workers (50% in crane operators; 44% in straddle-car drivers) than in office workers (34%) (Burdorf et al.,1993), a difference that appears to be constant over time (Harber et al., 1985); and

- back pain is more prevalent in women than in men (44% versus 32% respectively) (Foppa & Noack, 1996), a difference that also appears to be constant over time in both back and neck/shoulder pain (Manninen et al., 1995).

These findings suggest that when no inclusion criteria are placed on pain, that pain appears to be very common, and more prevalent than when only troublesome pain is examined. This suggests that less troublesome pain is at least as worthy of note as more troublesome pain, a proposition that appears to contrast with the view taken by many previous studies. When interpreting these studies, however, as with many other studies in the current review, it is important to take into consideration that these studies report evidence from a variety of designs, and as a result their evidence of differing levels of quality.

Two issues are important to note, however. First, although the studies included in Tables 2.18-2.20 address non-troublesome pain, they are not specifically addressing pain outwith clinical terms and definitions. Although pain intensity and duration are omitted as inclusion criteria, all studies categorise pain in terms of site or region. Only Sternbach (1986) examines pain outwith site-specific criteria, but puts duration-specific criteria in place, examining only pain of one day or more's duration.

The current study aims to examine pain *completely* in the absence of any clinical terms or definitions, putting no site-, duration- or intensity- specific inclusion criteria on the pain that will be included.

(iii) Risk factors for pain outwith clinical terms and definitions

Previous research also provides a somewhat rudimentary picture of the influence of work factors on pain outwith clinical terms and definitions. Studies in working populations examine the contribution of only a handful of factors.

Burdorf and colleagues (1993) present data from a variety of different measures, reporting stress and work group to be predictive of back pain of all descriptions, after adjusting for age and "work-related risk factors" in previous and current employment, age and previous history of pain were reported to be associated with occurrence and recurrence of pain. Burdorf and colleagues used the Nordic

Questionnaire (Kuorinka, Jonsson & Kilborn, 1987) to measure pain, which examines pain cross-sectionally within a retrospective period of twelve months. Duration of employment and job satisfaction were not found to be associated with pain of any duration. The Nordic Questionnaire is normally used to exclude all pain of under 30 days duration (see Table 2.18), however, Burdorf et al. (1993) report that half of their sample had experienced pain for less than 30 days, and a quarter of their sample for seven days or less.

Some of these findings are partially supported by other research. For example, Foppa & Noack (1996) also report stress and work group to be predictive of back pain measured in the absence of any duration-specific criteria. Other predictors of back pain reported by Foppa & Noack (1996) are workload control, and demands. These findings are generated from a study of reasonable quality, and show that psychosocial and work factors can be observed as risks for pain of duration as little as one week or less.

However, this literature is also not without its inconsistencies. In a study of excellent quality, Manninen and colleagues (1995) measure lower back and neck/shoulder pain in the absence of any duration-specific criteria, and find no effect of stress. It is impossible to draw any further conclusions, as Manninen and colleagues (1995) do not provide any further data on other work factors.

It would appear that no previous study has examined a comprehensive set of work and psychosocial variables as risk factors for pain of any duration. The current study sets out to remedy this, by combining the approaches to work of several researchers to include a variety of different factors (see Methods - Section 3). It is expected that pain measured in the absence of any site- or duration-specific criteria will be prey to psychosocial and work influences, (factor-specific hypotheses are given in Section 2.4.3 below).

(e) Summary of this study's approach to pain

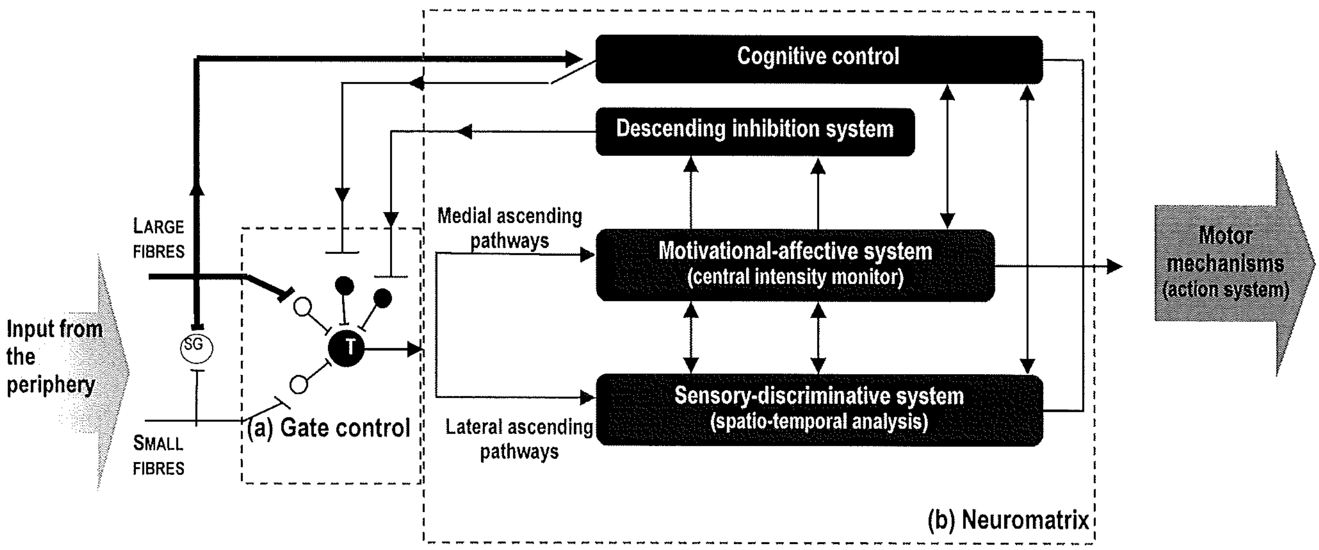
The current study aims to examine pain in the absence of any preconceived expectations about pain. It is hoped from this approach that the current research can provide the first picture of pain at work as a general, human experience, rather than as a clinical problem that is tied to an underlying pathology or site. In this way, there are no preconceived notions as to what type of pain is important, or disabling or has greatest impact. Crucial to this argument is the notion that the subjectivity of pain is a fundamental component of understanding pain at work, and that examining pain as part of a total human experience offers a richer illustration of pain at work than previous prevalence studies have provided.

2.4.2 Examining aspects other than prevalence or incidence

(a) The subjectivity of pain

One of the key debates in the study of pain is its subjectivity, and the influence of individual, situational and behavioural factors on pain perception and pain report (Melzack & Wall, 1965). Decades of research have been dedicated to investigating the variability of the pain experience between and within individuals and pain stimuli. Gate Control Theory (GCT) (Melzack & Wall, 1965) accounts for the pain experience in relation to individual, biological, cognitive and behavioural factors.

Figure 2.4
Gate Control Theory (Melzack & Wall, 1965) (Diagram adapted from Main & Spanswick, 2000)



(a) Gate Control Theory states that large and small fibres project onto the SG (Substantia gelantinosa) and T (Transmission cells) in the dorsal horn of the spinal chord. Activity in the large fibres increases inhibition in the SG, and activity in the small fibres decreases inhibition in the SG. Large fibres also excite the central control system (here, the neuromatrix (b)) which in turn has an effect on the cells. When the Gate is open in the T cells then pain is experienced, and when it is shut, the pain is not experienced. Any painful experience is the combination of input from the periphery and the central control system.
(b) The T-cells project onto the neuromatrix, in which there are 2 systems: the motivational affect system; and the sensory-discriminative system. The central control processes project also onto these systems, and also onto the dorsal horn. Additional inhibition of the dorsal horn occurs via the descending inhibition system that also receives input from the motivational affect system and the sensory-discriminative system. When a painful experience occurs, all of these systems interact with one another, and the delicate balance of internal and external influences determines the pain experience. This results in variable action being taken by the motor mechanisms.

Melzack (1990) proposes that the neuromatrix, as described in Figure 2.4 modulates the pain experience. As such, the pain experience is seen as the product of external stimulation, previous experience and expectations, emotional responses, attention and other cognitive processes. GCT has widely been accepted as a useful framework for understanding pain as a human experience. Although this theory is not without criticism, it is the best current mechanism through which individual and psychosocial influences on pain can be understood and accounted for (Skevington, 1995; Main & Spanswick, 2000; Waddell, 1998).

There is no doubt that this theory has led to the expansion of pain research into a variety of different disciplines, to which epidemiology is just one contributor. Without some recognition of the possibility of individual, behavioural and cultural factors having an influence on the pain experience, the epidemiological perspective on pain would not be possible nor plausible.

The majority of the literature reviewed here has made little comment on the underlying mechanisms of pain, and the way in which different factors may influence different aspects of pain. As such, the assumption that psychosocial and work factors influence pain perception is implicit, rather than discussed in detail. The majority of previous epidemiological approaches, therefore, pay little attention to the discussion of the subjectivity of the pain experience, the rationale for which is discussed below.

(b) Examining measures of pain other than pain prevalence

The epidemiological paradigm is predominantly biomedical in nature, studying disease and disease spread within populations. Fundamental to this approach is the drive to pinpoint the causes and agents of disease with a view to: increasing understanding of their course; improving the health and lives of disease-sufferers and those at risk; and ultimately to prevent disease occurrence and spread (Bhopal, 2002). Research on the epidemiology of pain has been extremely valuable, including its contribution to the shift from approaching pain as a singular symptom of a disease to approaching pain as a multifactorial dynamic construct, and often a condition in its own right. In 1999, Crombie discusses the potential for epidemiology in pain research (Crombie et al., 1999), concluding that:

> *"Epidemiology provides a rich(er) set of perspectives and methods, which when pursued with vigour and imagination, can make substantial contributions to the control and prevention of chronic pain."*
>
> Crombie et al. (1999 p.4)

Reflecting on the literature reviewed thus far, it seems that as epidemiology has revealed more risk factors for pain, the more complex the picture has become, and the further we have moved away from being able to successfully control and prevent pain. The tendency within scientific circles is to interpret this in terms of shortcomings in study design or data collection, and the debate goes on as to how to "correctly" apply epidemiological methods (Von Korff, 1998) to pain research.

Invariably no research design is without criticism, and it is unlikely that any epidemiologist or social scientist will ever be able to completely eliminate all sources of bias in *any* study (Coolican, 2001). The subjectivity of pain makes the likelihood of eliminating bias in pain research even less likely (Skevington, 1995).

The current study suggests that while it is important to devise a "better" or less biased approach to the study of pain, it might also be useful to question some of the fundamental assumptions of previous research. Two of these assumptions: the predominance of site-specific categorisation and the focus on troublesome (high intensity, long-duration) pain have already been questioned. A further assumption that deserves reflection is one that is rarely questioned: the assumption that pain can be predicted, and that identifying predictors will serve to enable the prevention of pain.

(i) The assumption that pain can be predicted and/or prevented

It may be that previous research has not found the definitive "recipe", as it were, of risk factors that underlie and contribute to pain. Many authors between 1980 and 1998 (and from 1998 to the present day – see Discussion, Section 5), have asked this question, and have devised a variety of different measures for observing physical, psychosocial and psychological pain predictors. However, where risk factors have been identified and intervened with, the evidence for successful intervention is far from convincing, especially where physical intervention is concerned (Frymoyer, 1992; Waddell & Burton, 2000; Hadler, 2005).

It might be useful to reflect on the extent to which the occurrence of pain can actually be predicted. Perhaps the occurrence of pain at work cannot be predicted from physical or psychosocial factors and that adjusting these factors will rarely lead to less or no pain. Hadler argues that the reason pain is difficult to predict is that it is a universal experience, and a part of the "human condition".

Just as pain in life often cannot be predicted or prevented, Hadler argues that pain at work often cannot be predicted or prevented (Hadler, 2005).

The evidence presented in Tables 2.4-2.15 would partially support this argument. Although many predictors have been identified, their effects are not uniform, and not consistent. Clearly lifetime prevalence of pain is high (see Tables 2.4-2.15), suggesting a certain amount of inevitability of pain in life and therefore in work. However, there is an irrefutable preponderance of pain in working groups, especially those working in manual occupations. This would suggest that there is a link between working and experiencing pain. Hadler, however, presents an alternative interpretation of this observation, suggesting that an association is not necessarily indicative of a causal relationship:

> *"Most regional musculoskeletal pain is exacerbated by usage of the particular musculoskeletal region that is hurting. Often, there is no discomfort without such usage. The association between usage and exacerbation of symptoms is reliable and predictable so as to render the causal nature of this association incontrovertible. Swayed by this association, generations of observers and people in pain have presumed a corollary association; the usage that exacerbates the pain must be the usage that caused it in the first place. Similar reasoning has long been applied to occupational musculoskeletal disorders and is the cornerstone of the drive for an ergonomic standard; when a worker declares incapacity for particular tasks because of regional musculoskeletal symptoms, those tasks, pari passu, are hazardous... Although the association between exacerbation of most regional musculoskeletal symptoms and particular musculoskeletal usage is incontrovertible, how can one generate confidence in the corollary inferences? Could they represent anything other than coincidence? Or, more daunting, could we be overlooking some association other than usage that is more likely to be primary, even causal? Could it be that the worker whose back hurts worse when bending in the warehouse would have the same backache if he or she had a desk job or was a homemaker and would hurt even more bending to get into an automobile or caring for a toddler? Could it be that most workers experiencing regional back or arm pain do not find the condition incapacitating regardless of their tasks? There is no reason to be certain that any association between regional musculoskeletal pain and either biomechanical exposure or work incapacity represents cause and effect."*
>
> *(Taken from Hadler, 2005; p.270)*

In this way Hadler argues against the assumption that the fact that there is a relationship between musculoskeletal activity and musculoskeletal pain does not necessarily mean the former causes the latter. Hadler uses the example of angina pain, arguing that although angina symptoms can be seen to be exacerbated by climbing stairs, it would be inappropriate to suggest avoidance of stairs as a "cure" for angina. In the same way, Hadler argues that it is a "leap of faith" to recommend avoidance of particular work tasks as an intervention for some pain.

This is a question of interpretation, and many would argue that the research evidence outweighs this opinion, and that regardless of the underlying mechanism, pain does seem to be more common in working populations. Hadler argues against this logic, claiming that this assumption has driven scientific thinking in the last few years, and has led to a focus on researching working populations and work factors. In his opinion, therefore, it could be that more pain is observed in working populations because more working populations are studied. Indeed, the current thesis shows that pain is also common in non-working populations, and pain also continues to be a problem long after the work-disabled give up work (Waddell, 1998). Some authors have reported leisure-time factors to be just as or more predictive of pain at work (Papageorgiou et al., 1997; 1998).

All of these observations suggest that the occurrence and development of pain may also be related to factors that are not associated with work. Traumatic or insidious organic injury aside, one would imagine that stopping the activity that "caused" or exacerbated the pain might at least provide a change, if not an improvement in the pain experience. Indeed it is often observed that inactivity and not being at work actually makes pain worse (Waddell, 1998). Therefore, it may be that pain at work is inevitable. It may be that pain is a predicament of life and not just of work (Hadler, 2005).

(ii) Evaluating Hadler's approach to pain at work

Given the evidence presented earlier in this thesis, it is not difficult to challenge the "predictability" of pain at work from psychosocial factors, and to question the potential success of work-based interventions. Hadler's views provide the epidemiologist with cause for reflection, regardless of their basis in fact, or their implications. If science were to adopt Hadler's stance, it would require a substantial societal and epistemological shift. In practical terms, if industry were to adopt Hadler's stance, it would have major legal and personal implications for everyone involved in occupational pain, as well as with regard to issues such as accountability for injury, and compensatability for lost work and lost resources. Hadler discusses many of these issues in depth, but fails to provide an alternative or a solution to the problem. As such his discussions are intellectually pleasing and challenging, but not entirely useful.

One major fact remains: millions of people are suffering from pain worldwide, and for around 10-15%, the pain renders them unable to work again (Waddell, 1998; Main & Spanswick, 2000). So what can be done to help the worker in pain? Moreover, how can we help the employer attempting to keep the worker in pain at work?

One of the major flaws of Hadler's argument is that his view of epidemiology fails to include the fact that many epidemiological approaches often consider societal and non-physical influences on illness and disease. Indeed, many epidemiologists would support his argument, as is manifest in the stringent procedures used to adjust for confounding effects in many of the investigations cited in Tables 2.4-2.15. Hadler is perhaps taking a somewhat reductionist view of the epidemiological paradigm, by discussing the epidemiology of pain as the search only for pain cause. Many would argue that the epidemiology of pain need not be so limited, and can contribute as an approach to understanding the course of pain, throughout populations and over time (Crombie, 1999). Indeed, Crombie notes that, "too often in the literature on pain the term epidemiology is used to refer solely to a prevalence survey." It might be worthwhile, therefore, to interpret Hadler's views as a criticism of previous research in this area, rather than of epidemiology as a whole.

Tables 2.4-2.15 do confirm that the majority of epidemiological studies reviewed for this thesis use pain prevalence as their sole outcome measure, however, not all epidemiological research has focussed on pain prevalence as a dependent variable (see Section 2.4.2 below).

(iii) The middle ground: examining predictors of pain experience

There may be some common ground between Hadler's account of the potential for the extension of epidemiological conclusions, and the current incomplete and inconsistent picture of the psychosocial underpinnings of pain at work. The current thesis proposes a third viewpoint, that is, to examine the relationship between the pain *experience* and work. In addition to examining whether psychosocial and work factors predict pain *occurrence*, it will examine how these factors predict different aspects of the pain *experience*. In this sense, the aim is not to examine the source of pain as such, but to explore how these factors contribute to and maintain the way the pain is experienced, *once it occurs.*

Therefore, this study will apply an epidemiological paradigm to pain *experience* (as well as to explore risk factors for the occurrence of pain) and it is hoped that the "risk factors" for a particular pain experience or profile can be identified. It is hoped that this will extend current understanding of pain in the workplace, but also provide pain professionals and employers with an understanding of which aspects of work relate to which aspects of pain. This may provide a useful tool for intervening and enabling work in a workforce suffering from pain, rather than intervening to eradicate pain altogether.

There are two important questions that need to be asked before proceeding, however, and these are:

- What is already known about the pain experience at work?
- How can the pain experience be measured?

2.4.3 Examining the pain experience

Although the majority of previous studies focus on pain prevalence, some report additional information on different aspects of pain. These provide an illustration of the nature of the pain experience in relation to work, and in particular information on the magnitude of the pain at work, and the impact of pain on work.

(a) Previous research on the magnitude of the pain experience in relation to work

(i) Pain intensity and severity in clinical and general populations

Two main indicators of the magnitude of the pain experience are used in previous research: pain intensity and pain severity. It is difficult to draw a distinction between the uses of these two terms in the literature, as no study gives an exact definition of the pain construct to which they are referring. Instead authors define the constructs of pain intensity and severity by giving details of the specific measures applied, and at times intensity and severity are used interchangeably (see Section 2.4.2). In correspondence with the literature, both intensity and severity of pain will be discussed together here.

Where self-report measures are applied, pain of moderate to high intensity appears to be prevalent in a variety of populations, as is the case for back pain (Deyo & Tsui-wu, 1987; Miedema et al., 1998), as well as headache (Schwartz et al., 1988).

Cross-sectional data show prevalence of moderate to severe back pain to be as high as 80% in one population (Miedema et al., 1998). This however was a clinical population, all of whom had presented to healthcare services for help with acute or sub-acute back pain, therefore this figure may not be representative of general or working populations as a whole. Cross-sectional evidence from non-clinical studies shows that back pain of middle to high severity or intensity was reported in over half of a sample of the U.S. general population (Deyo & Tsui-wu, 1987). In addition, one study reports that chronic pain intensity varies in relation to site, with back and head pain being of highest magnitude, and abdominal and knee pain being of lowest magnitude (Andersson et al., 1993). Therefore, not only is pain prevalent in the general population, but it would appear that it is of substantial intensity or severity when it does occur. As discussed previously (see Section 2.3), the fact that these studies present only cross-sectional data from these populations, means that the extent to which they can be said to be representative over time is not clear. Moreover, only one of them (Miedema et al., 1998) presents evidence from a design of "reasonable quality" (meeting four out of the five criteria discussed in Section 2.1(e)). Therefore, the findings published in studies by Deyo and Tsui-wu (1987) and Andersson et al. (1993) may have been open to bias.

Prospective studies show that pain intensity and severity appears to decrease over time (Coste et al., 1994). However this is not to say that high levels of pain intensity and severity disappear altogether, as Miedema and colleagues (1998) show in the prospective arm of their study, that 50% of individuals referred to a health service for acute pain that did not become chronic still described their incident pain as severe during three years of follow up (Miedema et al., 1998). It was argued above that traditionally "non-important", non-chronic pain is as worthy of study as "important", chronic pain. Miedema et al.'s finding (1998) supports this argument. As non-chronic pain is often considered "non-important" by researchers, there is the assumption that non-chronic pain may be a more moderate experience than chronic pain. . Miedema et al.'s data show that a proportion of non-chronic pain that is experienced outwith clinical supervision may be of moderate to severe intensity, suggesting that perhaps non-chronic pain may be more "important" to study than has previously been considered.

(ii) Pain intensity and severity in working populations

Articles measuring self-reported pain intensity and severity as a single construct in working populations are rare. One study asks participants to comment on the "character" of their pain in terms of the following nominal categories: "acute/dull/stiff/indeterminate" (Toroptsova et al., 1995). While none of these adjectives describe intensity or severity specifically, they represent an incremental categorisation of the pain experience, with notable magnitude ("acute") pain at one end, and low magnitude ("indeterminate") pain at the other. Data from Toroptsova et al's study (1995) suggests that pain in a sample of Russian factory machine-workers was of notable intensity, with over 80% of workers describing their pain as "dull" or "acute". However it is unclear to what extent this perceived intensity was affected by confounding in Toroptsova et al's study, and the adjustment these authors made for confounders is not made explicit. As gender is a known confounder of pain prevalence (see Section 2.3) and pain experience is known to differ between genders (Unruh, 1996) it is not unreasonable to speculate that gender may in fact be influencing these reports of pain intensity also. Toroptsova et al., (1995) do stratify for gender and age in presenting prevalence findings, but do not make clear whether they account for the effect of gender and age on intensity findings. It is important to take these design and analysis issues into account when interpreting findings, as with Toroptsova et al's study (1995) it is unclear whether the reported intensities were affected by the categories given, or by unanalysed (or un-measured) confounders.

In contrast, Brown et al. (1998) report pain of high severity in a quarter of police drivers and a recurring lower back pain problem in over three quarters of the same sample. These studies would suggest that pain of notable severity is common in this working population. These findings were reported in a study of reasonable quality, suggesting that pain may be of high severity in a sample of their police drivers.

This is not to say that where information on pain intensity is available, it is always high. Hemsley and colleagues (1998), for example, report 95% of workers reported pain of low intensity (1-2 on a 0-5 visual analogue scale (VAS)). This suggests that although pain was prevalent in their population of sand-mine workers, when it was experienced, it was of minimal severity in the majority of cases. However, strictly speaking Hemsley et al. (1998) do not measure intensity or severity as a single construct. Their measure is described as a VAS, "of 0-5, with 0 being no pain, and 5 being severe pain and unable to work". While one end represents low intensity ("no pain"), the other end is a measure of severity *and* impact on work. Other researchers have taken a similar approach, asking participants to express the severity of their pain in terms of the extent to which it leads to work absence or compromises their ability to work (Feyer et al., 1992; Fujimura, Yasuda & Ohara, 1995; Harber et al., 1985; Hemsley et al., 1998).

To the extent that these studies can be said to be reporting observations in designs that were unbiased, they suggest that in many working populations pain may be of significant severity and/or impact. As a general conclusion therefore, it can be said that pain in working populations appears to be of notable intensity or severity, although the inconsistencies of measures and differing quality of designs in these studies should be borne in mind when interpreting findings.

Another approach to examining the magnitude of pain is by inferring pain intensity or severity from chronicity (Engels et al., 1996; Harreby et al., 1996; Schwartz et al., 1998). In most cases, inferred severity and intensity of pain is minimal to moderate. It is unclear, however, the extent to which these measures provide a valid indication of individual participants' pain intensity or severity. For example, one study employs the use of "trained interviewers" to approximate pain severity (Anderson, 1999), while others judge severity of pain using clinical definitions rather than self-report (Pryse-Phillips et al., 1992; Schwartz et al., 1998). The extent to which these studies may have been unaffected by observer bias, is not clear. While these authors' attempts to establish an objective measure of pain should be applauded, taken in the context of the above discussion regarding the subjectivity of pain (and more importantly the subjectivity of pain intensity and/or severity), the validity of these measures could be seen as somewhat problematic.

The current study aims to embrace the subjectivity of the pain experience, assuming that the only way to measure pain experience subjectively is to access participants' reports of the pain experience directly. In addition to measures of severity and intensity, another aspect of pain experience that has been examined by previous research is pain frequency. This is discussed in detail below.

(iii) Frequency of pain in general, clinical and working populations

Research suggests that there is a substantial amount of pain taking place at frequent intervals. For example, a fifth of the clinical population examined by Miedema and colleagues (1998) reported back pain to be constant, and a further 60% report it to be frequent. Although these authors examine a clinical population, Moens and colleagues report similar figures in a population of Flemish carers, where repeated or continuous pain was experienced by over 80% of workers (Moens et al., 1993). In addition, Masset et al. (1994) report similar data, with 7% of their sample of steel-workers experiencing daily back pain. These findings suggest that pain in working populations is not only prevalent, but it occurs regularly for a substantial proportion of steelworkers, and for some it is constant. Given that all three of these studies report from study designs that were judged to be of "reasonable quality" in the current review, these findings can be interpreted as being reasonably valid and reliable. In a study of slightly "lower quality" (meeting only three of the five criteria used in the current review, see Section 2.1(e)), Rotgoltz et al. (1992) show back pain to be frequent in pharmaceutical factory workers, with over half of the sample reporting over two annual episodes, and 16% being in constant pain. Pain of notable duration was also highly prevalent in this population, with only 16% reporting pain of less than 3 days (Rotgoltz et al., 1992). However, given that these percentages were derived from a small sample (N = 138) in which there was a somewhat low response rate (66.3%), it is not clear whether these findings are representative of Rotgoltz et al's target population, as well as the general population of pharmaceutical factory workers as a whole.

It has already been argued that duration-specific inclusion criteria prohibit the study of short-term pain, and that short-term, "non-important" pain may be worthy of study. The findings published by Masset et al. (and to some extent those published by Rotgoltz and colleagues) are especially important as they show pain lasting three to seven days to be highly prevalent in working populations. Therefore, it may be that short-term pain is not only prevalent, but also that episodes are frequent. The final aspect of the pain experience that is examined by previous literature is the impact of pain on the ability to work. This is discussed in detail below.

(b) Previous research on the impact of pain on work

Many previous authors have examined the pain experience at work by measuring the impact of pain on working life. The most common method of measuring impact on work is to examine sickness absence rates due to different types of pain.

(i) Rates of pain-related work absence

Overall, there is a notable rate of sickness absence attributable to pain in a variety of populations, for a variety of different pain types (see Table 2.21 below). Rates of sickness absence attributable to pain range from as low as 6% of participants in some studies (Gatchel et al., 1985; Klaber-Moffett et al., 1993; Perlik, Susta & Kuchynkova, 1981) to as high as 63% of participants in others

(Deyo & Tsui-wu, 1987). There appears to be little difference between general, clinical or working populations, with this inconsistency being observed in all populations (see Table 2.21).

As with a great deal of pain research, the majority of previous studies focus on back pain, about which there is little agreement across populations. Cross-sectional studies report sickness absence for back pain to be between 6% and 13% in general or clinical populations (Gatchel et al., 1985; and Rotgoltz et al., 1992, respectively) and between 6% and 63% in working populations (Klaber-Moffett et al., 1993; and Deyo & Tsui-wu, 1987, respectively). There is similar inconsistency between observed sickness absence rates for other pain types, and between prospective studies for back and other pains (see Table 2.21). It is important to note regarding these studies, however, that the way in which sickness absence is recorded in studies is not always comparable or useful. For example, in three studies presenting evidence of "reasonable quality" (Westerling & Jonsson, 1980; Moens et al., 1993; Burdorf et al., 1998), all three used different measures of sickness absence. Westerling and Jonsson (1980) approximate sickness absence from, "health insurance records"; Burdorf et al (1998) through medical records; and Moens et al (1993) through self-report. While objective measures such as insurance or medical records have the benefit of not being subject to recall bias, they are only useful where they are kept up-to-date and reliable. Both Westerling and Jonsson (1980) and Burdorf et al (1998) discuss these processes briefly, and as such, the way in which these were accessed, as well as their respective validity and reliability is unclear. It is prudent to conclude, therefore, that sickness absence is likely to be common for many pain types, however the extent to which it impacts on work in different populations may vary.

One measure of impact on work employed by authors is to provide information on the length of sickness absence from work. Where authors measure length or duration of work absence, the majority report sickness absence to be short, between one week and one month (Brown et al., 1998; Burdorf et al., 1998; Moens et al., 1993; Rotgoltz et al., 1992; Schwartz et al., 1998). While these figures represent a prevalence of lost workdays that would appear to be minimal, one study argues that the cumulative effect of lost workdays from different types of pain in different industries is substantial (Sternbach, 1986).

Table 2.21
Studies examining sickness absence from work due to pain

(a) General or clinical populations

Back pain	Design	% of participants attributing sickness absence to pain (unless otherwise stated)
Gatchel et al., 1985	Cross-sectional	6
Harreby et al., 1996	Prospective study of schoolchildren (1965) followed up	23% for all conditions, 2% of which for back pain
Rotgoltz et al., 1992	Cross-sectional	12.5
Other pain	**Design**	**% of participants attributing sickness absence to pain (unless otherwise stated)**
Chan & Ho, 1998 [MSK]	Cross-sectional	54
Linton et al., 1998 [MSK]	Cross-sectional baseline with cross-sectional follow-up 6mth later	38
Schwartz et al., 1998 [Headache]	Cross-sectional	episodic tension headache (8); chronic tension headache (12)
Sternbach , 1985 [General pain]	Cross-sectional	Workdays lost to pain, projected onto entire U.S. population (in millions): headache(157); back pain(89); muscular pain(58); joint pain(108); stomach-ache(99); menstrual pain(24); dental pain(15).
Westerling & Jonsson, 1980 [NSP]	Cross-sectional	22

(b) Working populations

Back pain	Design	% of participants attributing sickness absence to pain (unless otherwise stated)
Brown et al., 1998	Cross-sectional	25
Deyo & Tsui-wu, 1987	Cross-sectional	63 - mild back pain (11); moderate back pain (18); severe back pain (34)
Feyer et al., 1992	Cross-sectional	nurses(13); postmen (36); chronic pain patients(96)
Fujimura, Yasuda & Ohara, 1995	Cross-sectional	11.5
Harber et al., 1985	Cross-sectional with retrospective at 2 weeks and 6 months	At 6 mth recall (9); at 2 week recall (3)
Klaber- Moffett et al., 1993	Cross-sectional	6
Moens et al., 1993	Cross-sectional	24
Perlik, Susta & Kuchynkova, 1981	Prospective over 3 years	6
Sairanen et al., 1981	Case-control	back pain seriously affected work ability, often in lumberjacks (41); non-manual controls (34)
Symonds et al., 1996	Cross-sectional	office workers(74% of all sickness absences); factory workers (75% of all sickness absences)
Van Poppel et al.	Prospective over 1 year	Median 1.5 days/wk absence for back pain
Wickstrom & Pentti, 1998	Cross-sectional baseline repeated on same cohort at T2 2 years later	workers (12); planners (4)
Other pain	**Design**	**% of participants attributing sickness absence to pain (unless otherwise stated)**
Burdorf et al., 1998	Cross-sectional baseline with prospective follow-up over 2 years	back pain (50); neck/shoulder pain (38); upper extremities (40); lower extremities (51)
Pryse-Phillips et al., 1992 [Headache]	Cross-sectional baseline, then telephone interview of sub-sample, then prospective diary	migraines (19); headache (8)
Westgaard et al., 1992 [MSK complaints]	Cross-sectional	production workers (82% of those suffering from pain); office workers (5% of those suffering from pain)

Pain types: MSK= Musculoskeletal Pain; NSP=Neck/shoulder Pain

In a cross-sectional investigation of general pain and ailments in the general population, Sternbach presents figures projected from his sample onto the U.S. working population. He reports lost workdays due to pain as substantial, estimating them to be as high as: 157 million days for headache; 89 million for back pain; 58 million for muscular pain; 108 million for joint pain; 99 million for stomach pain; 24 million menstrual pain; and 15 million for dental pain. These figures illustrate the potential impact of everyday pain on working life. Sternbach states that "these are not merely trivial pain episodes," and that "the (U.S.) society lost £55 billion in productivity in the preceding year as a direct result of pain alone" (Sternbach, 1985). This perspective is somewhat problematic due to the fact that these figures are based on estimated and projected figures, as opposed to actual prevalence rates. Moreover, assessment of the quality of this study shows it to meet with only two out of the five quality criteria for this review (adjustment for confounders; and a large population). However, in his defence, Sternbach did not intend his study to be the most supremely "scientific", but merely as a cross-sectional illustration of the nature of pain in a large population. Criticisms of inclusion criteria aside, he succeeds in doing this, and in raising awareness of the potential cost that workdays lost to pain may have within a large population.

It was argued earlier that pain of short duration is worthy of study, but that previous studies have omitted it on the premise that it was "non-important". These data suggest that pain of minimal duration can lead to absence from work, and therefore the impact of supposedly "non-important" pain on work is important to study.

A selection of authors present information on pain frequency as a measure of sickness absence (Moens et al., 1993; Schwartz et al., 1998; Van Poppel et al., 1998). Van Poppel and colleagues (1998) found chronic back pain to account for an average of one-and-a-half days off every week in a general population. This is supported by an earlier study of back pain in nurses, which reported a sickness absence rate of just over thirty-six days per annum (Moens et al., 1993). Both of these authors present data of "reasonable quality", and therefore their observations can be viewed with some confidence. Hagen & Thune (1998) report that after absence for lower back pain, 70% of their sample had returned to work within three months. Although there were some issues with the design of this study (see Section 2.3), this would fit with figures published in current guidelines for the management of acute back pain in primary care (CSAG, 1994; Kendall, Linton & Main, 1997). As such, it would seem that pain may account for a substantial amount of sickness absence from work.

Whether rates of sickness absence are measured in terms of prevalence, lost workdays, or frequency of pain episodes within a given period, clearly pain is having an impact on attendance at work. The very fact that pain renders a proportion of individuals unable to work, shows the importance of examining the impact of pain on working practice. However, the impact of pain on work is not merely a matter of the ability to attend work. There is evidence to suggest that even where work attendance is possible, a substantial proportion of individuals are affected by pain. This evidence is discussed below.

(ii) Rates of pain-related reduced productivity at work

Many authors report a significant proportion of their sample to be moderately or severely compromised in their ability to do their jobs when they remain in work. For example:

- Harber et al. (1985) report that 15% of their sample experienced lower back pain severe enough to cause them to be compromised at work.
- Chan & Ho (1998) show that 82% of the workers in their sample suffered from musculoskeletal pain but continued to work.
- Hasvold & Johnsen (1993) report on work fitness in relation to head and neck pain within a general population. Headache on at least a monthly basis was reasonably common (in 30% of men and 50% of women), as was neckache (36% of men and 54% of women). Of those that reported head and neckache, a substantial proportion described themselves to be "seriously hampered or unable to perform ordinary work". The more regularly an individual experienced their pain, the more likely they were to be hampered at work. Moreover, those suffering from headache and neckache on a daily basis deemed themselves only to be fully fit for work 46-61% of the time (Hasvold & Johnsen, 1993).
- Pryse-Phillips and colleagues (1992) report that 50% of migraine and 18% of headache sufferers stated that they had to discontinue normal activities as a result of their pain.

- In a cross-sectional study, Brown and colleagues (1998) reported a quarter of their sample to take sick leave attributable to back pain, and a further 61% to suffer from back pain severe enough to warrant absence, although they worked anyway.
- Schwartz et al. (1998) report reduced effectiveness at work as common in almost half of headache sufferers in their sample (43.6% for episodic tension headache, 46.5% for chronic tension headache).
- Sairanen et al. (1981) compared "subjective degree of back pain" in lumberjacks to that in non-manual controls, and found that ability to work was mildly affected in approximately 40% of individuals, and that there were no difference between groups on this measure.
- Fujimura, Yasuda & Ohara (1995) measured sickness absence for lower back pain by severity and found levels of absence to be low, but reported interrupted work and lost time at work to be substantial (38%).
- Masset and colleagues (1994) report that 11% of the individuals they examined were significantly limited in work by lower back pain.
- Harreby et al. (1996) show that within a year, 24% reported that pain affected them while they were in work, such that: 8% decreased their work activity, 8% changed their job; 3% changed their work function; and 5% reduced their working hours.

It is important to remember that these studies present evidence from a variety of different designs, and therefore some of these observations may have been made in designs that were affected by bias. The study by Pryse-Phillips et al, for example, has already been criticised for the potential effect of attrition bias on its sample (see Section 2.3). Some of the studies above are, however, taken from research designs of reasonable quality (for example, Masset et al., 1994; Fujimura et al., 1995; Harreby et al., 1996; and Brown et al., 1998), suggesting that not only that sickness attributed to pain is common, but that pain also has the potential to substantially affect an individual's ability to do their job when they do go to work. Clearly, then it is as important to examine the impact of pain in those continuing to work as it is to examine the pain that makes it impossible to work. This approach reaffirms the current perspective on examining "non-important" pain in that pain that may be classified as "non-disabling" can still have an impact on work capacity.

In relation to previous findings on the experience of pain at work discussed above, it is expected that in the current study:

- pain frequency, intensity and impact will be high (H_9);
- pain intensity, frequency and impact will differ in relation to pain type or pain cause (H_{10})
- pain intensity, frequency and impact will differ in relation demographic groups (H_{11})[†]; and that
- pain intensity, frequency and impact will differ in relation to work factors (H_{12}) [†].

In addition, two exploratory hypotheses will be tested, to explore the possibility that:

- demographic variables are associated different pain experience scores after adjustment for other factors (EH_3); and that
- work variables are associated different pain experience scores after adjustment for other factors (EH_4)

(c) Evaluating previous measures of pain experience

(i) Previous measures of pain magnitude in general, clinical and working populations

As discussed above, some authors include a variety of pain outcomes in their studies from the outset, asking participants to comment on the nature of their pain during data collection. Table 2.22 below summarises measures of pain magnitude employed by research in the current literature review. A variety of different aspects are examined, including pain intensity/severity and frequency/duration. The majority of studies involve self-report measures, asking participants to comment on their pain intensity, frequency, severity or a combination of these factors. Studies employ visual analogue scales (VAS), ordinal or nominal categories, or specific questions relating aspects of pain magnitude.

(ii) Evaluating previous measures of pain magnitude

There are some issues that can be raised with the measures summarised in Table 2.22. Amongst others, these are: the lack of specific definition of different aspects of pain; the lack of standardisation of measures within aspects; and the utility of composite measures. Each of these issues is discussed in detail below.

[†] These hypotheses are given again in Section 2.4.3d, after the inclusion of additional pain experience variables.

It was mentioned above that many of the studies include measures of aspects of pain magnitude providing little rationale for the construct they are measuring. The most obvious example of this is in the measurement of pain intensity and severity. Studies tend to use these two terms together, without drawing any distinction between the two. The Collins English Dictionary defines severity as: "serious in appearance or manner; causing discomfort by its harshness". Intensity is defined as "of extreme force, degree or amount". Using these definitions, severe pain would therefore be pain that is deemed to be pain serious in appearance or manner, causing discomfort by its harshness. Additionally, intense pain would be pain that was of an extreme force, degree or amount. It could be argued, therefore that although both terms connote a high level of discomfort, severity appears to imply an added dimension of seriousness. Indeed this would fit well with the measures summarised in Tables 2.18-2.21 and Table 2.22 below. Many of the scales that measure "severity" have connotations of seriousness, either indirectly (for example those measuring severity in relation to impact on work, see Tables 2.18-2.21 and Table 2.22 below); or directly (such as those equating severity of pain with chronicity of pain, see Tables 2.18-2.21 and Table 2.22 below). There is potential for bias in many of these studies, in that one can only speculate as to exactly what participants completing self-report items on pain intensity and severity understood these terms to mean. Whether they understood them as indicative of level of discomfort, force, intensity, severity or seriousness of pain is impossible to know. Indeed, the utility of these terms in the articulation and measurement of pain is a debate that reaches far beyond the current study (Craig, 1997; Lilley, Craig & Grunau, 1997).

In terms of establishing a useful and valid measure for the pain experience, it is important to be systematic and explicit when investigating the pain experience. The current study will use the term 'intensity' to describe the level of discomfort in the pain experience. There are two reasons for this. First, the current study works on the assumption that intensity and severity are two different terms, and that it is therefore possible for pain to be intense without being severe (although probably less likely for pain to be severe without being intense). It could be argued then that intensity is the term that holds fewer connotations, and can be argued to be the "pure" pain experience, as it were (rather than the pain experience plus the subjective evaluation of its seriousness). Second, as one of the main aims of the current study is to examine pain in the absence of any preconceptions of seriousness or "importance," it would seem sensible to use a term that implies any level of seriousness.

Table 2.22
Measures of pain magnitude in previous research

(a) Aspects of pain magnitude by self-report

(i) Aspects of pain magnitude as single constructs

General or clinical population, mixed design			
Andersson et al., 1993 [CP]	Cross-sectional	Intensity	VAS 1-5 (weak-intense)
Coste et al., 1994 [LBP]	Inception cohort	Intensity	VAS (no details given)
Deyo & Tsui-wu, 1987 [BP]	Cross-sectional	Severity	Nominal categories: mild / moderate / severe
Haegerstam & Allerbring, 1995 [CP - facial pain]	Inception cohort (referred to clinic between 1981 & 1987)	Intensity	VAS 1-10 (minimal-maximal)
Hasvold & Johnsen, 1993 [MSK& Headache]	Cross-sectional	Severity & Frequency	Seldom-Never / Monthly / More often / Daily Reducing work fitness: Seldom-Never / Monthly / More often / Daily
Linton et al., 1998 [MSK]	Cross-sectional baseline with follow-up 6mth later	Intensity & Frequency	VAS 1-10 (no pain-pain as bad as it could be) Categories: past 3 mths / never / very seldom / seldom / often / very often / always
Miedema et al., 1998 [BP]	Follow up 3 years retrospective, 3 prospective, inc acute/subacute back & neck pain	Severity & Frequency	Categories: severe / moderate / mild / no pain Categories: constant / frequent / sometimes / only once
Sternbach, 1985 [Gen P]	Cross-sectional	Severity	No details given
Working populations, mixed design			
Feyer et al., 1992 [BP]	Cross-sectional	Severity	VAS 1-100mm (not severe at all – very severe)
Moens et al., 1993 [BP]	Cross-sectional	Frequency & Duration	Categories: Once / Repeated / Constant <1wk; 1-4wks; >4wks
Rotgoltz et al., 1992 [LBP]	Cross-sectional	Severity (duration) & Frequency	0 / Few hours / 1-3days / 4-7days / >30days Attacks/yr: 0 /1 /2 /2-12 / >12 / Constant
Toroptsova et al., 1995 [BP]	Cross-sectional	Pain "character"	Categories: Acute/ Dull / Stiff / Indeterminate

(ii) Aspects of pain as composite measures

Working populations, mixed design			
Brown et al., 1998 [LBP]	Cross-sectional	Severity & work	LBP of sufficient severity to take sick leave? LBP of sufficient severity to take sick leave but went to work nevertheless?
Fujimura, Yasuda & Ohara, 1995 [LBP]	Cross-sectional	Severity & work	Categories: severe, resulted in absences & breaks at work / severe no SA or breaks / light LBP / no problems
Harber et al. (1985) [LBP]	Cross-sectional (retrospective at 2 wks & 6 mth)	Severity & work	Severe BP while working which made you stop working?; Go home with a sore back?; Miss work due to BP?; Changed jobs due to BP?
Hemsley et al., 1998 [BP]	Cross-sectional	Severity & work	VAS 1-5 (No pain - Severe pain, unable to work)
Sairanen et al., 1981	Case-control	Severity & work	Categories: 0(not disturbing) / I(mildly affects work ability, occasionally absent) / II(seriously affects work ability, absent often)
Schwartz et al., 1998 headache	Cross-sectional	Severity & work	Categories:1-3days absent = mild / 4-7days absent = moderate / 8-10 days absent = severe
Videman et al., 1984 [BP]	Cross-sectional	Severity & activity	LBP leading to unfitness for daily tasks?; LBP severe enough to require bed-rest?
Westgaard et al., 1993 [MSK]	Cross-sectional	Intensity & frequency	"Symptom score" = VAS intensity x VAS frequency

(b) Aspects of pain magnitude inferred from other indices

General population, mixed design			
Gatchel et al., 1985 [BP]	Cross-sectional	Severity	Inferred by level of disability, as decided by researchers?
Harreby et al., 1996 [BP]	Prospective study of schoolchildren (1965) followed up	Severity	Comparison of Severe LBP to Gen LBP (as decided by researchers)
Working population, mixed design			
Anderson, 1992 [BP]	Cross-sectional	Severity	Severity decided by "trained interviewer": Mild / Moderate / Severe
Masset et al., 1994 [BP]	Cross-sectional	Severity	By diagnostic category - common back pain / fatigue / common lumbar pain / lumbago / sciatica above knee / sciatica below knee
Pryse-Phillips et al., 1992 [Headache]	Cross-sectional ; then telephone interview of sub-sample; then prospective diary	Severity	By diagnostic category - migraine versus headache

BP=Back Pain; LBP= Low Back Pain; NSP= Neck/shoulder Pain; CP= Chronic Pain; Gen P = General Pain

Another criticism that can be made of previous measures of pain magnitude is their lack of standardisation within and between aspects. Taking the visual analogue scales as an example, there is little agreement on the format of these scales. Some authors offer five alternatives, others ten, and others offer fewer ordinal cues, asking participants to place a mark on a line of 100mm. Varied use of these measures is common in all research, and despite their utility, their reliability and validity is the source of ongoing debate (Coolican, 2001). The issues with the design of the VAS are beyond the scope of the current study, and therefore will not be debated here. However, it is important to draw the reader's attention to the lack of rationale given to support their use in the studies in Table 2.22, as well as the lack of reflection on their use and their potential for bias in these studies. The majority of authors measuring aspects of pain magnitude use scales in the absence of any information on previous use, validity or reliability of items. This presents substantial problems to the researcher attempting to synthesise findings from many studies.

As a result of the differences in format of VAS, one cannot be sure whether two measures of "intensity" or "frequency" are accessing the same construct within populations. Indeed, given the lack of standardisation of scale it is possible that they are not. For example, Andersson et al. (1993) measure chronic pain "intensity" using a five-point VAS with "weak" pain at one end and "intense" pain at the other. Linton and colleagues (1998) measure pain intensity by using a ten-point VAS with "no pain" at one end and "pain as bad as it could be". At the low end of intensity, a score of "1" on Andersson et al.'s scale implies chronic pain of weak intensity (but is still chronic), while a corresponding score of "1" on Linton et al.'s scale indicates virtually no pain at all. Moreover, maximum intensity on Anderson et al.'s scale is connoted by the descriptor "intense", whereas on Linton et al.'s scale it is "pain as bad as it could be". While Andersson and colleagues continue to focus on the pain experience, Linton et al. include aspects of the pain experience with an additional subjective value judgement. In this sense it is unclear whether the pain that is "as bad as it ever could be" is high intensity, or intensity of a level that the individual could not cope with. Admittedly, this is a somewhat pedantic criticism, and many would argue that pain of an intensity that is difficult to cope with is the same as pain of high intensity. Indeed, in light of the subjectivity of pain, it is probably unlikely that a completely objective measure of either construct would be feasible (Skevington, 1995). It is important to point out, however, if only in the name of "good science", that both authors publish what many might assume to be comparable data on pain intensity. In fact one author is referring purely to the pain experience, and the other is not separating the pain experience from the individual's ability to cope.

This tendency to combine aspects of the pain experience is common throughout the literature. Table 2.22 above shows that studies have examined pain magnitude as a composite measure of severity in relation to impact on work (Brown et al., 1998; Harber et al., 1985; Videman et al., 1984), severity and frequency (Rotgoltz et al., 1992; Hasvold & Johnsen, 1993; Miedema et al., 1998), or frequency and intensity (Westgaard et al., 1993; Linton et al., 1998). These are useful in that they convey the magnitude of the pain experience, but in general rather than specific terms. For example, studies that ask specific questions about pain severity offer descriptive data about the severity and impact of pain in general, but little about each aspect (Brown et al., 1998; Harber et al., 1985; Videman et al., 1984). Just as severity can be delineated from intensity, so severity can also be seen as a separate concept to impact. Is it not possible that a pain can be severe but have little impact on an individual's working life? The proportion of individuals continuing to work in severe pain would suggest that it is possible to experience pain without taking time away from their job.

This criticism can also be levied at the categorical data collected by studies in Table 2.22. For pain severity (assuming this is the appropriate term) there are a variety of categories, all of which provide a different set of information. Sairanen et al. (1981) make no allowances for the impact of pain on ability to work, and assume that the level of back pain will either not be disturbing, or will lead to at least some absences.

Similarly, Hemsley et al. (1998) offer no alternative for individuals in severe pain except to be unfit for work, making the assumption that the two are inseparable. It may be that these concepts are related, however without the data to support a relationship, or indeed a discussion of the issues surrounding them, it is inadvisable to *assume* that they are related. It is unlikely that the lack of specificity inherent in measures was intentional, and indeed ambiguous information is better than no information at all. Clearly, however, there is a need for a less ambiguous, more systematic way of measuring the pain experience, and its relation to the workplace.

The final criticism that can be made of the previous measures of pain experience is the lack of operationalisation of the impact of pain. As Section 2.3 shows, the majority of studies equate impact of pain on work as sickness absence at work, or inability to do work. There are many issues that can be raised regarding this perspective.

First, the functional impact of pain can extend beyond work. It is possible that pain can affect areas of life other than work. Indeed in the few studies that have addressed other functional areas of life such as leisure activities, housework and other daily activities, pain has been shown to have a significant impact on life rather than just work (Papageorgiou et al., 1997; 1998; amongst others).

Second, it could be argued that the rationale behind the focus on lost work days and lost time is largely economic, and many authors justify the examination of industrial samples and the importance of measuring impact on work in terms of the cost of pain to industry and society. This reaffirms the importance of this issue from a national and public health perspective, and that it is therefore an important line of inquiry. As such, most authors are concerned with the pain that is costly to work, and has the potential to be ultimately costly to their employer, more widely to health care, and society as a whole (Sternbach, 1985). In addition, many authors discuss the long-term costs of work incapacity to the individual through long-term disability (Waddell, 1998; Main and Spanswick 2000). As such the cost or impact of work disability at an individual or group level is made apparent. The current study does not seek to undermine this stance, and is in agreement that this perspective serves as a useful and essential area of public health research. However, in line with previous arguments surrounding the study of "non-important" pain, the current study asks whether this focus on lost workdays and lost time is the only way by which to address the impact of pain on work.

It was previously argued that the focus on "important" pain has led to the omission of "non-important" pain in research, and that "non-important" pain may be as worthy of study as "important" pain. In line with this argument, the current study suggests that previous research has focused on the "worst case scenario" of pain impact on work, by examining pain that results in work limitation or work incapacity. It might be as important to examine the impact of pain on individuals who are still able to work, *despite* their pain. Therefore, just as the current study aims to examine both "important" and "non-important" pain, so it aims to examine pain that compromises individuals at work, or pain that leads sufferers to be only minimally affected. It was argued earlier that the easiest way to gather pain information in the absence of any assumptions of importance or seriousness is to omit examination of duration or site-specific cues. Equally, the best way to examine the impact of pain on work in the absence of any assumptions of importance or seriousness is to use a measure of pain impact that includes no cues on the seriousness of the pain, such as loss of work, or work activities.

(iii) Standardised measures of the pain experience

Although a great deal of research into the study of pain and its measurement has taken place over the last few decades current epidemiological research makes surprisingly little mention of it (see Tables 2.4-2.15). This issue has already been raised with respect to the subjectivity of pain (see Section 2.4.3 above). There are a variety of standardised pain measures available, all of which provide reasonably reliable and valid measures of pain and its effect on individuals. These measures include: the McGill Pain Questionnaire (MPQ; Melzack & Wall, 1975); Oswestry Disability Index (ODI; Fairbank, 1980); Roland Morris Disability Questionnaire (RDQ; Roland & Morris,1983); or the Zung Self-rating Pain and Distress Scale (ZPSS; Zung, 1983). Many of these could have been used in the current study, although in terms of measuring pain experience, the focus of these questionnaires is limited to only one or two aspects of pain: impact and intensity in the ODI (Fairbank, 1980); and functional limitation only in the RDQ (Roland & Morris,1983). The ZPDS (Zung, 1983) does allow for the examination of the emotional aspects of acute pain, but does not provide any measures of pain severity (MacDowell, 1987).

One of the most commonly-used pain questionnaires that has been shown to be suitable for a variety of different pains and pain experiences is the McGill Pain Questionnaire (MPQ) (Melzack & Wall, 1975). In correspondence with Melzack and Wall's Gate Control Theory (see Section 2.4.2) this provides a number of different measures of pain. The MPQ (20 items) and the MPQ Short Form (15 items) asks individuals to pinpoint the location of their pain, and to articulate their pain in terms of verbal descriptors. Participants choose from seventy-eight adjectives in twenty sub-classes, in relation to what best describes their pain. Adjectives in each sub-class are weighted in relation to factors, such that each individual yields a score for:

- sensory components (physiological aspects of pain);
- affective components (the emotional effect the pain has on the individual);

- evaluative components (the individual's cognitive appraisal of their pain); and
- miscellaneous components (other factors such as pain radiation; temperature-related pain)

Pain frequency is measured on the MPQ with reference to pattern over time, in terms of duration and regularity. In addition, pain intensity is measured on a VAS where "0" is "no pain", and "5" is "excruciating". This is standardised by taking concurrent measures of the pain at different intervals, at extremes, and in relation to pain in other areas.

The MPQ correlates well with concurrent pain reports (Melzack, 1976), and in follow-up studies Melzack and colleagues have shown MPQ scores to be predictive of pain diagnoses (Dubuission & Melzack, 1975; Melzack et al., 1976). Other researchers report evidence in support of the affective and sensory components of pain, but not evaluative (Reading, 1979). In addition, the affective components correlate with other affect measures such as depression (Kremer & Atkinson, 1981).

The MPQ is also reasonably reliable in small populations (ten cancer patients) over short time intervals (three days) (Melzack, 1975). This reliability is also supported by Love et al. (1989), who show substantial consistency in administration of the pain rating index, and by Graham et al. (1980), who show a high level of consistency between two cancer outpatient samples (N=18 for each) for the pain descriptors.

The MPQ and MPQ Short-Form are often seen therefore, as the "Gold Standard" pain measure and have been translated into at least twenty different languages. As such, in the absence of a better measure, most pain professionals continue to use the MPQ in various clinical and research settings (Reading et al., 1982).

However, there is also evidence against the observed validity and reliability of the MPQ. Some researchers report little support for validity of the four factors structure (Gracely, 1992), and other authors report it to be less reliable than Melzack's data suggests (Graham et al., 1990; Reading et al., 1982). Although Reading showed notable reliability for three-quarters of his sample, the range in actual scores was substantial, with observed consistency reported as low as 30% in some cases

(Reading et al., 1982). These measures only refer to test-retest reliability however, and do not take account of any measures of internal consistency.

In addition, the sample sizes on which some observations are based are very small (N=10 in Melzack, 1975; N=36 in Graham et al., 1980), bringing into question the extent to which their samples are representative of larger populations, and therefore the extent to which the MPQ is a reliable measure in larger populations.

In relation to the current study, there are also some issues with using the MPQ from a conceptual viewpoint. The literature examining the pain experience reviewed thus far has focussed on pain intensity, frequency and impact on work. The MPQ provides a validated measure of pain intensity and frequency, but makes little mention of the impact of pain (Thomas et al., 1996). It has already been argued that the impact of pain on activities is important to study, and therefore an additional measure of impact, or a measure that incorporates all of these pain aspects is required.

One instrument that provides a measure of several aspects of the pain experience is the Glasgow Pain Questionnaire (GPQ) (Thomas et al., 1996). Thomas and colleagues (1996) generated questionnaire items by asking members of the general public to "talk about their past or present pain experiences, and were free to include any aspect of that experience" in unstructured interviews. Over five-thousand categories were identified, from which fifty-nine items were selected in relation to five main categories: intensity, frequency, ability to cope, emotion and activity restriction or impact. Individuals from a general population were then asked to rate the "strength" of the pain description on a scale of one to ten. Using Thurstone's approach (Streiner and Norman, 1989), weightings of final items were developed from the median values of these ratings (see Section 3.2). Individuals were also asked whether they had ever felt this way about their own pain, so that the proportion of positive responses could be calculated. Of the fifty-nine items identified at this intermediate stage, only twenty-four corresponded to a positive response in approximately twenty percent of people, and these were the items used in the final version of the GPQ (see Figure 2.5).

Figure 2.5

Items in the Glasgow Pain Questionnaire by pain aspect

(a) Frequency of pain
1. I rarely had any pain
2. I had occasional pain
3. I had some pain often
4. I had pain frequently
5. I had pain all the time

(b) Intensity of pain
1. The pain was mild
2. The pain was uncomfortable
3. The pain was moderate
4. I had some strong pain
5. The pain was severe
6. The pain was intense

(c) Coping with pain
1. The pain was difficult to cope with
2. At times the pain was a bit hard to bear
3. Sometimes I just couldn't stand the pain
4. The pain was unbearable at times

(d) Emotional effects of pain
1. I felt upset by the pain
2. The pain got me down
3. Pain has made me feel miserable
4. I felt the pain was wearing me down

(e) Impact of pain
1. Pain upset my normal routine
2. My social life was affected by pain
3. Pain stopped me from doing the things I wanted to do
4. I could hardly move for the pain
5. Pain made everything come to a standstill

Comparing the five GPQ subscales to the MPQ sub-components, it can be seen that the GPQ provides some similar data, but also additional measures that the MPQ does not:

- GPQ pain intensity could be argued to be related to the sensory component describe by Melzack and Wall (1975);
- the GPQ coping and/or emotion sub-scale could be argued to be to related to the affective component of the MPQ;
- the one evaluative item on the MPQ could be argued to be related to impact items on the GPQ.

However, the GPQ adds two additional measures that the MPQ does not: an expanded examination of the impact of pain on the individual; and examination of patterns of aspects of pain frequency. Although the MPQ also provides information on other miscellaneous aspects of pain, it could be argued that this information is useful for clinical inquiry, but perhaps not as important for research purposes. For example, miscellaneous items such as extent of radiation can be a useful diagnostic tool; or items such as "torturing" or "agonising" might be useful for identifying particular suffering or potential psychological problems.

The construct validity of the GPQ is reasonable, with relative consistency across different groups, but also sensitivity to different groups (see Section 3.2). The authors of the GPQ report scores for all pain aspects to be higher in two pain populations than in an occupational population. This suggests that the scale accesses an observable construct that is related to strength or magnitude of pain experience. In addition, the authors report a high level of convergent validity, such that the GPQ shows moderate to strong correlations with single VAS pain ratings for each of the pain aspects (Thomas et al., 1996). Finally, test-retest reliability of the GPQ was seen to be reasonable, yielding moderate correlations between data gathered at two separate times in the same population (Thomas et al., 1996).

To the extent that the GPQ has been shown to be a useful and reliable instrument, it would seem to be the instrument of choice for the current study. In relation to issues raised about previous examinations of the pain experience, the GPQ:

- addresses pain intensity rather than severity, making no assumptions about the seriousness or "importance" of the pain experience;
- addresses each aspect of pain separately, in a systematic manner, resolving any issues raised regarding previous measures addressing severity/impact, or impact/coping;
- provides a measure for impact of pain that extends beyond inability to work, allowing for impact in various aspects of life, and for the possibility that an individual may be suffering from pain and continuing to work successfully; and
- provides a measure for two aspects of pain that had not been included in previous epidemiological enquiries – ability to cope with pain and the emotional aspects of pain (see Section 2.5 below).

Moreover, unlike many of the other pain instruments normally applied in pain research use (Oswestry, Roland Morris, MPQ), the GPQ is designed to be used as a postal questionnaire, rather than as a clinical tool. The ability of the GPQ to be used remotely as opposed to depending on an investigator or clinician being present is a distinct advantage, in as it enables the collection of a large sample of data, and collection to take place in various workplaces at minimal cost.

The current study will therefore use the GPQ in a working population, in order to investigate the pain experience (intensity, frequency and impact) in a working population. In addition, the influence of pain type and population on pain intensity, frequency and impact will be explored.

(d) Psychological risk factors and pain

Previous studies would suggest that psychological factors have a strong influence over the occurrence and reporting of pain (Bigos et al., 1990; Brulin et al., 1998; Croft & Rigby, 1994; Estlander et al. 1998; Helliwell et al., 1992; Niedhammer, 1998; Vasseljen et al., 1995; Westgaard et al., 1992). Several of these studies present evidence for an association between various psychological factors with pain prevalence and incidence in studies of "reasonable quality" (see Section 2.1(f); Bigos et al., 1991; Niedhammer, 1998; Vasseljen et al., 1995).

It is important to distinguish between what is meant by "psychological factors". Here it is used as an umbrella term, although on closer examination of these studies, one can see that this term refers to a variety of different measures. There is a tendency in the literature towards focusing on psychological problems or disorders such as depression or anxiety in the literature surrounding psychological factors and pain. For example, Croft and Rigby (1994) apply the General Health Questionnaire (GHQ; Goldberg & Williams, 1988) to measure psychological problems or disorders such as depression or anxiety in a general population, reporting individuals with higher GHQ scores to have increased likelihood of pain in univariate data. Unfortunately these authors do not report details of the association between GHQ scores and back pain after adjustment, preferring to use the GHQ as one of the confounding variables. The effect of GHQ on data can be estimated, in that when it was used as a confounder during the adjustment process, it had every little effect on the relationships between lower household income and increased pain in women, and less skilled work and pain in men. These findings suggest that what the authors refer to as anxiety and depression may not be directly be related to an increased risk of pain in either sex. Indeed, this finding is re-affirmed by Papageorgiou et al. (1998) several years later in a working population, who showed that adjusting for GHQ scores in regression analyses also had little effect on their overall results. The merits of the design of Papageorgiou et al's study are discussed briefly in Section 2.3. These authors present evidence of new pain in a pain-free cohort, with strict inclusion criteria, and in which substantial adjustment for confounders took place. It could be argued, therefore, that given these two findings in studies of reasonable quality, there is little evidence for an association between "psychological distress" and increased risk of pain.

This is not to say that there is little evidence for a relationship between all psychological variables and pain, as there are many variables that could be measured (Ogden, 2001). It could be argued that in focusing on psychological distress, previous pain research has focussed more on mental health, as opposed to the psychological processes underlying the perception of and reporting of pain (although the two are inextricably linked). This focus conveys the underlying assumption that something is psychologically "wrong" with pain sufferers, and that identifying these tendencies or pathologies as risk factors for pain will be helpful.

There is a great deal of debate surrounding the mechanisms by which psychological tendencies or pathologies predispose an individual to pain and/or disability, most of which is beyond the scope of the current study (Linton & Skevington, 1999). Central to this debate is the extent to which psychological problems predispose an individual to more troublesome pain, and the extent to which troublesome pain affects an individual psychologically (Skevington, 1995; Gatchel & Turk, 1996; Linton & Skevington, 1999; Main & Spanswick, 2000). The current study does not attempt to answer this question, only noting that it is important to reflect on this issue.

It was argued earlier that to understand the evolution from "normal" pain to chronic pain, it is important to allow for pain to be conceptualised as an inevitable part of working life, and that trying to predict pain prevalence from a selection of risk factors has led to increased understanding of the influences on pain, although finding a consensus with which to inform intervention has become very difficult. The examination of psychological factors can also be evaluated in this context. If pain is a part of life, and reporting pain is associated with psychological disorders, then does it follow that everyone who experiences pain has a psychological disorder? If so, then does that mean that three-quarters of the working population have psychological problems? No doubt a proportion of them will have, but whether this justifies a focus on only the more "serious" aspects of psychological health is not clear. It may be that just as previous research has focused on the more serious or troublesome end of the pain continuum, so previous studies have focussed on the more serious or troublesome end of the psychological continuum.

There is little scope for "normal" pain psychology, and very little research is carried out on less problematic psychological factors in relation to pain at work, certainly none in the current review. It may be that it is possible to suffer from high levels of troublesome pain on a regular basis and not have a psychological disorder. In this way, while there is every reason to suspect that individuals experiencing "troublesome" pain will be psychologically "different" from others, there is no conclusive evidence to support the notion that individuals experiencing "non-troublesome" pain will be *not* be any "different" psychologically from others.

One way to address this issue is to apply measures of psychological factors that do not assume an underlying pathology or disorder. Two studies of reasonable quality in the current literature review show relationships between pain prevalence and non-clinical psychological measures of personality (Bigos et al., 1990; Vasseljen et al., 1995).

Other authors have focused on the tendency towards psychosomatism, which is the tendency of an individual to experience bodily symptoms that are more related to psychological problems than physical issues. Bigos et al, for example, measure the personality trait "hysteria", which, although strictly speaking is not a measure of psychosomatism, is described in Bigos et al's study as "[the] tendency[y] towards somatic complaints or denial of emotional distress" (as measured using the MMPI; Fordyce, 1979; Graham, 1978; and Lachar, 1974 as cited in Bigos, 1991). Clearly, then, there is some overlap between the concepts. Bigos et al (1991) publish an association between higher "hysteria" scores and back pain prevalence at baseline, as well with incident pain in those with a prior history of back injury, and incident pain in those without prior history of back injury. Given the relative strengths of Bigos and colleagues' observations discussed earlier (see Section 2.3), these associations are based on reasonable evidence, and therefore it is likely that they reflect a real relationship in the sample.

Indeed, similar findings have been reported elsewhere. For example, Vasseljen and colleagues (1995) report that a tendency towards psychosomatism (as approximated by an inventory developed by Bru et al., 1984) was amongst the significant factors distinguishing shoulder/neck pain cases from controls in their working sample. This is particularly interesting as these authors also report no association between personality (as measured by the Eysenck Personality Questionnaire; EPQ; Eysenck & Eysenck, 1981) and shoulder/neck pain. This finding adds strength to the speculation that Bigos et al could have been measuring a facet of psychosomatism (be it dispositional or not). In this way, although on the surface these two studies appear to disagree with one another (in that is one finds an association between personality and pain while the other does not) closer examination of the constructs being measured by each set of authors suggests a level of comparability. As such, it is reasonable to assume that there may be some relationship between tendency towards psychosomatism and pain.

These studies support the idea that there may be a relationship between dispositional (non clinical) psychological characteristics and pain, as well as point to the possibility that there are some individuals in the general public who are predisposed to experience and/or report pain more readily than others. In the context of the current study's generic focus on pain, both of these sets of authors assess the associations between psychological variables and site-specific and "important" pain in particular working populations. Bigos and colleagues' study pain of sufficient severity to present to primary care or occupational health services, and Vasseljen et al. (1995) study neck and shoulder pain that is of middle-high intensity, and continuous for at least two weeks. As such, it can only be concluded that there are some individuals in the general public who may be predisposed to experience and/or report "important" pain in these populations.

It is impossible to predict from previous data whether psychological factors may have an effect on "non-important" pain, as the literature only refers to "important" pain. Therefore, one interpretation of the studies examining psychological factors might be that psychological variables present a risk for experiencing *more troublesome* pain. Given other pain data discussed these studies, it is likely that most of these individuals have been suffering from pain of a reasonable intensity, and frequency/duration. As such, it is not surprising that they show signs of the psychological problems reported by many authors, or the social withdrawal and/or anxiety reported by Bigos et al. (1990). Therefore, just as there is very little known about the less problematic psychology of pain, very little is known about the psychology of acute or non-chronic pain.

The focus on the psychology of chronic pain is understandable for two reasons. First, this focus is for practical and logical reasons. Pain that is not chronic is assumed not to be troublesome, and where it is not troublesome, it is assumed that it will have little in the way of psychological consequences. The assumption is that non-troublesome pain is not problematic because it can be treated, and where pain is troublesome (such as acute pain or post-surgical pain), if it is treatable, then it need only be problematic for a short time. It is assumed that where pain is more troublesome and difficult to treat (such as chronic pain) it is more problematic, and sufferers become more likely to experience psychological problems. This logic has substantial theoretical basis, where non-chronic, non-serious pain is depicted in more physical terms, and the pathway from non-chronic pain to chronic pain and disability is described in terms of increasing psychological and behavioural difficulties and alterations (Skevington, 1995, Waddell, 1998; Gatchel & Turk, 1996; Waddell, 1998; Main & Spanswick, 2000). There is also substantial literature in support of the psychological effects of chronic pain and disability (Skevington, 1995), and this is often used as a justification for a greater focus on the psychological aspects of more troublesome, chronic pain (Williams, 1996).

The current study does not seek to undermine the psychological approach to chronic pain, and indeed applauds its inclusion in many areas of recent pain research and pain provision. This study is simply questioning whether the psychological approach need be limited only to chronic pain, and suggests that psychological factors in acute pain could benefit from further research.

Currently there is little or no research examining the role of psychological factors in less troublesome, non-chronic pain, although some authors have discussed the potential utility of psychological interventions in increasing coping skills and reducing emotional effects of acute pain (Williams, 1996). If, as these authors imply, it was the case that psychological factors were also as important in acute and non-chronic pain, then this may provide a useful tool in prevention of chronicity and/or disability. Therefore, in identifying the risk factors of all pain, it may be useful to study the psychology of "normal" pain.

One way that this can be done is to draw a distinction between the pain and the *person* in pain. This is not to completely separate the two, but to focus less on the psychological characteristics of the *individu*al in pain, and more on individual beliefs about the pain experience when it occurs. The GPQ provides such a focus, including a measure for the emotional aspect of pain as well as perceived ability to cope with the pain (see Figure 2.5). This measure offers a unique insight into the pain experience that is not addressed by previous studies, and may provide an illustration of the "normal" psychology of non-troublesome, as well as troublesome pain.

The current study will explore some aspects of the psychology of troublesome and non-troublesome pain using the GPQ scores for coping and emotion. Given that there is little previous research on the emotion and coping associated with non-chronic pain, nor on the pain experience, it is difficult to predict any direction in these associations, if they exist at all. However, the current study will explore the possibility that GPQ scores for coping with pain and pain emotions differ in relation to pain type or pain cause (EH_2). In addition the possibility of variation across demographic and work groups in relation GPQ scores and all sub-scores for pain coping and emotion scores will also be explored. In this way pain coping and emotions score are incorporated into Hypotheses 11 and 12 and it is expected that :

- GPQ scores and all sub-scores (pain intensity, frequency, coping, emotion and impact) will differ in relation to demographic groups (H_{11}); and that
- GPQ scores and all sub-scores (pain intensity, frequency, coping, emotion and impact) will differ in relation to work factors (H_{12}).

The rationale behind the hypotheses is discussed below.

(e) Psychosocial and work influences on the pain experience

Research shows that pain in general and in working populations appears to be one of notable intensity, frequency/duration and impact. Studies that examine risk factors for different aspects of the pain experience are rare, especially in terms of the parameters normally applied to the prevalence studies in Tables 2.4-2.15. Only a few authors have examined the influence of work and psychosocial factors in relation to separate aspects of pain, and these are discussed below.

(i) Psychosocial and work influences on pain intensity and frequency

Andersson and colleagues (1993) report a gender bias in relation to the pain experience, such that women are more likely to rate pain as of greater magnitude than men (Andersson et al., 1993). In addition, different work groups report different pain intensity and severity, and these differ again from the perceptions of chronic pain patients who are no longer in full-time work (Feyer et al., 1992). It is impossible to tell if these findings represent differences in actual pain experience, or biases in tendency to report intensity and severity. Indeed, given that the study by Andersson and colleagues (1993) did not control for previous pain or physical load in their study, it is possible that these findings were reported from biased data. Nonetheless, these data show that aspects of the pain experience at least have the potential to be similarly influenced by psychosocial and work factors.

In relation to pain frequency, it is often assumed that pain frequency is associated with the work task, and that frequent exposure to work risk factors will lead to more frequent pain. This inference is made given the evidence surrounding physical exposure at work, duration of employment, and indeed predominance of pain in manual labour discussed earlier (Section 2.2 and 2.3). However, few researchers actually test this hypothesis in relation to pain frequency per se. One study shows that nurses with more managerial responsibilities tend to feel pain of a lower frequency and intensity, suggesting that pain frequency may be related to manual work tasks (Videman et al., 1984). However, an early study by Sairanen et al. (1981) questions the extent to which work can be specifically mapped onto the pain experience. Although Sairanen and colleagues report a high level of pain frequency (with nearly two-thirds of their total sample reporting occasional or constant pain), comparison between lumberjacks and non-manual controls showed no significant differences. In other words, although pain frequency and intensity was high, it was just as high in non-manual workers as it was in manual workers. Again these findings should be compared taking the quality of evidence they present into consideration, and neither meet more than three of the quality criteria used in the current study. As such, it is unclear the extent to which the groups individuals were put into, the way that they were questioned and the questions that were asked may have biased results. However, these findings do raise the familiar debate as to whether the pain experience is influenced by physical work risk factors, or psychosocial work risk factors. Given the evidence that both influence pain prevalence (see Section 2.2 and 2.3), it is likely that both physical and psychosocial factors may contribute to perceptions of the pain experience.

There is also some evidence to suggest that the presence of psychosocial problems at work can lead to more negative perceptions of pain experience. Westgaard et al. (1993) report on a "symptom score", a measure calculated using scores for self-reported pain intensity and frequency. They found symptom scores to be highest where concurrent psychosocial problems were considerable. The authors are reasonably vague as to what they mean by "psychosocial problems", but it is assumed that they are referring to negative scores for their indices of stress in the work environment, to economic pressures, and social and family issues. These authors provided the only study identified in the current literature review that addresses psychosocial factors in relation to pain intensity and frequency, which is unfortunate as this study only of moderate quality (meeting three of the five quality criteria by which all studies were judged). This is a gap in the literature that the current study aims to fill.

(ii) Psychosocial and work influences on work absence and reduced productivity due to pain

A selection of studies examine the impact of psychosocial and work factors on sickness absence rates. There is some evidence that demographic factors contribute to different rates of sickness absence. For example, Chan & Ho (1998) show a high level of medical leave from work (54%) for various musculoskeletal pains, and show that medical leave was influenced by several psychosocial variables. These authors also report gender differences within production workers, such that male production workers (66%) had significantly more musculoskeletal pain than female workers (57%), and also took significantly more time off for pain than female workers (61% of male pain sufferers versus 50% of female pain sufferers). On the other hand, Hagen and Thune (1998) showed the number of days of sickness absence for back pain to be higher in women than in men, and highest in individuals over sixty years old. Perlik, Susta & Kuchynkova (1981) reported rates of work disability to be influenced by gender, age, work-type and seasonal biases, such that back pain was most common in winter months, while gender and age effects varied between work groups. Although these studies differ in design, in quality and in the populations that they purport to summarise, they do suggest that the impact of pain on ability to work may differ between genders.

Previous studies suggest that demographic and psychosocial variables may affect sickness absence for pain in a variety of populations, although the nature of this effect is far from clear. For example, some studies also report differences in sickness absence rates between work groups. Chan & Ho (1998) show a higher level of sickness absence in production workers than in professional or office workers and service workers. In addition, Wickstrom & Pentti (1998) report that manual workers were six times more likely to take sick leave for lower back pain than non-manual planners. Moreover, Videman and colleagues (1984) report nursing assistants to take more sickness leave for back pain than qualified nurses, and Feyer et al. (1992) report postal workers to be more likely to take time off work for back pain than nurses (with sickness absence rates of 36% and 13% respectively). Again, although these studies are of differing design and quality (indeed only the study by Wickstrom & Pentti can be said to be of "reasonable quality") they suggest the importance of physical load at work in determining sickness absence for pain. This is not necessarily to say that the pain was *caused* by physical workload. As argued earlier, it could equally be the case that the psychosocial variables that accompany manual labour are masked by the physical demands. As such, the pain sufferer may find it as preferable to avoid the work environment as the work itself.

Regardless of the mechanism of this effect, if high physical load has a notable impact on a pain sufferer's perceived or actual ability to go to work, then industry needs to take note. This is especially important in light of the evidence to suggest that the less an individual engages in activity and work, the less likely they are to recover, and the more likely they are to develop chronic pain (Waddell, 1998; Main & Spanswick, 2000).

It may not be, however, that a job with a high physical load automatically precludes an individual from engaging in active work altogether. First, in a sample of lower back pain sufferers, Symonds and colleagues (1996) found comparable rates of sickness absence in office (22%) and factory workers (26%), suggesting that physical load was of little importance in determining sickness absence. Second, some authors actually report converse findings, such that sickness absence for pain is less in jobs with high physical loads than in those with low physical loads. Perlik, Susta & Kuchynkova (1981) report that for office staff, disability (defined as incapacity to work) due to back pain was more common in older women, but less common in older men. In manual workers, however, disability due to back pain was more prevalent in both older men and women. Consequently these authors argue that sedentary (in this case office) work is as related to back pain as non-sedentary work. Finally, Westgaard et al. (1992) report that non-manual office workers were more likely to be absent from work for musculoskeletal pain than manual production workers. Again the extent to which these studies can be compared with one another is limited, given the variety of measures, populations and sampling techniques therein. However these findings at least raise the possibility that, just as with the literature on pain prevalence, perceived work capacity and/or sickness absence is related to the physical and/or psychosocial aspects of work. Moreover, it is likely that it is related to the combination of the two.

A third challenge to the hypothesis that sickness absence for pain is more prevalent in manual jobs lies in the prospective literature on psychosocial work factors and sickness absence. In a repeated cross-sectional study carried out on two occasions, Wickstrom and Pentti (1998) found several factors to be predictive of sickness absence two years later. As well as biomechanical load, sickness absence for back pain and other musculoskeletal pains were associated with lack of recognition and respect at work. In the case of sickness absence for non-back musculoskeletal pains, perceived stress at baseline was also significantly associated. These findings can be accepted with some confidence, as they are drawn from what the current review would deem as "reasonable evidence" (see Section 2.1(e)). Wickstrom & Pentti (1998) are therefore suggesting that sickness absence for back pain is related to a combination of factors, and even though on the surface one could argue that work factors are related to both manual and non-manual labour, the profile of these risk factors may differ between manual and non-manual labour workgroups.

(iii) The role of work perceptions in sickness absence and reduced productivity due to pain

Symonds et al. (1996) report that psychosocial factors such as beliefs about pain control, responsibility for pain, and inevitability of pain were significantly more negative in workers that were absent for more than one week with "lower back trouble" (LBT), than workers who were absent for less than one week or who stayed at work. As suggested above, t may be that the *perceptions of work* differ in relation to work group, and it is these perceptions of work that influence sickness absence, rather than the work itself. Symonds et al. (1996) put forward evidence in support of this argument, reporting office workers to be more positive about more psychosocial factors than factory workers. A principal components analysis revealed three main factors in their data: beliefs about "lower back trouble" (LBT); attitudes to work; and pain control/responsibility. When these factors were then put into a multivariate analysis, only beliefs about LBT and pain control/responsibility were found to be associated with LBT absence. This finding contrasts with other studies, as it re-affirms the potential importance of perceptions of pain in predicting work absence, such that where individuals felt less in control of their pain, or responsible for their pain, it may be that attendance at work was less likely.

It is also important to consider the design of these studies in that the extent to which the groups included are representative of the work populations they are taken from is not always clear. Feyer et al. (1992) report different sets of associations between work factors and sickness absence for pain in relation to workgroups. For nurses, sickness absence was predicted by a high severity of pain, whereas the extent to which average daily activities were compromised by pain predicted sickness absence in postal workers. As such it was not so much that differences between populations (be they task-based or demographic) led to differences in sickness absence, but that sickness absence was the result of differing perceptions of what renders an individual unable to work due to pain. For nurses, pain experience was most limiting; but for postal workers the impact of pain on their daily life was most limiting. These studies demonstrate the importance of perceptions of workload in relation to pain impact. As such, the work experience may be just as important as the pain experience. However, these findings should be viewed with a certain degree of caution. For example, it is unclear whether these differences between nurses and postal workers reflect differences in workgroups per se, or whether this is reflective of a gender difference, given the gender-specificity within each occupational group (93% women as nurses and 72% men as postal workers). This example shows how crucially important it is to control for confounders when analysing the effects of potential exposure variables.

Regardless of quality of design, there is enough evidence available to suggest that, at the very least, the effect of the work experience on the pain experience deserves further research attention. The current study aims to explore this possibility. Work will be measured in terms of perceived load as well as direct measurement (through occupational and work group categories). In addition, psychosocial and a selection of psychosocial and work factors will be measured in line with the factors addressed by prevalence studies (see Tables 2.4-2.15). Specifically these will be:

- Demographic factors
    - Age
    - Gender
    - Socioeconomic group/Income
    - Marital status
    - Family size
    - Previous pain

- Work factors
    - Duration of employment
    - Working conditions
    - Control
    - Workload demands
    - Stress
    - Job satisfaction
    - Workgroup comparison

The influences of demographic and work factors on the pain experience will be explored. Given the lack of previous research in this area it is difficult to predict the presence or direction of these potential influences.

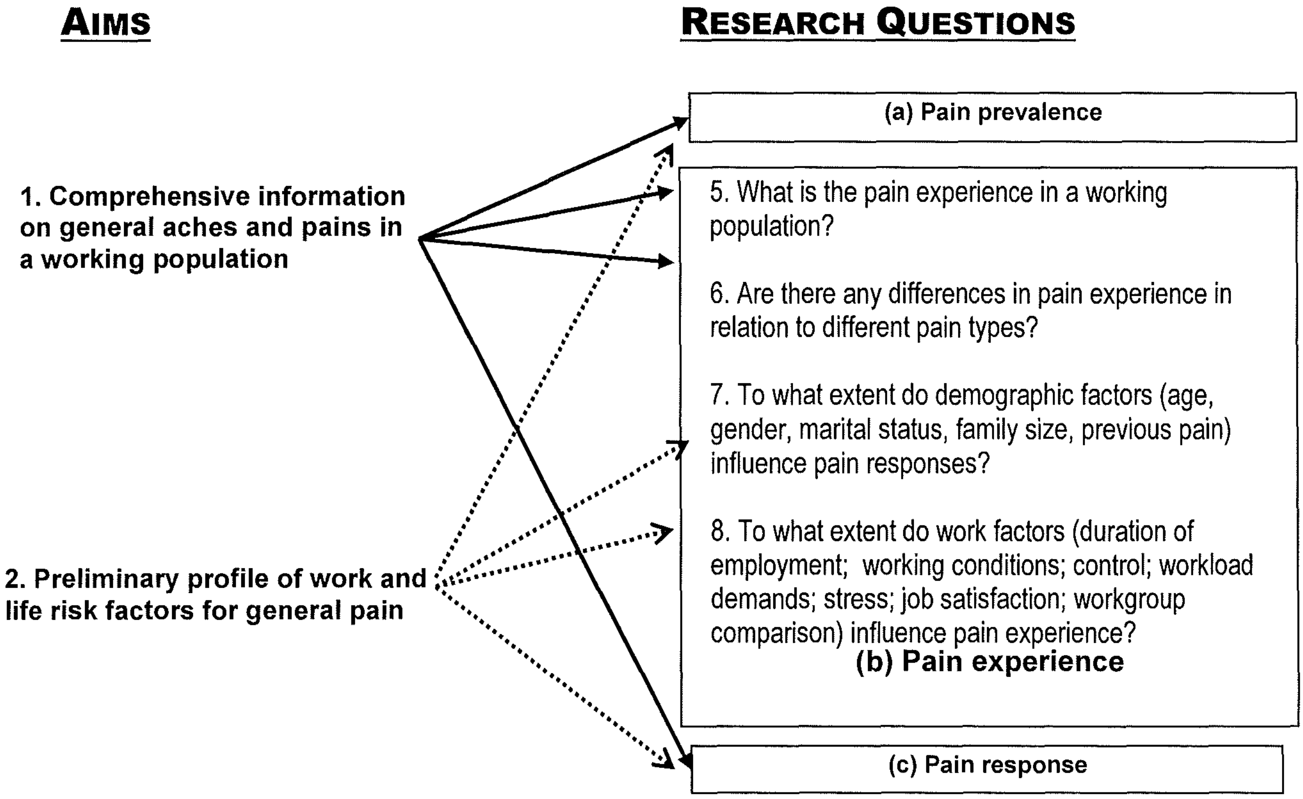
H_{13} *It is expected that total GPQ scores and sub-scores for pain intensity, frequency, coping, emotion and impact will differ in relation demographic groups.*

Similarly, it is expected that there will be differences in pain experience in relation to work factors, however given the nature of previous research, it is also impossible to predict the direction of these differences.

H_{14} *It is expected that total GPQ scores and sub-scores for pain intensity, frequency, coping, emotion and impact will differ in relation to work factors.*

Figure 2.6 below shows the current research aims projected onto research questions relating to pain experience as measured by the GPQ. Each of these research questions has been generated by the discussion of previous literature in Sections 2.3 and 2.4 above.

Figure 2.6
Summary of research aims in relation to research questions generated from previous research on pain experience



2.5 Responses to pain in the workplace

It was discussed above that previous research on the risk factors for pain in the workplace is limited in its approach. One of the limitations discussed was the focus on pain occurrence only, and the utility of examining pain as a multidimensional experience was discussed in detail. There is one further aspect of pain that is not examined in any great detail by previous prevalence research, and that is individual responses to pain at work. There are several reasons why studying responses to pain at work might be important, and these are discussed below.

First, very little research has been done with regard to medication use for pain in the U.K. (see Figure 2.7c overleaf), and that in itself may be enough to warrant further study. Second, examining the use of healthcare and medication for pain makes economic sense. It is estimated that £825m per annum is spent in the U.K. on treatments or medications that could otherwise have been bought over the counter (OTC), accounting for approximately 20% of annual expenditure on healthcare (Anonymous, 1992). Allowing for inflation, this figure is likely to increase over the next few years. Moreover, consultations with health professionals for conditions that could easily be managed by self-medication (such as common aches or pains) are approaching 96 million GP visits annually (Proprietary Association of Great Britain, 1998). Avoiding these consultations could save over £1500m annually, and could amount to a time gain of approximately eighty minutes per practitioner day (Proprietary Association of Great Britain, 1998). As such, the shift from dependency on a paternalistic NHS to an individualistic, self-medicating public could have substantial resource implications for the healthcare system. Most GPs support a shift from prescription medication to OTCs where possible (Spencer & Edwards, 1992), but in practice very few make these recommendations (Baines & Whynes, 1996). This figure does not include ibuprofen, therefore, it is likely that the actual savings on transferring costs for OTC analgesics would be higher. As such, where the healthcare system stands to make a substantial saving, it would seem important to establish the nature of current consumption of pain medications, and the extent to which individuals are self-medicating for pain, or choosing other options.

Third, OTC analgesics are one of the most commonly bought non-prescription medicines on the market (Ahonen et al., 1991; Proprietary Association of Great Britain, 1996; Wessling, 1987), with only cold and flu remedies being more common (Wessling, 1987). Some authors have attempted to measure analgesic use for pain specifically (Ahonen et al., 1991; Wessling, 1987) but have assumed that analgesic sales are equivalent to analgesic consumption, and have not allowed for the use of analgesics from other sources. Stoehr and colleagues (1997) interviewed individuals in their own homes, and report analgesic use within their sample to be as high as 66%, considerably more than other OTC medications. The most commonly used analgesic in this sample of analgesic users was aspirin (42%), followed by paracetamol (24%), and then ibuprofen (6%). These data suggest that the use of OTC analgesics is widespread, and point to the importance of clarifying some of the issues surrounding OTC use for pain.

Fourth, the safety concerns surrounding the misuse of OTC analgesics serve to draw attention to the importance of documenting their use. European Community guidelines (1992) state that a drug will not be given OTC status if it is: (a) dangerous if used without medical supervision; (b) frequently used incorrectly; (c) new and requires further investigation; or (d) administered by injection. Historically, enforcing this legislation is a relatively new process in the U.K. (Schaftheutle et al., 1996) and therefore these criteria have been difficult to enforce. This has led to OTC analgesics such as aspirin and paracetamol currently having general sales status, when both of these drugs would have been excluded from OTC status had these criteria been in place at the time of their release many years ago. Although ibuprofen was made available comparatively recently, the drug has received a mixed press, with its potential long-term side effects and interaction with different medications used for chronic conditions being the subject of much discussion (Cramer et al., 1998; Lamb & Cantrill, 1995). Therefore, in the absence of other contraindications such as renal or gastrointestinal problems, moderate use of NSAIDs in the general public can be done safely. However, with virtually no peer-reviewed literature on the extent of "normal", everyday use of these drugs for pain, it is very difficult to speculate whether or not use or abuse of these drugs present a risk to the general public. As such, it is important to record the use of OTC medications for pain.

These observations about the literature (or rather, the lack of literature) surrounding the use of OTC analgesics by the general public suggest that an investigation in this area has the potential to be an informative and useful endeavour. In terms of understanding the relationship between psychosocial work factors and pain, the actions an individual takes in response to their pain may also be important to study. This issue is discussed below.

(a) Theoretical perspectives on actions taken in response to pain

It was argued in Section 2.4 that the experience of pain is ultimately subjective, and that attitudes and beliefs about pain have the potential to affect the perception of pain. As such, it seems counter-intuitive to examine the experience of pain without taking some account of the desire to reduce the sensation.

The importance of beliefs and attitudes about chronic pain has been discussed in a variety of contexts (Kendall, Linton & Main, 1997) and all authors point to the importance of behavioural changes that take place as a result of long-term chronic pain. However, very little is known about behavioural responses to non-chronic pain. It has been argued that the focus on more "important" pain is the result of the assumption that non-chronic pain is not as important to study as chronic pain. Indeed, this may be the case, however in terms of pain classification (Merskey & Bogduk, 1999) all pain has the potential to become chronic, and therefore it could be argued that all pain has the potential to influence behaviour. As such, it may be important to examine the actions an individual takes in relation their pain (seeking help, self-medicating, avoiding help and so on). This point it illustrated by Hadler, and is discussed overleaf.

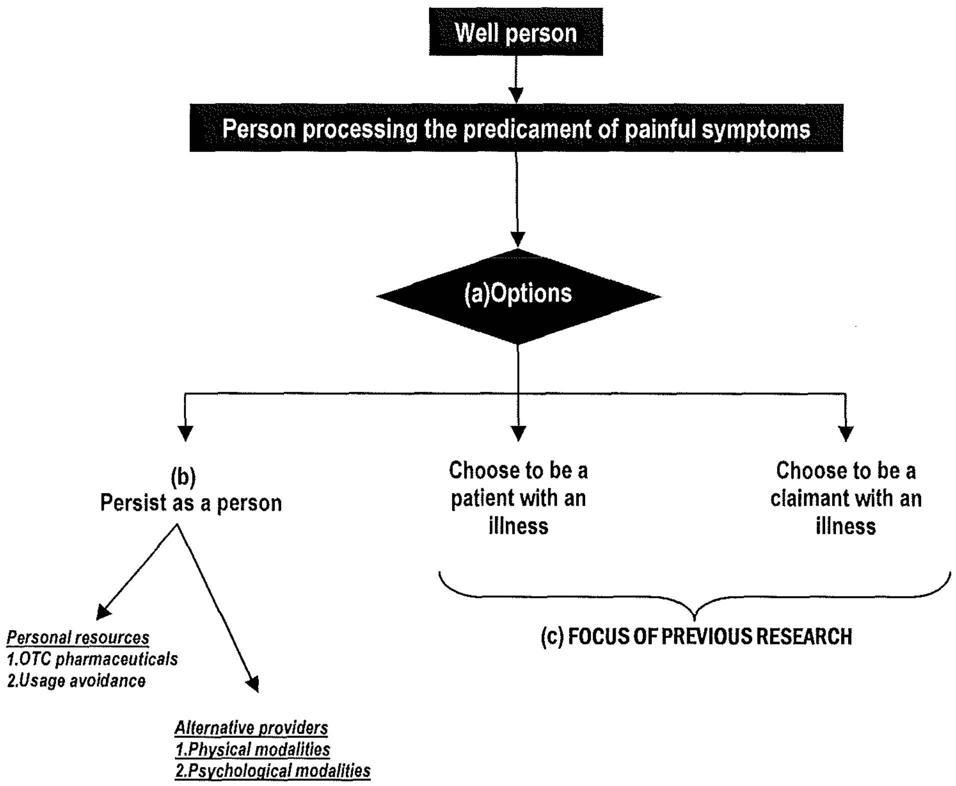
The association between occupational activity and musculoskeletal disorders are discussed at length in Section 2.4, and the reader's attention is drawn to the Hadler's views on this relationship in particular. Hadler also comments on individual responses to pain, applying a critical perspective to the options available to a working person in pain (see Figure 2.7 overleaf).

Figure 2.7
Summary of the pathways available to an individual in pain (adapted from Hadler, 2005)

(a) Options available to an individual in pain (adapted from Hadler, 2005)

(b) Options available for the self-management of painful symptoms (adapted from Hadler, 2005)

(c) Focus of previous research on options for responding to the pain (added by the current study)



Hadler describes this process:

> *"Whenever we are afflicted with regional musculoskeletal symptoms, we must react. We must consider the intensity of pain, restriction in function and options. Such consideration may be a subliminal or an anxiety-provoking process. However, it forces us to choose between three options: we can maintain our autonomy and deal with the experience [as in Figure 2.7b], or we can choose to seek medical advice. The moment we speak to a physician, we are no longer people with predicaments; we become patients with a regional musculoskeletal illness. We can choose to report to a health officer at our worksite. Instantly, we become claimants for insurance coverage under Worker's Compensation Insurance if we are considered injured, or under medical insurance if we are considered ill."*

(Taken from Hadler, 2005; p.4)

This algorithm was developed in relation to regional musculoskeletal symptoms, although it could be argued that it is applicable to all painful symptoms. In addition, the pathway is given in terms of the U.S. healthcare system. However regardless of whether insurance is involved or not, the overall message is the same. This perspective argues that seeking help for pain is a decision, and that this decision has consequences for the individual's identity and role within the systems in which they operate. Hadler takes a social constructionist perspective on this issue, describing the pathways to remission of pain in societal terms. He describes two alternate processes that take place in relation to "persisting as a person" and dealing with pain oneself (Figure 2.7b). Either the individual can draw upon internal resources and take medication (or avoid it); or they can draw upon external resources available to them that are not specifically related to conventional healthcare (for example, complementary health providers or lifestyle behaviours such as yoga, or exercise). In Hadler's model, the decision an individual takes in relation to their pain is guided by the nature of their pain, personal resources, as well as societal expectations and opportunities. This fits very well within current biopsychosocial models of health and illness (Engel, 1980) and the literature on illness cognitions (Leventhal et al., 1984).

In addition, this theory illustrates the limitations of the focus of previous epidemiological research in this area. Figure 2.7c draws the reader's attention to the fact that the majority of research carried out on the risk factors for pain in work, focuses on Hadler's second and third options for pain: where an individual chooses to present to healthcare systems as a patient with an illness; or where an individual chooses to formalise their incapacity to work as a result of pain.

There are two main approaches to the examination of responses to pain at work. These are analysis of healthcare usage or contact, and measurement of medication use (see Table 2.23 overleaf). Frustratingly, some studies report having measured healthcare and medication usage, but do not publish any data about it (Sternbach, 1985; Pryse-Phillips et al., 1992).

(i) Studies examining healthcare consultation for pain

The little research available in this area shows that healthcare consultation rates for pain to be generally low, sometimes as low as 17% (Masset et al., 1994; Miedema et al., 1998), and rarely more than half of the total sample examined (see Table 2.23 below).

The majority of studies examine consultation rates for back pain and only one study compares different pain types to one another, reporting consultation for back pain to be more common than consultation for arm or neck pain (Engels, 1996). There also appears to be some consistency of consultation over time. In a prospective study, Miedema and colleagues (1998) showed that individuals who didn't consult a health care professional for back pain at baseline were less likely to do so for incident back pain throughout a three year follow-up. Aside from this criticism, five of the studies reporting consultation rates do so from evidence of "reasonable quality" (Moens et al., 1993; Chiou et al., 1994; Masset et al., 1994; Fujimura, Yasuda & Ohara, 1995; Harreby et al., 1996; Papageorgiou et al. 1998; Brown et al., 1998) and as such the extent to which they have been biased by previous pain, physical load, or that interpretation of consultation rates has been obscured by the effects of confounders is arguably minimal. This is not to say that these studies were completely free of bias, however. For example, Miedema and colleagues (1998) collected data within a clinical population, therefore their cohort comprised individuals that had previously presented to health services for treatment. Thus it is possible that their consultation rates were elevated by a predisposition to consult for pain, and would have been different than from those in a general population.

Some authors describe their measures of healthcare usage in terms of provider, comparing allied health professional intervention to physician-based intervention (Chiou et al., 1994, Hemsley et al., 1998), while others simply report overall health care consultation rates (see Table 2.23). Where consultation rates are split, one author reports a preference of allied health professional intervention over medical intervention (Chiou et al., 1994); while another reports the converse (Hemsley et al., 1998). Again, however, the extent to which these can be seen as directly opposing findings is limited by the extent to which designs can be compared. Where Chiou and Wong present evidence from data that with reference to the current quality criteria could be seen to be of reasonable quality (see Section 2.1(e)), it could be argued that their study may have been relatively unaffected by bias. Hemsley et al's findings, however, are less easy to interpret.

There appears to be some relationship between consulting for back pain and increased risk of disability, as research shows previous healthcare consultations to be significantly associated with activity and work limitation (Deyo & Tsui-wu, 1987). However, it is unclear whether this is a feature of the pain itself, a feature of the individual sufferer, or indeed a feature of the fact that these authors did not control for the effects of previous pain (and hence potential previous consultation for pain)..

(ii) Studies examining medication use for pain

A small selection of studies examines the use of prescription and non-prescription medication for pain. In a study fulfilling four of the five quality criteria in the current review (see Section 2.1(f)), Moens et al. (1993) report just over 83% of those who consulted a healthcare professional for back pain used a drug as a result, and 65% used another treatment in addition. As only those who consulted were asked about their medication use, it is unclear whether or not the decision to consult was discrete from the decision to use medication. In terms of Hadler's model, Moens et al.'s study does not distinguish between option 1 and 2, and therefore the extent to which this provides any further illustration of the "person persisting with pain" is questionable. Indeed this is a criticism that can be levied at all of the studies in Table 2.23.

Another striking feature of this literature is the extent to which individuals avoid intervention entirely. Up to four-fifths of Harber et al.'s (1989) sample chose to avoid pain medication, and Hemsley et al. (1998) report that a third of men and a quarter of women avoided treatment altogether. Although there is relatively little research in this area, these studies suggest that pain medication avoidance may be substantial in a large proportion of the community. This is important, as these individuals were suffering from pain, but were able to "soldier on" regardless. However, Harber et al's study should, be viewed with caution, given that it only fulfilled one of the current review's criteria for quality, and did not adjust for confounders.

One study that goes some way to illustrating this use of prescription versus non-prescription medicines is Hannay (1979) who reports analgesics to be the third highest of all medications taken, 4% of which were prescribed, and 5% were not prescribed. Hannay's sample was drawn from GP patient records, and therefore sampled only those individuals who were registered with a GP in the area. Moreover, although substantial demographic data were provided, no data on work was given.

Table 2.23
Healthcare and medication use in studies predicting risk factors for pain in various populations between 1980 and 1998

(a) Studies that measured rates of healthcare consultancy only		
General or clinical populations	**Design**	**% of sample (unless otherwise stated)**
Miedema et al., 1998 [BP]	Cross-sectional retrospective 3-4 years, plus 3 yrs prospective	Sought help for incident back pain during follow-up from: GP(% of non-consulters at baseline (NC)(50),% of consulters at baseline (C)(82)); physiotherapist (NC(39), C(62)); medical specialist/consultant(NC(17), C(47)). All NC were significantly different from C. Consulting GP for back pain predicted chronic back problems.
Papageorgiou et al. 1997 & 1998 [LBP]	Cross-sectional baseline with inception cohort followed up for 12 months	No significant differences across age and gender, but an interaction between age and gender. Not consulting was associated with inadequate income; dissatisfaction with job; relationship with others at work, but not socioeconomic group. Consulting was associated with inadequate and socioeconomic group. Consulters were more likely to perceive their income as inadequate and be less satisfied with work.
Working populations	**Design**	**% of sample (unless otherwise stated)**
Brown et al., 1998 [BP]	Cross-sectional	53.4 sought help for pain from medical practitioner, chiropractor or other health professional help.
Chiou et al., 1994 [BP]	Cross-sectional	Rated intervention for pain by order of preference: Physiotherapy>Manual therapy>Medical advice>Herbal medicine>Acute services>Surgical intervention
Deyo & Tsui-wu, 1987 [BP]	Cross-sectional	Days of activity limitation and days of reduced housework predicted by ever having sought HC for LBP
Engels, 1996 [MSK]	Cross-sectional	Sought medical help for: arm/neck pain(61), back pain(51); and leg pain(47)
Fujimura, Yasuda & Ohara, 1995 [LBP]	Cross-sectional	Visited healthcare professional for LBP: ever (64); currently(24%)
Masset et al., 1994 [BP]	Cross-sectional	Sought medical help for LBP (17)
Videman, 1984 [BP]	Cross-sectional	No. Nursing assistants consulted doctor for help for pain significantly less than qualified nurses
Westgaard et al., 1993 [MSK complaints]	Cross-sectional	Office workers consulted doctor for help for pain significantly less than production workers Consultation interacted with pain quality – pain for which individuals consulted was of less intensity in the office workers
(b) Studies that measured rates of healthcare consultancy and medication use		
General or clinical populations	**Design**	**% of sample (unless otherwise stated)**
Harreby et al., 1996	Prospective study of schoolchildren (1965) followed up	Analgesic use: % of those with severe LBP (44); % of those with general LBP (32) Gender: M(24%)<W(29%)
Working populations	**Design**	**% of sample (unless otherwise stated)**
Anderson, 1992 [BP]	Cross-sectional	Sought help from healthcare professional for pain: bus drivers (43); non-drivers (27) OTC use: bus drivers (34); non-drivers(19)
Harber et al. (1985) [LBP]	Cross-sectional with retrospective at 2 weeks and 6 months	Sought help for pain from healthcare professionals: (% of nurses (N)(23); % of Nurse managers (NM)(36) NS 6 mths). Medication use for pain: all at 2 weeks(21); all at 6 mths(29)N(21); USC(14) at 2 weeks; N(29); USC(30) at 6 mths. No significant differences between N and NM.
Hemsley et al., 1998 [BP]	Cross-sectional	No treatment: 30% males >25% females. ("presumably because such pain is considered inevitable and usually improves with time, rest and pain relief" - p.505) Perceived effectiveness of interventions: GP>Chiropractor>Physiotherapist; Medicine (50% effective); Stretching (90% effective)
Moens et al., 1993 [BP]	Cross-sectional	61.4% Consulted a physician (61) 83.3% of which used a drug, and 65% another treatment
Sairanen et al., 1981	Case-control	Lumberjack/referent: occasional use of an analgesics(28/36); constant use of analgesic(3/0); physical therapy(11<36); visits to physician(60/59); hospital care(9/3). The only significant difference was for physical therapy.

Pain types: BP= Back Pain; LBP= Low Back Pain; MSK= Musculoskeletal Pain;

Hannay (1979) describes a "Symptom Iceberg" in community health, where only a fraction of symptomatic individuals present to general practitioners, and the majority of symptomatic individuals do nothing about them (two-thirds), visit an alternative practitioner, or self-medicate (one third). It is these individuals that the current study is keen to access, as it may be that pain sufferers who are able to work can provide a clue as to how individuals are able to feel pain and still work (as opposed to feel pain but not be able to work).

In a study of reasonable quality, Harreby et al. (1996) report analgesic use to be more common in those with severe low back pain than those with general low back pain, suggesting that the actions taken in response to pain may be different in relation to different aspects of the pain experience. In addition, Westgaard et al. (1993) report differences between work groups in relation to pain experience. In their study, all but one of the sample of office workers consulted a doctor for pain of less than three on a ten-point Likert scale. For production workers, however, consultation was more likely where pain was more severe (five or six on the same scale). Although the study by Westgaard et al. (1993) is of slightly lower quality of that of Harreby et al. (1996), these findings do point to the possibility of the pain response varying in relation to differential pain experience. Moreover, Skevington (1992) provides a useful review of the literature surrounding consulting for pain, reaffirming the importance of the affective aspect of pain and psychosocial factors in relation to consulting for pain and other medical problems. It would therefore be interesting to explore the possibility of the differences between the rates of medication use and avoidance in relation to different pain types and pain experience scores.

In relation to the literature on pain responses discussed above the current study seeks to quantify the responses taken to general aches and pains in a working sample (EH_5), and to explore the possibility that:

- rates of medication use, medication avoidance and healthcare use will differ in relation to pain type and pain experience (EH_6); and that
- pain experience scores predict rates of medication use, medication avoidance and healthcare use (EH_7).

(b) The influence of psychosocial factors on actions taken in response to pain

Research shows that, as Hadler suggested (2005), the actions taken to deal with pain are related to a variety of psychosocial variables. Table 2.24 below shows a selection of studies that focus on the influence of demographic factors on the use of OTC medications.

In addition, in a study of "reasonable quality" (meeting four out of the five quality criteria used in the current review, see Section 2.1(e)) Harreby et al. (1996) report that analgesic use is more prevalent in women than in men. These findings suggest that demographic factors such as gender, age and socioeconomic status have an influence on the decision to consult for pain. The current study aims to explore this possibility in relation to the demographic factors. It is expected that rates of medication use, medication avoidance and healthcare use will differ in relation to demographic groups (H_{13}). In addition, the possibility that demographic variables will be associated with rates of medication use, medication avoidance and healthcare use (after adjustment) will also be explored (EH_8).

Table 2.24
Summary of demographic influences of the use of OTC analgesics

Gender	
Men are less likely to use OTC analgesics than women	Stoehr at al, 1997; Ahonen et al., 1991; Ahonen et al., 1992; Christie, 1978; Lewis & Rayner 1978
Women are more likely to purchase OTCs for themselves and for other people	BMRB Study (see below)
Age	
Elderly individuals use more analgesics that younger individuals	Wessling, 1987; Stoehr at al, 1997; Ahonen et al., 1991; Dunnel & Cartwright, 1972; Fillenbaum et al., 1993; Hanlon et al., 1992; Hanlon et al., 1996; Ahonen et al., 1992,Ahonen et al., 1993, Helling et al., 1987, Rantuuci & Segal, 1991; Stewart et al., 1991; Chrischilles et al., 1990
Socioeconomic variables	
Individual in rural areas are just as likely to use OTCs as those in urban areas	Ahonen et al., 1991
Economic status is less important in prediction of OTC use than the availability of products	Stein et al., 1989
Individuals in less privileged social groups are less likely to use analgesics	Ahonen et al., 1991; Hanlon et al., 1996; Ahonen et al., 1992, Ahonen et al., 1993
Individual variables	
OTC analgesic use is more likely in individuals who have psychologcial problems, and depression	Ahonen et al., 1991; Stewart et al., 1991; Chrischilles et al., 1990
The presence or absence of a chronic debilitating disease has no effect on the use of OTC analgesics	Ahonen et al., 1991

(c) The influence of work factors on actions taken in response to pain

Regarding the influence of psychosocial work factors on the actions taking in response to pain, variation between occupational groups has also been observed by a number of authors, such that manual workers have been shown to be more likely to consult for a variety of pains than non-manual workers. This has been shown when comparing: nurses to nurse managers (Harber et al., 1985); qualified nurses to nursing assistants (Videman, 1984), office workers to non-manual workers (Westgaard et al., 1993); bus drivers to non-drivers (Anderson, 1992). These findings would suggest that healthcare usage is more common in more manual occupations, although this should be concluded with relative caution, as none of these studies met with what has been described as "reasonable evidence" by the current review. As a result, there is the possibility that these findings are influenced by a variety of biases.

Data from a study that has been argued to be of better quality (Papageorgiou et al., 1997) suggests that there are also differences in work perceptions between consulters and non-consulters. Papageorgiou and colleagues (1997) report that economic factors such as inadequacy of income and being in a less privileged social group were associated with consulting for pain. Work factors such as satisfaction with job, and good relationships with co-workers were associated with non-consulting. Although the effects were modest, and differed in relation to gender, they suggest that perception of work may be important in the decision to consult, and that consulting for back pain may be less likely where working circumstances are more positive (Papageorgiou et al., 1997). As such, it was not so much the type of work the individual carries out, but the perceived nature of the work environment that was important.

Data from reasonably reliable sources suggests, therefore, that the consultation rate for pain may differ in relation to psychosocial and work factors, and as such this area deserves further research attention. The current study aims to explore this possibility in relation to a selection of work factors. It is expected that medication avoidance and healthcare use will differ in relation to work groups (H_{14}). In addition, the possibility that work factors will be associated with rates of medication use, medication avoidance and healthcare use (after adjustment) will also be explored (EH_9)

(d) Measuring actions taken in response to pain

The lack of a comprehensive literature on the use of OTC analgesics by the general public presents the researcher in this area with a problem related to measuring actions taken in responses to pain. Previous studies have applied a combination of methods, mainly based around interviews or single questions, and as a result, there are very few standardised questionnaires available in the peer-reviewed literature. Very few authors have considered the consulting process in great detail. Specifically, they record the health professional seen and the result of this consultation; as well as the reasons for not taking any action. In addition, very few authors have considered the factors surrounding the use of OTC medications for pain, particularly: the nature of the medication (prescription/non-prescription/home remedy); sources of medicine (purchaser, place of purchase, reason for place of purchase); medication effectiveness; understanding of medicine information; and continuing/stopping medication use.

One study that has included all of these factors is that carried out by the British Marketing Research Bureau (BMRB) in 1997, on behalf of the Proprietary Association of Great Britain (PAGB). Researchers interviewed over 2,000 individuals across the U.K. about the prevalence of everyday, non-serious ailments in their household, and the actions they took in response to them. Results from this study are given in Tables 2.25 and 2.26 overleaf.

From these data, pain ailments were the most commonly experienced ailments, accounting for 26% of all ailments reported, and being reported by just fewer than 70% of the sample. Headache was the most common everyday pain, and was also most frequently reported in under 35's (see Table 2.25).

In response to all ailments, 12% of individuals requested help from professional sources, and 38% opted for self-treatment. The most common response to a non-serious ailment was to do nothing at all (56% on some occasions; 48% on every occasion) and this was the case across both genders and all age groups (see Table 2.25).

Table 2.25
Prevalence of pain experienced in the last 2 weeks *(taken with permission from BMRB study, 1996)*

	Prevalence(%)							
								Age groups
	All	Men	Women	15-19	20-34	35-49	50-64	65+
Any pain ailment	**66**	**62**	**67**	**76**	**62**	**66**	**66**	**61**
Headache	33	28	39	46	42	38	25	17
Muscle aches and pains	29	31	28	37	27	25	35	30
Stiffness in joints	22	23	21	16	12	17	35	33
Back problems	20	19	20	11	18	19	25	21
Arthritis/rheumatism	14	12	15	1	4	7	23	34
Pain from injury/strains/sprains	11	16	6	19	13	11	8	7
Migraine	5	3	6	5	7	6	4	2
Neuralgia	1	-	1	1	-	1	1	2

Table 2.26

Actions taken to deal with all non-serious ailments in the last 2 weeks based on all adults *(taken with permission from BMRB study, 1997)*

	Prevalence (%)							
								Age groups
	All	Men	Women	15-19	20-34	35-49	50-64	65+
Saw a doctor/dentist	16	16	18	10	14	16	18	16
Saw nurse/health visitor	2	2	2	2	2	0	2	2
Saw another health professional	4	4	4	2	4	6	6	4
Asked a pharmacist for advice	2	2	2	0	2	2	2	2
Used a prescription medicine that was already in the house	22	22	22	12	12	20	32	22
Bought a medicine you can buy without a prescription	16	14	18	24	20	14	14	16
Used a medicine you can buy that was already in the house	24	24	26	10	28	32	22	24
Used a home remedy	14	12	16	6	18	16	10	14
Did not use anything on some occasions	56	58	54	72	58	56	53	50
Did not use anything on any occasions	48	51	45	65	50	46	47	40

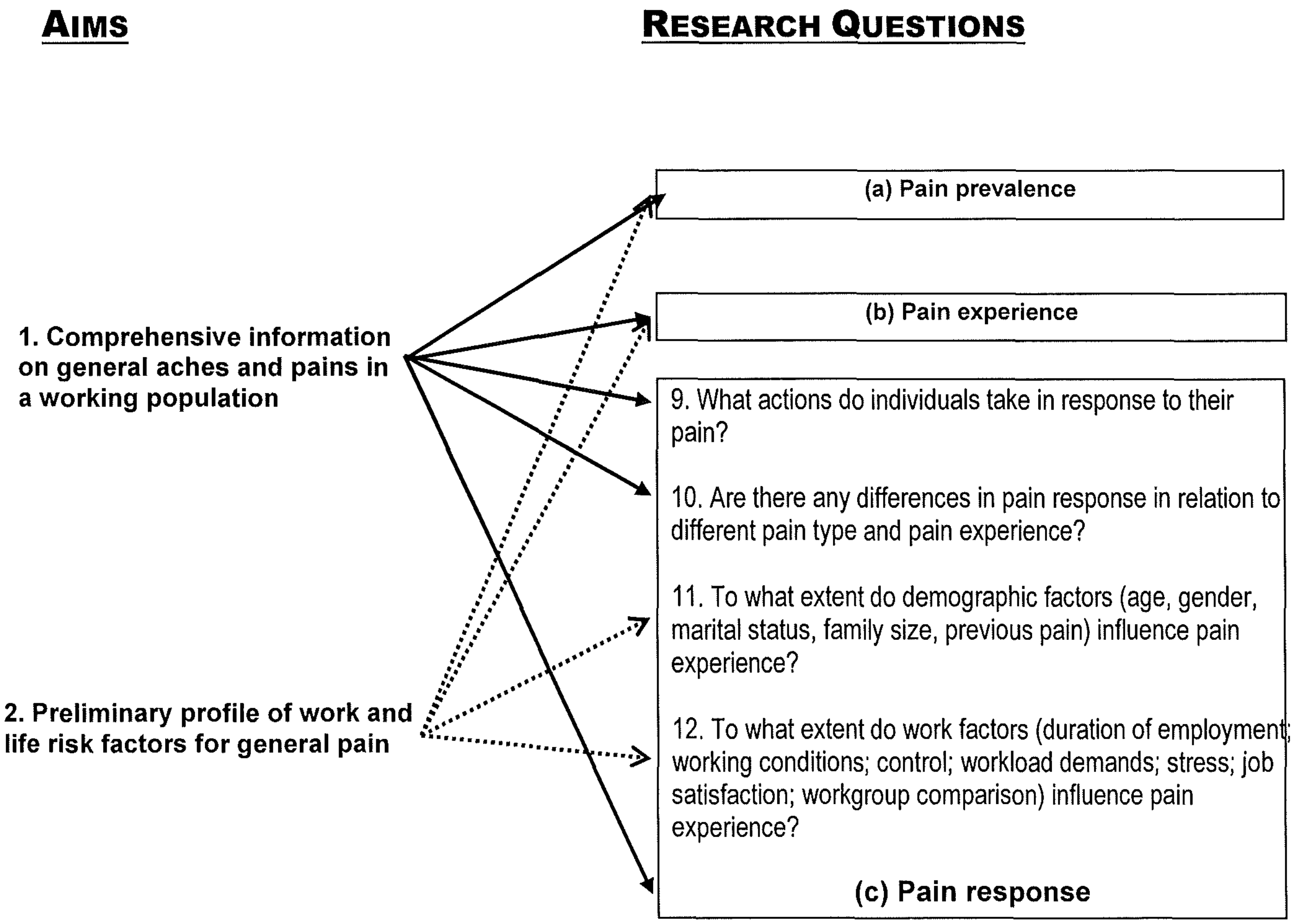
These data suggest that, despite the high prevalence of non-serious ailments, very few individuals take action to deal with it. However, the BMRB study gives these as percentages of all ailments, not offering any information about actions taken for pain specifically, and therefore the extent to which these data would generalise to a pain population is open to question.

The BMRB study can also be criticised in that the statistics provided by the BMRB provides only descriptive data, therefore very few inferences can be made about the relationships between findings and a larger population. Secondly, the context of the BMRB study was primarily a market research study, funded by the Proprietary Association of Great Britain (PAGB), the official body representing commercial pharmacists in the U.K. As such, the sub-text of the investigation was to document community use of pharmacists and of OTC medicines (PAGB, personal communication). Data collection and interpretation may have been somewhat biased towards addressing pharmaceutical issues, rather than to inquiring about responses to common ailments as a whole.

Finally, and most importantly, despite the variety of issues included in the survey, the BMRB study provides no validity and reliability statistics. While the context of this study did not require these statistics, for scientific credibility and utility, this information would be needed. Despite these criticisms, the BMRB study presents the only comprehensive review of the issues surrounding self-medication, and therefore an adapted version of their questionnaire will be used in the current study.

Figure 2.8 below shows the current research aims projected onto research questions relating to pain experience as measured by the GPQ. Each of these research questions has been generated throughout the discussion of previous literature in Sections 2.3 and 2.4 above.

Figure 2.8
Summary of research aims in relation to research questions generated from previous research on pain response



2.6 Study Aims, Research Questions and Hypotheses

Section 2.3 of this thesis discussed the research evidence that psychosocial and work circumstances present varied risks for the individual in pain, and demonstrated that as a result of differences in design and approaches, the knowledge of these influences is conclusive in some cases, but not in all. An alternative approach to making sense of this literature was suggested. It was argued that just as it was crucial to focus on "important" or troublesome pain, and that it may be just as useful to include "non-important" pain in any enquiry into risk factors for pain in the workplace (Section 2.4). In addition, the merits of examining pain more than just pain prevalence or incidence were discussed, and the value of applying an epidemiological approach to the psychosocial influences on the pain experience were discussed in detail (Section 2.4). Literature on the pain experience was then reviewed, and the effects of psychosocial and work factors on the pain experience were discussed.

One final issue with the previous literature was discussed in the final section of this review. Few studies have addressed the responses that individuals take in relation to pain at work, and whether these relate to pain prevalence, work factors and the pain experience.

Section 1 stated that the current study aimed to address the gaps in current pain research, by:

1. Providing a more comprehensive information on general aches and pains in a working population;
2. Providing a preliminary profile of work and life risk factors for general pain.

These study aims are incorporated into Figure 2.9 below, and are projected onto the three areas featured in the current discussion: pain prevalence, pain experience and actions taken in response to pain. These are then formulated into research questions that are generated specifically by previous findings, and can be found in various parts of the previous sections (as labelled). Finally, these research questions are used to generate Hypotheses 1-14 and Exploratory Hypotheses 1-9 (Figure 2.9 overleaf).

Figure 2.9

Summary of current study's Aims, Research Questions, Hypotheses and Exploratory Hypotheses in relation to (a) pain prevalence; (b) pain experience and (c) pain response

AIMS

1. **Comprehensive information on general aches and pains in a working population**

2. **Preliminary profile of work and life risk factors for general pain**

QUESTIONS

(a) Pain prevalence

1. What is the prevalence of general aches and pains in a working population?
2. Are there any differences in prevalence in relation to different pain types?
3. To what extent do demographic factors (age, gender, marital status, family size, previous pain) influence pain prevalence?
4. To what extent do work factors (duration of employment; working conditions; control; workload demands; stress; job satisfaction; workgroup comparison) influence pain prevalence?

(b) Pain experience

5. What is the pain experience in a working population?
6. Are there any differences in pain experience in relation to different pain types?
7. To what extent do demographic factors (age, gender, marital status, family size, previous pain) influence pain responses?
8. To what extent do work factors (duration of employment; working conditions; control; workload demands; stress; job satisfaction; workgroup comparison) influence pain experience?

(c) Pain response

9. What actions do individuals take in response to their pain?
10. Are there any differences in pain response in relation to different pain type and pain experience?
11. To what extent do demographic factors (age, gender, marital status, family size, previous pain) influence pain experience?
12. To what extent do work factors (duration of employment; working conditions; control; workload demands; stress; job satisfaction; workgroup comparison) influence pain experience?

HYPOTHESES (H) AND EXPLORATORY HYPOTHESES (EH)

(based on previous observations*)

H_1 The prevalence of general pain in a working population will be high

H_2 Pain prevalence will differ in relation to pain type

H_3 Pain prevalence will be higher in women, in older age groups, and in less privileged socioeconomic groups, and where individuals have a chronic condition.

H_4 Pain prevalence will differ in relation to marital status and family size.

H_5 Demographic factors will be associated with pain prevalence after adjustment.

H_6 Pain prevalence will be higher where: duration of employment is longer; control is lower; work demands are higher; stress is more common; and job satisfaction is lower.

H_7 Pain prevalence will differ in relation to different working conditions and between workgroups.

H_8 Psychosocial work factors will be associated with pain prevalence after adjustment.

H_9 GPQ scores and sub-scores for pain frequency, intensity and impact will be high.

EH_1 What is the nature of the sub-scores for coping with pain and pain emotions?

H_{10} GPQ scores and sub-scores for pain intensity, frequency and impact will differ in relation to pain type or pain cause.

EH_2 Do the sub-scores for coping with pain and pain emotions differ by pain type or pain cause?

H_{11} GPQ scores and all sub-scores will differ in relation to demographic groups.

EH_3 Are demographic variables associated with pain experience scores after adjustment?

H_{12} GPQ scores and all sub-scores will differ in relation to work factors.

EH_4 Are work variables associated with pain experience scores after adjustment?

EH_5 What are the rates of medication use, medication avoidance and healthcare use for pain?

EH_6 Do rates of medication use, medication avoidance and healthcare use differ in relation to pain type and pain experience?

EH_7 Are pain experience scores related (after adjustment) to rates of medication use, medication avoidance and healthcare use?

H_{13} Rates of medication use, medication avoidance and healthcare use will by demographic groups.

EH_8 Are demographic variables predict rates of medication use, medication avoidance and healthcare use after adjustment?

H_{14} Rates of medication use, medication avoidance and healthcare use will differ by work groups

EH_9 Are work variables associated with of medication use, medication avoidance and healthcare use afte adjustment?

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3. Methods

The following section will provide an overview of the Methods used in the current study, why they were seen to be appropriate, and measures taken to minimise bias. Correspondingly, this section will include discussion of the reasons for the choice of design, analysis of response rates, and some preliminary data analysis. This preliminary data analysis was carried out in order to inform decisions about appropriate methods of categorising results (for example showing the distribution of scores; dichotomisation of outcome variables). The methods of the main data analysis will be outlined here (Section 3.4 below), however the actual data analysis will be reported in the Results chapter (Section 4).

3.1 Choice of design

The standard method of examining the *aetiology* of pain would be to carry out a cohort study examining prevalence and incidence of general pain within a given time interval. This would enable the researcher to distinguish between ongoing and new pain cases, and to chart the nature of this pain over a series of episodes, rather than just one. A cohort study would also have the added benefit of enabling examination of change in pain experience within and between episodes. However, the current study aims to examine general pain, that is "important" pain and "non-important" pain, recorded in the absence of any clinical or duration-specific criteria. The observed lifetime prevalence of all pain is high (James et al, 1991; Sternbach 1986, others) therefore it can be said with confidence that throughout their lifetime, the majority of individuals will experience pain of some sort. Where studies are focused on a *specific* pain type there is a substantial rationale for a cohort approach, as one would not expect an entire cohort to suffer from a *specific* pain in a given time interval. Where studies are focused on *all* pain, however, it is highly likely that most individuals in the cohort will suffer from pain at some point in their lives. As such, where incidence is defined as the number of new cases of pain over the population at risk of pain within a specific period of time (Bhopal, 2003), it is unlikely that there will be anyone in the cohort who has *never* experienced pain in their lifetimes. Moreover, even where time is restricted (retrospectively or prospectively) it is also unrealistic to expect individuals within that cohort not to suffer from any pain within in this interval. For a general approach to pain, therefore, it can be argued that the incidence measure is unlikely to show much variation between groups. In recording the extent of general pain in the community, therefore, a week retrospective period prevalence of pain suffices.

Methods using case-control comparisons of pain sufferers to matched controls have been shown to be highly successful in expanding understanding of specific pain types such as low back pain and chronic pain (see Section 2.3), and would increase the validity of observations made. However, the provision of a pain-free control group is a key requirement of the case-control investigation, and if lifetime prevalence of general pain is high, and period or point prevalence of *any* pain is also likely to be high, one might expect that an appropriate control group would be difficult to find for a case-control study. Where it might be easy to source cases, it is unlikely that a large enough group of individuals who have never experienced *any* pain (within a given timeframe) would be found in the workplace. Thus, as with the cohort design, the case-control design may be appropriate for specific pain types, but would be difficult to apply with regard to general pain.

It could be argued therefore, that on a conceptual basis, that the objective of recording general pain permits no other realistic research design than a cross-sectional one.

There is a further conceptual issue that justifies an observational approach to general pain. Cohort and case-control designs are useful in determining the aetiology of conditions, in that they can quantify the effects of confounding factors such as previous pain or demographic variables. This is necessary in the identification of risk factors for the occurrence of pain. However, it has already been argued that the focus of the current study is not on the *prediction* of pain, and the aetiology of pain is also not of primary concern. As such, the importance of eliminating the effect of bias and quantifying confounders on the *occurrence* of pain (for example in a new case) or in the *non-occurrence* of pain (for example in a pain-free control group) could be argued to be irrelevant to the research aims. This is not to say that confounders will have no effect on the experience of pain (and indeed it is expected that they will) but merely that conventional designs are better suited for aetiologically driven studies. Many authors have made recommendations for minimising bias and adjusting for confounders in observational studies (for example, Bongers et al., 1993) and to the extent that these are appropriate, these will be incorporated in the current analysis (see Section 3.4 below).

A cross-sectional method of enquiry is also deemed to be appropriate for the current study for practical reasons. There are many comparisons relating to work groups planned in the current study. To facilitate these it was important to gain a representative sample of workplaces in Scotland (see Section 3.3 below). This involved collecting information from a variety of different work groups and organisations. It became apparent in the planning stages that establishing and maintaining contact with, as well as gaining access to staff within these organisations was going to be difficult (see Section 3.3 below). Within the time and resources available, to have had any more than minimal contact with staff would have required limiting the number of companies invited to take part. Representing a wide variety of occupations was thought to be necessary for the principal objectives of this study, and therefore it was decided that a cross-sectional questionnaire design would be the most appropriate method of enquiry.

The current study therefore applies a cross-sectional design to a working population, acknowledging that it will not permit causal attributions of risk factors.

3.2 Questionnaire Development

(a) Questionnaire content

Table 3.1 summarises the questionnaire items designed to test and explore the current hypotheses (see Figure 2.5). Originally, two questionnaires were developed: one to measure pain prevalence and experience, and the other to measure demographic and work factors.

In order to make these as appealing to participants as possible, these were entitled "Pain in the New Millennium"; and "Your Job in the New Millennium" respectively (see Appendix Ai). Each of these is discussed below.

(i) "Pain in the New Millennium" (PainQ)

Individuals were asked whether they had experienced pain in the last month (Table 3.1a). As discussed in Section 2.4, the aim was to include all pain, therefore no duration-, type-, or intensity-specific descriptors or criteria were placed on this definition. Put simply, if an individual believed themselves to have experienced pain, of any type or any duration, it was recorded.

Table 3.1
Mapping hypotheses onto questionnaire content

Pain in the New Millennium (PainQ)

Information required	*Information asked* [Questionnaire Item numbers in brackets]	*Hypotheses (H) & Exploratory hypotheses (EH)*
(a) Pain prevalence and pain type	• Pain at any point in the last month [1]	H_1-H_8
(b) Pain site and cause	• Pain site [3(6)] • Pain cause [3(7)] • Chronic condition [24]	H_1, H_2, H_{10}, EH_2, EH_6
(c) Pain experience (as measured by the GPQ)	• Pain experience: Frequency, Intensity, Emotion, Coping, Impact [3 (1-5)]	H_9-H_{12}, EH_1-EH_4
(d) Rates of medication use, medication avoidance and healthcare use for pain	• For this pain, what did you do? (healthcare use & result/medication use/ do nothing & why not) [2] • Medicine use (name/type/purchaser) [4(1a-e)] • Place of purchase and why [4(2a, b)] • Medicine effectiveness [4(3)] • Medicine behaviour (instructions/ duration/cessation) [4(4a-d)]	H_{13},H_{14}, EH_5 EH_9

Your Job in the New Millennium (WorkQ)

Information required	*Information asked [Items numbers]*	*Hypotheses (H) & Exploratory hypotheses (EH)*
(e) Demographic information (gender, socioeconomic groups, marital status, family size and previous pain)	• *Gender[12]* • *Family size [13]* • *Marital status [14]*	H_3-H_5, H_{11}, EH_3, H_{13},EH_8
(f) Work factors (duration of employment, control, demands, stress, job satisfaction, working conditions and between work groups)	• *Employment (status & duration) [1, 2a&b];* • *Job type (current job title [3]; earnings [5]; perceptions: manual/skilled/professional [4]; physical/mental [15a])* • *Working conditions (hours/day, hours/wk [6 a,b]; shift-work[7]; permanent/temporary, full-time/part-time [8a,b]; conventional working hours [9]; computer use [11])* • *Control (organization of own tasks [10]; working on own all of the time [15d]; control over breaks [23a] –control)* • *Demands (beyond/within capabilities[15c]; length of breaks [23c])* • *Job satisfaction (job enjoyment [16]; desire to continue in job [18])* • *Impact of pain on work, and work on pain: (sickness absence- actual [20]/ impact[19]/ reason[25]; painkillers at work (use [21]/source[24]/ ability to work without painkillers [26]/ prevention [27])* • *Stress (main breadwinner [14b]; perceptions of stressful/easygoing [15b]; job security [17]; regularity of breaks [23b])*	H_6-H_8, H_{12}, EH_4, H_{14}, EH_9

In addition, individuals were asked the action they had taken in response to their pain. If they sought help, the outcome of this consultation was explored, and if they had avoided treatment (Table 3.1b and 3.1d), the reasons behind this were also explored. Pain experience was addressed using the Glasgow Pain Questionnaire (GPQ; Thomas et al, 1996), where participants were asked whether they agreed or disagreed with each pain statement (see Table 3.1c). GPQ items are weighted such that endorsement scored the weighting for each item (see Figure 3.1 below). Therefore, each of the five aspects of pain yielded a score out of ten, and a total GPQ score with a maximum of fifty.

Figure 3.1
GPQ items given by each of the five aspects of pain (Frequency, Intensity, Ability to cope, Emotion and Impact) and corresponding weightings

Frequency (weighting)
I rarely had any pain (0.3846)
I had occasional pain (0.7692)
I had some pain often (2.3077)
I had pain frequently (2.6923)
I had pain all the time (3.8462)

Intensity (weighting)
The pain was mild (0.556)
The pain was uncomfortable (1.3887)
The pain was moderate (1.3887)
I had some strong pain (1.9444)
The pain was severe (2.2222)
The pain was intense (2.5)

Ability to cope (weighting)
The pain was difficult to cope with (1.4815)
At times the pain was a bit hard to bear (2.2222)
Sometimes I just couldn't stand the pain (2.963)
The pain was unbearable at times (3.3333)

Emotion (weighting)
I felt upset by the pain (2.0)
The pain got me down (2.4)
Pain has made me feel miserable (2.8)
I felt the pain was wearing me down (2.8)

Impact (weighting)
Pain upset my normal routine (1.6216)
My social life was affected by pain (1.8919)
Pain stopped me from doing the things I wanted to do (1.8919)
I could hardly move for the pain (2.1622)
Pain made everything come to a standstill (2.4324)

Previously published evidence for the reliability and validity of the GPQ is summarised in Table 3.2 below. Although correlations yielded are moderate, the authors note that, "too high a degree of correlation between the measures would not be desirable as this would make the new measure redundant" (Thomas et al, 1996). Where correlations are low (for example for GPQ frequency versus VAS frequency) the authors note that a positive relationship still indicates some level of agreement between the two measures. It would seem, therefore, that the GPQ has reasonable validity and reliability for measuring general pain in an occupational sample.

Moreover, given that the GPQ uniquely measures some aspects of the pain experience that are not addressed by other scales (see Section 2.4.3), it remains the measure of choice for the current study.

Table 3.2
Summary of validity and reliability statistics given for the GPQ items and weightings taken from Thomas et al (1996)

(a) Convergent validity	Moderate correlations between sub-scores and VAS scores for the same constructs: Frequency (0.26); Intensity (0.37); Emotion (0.45); Coping (0.6); Impact (0.62); Total GPQ score (0.6)
(b) Consistency across similar groups	No significant difference between a pain clinic sample and a rheumatoid group for 4/5 pain aspects (only difference on impact, where impact was less for the rheumatoid group)
(c) Sensitivity to different groups	Distinguished between an occupational group (scores were lower) and a pain clinic group (scores were higher). Significant for all sub-scores (Kruskal Wallis= $p < 0.001$)
(d) Test-retest reliability	Moderate to high correlations between scores for the same sample one month apart: Frequency (0.56); Intensity (0.64); Emotion (0.63); Coping (0.69); Impact (0.69); Total GPQ (0.69).

After the GPQ items, individuals were asked to specify the site of their pain. This would enable comparison rates of pain-types with previous studies. Individuals were also asked to give the cause of their pain. This was done to explore individual perceptions about the causes of their pain, and whether they related to previous pain. Site and cause information, as well as chronic condition information (Table 3.1e) was also required to establish whether the pain the individual was experiencing was the result of an ongoing chronic condition. The purpose of this item was as a measure of the potential for co-morbid symptoms, as well as the potential effect for experiencing previous pain (see Section 2.3).

Individuals were asked about the pain medications they had consumed in the last month, the name and preparation of this medication, and various issues concerned with medication use (Table 3.1(d)). These items were adapted from the original BMRB study, which was an interview design, collecting information on all non-serious ailments in a community sample. Specifically these adaptations were as follows:

- interview questions were converted into a paper questionnaire format;
- original questions worded to ask about general ailments were modified to be specific to a pain population (for example, where the original BMRB study asked, "Did you take any actions to deal with your ailment?" the current study asked, "Did you take any action for your pain?"); and

- the discrepancy between the retrospective intervals of the BMRB study (two weeks) and the GPQ (one month) was resolved by extending the interval in BMRB questions from two weeks to one month.

Postcode information was also requested to allow calculation of the Carstairs Deprivation Index relevant to each individual (Carstairs &, Morris, 1991). This score was used as it is considered to be reliable and valid (Carstairs &, Morris, 1991; Rees, Martin & Williamson, 2000; McLoone, 2001). Unlike deprivation scores such as the Department of the Environment Index (HMSO, 1995), the Jarman Index (Jarman, 1984), or the Townsend Index (Townsend, Phillimore & Beattie, 1988), the Carstairs Index provides information specifically in relation to Scotland and Scottish postcode sectors. Deprivation scores are pre-calculated on the basis of four characteristics of each post-code ward: level of unemployment (male residents over 16 as a proportion of all economically active male residents aged over 16); level of overcrowding (persons in households with 1 and more persons per room as a proportion of all residents in households); car ownership (residents in households with no car as a proportion of all residents in households); and social class (residents in households with an economically active head of household in social class IV or V as a proportion of all residents in households). Carstairs scores for Scotland for 2001 were provided by the Department of Public Health at the University of Glasgow (McLoone, 2001).
Finally, "Pain in the New Millennium" contained a selection of statements about self-medication practice. These were intended to be used for exploratory purposes, and to derive descriptive information only.

(ii) Your Job in the New Millennium (WorkQ)

This questionnaire was devised to record demographic and work details of participants. Several demographic details variables were included:

- gender (male/female);
- age (by bracket 16-25; 26-35; 36-45; 46-55; 56-65; over 65);
- socioeconomic group (as indicated by occupational title, according to ref);
- number of children (including zero)
- marital status (and employment status of spouse should they have one)

- chronic condition (whether they had one or not, and if so, what is was)

Design of work items was informed by previous research, such that a selection of key factors was recorded (see Table 3.2(f)). Reliability and validity analyses of work items are reported in Sections 3.3 and 4.1.

(b) Piloting PainQ and WorkQ

A summary of the pilot study is provided in Table 3.2 below. Both questionnaires were piloted together.

(i) Objectives

There were four objectives of the Pilot Study:

- to establish the method of distribution that yielded the highest response rate;
- to establish the readability of the questionnaire
- to identify any problematic questions
- to offer the opportunity to comment on the questionnaire.

(ii) Recruitment of participants

Supervisors of each University or Hospital department or section were sourced using the internal staff directory, and were contacted by letter giving basic details of the study (see Appendix Aii) at first contact, then by follow-up phone-call within two weeks of receipt of the letter. At this point the supervisor could withdraw from participation. If they agreed, the researcher met each supervisor to discuss: access to staff; number of participants available versus number of participants required; and the process of distribution of questionnaires.

(iii) Sample included in the Pilot Study

In total, 100 individuals were approached during piloting, all of whom were of working age, and employed by the University of Glasgow (GU), the Western Infirmary Glasgow (WIG); or Gartnavel General Hospital, Glasgow (GGH). 40% of this sample were domestic services workers, 60% were full-time staff on general medical wards (nurses and nursing assistants). The majority of this sample was female.

(iv) Methods of the Pilot Study

In total 100 questionnaires were distributed in the piloting phase. Response rates were explored by giving supervisors two options of questionnaire distribution: half were distributed in person (researcher speaking to individuals as a group, giving details of the study); and half were distributed by the supervisor (participants given both questionnaires with an information sheet containing details of the study (see Appendix Aii). Equal numbers of each job type were accessed by each method (20% in person to domestic service workers, and 20% by supervisor; and 30% in person to general medical ward workers, and 30% by supervisor).

Table 3.3
Summary of pilot study questions

(a)Objectives	(b) Method/Question	(c) Results		
To establish the method distribution that yielded the highest response rate.	50% distributed by supervisor 50% distributed by the researcher in person	Response rate by supervisor 6 (12%)		Response rate in person 38 (56%)
To establish the readability of the questionnaire	(i) Would you say this questionnaire is easy to read? Yes/No/Don't know	Yes 59 (95%)	No 2 (3%)	Don't know 1 (2%)
To identify any problematic questions	(ii) Can you point out any questions that you thought were difficult or problematic?	Yes 41 (66%)	No 21(33%)	Don't know 0
To offer the opportunity to comment on the questionnaire	(iii) Do you have any further comments or suggestions about these questionnaires?		54 comments	

(v) Results of the Pilot Study

Table 3.3c shows that response rates were much higher where questionnaires were distributed in person, therefore it was decided that in the final study, the preferred method of distribution would be in person by the researcher. The vast majority of individuals reported the questionnaire to be easy to read (95%). This was further supported by tests of reading ease, carried out on Microsoft Word (see Table 3.4 below). These show a reading age of ten or eleven years for each questionnaire, suggesting that the questionnaires were of an accessible level to most working individuals. As such, very few changes were made to the wording of questions in relation to pilot participants' comments (see Section 3.1biv below).

Table 3.4
Readability statistics for both questionnaires

Statistics (Microsoft Word)	*PainQ*	*WorkQ*
Flesch Reading Ease score	78.1	79.3
Flesch-Kincaid Grade Level	5.2	4.9
Reading Age	10 – 11	10 – 11

There was one considerable exception to the positive feedback yielded in the Pilot Study. Just over half of the piloting sample identified questions that they found in Section X of the PainQ, where views on self-medication practice were sought, to be difficult or problematic. For these individuals the opinions were unanimous, with comments relating to this section being: time-consuming; difficult to answer; or simply that they "didn't like" this section.

(vi) Adjustments to the PainQ and WorkQ

With the exception of the section on views about self-medication, piloting results suggested that the adjustments required to the questionnaire were minimal. Some changes were required for practical reasons, however, and these were as follows:

- combination of both questionnaires into one, entitled, "Pain in the Workplace", with two parts: "Pain" and "Work";
- minor changes to wording of questions;
- movement of questions between sections;
- omission of some questions, namely the section relating to individual opinions about pain, primary care and medication issues*.

Through these processes, the final draft of the questionnaire, "Pain and the Workplace" was derived (see Appendix Av).

3.3 Final Study

(a) Final questionnaire and accompanying documentation

All participants received a copy of the Pain in the Workplace Questionnaire (see Appendix Aii) and an Information Sheet/Consent form. The Information Sheet included a photograph of the researcher as well as a brief outline given in terms of questions the participants might ask about the study (see Appendix Aii). All participants were reminded that their responses would remain confidential to researchers, and that their signed consent form (on the first page of the questionnaire; see Appendix Aii) would be removed upon return. The transparency of the study was reinforced by the provision of the names and addresses of all researchers given on the first page, and individuals being invited to contact them should they wish any further information. Participants were also reassured throughout the questionnaire that their responses would remain confidential, by the running footer: *"All information will be held in the strictest confidence on computer and will only be seen by the (listed) researchers".*

Further information was given about the study at the beginning of each of the two parts (see Figure 3.2 below).

Figure 3.2
Information given before each part of the Pain in the Workplace Questionnaire

Part 1 – Pain

Recent research has shown that many more people are suffering from pain in their daily lives than has previously been thought. We are interested in understanding more about everyday pain and people's attitudes to it. The following questions will ask you about your experience of pain, and the actions that you normally take to deal with it.
Please be as honest as possible, so that we can use your responses to improve our understanding of how people deal with pain on a day-to-day basis.

Part 2 – Work

People spend a large part of their lives at work, so it is very important to understand how they feel about their job. We are interested in different aspects of your working life, as well as how your job affects your life outside work, and your health. This short questionnaire is designed to ask you a few simple, unobtrusive questions about your job.
Please be as honest as possible, so that we can use your responses to improve our understanding of people in the workplace.

* Inclusion of this section was intended to yield descriptive statistics about overall views only, and was therefore essentially

(b) Sample in the Final Study

(i) Sample size

To minimise the possibility of a Type II error, sample size was calculated in expectation of carrying out regression analysis on three outcome variables: pain prevalence, pain experience and pain response. There were nine potential demographic predictors and twelve potential work predictors (a total of twenty-one variables). According to Cohen (1988), for regression and correlation analysis, sample size can be calculated by the following equation:

$$N = \frac{\Lambda(1 - R^2_{Y.B})}{R^2_{Y.B}}$$

where $R^2_{Y.B}$ =effect size

For twenty-one variables (approximated as twenty-four variables in Cohen, 1988), assuming a power of 0.95 as a conservative estimate, at $p<0.05$, $\Lambda = 32.8$. Assuming an effect size ($R^2_{Y.B}$) of 0.20:

$$N = \frac{\Lambda(1 - R^2_{Y.B})}{R^2_{Y.B}} = \frac{32.8 \times 0.80}{0.20} = \frac{26.24}{0.20} = 131.2$$

Therefore, each industry group should comprise at least 132 individuals. It was decided therefore, that a target group of 130-150 individuals should be sought in each organisation. This limited the range of different sizes of company, as it was expected that not all small companies would have this number of workers. As a result, where this number of participants was not available, it was anticipated that data from smaller companies could be combined with data from other companies of a similar function. Assuming ten categories of organisation, adequate representation required at least 1500 (10 x 150) individuals. Allowing for a conservative estimate of a 20% response rate this number was multiplied by five, amounting to 7500 questionnaires. Therefore, it was essential that at least 7500 questionnaires be sent out, to ensure that each industry group have at least 132-150 individuals, and assuming ten categories of organisation, that at least 1500 responses were received in total.

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surplus to the hypotheses given in Figure 2.4.

(ii) Recruiting participants

The decision to recruit from workplaces differed from previous research, where conventional means of accessing samples included using general population or electoral roll, or using general practice or healthcare clinic lists. The former approach was not used, as one of the main aims of the current study was to examine the experience of pain *in the workplace.* Accessing individuals via general population or electoral rolls would have involved screening to ensure that all individuals were currently employed, and this was considered to be less cost-effective than accessing individuals known to be employed by contacting their employers. Moreover, the status of "current employment" may not necessarily indicate capacity to work. Approaching employers for access minimised the possibility of examining individuals who were employed but not engaging in current work. Many authors have discussed this migration towards ability to work – the "Healthy Worker Effect" - as a confounder in other studies (Punnett, 1996; Hartvigsen, Bakketeig & Leboeuf-Yde, 2001). Indeed in many studies the migration of less healthy individuals out of work or into different jobs is another potential confounder, and those "in work" are unlikely to be representative of the larger pain population. However, in the current study, it was less important to be representative of the pain population as a whole, but more important to be representative of the pain population who were able to work. Therefore it was crucial to access those able to work regardless of pain, and the effect of those unable to work (the "*Un*healthy *Non*-Worker Effect") was less relevant. The sample was therefore recruited exclusively from individuals in current employment and at work. The only way to achieve this was to ensure that only those who were managing to get to work on a regular basis received the questionnaires.

The second conventional approach in previous research, that is to access participants via general practice or healthcare clinic lists, was also deemed to be inappropriate for the current study. The reason for this was that the current study aimed to gain an accurate illustration of pain at an individual level, including those who were not receiving any formal treatment for pain, as well as those who tended to self-medicate or do nothing about their pain. To access individuals via healthcare services would decrease the likelihood of accessing this group of pain sufferers, and had the potential to skew data towards those who were more likely to be in regular contact with the health services. A further consideration was in relation to the type of pain examined. Section 2.4

argues for the relevance of examining both “unimportant” *and* “important” pain. Accessing individuals outwith any healthcare context ensured that this was possible.

(c) Maximising the representativeness of the final sample

In order to maximize the representativeness of the current sample, selection of organizations was done as systematically as possible and additional information on working populations was requested from companies. These processes are discussed in detail below.

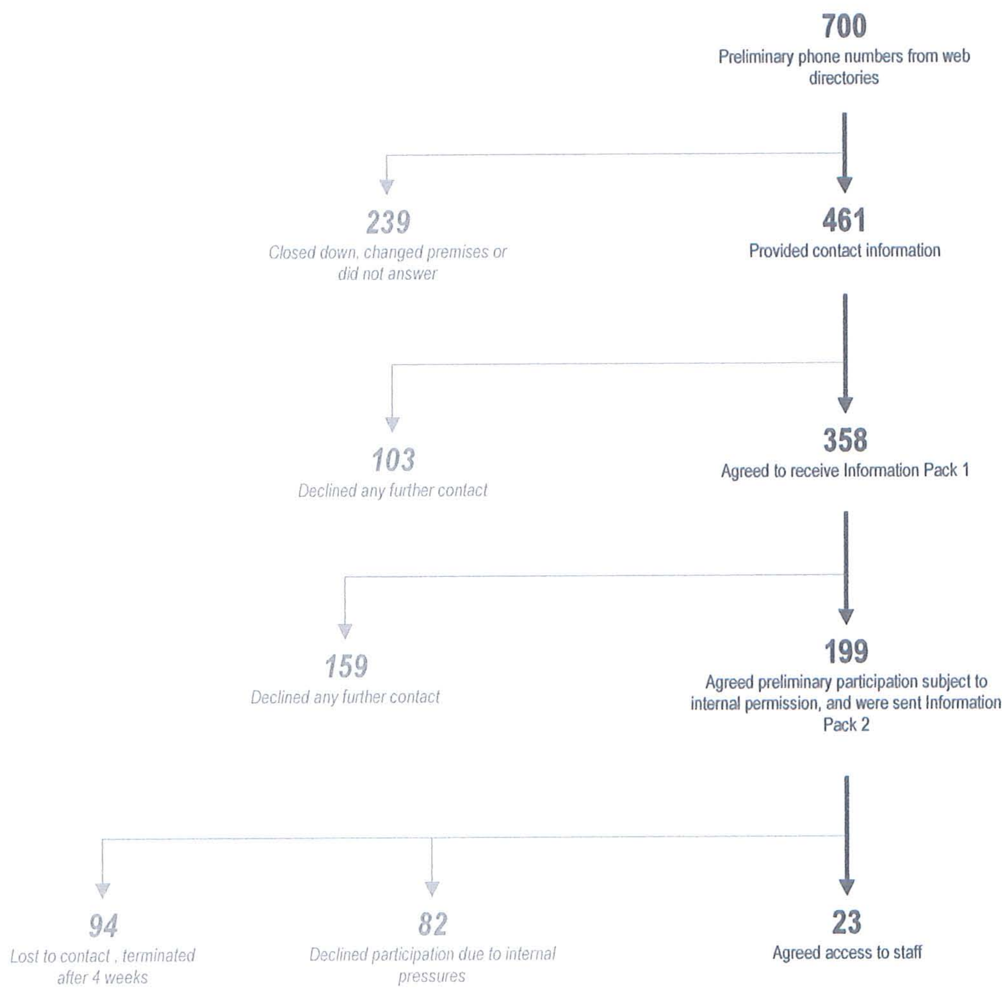
(i) Gauging representativeness of sample: selecting organisations

Organisations were selected from a number of different sources, including telephone directories and web directories. In order to ensure that a representative sample of manual labour was included, access was gained to a local governmental website (www.glasgow gov.uk), and manual companies were identified from this. On the whole, contact details for non-manual companies were easier to access via mainstream web directories such as the Yellow Pages and Thomson Directory. 700 potential companies were identified for contact: 350 whose workforce was considered to comprise predominantly manual workers, and 350 whose workforce was considered to comprise predominantly non-manual workers.

First contact was made by the researcher telephoning to request the name of the individual who would be responsible for giving access to staff. This varied between organisations, from HR or personnel managers, to occupational health physicians, to managing directors of firms. Where the postal address was not available for these contacts, this was also requested. Of the 700 organisations contacted, 183 had closed down, had changed premises or did not answer the phone, despite repeated attempts to contact them (see Figure 3.3 below for a summary of the selection process). For a further 56 organizations, the contact phone-numbers indexed in directories were incorrect. Of the remaining 461 organisations, 358 (77.6%) provided information for preliminary mailing of Information Pack 1 (invitation letter, preliminary research information and questionnaire, for details see, Appendix Aiv).

Figure 3.3

Selection of organisations and drop-out information



Within one week of receiving Information Pack 1, all 358 organizations were contacted by telephone to negotiate access to employees. At this stage, 159 organizations declined any further contact, and only 199 agreed to receive Information Pack 2 (Questionnaire and further information; see Appendix Av and Avi) by post or by fax.

The researcher then followed up Information Pack 2 with a phone call, requesting consent to participate, and access to staff. Despite persistent attempts to establish contact, at this point contact with 94 organisations/contacts was lost, which was then abandoned after 4 weeks. A further 82 organisations did not consent to participation. Common reasons for this included reluctance to take part in research of any sort, reluctance to take part in research about pain, supervisor resistance, perceived resistance of workforce, or "inappropriate" timing (for example one organisation announced major job cuts one week after contact was terminated).

In total, therefore, only 23 of the 199 organisations agreed to participate. This represented only 5% of those given at first contact preliminary mailing, 6.4% of those in receipt of Information Pack 1, and 12% of those who received Information Pack 2. Given the low participation rate, it was decided to relax constraints placed on maintaining representativeness of sample across gender, age, socioeconomic and manual/non-manual variables. In short, it was decided that questionnaires should be distributed wherever access was given, provided that power recommendations across industry categories were achieved (see Section 3.1bi). This had obvious implications for response rate and therefore potential attrition bias, and therefore this was examined using an additional questionnaire given to staff. This is described below.

(ii) Gauging representativeness of sample: The "Your Workforce" questionnaire

To gauge the extent to which sample data reflected the each working population within each organisation, questionnaires were sent out to organisational contacts either during or after data collection. Questionnaires were entitled "Your Workforce", and contacts were asked to provide:

- total number of employees in their workforce
- gender distribution of their workforce;
- average age of staff
- a list of job titles with corresponding salary information, and the number of employees that were in that bracket and/or job title.

A copy of this questionnaire can be found in Appendix Avi. Where organisational contacts were unable to provide the above information, they were instructed to forward the questionnaire to someone in the organisation who could.

The response rates to "Your Workforce" were very low despite one written and two phone-call reminders. Only five out of 23 contacts (22%) that were sent supervisor questionnaires returned them with information. Of these, only two provided the information specifically as requested by the questionnaire. Two organisations gave general salary and job title groups but omitted number of staff in each category, and one organisation provided approximate numbers for all entries. Despite problems with these data, some approximations about representative of sample can be made. In general, gender distributions in responders resembled the gender distributions in the entire workforce. In addition, average age provided by organisation contacts fell within the age group in which most responders fell. It would appear therefore that age and gender of responders was representative of the age and gender of the workforce in each organisation.

Where income data were available, proportions of individuals in each income bracket were comparable across responder sample and workforce population, with the exception of one organisation, where the income bracket 10-25K was slightly underrepresented (20.1% in the sample; versus 28.1% in the workforce population), and the income bracket 26-40K was somewhat over represented (73.6% in the sample; versus 50% in the workforce population). It is unclear why this was the case. Job title data and numbers in each job title were available for four out of the five organisations, and this showed that individuals in lower socioeconomic groups were also less likely to respond, despite the fact that these groups were represented in all the four companies.

The information provided by the "Your Workforce" questionnaire, where data was available, suggest that, in general, the demographic characteristics of the current sample were reasonably representative of the demographic characteristics of the organisations they purported to represent.

(d) Procedure of the Final Study

(i) Distributing questionnaires

In total, 7800 questionnaires were distributed to 23 companies. The Pilot Study showed that in order to maximise the response rate, questionnaires should be given out by hand, with a researcher introducing the study in person. This method of distribution was pursued with all companies at first contact, however, it became clear as time went on that this method of distribution was not always possible. In addition to the impracticalities of this procedure in some workplaces, it was also clear that forcing supervisors to allow access to staff in person would not only limit the size of the sample to those available at any given time, but may also have contributed to the low participation rate at first contact. As such, the decision was taken to offer adjust the method of distribution to where requested. Distribution was therefore done in one of three ways:

- questionnaire delivered by hand, in person by the researcher;
- questionnaire delivered by hand, in person by the supervisor, team leader or occupational health specialist;
- questionnaires delivered by post (either internal or external).

This alteration of design was tolerated in view of the possibility that forcing companies to distribute in a particular way might have affected the company participation rate. All methods of distribution for each company were recorded for future analysis should it be required (see Tables 3.5a and 3.6).

Table 3.5
Methods of questionnaire distribution and response rates

	(a) Distributing questionnaires			*(b) Responses*	
Method of distribution	*No. of companies*	*No. distributed*	*% Total sample*	*No. responses*	*Response rate*
By hand	4	1620	20.8	541	33.4%
Posted to supervisor	7	650	8.3	131	20.2%
Internal mail	5	2075	26.6	505	24.3%
Internal mail via pay-slips	4	2235	28.6	490	21.9%
Via occupational health	3	870	11.2	158	18.2%
Posted to home address	1	350	4.5	63	18%

Table 3.6 overleaf shows the distribution of questionnaires to companies, and their categorisation into industry types. Response rates are also given in Table 3.6, and are discussed in more detail below.

Table 3.6
Distributing questionnaires and response rates

	Banks & Financial Services (BFS)				Computer Industry (CI)					Emergency Service (ES)			Food Production & Distribution (FPD)			
	Financial & Insurance Services	Bank 1	Bank 2	Total	Software manufacturer & printer	Soft- & hard-ware manufacturer & retailer 1	Soft- & hard-ware manufacturer & retailer 2	Soft- & hard-ware manufacturer & retailer 3	Total	Fire Service (a)	Fire Service (b)	Total	Food wholesaler & supplier	Brewery	Bakery	Total
No. given out	500	15	200	715	250	40	740	805	1835	70	350	490	60	175	780	1015
Distribution*	c	b	a	-	c	b	a	d	-	e	f	-	b	c	d	-
No. returned	136	8	33	177	48	2	228	210	488	14	63	91	2	18	60	80
Response rate	27.2%	53.3%	16.5%	24.8%	19.2%	5%	30.8%	26.1%	26.6%	20%	18%	18.6%	3.3%	10.3%	7.7%	7.9%

	Higher Education (HE)			Heavy Industry Production & Research (HIPR)					Health Services (HS)			Local Govt	Media	Pharmaceutical Production & Research (PPR)		
	University	HE College	Total	Machinery component manufacturer	Aircraft & defence manufacturer 1	Aircraft & defence manufacturer 2	Aircraft & defence manufacturer 3	Total	Call centre 1	Call centre 2	Total	Local Council	TV, Radio and multimedia service	Pharmaceutical research & manufacturer 1	Pharmaceutical research & manufacturer 1	Total
No. given out	330	150	480	70	300	100	500	970	15	400	415	250	350	1050	300	1350
Distribution*	a	b	-	b	e	c	e	-	b	d	-	d	a	c	b	-
No. returned	156	2	158	32	32	22	112	198	13	95	108	125	124	281	72	353
Response rate	47.3%	1.3%	32.9%	45.7%	10.7%	22%	22.4%	20.4 %	86.7%	23.8%	26%	50%	35.4%	26.8%	24%	26.1%

*a = by hand; b = posted to supervisor; c = internal mail; d = internal mail via payslips; e = via occupational health; f = posted to home address

3.4 Aspects of the data and data analyses

(a) Response rates

Response rates for the current study fell within the range elicited by the pilot study (12-56%). Power calculations recommended at least 131 in each industry category (see Section 3.1bi). Table 3.6 shows that all ten categories met with these criteria, and most comprised substantially more.

Despite power calculations, in comparison to other epidemiological studies in this area, response rates in the current study were very low (23%). As response rates varied considerably in relation to the different organisations approached (see Table 3.5), an attempt to increase representativeness of sample (and "improve the overall response rate") was explored. One way to do this was to exclude companies where response rates were low (see Table 3.7 below). As can be seen, excluding companies where the response rate was less than 10% increased the overall response rate by only 4%. Further adjustments were, therefore explored, where all companies with a response rate of less than 25% were excluded, resulting in an overall response rate of 32%. Given that this was only marginally better than the response rate before adjustment (9%), and that this resulted in the exclusion of eleven companies and three industry categories, it was decided that analyses would be done on the analysis of raw data. This was to ensure that a wide variety of jobs were represented in the overall sample. This decision has obvious implications for the representativeness of the data, and this issue is acknowledged in detail in Section 5.5.

(b) Distribution of data

(i) Normality analyses of pain experience data (GPQ scores and sub-scores)

Continuous data for the pain group were shown to be highly negatively skewed (see Table 3.7 and Figure 3.4 below). This was seen to be the case for large groups (GPQ scores) as well as subgroups (Pain/no pain; GPQ sub-scores; and across demographic groups).

Transformations were carried out in an attempt to normalise data (see Table 3.7), however these were not adequately successful. This prevented the use of parametric statistics being used on these scores, and prevented these variables from being used as outcome variables for multiple regression analysis (Field, 2001; Tabachnick & Fidell, 2001). To enable use in logistic regression, GPQ scores and sub-scores were therefore dichotomised.

Table 3.7
Adjustments for response rate

		No. of responders	Overall response rate
Raw response rates - all companies included	No excluded companies *No excluded categories*		23%
(a) Excluding all companies where the response rate was less than 10%	Excluded companies: Soft- & hard-ware manufacturer & retailer 1; Food wholesaler & supplier; Bakery; HE College *No excluded categories*		27% (+ 4%)
(b) Excluding all companies where the response rate was less than 25%	Excluded companies - All in (a), plus: Bank 2; Software manufacturer & printer; Fire Service(a); Fire Service(b); Brewery; Aircraft & defence manufacturer 1; Aircraft & defence manufacturer 2; Aircraft & defence manufacturer 3; Call centre 1; Call centre 2; Pharmaceutical research & manufacturer 2 *Excluded categories:* *Emergency Services;* *Food Production & Distribution;* *Health Services*		32% (+ 9%)

(ii) Dichotomising GPQ scores and sub-scores

Three potential ways for dichotomising GPQ scores and sub-scores were explored. Firstly, for any score other than zero (that is agreement with one or more items) to be seen as a "case" of pain experience, and all zero scores (that is disagreement with all items) to be taken as "controls". In this case the scores would be dichotomised between those who commented on pain, and those who did not. Table 3.8 and Figure 3.2 below shows that this split the scores for Ability to Cope, Emotion and Impact reasonably evenly, but not so evenly for Frequency and Intensity scores.

GPQ scores and sub-scores were dichotomised around the median value (see Table 3.8). This meant that all values above the median were taken as a "case" of a higher score for that aspect, for example, all values above the frequency median score were taken as "higher frequency" scores. All values below the median *plus all zero scores* were therefore taken as the "control" group. In terms of questionnaire weightings (see Figure 3.1 above), dichotomising scores around medians made theoretical sense, as it distinguished between:

- rare/occasional pain and frequent/constant pain;
- mild/moderate pain and more intense pain;
- some difficulties with coping and unbearable pain;
- some upset from pain and more serious upset; and
- routine disruption from more serious disruption.

Although dichotomisation at the medians also reduced the proportion of "cases" to comparisons considerably, given the GPQ item weightings, this was considered to be the most meaningful way of dichotomising scores. Moreover, this method of splitting scores provided a measure of distinguishing between what could be seen as "important" or "troublesome" and "unimportant" or "non-troublesome" pain. This distinction will be explored in more detail in the following sections.

Table 3.8

Summary statistics and normality tests for GPQ scores and sub-scores (a) as raw data, (b) after logarithmic transformation, and (c) after square-root transformation

	(a) Total GPQ	Freq.	Int.	Ability to cope	Emotion	Impact	*(b)* Total GPQ	Freq.	Int.	Ability to cope	Emotion	Impact	*(c)* Total GPQ	Freq.	Int.	Ability to cope	Emotion	Impact
Mean	9.76	1.75	1.87	1.64	2.61	1.89	0.87	0.12	0.28	0.34	0.50	0.40	2.97	1.25	1.42	1.52	1.83	1.65
Median	9.08	0.77	1.39	1.48	2.40	1.62	0.96	0.06	0.14	0.35	0.45	0.28	3.03	1.07	1.18	1.49	1.67	1.38
Mode	2.16	0.77	1.39	0.00	0.00	0.00	0.33	-0.11	0.14	0.35	0.38	0.21	1.47	0.88	1.18	1.49	1.55	1.27
Std. Deviation	6.75	1.45	1.41	1.65	2.51	2.10	0.39	0.34	0.19	0.17	0.20	0.23	1.06	0.49	0.36	0.36	0.50	0.49
Variance	45.62	2.10	1.99	2.72	6.31	4.40	0.15	0.12	0.04	0.03	0.04	0.05	1.13	0.24	0.13	0.13	0.25	0.24
Skewness	1.43	1.80	2.06	2.02	1.45	1.49	-1.44	0.07	1.44	1.54	1.43	0.95	0.10	0.71	2.00	2.42	1.67	1.27
Std. Error of Skewness	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.07	0.07	0.07	0.08	0.08	0.08
Range	49.06	10.00	9.44	10.00	10.00	10.00	2.11	1.41	0.83	0.83	0.70	0.79	6.38	2.54	1.89	1.95	1.75	1.89
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	-0.41	-0.41	0.14	0.17	0.30	0.21	0.62	0.62	1.18	1.22	1.41	1.27
Maximum	49.06	10.00	9.44	10.00	10.00	10.00	1.69	1.00	0.98	1.00	1.00	1.00	7.00	3.16	3.07	3.16	3.16	3.16
Kolmogorov-Smirnov	0.12*	0.25*	0.24*	0.23*	0.30*	0.25*	0.13*	0.28*	0.23*	0.29*	0.38*	0.31*	0.16*	0.22*	0.24*	0.32*	0.40*	0.31*

*significant at $p<0.01$

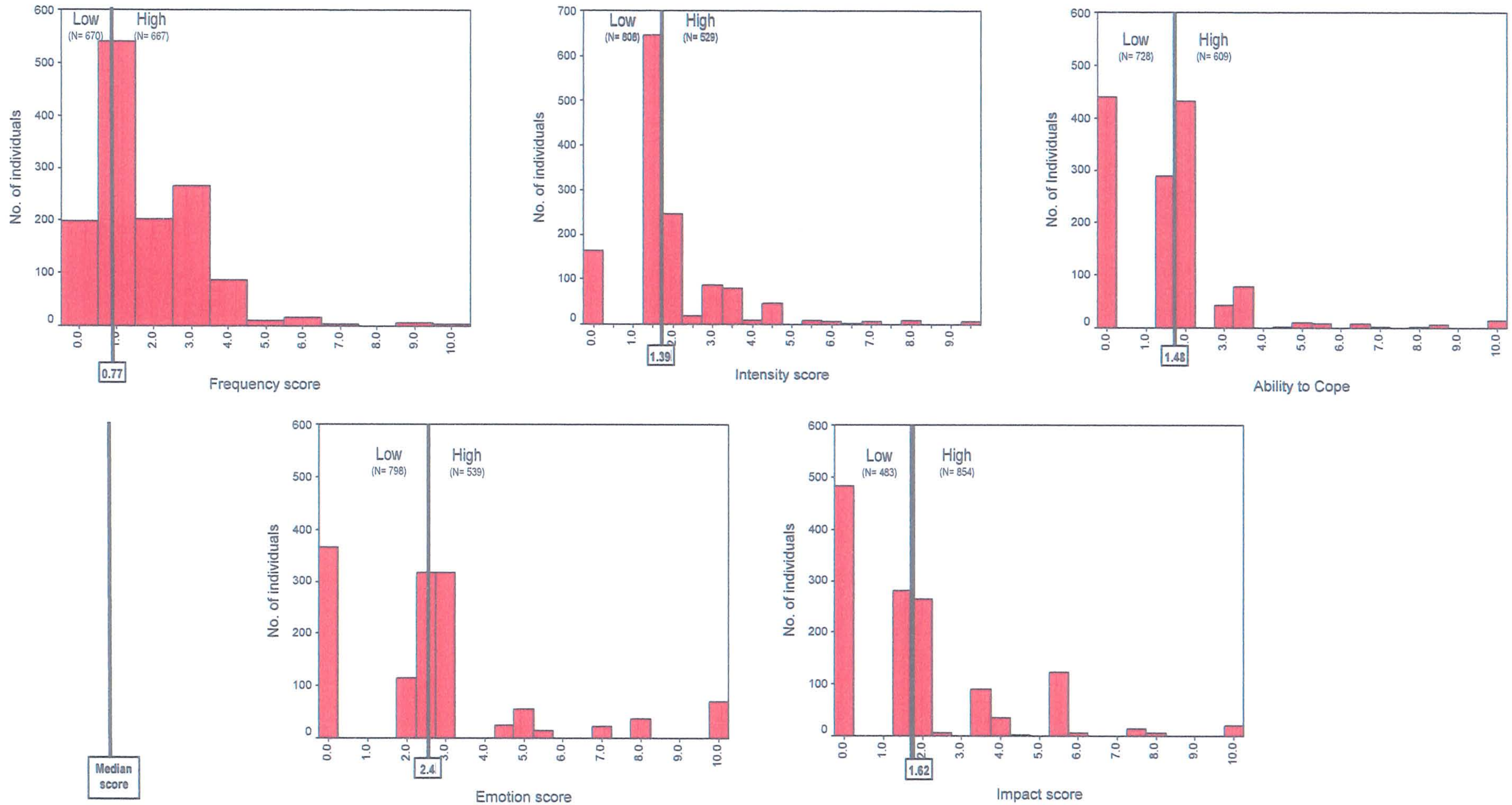
Table 3.9

Frequencies of scores and dichotomisation

	Frequency	Intensity	Ability to cope	Emotion	Impact
Mean	2.86	2.13	2.44	3.60	2.97
Median	2.69	1.39	2.22	2.80	1.89
Mode	2.69	1.39	2.22	2.40	1.62
Range	8.85	8.06	8.52	8.00	8.38
No. of values > median	396	529	609	222	573
All zero values + No. of values< median	1489	1356	1276	1663	1312
Dichotomised "cases" (yes)	*396*	*529*	*609*	*222*	*573*
Dichotomised "controls" (no)	*1489*	*1356*	*1276*	*1663*	*1312*

Figure 3.4

Frequency Distributions of GPQ subscores around medians



(d) Methods of data analysis

(i) Univariate (crude) analysis

In relation to hypotheses 1-14 and exploratory hypotheses 1-9, odds ratios and their confidence intervals were calculated. In addition chi-square analyses were carried out to test for differences across categories.

Crude analyses were as follows:

- Firstly, comparisons were carried out to assess the level of association between demographic factors, work variables and the outcome variable of pain prevalence (Pain versus No pain; see Section 4.3).
- Secondly, comparisons were carried out to assess the level of association between dichotomous pain experience variables and actions taken in response to pain. This was done for the five GPQ sub-scores (Frequency, Intensity, Ability to Cope, Emotion and Impact). Total GPQ score represented a composite score of all sub-scores and therefore was not analysed separately in this section. Two sets of analyses were carried out, entering the five GPQ sub-scores as covariates and using following pain response variables as outcomes: Likelihood of acting on pain (Yes versus No); and Likelihood of consulting for pain (Yes versus No). The purpose of these analyses was to test the extent to which pain experience covariates were related to acting on pain, and the extent to which pain experience covariates were related to consulting for pain (see Section 4.5).
- Thirdly, the level of association between individual variables and the pain experience was assessed, using the pain experience variables as *outcomes*: High GPQ versus Low GPQ for Total GPQ scores; and High versus Low sub-scores for each of the five aspects of pain experience (Frequency, Intensity, Ability to Cope, Emotion and Impact). Inclusion of Total GPQ scores was possible in this analysis, as although they were composite score of the five sub-scores, they could be seen as an outcome variable demoting overall pain experience. Two sets of pain experience analyses were carried out: the first relating to potential associations between pain site, pain cause and all six pain experience outcomes; and the second relating to potential

associations between demographic factors, work variables and all six pain experience outcomes (see Section 4.4).

- Finally the level of association between individual variables and the outcome of pain response was assessed, using the following pain response variables as outcomes: Likelihood of acting on pain (Yes versus No); and Likelihood of consulting for pain (Yes versus No). Details of these variables can be founds in Table 3.5c below. Again, two sets of pain experience analyses were carried out: the first relating to potential associations between pain site, pain cause and both pain response outcomes; and the second relating to potential associations between demographic factors, work variables and both pain response outcomes (see Section 4.5).

Where more than two categories of pain site, pain cause, demographic or work variables were to be compared across any outcome, the group considered to be at 'highest risk' or 'most negative' was taken as the referent group (for example 'SEG V' for socioeconomic group; or 'Very Stressful' for perceived stress of workload).

Where categories were nominal, and no ordinal assumptions could be assumed, the group considered to be at 'highest risk' or 'most exposed' in relation to the literature (where possible) was also taken as the referent group (for example, for industry type, the indicator was 'Heavy Industry Production & Research'; and for 'full-time/part-time', the indicator was 'full-time'). Details of all referent groups for each variable are stated clearly throughout the Tables in the Results (Section 4).

(ii) Multivariate analysis

Multivariate analyses are summarised in Figure 3.5 below. Logistic regression was used for adjustment, and the exact methods applied differed in relation to the particular research question being asked. This process was informed, where possible, by the literature reviewed in Section 2.

Where the nature of associations between variables and an outcome was explored by (or was regularly carried out in) previous studies, the forced entry regression method was used to confirm rather than to explore relationships. This was the case for the model assessing the associations between and pain prevalence, where the association between gender and age on the prevalence outcome were entered first (Block 1 of the regression model), and the other demographic and work variables were added (Block 2 of the regression model) afterwards (see Table 3.5a).

Similarly, forced entry regression analysis was used to adjust associations between pain site, pain cause and pain experience (Table 3.b), as well as associations between pain site, pain cause and pain response (see Table 3c). Sixteen separate models were tested: six testing pain site in relation each of the six pain experience outcomes; six testing pain cause in relation each of the six pain experience outcomes; two testing pain site in relation each of the two pain response outcomes; and two testing pain cause in relation each of the two pain response outcomes (see Table 3.b and 3.c below). In all sixteen of these models gender and age were forced in as confounders. This was done to control for potential gender differences in pain site (for example, abdominal or menstrual pain) as well as potential age-related differences in pain causes (for example arthritic pain).

Forced entry regression analyses was also used to test associations between dichotomous pain experience variables in relation to both pain response outcomes. This was done in relation to the five GPQ sub-scores (Frequency, Intensity, Ability to Cope, Emotion and Impact) only.

Given the exploratory nature of the regression analysis where the likelihood of a pain experience in relation to demographic factors and work variables was being tested, a stepwise regression method was used. On the recommendation of Field (2001) the backward stepwise method was used in this case. Six separate models were constructed, one using each of the five dichotomised GPQ sub-score variables (Frequency, Intensity, Ability to Cope, Emotion and Impact) as outcomes, and one using dichotomised Total GPQ score as the outcome. Only variables that were crudely associated with the outcomes at the significance level of $p<0.1$ and below were included in these regression models (Tabachnick & Fidell, 2001).

Similarly, as the likelihood of a response to general aches and pains in relation to demographic factors and work variables was essentially exploratory, a stepwise regression method was used, and again, the backward stepwise method was deemed to be preferable (Field, 2001). Two separate models were constructed, one using each of the pain response variables (Acting on pain yes/no; and Consulting for pain yes/no) as the outcomes (for details see Figure 3.5). Again, only variables that were crudely associated with the outcomes at the significance level of $p<0.1$ and below were included in these regression models (Tabachnick & Fidell, 2001).

Diagnostics for *all* regression models were carried out, and the Hosmer & Lesmahow Test of Goodness of Fit are reported in the text of the Results (Section 4). In addition, correlation matrices for each model (and each final step in stepwise analyses) were checked for collinearity, and descriptive analyses of each model (and each final step in stepwise analyses) ensured that all residual scores fell with ranges recommended by Field (2001). Results for residual diagnostics were only reported if there were any particular problems.

For stepwise analyses, the results of the final step were taken to be significant, and odds ratios for all variables removed from analyses will be reported as they were at the point of their removal, with corresponding Nagelkerke R^2 values. In some cases SPSS reported odds ratios with confidence intervals that just included or were very close to '1.0'. Where this occurred, confidence intervals were extended in text to three decimal places for illustration, and corresponding associations were reported as trends.

Figure 3.5
Multivariate analyses

Outcome variable and values	*Tests and diagnostics for assumptions*
(a) <u>Demographic and work variables into pain prevalence outcomes</u> Yes = pain; No = no pain	Forced-entry logistic regression: Gender and chronic condition in the first step. Age was not treated as a confounder in this analysis as its effect failed to reach significance in univariate analysis (see Section 4.3). All work influences of alpha level 0.1 and above in the univariate analyses (industry, full-time contract, stress, ability to cope with workload, desire to continue) added in second step.
(b) <u>Pain site and pain cause into pain experience outcomes</u> Outcomes: All six dichotomised GPQ scores and subs-scores (Total GPQ score, Frequency, Intensity, Ability to Cope, Emotion and Impact). Yes = scores higher than the median; No= scores less than the median.	Forced-entry logistic regression (12 models) including the following covariates: *<u>Models 1- 6</u>* Pain site, plus gender and age as confounders *<u>Models 7-12</u>* Pain cause, plus gender and age as confounders
(c) <u>Pain site and pain cause pain response outcomes</u> 2 new variables to create dichotomous outcomes: *<u>Likelihood of acting on pain</u>* Yes = all consulters and all self-medicators (see below) No = all individuals who did not act on their pain *<u>Likelihood of consulting for pain</u>* Yes = all consulters *("saw doctor or dentist"; "saw nurse/health visitor"; "saw another health professional"; "asked a pharmacist for advice")* No = all self-medicators *("used a prescription medicine that was already in the house"; "bought a medicine you can buy without a prescription"; "used a medicine you can buy that was already in the house"; "used a home remedy")*	Forced-entry logistic regression (4 models) including the following covariates: *<u>Models 1 and 2</u>* All five pain dichotomous pain experience variables into "Likelihood of acting pain" *<u>Model 3 and 4</u>* All five pain dichotomous pain experience variables into "Likelihood of consulting for pain"
(d) <u>Demographic and work variables into pain experience outcomes</u> Outcomes as in (b) above.	Stepwise backward logistic regression (comparing log-likelihood ratios). All demographic work influences of alpha level 0.1 and above on each pain experience score in the univariate analyses (see Section 4.4).
(e) <u>Demographic and work variables into pain response outcomes</u> Outcomes as in (c) above.	Stepwise backward logistic regression (comparing log-likelihood ratios) All demographic work influences of alpha level 0.1 and above on each pain response score in the univariate analyses (see Table 4.5).

4. Results

4.1 Reliability and validity of Work Items

(a) Internal consistency

Current work items showed reasonable internal consistency, as illustrated by a Spearman's correlation matrix of all continuous and ordinal work items in the entire original dataset (individuals with and without pain) (see Table 4.1 below). There was substantial agreement between the majority of measures of physical load and manual labour (see Table 4.1). High manual component correlated with:

- low skilled component (-0.52, $p<0.00$);
- low professional component (-0.58, $p<0.00$); and
- high mental workload (0.070, $p<0.00$).

High level of skilled component correlated with high professional component scores (0.72, $p<0.00$) and high mental workload (0.43, $p<0.00$). There was also a relationship between professional component and physicality (0.45, $p<0.00$).

Reasonable consistency was also noted between measures of:

- working conditions (more shift-work by less conventional hours, -0.62, $p<0.00$);
- job control (organisation of own tasks with working on own all of the time -0.22, $p<0.00$; high control over breaks and organisation of own tasks, 0.40, $p<0.00$; and working on own all of the time with control over breaks -0.22, $p<0.00$);
- low stress with low demands (0.46, $p<0.00$)

Some *non*-correlations are also worthy of note. Economic circumstances (SEG and Carstairs scores: 0.08; $p<0.02$; income and Carstairs score: -0.09; $p<0.01$) but remember this was only half of the scores. Even where comparisons were done for only those providing postcodes these correlation co-efficients remained significant, but not powerful (SEG and Carstairs scores: 0.08; $p<0.02$; income and Carstairs score: -0.09; $p<0.01$). Given the high correlation between current measures of SEG and income (-0.84; $p<0.00$), as well as the low responses rate for this item (42% of the total sample), clearly there were problems with the representation of the different levels of the Carstairs Index. Post-hoc tests of concurrent validity and test-retest reliability were also carried out on a sub-sample of the final data, and these are reported below.

(b) Concurrent validity and test-retest reliability

Questionnaire reliability and external validity were examined post-hoc on a small cohort of individuals working in a Higher Education Institution at two intervals. This was done post-hoc several months after data collection, therefore these data were not included in the final dataset. An email inviting participation was sent to all staff at Queen Margaret University College (N=400) to which 42 participants responded and agreed to receive the Pain in the Workplace Questionnaire, and Karasek's Job Content Questionnaire (JCQ; Karasek, 1985) by internal mail. These questionnaires were sent to the same 42 individuals at Time 1, and at Time 2 (two weeks later). After two email reminders, 38 questionnaires were returned at Time 1 (90.5%), and 32 questionnaires were returned at Time 2 (76%). Subsequent analyses are discussed below.

(i) Test-retest reliability

Test-retest reliability was calculated by pairing responses at Time 1 and Time 2 by post-code. As recommended by Bland and Altman (1986) an independent samples t-test was used to assess the level of difference between scores at Time 1 and Time 2. No significant differences were found between Time 1 and Time 2 for any of the work items, indicating good level of repeatability for the Pain in the Workplace (PWQ) scale (see Appendix X for all scores).

(ii) Convergent validity

Table 4.2 below summarises the Spearman's correlation matrix between work items in the Pain in the Workplace Questionnaire (PWQ) and Job Content Questionnaire (JCQ). The extent to which an individual organised their own tasks correlated with JCQ Decision Authority (0.37, $p<0.01$), therefore the current measure of "organising own tasks" can be seen as a valid approximation of authority over workload. Similarly, the correlation between psychological demands (JCQ) and the current measure of extent to which individuals felt they were able to cope with their workload ("Easy/Difficult to cope") suggests that both of these measures were accessing similar constructs.

Table 4.1

Correlation matrix of work items in original dataset including all individuals (with and without pain); **p<0.01; *p<0.05; co-efficients are significant and >0.4

	Carstairs score	Manual Component	Skilled component	Professional Component	Income	Hours/day	Hours/week	Shift-work	Conventional hours	Organise own tasks	Computer use	Physical/mental workload	Stress	Easy/Difficult to cope	Autonomy/Teamwork	Job enjoyment	Control of breaks	Regularity of breaks	Length of breaks
SEG	0.08**	**-0.41*** **	**-0.52*** **	**-0.58*** **	**-0.86*** **	-0.36***	**-0.43*** **	0.30***	-0.22***	-0.27***	-0.17***	**-0.40*** **	0.20***	0.20***	0.08***	-0.12***	**-0.49*** **	-0.2***	0.10***
Carstairs score		-0.09**	-0.06	-0.05	-0.09**	-0.02	0.02	0.14***	-0.11***	-0.07**	-0.05	-0.08**	0.02	0.02	-0.04	-0.08**	-0.08**	0.00	0.09**
Manual Component			**0.45*** **	**0.44*** **	**0.43*** **	0.06***	0.08***	**-0.44*** **	**0.42*** **	0.30***	**0.46*** **	**0.70*** **	-0.11***	-0.13***	-0.14***	0.11***	**0.40*** **	0.23***	-0.15***
Skilled component				**0.72*** **	**0.50*** **	0.18***	0.21***	-0.27***	0.25***	0.25***	0.19***	**0.43*** **	-0.14***	-0.16***	-0.03	0.14***	**0.42*** **	0.25***	-0.10***
Professional Component					**0.55*** **	0.24***	0.27***	-0.31***	0.27***	0.29***	0.23***	**0.45*** **	-0.16***	-0.18***	-0.03	0.17***	**0.43*** **	0.30***	-0.11***
Income						**0.43*** **	**0.52*** **	-0.26***	0.19***	0.28***	0.22***	**0.43*** **	-0.21***	-0.18***	-0.07***	0.11***	**0.49*** **	0.33***	-0.13***
Hours/day							**0.79*** **	0.13***	-0.16***	0.04	0.02	0.08***	-0.20***	-0.15***	0.03	0.06**	0.18***	0.25***	-0.07***
Hours/week								0.05**	-0.12***	0.10***	0.04	0.11***	-0.20***	-0.15***	-0.01	0.09***	0.26***	0.25***	-0.08***
Shift-work									**-0.62*** **	-0.37***	-0.31***	**-0.42*** **	0.10***	0.12***	0.28***	-0.10***	-0.45***	-0.03	0.16***
Conventional hours										0.25***	0.34***	**0.40*** **	-0.04	-0.08***	-0.14***	0.08***	0.33***	0.01	-0.08***
Organisation of own tasks											0.25***	0.28***	-0.09***	-0.05**	-0.22***	0.15***	**0.40*** **	0.15***	-0.13***
Do you use a computer?												**0.48*** **	-0.11***	-0.08***	-0.12***	0.04	0.28***	0.12***	-0.15***
Physical component													-0.13***	-0.15***	-0.12***	0.10***	**0.41*** **	0.19***	-0.16***
Stress														**0.46*** **	0.03***	0.19***	-0.09***	-0.24***	0.15***
Easy/Difficult to cope															0.10***	0.20***	-0.11***	-0.15***	0.12***
Autonomy/Teamwork																0.05**	-0.22***	-0.06**	0.09***
Job enjoyment																	0.20***	0.07***	-0.01
Control of breaks																		0.32***	-0.12***
Regularity of breaks																			-0.20***

"Control of breaks" (PWQ) correlated with Skill Discretion scores (JCQ); as well as Decision Latitude (JCQ) (see Table 4.1) suggesting that this measure was a reasonable analogue of control over workload. Finally, although the autonomy/teamwork item was originally intended as an indicator of authority over workload, the correlation between "autonomy/teamwork" scores and Co-worker support (JCQ) scores suggests that this item may be a better measure of the contribution of others to the workload. As such, any effects of "autonomy/teamwork" scores will be interpreted accordingly.

One area of concern in these analyses related to findings for perceptions of physical versus psychological workload. As would be expected, perceptions of the manual component of individual workload in the current study were negatively correlated with physical demands (-0.34; $p<0.01$). Manual component was a negatively worded item, thus a "high" manual score referred to a job that was seen as highly *non*-manual. Therefore, when a job was highly non-manual, physical demands were low. Taken in isolation, this would suggest that the current measure is a reasonable indicator of manual load. However, analyses also showed a negative correlation between psychological job demands (JCQ) and perceptions of manual workload (-0.36, $p<0.01$). The psychological demands (JCQ) item appeared to be a reasonably valid measure, as it correlates well with the current measure of "ability to cope" with workload (0.44, $p<0.01$). In addition, there was a high degree of agreement between perceptions of manual workload and perceived physicality of workload within the original sample (0.7; $p<0.01$, see above) suggesting that both of these Pain in the Workplace items were accessing a similar construct. However, it is unclear whether this was the same notion of "physicality" as that accessed by the JCQ. Internal consistency for these two measures in the post–hoc sample was significant, but less convincing (0.43; $p<0.01$). It may be therefore, that the negative correlations given in Table 4.2 are confined to the post-hoc sample. The distribution of labour-types in the post-hoc sample was somewhat less heterogeneous than in the full study sample, and it is possible that the lack of individuals reporting a manual component to their job (less than 5% of the post-hoc sample) or a mostly physical workload (less than 2% of the post-hoc sample) skewed the results. Without JCQ data for the whole sample, it is impossible to infer the concurrent validity of perceptions of physical versus psychological workload; therefore, it is important to treat any findings relating to these variables ("Manual Component"; "Physical Component") with necessary caution.

Table 4.2

Spearman's correlation matrix between current work measures (Pain in the Workplace Questionnaire) and Karasek's Job Content Questionnaire (JCQ)

	JCQ measures							
Current work items	Skill Discretion	Decision Authority	Decision Latitude	Psychological Job Demands	Supervisor Support	Co-worker Support	Physical Job Demands	Job Insecurity
Manual/Non-manual	0.24**	0.03	0.19	**-0.36*****	-0.10	-0.04	**-0.34*****	-0.20
Skilled/Unskilled	0.24**	0.17	0.18	-0.13	-0.05	-0.16	-0.01	-0.01
Professional/Unprofessional	0.28**	0.18	0.29***	-0.02	-0.07	-0.09	-0.18	-0.07
Organise own tasks	0.19	**0.37*****	0.30***	0.21	-0.13	0.19	0.14	0.09
Computer use	0.04	0.08	0.10	0.14	0.00	0.15	-0.18	0.08
Physical component	0.19	-0.08	0.11	-0.11	0.10	0.22	**-0.36*****	**-0.33*****
Stress	-0.15	-0.07	-0.13	0.13	-0.04	-0.19	-0.14	0.02
Easy/Difficult to cope	-0.03	0.03	0.03	**0.44*****	0.17	-0.09	-0.16	0.17
Autonomy/Teamwork	-0.05	-0.05	-0.02	-0.07	0.10	**0.34*****	-0.06	-0.07
Job enjoyment	-0.03	0.16	0.02	0.18	0.11	0.10	0.16	0.06
Control of breaks	**0.34*****	0.09	**0.33*****	0.15	0.10	0.17	-0.10	0.20
Regularity of breaks	-0.04	-0.00	-0.04	0.04	0.17	0.17	0.06	-0.05
Length of breaks	-0.01	0.14	0.06	0.07	-0.27***	-0.16	-0.11	-0.00

**p<0.05; ***p<0.01

Another area of concern is that although many of these correlations are significant, none of them are substantially "powerful". It is recommended that correlation co-efficients should fall between 0.4 and 0.7 in order to be "powerful" (Tabachnick & Fidell, 2000). Only one of the correlation co-efficients given in Table 4.2 falls within this range, and the majority barely reach this level of power. Therefore although the relationships exist, the extent to which an actual relationship can be inferred is unclear.

Finally, it is important to note the *lack* of relationships between some measures. In some cases this throws some doubt on the PWQ work items. One might have expected a more powerful relationship between Skilled component (PWQ) and Skill Discretion (JCQ) for example. However, Skill Discretion (JCQ) can be said to measure the extent to which an individual's skills are used in their job, as opposed to the extent to which skills are required (Skilled component in PWQ). Similarly, one might have expected Professional Component (PWQ) to have correlated more with

JCQ measures of Skill Discretion, Decision Authority, and/or Decision Latitude. Again this could be explained by a difference in perceived job requirements (PWQ) versus the extent to which professional attributes are actualised within a position (JCQ).

From the data in Table 4.2, it can be concluded that, allowing for the strength of some relationships, there is a reasonable level of concurrent validity between the PWQ and the JCQ.

4.2 Final study sample characteristics

(a) Demographic characteristics of the final study sample

It was inappropriate to combine the post-hoc data with the original dataset, as the original data collection took place between 1999 and 2001, whereas post-hoc data collection took place in 2005. All data discussed from this point onwards will therefore relate to the original dataset.

Figure 4.1
Respondent sample by demographic groups

								Missing
Whole sample	1885							
Gender	Male: 931	Female: 952						2
Age	16-25: 290	26-35: 619	36-45: 598	46-55: 361	Over 55: 98			19
SEG	I: 684	II: 482	IIIN: 327	IIIM: 205	IV: 167	V: 20		0
Carstairs score	1: 63	2: 116	3: 134	4: 203	5: 141	6: 84	7: 41	1103
Married/ cohabiting?	Yes: 1322	No: 561						2
Spouse employment status	Yes: 1315	No: 204	No spouse: 561					7 (+2 from 'Married/ cohabiting?' above)
Children?	Yes: 956	No: 927						2
	1 child: 289	2: 479	3: 150	More than 3: 38				0 (+2 from 'Children?' above)

In general, equal numbers of males and females responded to the questionnaire (49.4% and 50.5% respectively; see Figure 4.1 above). Those aged 26-35 and 36-45 were the most represented age-group, accounting for just under two-thirds of the sample (32.8% and 31.7% respectively). Over one third of the sample were from socioeconomic group I (36.3%). This differed from the distribution of Carstairs scores where the majority of the sample scored deprivation categories three and five (25.8%). However, the extent to which this was representative of the whole sample is questionable, given that 28.7% of all individuals did not provide a postcode, and 29.8% provided a partial or unrecognisable post-code that could not be transposed into a Carstairs score.

Figure 4.1 shows that most individuals were married or cohabiting (70.1%), and the majority of spouses were working (84% of those married or cohabiting). Representation of those with and without children in the sample was almost equal (50.7% and 49.2% respectively). Of those with children, one half had two children (50.1%), and just under one third had one child (30.2%).

(b) Employment characteristics of the whole sample

Individuals working in the Computer Industry or Pharmaceutical production and research were most likely to respond to the questionnaire, together accounting for nearly half of responders (29.1% and 18.8% respectively; see Figure 4.2 below). This reflects the fact that these two industry types were heavily represented in questionnaire distribution (see Table 3.6). The majority of the sample were: in permanent full-time employment (86.6%); earning £10-24 000 per annum (53.2%); and working more than 35 hours every week (80.5%), at conventional hours (47.6%) for eight hours or less (74%) with rarely in shifts (67.8% respectively).

Figure 4.2
Respondent sample by employment groups

Whole sample			1885			
Industry	*Computer industry* 550	*Pharmaceutical production & research* 354	*Banks & Finance* 176	*Higher Education* 147	*Local government & council business* 124	*Missing* 0
	Heavy Industry production & research 138	*Media* 121	*Health services* 118	*Food production & distribution* 82	*Emergency service* 75	
Income	*Under £10 000* 274	*£10 - 24 000* 1002	*£24 - 39 000* 446	*£40 - 54 000* 110	*Over £55 000* 50	*Missing* 3
Hours/day		*8 hrs/day or less* 1394	*More than 8 hrs/day* 487			*Missing* 4
Hours/week	*<20 hrs/wk* 38	*20-34 hrs/wk* 117	*35 hrs/wk* 212	*>35 hrs/wk* 1515		*Missing* 3
Shift-work		*Never* 1278	*Sometimes* 222	*Always* 379		*Missing* 6
Contract Type		*Permanent, Full-time* 1629	*Temporary, Full-time* 112	*(FT/PT)*		*Missing* 5
		Permanent, Part-time 131	*Temporary, Part-time* 120	*(Perm/ temp)*		*Missing* 2
Conventional hours?		*Never* 492	*Sometimes* 493	*Always* 898		*Missing* 3

4.3 Prevalence of general aches and pains

General aches and pains were experienced in the previous month by 70.9% of the sample, and this differed in relation to pain type and perceived pain cause.

(a) Pain type

Thirty-three different pain types were reported, all of which were recoded into eleven grouped pain types (see Figure 4.3a below and Appendix Ci for details of coding). It was hypothesised that pain prevalence would differ in relation to pain type, although the nature of the distribution of this prevalence across pain type was not predicted (H_1). Figure 4.3a below shows that this was the case, with back and head pain being significantly more prevalent than other pain types. Backache and headache accounted for approximately half of all pain reported, with headache being marginally more prevalent than back pain. The third most common pain reported was abdominal pain, followed by joint and neck/shoulder pain, which accounted for 10% of the sample each.

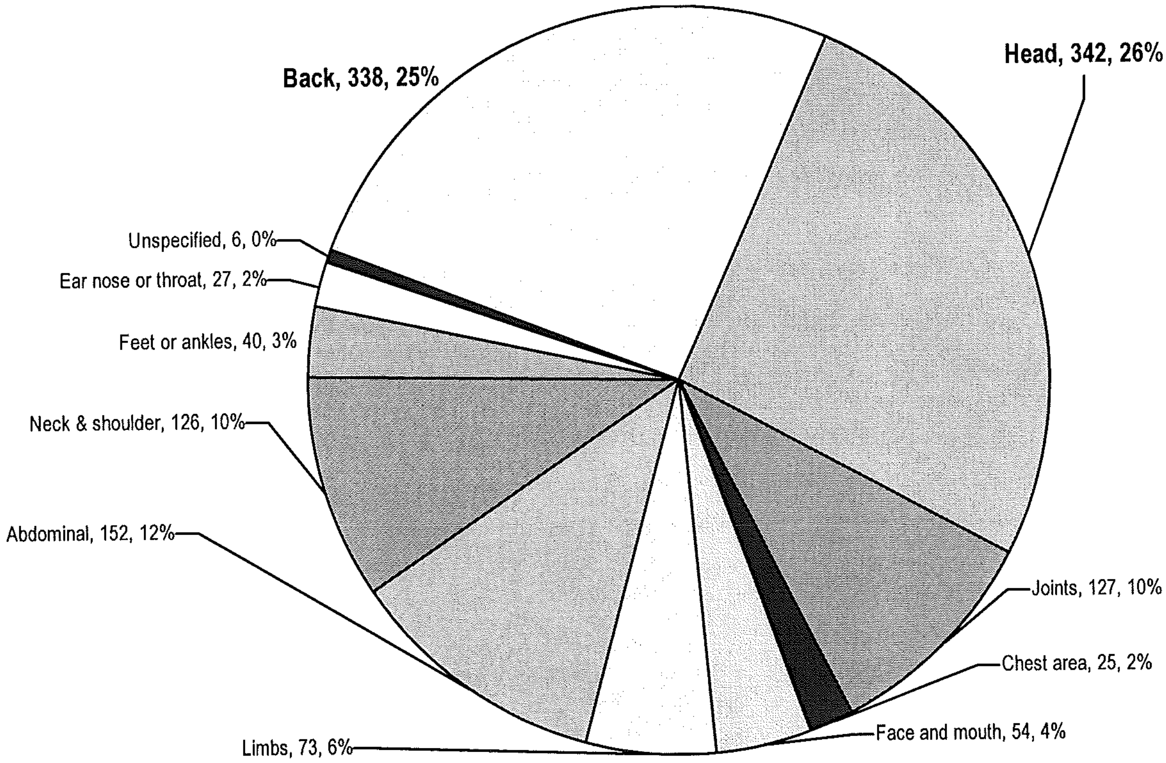
(b) Pain cause

Eighty-one causes for pain were given by respondents, which were recoded into ten cause groupings (see Figure 4.3b, and Appendix Cii for details of coding for these groups). The most common cause given for pain was "unknown", which accounted for 24.4% of reported pain. Recent injury accounted for 15% of pain, followed by short-term medical problems (12%) and life variables[†] (12%). Old injury and long-term medical problems were the least common cause given by responders (2.5% and 2.7% respectively), and a broad category of "pain problems"[‡] accounted for just 9% of the causes given.

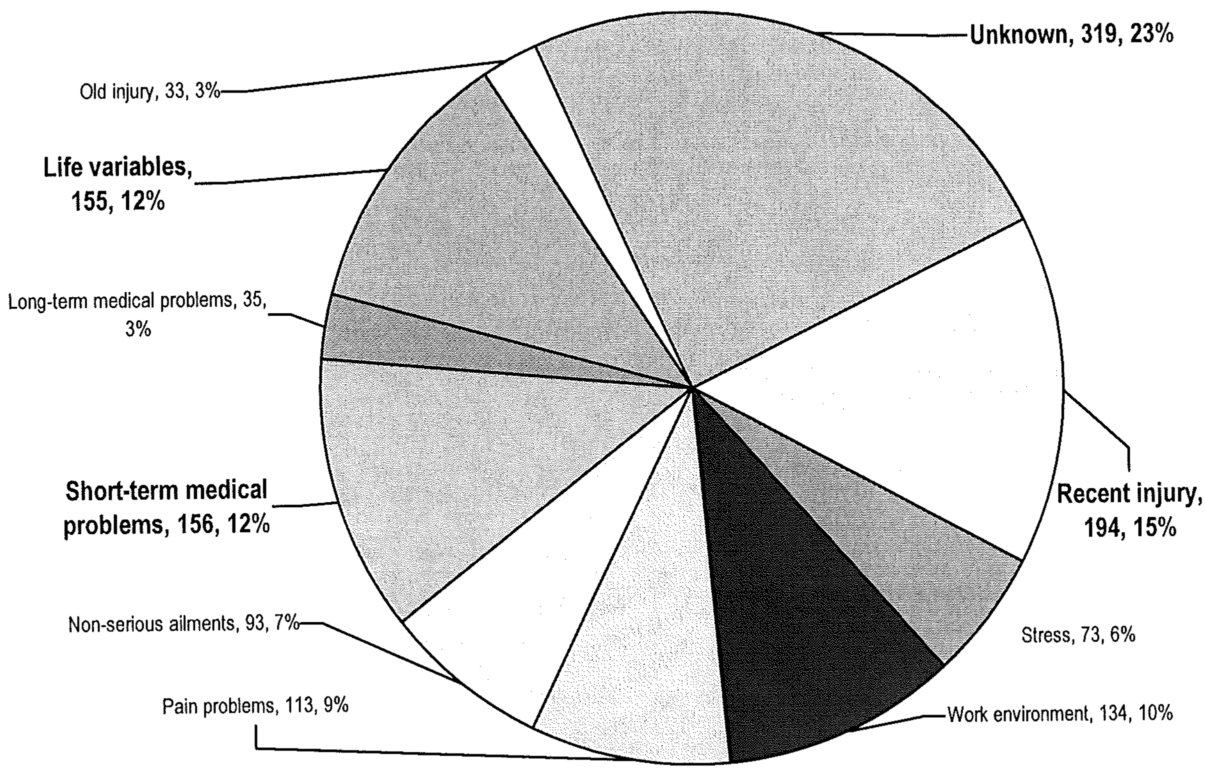
[†] "Life variables" included: Period pain; Fatigue; Exercise; Dehydration; Cold weather; Age; Smoking; Pregnancy; Poor posture; Being overweight; Wear and tear/tiredness (for a full list of all codings for pain cause categories see Appendix B)

[‡] "Pain problems" included: "Spinal problems"; Arthritis; Repetitive Sprain Injury; Spondylosis; Sciatica; Neuralgia; "Tennis elbow"; Multiple Sclerosis; Tendonitis (for a full list of all codings for pain cause categories see Appendix B).

Figure 4.3
Prevalence of general aches and pains
(a) By pain site (n=N; % of all sites)



(b) By pain cause (n=N; % of all causes)



In the following sections, the relationship between demographic variables, work factors and various outcomes (pain prevalence, pain experience and pain response) will be summarised in Tables 4.3 through to Table 4.26. Although regression models included adjustment for all significant demographic and work variables as co-variates (see Methods Section 3.4 and Figure 3.5), the relationship between demographic variables and pain outcomes are given first, and then the relationship between work variables and pain outcomes are given separately for each pain outcome. For reasons of formatting, these Tables do not always appear immediately after they are introduced in the text, and the majority are given in landscape format as close to their introduction as possible.

(c) Prevalence of general aches and pains in relation to psychosocial factors

The unadjusted relationship between demographic factors, work variables and prevalence of general aches and pains was explored using Chi-square comparisons. To reduce the likelihood of a Type I error, a Bonferoni calculation was done. Allowing for nine tests for each demographic variable, the value of P taken to be significant was reduced from 0.05 to 0.006. Using these criteria for significance, Table 4.3 below shows crude odds ratios for demographic variables in relation to prevalence of general aches and pains.

Only gender and presence of a chronic condition were crudely associated with general aches and pains, such that general aches and pains were more prevalent in women (OR 1.4, 95% C.I.1.1-1.7; X^2=10.58 (1) p <0.001), and less prevalent in individuals *without* a chronic condition (OR 0.3, 95%C.I. 0.2-0.4; X^2=53.71 (1) p<0.001).

Table 4.3
Demographic variables and likelihood of reporting general aches and pains given as: (a) Crude ORs and (b) ORs after adjustment using forced entry logistic regression. Adjusted variables that were significant are given in bold. *Reference categories are given in italics.*

		(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adj. OR	[95% C.I.]
Gender	*Men*	*1.0*			*1.0*	
	Women	1.4	[1.1 - 1.7]	10.58*** (1)	**1.3**	****[1.1 -1.7]**
	Aged 16-25	*1.0*				
	26-35	1.0	[0.7 - 1.3]	3.84 (4)		
	36-45	1.3	[0.9 - 1.7]			
	46-55	1.1	[0.8 - 1.5]			
	56-65	1.1	[0.7 - 1.8]			
SEG	*Unskilled*	*1.0*				
	Partly skilled	0.2	[0.1 - 1.0]	5.03 (5)		
	Manual skilled	0.3	[0.1 - 1.2]			
	Non-manual skilled	0.3	[0.1 - 1.2]			
	Managerial & Intermediate	0.3	[0.1 - 1.1]			
	Professional	0.3	[0.1 - 1.2]			
Carstairs score	*Least affluent*	*1.0*				
	6	0.7	[0.3 - 1.6]			
	5	0.9	[0.4 - 1.9]			
	4	0.7	[0.4 - 1.4]			
	3	0.8	[0.4 - 1.7]			
	2	1.0	[0.5 - 2.1]			
	Most affluent	1.2	[0.5 - 2.6]			
	Married/living with partner	*1.0*				
	Single	0.9	[0.7 - 1.1]	1.7 (1)		
	Spouse doesn't work	*1.0*				
	Spouse works	0.9	[0.6 - 1.2]	0.84 (1)		
	More than 3 children	*1.0*				
	3 children	1.0	[0.4 - 2.4]	4.34 (4)		
	2 children	0.7	[0.3 - 1.5]			
	1 child	0.8	[0.4 - 1.8]			
	No children	0.7	[0.3 - 1.6]			
Chronic condition	*Yes*	*1.0*			*1.0*	
	No	0.3	[0.2 - 0.4]	53.71*** (1)	**0.3**	*****[0.2 -0.4]**

**p<0.05; ***p<0.01; Underlined= significant at p<0.006

Table 4.4

Work variables and likelihood of reporting general aches and pains given as: (a) Crude ORs and (b) ORs after adjustment using logistic regression. Adjusted variables that were non-significant are given in italics, and adjusted variables that were significant are given in bold. *Referent categories are given in italics.*

	(a) Crude OR [95% C.I.]	X^2 (df)	(b) Adj. OR	[95% C.I.]
Heavy Industry production & research	*1.0*		*1.0*	
Banks & Financial services	1.5 [0.9-2.4]	16.75*	1.2	[0.7-2.0]
Computer industry	1.2 [0.8-1.8]	(9)	1.2	[0.8-1.8]
Emergency service	1.5 [0.8-2.7]	.053	1.7	[0.9-3.2]
Food production & distribution	1.7 [0.9-3.0]		1.6	[0.9-3.1]
Higher Education	2.5 [1.5-4.3]		**2.3**	*****[1.3-4.2]**
Health services	1.3 [0.8-2.2]		1.1	[0.6-2.0]
Local government & council business	1.8 [1.0-3.0]		1.4	[0.8-2.5]
Pharmaceutical production & research	1.4 [0.9-2.1]		1.3	[0.8-1.9]
Media	1.5 [0.9-2.5]		1.4	[0.8-2.4]
Earning under £10K	*1.0*			
£10 - 24K	0.9 [0.7-1.3]	3.01		
£25 - 39K	0.9 [0.7-1.3]	(4)		
£40 - 54K	1.3 [0.8-2.1]			
Over £55K	0.7 [0.4-1.5]			
Manual	*1.0*			
Manual > Non-manual	0.9[0.5-1.5]	3.99		
Manual = Non-manual	0.8 [0.6-1.3]	(4)		
Manual < Non-manual	1.1 [0.7-1.7]			
Non-manual	0.8 [0.6-1.1]			
Unskilled	1.0			
Unskilled > Skilled	1.5 [0.8-2.6]	2.26		
Unskilled = Skilled	1.2 [0.8-1.9]	(4)		
Unskilled < Skilled	1.1 [0.7-1.6]			
Skilled	1.1 [0.8-1.7]			
Unprofessional	1.0			
Unprofessional > Professional	0.9 [0.6-1.4]	2.51		
Unprofessional = Professional	0.8 [0.6-1.2]	(4)		
Unprofessional < Professional	1.0 [0.7-1.4]			
Professional	0.8 [0.6-1.1]			
8 hours/day and below	1.0			
over 8 hours/day	1.1 [0.9-1.4]	1.18		
		(1)		

	(a) Crude OR [95% C.I.]	X^2 (df)	(b) Adj. OR	[95% C.I.]
35 hours/week	*1.0*			
20-34 hours/week	1.2 [0.8-1.6]	5.55		
under 20 hours/week	1.3 [0.8-2.0]	(3)		
over 35 hours/week	2.3 [1.0-5.5]			
Full-time	*1.0*		*1.0*	
Part-time	1.5 [1.0-2.3]	4.11**	1.5	[0.9-2.4]
		(1)		
Always work shifts	*1.0*	.043		
Sometimes work shifts	0.9 [0.6-1.2]	1.32		
Never work shifts	1.0 [0.8-1.3]	(2)		
Permanent	*1.0*			
Temporary	0.8 [0.5-1.2]	1.12		
		(1)		
Never work conventional hours	*1.0*			
Sometimes conventional hours	1.3 [1.0-1.7]	2.92		
Always conventional hours	1.1 [0.9-1.4]	(2)		
Never organise own task	*1.0*			
Sometimes organise own task	1.1 [0.8-1.7]	1.01		
Always organise own task	1.0 [0.7-1.5]	(2)		
Always use a computer	*1.0*			
Sometimes use a computer	1.0 [0.8-1.2]	0.28		
Never use a computer	0.9 [0.7-1.3]	(2)		
Physical	*1.0*			
Physical > Mental	0.8 [0.4-1.6]	1.4		
Physical = Mental	0.8 [0.4-1.4]	(4)		
Physical < Mental	0.7 [0.4-1.3]			
Mental	0.7 [0.4-1.3]			

	(a) Crude OR [95% C.I.]	X^2 (df)	(b) Adj. OR	[95% C.I.]
Very stressful	*1.0*		*1.0*	
Quite stressful	0.6 [0.4-1.0]	48.81***	**0.6**	****[0.4-1.0]**
Stressful = Easygoing	0.5 [0.3-0.8]	(4)	**0.5**	*****[0.3-0.9]**
Quite easygoing	0.2 [0.1-0.4]	.000	**0.3**	*****[0.2-0.5]**
Very easygoing	0.2 [0.1-0.5]		**0.3**	*****[0.1-0.6]**
Beyond capabilities & Difficult to cope a lot of the time	*1.0*		*1.0*	
Easy to cope = Difficult to cope	0.9 [0.5-1.5]	20.22***	1.3	[0.7-2.3]
Easy to cope a lot of the time	0.6 [0.3-1.0]	(3)	1.0	[0.6-2.0]
Well within capabilities	0.6 [0.3-1.0]		1.0	[0.5-1.8]
Autonomous	*1.0*			
Autonomous > Teamwork	1.0 [0.6-1.7]	4.49		
Autonomous = Teamwork	0.8 [0.5-1.4]	(4)		
Autonomous < Teamwork	1.0 [0.6-1.8]			
Teamwork	1.2 [0.7-2.0]			
Never enjoy work	*1.0*		*1.0*	
Sometimes enjoy work	0.9 [0.6-1.5]	7.97**	1.0	[0.6-1.8]
Always enjoy work	0.7 [0.4-1.1]	(2)	0.9	[0.5-1.6]
		.019		
Job not secure	*1.0*			
Job secure	1.0 [0.8-1.3]	0.001		
		(1)		
No desire to continue in job	*1.0*		*1.0*	
Desire to continue in job	0.8 [0.6-1.0]	3.49*	0.8	[0.6-1.1]
		(1).062		
Others control breaks	*1.0*			
Others control = Own control	1.2 [0.8-1.7]	1.07		
Own control of breaks	1.1 [0.8-1.4]	(2)		
Irregular breaks	*1.0*			
Regular = Irregular	0.9 [0.7-1.2]	1.56		
Regular breaks	1.1 [0.8-1.4]	(2)		
Short breaks (<15min/4hrs)	*1.0*			
Long = Short	0.9 [0.8-1.2]	0.57		
Long breaks (>15min/4hrs)	1.0 [0.8-1.4]	(2)		

*p<0.1; **p<0.05; ***p<0.01; Underlined= significant at p<0.002

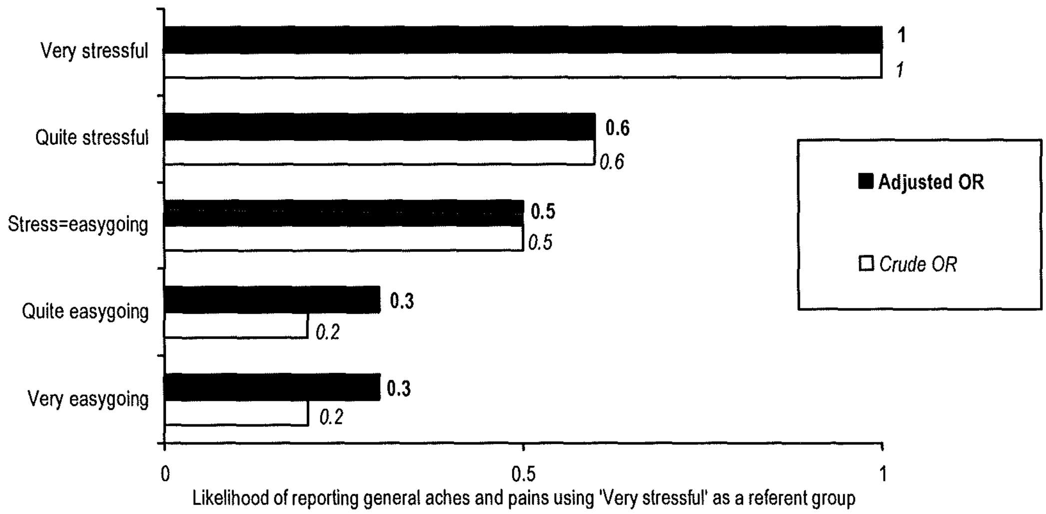
In relation to work variables, to reduce the likelihood of a Type I error, a Bonferoni calculation was also done. Allowing for twenty-three tests for each work variable, the value of P taken to be significant was reduced from 0.05 to 0.002. Using this criterion for significance, prevalence of general aches and pains was crudely associated with only two work factors: stress (X^2=48.81(4), p<0.001) and perceived ability to cope with workload (X^2=20.47 (4), p<0.001). Individuals showed a decrease in the likelihood of reporting pain the less stressful they perceived their jobs to be (see Table 4.4 above). In relation to perceived ability to cope with workload, only one respondent reported that their job was beyond their capabilities. This prevented the 'Beyond capabilities' category from being used as the referent value in calculation of odds ratios. Consequently, the values 'Beyond capabilities' and 'Difficult to cope a lot of the time' were combined, and this combined group was used as the referent group (see Table 4.4 above). Chi-square tests showed that observed frequencies varied significantly from expected frequencies for these groups (X^2=20.22 (3), p<0.001), such that the there was a trend towards a decreased likelihood of pain in those who found their jobs easier to cope with most or all of the time (see Table 4.4).

Adjustment was carried out using logistic regression, with gender and chronic condition entered as confounders in the first step. This first step accounted for 6% of the variability between outcomes (Nagelkerke R^2= 0.056), and was of good fit (X^2=0.08 (2), n.s.). In this step, gender and chronic condition were significantly associated with prevalence of general aches and pains (Adj. ORs 1.3, 95% CI 1.1-1.7 and 0.3, 95% CI 0.2-0.4 respectively).

In the second step, all demographic and work variables significant at p<0.1 or less in the crude analysis were forced into the model, which resulted in three variables remaining significantly associated with prevalence of general aches and pains (gender, chronic condition and stress of workload). As shown in Table 4.4, further inclusion of all variables Inclusion of all variables accounted for a further 4% of the variability between outcomes (Nagelkerke R^2= 0.1), and this model was also of good fit (X^2=5.55 (8), n.s.). Adjustment for other factors had very little effect on gender and chronic condition associations, with general aches and pains remaining more likely in women (Adj. OR 1.3, 95% CI 1.1-1.7), and less likely in those without a chronic condition (Adj OR 0.3, 95% CI 0.2-0.4).

The association between stress of workload and prevalence of general aches and pains was also relatively unchanged by the inclusion of other factors (see Figure 4.4 below). The more stressful individuals perceived their workload to be, the more likely they were to experience general aches and pains (for 'Equally stressful and easygoing' Adj. OR 0.5, 95%C.I. 0.3-0.9; for 'Quite easygoing' Adj. OR 0.3, 95%C.I. 0.2-0.5; for 'Very easygoing' Adj. OR 0.3, 95%C.I. 0.1-0.6).

Figure 4.4
Odds ratios for prevalence of general aches and pains by 'Very easygoing'-'Very stressful'



Although the crude association between industry group and prevalence of general aches and pains was not strictly significant before adjustment (X^2=16.75 (9), p<0.053), after adjustment, the category 'Local government & council business' significantly contributed to the variability (X^2=7.5 (1), p<0.01). Individuals working in Higher Education were more likely to report general aches and pains (Adj OR 2.3, 95% C.I. 1.3-4.2).

Finally, Figure 4.5 overleaf shows that although perceived ability to cope was significantly associated with prevalence of aches and pains before adjustment, none of these categories remained significantly associated when the influence of other variables were taken into consideration. In fact, the effect of perceived ability to cope virtually disappeared after adjustment. Table 4.5 below summarises the unadjusted and adjusted effects of demographic and work variables on prevalence of general aches and pains in the current population.

Figure 4.5
Odds ratios for prevalence of general aches and pains by 'Well within capabilities'-'Beyond capabilities'

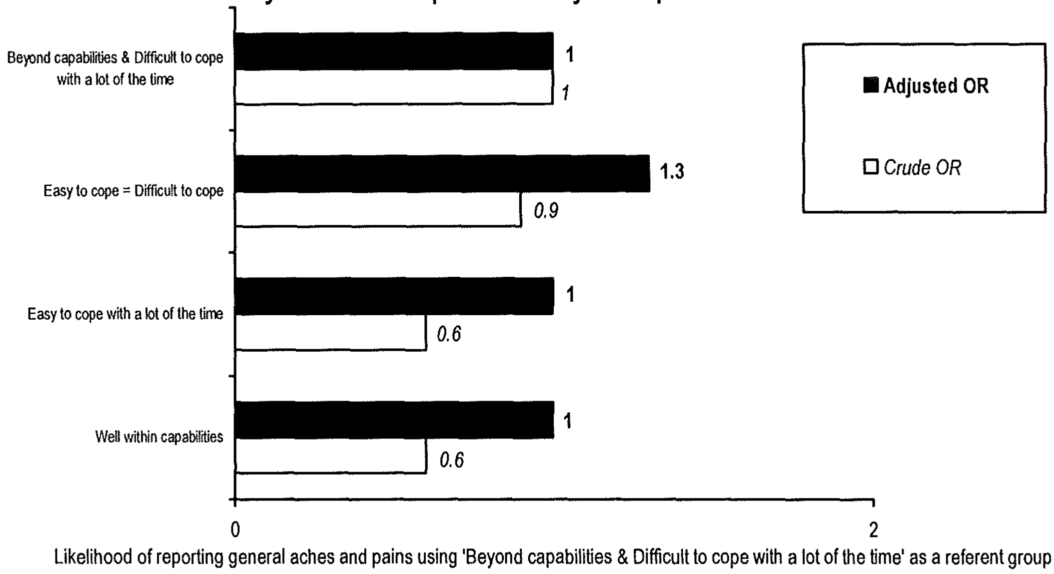


Table 4.5
Summary of associations between demographic factors, work variables and prevalence of general aches and pains (a) before adjustment and (b) after adjustment

(a)Crude Associations	(b) Adjusted associations
	More likely to experience general aches and pains
Gender***	**Female****
Industry*	**Working in Higher Education****
	Less likely to experience general aches and pains
Chronic condition***	**Having a chronic condition*****
Stress***	**Equally stressful and easygoing*****
	Quite easygoing***
	Very easygoing***
Full-time**	n.s.
Cope***	n.s
Enjoy**	n.s.
Continue*	n.s.

*p<0.1; **p<0.05; ***p<0.01; Underlined= significant at p<0.002 for demographic variables; and p<0.006 for work variables

(d) Interactions between psychosocial factors and pain prevalence

To explore the interaction between psychosocial variables in relation to pain prevalence, data were split by gender and the analysis was run separately on all men, and then on all women. Table 4.6 below summarises associations.

Table 4.6

Demographic and work variables in relation to the likelihood of reporting general aches and pains split by Men and Women. Associations given as: (a) Crude ORs and (b) ORs after adjustment using backward stepwise logistic regression. Adjusted variables that were significant are given in bold. *Referent categories are given in italics.*

		Men						Women					
		(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adj. OR	[95% C.I.]		(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adj. OR	[95% C.I.]	
	Aged 16-25	*1.0*						*1.0*					
	26-35	0.9	[0.6-1.5]	5.76 (4)				1.1	[0.7-1.6]	5.08 (4)			
	36-45	1.3	[0.8-2.2]					1.4	[0.9-2.1]				
	46-55	1.4	[0.8-2.3]					1.0	[0.6-1.6]				
	56-65	1.0	[0.5-1.9]					2.3	[0.8-6.2]				
SEG	*Unskilled*	*1.0*						*1.0*					
	Partly skilled	0.7	[0.1-8.4]	3.57 (5)				0.2	[0.0-1.2]	4.91 (5)			
	Manual skilled	0.9	[0.1-10.7]					0.2	[0.0-1.4]				
	Non-manual skilled	1.1	[0.1-12.8]					0.2	[0.0-1.4]				
	Managerial/Intermediate	0.9	[0.1-10.3]					0.2	[0.0-1.3]				
	Professional	1.1	[0.1-12.5]					0.2	[0.0-1.6]				
Carstairs	*Least affluent*	*1.0*						*1.0*					
	6	0.8	[0.3-2.3]	4.53 (6)				0.7	[0.2-2.1]	4.58 (6)			
	5	0.8	[0.3-2.2]					1.0	[0.3-2.9]				
	4	0.5	[0.2-1.3]					1.1	[0.4-3.2]				
	3	0.8	[0.3-2.0]					0.9	[0.3-2.5]				
	2	0.7	[0.3-2.0]					1.3	[0.4-3.8]				
	Most affluent	0.7	[0.2-2.4]					1.6	[0.5-5.3]				
	Married/living with partner	*1.0*						*1.0*					
	Single	0.8	[0.6-1.2]	1.10 (1)				0.8	[0.6-1.1]	1.77 (1)			
	Spouse doesn't work												
	Spouse works	0.8	[0.6-1.2]	0.78 (1)				0.6	[0.3-1.3]	1.53 (1)			
	More than 3 children	*1.0*						*1.0*					
	3 children	1.2	[0.4-3.1]	7.77 (4)*	1.2	[0.4-3.5]*	Removed at Step 3 R^2= 0.08	0.7	[0.1-3.8]	3.01 (4)			
	2 children	0.7	[0.3-1.8]		0.9	[0.3-2.4]		0.6	[0.1-2.7]				
	1 child	1.1	[0.4-3.0]		1.6	[0.6-4.3]		0.4	[0.1-2.1]				
	No children	0.7	[0.3-1.8]		1.0	[0.4-2.6]		0.5	[0.1-2.3]				
	Have a chronic condition	*1.0*						*1.0*					
	No chronic condition	0.3	[0.2-0.4]	<u>29.88</u>*** (1)	**0.3**	**[0.2-0.5]***	**Remained at Step 4 R^2= 0.07**	0.3	[0.1-0.5]	<u>24.18</u>*** (1)	**0.3**	**[0.1-0.5]***	Removed at Step 2 R^2= 0.11

*p<0*p<0.1; **p<0.05; ***p<0.01; <u>Underlined= significant at p<0.006</u>

(i) Associations between psychosocial variables and pain prevalence in men

For men, three variables were associated with pain prevalence before adjustment: chronic condition (X^2=29.88 (1) p<0.006); stress (X^2=19.88 (4) p<0.002) and ability to cope with workload (X^2=8.63 (3) p<0.03). The unadjusted association between ability to cope with workload and pain prevalence in men was not significant at the alpha level after Bonferoni correction for all work variables (p<0.002). Before adjustment pain prevalence was less likely in those without a chronic condition (OR 0.3; 95% C.I. 0.2-0.4); and for those with less stressful workloads (for 'Quite stressful' OR 0.5; 95% C.I. 0.3-1.0; for 'Stressful = Easygoing' OR 0.5; 95% C.I. 0.3-1.0; for 'Quite easygoing' OR 0.3; 95% C.I. 0.1-0.6; and for 'Very easygoing' OR 0.2; 95% C.I. 0.1-0.6).

There was some variability in relation to the ability to cope with workload, although using 'Beyond capabilities & Difficult to cope a lot of the time' as a referent category, the relationship between these categories and pain prevalence was difficult to interpret before adjustment (for 'Easy to cope = Difficult to cope' OR 1.1; 95% C.I. 0.6-2.3; for 'Easy to cope a lot of the time' OR 0.8; 95% C.I. 0.4-1.7; and for 'Well within capabilities' OR 0.7; 95% C.I. 0.4-1.4). There were also some crude trends before adjustment, such that pain prevalence in men was marginally associated with: having children (X^2=7.77 (4) p<0.10; for ORs see Table 4.6 above); and income (X^2=8.54 (4) p<0.07; for ORs see Table 4.6 above).

All associations between men and pain prevalence significant at p<0.10 were put into a stepwise logistic regression (comparing log-likelihoods). This process terminated after four steps, where only chronic condition and stress were significantly associated with pain prevalence in men. Statistics for this final model showed it to be of good fit (X^2=0.75 (5) p<0.98), and to account for 7% of the variability between outcomes (Nagelkerke R^2=0.07). Adjustment for other factors had little effect on the association between men and having a chronic condition, such that those without a chronic condition remained less likely to report pain (Adj.OR 0.3; 95% C.I. 0.2-0.5). Similarly, after adjustment, men with less stressful workloads were less likely to experience pain, although these associations were only significant in those in the least stressful categories (for 'Quite easygoing' Adj.OR 0.3; 95% C.I. 0.2-0.6; and for 'Very easygoing' Adj.OR 0.2; 95% C.I. 0.1-0.6).

Table 4.6 (contd)

Demographic and work variables in relation to the likelihood of reporting general aches and pains split by Men and Women. Associations given as: (a) Crude ORs and (b) ORs after adjustment using backward stepwise logistic regression. Adjusted variables that were significant are given in bold. *Referent categories are given in italics.*

	Men						Women					
	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adj. OR	[95% C.I.]		(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adj. OR	[95% C.I.]	
Heavy Industry production & research	*1.0*						*1.0*					
Banks & Financial services	1.6	[0.8-3.2]	14.05				0.8	[0.3-1.9]	11.00			
Computer industry	1.4	[0.9-2.2]	(9)				0.7	[0.3-1.6]	(9)			
Emergency service	2.0	[1.0-3.8]					0.5	[0.1-2.4]				
Food production & distribution	2.5	[1.3-5.0]					0.3	[0.1-1.2]				
Higher Education	1.7	[0.7-4.6]					1.5	[0.6-3.6]				
Health services	0.9	[0.4-2.1]					0.8	[0.3-2.0]				
Local government & council business	3.1	[1.2-7.7]					0.8	[0.3-1.9]				
Pharmaceutical production & research	1.5	[0.9-2.4]					0.9	[0.4-1.9]				
Media	1.7	[0.8-3.3]					0.8	[0.3-2.1]				
Earning under £10K	*1.0*			*1.0*			*1.0*					
£10 - 24K	2.0	[1.2-3.3]	8.54	1.7	[1.0-2.9]*	Removed at Step 1 R^2=0.10	0.6	[1.36.04]				
£25 - 39K	2.0	[1.2-3.4]	(4)*	1.5	[0.8-2.6]		1.1	[0.6-1.8]				
£40 - 54K	1.9	[1.0-3.5]		1.4	[0.7-2.9]		0.3	[0.1-0.9]				
Over £55K	2.7	[1.2-6.3]		1.8	[0.8-4.4]		1.6	[0.2-14.0]				
Manual	*1.0*						*1.0*					
Manual > Non-manual	0.9	[0.5-1.9]	1.95				0.7	[0.3-1.6]	3.60			
Manual = Non-manual	1.0	[0.6-1.7]	(4)				0.6	[0.3-1.2]	(4)			
Manual < Non-manual	1.1	[0.7-2.0]					0.9	[0.5-1.7]				
Non-manual	0.9	[0.6-1.2]					0.7	[0.4-1.1]				
Unskilled	*1.0*						*1.0*					
Unskilled > Skilled	1.3	[0.6-2.8]	1.01				1.7	[0.8-3.9]	2.73			
Unskilled = Skilled	1.1	[0.5-2.2]	(4)				1.3	[0.7-2.4]	(4)			
Unskilled < Skilled	0.9	[0.5-1.7]					1.2	[0.7-2.1]				
Skilled	1.0	[0.6-1.8]					1.4	[0.8-2.3]				
Unprofessional	*1.0*						*1.0*					
Unprofessional > Professional	1.0	[0.5-2.1]	1.06				0.8	[0.4-1.4]	1.68			
Unprofessional = Professional	0.9	[0.5-1.5]	(4)				0.7	[0.4-1.2]	(4)			
Unprofessional < Professional	1.1	[0.6-1.9]					0.9	[0.5-1.4]				
Professional	0.9	[0.6-1.3]					0.8	[0.6-1.3]				
over 8 hours/day	*1.0*						*1.0*					
8 hours/day and below	1.1	[0.8-1.5]	0.46 (1)				0.9	[0.6-1.4]	0.10 (1)			
35 hours/week	*1.0*						*1.0*					
20-34 hours/week	1.1	[0.6-2.0]	2.30				1.1	[0.7-1.6]	5.39			
under 20 hours/week	0.5	[0.2-1.4]	(3)				1.4	[0.8-2.3]	(3)			
over 35 hours/week	0.5	[0.1-3.4]					2.8	[1.0-8.1]				
Full-time	*1.0*						*1.0*			*1.0*		
Part-time	0.5	[0.2-1.3]	2.26 (1)				1.7	[1.0-2.7]	5.20 (1)**	**1.9**	**[1.1-3.1]****	Remained at Step 3 R^2= 0.11
Always work shifts	*1.0*						*1.0*			*1.0*		
Sometimes work shifts	0.9	[0.6-1.6]	1.34				0.8	[0.4-1.3]	4.87	0.8	[0.4-1.4]	Removed at Step 2 R^2= 0.11
Never work shifts	0.8	[0.6-1.1]	(2)				1.2	[0.8-1.8]	(2)*	1.1	[0.7-1.8]	
Permanent	*1.0*						*1.0*					
Temporary	0.9	[0.51.6]	0.18 (1)				0.7	[0.4-1.2]	1.37 (1)			

*p<0.1; **p<0.05; ***p<0.01; Underlined= significant at p<0.002

Table 4.6 (contd)

Demographic and work variables in relation to the likelihood of reporting general aches and pains split by Men and Women. Associations given as: (a) Crude ORs and (b) ORs after adjustment using backward stepwise logistic regression. Adjusted variables that were significant are given in bold. Referent categories are given in italics.

	Men						Women					
	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adj. OR	[95% C.I.]		(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adj. OR	[95% C.I.]	
Never work conventional hours	*1.0*						*1.0*					
Sometimes conventional hours	1.1	[0.8-1.6]	0.40				1.5	[0.9-2.2]	2.88			
Always conventional hours	1.0	[0.7-1.4]	(2)				1.2	[0.8-1.7]	(2)			
Never organise own task												
Sometimes organise own task	1.3	[0.8-2.3]	1.24				1.0	[0.5-1.8]	1.11			
Always organise own task	1.2	[0.7-2.0]	(2)				0.8	[0.5-1.5]	(2)			
Always use a computer	*1.0*						*1.0*					
Sometimes use a computer	1.1	[0.8-1.5]	1.24				0.9	[0.7-1.3]	0.23			
Never use a computer	0.8	[0.5-1.3]	(2)				1.0	[0.6-1.7]	(2)			
Physical	*1.0*						*1.0*					
Physical > Mental	0.7	[0.3-1.8]	1.40				1.1	[0.4-3.3]	2.55			
Physical = Mental	0.8	[0.4-1.8]	(4)				0.7	[0.3-1.8]	(4)			
Physical < Mental	0.8	[0.4-1.6]					0.7	[0.3-1.6]				
Mental	0.7	[0.3-1.5]					0.8	[0.3-1.9]				
Very stressful	*1.0*			*1.0*			*1.0*			*1.0*		
Quite stressful	0.5	[0.3-1.0]	19.88	0.6	[0.3-1.1]	Remained at Step 4 R^2=0.07	0.7	[0.3-1.4]	32.30	0.6	[0.31.3]	Remained at Step 3 R^2= 0.11
Stressful = Easygoing	0.5	[0.3-1.0]	(4)	0.6	[0.3-1.1]		0.4	[0.2-0.9]	(4)***	**0.4**	**[0.2-0.9]****	
Quite easygoing	0.3	[0.1-0.6]		**0.3**	**[0.2-0.6]*****		0.2	[0.1-0.4]		**0.2**	**[0.1-0.4]*****	
Very easygoing	0.2	[0.1-0.6]		**0.2**	**[0.1-0.6]*****		0.2	[0.1-0.7]		**0.2**	**[0.1-0.8]****	
Beyond capabilities OR Difficult to cope a lot of the time	*1.0*			*1.0*			*1.0*			*1.0*		
Easy to cope = Difficult to cope	1.1	[0.6-2.3]	8.63	1.6	[0.8-3.5]	Removed at Step 2 R^2=0.09	0.6	[0.2-1.5]	14.86	0.8	[0.3-2.2]	Removed at Step 1 R^2= 0.12
Easy to cope a lot of the time	0.8	[0.4-1.7]	(3)*	1.2	[0.6-2.8]		0.3	[0.1-0.9]	(4)**	0.7	[0.2-1.9]	
Well within capabilities	0.7	[0.4-1.4]		1.2	[0.5-2.6]		0.3	[0.1-0.9]		0.7	[0.2-1.9]	
Autonomous	*1.0*						*1.0*					
Autonomous > Teamwork	0.9	[0.4-1.9]	3.23				1.1	[0.6-2.4]	3.09			
Autonomous = Teamwork	0.7	[0.3-1.6]	(4)				1.0	[0.5-1.9]	(4)			
Autonomous < Teamwork	1.0	[0.5-2.3]					1.0	[0.5-2.1]				
Teamwork	0.9	[0.4-2.1]					1.5	[0.7-3.2]				
Never enjoy work	*1.0*						*1.0*			*1.0*		
Sometimes enjoy work	0.7	[0.4-1.3]	2.22				1.3	[0.6-2.8]	10.16	1.7	[0.7-4.0]	Remained at Step 3 R^2= 0.11
Always enjoy work	0.6	[0.3-1.2]	(2)				0.8	[0.3-1.7]	(2)**	1.1	[0.5-2.7]	
Job not secure	*1.0*						*1.0*					
Job secure	1.0	[0.7-1.3]	0.09 (1)				1.0	[0.7-1.5]	0.04 (1)			
No desire to continue in job	*1.0*						*1.0*					
Desire to continue in job	1.3	[0.9-1.9]	2.50 (1)				1.2	[0.8-1.7]	1.03 (1)			
Others control breaks	*1.0*						*1.0*					
Others control = Own control	1.2	[0.7-2.0]	0.57				1.3	[0.8-2.1]	1.31			
Own control of breaks	1.1	[0.8-1.7]	(2)				1.2	[0.8-1.7]	(2)			
Irregular breaks	*1.0*						*1.0*					
Regular = Irregular	1.0	[0.7-1.4]	1.53				1.2	[0.8-1.7]	1.35			
Regular breaks	0.8	[0.6-1.2]	(2)				1.0	[0.7-1.5]	(2)			
Short breaks (<15min/4hrs)	*1.0*						*1.0*					
Long = Short	1.1	[0.8-1.5]	0.56				0.8	[0.6-1.2]	1.04			
Long breaks (>15min/4hrs)	1.2	[0.8-1.8]	(2)				0.9	[0.6-1.5]	(2)			

*p<0.1; **p<0.05; ***p<0.01 Underlined= significant at p<0.002

The previous trend between pain prevalence in men and 'ability to cope with workload' remained non-significant when other factors were taken into consideration. Similarly, previous trends between pain prevalence in men and: 'having children; and 'income' disappeared after adjustment.

(ii) Associations between psychosocial variables and pain prevalence in women

In women, five crude associations were noted between psychosocial factors and pain prevalence: 'chronic condition' (X^2=24.18 (1) p<0.006); 'full-time/part-time' (X^2=5.2 (1) p<0.02); 'stress of workload'(X^2=32.3(4) p<0.002); 'ability to cope with workload' (X^2=14.86 (4) p<0.01); and 'job enjoyment' (X^2=10.16 (2) p<0.01) . The unadjusted associations between pain prevalence in women and: 'full-time/part-time' and 'ability to cope with workload' were not significant at the alpha level after Bonferoni correction for all work variables (p<0.002).

Pain was less likely in women who did not have a chronic condition (OR 0.3; 95% C.I. 0.1-0.5); and in those with less stressful workloads (for 'Stressful = Easygoing' OR 0.4; 95% C.I. 0.2-0.9; for 'Quite easygoing' OR 0.2; 95% C.I. 0.1-0.4; and for 'Very easygoing' OR 0.2; 95% C.I. 0.1-0.8). There was some variability in relation to enjoyment of work before adjustment, however, it was difficult to interpret the nature of this variability in relation to specific categories as the 95% CI included 1.0 ('sometimes enjoy work' (OR 1.3; 95% C.I. 0.6-1.8); and 'always enjoy work' (OR 0.8; 95% C.I. 0.3-1.7). Finally, a trend between pain prevalence and the extent to which an individual participated in shift-work was noted (X^2=4.87 (2) p<0.09).

All associations that were significant at p<0.1 and below were put into a backward stepwise regression, and the resulting model contained four significant associations between pain prevalence in women and: 'chronic condition'; 'stress of workload'; 'full-time/part-time; and 'job enjoyment'. The model combining all of these factors accounted for 11% of the variability between outcomes (Nagelkerke R^2 = 0.11), and was of good fit (X^2=1.75 (7) p<0.97).

Adjustment had little effect on the association between pain prevalence in women and chronic condition, such that pain remained less likely in women without a chronic condition (Adj.OR 0.3; 95% C.I. 0.1-0.5). Similarly, pain remained less likely in women with less stressful workloads (for

'Stressful = Easygoing' Adj.OR 0.4; 95% C.I. 0.2-0.9; for 'Quite easygoing' Adj.OR 0.2; 95% C.I. 0.1-0.4; and for 'Very easygoing' Adj.OR 0.2; 95% C.I. 0.1-0.8). In addition, pain became significantly more likely in women working part-time (Adj.OR 1.9; 95% C.I. 1.1-3.1).

The association between 'job enjoyment' and pain prevalence in women became significant in the final model, however the nature of this relationship was difficult to decipher. Although adjusted odds ratios suggested a tendency towards those who enjoyed their jobs being more likely to report pain than those who did not enjoy their jobs, 95% confidence intervals for these Adj.ORs were not significant (for 'sometimes enjoy work' Adj.OR 1.7; 95% C.I. 0.7-4.0; and for 'always enjoy work' Adj.OR 1.1; 95% C.I. 0.5-2.7). Finally, the crude trend between 'ability to cope with workload' and pain prevalence in women disappeared after adjustment; as did the crude trend between pain prevalence in women and shift-work (see Table 4.6 for ORs).

Table 4.7
Summary of associations between demographic factors, work variables and prevalence of general aches and pains in (i) Men and (ii) Women; (a) before adjustment and (b) after adjustment. Adjusted variables that were significant are given in bold.

Men: (a) Crude association	Men: (b) Adjusted association	Women: (a) Crude association	Women: (b) Adjusted association
	Less likely to report pain		*Less likely to report pain*
Having a chronic condition***	**No chronic condition *****	Having a chronic condition ***	**No chronic condition*****
Stress of workload ***		Stress of workload***	**Stressful = Easygoing****
	Quite easygoing ***		**Quite easygoing *****
	Very easygoing ***		**Very easygoing ****
		Job enjoyment**	**Job enjoyment** (non-specific)
			More likely to report pain
		FTPT**	**Part-time ****
Having children*	Removed at Step 3	Shiftwork *	Removed at Step 2
Ability to cope with workload**	Removed at Step 2	Ability to cope with workload**	Removed at Step 1
Income*	Removed at Step 1		

*p<0.1; **p<0.05; ***p<0.01; Underlined= significant at p<0.002 for demographic variables; and p<0.006 for work variables

(iii) Comparing prevalence data for men with prevalence data for women

Table 4.7 below summarises the crude and adjusted associations between psychosocial variables and pain prevalence for (i) men and (ii) women. The association between not having a chronic condition and lower prevalence was virtually identical for both sexes, suggesting this association was independent of an interaction with gender. In addition, the association between a less stressful workload and lower pain prevalence was similar in both sexes, although women working in 'equally stressful and easygoing' environments were also significantly associated with lower pain prevalence, an association that was not significant in men.

There was also similarity between the effects of adjustment in both sexes. There was a crude trend towards a relationship between 'Ability to cope with workload' and pain prevalence in men and women before adjustment that was removed by the inclusion of other factors in both sexes. This suggests that the effect of 'ability to cope' on pain prevalence was independent of gender, but related to another variable in the model.

Associations between two additional psychosocial factors (part-time work; less job enjoyment) and pain reports were also noted in women. These associations were not observable in the current prevalence data for men.

From this it can be concluded that certain psychosocial work factors (part-time work and job enjoyment) appear to be more influential in the prevalence of general aches and pains in women, but not in men. In addition, the association between having a chronic condition and workload stress appear to exist largely independently of gender, being of similar magnitude in both sexes.

(e) Summary of demographic and work influences on prevalence in relation to hypotheses

It was hypothesised (H_3) that pain prevalence would be higher in women, in older age groups, in less privileged socioeconomic groups, and where individuals had a chronic condition. These hypotheses were not wholly confirmed by current data. The association between women and higher prevalence of general aches and pains was confirmed, as was that between no chronic condition and lower prevalence of general aches and pains. Both of these associations were relatively resistant to adjustment for other factors. Age and socioeconomic group, however, showed no association with prevalence of general aches and pains in current data.

Hypothesis 4 predicted that pain prevalence would differ in relation to marital status and family size. Current data show that no such variability was observed in the crude or adjusted data, and therefore this hypothesis is rejected.
Hypothesis 6 predicted that pain prevalence would be higher where: duration of employment was longer; control was lower; work demands were higher; where stress was more common; and where job satisfaction was lower. Current data showed that work factors had little relationship with the prevalence of general aches and pains. This was with the exception of stress, however, which retained a significant association with prevalence after adjustment. This association was similar to that observed in previous research, where general aches and pains were more prevalent in those with more stressful workloads. Hypothesis 6 can therefore only be partially confirmed.

It was predicted that pain prevalence would differ in relation to different working conditions and between workgroups (H_7). Overall, current data show that no working condition had a significant effect at the adjusted level of significance, with the exception of one industry group, Higher Education. Individuals in this group were more likely to experience aches and pains. Hypotheses 7, therefore, can only partially be accepted.

Finally, Hypotheses 5 and 8 predicted that demographic and work factors would be related pain prevalence after adjustment. Multivariate analysis shows that this in fact was only the case for two of a possible nine demographic variables (gender, chronic condition), and two of a possible twenty-two work variables (perceived stress and industry groups, specifically Local Government and Council business). As such Hypotheses 5 and 8 can also only be partially confirmed.

4.4 Pain experience

(a) Pain experience in general

Table 4.6 below shows summary statistics for total GPQ scores and sub-scores. The distribution of these scores was discussed in detail in Section 3.4. In general, total GPQ scores were low, with both mean and median scores of less than ten out of a possible fifty. Moreover the modal score was 2.16, which illustrates the extreme negative skew in GPQ data discussed in Section 3.4. Pain frequency and intensity were also low, all less than two out of a possible ten. Similarly, ability to cope, emotional aspects and impact of pain were all relatively low, all yielding scores of less than three out of a possible ten. Notably, the modal value for these three aspects of pain was zero.

Table 4.8
Summary statistics for GPQ scores and sub-scores

	Total GPQ Score	*Frequency*	*Intensity*	*Ability to cope*	*Emotion*	*Impact*
Mean	9.76	1.75	1.87	1.64	2.61	1.89
Median	9.08	0.77	1.39	1.48	2.40	1.62
Mode	2.16	0.77	1.39	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	49.06	9.62	9.44	10.00	10.00	10.00

It was hypothesised that GPQ scores and sub-scores for pain frequency, intensity and impact would be high (H_9). Table 4.8 shows that in fact this was not the case, and that pain frequency, intensity and impact scores are relatively low. An exploratory hypothesis for pain coping and emotion scores explored the nature of the sub-scores for coping with pain and pain emotions (EH_1). Observed scores show that these aspects of pain were also relatively less negative. To enable these variables to be used as outcome measures for logistic regression, pain experience variables were dichotomised at the median (Section 3.4). Table 4.9 shows descriptive statistics for each half of these scores (a) below and including the median and (b) above the median after dichotomisation.

Table 4.9
Summary statistics for dichotomised GPQ scores and sub-scores

	GPQ Score		*Frequency*		*Intensity*		*Ability to cope*		*Emotion*		*Impact*	
	(a) Below & inc median (9.1)	(b) Above median (9.1)	(a) Below & inc median (0.77)	(b) Above median (0.77)	(a) Below & inc median (1.39)	(b) Above median (1.39)	(a) Below & inc median (1.482)	(b) Above median (1.482)	(a) Below & inc median (2.4)	(b) Above median (2.4)	(a) Below & inc median (1.62)	(b) Above median (1.62)
N	669	668	670	667	808	529	728	609	798	539	483	854
Mean	4.98	14.6	0.63	2.86	1.11	3.04	0.59	2.9	1.24	4.64	0	2.97
Median	5.53	12.2	0.77	2.69	1.39	2.78	0	2.22	2	2.8	0	1.89
Mode	2.16	10.2	0.77	2.69	1.39	1.94	0	2.22	0	2.8	0	1.62
Range	9.08	40	0.77	8.85	1.39	7.5	1.48	7.78	2.4	7.2	0	8.38
Minimum	0	9.1	0	1.15	0	1.94	0	2.22	0	2.8	0	1.62
Maximum	9.08	49.1	0.77	10	1.39	9.44	1.48	10	2.4	10	0	10

Odds ratios were calculated in relation to the likelihood of giving a higher pain experience score versus a lower pain experience score for each aspect (as illustrated in Figure 4.6).

Figure 4.6
Examples of 2x2 comparisons for all GPQ scores and sub-scores

	GPQ score higher than median (Yes)	GPQ score lower than & inc. median (No)
Yes	-	-
No	-	-

	Frequency score higher than median (Yes)	Frequency score lower than & inc. median (No)
Yes	-	-
No	-	-

	Intensity score higher than median (Yes)	Intensity score lower than & inc. median (No)
Yes	-	-
No	-	-

	Coping score higher than median (Yes)	Coping score lower than & inc. median (No)
Yes	-	-
No	-	-

	Emotion score higher than median (Yes)	Emotion score lower than & inc. median (No)
Yes	-	-
No	-	-

	Impact score higher than median (Yes)	Impact score lower than & inc. median (No)
Yes	-	-
No	-	-

Using dichotomised GPQ scores and sub-scores as the outcome variable (as in the columns in Figure 4.6), crude odds ratios were calculated for all levels of pain type and pain cause, as well as for every level of demographic and work variables.

(i) Pain type

Crude pain experience differed in relation to pain type for total GPQ score (X^2=23.11 (10); p<0.01), pain frequency (X^2=64.98 (10); p<0.001), and pain emotion (X^2=21.22 (10); p<0.02). Using back pain as the referent category, Table 4.10a shows that a high GPQ score was significantly more likely when individuals were experiencing abdominal pain (OR 1.9, 95% CI 1.2-2.8). Neck/shoulder pain was more likely to yield a higher frequency score than back pain (OR 1.7, 95% CI 1.1-2.6), and there was trend towards higher frequency scores in joint pain also (OR 1.5, 95% CI *0.99*-2.2). Headache, however, was less likely to yield a lower frequency score than back pain (OR 0.5, 95% C.I. 0.3-0.6). Pain emotion was likely to be higher in abdominal pain (OR 1.7, 95% CI 1.1-2.4)

Odds ratios for all pain types were adjusted for gender and age using forced-entry logistic regression. Six models were tested, each using dichotomised GPQ scores and sub-scores (Frequency, Intensity, Ability to cope, Pain emotion and Impact) as the outcome variables. Adjustment for age and gender changed scores only very slightly. Regression models for pain intensity, ability to cope and impact showed that these aspects of pain were not significantly associated with pain type after adjustment. Higher Total GPQ scores were associated with abdominal pain (Adj OR 1.9 95%CI 1.2-2.8) and there was a trend towards lower Total GPQ scores in headache (Adj OR 0.7 95%CI 0.5-*0.98*). Similarly, higher pain frequency scores remained more likely in those experiencing neck/shoulder pain (Adj OR 1.7 95%CI 1.1-2.6); and less likely in headache (Adj OR 0.4 95%CI 0.3-0.6). Finally, the crude association between abdominal pain and higher emotion scores was reduced to a trend after adjustment (Adj OR 1.5 95%CI *1.02*-2.2)

Table 4.10

Likelihood of yielding high GPQ score and sub-scores less than the median in relation to (i) pain type, and (ii) pain cause given as (a) crude odds ratios and (b) odds ratios after adjustment for gender and age using forced-entry logistic regression (Nagelkerke R^2 is given for every analysis). Significant adjusted associations are given in bold. *Referent categories for each group are given in italics.*

(i) Pain site

	GPQ Score (a) Crude OR *[95% CI's]* X^2 (df)	*GPQ Score* (b) Adj OR *[95% CI's]*	*Frequency* (a) Crude OR *[95% CI's]* X^2 (df)	*Frequency* (b) Adj OR *[95% CI's]*	*Intensity* (a) Crude OR *[95% CI's]* X^2 (df)	*Intensity* (b) Adj OR *[95% CI's]*	*Ability to cope* (a) Crude OR *[95% CI's]* X^2 (df)	*Ability to cope* (b) Adj OR *[95% CI's]*	*Emotion* (a) Crude OR *[95% CI's]* X^2 (df)	*Emotion* (b) Adj OR *[95% CI's]*	*Impact* (a) Crude OR *[95% CI's]* X^2 (df)	*Impact* (b) Adj OR *[95% CI's]*
Back	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
Abdominal	1.9 [1.2-2.8] 23.11**	**1.6 **[1.1-2.5]**	1.2 [0.8-1.7] 64.98**	1.0 [0.7-1.5]	1.3 [0.9-1.9] 9.19	1.1 [0.8-1.7]	1.5 [1.0-2.1] 11.64	1.2 [0.8-1.8]	1.7 [1.1-2.4] 21.22**	**1.5 **[1.0-2.2]**	1.5 [1.0-2.3] 13.53	0.7 [0.3-1.6]
Chest area	0.9 [0.4-2.0] (10)	0.8 [0.4-1.9	1.0 [0.4-2.2] (10)	1.0 [0.4-2.3]	0.8 [0.3-1.9] (10)	0.7 [0.3-1.8]	1.0 [0.4-2.2] (10)	0.9 [0.4-2.1]	0.8 [0.3-1.9] (10)	0.7 [0.3-1.8]	1.1 [0.5-2.6] (10)	0.8 [0.6-1.1]
Ear nose or throat	1.2 [0.5-2.7]	1.1]0.5-2.5]	1.8 [0.8-4.2]	1.8 [0.8-4.1]	0.8 [0.4-1.9]	0.7 [0.3-1.7]	0.6 [0.3-1.4]	0.6 [0.3-1.4]	2.1 [0.9-4.6]	1.9 [0.9-4.3]	0.8 [0.3-1.7]	1.0 [0.6-1.5]
Face and mouth	0.7 [0.4-1.3]	0.9 [0.5-1.8]	0.9 [0.5-1.5]	1.4 [0.7-2.8]	0.9 [0.5-1.6]	1.0 [0.5-1.9]	0.8 [0.51.5]	1.1 [0.6-2.1]	1.2 [0.7-2.2]	1.3 [0.7-2.5]	0.6 [0.3-1.1]	1.1 [0.4-2.5]
Feet or ankles	0.9 [0.5-1.7]	0.7 [0.4-1.2]	1.4 [0.7-2.7]	0.8 [0.5-1.5]	0.9 [0.5-1.8]	0.9 [0.5-1.5]	1.0 [0.5-1.9]	0.8 [0.4-1.4]	1.2 [0.6-2.4]	1.2 [0.7-2.1]	0.9 [0.4-1.7]	0.6 *[0.3-1.1]
Head	0.8 [0.6-1.0]	**0.7 **[0.5-1.0]**	0.5 [0.3-0.6]	**0.4 ***[0.3-0.6]**	0.8 [0.6-1.1]	0.8 *[0.5-1.0]	1.1 [0.8-1.4]	1.0 [0.7-1.3]	1.3 [0.9-1.7]	1.2 [0.9-1.6]	0.8 [0.6-1.1]	0.9 [0.5-1.5]
Joints	0.9 [0.6-1.3]	0.9 [0.6-1.4]	1.5 [1.0-2.2]	1.5 *[1.0-2.3]	0.8 [0.5-1.2]	0.8 [0.5-1.3]	0.8 [0.6-1.3]	0.9 [0.6-1.3]	0.8 [0.5-1.2]	0.8 [0.5-1.3]	1.0 [0.6-1.5]	1.5 *[1.0-2.3]
Limbs	0.8 [0.5-1.4]	0.8 [0.5-1.4]	1.3 [0.8-2.2]	1.3 [0.8-2.2]	1.0 [0.6-1.6]	1.0 [0.6-1.7]	0.9 [0.5-1.5]	0.9 [0.5-1.4]	0.6 [0.4-1.1]	0.6 *[0.3-1.0]	0.9 [0.5-1.5]	1.1 [0.7-1.6]
Neck/ shoulder	1.2 [0.8-1.8]	1.2 [0.8-1.8]	1.7 [1.1-2.6]	**1.7 **[1.1-2.6]**	1.1 [0.7-1.7]	1.1 [0.7-1.6]	1.2 [0.8-1.8]	1.2 [0.8-1.8]	1.4 [0.9-2.1]	1.4 [0.9-2.1]	1.1 [0.7-1.7]	0.9 [0.4-1.7]

(ii) Pain cause

	GPQ Score (a) Crude OR *[95% CI's]* X^2 (df)	*GPQ Score* (b) Adj OR *[95% CI's]*	*Frequency* (a) Crude OR *[95% CI's]* X^2 (df)	*Frequency* (b) Adj OR *[95% CI's]*	*Intensity* (a) Crude OR *[95% CI's]* X^2 (df)	*Intensity* (b) Adj OR *[95% CI's]*	*Ability to cope* (a) Crude OR *[95% CI's]* X^2 (df)	*Ability to cope* (b) Adj OR *[95% CI's]*	*Emotion* (a) Crude OR *[95% CI's]* X^2 (df)	*Emotion* (b) Adj OR *[95% CI's]*	*Impact* (a) Crude OR *[95% CI's]* X^2 (df)	*Impact* (b) Adj OR *[95% CI's]*
Unknown	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
Life variables	1.0 [0.7-1.5] 24.72***	0.9 [0.6-1.4]	0.7 [0.5-1.0] 25.42***	0.7 *[0.5-1.0]	1.4 [1.0-2.1] 25.18***	1.3 [0.9-2.0]	1.2 [0.8-1.8] 21.92**	1.1 [0.8-1.7]	1.2 [0.8-1.8] 18.95**	1.1 [0.7-1.7]	1.2 [0.8-1.8] 60.69***	1.2 [0.8-1.8]
Long-term medical	4.7 [2.1-10.6] [8]	**4.1 ***[1.8-9.3]**	4.3 [1.9-9.7] [8]	**4.0 ***[1.7-9.1]**	2.9 [1.4-5.9] [8]	**2.6 ***[1.2-5.3]**	6.0 [2.5-14.1] [8]	**5.2 ***[2.2-12.5]**	2.0 [1.0-4.0] [8]	1.7 [0.8-3.5]	7.1 [2.5-20.7] [8]	**6.6 ***[2.3-19.3]**
Non-serious ailments	1.5 [1.0-2.4]	1.4 [0.9-2.3]	2.5 [1.4-4.4]	0.8 [0.5-1.3]	1.9 [1.2-3.0]	**1.8 **[1.1-2.9]**	1.1 [0.7-1.8]	1.2 [0.8-2.0]	2.1 [1.3-3.3]	**1.9 ***[1.2-3.1]**	2.5 [1.5-4.2]	**2.4 ***[1.4-4.0]**
Old injury	1.3 [0.6-2.7]	1.4 [0.7-2.8]	2.5 [1.2-5.4]	**2.7 ***[1.2-5.7]**	1.4 [0.7-3.0]	1.5 [0.7-3.1]	1.0 [0.5-2.0]	1.0 [0.5-2.2]	1.4 [0.7-2.9]	1.4 [0.7-2.9]	6.7 [2.3-19.4]	**6.8 ***[2.3-19.9]**
Pain problems	2.2 [1.4-3.5]	**2.4 ***[1.5-3.8]**	2.7 [1.7-4.2]	**2.6 ***[1.7-4.2]**	1.9 [1.2-3.0]	**2.0 ***[1.3-3.1]**	1.1 [0.7-1.8]	0.7 *[0.5-1.0]	1.3 [0.9-2.1]	1.4 [0.9-2.2]	2.6 [1.6-4.1]	**2.7 ***[1.7-4.3]**
Recent injury	2.0 [1.4-2.8]	**2.1 ***[1.4-3.0]**	1.7 [1.2-2.5]	**1.8 ***[1.2-2.6]**	1.9 [1.3-2.7]	**2.0 ***[1.4-2.9]**	1.5 [1.0-2.1]	**4.0 ***[1.7-9.1]**	1.0 [0.7-1.5]	1.0 [0.7-1.5]	2.7 [1.8-4.0]	**2.7 ***[1.8-4.1]**
Short-term medical	1.7 [1.2--2.6]	**1.7 ***[1.2-2.5]**	1.6 [1.1-2.3]	**1.6 **[1.1-2.4]**	1.4 [0.9-2.0]	1.3 [0.9-2.0]	1.1 [0.7-1.8]	1.3 [0.9-1.9]	1.6 [1.1-2.4]	**1.6 ***[1.1-2.4]**	2.3 [1.5-3.4]	**2.2 ***[1.5-3.3]**
Stress	1.6 [1.0-2.6]	1.4 [0.9-2.4]	1.2 [0.7-1.9]	1.1 [0.6-1.8]	1.4 [0.9-2.4]	1.3 [0.8-2.2]	1.1 [0.7-1.8]	1.0 [0.6-1.8]	1.3 [0.8-2.2]	1.2 [0.7-2.0]	1.7 [1.0-2.8]	1.5 [0.9-2.6]
Work environment	1.0 [0.7-1.5]	1.0 [0.6-1.4]	1.2 [0.8-1.8]	1.2 [0.8-1.8]	1.4 [0.9-2.1]	1.3 [0.9-2.0]	1.1 [0.7-1.8]	1.1 [0.7-1.7]	1.5 [1.0-2.3]	1.5 *[1.0-2.2]	1.1 [0.8-1.7]	1.1 [0.7-1.7]

*p<0.1; **p<0.05; ***p<0.01

(ii) Pain cause

Several crude associations were found between GPQ scores and sub-scores and different pain causes (see Table 4.10b). Those who attributed their pain to 'long-term medical problems' were nearly five times more likely to have a high total GPQ score than those who did not know the cause of their pain (OR 4.7, 95% CI 2.1-10.6). In addition, those who attributed their pain to 'recent injury' or to 'pain problems' were also twice as likely to have high GPQ scores than those who stated that the cause of their pain was unknown (OR 2.0, 95% CI 1.4-2.8; and OR 2.2, 95% CI 1.4-3.5 respectively). Crude analyses showed that individuals who attributed their pain to 'long-term medical problems' were also more likely to report: higher levels of frequency (OR 4.3, 95% CI 1.9-9.7); higher intensity pain (OR 2.9, 95% CI 1.4-5.9); pain that was more difficult to cope with (OR 6.0, 95% CI 2.5-14.1); and pain that had a greater impact on their daily lives (OR 7.1, 95% CI 2.5-20.7). In addition, the likelihood of experiencing pain of notable emotional consequence was higher in individuals blaming their pain on 'non-serious ailments' than in those attributing their pain to unknown causes (OR 2.1, 95% CI 1.3-3.3). Pain attributed to 'recent injury' (OR 2.7, 95% CI 1.8-4.0) and pain caused by old injury (OR=6.7, 95% CI 2.3-19.4) were also more likely to yield a higher impact score than pain from unknown causes, as was pain from. Individuals who had been diagnosed with a pain problem were more likely to give higher pain frequency scores (OR 2.6, 95% CI 1.7-4.2) than those who did not know the cause of their pain, although their reported pain intensity was comparable to those suffering from 'recent injury', and/or 'non-serious ailments' (see Table 4.10b).

Odds ratios for all pain causes were adjusted for gender and age by forced-entry logistic regression, using dichotomised GPQ score and sub-scores (Frequency, Intensity, Ability to cope, Pain emotion and Impact) as outcome variables in turn. Adjustment altered the relationships between pain cause and pain experience substantially (see Table 4.10b).

Firstly, several significant crude associations became non-significant. Specifically, this occurred for: 'non-serious ailments' and Total GPQ; stress-related pain and Total GPQ; 'non-serious ailments' and pain frequency; 'long-term medical problems' and pain emotion; and stress-related pain and pain impact (see Table 4.10b).

Several associations were relatively unchanged by adjustment, however. Using pain of 'unknown cause' as a referent value, and pain caused by 'long-term medical problems' remained: more frequent (Adj OR 4.0 95% CI 1.8-9.3); more intense (Adj OR 2.6 95% CI 1.2-5.3); more difficult to cope with (Adj OR 5.2 95% CI 2.2-12.5); and more disruptive (Adj OR 6.6 95% CI 2.3-19.3). Similarly, pain from 'short-term medical problems' remained more frequent (Adj OR 1.6 95% CI 1.1-2.4) and more emotional (Adj OR 1.6 95% CI 1.1-2.4). In addition, individuals suffering pain as a result of 'non-serious ailments' were more likely to report higher: pain intensity (Adj OR 1.8 95% CI 1.1-2.9); emotion (Adj OR 2.1 95% CI 1.3-3.3), and impact (Adj OR 2.4 95% CI 1.4-4.0).

Pain caused by 'recent injury' remained more frequent (Adj OR 1.8 95% CI 1.2-2.6), more intense (Adj OR 2.0 95% CI 1.3-3.1), less easy to cope with (Adj OR 4.0 95% CI 1.7-9.1) and more disruptive (Adj OR 2.7 95% CI 1.5-3.3), whereas those suffering from the pain of an 'old injury' were only likely to be troubled by pain frequency (Adj OR 2.7 95% CI 1.2-2.7) and impact (Adj OR 6.8 95% CI 2.3-19.9). Finally, individuals suffering from 'pain problems' were more likely to experience pain of higher frequency (Adj OR 2.6 95% CI 1.7-4.2), higher intensity (Adj OR 2.0 95% CI 1.3-3.1), and greater impact (Adj OR 2.7 95% CI 1.7-4.3). Adjustment also uncovered a trend between individuals attributing their pain to a 'pain problem' and *increased* ability to cope with the pain (Adj OR 0.7 95% CI 0.5-1.0).

(iii) Summary of pain experience, pain type and pain cause in relation to hypotheses

It was hypothesised that GPQ scores and sub-scores for pain intensity, frequency and impact would differ in relation to pain type and pain cause (H_{10}). In addition, Exploratory Hypothesis 2 explored the possibility that sub-scores for coping with pain and pain emotions would differ in relation to pain type or pain cause.

Observed scores show that there was significant variability in relation to pain types across GPQ scores, pain frequency, and pain emotion. However, no significant differences were found for pain intensity, perceived ability to cope, nor pain impact in relation to pain type. Pain experience scores differed substantially in relation to pain cause, whereby pain was seen as significantly *less* negative by those attributing their pain to unknown causes. Those with 'long-term medical problems', 'pain problems' and in some cases 'old injury' and 'recent injury' were more likely to describe their pain experiences in more negative terms. Hypothesis 10 therefore can be partially confirmed for pain site (across total GPQ scores and pain frequency, but not pain intensity and impact), and can be confirmed across all experience scores for perceived pain cause. Exploratory Hypothesis 2 was also partially supported, as coping scores differed in relation to pain cause, and emotion scores differed in relation to pain type and pain cause.

(b) Pain experience in relation to psychosocial factors

To examine the relationship between demographic factors, work variables and pain experience, the likelihood of scoring lower than the median score on the dichotomised GPQ scale and sub-scales was explored. In order to reduce the likelihood of a Type I error in crude (unadjusted) calculations, a Bonferoni calculation was carried out. Allowing for nine tests for each demographic variable, the value of P taken to be significant in all comparisons relating to demographic variables was reduced from 0.05 to 0.006. There were twenty-three work variables, therefore after Bonferoni adjustment, required the value of P taken to be significant in all comparisons relating to work variables to be reduced from 0.05 to 0.002. Adjusted and unadjusted associations are discussed below in relation to specific aspects of the pain experience: Total GPQ; and sub scores for pain frequency, pain intensity, ability to cope with pain, pain-related emotion, and impact of pain (see Tables 4.11-4.14).

(i) Associations between demographic factors, work variables and Total GPQ score

Table 4.11a below summarises the crude analyses for Total GPQ scores. Gender was crudely associated with pain experience, such that overall GPQ scores were significantly more likely to be higher in women than in men (OR 1.4, 95% CI 1.2-1.8). Compared to SEG V, there were trends towards Total GPQ score being lower in those belonging to more privileged socioeconomic groups, although none of these confidence intervals were significant (see Table 4.11). Total GPQ was lower in individuals with three children or less (Table 4.11), as well as in those *without* a chronic condition (OR 0.5, 95% C.I. 0.4-0.6). No significant crude associations were found between age, Carstairs score, marital status, or spouse employment status.

In relation to work variables, high Total GPQ scores were significantly less likely where individuals viewed their jobs to be: more non-manual than manual (see Table 4.10 for crude ORs; X^2=19.23 (4) $p<0.01$); more skilled than unskilled (see Table 4.10 for crude ORs; X^2=25.34 (4) $p<0.001$); and more professional than unprofessional (see Table 4.10 for crude ORs; X^2=19.23 (4) $p<0.01$). These were complicated associations, as although there appeared on be an effect on odds ratios, confidence intervals included 1.0, casting doubt on their significance (for example, 'equally manual and non-manual' had an OR of 0.7 and a 95% confidence interval of 0.5 to 1.1).

Lower Total GPQ scores were *less* likely in those who: never worked shifts (OR 0.6, 95% C.I. 0.5-0.8); described their jobs as comprising more mental tasks than physical (see Table 4.12); were in jobs they wanted to stay in (OR 0.6, 95% C.I. 0.5-0.8); and had more control over their own breaks (OR 0.6, 95% C.I. 0.4-0.7). There was also a complex association between lower Total GPQ scores and perceived stress of workload. Using 'very stressful' as a referent group, those describing their workloads as 'equally stressful and easygoing' (OR 0.5, 95% C.I. 0.3-0.7) and 'quite easygoing' (OR 0.4, 95% C.I. 0.3-0.7) were less likely to report higher Total GPQ scores, whereas those reporting their workloads as 'very easygoing' were not significantly different from those reporting their jobs as 'very stressful'.

Backward stepwise regression adjusted for all demographic and work variables significant at $p<0.1$ in the crude analysis (see Table 4.19 below for a list of variables entered into the model). This adjustment removed one non-significant variable at each step (see Tables 4.11and 4.12), which led to the removal of the crude associations between Total GPQ and SEG, income, professional component of job, extent of shift-work, conventionality of hours, organisation of tasks, physicality of workload, ability to cope with workload and control of tasks from analysis (see Tables 4.11, 4.12 and 4.19 below).

In the final model, seven variables remained significant at the $p<0.05$ level: gender; chronic condition; 'manual/non-manual'; 'unskilled/skilled'; 'hours/day'; stress of workload; and desire to continue in job. This model was of good fit (X^2=8.41(8); n.s.), and explained 12% of the variability between higher and lower Total GPQ scores. After adjustment for other variables, the association between gender and Total GPQ score changed very little, such that women remained more likely to report higher Total GPQ scores than men (Adj OR 1.6, 95% C.I. 1.2-2.0). Associations for family characteristics and the presence of a chronic condition also remained similar to the crude association after adjustment. In the final step, those with a smaller family or no children at all were less likely to report high GPQ scores (Adj ORs: for 'two children' 0.3, 95% C.I. 0.1-0.7; for 'no children' 0.4, 95% C.I. 0.2-1.0). Similarly, after adjustment, those *without* a chronic condition were less likely to report a lower Total GPQ score than those with one (Adj OR 0.5, 95% C.I. 0.4-0.6).

Many of the associations between work variables and lower Total GPQ scores were also only minimally altered by adjustment. Specifically, high GPQ scores remained less likely in individuals reporting their jobs to be 'equally stressful and easygoing' (Adj OR 0.6, 95% C.I. 0.4-0.8); and 'quite easygoing' (Adj OR 0.5, 95% C.I. 0.3-0.8).

The association between daily working hours and Total GPQ score was altered considerably when other variables were taken into consideration. The non-significant association between working shorter hours in the crude analysis (1.4, 95% C.I. 1.1-1.8) became significant after adjustment, and reversed, such that working *shorter* hours became associated with *lower* Total GPQ score (Adj OR 0.6, 95% C.I. 0.5-0.8).

There were trends towards lower Total GPQ scores in individuals who: worked in more non-manual jobs than those in more manual jobs (for 'mostly non-manual' Adj OR 0.6, 95% C.I. 0.4-1.0); never worked shifts (Adj OR 0.7, 95% C.I. 0.5-1.0); and those who expressed a desire to continue in their current position (Adj OR 0.7, 95% C.I. 0.5-1.0). The adjusted association between the entire variable 'unskilled/skilled' and Total GPQ was somewhat complex. Although this work aspect contributed significantly contributed significantly to the overall variability between outcome values (X^2=11.52 (4) p<0.02) in the final step, none of the discrete categories within this variable were significant.

(ii) Associations between demographic factors, work variables and Pain Frequency score

In the crude analysis, perception of pain frequency differed in relation to age (X^2=16.08 (4), p<0.0002) and there was a non-significant trend towards older individuals giving higher frequency scores (see Table 4.9 above for crude ORs). Individuals in SEG I were significantly less likely to report a higher frequency score than SEG V in the crude analysis (OR 0.3, 95%CI 0.1-0.9; X^2=19.87(5) p<0.002), and those without a chronic condition were half as likely to experience frequent pain as those with a chronic condition (OR 0.5, 95% C.I. 0.4-0.7); X^2=18.92 (1), p<0.002). There were some trends towards elevated pain frequency in women (X^2=4.73 (1)), and in individuals who had three children (X^2=7.33 (3)) however, these associations failed to reach significance at the 0.002 level (see Table 4.9 for respective ORs).

In the crude analysis, physical work appeared to be associated with higher pain frequency, as unadjusted frequency scores were lower: where individuals had a non-manual component in their jobs (X^2=19.23 (4), p<0.001); where individuals were working in more skilled jobs (X^2=24.41 (4) p<0.001) and/or reported their tasks to include some level of mental effort as opposed to purely physical (X^2=27.58 (4), p<0.001) (see Table 4.13 below for all respective ORs). Higher pain frequency was less likely where individuals worked more conventional hours (X^2=18.33 (2), p<0.001); and where individuals had more control over their own breaks (X^2=13.73 (2), p<0.001). In addition, pain of higher frequency was less likely where individuals wished to continue in their current position (OR 0.6, 95% CI 0.5-0.8; X^2=16.01 (1), p<0.001).

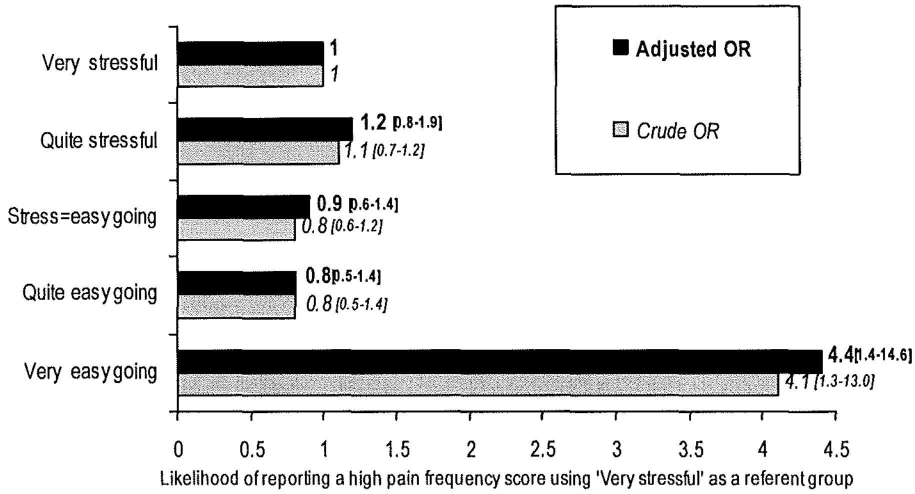
Adjustment for all demographic and work factors through backward stepwise regression removed all associations between variables and higher pain frequency scores, with the exception of gender, chronic condition, 'skilled/unskilled', conventional hours, ability to organise tasks, and desire to continue in job, all of which remained significant in the last step. The final step was of good fit (X^2=0.95 (8), n.s.), and accounted for 8% of the final variability between outcomes (Nagelkerke R^2=0.08).

The association between gender and pain frequency remained relatively unchanged by adjustment, with frequency scores remaining higher in women (Adj OR 1.5, 95% C.I. 1.1-1.9). This was also the case for the association between chronic condition and pain frequency, as pain remained less frequent in those *without* a chronic condition (Adj OR 0.5, 95% CI 0.3-0.7). There was still an association between age and pain frequency, although this was somewhat difficult to interpret. The entire variable 'age' contributed significantly to the final model (X^2=11.48 (4), p<0.02) but none of the specific age group categories could be identified as the single contributors. There appeared to be a trend towards older individuals experiencing more frequent pain, although adjusted ORs were not significant (see Table 4.9 for Adj ORs).

The association between 'skilled/unskilled' and pain frequency also remained relatively unchanged by adjustment, as higher pain frequency scores remained less likely where individuals worked in more skilled jobs (Adj ORs: for 'Mostly skilled' 0.6, 95% CI 0.3-0.9; using 'Mostly unskilled' as a referent group).

Several crude associations between work factors and pain frequency disappeared after adjustment for other factors. Specifically, these were associations between pain frequency and: 'manual/non-manual'; 'physicality of workload'; 'conventionality of hours'; and 'control of breaks'. However, the association between pain frequency and 'desire to continue in current job' remained unchanged, with higher pain frequency being *less* likely where individuals wanted to continue in their current positions (Adj OR 0.6, 95% CI 0.5-0.8). Three associations between pain frequency and work factors were uncovered by adjustment: for industry type, organisation of tasks, and stress. None of the crude associations between these work factors and pain frequency were significant. Pain frequency scores were significantly higher where individuals worked in Emergency Services and Media (Adj ORs: 2.4, 95% CI 1.2-5.0, and 2.2, 95% CI 1.2-4.1 respectively, using 'Heavy industry' as a referent group). Pain frequency scores were significantly lower where individuals were able to organise more of their own tasks (Adj ORs: for 'Always organises own tasks' 0.6, 95% CI 0.3-0.9; using 'Never organises own tasks' as a referent group). The association between stress and pain frequency also became significant after adjustment, and was complex, with those reporting jobs to be 'quite easygoing' over four times as likely to report higher frequency scores than those describing their jobs as 'very stressful' (see Figure 4.7 below).

Figure 4.7
Odds ratios for prevalence of pain frequency by 'Very stressful'-'Very easygoing'

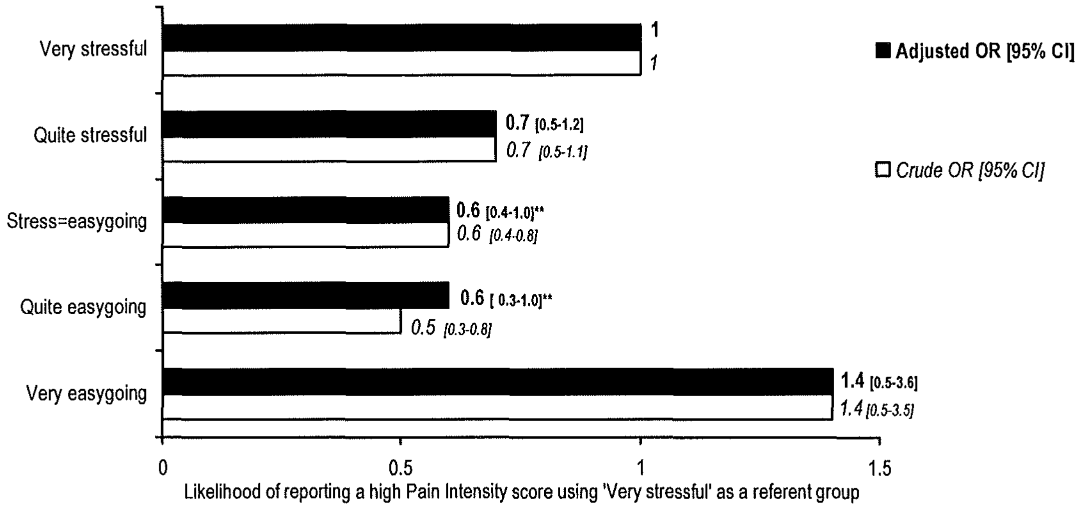


(iii) Associations between demographic factors, work variables and Pain Intensity score

Table 4.11iii shows that unadjusted pain frequency scores tended to be higher in women (OR 1.5, 95% CI 1.2-1.8). There was a trend towards lower pain intensity scores in more privileged socioeconomic groups, although this trend was not linear, and was not significant (see Table 4.11). There was some variability in other demographic factors; however, none of these were significant in the crude analysis (see Table 4.11).

In relation to work variables, there were four significant crude associations with pain intensity scores: 'income'; 'stress of workload'; 'desire to continue in job'; and 'control of breaks'. Using 'Under £10 000' per annum as a referent category, individuals were less likely to report higher frequency scores when they were in receipt of £50 000 per annum or more (OR 0.2, 95% CI 0.1-0.6). Individuals who found their workload: 'quite stressful'; 'equally stressful and easygoing' or 'quite easygoing' were more likely to report lower pain intensity (see Figure 4.8 below).

Figure 4.8
Odds ratios for pain intensity
by 'Very stressful'-'Very easygoing'



In addition, the crude analysis showed that individuals who wanted to continue in their current jobs were significantly less likely to report a higher pain intensity than those who wanted to move on (OR 0.7, 95% CI 0.5 -0.9). Similarly, those who could take a break whenever they needed one were less likely to report pain of higher intensity than those who had no control over their breaks (OR 0.6, 95% CI 0.5 -0.8). There was an unadjusted trend towards lower pain intensity scores where individuals never worked shifts (using 'always works shifts' as a referent category, OR 0.7, 95% CI 0.5 -1.0).

After adjustment for all demographic and work factors, the association between higher pain frequency, after ten steps, the stepwise regression identified nine factors that remained significantly associated with higher pain intensity scores: 'gender', 'size of family'; 'chronic condition'; 'industry', 'income'; 'unskilled/skilled'; 'hours/day'; 'stress of workload'; and 'desire to continue in current job'. This final model was of good fit (X^2=5.4 (8), n.s.), and contributed to 11% of the variability between outcomes (Nagelkerke R^2=0.107.

Associations between pain intensity scores and 'gender', 'income', 'stress', and 'desire to continue in job' were relatively unchanged by adjustment. Pain intensity was more likely to be higher in women (Adj OR 1.6, 95% CI 1.2-2.1), and more likely to be *lower* in those in the highest salary bracket (Adj OR 0.2, 95% CI 0.1-0.7), and/or in those who wanted to continue in their current job

(Adj OR 0.4, 95% CI 0.5-0.9). Pain intensity was also likely to be lower in individuals describing their jobs as somewhere in between 'stressful' and 'easygoing' (see Figure 4.8). The adjusted association between having a chronic condition and pain intensity became slightly less significant, although it remained significant overall (Adj OR 0.7, 95% CI 0.5-*0.97*);

Three significant crude associations disappeared after adjustment for other factors: socioeconomic group (removed at Step 4, see Table 4.11); shift-work (removed at Step 9, see Table 4.14); and control of breaks (removed at Step 7, see Table 4.14).

Finally, several associations that were only marginally associated with higher pain intensity became significant when other variables were taken into consideration. Specifically, these were: 'family size'; 'industry'; 'unskilled/skilled'; and 'hours/day'. Higher pain intensity scores were less likely; where individuals had smaller families than where individuals had more than three children (see Table 4.12 for Adj ORs); where individuals worked in the Health Services (Adj OR 0.4, 95% CI 0.2-0.9); and where individuals worked fewer hours every day (Adj OR 0.6, 95% CI 0.4-0.8). The factor 'unskilled-skilled' remained in the final model as a significant association (X^2=9.3 (4), $p<0.05$), although the nature of this association is unclear, as none of the individual categories in this variable were significant (see Table 4.12).

Table 4.11

Demographic variables and likelihood of yielding a higher score (> median) on measures of pain experience (Total GPQ, Frequency and Intensity) given as: (a) Crude ORs and (b) ORs after adjustment using backward stepwise logistic regression given as at the last step the variable was included in the analysis. Adjusted that remained in the last step are given in bold. Nagelkerke R^2 values are given for each step. *Referent groups are given in italics.*

	Total GPQ						Frequency						Intensity					
	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]		(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	*Removed at*	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	*Removed at*
Men	1.0			*1.0*			1.0			*1.0*			*1.0*			*1.0*		
Women	1.4	[1.2-1.8]	11.38***	1.6	***[1.2-2.0]	**Remained at**	1.3	[1.0-1.6]	4.73**	1.5	***[1.1-1.9]	**Remained at**	1.5	[1.2-1.8]	11.2***	1.6	***[1.2-2.1]	**Remained at**
			(1) .001			**Last Step**			(1).030			**Last Step**			(1).001			**last step**
Aged 16-25	1.0					**R^2=0.12**	1.0			*1.0*		**R^2=0.12**	*1.0*					**R^2=0.11**
26-35	0.7	[0.5--0.9]	6.14				0.7	[0.5-1.0]	16.08***	**0.8**	**[0.6-1.2]**	**Remained at**	0.8	[0.6-1.2]	2.65			
36-45	0.7	[0.5-1.0]	(4)				0.9	[0.6-1.3]	(4)	**1.0**	**[0.7-1.5]**	**Last Step**	1.0	[0.7-1.4]	(4)			
46-55	0.7	[0.5-1.0]					1.3	[0.9-1.9]		**1.4**	**[0.9-2.1]**	**R^2=0.12**	0.8	[0.6-1.2]				
56-65	0.8	[0.5-1.4]					1.4	[0.8-2.5]		**1.5**	**[0.8-2.7]**		1.0	[0.6-1.8]				
SEG Unskilled	1.0			*1.0*			1.0			*1.0*			*1.0*			*1.0*		
Partly skilled	0.5	[0.2-1.5]	16.6***	0.7	[0.2-2.1]	Removed at	0.6	[0.2-1.8]	19.87***	0.7	[0.1-2.9]	Removed at	0.7	[0.3-1.9]	21.23***	0.9	[0.3-2.8]	Removed at
Manual skilled	0.8	[0.3-2.2]	(5).002	1.1	[0.4-3.6]	Step 7	0.6	[0.2-1.9]	(5) .001	0.7	[0.1-3.3]	Step 1	1.0	[0.4-2.6]	(5).000	1.4	[0.4-4.4]	Step 4
Non-manual skilled	0.6	[0.2-1.7]		1.2	[0.4-3.6]	R^2=0.14	0.4	[0.1-1.0]		0.9	[0.2-4.3]	R^2=0.15	0.8	[0.3-2.1]		1.5	[0.4-4.9]	R^2=0.12
Managerial & Intermediate	0.5	[0.2-1.3]		0.9	[0.3-2.9]		0.3	[0.1-1.0]		0.7	[0.1-3.4]		0.7	[0.3-1.8]		1.5	[0.5-4.9]	
Professional	0.4	[0.1-1.1]		0.9	[0.3-2.8]		0.3	[0.1-0.9]		0.8	[0.1-4.0]		0.5	[0.2-1.2]		1.2	[0.3-4.3]	
Carstairs *Least affluent*	1.0						1.0						*1.0*					
score 6	1.5	[0.6-4.1]	2.87				1.7	[0.6-4.6]					1.2	[0.4-3.2]	5.31			
5	1.3	[0.5-3.2]	[6]				2.0	[0.8-5.0]					1.1	[0.4-2.8]	[6]			
4	1.0	[0.4-2.3]					1.7	[0.7-4.1]					0.9	[0.4-2.3]				
3	1.3	[0.5-3.2]					2.5	[1.0-6.4]					1.2	[0.5-3.1]				
2	1.4	[0.6-3.5]					3.0	[1.2-7.9]					1.2	[0.5-3.2]				
Most affluent	1.2	[0.5-3.3]					1.7	[0.6-4.7]					2.1	[0.8-5.7]				
Married/living with partner	1.0						1.0						*1.0*					
Single	1.1	[0.9-1.4]	0.39				1.0	[0.8-1.3]	0.01				1.0	[0.8-1.3]	0.01			
			(1)						(1)						(1)			
Spouse works	1.0						1.0						*1.0*					
Spouse doesn't work	1.0	[0.7-1.4]	0.05				1.3	[0.9-1.8]	2.09 (1)				1.3	[0.9-1.8	1.8 (1)			
			(1)															
More than 3 children	1.0			*1.0*			1.0			*1.0*			*1.0*			*1.0*		
3 children	0.6	[0.2-1.3]	15.61***	**0.5**	**[0.2-1.3]**	**Remained at**	1.3	[0.6-2.9]	15.1***	1.4	[0.6-3.3]	Removed at	0.5	[0.2-1.0]	8.78*	0.5	*[0.2-1.1]	**Remained at**
2 children	0.4	[0.2-0.9]	(4).004	0.3	***[0.1-0.7]	**Last Step**	0.7	[0.3-1.5]	(4).005	0.9	[0.4-2.0]	Step 13	0.4	[0.2-0.8]	(4).07	0.4	***[0.2-0.8]	**Last step**
1 child	0.4	[0.2-0.9]		0.4	*[0.2-1.1]	**R^2=0.12**	0.8	[0.3-1.7]		0.9	[0.4-2.1]	R^2=0.12	0.4	[0.2-1.0]		0.4	**[0.2-1.0]	**R^2=0.11**
No children	0.4	[0.2-0.9]		0.4	**[0.2-1.0]		0.6	[0.3-1.3]		0.8	[0.31.7]		0.4	[0.2-0.8]		0.4	***[0.2-0.8]	
With a chronic condition	1.0			*1.0*			1.0			*1.0*			*1.0*			*1.0*		
Without a chronic condition	0.5	[0.4-0.6]	27.91***	0.5	***[0.4-0.6]	**Remained at**	0.5	[0.4-0.7]	18.92***	0.5	***[0.4-0.7]	**Remained at**	0.7	[0.5-0.9]	5.74**	0.7	**[0.5-1.0]	**Remained at**
			(1).000			**Last step**			(1).000			**Last Step**			(1).017			**Last step**
						R^2=0.12						**R^2=0.12**						**R^2=0.11**

*p<0.1; **p<0.05; ***p<0.01; Underlined= significant at p<0.006

Table 4.12

Work variables and likelihood of yielding a higher Total GPQ score (> median) given as: (a) Crude ORs and (b) ORs after adjustment using backward stepwise logistic regression given as at the last step the variable was included in the analysis. Adjusted variables that were removed are given in italics, and adjusted variables that remained in the last step are given in bold. Nagelkerke R^2 values are given for each step. *Referent groups are given in italics.*

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
Heavy Industry production & research	1.0					
Banks & Financial services	1.6	[0.9-2.8]	12.75			
Computer industry	1.5	[0.9-2.4]	(9)			
Emergency service	2.0	[1.0-4.1]				
Food production & distribution	2.7	[1.4-5.3]				
Health services	1.6	[0.9-2.8]				
Higher Education	1.4	[0.8-2.6]				
Local government & council business	1.9	[1.0-3.4]				
Pharmaceutical production & research	1.3	[0.8-2.1]				
Media	1.4	[0.8-2.6]				
Under 10K	1.0			*1.0*		
10 – 24K	0.9	[0.7-1.3]	11.47**	1.3	[0.7-2.3]	Removed at
25 – 39K	0.7	[0.5-0.9]	(4).022	1.2	[0.5-2.9]	Step 2
40 – 54K	0.6	[0.3-1.0]		1.2	[0.4-3.1]	R2=0.14
Over 55K	0.6	[0.3-1.2]		1.0	[0.3-2.9]	
Manual	1.0			*1.0*		
Manual > Non-manual	1.2	[0.7-2.1]	19.23***	**1.3**	**[0.7-2.4]**	**Remained at**
Manual = Nonmanual	0.7	[0.5-1.1]	(4).001	**0.8**	**[0.5-1.3]**	**Last Step**
Manual < Non-manual	0.6	[0.4-0.9]		**0.6**	****[0.4-1.0]**	**R²=0.12**
Non-manual	0.6	[0.4-0.8]		**0.6**	****[0.4-0.9]**	
Unskilled	1.0			*1.0*		
Unskilled > Skilled	0.8	[0.4-1.4]		**0.9**	**[0.5-1.6]**	**Remained at**
Unskilled = Skilled	1.0	[0.6-1.7]		**1.3**	**[0.8-2.3]**	**Last Step**
Unskilled < Skilled	0.9	[0.5-1.4]		**1.1**	**[0.7-1.9]**	**R²=0.12**
Skilled	0.5	[0.3-0.8]		**0.7**	**[0.4-1.2]**	
Unprofessional	1.0			*1.0*		
Unprofessional > Professional	0.7	[0.4-1.1]	17.17***	0.8	[0.4-1.6]	Removed at
Unprofessional = Professional	1.3	[0.9-2.0]	(4).002	1.6	[0.8-3.0]	Step 9
Unprofessional < Professional	0.8	[0.5-1.2]		0.9	[0.5-1.8]	R2=0.15
Professional	0.7	[0.5-0.9]		1.0	[0.6-1.6]	
over 8 hours/day	1.0			*1.0*		
8 hours/day and below	1.4	[1.1-1.8]	6.53** (1).011	**0.6**	*****[0.5-0.8]**	**Remained at Last Step R²=0.12**

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
35 hrs/wk	1.0					
20-34 hrs/wk	1.1	[0.8-1.6]	1.32			
<20 hrs/wk	1.1	[0.7-1.7]	(3)			
>35 hrs/wk	0.8	[0.4-1.6]				
Full-time	1.0					
Part-time	0.9	[0.6-1.4]	0.01 (1)			
Shifts always	1.0			*1.0*		
Sometimes	0.8	[0.5-1.2]	14.1***	0.8	[0.5-1.3]	Removed at
Never	0.6	[0.5-0.8]	(2).001	**0.7**	****[0.5-1.0]**	Step 8 R2=0.13
Permanent	1.0					
Temporary	1.0	[0.9-1.2]	0.04 (1)			
Conventional hrs never	1.0			*1.0*		
Sometimes	0.9	[0.6-1.2]	8.24**	1.1	[0.8-1.7]	Removed at
Always	0.7	[0.5-0.9]	(2)	1.2	[0.8-1.8]	Step 3 R2=0.14
Organise tasks never	1.0			*1.0*		
Sometimes	0.6	[0.4-1.0]	6.58**	0.7	[0.4-1.2]	Removed at
Always	0.6	[0.4-0.9]	(2)	0.8	[0.5-1.3]	Step 6 R2=0.14
Computer use always	1.0					
Sometimes	0.9	[0.7-1.1]	2.78 (2)			
Never	1.2	[0.9-1.8]				
Physical	1.0			*1.0*		
Physical > Mental	0.7	[0.3-1.5]	20.99***	0.8	[0.4-1.9]	Removed at
Physical = Mental	0.5	[0.2-0.9]	(4)	0.6	[0.2-1.2]	Step 5
Physical < Mental	0.3	[0.2-0.6]		0.6	[0.2-1.3]	R2=0.14
Mental	0.4	[0.2-0.7]		0.6	[0.3-1.5]	

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
Very stressful	1.0			*1.0*		
Quite stressful	0.6	[0.4-1.0]	20.88***	**0.6**	****[0.4-1.0]**	**Remained at**
Stressful = Easygoing	0.5	[0.3-0.7]	(4)	**0.6**	*****[0.4-0.8]**	**Last Step**
Quite easygoing	0.4	[0.3-0.7]		**0.5**	*****[0.3-0.8]**	**R²=0.12**
Very easygoing	1.5	[0.6-4.2]		**1.5**	**[0.5-4.2]**	
Difficult to cope a lot of the time	1.0			*1.0*		
Easy to cope = Difficult to cope	0.7	[0.4-1.1]	6.79*	0.9	[0.5-1.7]	Removed at
Easy to cope a lot of the time	0.5	[0.3-0.9]	(3)	0.8	[0.4-1.6]	Step 1
Well within capabilities	0.7	[0.4-1.2]		0.9	[0.5-1.7]	R2=0.15
Autonomous	1.0					
Autonomous > Teamwork	1.0	[0.6-1.8]	5.79			
Autonomous = Teamwork	0.9	[0.5-1.7]	(4)			
Autonomous < Teamwork	0.8	[0.5-1.5]				
Teamwork	1.3	[0.7-2.4]				
Never enjoy job	1.0					
Sometimes enjoy job	0.7	[0.4-1.1]	3.39 (2)			
Always enjoy job	0.6	[0.4-1.0]				
Job not secure	1.0					
Job secure	1.0	[0.8-1.3]	0.03 (1)			
No desire to continue in job	1.0			*1.0*		
Desire to continue in job	0.6	[0.5-0.8]	11.89*** (1)	**0.7**	****[0.5-1.0]**	**Remained at Last Step R²=0.12**
Others control breaks	1.0			*1.0*		
Others control = Own control	0.8	[0.6-1.2]	19.7***	1.0	[0.6-1.5]	Removed at
Own control of breaks	0.6	[0.4-0.7]	(2)	**0.7**	****[0.5-1.0]**	Step 4 R2=0.14
Irregular breaks	1.0					
Regular = Irregular	0.8	[0.6-1.1]	2.57 (2)			
Regular breaks	0.9	[0.7-1.2]				
Short breaks (<15min/4hrs)						
Long = Short	0.9	[0.7-1.1]	1.94			
Long breaks (>15min/4hrs)	1.1	[0.8-1.6]	(2)			

*p<0.1; **p<0.05; ***p<0.01; Underlined= significant at p<0.002

Table 4.13

Work variables and likelihood of yielding a higher Frequency score (> median) given as: (a) Crude ORs and (b) ORs after adjustment using backward stepwise logistic regression given as at the last step the variable was included in the analysis. Adjusted variables that were removed are given in italics, and adjusted variables that remained in the last step are given in bold. Nagelkerke R^2 values are given for each step. *Referent groups are given in italics.*

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
Heavy Industry production & research	*1.0*			*1.0*		
Banks & Financial services	1.0	[0.6-1.8]	18.22**	**0.8**	**[0.4-1.5]**	**Remained**
Computer industry	1.3	[0.8-2.0]	(9)	**1.3**	**[0.8-2.1]**	**at Last Step**
Emergency service	2.1	[1.0-4.1]		**2.4**	****[1.2-5.0]**	**R^2=0.12**
Food production & distribution	2.0	[1.0-3.9]		**1.5**	**[0.7-3.1]**	
Health services	1.2	[0.7-2.0]		**1.6**	**[0.8-3.1]**	
Higher Education	1.7	[0.9-3.1]		**0.8**	**[0.4-1.6]**	
Local government & council business	1.7	[0.9-3.1]		**1.5**	**[0.8-2.8]**	
Pharmaceutical production & research	1.1	[0.7-1.7]		**1.1**	**[0.6-1.8]**	
Media	2.0	[1.1-3.6]		**2.2**	****[1.2-4.1]**	
Under 10K	*1.0*			*1.0*		
10 – 24K	0.7	[0.5-0.9]	14.82***	1.1	[0.7-1.8]	Removed at
25 – 39K	0.6	[0.4-0.8]	(4).005	1.1	[0.6-1.8]	Step 6
40 – 54K	0.4	[0.2-0.7]		0.7	[0.3-1.6]	R^2=0.14
Over 55K	0.6	[0.3-1.2]		1.0	[0.4-2.4]	
Manual	*1.0*			*1.0*		
Manual > Non-manual	0.9	[0.5-1.5]	<u>23.11</u>***	1.0	[0.5-1.9]	Removed at
Manual = Nonmanual	0.6	[0.4-1.0]	(4).000	1.0	[0.6-1.8]	Step 3
Manual < Non-manual	0.5	[0.4-0.8]		0.8	[0.4-1.4]	R^2=0.14
Non-manual	0.5	[0.4-0.7]		0.8	[0.5-1.3]	
Unskilled	*1.0*			*1.0*		
Unskilled > Skilled	0.8	[0.4-1.5]	<u>24.41</u>***	**0.8**	**[0.4-1.6]**	
Unskilled = Skilled	0.9	[0.5-1.4]	(4) 0.001	**1.1**	**[0.6-2.0]**	
Unskilled < Skilled	0.6	[0.3-0.9]		**0.6**	**[0.4-1.1]**	
Skilled	0.5	[0.3-0.7]		**0.6**	*****[0.3-0.9]**	
Unprofessional	*1.0*			*1.0*		
Unprofessional > Professional	0.6	[0.4-1.0]	16.02***	0.7	[0.4-1.3]	Removed at
Unprofessional = Professional	0.8	[0.5-1.2]	(4).003	1.0	[0.6-1.7]	Step 5
Unprofessional < Professional	0.6	[0.4-0.9]		1.1	[0.6-1.8]	R^2=0.14
Professional	0.6	[0.4-0.8]		1.1	[0.7-1.8]	
over 8 hours/day						
8 hours/day and below	1.1	[0.8-1.4]	0.22 (1)			

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
35 hrs/wk	*1.0*					
20-34 hrs/wk	1.0	[0.7-1.4]	1.95			
<20 hrs/wk	1.3	[0.9-2.1]	(3)			
>35 hrs/wk	0.9	[0.4-1.8]				
Full-time	*1.0*					
Part-time	1.2	[0.8-1.7]	0.55 (1)			
Shifts always	*1.0*			*1.0*		
Sometimes	1.0	[0.7-1.5]	8.22**	1.2	[0.8 2.0]	Removed at
Never	0.7	[0.5-0.9]	(2).016	1.2	[0.8-1.9]	Step 7 R^2=0.14
Permanent	*1.0*					
Temporary	1.2	[0.8-1.9]	0.53 (1)			
Conventional hrs never	*1.0*			*1.0*		
Sometimes	0.7	[0.5-0.9]	<u>18.33</u>***	0.8	[0.6-1.2]	Removed at
Always	0.6	[0.4-0.7]	(2)	0.8	[0.6-1.2]	Step 8 R^2=0.14
Organise tasks never	*1.0*			*1.0*		
Sometimes	0.6	[0.4-0.9]	11.3***	**0.6**	****[0.4-1.0]**	**Remained**
Always	0.5	[0.3-0.8]	(2).	**0.6**	****[0.3-0.9]**	**at Last Step R^2=0.12**
Computer use always	*1.0*			*1.0*		
Sometimes	1.0	[0.8-1.3]	10.92***	0.9	[0.6-1.1]	Removed at
Never	1.9	[1.3-2.8]	(2)	0.9	[0.5-1.5]	Step 9 R^2=0.14
Physical	*1.0*			*1.0*		
Physical > Mental	0.6	[0.3-1.3]	<u>27.58</u>***	0.7	[0.3-1.7]	Removed at
Physical = Mental	0.4	[0.2-0.8]	(4)	0.5	[0.2-1.2]	Step 10
Physical < Mental	0.3	[0.2-0.6]		0.5	[0.2-1.2]	R^2=0.13
Mental	0.3	[0.2-0.5]		0.5	[0.2 1.2]	
	0.3	[0.2-0.5]				

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
Very stressful	*1.0*			*1.0*		
Quite stressful	1.1	[0.7-1.6]	14.17***	**1.2**	**[0.8-1.9]**	**Remained at**
Stressful = Easygoing	0.8	[0.6-1.2]	(4)	**0.9**	**[0.6-1.4]**	**Last Step**
Quite easygoing	0.8	[0.5-1.3]		**0.8**	**[0.5-1.4]**	**R^2=0.12**
Very easygoing	4.1	[1.3-13.0]		**4.4**	*****[1.4-14.6]**	
Difficult to cope a lot of the time	*1.0*			*1.0*		
Easy to cope = Difficult to cope	0.7	[0.4-1.2]	10.86**	0.9	[0.5-1.7]	Removed at
Easy to cope a lot of the time	0.7	[0.4-1.1]	(3)	0.9	[0.5-1.7]	Step 11
Well within capabilities	1.1	[0.6-1.8]		1.2	[0.6-2.2]	R^2=0.13
Autonomous	*1.0*			*1.0*		
Autonomous > Teamwork	0.7	[0.4-1.3]	14.03***	1.0	[0.5-2.0]	Removed at
Autonomous = Teamwork	0.6	[0.3-1.1]	(4)	0.9	[0.5-1.7]	Step 12
Autonomous < Teamwork	0.8	[0.5-1.5]		1.2	[0.6-2.3]	R^2=0.13
Teamwork	1.1	[0.6-2.0]		1.4	[0.7-2.8]	
Never enjoy job	*1.0*			*1.0*		
Sometimes enjoy job	0.7	[0.4-1.2]	1.91			
Always enjoy job	0.7	[0.4-1.2]	(2)			
Job not secure	*1.0*			*1.0*		
Job secure	0.8	[0.6-1.0]	4.61** (1)	1.0	[0.7-1.3]	Removed at Step 2 R^2=0.14
No desire to continue in job	*1.0*			*1.0*		
Desire to continue in job	0.6	[0.5-0.8]	<u>16.01</u>** (1)	**0.6**	*****[0.5-0.8]**	**Remained at Last Step R^2=0.12**
Others control breaks	*1.0*			*1.0*		
Others control = Own control	0.7	[0.5-1.1]	<u>13.73</u>***	1.2	[0.7-1.8]	Removed at
Own control of breaks	0.6	[0.4-0.8]	(2)	1.1	[0.7-1.7]	Step 4 R^2=0.14
Irregular breaks	*1.0*					
Regular = Irregular	0.8	[0.6-1.0]	4.28			
Regular breaks	0.9	[0.7-1.2]	(2)			
Short breaks (<15min/4hrs)						
Long = Short	1.0	[0.8-1.3]	0.97			
Long breaks (>15min/4hrs)	1.2	[0.8-1.6]	(2)			

*p<0.1; **p<0.05; ***p<0.01; <u>Underlined= significant at p<0.002</u>

Table 4.14

Work variables and likelihood of yielding a higher Intensity score (> median) given as: (a) Crude ORs and (b) ORs after adjustment using backward stepwise logistic regression given as at the last step the variable was included in the analysis. Adjusted variables that were removed are given in italics, and adjusted variables that remained in the last step are given in bold. Nagelkerke R^2 values are given for each step. *Referent groups are given in italics.*

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
Heavy Industry production & research	1.0			*1.0*		
Banks & Financial services	1.5	[0.9-2.6]	23.78***	1.0	[0.5-1.8]	Remained
Computer industry	1.1	[0.7-1.8]	(9)	0.9	[0.6-1.5]	at last
Emergency service	2.1	[1.1-4.3]		1.8	[0.9-3.8]	step
Food production & distribution	2.0	[1.0-4.0]		1.4	[0.7-2.8]	R^2=0.11
Health services	1.5	[0.9-2.7]		0.4	**[0.2-0.9]	
Higher Education	0.7	[0.4-1.3]		0.9	[0.5-1.6]	
Local government & council business	1.7	[0.9-3.1]		1.2	[0.7-2.3]	
Pharmaceutical production & research	1.0	[0.6-1.7]		0.8	[0.5-1.4]	
Media	1.0	[0.5-1.9]		0.9	[0.5-1.7]	
Under 10K	*1.0*			*1.0*		
10 – 24K	0.9	[0.7-1.2]	21.32***	1.0	[0.7-1.5]	Remained
25 – 39K	0.6	[0.4-0.8]	(4).000	0.7	[0.4-1.2]	at last
40 – 54K	0.8	[0.5-1.4]		1.1	[0.5-2.1]	step
Over 55K	0.2	[0.1-0.6]		0.2	***[0.1-0.7]	R^2=0.11
Manual	*1.0*			*1.0*		
Manual > Non-manual	1.0	[0.6-1.8]	8.29*	1.3	[0.7-2.3]	Removed
Manual = Nonmanual	0.7	[0.5-1.1]	(4).081	1.0	[0.6-1.7]	at Step 2
Manual < Non-manual	0.7	[0.4-1.0]		1.0	[0.6-1.8]	R^2=0.13
Non-manual	0.7	[0.5-0.9]		1.2	[0.7-1.9]	
Unskilled	*1.0*			*1.0*		
Unskilled > Skilled	0.8	[0.4-1.4]		0.7	[0.4-1.4]	Remained
Unskilled = Skilled	1.1	[0.7-1.8]		1.2	[0.7-2.0]	at last
Unskilled < Skilled	0.9	[0.5-1.4]		1.0	[0.6-1.7]	step
Skilled	0.6	[0.4-0.9]		0.7	[0.4-1.2]	R^2=0.11
Unprofessional	*1.0*			*1.0*		
Unprofessional > Professional	0.9	[0.5-1.4]	16.04***	0.9	[0.5-1.6]	Removed
Unprofessional = Professional	1.2	[0.8-1.8]	(4).003	1.3	[0.8-2.1]	at Step 6
Unprofessional < Professional	0.8	[0.5-1.1]		0.9	[0.5-1.5]	R^2=0.12
Professional	0.6	[0.5-0.9]		1.0	[0.6-1.6]	
over 8 hours/day	*1.0*			*1.0*		
8 hours/day and below	1.3	[1.0-1.7]	4.67**	0.6	***[0.4-0.8]	Remained
			(1).031			at last
						step
						R^2=0.11

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
35 hrs/wk	1.0					
20-34 hrs/wk	1.3	[0.9-1.8]	2.44			
<20 hrs/wk	1.2	[0.8-1.9]	(3)			
>35 hrs/wk	0.9	[0.5-2.0]				
Full-time	*1.0*					
Part-time	1.1	[0.8-1.6]	0.61			
			(1)			
Shifts always	*1.0*			*1.0*		
Sometimes	0.8	[0.5-1.2]	10.89***	0.8	[0.5-1.3]	Removed
Never	0.6	[0.5-0.8]	(2).004	0.7	**[0.5-1.0]	at Step 9
						R^2=0.11
Permanent	*1.0*					
Temporary	1.1	[0.7-1.8]	0.31			
			(1)			
Conventional hrs never	*1.0*			*1.0*		
Sometimes	0.8	[0.6-1.0]	7.03**	1.0	[0.6-1.4]	Removed
Always	0.7	[0.5-0.9]	(2)	1.0	[0.7-1.6]	at Step 1
						R^2=0.13
Organise tasks never	*1.0*			*1.0*		
Sometimes	0.6	[0.4-1.0]	4.97*	0.8	[0.5-1.3]	Removed
Always	0.6	[0.4-1.0]	(2)	0.9	[0.5-1.5]	at Step 5
						R^2=0.12
Computer use always	*1.0*					
Sometimes	0.9	[0.7-1.1]	2.62			
Never	1.2	[0.8-1.7]	(2)			
Physical	*1.0*			*1.0*		
Physical > Mental	0.7	[0.4-1.4]	13.26**	0.9	[0.4-1.8]	Removed
Physical = Mental	0.7	[0.4-1.3]	(4)	1.0	[0.5-2.0]	at Step 3
Physical < Mental	0.5	[0.3-0.8]		0.8	[0.4-1.6]	R^2=0.12
Mental	0.5	[0.3-0.9]		0.9	[0.4-1.8]	

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
Very stressful	1.0			*1.0*		
Quite stressful	0.7	[0.5-1.1]	16.48***	0.7	[0.5-1.2]	Remained
Stressful = Easygoing	0.6	[0.4-0.8]	(4)	0.6	**[0.4-1.0]	at last
Quite easygoing	0.5	[0.3-0.8]		0.6	**[0.3-1.0]	step
Very easygoing	1.4	[0.5-3.5]		1.4	[0.5-3.6]	R^2=0.11
Difficult to cope a lot of the time	*1.0*			*1.0*		
Easy to cope = Difficult to cope	0.5	[0.3-0.8]	9.34**	0.6	*[0.3-1.1]	Removed
Easy to cope a lot of the time	0.6	[0.3-1.0]	(3)	0.7	[0.4-1.3]	at Step 8
Well within capabilities	0.6	[0.3-1.0]		0.7	[0.4-1.4]	R^2=0.11
Autonomous	*1.0*					
Autonomous > Teamwork	1.0	[0.6-1.7]	3.38			
Autonomous = Teamwork	0.9	[0.5-1.6]	(4)			
Autonomous < Teamwork	0.8	[0.4-1.4]				
Teamwork	1.1	[0.6-2.0]				
Never enjoy job	*1.0*					
Sometimes enjoy job	0.8	[0.5-1.2]	1.53			
Always enjoy job	0.7	[0.4-1.2]	(2)			
Job not secure	*1.0*					
Job secure	0.9	[0.7-1.2]	0.22			
			(1)			
No desire to continue in job	*1.0*			*1.0*		
Desire to continue in job	0.7	[0.5-0.9]	9.39***	0.7	**[0.5-0.9]	Remained
			(1)			at last
						step
Others control breaks	*1.0*			*1.0*		R^2=0.11
Others control = Own control	0.7	[0.5-1.0]	12.12***	0.7	[0.5-1.1]	Removed
Own control of breaks	0.6	[0.5-0.8]	(2)	0.9	[0.6-1.3]	at Step 7
						R^2=0.12
Irregular breaks	*1.0*					
Regular = Irregular	0.8	[0.6-1.0]	3.43			
			((2)			
Regular breaks	0.8	[0.6-1.1]				
Short breaks (<15min/4hrs)	*1.0*					
Long = Short	0.8	[0.7-1.1]	2.42			
Long breaks (>15min/4hrs)	0.9	[0.6-1.2]	(2)			

*p<0.1; **p<0.05; ***p<0.01; Underlined= significant at p<0.002

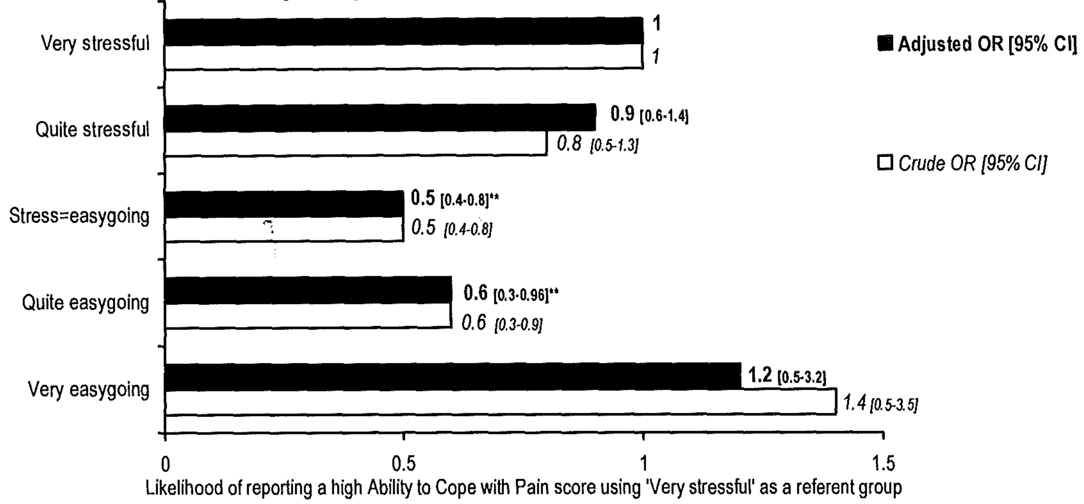
Crude and adjusted ORs discussed in the following sections can be found in Tables 4.15-4.18.

(iv) Associations between demographic factors, work variables and Ability to Cope with Pain score

As with the other aspects of pain experience, analyses were carried out to explore the extent to which demographic factors and work variables were associated with higher Ability to Cope with Pain scores. The higher the coping score, the less an individual was able to cope with their pain. Crude analyses revealed that four demographic variables were associated with perceived ability to cope with pain: 'gender', 'socioeconomic group', 'family size' and 'chronic condition' (X^2=23.48 (1), $p<0.001$; X^2=14.38 (3), $p<0.002$; X^2=18.36 (5), $p<0.001$; and X^2=12.05 (1), $p<0.001$ respectively). Women were more likely to perceive their pain more difficult to cope with than men (OR 1.7 95%CI 1.4-2.1). Although there was significant variability between observed and expected frequencies when socioeconomic group was cross-tabulated with Ability to Cope scores, the nature of this association was unclear from unadjusted ORs (see Table 4.15). Individuals were *less* likely to perceive their pain as difficult to cope with where they had a chronic condition (OR 0.6 95%CI 0.5-0.8), as well as where they had two children (OR 0.4 95%CI 0.2-0.8). However, crude ORs for having one child or having no children were not significant (see Table 4.15).

In relation to work factors, there were also only three crude associations with perceived ability to cope with pain: 'income'; 'stress of workload' and 'control of breaks' (X^2=19.91 (4), $p<0.002$; X^2=21.28 (4), $p<0.002$ and X^2=12.73 (2), $p<0.002$ respectively; see Table 4.14). Individuals were more likely to experience pain that was difficult to cope with where they had higher incomes (for '£40-54 000 per annum' OR 0.5 95% CI 0.3-0.9, and for 'Over £55 000 per annum' OR 0.4 95% CI 0.2-0.9, both using 'Under £10 000 per annum' as a referent category). Individuals perceiving their jobs to be between 'very easygoing' and 'very stressful' were less likely to experience pain that was difficult to cope with (see Figure 4.11 below), as were those who had control of their own breaks (OR 0.7 95% CI 0.5-0.9, using 'Others control breaks' as a referent category).

Figure 4.9
Odds ratios for ability to cope with pain by 'Very stressful'-'Very easygoing'



Adjustment for all significant (p<0.1) demographic and work factors using stepwise regression revealed seven variables to be significantly associated with higher Ability to Cope scores at the tenth and final step: 'gender', 'age', 'family size'; 'chronic condition', 'industry', 'stress of workload' and 'physicality of workload'. Adjustment barely affected the association betweens Ability to Cope with Pain and: 'gender', 'chronic condition', as well as 'industry'. Higher Ability to cope scores remained more likely in women (Adj OR 1.8, 95% CI 1.4-2.1); and less likely in individuals with two children (Adj OR 0.4, 95% CI 0.2-*0.96*); and those without a chronic condition (Adj OR 0.6, 95% CI 0.5-0.8). The association between Ability to Cope with Pain and 'stress of workload' was also only marginally changed by adjustment (see Figure 4.9 above).

Tables 4.15 and 4.16 show that several significant crude associations disappeared when other variables were taken into consideration: socioeconomic group (removed at Step 9); control of breaks (removed at Step 5) and 'income' (removed at Step 3).

Finally, three variables became significant after adjustment that were not significant in the crude analyses: 'age'; 'industry' and 'physicality of workload'. In the final regression model, SPSS reported age to be significantly associated with Ability to Cope with pain scores, even though its significance was greater than the conventional p value of 0.05 (X2=8.87 (4); p<0.06). It will therefore be discussed as a trend, the nature of which was somewhat difficult to interpret, however

Ability to Cope scores appeared to be lower in those aged 26-35 (Adj OR 0.7, 95% CI 0.5-*1.06*), and those aged 16-65 (Adj OR 0.6, 95% CI 0.3-*1.01*).

After adjustment, individuals working in the Emergency Services or in Local Government and Council business were more likely than those working in 'Heavy Industry' to experience pain that was difficult to cope with (Adj ORs 2.3, 95% CI 1.1-4.8 and 2.0, 95% CI 1.1-3.8 respectively). A relationship between physicality of workload and Ability to Cope with pain emerged after adjustment, also. Individuals were more likely to be able to cope with their pain where their level of physical effort than their mental effort (Adj ORs 0.4, 95% CI 0.2-0.8-2.1 for both 'More mental than physical effort', and 'Mostly mental effort').

(v) Associations between demographic factors, work variables and Pain Emotion score

Crude analysis of pain emotions cores showed very little association between any factors and emotion scores. Only gender was significantly associated with pain emotion, such that women were more likely to report a higher pain emotion score than men (OR 1.4 95%CI 1.2-1.8). No work factor was significantly associated with pain emotion at $p=0.002$ or less.

All crude associations significant at $p<0.1$ were entered into a stepwise regression analysis, which identified six significant associations with pain emotion that were not significant in the crude analyses for: 'gender'; 'chronic condition'; 'professional/unprofessional'; 'computer use'; and 'job enjoyment'. With the exception of gender, all associations significant in the final model were not significant in the crude analyses. This final model was of good fit ($X^2=2.78$ (8), n.s.) and accounted for only 5% of the variability between outcomes (Nagelkerke $R^2= 0.05$). . The association between gender and pain emotion was relatively unchanged, with women remaining more likely to report higher emotion scores than men (Adj OR 1.5 95%CI 1.2-1.9). Pain emotion was likely to be significantly lower where: individuals; had no chronic condition (Adj OR 0.7 95%CI 0.5-0.9); never worked shifts (Adj OR 0.7 95%CI 0.5-0.9); used computers only sometimes (Adj OR 0.7 95%CI 0.6-*0.96*).

The associations between 'professional/unprofessional' and 'job enjoyment' were more complex however. Although the entire factors of 'professional/unprofessional' and 'job enjoyment' were significant in the final model (X^2=10.19 (4), p<0.03 and X^2=6.05 (2), p<0.04 respectively), none of the categorical groups within these variables had significant adjusted ORs.

(vi) Associations between demographic factors, work variables and Impact score

There were few crude associations between demographic factors, work variables and impact scores. Only chronic condition was associated with pain impact, such that individuals without a chronic condition were less likely to experience pain of higher impact (OR 0.6 95%CI 0.4-0.8; X^2=12.36 (1), p<0.001). Certain aspects of work were also crudely associated with pain impact. Specifically, pain impact scores were likely to be lower where: individuals worked in jobs that: were *less* manual (for 'Mostly non-manual' OR 0.6 95% CI 0.4-0.9; X^2=18.38 (4), p<0.001); less skilled (for 'Mostly skilled' OR 0.5 95% CI 0.3-0.8; X^2=19.73 (4), p<0.001); and involved some level of mental effort (ORs: for 'Equally physical and mental effort' 0.4 95% CI 0.2-0.9; for 'More mental than physical effort' 0.4 95% CI 0.2-0.8; and for 'Mostly mental effort' 0.3 95% CI 0.2-0.7; X^2=18.38 (4), p<0.001).

Adjustment for all significant demographic and work factors had little effect on the association between pain impact and chronic condition, such that higher impact remained less likely in those without a chronic condition (Adj OR 0.6 95%CI 0.4-0.8; see Table 4.16 below). The relationship between physical effort in work and pain impact remained relatively similar, with pain impact likely to be greater where individuals' jobs required more mental effort than physical (Adj ORs: for 'More mental than physical effort' 0.4 95% CI 0.2-0.9; and for 'Mostly mental effort' 0.3 95% CI 0.2-0.8). The association between 'skilled/unskilled' and pain impact was substantially altered, however, such that its direction was reversed. In the adjusted figures, those reporting their jobs to be 'more unskilled than skilled' were the only significant category contributing to variability, and this group was *less* likely to report higher pain impact. When other factors were taken into consideration, the crude association between 'manual/non-manual' and pain impact was also altered, as it was no longer significant and was removed from analysis at Step 5 (see Table 4.17 below).

The final step of the regression revealed three associations with Pain impact that were not significant in the crude analysis: for 'income'; 'stress of workload'; and 'ability to cope with workload'. Pain impact was likely to be *higher* where: individuals earned between £10 000 and £25 000 (Adj OR 1.5 95%CI *1.04*-2.3); and where individuals viewed their jobs as being 'Mostly professional' (Adj OR 1.5 95%CI *1.04*-2.3).

Pain impact scores were less likely to be higher in individuals who reported their workloads to be: between stressful and easygoing (Adj ORs: for 'equally stressful and easygoing' 0.6 95%CI 0.3-0.9; and for 'quite easygoing' 0.5 95%CI 0.3-0.9); or easier to cope with (Adj ORs: for 'Equally easy and difficult to cope with' 0.5 95%CI 0.2-*0.98*; for 'Easy to cope with a lot of the time' 0.4 95%CI 0.2-0.9; and for 'Well within capabilities' 0.3 95%CI 0.2-0.6).

Table 4.15

Demographic variables and likelihood of yielding a high score (> median) on measures of pain experience (Ability to cope, Emotion and Impact) given as: (a) Crude ORs and (b) ORs after adjustment using backward stepwise logistic regression given as at the last step the variable was included in the analysis. Adjusted variables that were removed are given in italics, and adjusted variables that remained in the last step are given in bold. Nagelkerke R^2 values are given for each step. *Referent groups are given in italics.*

	Ability to cope						Emotion						Impact					
	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]		(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]		(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
Men	*1.0*			*1.0*			*1.0*			*1.0*			*1.0*					
Women	1.7	[1.4 -2.1]	23.48***	**1.8**	*****[1.4 -2.4]**	**Remained at**	1.4	[1.2 -1.8]	10.57***	**1.5**	*****[1.2 -1.9]**	**Remained at**	1.1	[0.9 -1.3]	0.36			
			(1) .000			**Last Step**			(1).001			**Last Step**			(1)			
Aged 16-25	*1.0*			*1.0*		**R^2=0.11**	*1.0*					**R^2=0.06**	*1.0*					
26-35	0.7	[0.5 -0.9]	7.87*	**0.7**	***[0.5 -1.0]**	**Remained at**	1.1	[0.7 -1.5]	6.09				0.9	[0.6 -1.3]	1.71			
36-45	0.7	[0.5 -1.0]	(4) .097	**0.9**	**[0.6 -1.4]**	**Last Step**	1.0	[0.7 -1.5]	(4)				0.9	[0.7 -1.4]	(4)			
46-55	0.8	[0.5 -1.1]		**1.0**	**[0.6 -1.5]**	**R^2=0.11**	0.7	[0.5 -1.1]					0.8	[0.6 -1.2]				
56-65	0.5	[0.3 -0.9]		**0.6**	***[0.3 -1.1]**		1.1	[0.6 -1.9]					1.2	[0.7 -2.1]				
SEG Unskilled	*1.0*			*1.0*			*1.0*			*1.0*			*1.0*					
Partly skilled	0.8	[0.3 -2.2]	18.36***	1.1	[0.3 -3.9]	Removed at	1.0	[0.4 -2.8]	8.02*	1.5	[0.5 -4.7]	Removed at	0.3	[0.1 -1.2]	5.78			
Manual skilled	1.0	[0.4 -2.7]	(5).001	2.1	[0.6 -7.7]	Step 9	1.1	[0.4 -2.8]	(5).091	1.5	[0.4 -5.1]	Step 3	0.5	[0.1 -1.7]	(5)			
Non-manual skilled	1.1	[0.4 -2.9]		1.5	[0.4 -5.4]	R^2=0.12	0.9	[0.4 -2.4]		2.0	[0.6 -6.7]	R^2=0.07	0.4	[0.1 -1.5]				
Managerial & Intermediate	0.9	[0.4 -2.4]		1.9	[0.5 -6.8]		0.9	[0.3 -2.3]		1.5	[0.4 -5.4]		0.3	[0.1 -1.2]				
Professional	0.6	[0.2 -1.6]		1.5	[0.4 -5.3]		0.7	[0.3 -1.8]		1.8	[0.5 -6.6]		0.3	[0.1 -1.1]				
Carstairs Score Least affluent 6	*1.0*						*1.0*						*1.0*					
5	2.3	[0.9 -5.7]	9.26				0.7	[0.3 -1.7]	6.37				1.6	[0.7 -3.9]	5.13			
4	1.5	[0.6 -3.9]	(6)				0.5	[0.2 -1.2]	(6)				1.0	[0.4 -2.4]	(6)			
3	1.5	[0.6 -3.8]					0.6	[0.2 -1.4]					1.3	[0.5 -3.2]				
2	1.5	[0.6 -3.9]					0.8	[0.3 -1.9]					1.1	[0.4 -2.6]				
Most affluent	3.3	[1.2 -9.3]					1.1	[0.4 -2.8]					0.9	[0.3 -2.4]				
Married/living with partner	*1.0*						*1.0*						*1.0*					
Single	1.1	[0.9 -1.4]	0.4				1.0	[0.8 -1.2]	0.1				1.1	[0.9 -1.4]	0.86			
			(1)						(1)						(1)			
Spouse works	*1.0*						*1.0*						*1.0*					
Spouse doesn't work	0.9	[0.6 -1.2]	0.84				1.2	[0.8 -1.6]	0.74				1.1	[0.8 -1.6]	0.57			
			(1)						(1)						(1)			
More than 3 children	*1.0*			*1.0*			*1.0*						*1.0*					
3 children	0.4	[0.2 -1.0]	19.22***	**0.5**	**[0.2 -1.3]**	**Remained at**	0.7	[0.3 -1.6]	11.24**				0.6	[0.2 -1.6]	4.51			
2 children	0.4	[0.2 -0.8]	(3).002	**0.4**	****[0.2 -0.96]**	**Last Step**	0.4	[0.2 -0.9]	(3).02				0.5	[0.2 -1.2]	(4)			
1 child	0.6	[0.3 -1.4]		**0.7**	**[0.3 -1.7]**	**R^2=0.11**	0.5	[0.2 -1.2]					0.5	[0.2 -1.2]				
No children	0.6	[0.3 -1.2]		**0.7**	**[0.3 -1.7]**		0.5	[0.2 -0.96]					0.6	[0.3 -1.4]				
With a chronic condition	*1.0*			*1.0*			*1.0*			*1.0*			*1.0*			*1.0*		
Without a chronic condition	0.6	[0.5 -0.8]	12.05***	**0.6**	**[0.5 -0.8]**	**Remained at**	0.7	[0.5 -0.9]	7.13***	**0.7**	****[0.5 -0.9]**	**Remained at**	0.6	[0.4 -0.8]	12.36***	**0.6**	*****[0.4 -0.8]**	**Remained at**
			(1).001			**Last Step**			(1).008			**Last Step**			(1).000			**Last Step**
						R^2=0.11						**R^2=0.06**						**R^2=0.08**

*p<0.1; **p<0.05; ***p<0.01; Underlined= significant at p<0.006

Table 4.16

Work variables and likelihood of yielding a high <u>Ability to Cope score</u> (> median) given as: (a) Crude ORs and (b) ORs after adjustment using backward stepwise logistic regression given as at the last step the variable was included in the analysis. Adjusted variables that were removed are given in italics, and adjusted variables that remained in the last step are given in bold. Nagelkerke R^2 values are given for each step.

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
Heavy Industry production & research	*1.0*			*1.0*		
Banks & Financial services	1.0	[0.5-1.8]	18.16**	**1.6**	**[0.9-3.0]**	**Remained**
Computer industry	2.0	[1.1-3.4]	(9).	**1.4**	**[0.8-2.2]**	**at Last Step**
Emergency service	1.4	[0.9-2.2]		**2.3**	****[1.1-4.8]**	**R^2=0.11**
Food production & distribution	2.0	[1.0-4.0]		**1.9**	***[0.9-3.8]**	
Health services	2.1	[1.1-4.0]		**0.9**	**[0.4-1.7]**	
Higher Education	1.7	[1.0-3.0]		**1.4**	**[0.7-2.6]**	
Local government & council business	1.3	[0.7-2.4]		**2.0**	****[1.1-3.8]**	
Pharmaceutical production & research	2.2	[1.2-3.9]		**1.1**	**[0.7-1.9]**	
Media	1.3	[0.8-2.1]		**0.9**	**[0.5-1.8]**	
Under 10K	*1.0*			*1.0*		
10 – 24K	1.0	[0.8-1.4]	<u>16.91</u>***	1.3	[0.7-2.4]	Removed at
25 – 39K	0.7	[0.5-1.0]	(4).002	1.5	[0.7-3.6]	Step 3
40 – 54K	0.5	[0.3-0.9]		1.3	[0.5-3.4]	R^2=0.14
Over 55K	0.4	[0.2-0.9]		1.0	[0.3-3.0]	
Manual	*1.0*			*1.0*		
Manual > Non-manual	1.3	[0.8-2.3]	9.44**	1.6	[0.9-2.9]	Removed at
Manual = Nonmanual	1.1	[0.7-1.6]	(4).051	1.4	[0.8-2.3]	Step 7
Manual < Non-manual	0.7	[0.5-1.1]		0.8	[0.5-1.5]	R^2=0.13
Non-manual	0.8	[0.6-1.1]		1.0	[0.6-1.7]	
Unskilled	*1.0*			*1.0*		
Unskilled > Skilled	0.9	[0.5-1.6]	8.89*	1.3	[0.7-2.5]	Removed at
Unskilled = Skilled	1.1	[0.6-1.8]	(4).064	1.6	[0.8-2.9]	Step 2
Unskilled < Skilled	1.0	[0.6-1.6]		1.4	[0.8-2.6]	R^2=0.14
Skilled	0.7	[0.5-1.1]		1.4	[0.8-2.6]	
Unprofessional	*1.0*					
Unprofessional > Professional	0.8	[0.5-1.3]	5.04			
Unprofessional = Professional	1.1	[0.7-1.6]	(4)			
Unprofessional < Professional	1.0	[0.7-1.5]				
Professional	0.8	[0.6-1.1]				
over 8 hours/day	*1.0*					
8 hours/day and below	1.2	[0.9-1.5]	1.33			
			(1)			

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
35 hrs/wk	*1.0*					
20-34 hrs/wk	1.2	[0.9-1.7]	1.83			
<20 hrs/wk	1.2	[0.8-1.8]	(3)			
>35 hrs/wk	1.0	[0.5-2.0]				
Full-time	*1.0*					
Part-time	1.0	[0.7-1.5]	0.22			
			(1)			
Shifts always	*1.0*					
Sometimes	1.0	[0.7-1.5]	3.26			
Never	0.8	[0.6-1.1]	(2)			
Permanent	*1.0*					
Temporary	0.7	[0.4-1.1]	2.18			
			(1)			
Conventional hrs never	*1.0*			*1.0*		
Sometimes	1.0	[0.8-1.4]	5.14*	1.1	[0.8-1.6]	Removed at
Always	0.8	[0.6-1.0]	(2)	0.8	[0.6-1.2]	Step 8
						R^2=0.12
Organise tasks never	*1.0*					
Sometimes	0.8	[0.5-1.3]	0.59			
Always	0.9	[0.6-1.3]	(2)			
Computer use always	*1.0*			*1.0*		
Sometimes	0.8	[0.6-1.0]	5.17*	0.8	[0.6-1.1]	Removed at
Never	1.2	[0.8-1.7]	(2)	0.7	[0.4-1.3]	Step 6
						R^2=0.13
Physical	*1.0*			*1.0*		
Physical > Mental	0.6	[0.3-1.1]	14.26***	**0.7**	**[0.3-1.4]**	**Remained at**
Physical = Mental	0.5	[0.3-1.0]	(4)	**0.7**	**[0.3-1.3]**	**Last Step**
Physical < Mental	0.4	[0.2-0.7]		**0.4**	*****[0.2-0.8]**	**R^2=0.11**
Mental	0.4	[0.2-0.7]		**0.4**	*****[0.2-0.8]**	

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
Very stressful	*1.0*			*1.0*		
Quite stressful	0.8	[0.5-1.3]	<u>21.28</u>***	**0.9**	**[0.6-1.4]**	**Remained**
Stressful = Easygoing	0.5	[0.4-0.8]	(4)	**0.5**	*****[0.4-0.8]**	**at Last Step**
Quite easygoing	0.6	[0.3-0.9]		**0.6**	****[0.3-1.0]**	**R^2=0.11**
Very easygoing	1.4	[0.5-3.5]		**1.2**	**[0.5-3.2]**	
Difficult to cope a lot of the time	*1.0*			*1.0*		
Easy to cope = Difficult to cope	0.5	[0.3-0.9]	6.23*	0.7	[0.4-1.3]	Removed at
Easy to cope a lot of the time	0.5	[0.3-1.0]	(3)	0.8	[0.4-1.5]	Step 4
Well within capabilities	0.5	[0.3-0.9]		0.9	[0.5-1.7]	R^2=0.14
Autonomous	*1.0*					
Autonomous > Teamwork	1.0	[0.5-1.7]	2.52			
Autonomous = Teamwork	1.0	[0.6-1.8]	(4)			
Autonomous < Teamwork	0.8	[0.5-1.5]				
Teamwork	1.1	[0.6-2.0]				
Never enjoy job	*1.0*					
Sometimes enjoy job	1.0	[0.6-1.7]	0.05			
Always enjoy job	1.0	[0.6-1.8]	(2)			
Job not secure	*1.0*					
Job secure	1.2	[0.9-1.6]	2.33			
			(1)			
No desire to continue in job	*1.0*					
Desire to continue in job	0.8	[0.6-1.0]	3.27*	1.1	[0.8-1.4]	Removed at
			(1)			Step 1
Others control breaks	*1.0*					R^2=0.14
Others control = Own control	1.0	[0.7-1.5]	<u>12.73</u>***	1.1	[0.7-1.6]	Removed at
Own control of breaks	0.7	[0.5-0.9]	(2)	0.8	[0.6 -1.2]	Step 5
						R^2=0.13
Irregular breaks	*1.0*					
Regular = Irregular	0.9	[0.7-1.2]	0.69			
Regular breaks	0.9	[0.7-1.2]	(2)			
Short breaks (<15min/4hrs)	*1.0*					
Long = Short	0.8	[0.7-1.1]	4.49			
Long breaks (>15min/4hrs)	1.1	[0.8-1.6]	(2)			

*p<0.1; **p<0.05; ***p<0.01; <u>Underlined= significant at p<0.002</u>

Table 4.17

Work variables and likelihood of yielding a high Emotion score (> median) given as: (a) Crude ORs and (b) ORs after adjustment using backward stepwise logistic regression given as at the last step the variable was included in the analysis. Adjusted variables that were removed are given in italics, and adjusted variables that remained in the last step are given in bold. Nagelkerke R^2 values are given for each step. ***Referent groups given in italics.***

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
Heavy Industry production & research	*1.0*					
Banks & Financial services	1.4	[0.8-2.5]	10.77			
Computer industry	1.1	[0.7-1.8]	(9)			
Emergency service	1.1	[0.5-2.1]				
Food production & distribution	1.2	[0.6-2.4]				
Health services	1.3	[0.8-2.3]				
Higher Education	0.9	[0.5-1.7]				
Local government & council business	1.6	[0.9-2.9]				
Pharmaceutical production & research	1.0	[0.6-1.7]				
Media	0.8	[0.4-1.4]				
Under 10K	*1.0*			*1.0*		
10 – 24K	0.9	[0.6-1.2]	9.33**	1.1	[0.8-1.6]	Removed at
25 – 39K	0.6	[0.4-0.9]	(4).053	1.0	[0.6-1.6]	Step 4
40 – 54K	0.7	[0.4-1.3]		1.5	[0.8-3.1]	R^2=0.07
Over 55K	0.6	[0.3-1.3]		1.2	[0.5-2.9]	
Manual	*1.0*					
Manual > Non-manual	1.1	[0.7-1.9]	5.32			
Manual = Nonmanual	0.9	[0.6-1.4]	(4)			
Manual < Non-manual	0.8	[0.5-1.1]				
Non-manual	0.8	[0.6-1.0]				
Unskilled	*1.0*			*1.0*		
Unskilled > Skilled	1.0	[0.6-1.9]	8.7*	1.1	[0.6-2.1]	Removed at
Unskilled = Skilled	1.0	[0.6-1.7]	(4).069	1.0	[0.6-1.9]	Step 2
Unskilled < Skilled	1.0	[0.6-1.6]		1.0	[0.6-1.9]	R^2=0.07
Skilled	0.7	[0.5-1.1]		0.9	[0.5-1.7]	
Unprofessional	*1.0*			*1.0*		
Unprofessional > Professional	0.7	[0.5-1.2]	16.11***	**0.8**	**[0.4-1.3]**	**Remained**
Unprofessional = Professional	1.3	[0.9-1.9]	(4).003	**1.3**	**[0.9-2.1]**	**at Last**
Unprofessional < Professional	1.2	[0.8-1.8]		**1.3**	**[0.9-2.0]**	**Step**
Professional	0.7	[0.5-1.0]		**0.9**	**[0.6-1.2]**	**R^2=0.06**
over 8 hours/day	*1.0*					
8 hours/day and below	1.2	[0.9-1.6]	2.18			
			(1)			

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
35 hrs/wk	*1.0*					
20-34 hrs/wk	1.2	[0.8-1.7]	1.17			
<20 hrs/wk	1.1	[0.7-1.7]	(3)			
>35 hrs/wk	0.9	[0.4-1.9]				
Full-time	*1.0*					
Part-time	1.1	[0.7-1.6]	0.05			
			(1)			
Shifts always	*1.0*			*1.0*		
Sometimes	1.0	[0.7-1.5]	6.99**	**0.9**	**[0.6-1.4]**	**Remained**
Never	0.7	[0.6-1.0]	(2).030	**0.7 *****	**[0.5-0.9]**	**at Last Step**
						R^2=0.06
Permanent	*1.0*					
Temporary	0.7	[0.4-1.1]	2.14			
			(1)			
Conventional hrs never	*1.0*					
Sometimes	0.9	[0.7-1.2]	4.34			
Always	0.8	[0.6-1.0]	(2)			
Organise tasks never	1.0					
Sometimes	0.7	[0.5-1.1]	1.84			
Always	0.8	[0.5-1.2]	(2)			
Computer use always	*1.0*			*1.0*		
Sometimes	0.8	[0.6-1.0]	5.12*	**0.7 ****	**[0.6-1.0]**	**Remained**
Never	1.2	[0.8-1.8]	(2)	**1.0**	**[0.6-1.5]**	**at Last Step**
						R^2=0.06
Physical	*1.0*			*1.0*		
Physical > Mental	0.7	[0.4-1.4]	8.01*	0.8	[0.4-1.6]	Removed at
Physical = Mental	0.6	[0.3-1.1]	(4)	0.6	[0.3-1.2]	Step 5
Physical < Mental	0.6	[0.3-1.0]		0.6	[0.3-1.2]	R^2=0.06
Mental	0.5	[0.3-0.9]		0.5	[0.3-1.1]	

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
Very stressful	*1.0*					
Quite stressful	0.8	[0.5-1.2]	4.95			
Stressful = Easygoing	0.7	[0.5-1.0]	(4)			
Quite easygoing	0.6	[0.4-1.0]				
Very easygoing	0.9	[0.4-2.3]				
Difficult to cope a lot of the time						
Easy to cope = Difficult to cope	0.8	[0.5-1.4]	3.61			
Easy to cope a lot of the time	0.7	[0.4-1.3]	(3)			
Well within capabilities	1.0	[0.6-1.7]				
Autonomous	*1.0*					
Autonomous > Teamwork	1.0	[0.6-1.8]	1.62			
Autonomous = Teamwork	0.9	[0.5-1.6]	(4)			
Autonomous < Teamwork	1.0	[0.5-1.7]				
Teamwork	1.1	[0.6-2.0]				
Never enjoy job	*1.0*			*1.0*		
Sometimes enjoy job	1.2	[0.7-2.0]	5.48*	**1.2**	**[0.7-2.1]**	**Remained at**
Always enjoy job	0.9	[0.5-1.5]	(2)	**0.9**	**[0.5-1.6]**	**Last Step**
						R^2=0.06
Job not secure	*1.0*					
Job secure	1.0	[0.8-1.3]	0.02			
			(1)			
No desire to continue in job	*1.0*					
Desire to continue in job	1.1	[0.8-1.4]	0.2			
			(1)			
Others control breaks	*1.0*					
Others control = Own control	0.9	[0.6-1.3]	5.48*	1.0	[0.6-1.5]	Removed at
Own control of breaks	0.7	[0.6-1.0]	(2)	1.0	[0.7-1.4]	Step 1
						R^2=0.07
Irregular breaks	*1.0*					
Regular = Irregular	1.0	[0.7-1.3]	0.29			
Regular breaks	1.1	[0.8-1.4]	(2)			
Short breaks (<15min/4hrs)	*1.0*					
Long = Short	0.9	[0.7-1.1]	2.36			
Long breaks (>15min/4hrs)	1.1	[0.8-1.5]	(2)			

*p<0.1; **p<0.05; ***p<0.01; Underlined= significant at p<0.002

Table 4.18

Work variables and likelihood of yielding a high Impact score (> median) given as: (a) Crude ORs and (b) ORs after adjustment using backward stepwise logistic regression given as at the last step the variable was included in the analysis. Adjusted variables that were removed are given in italics, and adjusted variables that remained in the last step are given in bold. Nagelkerke R^2 values are given for each step. *Referent groups given in italics.*

		[95% C.I.]	X^2 (df)		[95% C.I.]	
Heavy Industry production & research	*1.0*					
Banks & Financial services	1.3	[0.8-2.3]	12.12			
Computer industry	1.6	[1.0-2.5]	(9)			
Emergency service	2.8	[1.3-5.8]				
Food production & distribution	2.7	[1.3-5.5]				
Health services	1.6	[0.9-2.8]				
Higher Education	1.4	[0.8-2.6]				
Local government & council business	1.6	[0.9-2.9]				
Pharmaceutical production & research	1.5	[0.9-2.4]				
Media	1.5	[0.8-2.7]				
Under 10K	*1.0*			*1.0*		
10 – 24K	1.2	[0.8-1.6]	9.01*	**1.5**	**[1.0-2.3]**	**Remained**
25 – 39K	1.0	[0.7-1.4]	(4).061	**1.4**	**[0.9-2.3]**	**at Last Step**
40 – 54K	0.6	[0.4-1.1]		**1.0**	**[0.5-1.9]**	**R^2=0.08**
Over 55K	0.7	[0.3-1.3]		**0.9**	**[0.4-2.0]**	
Manual	*1.0*			*1.0*		
Manual > Non-manual	1.5	[0.8-2.9]	18.38***	1.9	*[0.9-3.7]	Removed at
Manual = Nonmanual	0.8	[0.5-1.3]	(4).001	1.1	[0.6-1.8]	Step 5
Manual < Non-manual	0.9	[0.6-1.5]		1.3	[0.7-2.2]	R^2=0.09
Non-manual	0.6	[0.4-0.9]		0.9	[0.5-1.5]	
Unskilled	*1.0*			*1.0*		
Unskilled > Skilled	0.4	[0.2-0.8]	19.73***	**0.5**	*****[0.2-0.9]**	**Remained**
Unskilled = Skilled	0.7	[0.4-1.2]	(4).001	**0.9**	**[0.5-1.7]**	**at**
Unskilled < Skilled	0.8	[0.5-1.4]		**1.1**	**[0.6-2.0]**	**Last Step**
Skilled	0.5	[0.3-0.8]		**0.7**	**[0.4-1.2]**	**R^2=0.08**
Unprofessional	*1.0*			*1.0*		
Unprofessional > Professional	0.8	[0.5-1.3]	16.11***	1.0	[0.6-1.7]	Removed at
Unprofessional = Professional	1.0	[0.7-1.6]	(4).003	1.2	[0.8-2.0]	Step 3
Unprofessional < Professional	1.1	[0.7-1.7]		1.4	[0.8-2.3]	R^2=0.09
Professional	0.8	[0.6-1.1]		1.3	[0.8-2.1]	
over 8 hours/day	*1.0*					
8 hours/day and below	1.1	[0.9-1.5]	0.94 (1)			

		[95% C.I.]	X^2 (df)		[95% C.I.]	
35 hrs/wk	*1.0*					
20-34 hrs/wk	0.9	[0.7-1.3]	0.78			
<20 hrs/wk	1.1	[0.7-1.8]	(3)			
>35 hrs/wk	0.8	[0.4-1.7]				
Full-time	*1.0*					
Part-time	1.0	[0.7-1.5]	0.08 (1)			
Shifts always	*1.0*			*1.0*		
Sometimes	0.9	[0.6-1.3]	6.73**	1.0	[0.6-1.5]	Removed at
Never	0.7	[0.5-0.9]	(2).035	1.0	[0.7-1.4]	Step 1 R^2=0.09
Permanent	*1.0*					
Temporary	0.8	[0.5-1.3]	0.54 (1)			
Conventional hrs never	*1.0*					
Sometimes	0.9	[0.6-1.2]	2.14			
Always	0.8	[0.6-1.1]	(2)			
Organise tasks never	*1.0*					
Sometimes	0.9	[0.6-1.4]	1.75			
Always	0.8	[0.5-1.2]	(2)			
Computer use always	*1.0*					
Sometimes	0.9	[0.7-1.1]	3.4			
Never	1.3	[0.9-1.9]	(2)			
Physical	*1.0*			*1.0*		
Physical > Mental	0.8	[0.3-1.8]	19.69***	**1.0**	**[0.4-2.5]**	**Remained at**
Physical = Mental	0.4	[0.2 -0.9]	(4)	**0.5**	***[0.2-1.1]**	**Last Step**
Physical < Mental	0.4	[0.2-0.8]		**0.4**	****[0.2-0.9]**	**R^2=0.08**
Mental	0.3	[0.2-0.7]		**0.3**	*****[0.2-0.8]**	

		[95% C.I.]	X^2 (df)		[95% C.I.]	
Very stressful	*1.0*			*1.0*		
Quite stressful	0.6	[0.4-1.0]	15.6***	**0.7**	**[0.4-1.2]**	**Remained at**
Stressful = Easygoing	0.5	[0.3-0.8]	(4)	**0.6**	****[0.3-0.9]**	**Last Step**
Quite easygoing	0.4	[0.2-0.7]		**0.5**	*****[0.3-0.9]**	**R^2=0.08**
Very easygoing	0.8	[0.3-2.3]		**0.8**	**[0.3-2.4]**	
Difficult to cope a lot of the time	1.0			1.0		
Easy to cope = Difficult to cope	0.4	[0.2-0.7]	12.47***	**0.5**	****[0.2-1.0]**	**Remained at**
Easy to cope a lot of the time	0.3	[0.1-0.6]	(3)	**0.4**	****[0.2-0.9]**	**Last step**
Well within capabilities	0.3	[0.2-0.6]		**0.4**	****[0.2-0.9]**	**R^2=0.08**
Autonomous	*1.0*					
Autonomous > Teamwork	0.8	[0.4-1.4]	3.43 (4)			
Autonomous = Teamwork	0.7	[0.4-1.3]				
Autonomous < Teamwork	0.6	[0.3-1.1]				
Teamwork	0.7	[0.4-1.3]				
Never enjoy job	*1.0*					
Sometimes enjoy job	0.6	[0.3-1.0]	4.17 (2)			
Always enjoy job	0.6	[0.3-1.0]				
Job not secure						
Job secure	0.9	[0.7-1.2]	0.17 (1)			
No desire to continue in job	*1.0*			*1.0*		
Desire to continue in job	0.8	[0.6-1.0]	2.74* (1)	1.0	[0.8-1.4]	Removed at Step 2 R^2=0.09
Others control breaks	*1.0*			*1.0*		
Others control = Own control	1.1	[0.7-1.7]	9.48***	1.2	[0.8-1.9]	Removed at
Own control of breaks	0.7	[0.5-1.0]	(2)	0.9	[0.6-1.3]	Step 4 R^2=0.09
Irregular breaks	*1.0*					
Regular = Irregular	0.8	[0.6-1.1]	2.48			
Regular breaks	0.8	[0.6-1.1]	(2)			
Short breaks (<15min/4hrs)	*1.0*					
Long = Short	0.9	[0.7-1.1]	2.79			
Long breaks (>15min/4hrs)	1.1	[0.8-1.6]	(2)			

*p<0.1; **p<0.05; ***p<0.01; Underlined= significant at p<0.002

Table 4.19

Summary of associations between demographic factors, work variables and pain experience scores (a) before adjustment and (b) after adjustment

Total GPQ

(a) Crude Association	(b) Association after adjustment
	High GPQ score more likely
Gender***	**Women*** **
	High GPQ score less likely
Family size***	**2 children**
	1 child
	No children
Chronic condition***	**Without a chronic condition**
'Manual/Non-manual'***	**Manual < Non-manual**
	Non-manual
'Unskilled/Skilled'***	**'Unskilled/Skilled'** (not specific to one category)
Hours/day**	**8 hours/day and below**
Stress of workload***	**Quite stressful**
	Stressful = Easygoing
	Quite easygoing
Desire to continue in job***	**Wanted to continue in job**
'Unprofessional/Professional'***	*Removed at Step 9*
Shift-work***	*Removed at Step 8*
SEG***	*Removed at Step 7*
Organise own tasks**	*Removed at Step 6*
Physicality of workload***	*Removed at Step 5*
Control of breaks***	*Removed at Step 4*
Conventionality of hours**	*Removed at Step 3*
Income**	*Removed at Step 2*
Ability to cope with workload*	*Removed at Step 1*

Pain Frequency

(a) Crude Association	(b) Association after adjustment
	High Frequency score more likely
Gender**	**Women*** **
*Industry***	**Emergency service** **
	Media **
Stress of workload***	**Very easygoing*** **
	High Frequency score less likely
Age**	**Age** (not specific to one category)
Chronic condition***	**Without a chronic condition*** **
Unskilled/Skilled***	**Skilled*** **
*Organisation of tasks****	**Organise tasks sometimes** **
	Organise tasks always **
Desire to continue in job**	**Wanted to continue in job*** **
Family size*	*Removed at Step 13*
Autonomy/Teamwork***	*Removed at Step 12*
Ability to cope with workload**	*Removed at Step 11*
Physicality of workload***	*Removed at Step 10*
*Computer use****	*Removed at Step 9*
Conventionality of hours***	*Removed at Step 8*
*Shiftwork***	*Removed at Step 7*
Income***	*Removed at Step 6*
Unprofessional > Professional***	*Removed at Step 5*
Control of breaks***	*Removed at Step 4*
Manual/Non-manual***	*Removed at Step 3*
Job security**	*Removed at Step 2*
SEG***	*Removed at Step 1*

Pain Intensity

(a) Crude Association	(b) Association after adjustment
	High Intensity score more likely
Gender***	**Women***[1.2**
	High Intensity score less likely
Family size**	**2 children*** **
	1 child **
	No children* **
Chronic condition**	**Without a chronic condition** **
Industry***	**Higher Education** **
Income***	**Over 55K*** **
Unskilled/Skilled	**Unskilled > Skilled** (not specific to one category)
Hours/day**	**8 hours/day and below*** **
Stress of workload***	**Stressful = Easygoing** **
	Quite easygoing **
Desire to continue in job***	**Wanted to continue in job** **
Shiftwork***	*Removed at Step 9*
Ability to cope with workload**	*Removed at Step 8*
Control of breaks***	*Removed at Step 7*
Unprofessional/Professional***	*Removed at Step 6*
Organisation of tasks*	*Removed at Step 5*
Socioeconomic group***	*Removed at Step 4*
Physicality of workload**	*Removed at Step 3*
Manual/Non-manual*	*Removed at Step 2*
Conventionality of hours**	*Removed at Step 1*

Ability to Cope with Pain

(a) Crude Association	(b) Association after adjustment
	High Ability to Cope score more likely
Women***	**Women*** **
Industry**	**Local government & council business** **
	Emergency service **
	High Ability to Cope score less likely
Aged*	**26-35***
	56-65*
Family size***	**2 children** **
Chronic condition***	**Without a chronic condition*** **
Industry**	**Food production & distribution***
Physicality of workload***	**Physical < Mental*** **
	Mental* **
Stress of workload***	**Stressful = Easygoing*** **
	Quite easygoing **
Socioeconomic group***	*Removed at Step 9*
Conventionality of hours*	*Removed at Step 8*
Manual/Non-manual**	*Removed at Step 7*
Computer use *	*Removed at Step 6*
Control of breaks***	*Removed at Step 5*
Ability to cope with workload*	*Removed at Step 4*
Income***	*Removed at Step 3*
Unskilled/Skilled*	*Removed at Step 2*
Desire to continue in job*	*Removed at Step 1*

Pain Emotion

(a) Crude Association	(b) Association after adjustment
	High Emotion score more likely
Women***	**Women*** **
	High Emotion score less likely
Family size**	**2 children** **
Chronic condition***	**Without a chronic condition** **
Unprofessional/Professional***	**Unprofessional > Professional**
	(not specific to one category)
Shiftwotk**	**Shifts Never*** **
Computer use*	**Computer use Sometimes** **
Job enjoyment*	**Sometimes enjoy job**
	Always enjoy job
Physicality of workload*	*Removed at Step 5*
Income**	*Removed at Step 4*
Socioeconomic group*	*Removed at Step 3*
Unskilled/Skilled*	*Removed at Step 2*
Control of breaks*	*Removed at Step 1*

Pain Impact

(a) Crude Association	(b) Association after adjustment
	High Impact score more likely
Income*	**10 – 24K** **
	High Impact score less likely
Chronic condition***	**Without a chronic condition*** **
Unskilled/Skilled***	**Unskilled > Skilled*** **
Physicality of workload***	**Physical = Mental***
	Physical < Mental **
	Mental* **
Stress of workload***	**Stressful = Easygoing** **
	Quite easygoing* **
Ability to cope with workload***	**Easy to cope = Diff** **
	Easy to cope a lot of the time **
	Well within capabilities **
Control of breaks***	*Removed at Step 4*
Manual/Non-manual***	*Removed at Step 5*
Unprofessional/Professional***	*Removed at Step 3*
Desire to continue in job*	*Removed at Step 2*
Shiftwork**	*Removed at Step 1*

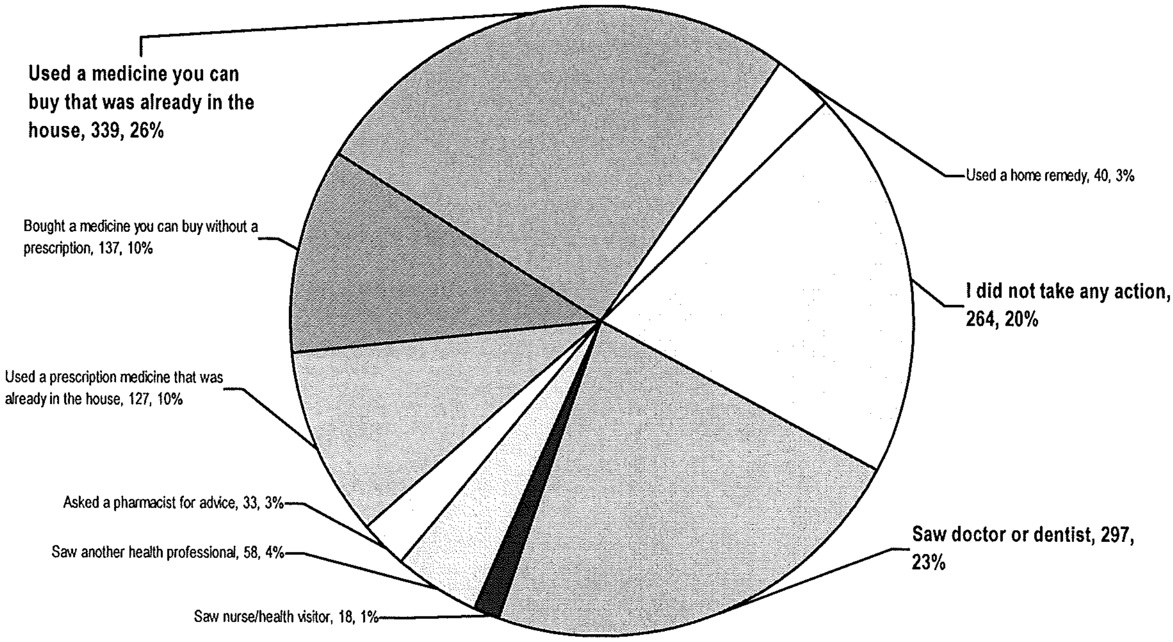
*p<0.1; **p<0.05; ***p<0.01; Underlined= significant at P value after Bonferoni correction (p<0.006 for demographic variables; p<0.002 for work variables)

4.5 Pain responses

(a) Responses to pain

Exploratory hypotheses 5-7 aimed to investigate the rates of medication use, medication avoidance and healthcare use for pain. Figure 4.10 below shows that the most common response to pain was to use non-prescription medicine that was already in the house (26% of those experiencing pain). The next most prevalent response was to consult a doctor or a dentist (23% of those experiencing pain), followed by not taking any action at all (20% of those experiencing pain).

Figure 4.10
Responses to pain (n=N; % of all responses given)



As discussed in Section 3.4, two different dichotomous variables were created from the pain response variable: (a) likelihood of acting on pain, which included all consulters and all self-medicators; and (b) likelihood of consulting for pain, which included all consulters ("saw doctor or dentist"; "saw nurse/health visitor"; "saw another health professional"; "asked a pharmacist for advice"), and all self-medicators ("used a prescription medicine that was already in the house"; "bought a medicine you can buy without a prescription"; "used a medicine you can buy that was already in the house"; "used a home remedy").

Table 4.20a below shows that the decision to act on pain differed in relation to pain type (X^2=87.26 (9), p<0.01). Using back pain as a referent, individuals were more likely to act on abdominal pain (OR 2.2, 95%CI 1.3-3.7); or ear nose and throat (ENT) pain (OR 5.1, 95%CI 1.2-21.9); face/mouth pain (OR 3.3, 95%CI 1.4-7.9); headache (OR 4.3, 95%CI 2.8-6.8); and neck/shoulder pain (OR 2.5, 95%CI 1.5-4.3). Odds ratios for acting on pain were adjusted for age and gender using forced-entry logistic regression, and this altered the associations between several pain types an the likelihood of acting on pain only very slightly (for 'abdominal pain' Adj OR 2.2, 95%CI 1.3-3.7); for 'ENT pain' (Adj OR 5.5, 95% CI 1.3-24.2); for 'headache' (OR 4.4, 95% CI 2.8-7.0); and for 'neck/shoulder pain' (Adj OR 2.3, 95% CI 1.3-4.0). The crude association between face/mouth pain and propensity to take action became non significant after adjustment, however. In addition, those suffering from feet or ankle pain became more likely to act on pain when the effects of gender and age were adjusted for (Adj OR 3.5, 95% CI 1.4-8.6).

Table 4.20
Likelihood of yielding high GPQ score and sub-scores less than the median in relation to (i) pain type, and (ii) pain cause given as (a) crude odds ratios and (b) odds ratios after adjustment for gender and age. Significant adjusted associations are given in bold. *Referent categories for each group are given in italics.*

(a) Pain site	*Likelihood of acting on pain*					*Likelihood of acting on pain*				
	(a) Crude OR	[95%CI]	X² (df)	(b) Adj. OR	[95%CI]	(a) Crude OR	[95%CI]	X² (df)	(b) Adj. OR	[95%CI]
Back	*1.0*			*1.0*		*1.0*			*1.0*	
Abdominal	2.5	[1.5-4.3]	87.26***	**2.2**	***[1.3-3.7]**	1.0	[0.6-1.5]	140.86***	1.0	[0.6-1.5]
Chest area	0.9	[0.4-2.1]	(9)	1.0	[0.4-2.5]	2.7	[1.0-7.4]	(9)	2.4	*[0.9-6.9]
Ear nose or throat	5.1	[1.2-21.9]		**5.5**	**[1.3-24.2]**	3.7	[1.5-9.3]		3.6	***[1.4-8.9]**
Face and mouth	3.3	[1.4-7.9]		1.4	[0.7-3.1]	7.3	[3.3-16.2]		7.3	***[3.3-16.4]**
Feet or ankles	1.2	[0.6-2.6]		**3.5**	***[1.4-8.6]**	2.9	[1.3-6.5]		2.9	***[1.3-6.5]**
Head	4.3	[2.8-6.8]		**4.4**	***[2.8-7.0]**	0.3	[0.2-0.4]		0.3	***[0.2-0.4]**
Joints	0.8	[0.5-1.2]		0.9	[0.5-1.3]	1.1	[0.7-1.8]		1.1	[0.7-1.8]
Limbs	0.7	[0.4-1.2]		0.7	[0.4-1.3]	1.8	[1.0-3.5]		1.7	[0.9-3.3]
Neck & shoulder	2.5	[1.5-4.3]		**2.3**	***[1.3-4.0]**	1.2	[0.8-2.0]		1.2	[0.82.0]

(b) Pain cause	*Likelihood of acting on pain*					*Likelihood of acting on pain*				
	(a) Crude OR	[95%CI]	X² (df)	(b) Adj. OR	[95%CI]	(a) Crude OR	[95%CI]	X² (df)	(b) Adj. OR	[95%CI]
Unknown	*1.0*			*1.0*		*1.0*			*1.0*	
Life variables	1.1	[0.7-1.7]	39.58***	1.0	[0.6-1.6]	0.6	[0.4-1.1]	98.49***	0.7	[0.4-1.1]
Long-term medical problems	1.6	[0.6-3.9]	(9)	1.3	[0.5-3.3]	3.8	[1.7-8.3]	(9)	3.6	***[1.6-8.0]**
Non-serious ailments	2.0	[1.0-3.7]		1.8	*[0.9-3.4]	0.8	[0.5-1.5]		0.7	[0.4-1.3]
Old injury	0.8	[0.4-1.9]		0.9	[0.4-2.2]	2.1	[0.9-5.0]		2.1	*[0.9-4.9]
Pain problems	1.3	[0.8-2.2]		1.3	[0.7-2.2]	2.2	[1.4-3.7]		2.2	***[1.3-3.6]**
Recent injury	1.0	[0.6-1.5]		1.0	[0.7-1.6]	2.9	[1.9-4.5]		2.8	***[1.8-4.4]**
Short-term medical problems	6.9	[3.1-15.4]		6.8	***[3.0-15.3]**	3.5	[2.3-5.4]		3.5	***[2.3-5.4]**
Stress	2.2	[1.1-4.7]		1.8	[0.8-3.9]	0.7	[0.3-1.3]		0.6	[0.3-1.3]
Work environment	0.9	[0.6-1.5]		0.9	[0.5-1.5]	0.8	[0.5-1.3]		0.8	[0.5-1.3]

*p<0.1; **p<0.05; ***p<0.01

The decision to consult for pain also differed in relation to pain site (X^2=140.86 (9), p<0.01). Crude analyses showed individuals to be more likely to present to a health professional for: ENT pain (OR 3.7, 95% CI 1.5-9.3); feet and ankle pain (OR 2.9, 95% CI 1.3-6.5); or face/mouth pain (OR 7.3, 95% CI 3.3-16.2) than they were to present for back pain. Again using back pain as the referent group, those suffering from headache were less likely to consult than they were for back pain (OR 0.3, 95% CI 0.2-0.4).

There were also two trends in consulting data, where consulting was more likely in those with chest pain (OR 2.7, 95% CI *1.0*-7.4), and in those with limb pain (OR 1.8, 95% CI *1.0*-3.5) than it was for those with back pain. After adjustment for age and gender using forced-entry logistic regression, the majority of associations remained relatively unchanged (for 'ENT pain' Adj OR 3.6, 95% CI 1.4-8.9; for 'feet and ankle pain' Adj OR 2.9, 95% CI 1.3-6.5); or 'face/mouth pain' Adj OR 7.3, 95% CI 3.3-16.4; and for 'headache' Adj OR 0.3, 95% CI 0.2-0.4). The trends for likelihood of consulting for chest pain and limb pain, however, became non-significant.

In the crude analysis, the decision to act on pain differed in relation to pain cause (X^2= 39.58 (9); p<0.01, see Table 4.20b such that action was more likely to be taken where individuals perceived their pain to be the result of stress (OR 2.2, 95% CI 1.1-4.7), short-term medical problems (OR 6.9, 95% CI 3.1-15.4), and was marginally more likely for pain associated with non-serious ailments (OR 2.0, 95%CI *1.0*-3.7). After adjustment for age and gender the associations between acting on pain and non-serious ailments, and acting on pain and stress were no longer significant. The adjusted association between acting on pain related to short-term medical problems, however, remained significant, such that those with short-term medical problems were almost seven times more likely to act on their pain (Adj OR 6.8, 95% CI 3.0-15.3).

Consultation for pain also differed in relation to pain cause (X^2= 98.49 (9), p<0.01). Using pain of unknown cause as the referent group, crude analyses showed that individuals were more likely to consult for pain that was the result of: recent injury (OR 2.9, 95% CI 1.9-4.5); pain problems (OR 2.2, 95%CI 1.4-3.7), short-term medical problems (OR 3.5, 95%CI 2.3-5.4) or long-term medical problems (OR 3.8, 95%CI 1.7-8.3).

After adjustment for age and gender, these associations remained significant, and were virtually unchanged in nature (for 'recent injury' (Adj OR 2.8, 95% CI 1.8-4.4); pain problems (Adj OR 2.2, 95%CI 1.3-3.6), short-term medical problems (Adj OR 3.5, 95%CI 2.3-5.4) or long-term medical problems (OR 3.6, 95%CI 1.6-8.0).

Exploratory hypothesis 6 asked whether rates of medication use, medication avoidance and healthcare use differ in relation to pain type and pain cause. Current results show that this is the case, and that individuals in the current sample tended to respond differently in relation to pain type and perceived pain cause.

(b) Pain response in relation to pain experience

Table 4.21 and 4.22 show that crude analysis of scores revealed all pain responses to differ in relation to pain experience scores. In every case, where the pain experience was more negative (lower frequency, lower intensity, easier to cope with, less emotional, and lower impact) individuals were less likely to act on the pain, as well as less likely to seek professional help for pain.

Table 4.21
Dichotomised pain experience scores in relation to likelihood of acting on pain. Significant adjusted associations given in bold.

	Crude OR	[95% C.I.]	X^2 (df)	Adjusted OR	[95% C.I.]
Higher frequency					
Lower frequency	0.6	[0.4 -0.8]	16.06***(1)	1.0	[0.7 -1.3]
Higher intensity					
Lower intensity	0.4	[0.3 -0.5]	40.34***(1)	**0.6**	*****[0.4-0.8]**
Less able to cope					
More able to cope	0.4	[0.3 -0.6]	30.92***(1)	0.8	*[0.5-1.04]
More emotional					
Less emotional	0.4	[0.3 -0.5]	36.00*** (1)	**0.6**	*****[0.5-0.9]**
More impact					
Less impact	0.3	[0.2 -0.4]	67.88***(1)	**0.4**	*****[0.3-0.6]**

**p<0.05; ***p<0.01

Exploratory hypothesis 7 examined the possibility that pain experience scores would be associated (after adjustment) with rates of medication use, medication avoidance and healthcare use. All dichotomised GPQ sub-scores were entered into a regression analysis using likelihood of acting on pain as the outcome variable.

Total GPQ scores were excluding from analysis, as these were composite scores of all sub-scores. Three aspects of pain remained associated with a decreased likelihood of acting on pain after adjustment: lower pain intensity (Adj OR=0.6, 95% CI 0.4-0.8), lower pain emotion (Adj OR=0.6, 95% CI 0.5-0.9), and lower pain impact (Adj OR=0.4, 95% CI 0.3-0.6) there was also a trend towards increased ability to cope with and likelihood of not acting on pain, although this was not significant at the 0.05 level (Adj OR=0.8, 95% CI 0.5-1.04). This final model was of good fit (X^2=10.48 (7), n.s.), and accounted for 11% of the variability between acting and not taking any action (Nagelkerke R^2=0.11).

Table 4.22
Dichotomised pain experience scores in relation to likelihood of consulting a health professional for pain. Significant adjusted associations given in bold.

	Crude OR	[95% C.I.]		Adjusted OR	[95% C.I.]
Higher frequency					
Lower frequency	0.4	[0.3 -0.5]	59.18***(1)	**0.5**	*****[0.4-0.6]**
Higher intensity					
Lower intensity	0.5	[0.4 -0.6]	29.86***(1)	0.8	[0.6 -1.1]
Less able to cope					
More able to cope	0.5	[0.4 -0.7]	24.41***(1)	0.8	[0.6-1.1]
More emotional					
Less emotional	0.6	[0.5 -0.7]	17.99*** (1)	0.9	[0.7 -1.2]
More impact					
Less impact	0.3	[0.3 -0.5]	50.34***(1)	**0.5**	*****[0.3-0.7]**

*p<0.1; **p<0.05; ***p<0.01

Crude odds ratios for likelihood of consulting a health professional for pain were also forced into a regression model, excluding the composite Total GPQ score. Only two associations remained significant after adjustment: lower frequency and likelihood of not consulting (Adj OR=0.5, 95% CI 0.4-0.6); and lower impact and likelihood of not consulting (Adj OR=0.5, 95% CI 0.3-0.7). This model was also of good fit (X2=12.55 (7), n.s) and accounted for 12%of the variability between outcomes.

Exploratory hypothesis 7 can be therefore be confirmed, such that the likelihood of individuals acting on pain was related to pain intensity., emotion and impact, and the likelihood of individuals consulting for pain was related to pain frequency and impact experience scores would predict rates of medication use, medication avoidance and healthcare use.

(c) Pain response in relation to psychosocial factors

To examine the relationship between demographic factors, work variables and pain response, the likelihood of scoring lower than the median score on the dichotomised GPQ scale and sub-scales was explored. Again, to reduce the likelihood of a Type I error in crude (unadjusted) calculations, the p value taken to be significant was 0.006 for all comparisons relating to demographic variables, and 0.002 for all comparisons relating to work variables. All crude and adjusted odds ratios for pain response outcomes can be found in Tables 4.23-4.24. As with pain experience scores, for formatting reasons, these are placed together, and corresponding commentary of scores can be found prior to the tables.

(i) Associations between demographic factors, work variables and acting on pain

There was a crude association between gender and likelihood of acting on pain, such that women were more likely to act on pain than men (OR 2.9 95% CI 2.3-3.8; see Table 4.23). Socioeconomic group was also crudely associated with acting on pain, although the nature of this relationship was difficult to decipher from crude data. No other demographic variable was significantly related to likelihood of acting on pain, although there were crude trends towards acting on pain being less likely in older age groups, and less likely in those *without* a chronic condition.

In relation to work variables, crude associations were found between likelihood of acting on pain and: 'income'; 'unprofessional/professional'; and 'full-time/part-time'. Acting on pain was less likely where: individuals were in receipt of higher annual incomes (ORs: for '£29-39,000' 0.5 95% CI 0.3-0.7; and for 'Over £55,000' 0.4 95% CI 0.2-*0.98*); in more professional jobs (for 'Mostly professional' OR 0.6 95% CI 0.4-0.9); and/or worked part-time (OR 2.9 95% CI 1.5-5.9).

All demographic and work variables that were significant at $P<0.1$ and below were entered into a backward stepwise regression model (comparing log-likelihoods; see Table 4.26 below for a list of variables). Seven variables were removed by this analysis as they were not significant: 'control of breaks'; skilled/unskilled'; 'socioeconomic group', 'income', 'hours/week'; full-time/part-time' and 'regularity of breaks'. The association between gender and acting on pain remained significant and similar in nature, such that women remained more likely to act on pain than men (Adj OR 3.3 95% CI 2.4-4.5). Adjustment also altered the association between 'professional/unprofessional and

acting on pain' only very slightly, such that action remained less likely in those in professional groups when other variables were considered (Adj ORs: for 'More professional than unprofessional' 0.6 95% CI 0.3-0.9; and for 'Mostly professional' 0.6 95% CI 0.4-*0.97*) when other variables were considered. Three variables that were only marginally associated with acting on pain in the crude analysis became significant after adjustment: age; chronic condition; and stress. Acting on pain was significantly less likely in some age groups than it was for those aged 16-25 (Adj ORs: for '26-35' 0.4 95% CI 0.1-0.9; for '46-55' 0.4 95% CI 0.2-*0.96;* and for '56-65' 0.2 95% CI 0.1-0.5). In addition, acting on pain was less likely where individuals rated their jobs as 'Equally stressful and easygoing' (Adj OR 0.5 95% CI 0.3-0.9). There were also trends towards a lower adjusted likelihood of acting on pain in those *without* a chronic a condition (Adj OR 0.2 95% CI 0.1-1.05); and those in more stressful jobs (Adj ORs for 'Quite stressful' 0.2 95% CI 0.3-1.01).
The final model of five significant variables ('gender', 'age', 'chronic condition', 'professional/unprofessional', and 'stress of workload') was of good fit (X^2= 14.13 (8), n.s.) and accounted for 13% of the variability between acting and not acting on pain (Nagelkerke R^2= 0.129).

One final finding of note is the effect of adjustment on 'hours/week'. The variation between the categories of this variable was not significant in the crude analysis, and all categories were removed in the regression, as they were non-significant (X^2= 3.39 (3), n.s. at Step 6), However, analysis of odds ratios shows that within this analysis there was significant variation between two categories within this variable. Individuals working 'less than 20 hours work/week' were significantly less likely to act on pain than those working more than 35 hours every week.

(ii) Associations between demographic factors, work variables and Consulting for pain

Table 4.25 shows that in the crude analysis, only two demographic and work variables were related to the decision to consult a health professional for pain: size of family and annual income. In the crude analysis, consultation was less likely for individuals without children than it was for those who had three children or more (OR 0.3 95% CI 0.1-0.9). Consulting was significantly associated with annual income, although the nature of this relationship was not clear from crude scores.

All demographic and work variables that were significant at the 0.1 level and below were put into backward stepwise regression model (comparing Log-likelihoods). This process removed six variables as they were not significant ('physicality of workload', 'SEG', 'income', conventionality of hours', 'spouse employment status', and 'skilled/unskilled), and identified five significant variables ('family size', 'chronic condition', 'manual/non-manual', 'full-time/part-time' and 'shift-work'), three of which were not significant before adjustment ('manual/non-manual', 'full-time/part-time' and 'shift-work'). Consultation for pain was significantly less likely where individuals: described their jobs as more non-manual (Adj ORs: for 'Mostly non-manual' 0.5 95% CI 0.3-0.8 and for 'More non-manual than manual' 0.5 95% CI 0.3-0.9); worked part-time (Adj OR 0.4 95% CI 0.2-0.6); and/or worked shifts 'sometimes' (Adj OR 1.9 95% CI 1.1-3.4). Consulting a health professional was more likely where individuals worked shifts sometimes (Adj 1.9 95% CI 1.1-3.3), however the adjusted association between consultation and 'Never working shifts' was only a trend (Adj 1.4 95% CI *0.9*-2.2). There were also some adjusted trends between not consulting for pain and: not having a chronic condition (Adj 0.7 95% CI 0.5-*1.03*); and not having a family (Adj 0.4 95% CI 0.1-*1.03*). The final model of five variables was of good fit (X^2=4.54 (8), n.s.); and accounted for 7% or the variability between consulting and not consulting (Nagelkerke R^2 = 0.07).

Table 4.23

Demographic variables and likelihood of (i) Acting on pain and (ii) Consulting a Health Professional for Pain given as: (a) Crude ORs and (b) ORs after adjustment using backward stepwise logistic regression given as at the last step the variable was included in the analysis. Adjusted associations that remained in the last step are given in bold. Nagelkerke R2 values are given for each step. Significant adjusted associations given in bold. *Referent groups are given in italics.*

		i) Acting on pain						(ii) Consulting a Health Professional for Pain					
		(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]		(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adjusted OR	[95% C.I.]	
	Men	*1.0*			*1.0*			*1.0*					
	Women	2.9	[2.2-3.8]	55.77*** (1).000	**3.3**	***[2.4-4.5]	**Remained at Last Step 8**	1.2	[0.9-1.5]	1.83 (1).176			
	Aged 16-25	*1.0*			*1.0*		**R^2=0.13**	*1.0*					
	26-35	0.3	[0.1-0.8]	12.1**	**0.4**	**[0.1-0.9]	**Remained at**	1.3	[0.9-1.9]	6.33			
	36-45	0.5	[0.2-1.1]	(4).017	**0.5**	**[0.2-1.2]**	**Last Step 8**	1.2	[0.8-1.8]	(4).176			
	46-55	0.4	[0.2-1.0]		**0.4**	**[0.2-0.96]	**R^2=0.13**	0.9	[0.6-1.4]				
	56-65	0.3	[0.1-0.7]		**0.2**	***[0.1-0.5]		0.8	[0.4-1.5]				
SEG	*Unskilled*	*1.0*			*1.0*			*1.0*			*1.0*		
	Partly skilled	0.4	[0.1-3.6]		1.6	[0.2-15.5]	Removed at	0.5	[0.2-1.5]		0.5	[0.1 2.2]	Removed at
	Manual skilled	0.3	[0.0-2.2]	22.04***	0.7	[0.1-6.7]	Step 3	0.5	[0.2-1.3]	12.9**	0.3	[0.1 1.5]	Step 2
	Non-manual skilled	0.2	[0.0-1.9]	(4).000	0.8	[0.1-7.7]	R^2=0.15	0.8	[0.3-2.4]	(5) .024	0.3	[0.1 1.4]	R^2=0.10
	Managerial & Intermediate	0.3	[0.0-2.7]		0.9	[0.1-9.5]		0.4	[0.1-1.1]		0.2	[0.0 1.3]	
	Professional	0.2	[0.0-1.3]		0.6	[0.1-6.3]		0.5	[0.2-1.3]		0.3	[0.1 2.0]	
Carstairs	*Least affluent*	*1.0*						*1.0*					
score	6	0.6	[0.2-2.3]	5.04				0.6	[0.2-1.7]	3.7			
	5	1.4	[0.5-4.2]	(6).539				1.0	[0.3-2.8]	(6).717			
	4	1.6	[0.5-4.5]					0.9	[0.3-2.5]				
	3	1.0	[0.3-3.2]					0.9	[0.3-2.5]				
	2	1.4	[0.5-4.2]					1.2	[0.4-3.6]				
	Most affluent	1.5	[0.5-4.9]					0.7	[0.2-2.2]				
	Married/living with partner	*1.0*						*1.0*					
	Single	1.1	[0.8-1.5]	0.58 (1).450				0.9	[0.7-1.2]	0.29 (1).589			
	Spouse doesn't work	*1.0*						*1.0*			*1.0*		
	Spouse works	1.0	[0.7-1.6]	0.03 (1).856				0.7	[0.5-1.1]	2.77* (1).096	1.3	[0.8-1.9]	Removed at Step 5 R^2=0.09
	More than 3 children	*1.0*						*1.0*			*1.0*		
	3 children	0.6	[0.2-1.6]	3.32				0.5	[0.2-1.3]	16.42***	**0.5**	**[0.2-1.4]**	**Remained at**
	2 children	0.7	[0.3-1.7]	(4)				0.4	[0.2-1.02]	(3)	**0.4**	**[0.2-1.2]**	**Last step**
	1 child	0.6	[0.2-1.5]					0.6	[0.3-1.7]		**0.7**	**[0.2-1.8]**	**R^2=0.07**
	No children	0.8	[0.3-1.9]					0.3	[0.1-0.9]		**0.4**	*[0.1-1.04]	
	With a chronic condition	*1.0*			*1.0*			*1.0*			*1.0*		
	Without a chronic condition	0.7	[0.5-1.0]	4.32** (1).038	**0.7**	*[0.5-1.05]	**Remained at Last Step 8 R^2=0.13**	0.7	[0.5-0.9]	6.15** (1).013	**0.7**	*[0.5-1.03]	Remained at Last step R^2=0.07

*p<0.1; **p<0.05; ***p<0.01; Underlined= significant at p<0.006

Table 4.24

Work variables and likelihood of Acting on pain given as: (a) Crude ORs and (b) ORs after adjustment using backward stepwise logistic regression given as at the last step the variable was included in the analysis. Adjusted associations that remained in the last step are given in bold. Nagelkerke R2 values are given for each step. Referent groups are given in italics

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adj ORs	[95% C.I.]	
Heavy Industry production & research	*1.0*					
Banks & Financial services	1.0	[0.5-1.9]	8.07			
Computer industry	1.0	[0.6-1.7]	(9)			
Emergency service	0.7	[0.3-1.8]				
Food production & distribution	0.8	[0.4-1.8]				
Higher Education	0.8	[0.4-1.6]				
Health services	0.6	[0.3-1.3]				
Local government & council business	0.5	[0.2-1.2]				
Pharmaceutical production & research	1.1	[0.6-2.0]				
Media	0.9	[0.4-2.0]				
Under 10K	*1.0*					
10 – 24K	0.8	[0.5-1.3]	19.3***	1.4	[0.8-2.5]	Removed at
25 – 39K	0.5***	[0.3-0.7]	(4)	1.1	[0.6-2.2]	Step 4
			.001			R^2=0.14
40 – 54K	0.6	[0.3-1.1]		1.7	[0.7-4.2]	
Over 55K	0.4	**[0.2-1.0]		1.0	[0.4-2.8]	
Manual	*1.0*					
Manual > Non-manual	1.1	[0.5-2.5]	6.28			
Manual = Nonmanual	0.9	[0.4-1.9]	(4)			
Manual < Non-manual	1.3	[0.6-2.5]				
Non-manual	1.9	[1.0-3.5]				
Unskilled	*1.0*					
Unskilled > Skilled	0.9	[0.4-2.1]	15.09***	1.0	[0.4-2.4]	Removed at
Unskilled = Skilled	1.1	[0.5-2.3]	(4)	1.1	[0.5-2.6]	Step 2
Unskilled < Skilled	0.8	[0.4-1.6]		0.9	[0.4-2.0]	R^2=0.16
Skilled	0.5	[0.3-1.0]		0.6	[0.3-1.4]	
Unprofessional	*1.0*					
Unprofessional > Professional	1.1	[0.5-2.1]	19.47***	**1.0**	**[0.5-2.0]**	**Remained in**
Unprofessional = Professional	1.6	[0.9-3.1]	(4)	**1.8**	***[0.9-3.6]**	**Last Step**
Unprofessional < Professional	0.6	[0.4-1.0]	.001	**0.6**	****[0.3-0.9]**	**R2=0.13**
Professional	0.6	[0.4-0.9]		**0.6**	****[0.4-0.97]**	
	1.0					
over 8 hours/day	1.0	[0.7-1.4]				
8 hours/day and below	0.9	[0.6-1.2]	0.72			
			(1)			

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adj ORs	[95% C.I.]	
over 35 hours/week	*1.0*			*1.0*		
35 hours/week	0.6	[0.4-1.0]	10.55**	1.2	[0.7-2.0]	Removed at
20-34 hours/week	0.4	[0.2-0.8]	(3)	0.3	*[0.1-1.2]	Step 5
under 20 hours/week	0.5	[0.2-1.5]		0.1	***[0.0-0.8]	R^2=0.14
Full-time	*1.0*					
Part-time	2.9	[1.5 -5.9]	10.09***	1.5	[0.7-3.2]	Removed at
			(1)			Step 6
						R^2=0.13
Shifts always	*1.0*					
Sometimes	1.0	[0.8-1.2]	1.61			
Never	0.9	[0.5-1.5]	(2)			
Permanent	*1.0*					
Temporary	0.3	[0.2-0.7]	0.28			
			(1)			
Conventional hrs never	*1.0*					
Sometimes	1.2	[0.8-1.7]	3.66			
			(2)			
Always	1.4	[1.0-2.0]				
Organise tasks never	*1.0*					
Sometimes	1.3	[0.7-2.3]	1.18			
Always	1.2	[0.7-2.0]	(2)			
Computer use always	*1.0*					
Sometimes	1.5	[0.9-2.5]	3.49			
Never	1.2	[0.7-2.0]	(2)			
Physical	*1.0*					
Physical > Mental	0.8	[0.3-2.4]	6.71			
Physical = Mental	1.5	[0.6-3.5]	(4)			
Physical < Mental	1.6	[0.7-3.7]				
Mental	1.8	[0.8-4.1]				

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adj ORs	[95% C.I.]	
Very stressful	*1.0*			*1.0*		
Quite stressful	0.6	[0.3-1.0]	7.9*	**0.5**	****[0.3-1.01]**	**Remained at**
Stressful = Easygoing	0.5	[0.3-0.8]	(4)	**0.5**	*****[0.3-0.9]**	**Last Step**
Quite easygoing	0.7	[0.3-1.4]		**0.7**	**[0.3-1.6]**	**R2=0.13**
Very easygoing		[0.7-6.8]		**0.5**	**[0.1-1.5]**	
Difficult to cope a lot of the time	*1.0*					
Easy to cope = Difficult to cope	1.4	[0.7-2.8]	5.23			
			(3)			
Easy to cope a lot of the time	1.3	[0.6-2.8]				
Well within capabilities	0.9	[0.4-2.0]				
Autonomous	*1.0*					
Autonomous > Teamwork	1.1	[0.5-2.3]	0.62			
Autonomous = Teamwork	1.0	[0.5-2.2]	(4)			
Autonomous < Teamwork	1.1	[0.5-2.3]				
Teamwork	0.9	[0.4-2.1]				
Never enjoy job	*1.0*					
Sometimes enjoy job	1.5	[0.7-2.9]	1.33			
Always enjoy job	1.5	[0.7-3.1]	(2)			
Job not secure	*1.0*					
Job secure	0.9	[0.6-1.2]	0.82 (1)			
No desire to continue in job	*1.0*					
Desire to continue in job	1.0	[0.7-1.3]	0.03			
			(1)			
Others control breaks	*1.0*			*1.0*		
Others control = Own control	0.6	[0.4-1.0]	9.39*** (2)	0.7	[0.4-1.3]	Removed at
Own control of breaks	0.5	[0.4-0.8]		0.7	[0.4-1.3]	Step 1 R^2=0.16
Irregular breaks	*1.0*			*1.0*		
Regular = Irregular	0.7	**[0.5-1.0]	6.07** (2)	0.7	**[0.5-0.99]	Removed at
Regular breaks		[0.7-1.6]		0.8	[0.5-1.2]	Step 7 R^2=0.13
Short breaks (<15min/4hrs)	*1.0*					
Long = Short	1.2	[0.9-1.7]	2.20			
Long breaks (>15min/4hrs)	1.3	[0.8-1.9]	(2)			

*p<0.1; **p<0.05; ***p<0.01; Underlined= significant at p<0.006

Table 4.25

Work variables and likelihood of Consulting a Health Professional for Pain given as: (a) Crude ORs and (b) ORs after adjustment using backward stepwise logistic regression given as at the last step the variable was included in the analysis. Adjusted associations that remained in the last step are given in bold. Nagelkerke R2 values are given for each step. Referent groups are given in italics

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adj ORs	[95% C.I.]	
Heavy Industry production & research	*1.0*					
Banks & Financial services	1.1	[0.6-2.2]	6.49			
Computer industry	0.9	[0.5-1.5]	(9)			
Emergency service	0.8	[0.4-1.8]				
Food production & distribution	0.6	[0.3-1.3]				
Higher Education	1.0	[0.5-1.8]				
Health services	1.2	[0.6-2.5]				
Local government & council business	0.7	[0.4-1.4]				
Pharmaceutical production & research	1.0	[0.4-1.4]				
Media	0.9	[0.4-1.8]				
Under 10K	*1.0*					
10 – 24K	1.1	[0.8-1.6]	19.3***	1.3	[0.7-2.4]	Removed at Step
25 – 39K	0.9	[0.6-1.4]	(4).001	1.1	[0.5-2.3]	3 R^2=0.09
40 – 54K	0.9	[0.5-1.8]		1.4	[0.6-3.5]	
Over 55K	1.0	[0.4-2.3]		1.1	[0.3-3.4]	
Manual	*1.0*			*1.0*		
Manual > Non-manual	0.9	[0.5-1.6]	13.16**	**1.2**	**[0.6-2.4]**	**Remained at Last**
Manual = Nonmanual	0.8	[0.5-1.3]	(4)	**1.0**	**[0.5-1.8]**	**Step R^2= 0.07**
Manual < Non-manual	0.5	[0.3-0.8]		**0.5**	****[0.3-0.9]**	
Non-manual	0.6	[0.4-0.8]		**0.5**	*****[0.3-0.8]**	
Unskilled	*1.0*			*1.0*		
Unskilled > Skilled	0.8	[0.4-1.5]	10.34**	0.9	[0.4-2.0]	Removed at Step
Unskilled = Skilled	0.6	[0.3-1.0]	(4)	0.7	[0.4-1.4]	6 R^2= 0.09
Unskilled < Skilled	0.7	[0.4-1.2]		0.7	[0.4-1.4]	
Skilled	0.5	[0.3-0.8]		0.5	**[0.3-0.9]	
Unprofessional	*1.0*					
Unprofessional > Professional	0.9	[0.6-1.3]	5.99			
Unprofessional = Professional	1.1	[0.7-1.6]	(4)			
Unprofessional < Professional	1.1	[0.6-2.1]				
Professional	1.0	[0.4-2.4]				
over 8 hours/day	*1.0*					
8 hours/day and below	0.8	[0.6-1.1]	2.34			
			(1)			

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adj ORs	[95% C.I.]	
35 hrs/wk	*1.0*					
20-34 hrs/wk	1.4	[0.9-2.0]	6.06			
<20 hrs/wk	1.6	[1.0-2.7]	(3)			
>35 hrs/wk	1.4	[0.6-3.2]				
Full-time	*1.0*			*1.0*		
Part-time	0.6	[0.4-0.9]	5.96**	**0.4**	*****[0.2-0.6]**	**Remained at last**
			(1)			**step R^2=0.07**
Shifts always	*1.0*			*1.0*		
Sometimes	1.7	[1.1-2.6]	8.21**	**1.9**	****[1.1-3.4]**	**Remained at last**
Never	1.0	[0.7-1.3]	(2).016	**1.4**	**[0.9-2.1]**	**step R^2=0.07**
Permanent	*1.0*					
Temporary	1.8	[1.1-2.8]	0.05			
			(1)			
Conventional hrs never	*1.0*			*1.0*		
Sometimes	0.8	[0.6-1.2]	5.40*	0.8	[0.5-1.3]	Removed at Step
Always	0.7	[0.5-0.9]	(2).067	0.8	[0.5-1.3]	4 R^2=0.09
Organise tasks never	*1.0*					
Sometimes	1.0	[0.6-1.7]	0.39			
Always	1.1	[0.7-1.8]	(2)			
Computer use always	*1.0*					
Sometimes	1.5	[0.9-2.3]	3.62			
Never	1.5	[1.0-2.2]	(2)			
Physical	*1.0*			*1.0*		
Physical > Mental	0.5	[0.2-1.04]	14.94***	0.6	[0.2-1.7]	Removed at Step
Physical = Mental	0.6	[0.3-1.2]	(4)	0.9	[0.4-2.6]	1 R^2=0.10
Physical < Mental	0.4	[0.2-0.8]		0.8	[0.3-2.2]	
Mental	0.4	[0.2-0.7]		0.7	[0.2-2.2]	

	(a) Crude OR	[95% C.I.]	X^2 (df)	(b) Adj ORs [95% C.I.]	
Very stressful	*1.0*				
Quite stressful	1.2	[0.8-1.9]	2.5		
Stressful = Easygoing	1.2	[0.8-1.9]	(4)		
Quite easygoing	1.2	[0.7-2.0]			
Very easygoing	0.7	[0.2-1.9]			
Difficult to cope a lot of the time	*1.0*				
Easy to cope = Difficult to cope	1.5	[0.9-2.8]	3.45		
Easy to cope a lot of the time	1.4	[0.8-2.6]	(3)		
Well within capabilities	1.2	[0.7-2.3]			
Autonomous	*1.0*				
Autonomous > Teamwork	1.5	[0.9-2.8]	2.9		
Autonomous = Teamwork	1.4	[0.8-2.6]	(4)		
Autonomous < Teamwork	1.2	[0.7-2.3]			
Teamwork	1.0	[0.5-2.2]			
Never enjoy job	*1.0*				
Sometimes enjoy job	1.2	[0.7-2.1]	3.64		
Always enjoy job	0.9	[0.5-1.6]	(2)		
Job not secure	*1.0*				
Job secure	1.1	[0.8-1.5]	0.4		
			(1)		
No desire to continue in job	*1.0*				
Desire to continue in job	1.0	[0.8-1.4]	0.10		
			(1)		
Others control breaks	*1.0*				
Others control = Own control	1.3	[0.9-2.1]	3.62		
Own control of breaks	1.3	[1.0-1.8]	(2)		
Irregular breaks	*1.0*				
Regular = Irregular	1.2	[0.9-1.7]	2.17		
Regular breaks	1.1	[0.8-1.5]	(2)		
Short breaks (<15min/4hrs)	*1.0*				
Long = Short	1.2	[0.9-1.5]	1.78		
Long breaks (>15min/4hrs)	1.2	[0.8-1.8]	(2)		

*p<0.1; **p<0.05; ***p<0.01; Underlined= significant at p<0.006

(iii) Summary of associations between pain responses and psychosocial factors in relation to hypotheses

There were several hypotheses made in relation to psychosocial factors and pain response scores:

- That rates of medication use, medication avoidance and healthcare use would differ in relation to demographic groups (H_{13})
- That demographic variables would be associated (after adjustment) with rates of medication use, medication avoidance and healthcare use (EH_8)
- That rates of medication use, medication avoidance and healthcare use will differ in relation to work groups (H_{14})
- That work variables would be associated (after adjustment) with medication use, medication avoidance and healthcare use (EH_9)

Table 4.26 below shows that all of these hypotheses can be confirmed, and that after adjustment, pain responses scores differed considerably between demographic and work categories.

Table 4.26
Summary of associations between demographic factors, work variables and pain responses (a) before adjustment and (b) after adjustment

(i) Acting on Pain		*(ii) Consulting for pain*	
(a)Crude association	(b) Association after adjustment	(a)Crude association	(b) Association after adjustment
	<u>More likely to act on pain</u>		<u>More likely to consult</u>
<u>Gender</u>***	Women***	Shifts**	Shift-work sometimes**
	<u>Less likely to act on pain</u>		<u>Less likely to consult</u>
Age**	26-35**	<u>Family size</u>***	*No children**
	46-55**	Chronic condition**	*Without a chronic condition**
	56-65***	Manual/Non-manual**	Less non-manual than manual **
Chronic condition**	*Without a chronic condition**		Mostly non-manual***
<u>Unprofessional /Professional</u>***	Equally unprofessional & professional*	Part-time**	Part-time***
	More professional than unprofessional**	Unskilled/Skilled**	*Removed at Step 6*
	Mostly professional**	Spouse works*	*Removed at Step 5*
Quite stressful*	*Quite stressful***	Conventional hours sometimes*	*Removed at Step 4*
	Equally stressful & easygoing***	<u>Income</u>***	*Removed at Step 3*
Regularity of breaks**	*Removed at Step 7*	SEG**	*Removed at Step 2*
<u>Part-time</u>***	*Removed at Step 6*	Physical > Mental***	*Removed at Step 1*
35 hours/week**	*Removed at Step 5*		
<u>Income</u>***	*Removed at Step 4*		
<u>SEG</u>***	*Removed at Step 3*		
Unskilled/Skilled***	*Removed at Step 2*		
control of breaks***	*Removed at Step 1*		

*p<0.1; **p<0.05; ***p<0.01; <u>Underlined= significant at p<0.006</u>

4.6 Summary of all results in relation hypotheses and exploratory hypotheses

Table 4.27
Summary of results in to relation Hypotheses

(a) Prevalence of general aches and pains	
H_1 The prevalence of general pain in a working population will be high	Confirmed
H_2 Pain prevalence will differ in relation to pain type	*Confirmed*
H_3 Pain prevalence will be higher in women, in older age groups, and in less privileged socioeconomic groups, and where individuals had a chronic condition.	*Rejected*
H_4 Pain prevalence will differ in relation to marital status and family size.	*Partially confirmed*
H_5 Demographic factors will be associated with pain prevalence after adjustment.	*Partially confirmed*
H_6 Pain prevalence will be higher where: duration of employment is longer; control is lower; work demands are higher; stress is more common; and job satisfaction is lower.	*Partially confirmed*
H_7 Pain prevalence will differ in relation to different working conditions and between workgroups.	*Partially confirmed*
H_8 Psychosocial work factors will be associated with pain prevalence after adjustment.	*Partially confirmed*
(b) Pain experience	
H_9 GPQ scores and sub-scores for pain frequency, intensity and impact will be high.	*Rejected*
H_{10} GPQ scores and sub-scores for pain intensity, frequency and impact will differ in relation to pain type or pain cause.	*Partially confirmed*
H_{11} GPQ scores and all sub-scores for pain intensity, frequency, coping, will differ in relation Demographic groups.	*Partially confirmed*
H_{12} It is expected that total GPQ scores and all sub-scores will differ in relation to work factors.	*Partially confirmed*
(c) Pain response	
H_{13} It is expected that the rates of medication use, medication avoidance and healthcare use will Differ in relation to demographic groups.	*Partially confirmed*
H_{14} Rates of medication use, medication avoidance and healthcare use will differ in relation to work groups	*Partially confirmed*

Table 4.28
Summary of results in relation to Exploratory Hypotheses

(a) Pain experience	
EH_1 What is the nature of the sub-scores for coping with pain and pain emotions?	*Scores for pain emotion and coping are low overall*
EH_2 Do the sub-scores for coping with pain and pain emotions differ in relation to pain type or pain cause?	*Yes for pain cause therefore EH_2 partially "confirmed"*
EH_3 Are demographic variables associated with pain experience scores after adjustment?	*Yes, therefore EH_3 "confirmed"*
EH_4 Are work variables associated with pain experience scores after adjustment?	*Yes, therefore EH_4 "confirmed*
(b) Pain response	
EH_5 What are the rates of medication use, medication avoidance and healthcare use for pain?	See Figure 4.10
EH_6 Do rates of medication use, medication avoidance and healthcare use differ in relation to pain type and pain experience?	*Yes, marginally, therefore EH_6 partially "confirmed"*
EH_7 Are pain experience scores related (after adjustment) to rates of medication use, medication avoidance and healthcare use?	*Yes, therefore EH_7 "confirmed"*
EH_8 Are demographic variables related (after adjustment) rates of medication use, medication avoidance and healthcare use?	*Yes, therefore EH_8 "confirmed"*
EH_9 Are work variables related (after adjustment) rates of medication use, medication avoidance and healthcare use?	*Yes, therefore EH_9 "confirmed"*

5. Discussion

Section 2 of this thesis reviewed the literature between 1980 and 1998, prior to the design of this study and data collection. This section will compare current results to (a) the literature between 1980 and 1998, and (b) the relevant literature between 1998 and the present day.
A search of MEDLINE and PsychINFO databases was carried out using the same terms as the original search: "pain" and "work". This yielded 3572 papers, of which 240 were selected as completely, or marginally relevant to the current findings (See Table 5.1 overleaf).

As with the literature between 1980 and 1998, research on back and other musculoskeletal pain continues to predominate. The current study therefore remains virtually unique in its focus on pain as a generic experience, above and beyond site- and duration-specific criteria.

It is important to note that search was not intended to be more illustrative than comprehensive, and as with all literature searches, it is possible that the results of this search was limited, and that some papers were missed (see Section 5.4 below).

Table 5.1
Literature between 1998 and 2005 categorised by research aim and population type

	General population (with ref. to work risks)	General working sample	Specific occupation group or job title	Comparing specific occupational groups	*Total*
(a) Back pain only					
Physical risks only	1	2	2	0	5
Psychosocial risks only	9	0	2	0	11
Not specifically physical risks or psychosocial risks only, or both	8	10	26	3	47
	18	12	30	3	**63**
(b) Musculoskeletal pain					
Physical risks only	0	1	17	2	20
Psychosocial only	2	0	3	0	5
Not specifically physical risks or psychosocial risks only, or both	4	10	31	5	50
	6	11	51	7	**75**
(c) Other specific pain					
Physical risks only	1	1	0	1	3
Psychosocial only	3	2	2	0	7
Not specifically physical risks or psychosocial risks only, or both	17	10	7	0	34
	21	13	9	1	**44**
(d) General aches and pains					
Physical risks only	0	1	0	0	1
Psychosocial only	0	0	0	0	0
Not specifically physical risks or psychosocial risks only, or both	0	2	0	0	2
	0	3	0	0	**3**
(f) Other articles of interest					
Health-care use and back pain					8
Health-care use and chest pain					1
Health-care use and chronic pain					2
Health-care use and neck/shoulder pain					1
Commentary on pain and work					1
Experimental pain and work					1
Medication and pain at work					1
Psychological risks for pain alone					21
Systematic reviews of relationship between back pain and work risks					11
Systematic reviews of relationship between musculoskeletal pain and work risks					2
Systematic reviews of relationship between other specific pain and work risks					6
					55

5.1 Pain Prevalence

(a) Prevalence of general aches and pains

On the basis of previous research, it was hypothesised that the prevalence of general aches and pains in a working population would be high (H_1). This hypothesis can be confirmed, as current prevalence was high, accounting for nearly three-quarters of responders. Given the variety of pain measures, pain intervals and population types used in previous studies, a discrepancy between the findings of the current study and previous research is perhaps to be expected (see Section 2.3). These issues are discussed in more detail below.

(i) Current prevalence in comparison to the literature between 1980 and 1998

As discussed in previous sections, very few studies published between 1980 and 1998 report rates of general aches and pains, therefore there is very little previous research with which to compare current findings. Although Sternbach et al. (1985), carried out a study examining both troublesome and non-troublesome pain, he did not provide overall prevalence rates for general aches and pains, instead publishing site-specific prevalence rates. Moreover, Sternbach et al. focus on a general population (as opposed to a working population), and although some reference to work factors were measured, a proportion of this study population may not have been employed. Finally some issues with the design of Sternbach et al's study may also require reflection. Section 2.3 summarises these issues, noting the lack of consideration of two potential sources of bias: exposure to physical load in the workplace in Sternbach's sample; and the potential effect of previous musculoskeletal symptoms and/or ongoing concurrent illness. Both of these may have predisposed his sample to pain, therefore, the extent to which site-specific prevalence rates (reported below) reflect the "true" prevalence of pain in the population is unclear.

In an attempt to gauge level of agreement between current prevalence rates and those published prior to the design of the current study, Table 5.2 shows (a) site-specific four-week period prevalence from the current study compared to (b) weighted point and period prevalence from a selection of cross-sectional studies on populations published between 1980 and 1998.

Point prevalence of back pain in the current study was similar to that in other studies, however, for other pains, the current prevalence appears to be considerably lower. This is especially so for current rates of headache versus those recorded by Pryse-Phillips et al. (1992). However, it was argued in Section 2.3 that the study by Pryse-Phillips and colleagues (1992) was likely to be biased due to a high attrition rate in their sample, therefore it is possible that headache reports were biased by this in some way. This may partially explain the differences between rates of headache in Table 5.2.

Another reason for the disparity between reported site-specific prevalence rates and the current study may be the types of working populations studied. The majority of studies focus on occupations where manual tasks are common, such as industrial workers (for example Birger-Hagen et al, 1998; Herberts et al, 1984), or healthcare personnel (for example Ahlberg-Hulten et al, 1995; Brulin et al, 1998). Given the predominance of pain already reported in more manual occupations (see Section 2.2 and 2.3), it is possible that the over-representation of these occupations in the studies in Table 5.2 led to an elevated prevalence rate. Moreover, as the current sample included a variety of occupations (both manual and non-manual), this may also have accounted for lower prevalence in this study.

Table 5.2
Prevalence rates in the current study compared to the weighted average from cross-sectional studies between 1980 and 1998 publishing *point prevalence* or prevalence *within last four weeks* in *working populations only*

(a) Current study (n=1885)		(b) Weighted average prevalence (%); (studies used for calculation of weighted average) [cumulative denominator n=62717]	
Site	*Current prevalence rate (%)*		
Back	***25.8***	30.7	(Ahlberg-Hulten et al,1995; Birger-Hagen et al, 1998; Brulin et al, 1998; Burdorf et al,1993; Chiou & Wong, 1992; Feyer et al, 1992; Foppa & Noack,1996; Fujimura et al,1995; Harber et al, 1985; Hildebrandt et al, 1995; Lemasters et al, 1998; Masset et al,1994; Moens et al,1993; Rotgoltz et al, 1992; Videman, 1984)
Head	***26.1***	62.4	(Pryse-Phillips, 1992)
Joints	***9.7***	57.5	(Brulin et al, 1998; Lemasters et al, 1998)
Chest area	***1.9***	-	-
Face and mouth	***4.1***	-	-
Limbs	***5.6***	37.1	(Brulin et al, 1998; Helliwell et al, 1992; Lemasters et al, 1998)
Abdominal	***11.6***	-	-
Neck & shoulder	***9.6***	33	(Ahlberg-Hulten et al, 1995; Birger-Hagen et al, 1998; Brulin et al, 1998; Herberts et al, 1984; Lemasters et al,1998; Niedhammer, 1998)
Feet or ankles	***3.1***	11.0	(Brulin et al, 1998; Lemasters et al, 1998)
Ear nose or throat	***2.1***	-	-
Unspecified	***0.5***	-	-

It is interesting to note that the weighted average back pain prevalence was calculated from substantially more studies than that of other pain types. A greater number of studies included in this calculation led to more variety in the working populations incorporated. There was a similar level of variety of jobs in the current study population, and this may have led to the current back pain prevalence being closer to (although certainly not aligned with) the weighted back pain average (Table 5.2b).

One of the main issues argued in Section 2.4 is the unique focus of the current study, whereby the definition of pain outcome was extended to include "non-troublesome pain" as well as the "troublesome" pain that has been the focus of so many previous studies. As a result, the extent to which results of the other studies can be compared to this study is limited.

In addition, as also discussed in Section 2.4 of this thesis, the extent to which *any* two studies can be compared with one another is limited, given that all refer to a variety of populations, using many different inclusion and exclusion criteria, definitions and outcomes. As such it could be argued that the weighted prevalence is somewhat artificial, as it represents an approximation of combined site-specific prevalence rates that may not strictly be comparable. Section 2.4.2, for example discusses the variety of pain outcomes used in these studies. As such the extent to which "back pain on most days for at least two weeks at some point in your lifetime" (in a cross-sectional study with little account of previous back symptoms; Deyo & Tsui-wu, 1987) versus "any ache or pain in the back lasting for more than 24 hours in the past month" (measured prospectively in a pain-free cohort with strict inclusion criteria in place; Papageorgiou et al.,1998) can be seen to be accessing the same outcome is questionable.

(ii) *Current prevalence in comparison to the literature between 1998 and 2005*

In relation to studies publishing prevalence rates for pain in a variety of working populations, current prevalence rates can be seen to be comparable to the observations of a number of authors: for back pain (Kaneda, Shirai & Miyamoto, 2001; Magnavita et al,1999; Molano et al, 2001; Shehab et al, 2003; Nahit et al, 2001), various musculoskeletal pains (Joshi, Menon & Kishore, 2001); neck/shoulder pain (Andersen et al, 2003; Magnavita et al,1999; Nahit et al, 2001); joint pain

(Magnavita et al,1999; Nahit et al, 2001); and pain in the limbs (specifically the forearm; Nahit et al, 2001).

As with previous literature, however, there was also substantial disagreement between the current study and observations of: back pain (Omokhodion, Umar & Ogunnowo, 2000; Cole et al, 2001; Yip, 2001; Tsuboi et al, 2002; Gomez et al, 2003; Stewart et al, 2003; Byrns et al 2004; Van Nieuwenhuyse et al); various musculoskeletal pains (Stewart et al, 2003; Chyuan et al, 2004); joint pain (Gomez et al, 2003; Stewart et al, 2003); limb pain (Gomez et al, 2003); and neck/shoulder pain (Pope et al, 2001; Vasseljen, Holte & Westgaard, 2001; Gomez et al, 2003; Chyuan et al, 2004). Articles that differed from the current study included prevalence rates that were higher than the current study in every case.

It is argued above that as there are many differences between the designs of these studies and the current study, it not surprising that discrepancies in prevalence rates are observable. One design-related explanation may be the tendency of authors to focus on more manual occupations such as nursing (for example, Trinkoff et al., 2003; Menzel et al., 2004; Eriksen, Bruusgaard & Knardahl, 2004), farming (Gomez et al, 2003; Torén et al., 2002; Kirkhorn, Greenlee & Reeser, 2003; Holmberg et al., 2004) or construction (Sporrong et al., 1999; van der Molen et al., 2004, Turner, Franklin & Turk, 2000; Cole et al., 2002; Welch, 1999). This may have led to an elevated prevalence rate in studies measuring manual populations.

Although some authors do use a variety of different groups in their samples, the majority are focussed on manual occupations. For example, Pope and colleagues (2001) examine shoulder pain in six different occupational groups (workers in a Post office, Supermarket, Department store, Packaging factory, and Hospital), and Vasseljen, Holte & Westgaard (2001) examine shoulder and neck pain in healthcare workers versus shopping centre workers. However, both of these studies explicitly use these occupational groups as indicative of jobs with a high proportion of manual tasks, and both report pain prevalence rates that are higher than the current study for all groups (Pope et al, 2001; Vasseljen, Holte & Westgaard, 2001).

It is likely, however that the discrepancy between these studies and the current study may also be partially explained by differences in the pain outcomes used. As with studies carried out between 1980 and 1998, recent research also tends to focus on a variety of pain outcomes. Taking the two studies mentioned above as an example, Pope et al (2001) measure shoulder pain as, "symptoms in and around the shoulder complex lasting for more than 24 hours in the month [prior to their investigation]", and ask individuals to exclude "the more minor or transient episodes of shoulder pain" (Pope et al, 2001). Vasseljen, Holte and Westgaard (2001), on the other hand, use recorded reports of shoulder and neck pain on a six-point visual analogue scale (VAS) for the day, week and six months prior to their study. This VAS scale recorded observations of intensity and frequency of shoulder and neck pain, and although these authors do report one-year prevalence of pain in two occupational groups (57% for healthcare employees; 54% for shopping centre employees); this is done in the context of frequency and intensity ratings described above. There are several outcome-related issues that make these studies difficult to compare with one another. First, one refers to "shoulder pain" as defined on a manikin (Pope et al, 2001) while the other refers to "shoulder and neck" pain (Vasseljen, Holte & Westgaard, 2001). In other words, although there may be overlap between the two, strictly speaking both studies are measuring different things. Moreover, it is difficult to compare either of these studies with current prevalence rates, given that no site-specific criteria in the current study were used, therefore, it is unclear whether the participant-defined "neck/shoulder pain" in the current study; the manikin-based shoulder pain in Pope et al's study; and/or the less specific "shoulder and neck pain" in Vasseljen, Holte and Westgaard's study are referring to the same construct.

Another outcome-related issue that makes these studies difficult to compare with one another is that one describes the occurrence of pain at a particular level of functional impact only (Pope et al, 2001), while the other uses a measure of occurrence combined with intensity and frequency (Vasseljen, Holte & Westgaard, 2001). In addition, the focus of the former study may have led to the reporting of prevalence rates of *disabling* pain in different occupational groups (Pope et al, 2001), which was one of its research aims. This approach is not being criticised as such, however it may have led to under-reporting of *all* pain in their sample, such that had other non-disabling shoulder pain been included (as in this sample) prevalence rates may have been similar to those in current data.

The fact that both of these studies report greater prevalence rates of neck and/or shoulder pain than the current study is somewhat puzzling. One explanation might be that the focus of the study by Vasseljen, Holte and Westgaard (2001) could have led to a bias in reports of pain. Their study, for example, could have been affected by detection bias, whereby individuals only reported pain that was intense or frequent, and/or recall bias whereby only pain that was intense and frequent was recalled. It is important to point out that this is not in any way suggesting that prevalence rates reported in these studies are *wrong*, only that the way that one might ask the question will affect the way that someone answers it (Coolican, 2001). In addition, it might be that the differences in reported prevalence between studies are related to methodological issues in the current design, which can be criticised for having a number of limitations (see Section 5.4 below). Thus it is possible that the discrepancy between the current prevalence rates and those reported by Pope et al (2001) and Vasseljen, Holte and Westgaard (2001) (as well as with all of the others) were the result of differences between their studies and the current methodology.

Finally, and perhaps most importantly, is the point that transcends all design issues, that is likely to provide the most obvious explanation for the discrepancies between site-specific prevalence given in Table 5.2 above and those reported in the current study. As with studies between 1980 and 1998, recent literature focuses on the more troublesome end of pain in the workplace. Some authors refer only to pain that was troublesome enough to result in sickness absence from work (Molano et al, 2001; Stewart et al, 2003), while others specifically exclude less troublesome pain (for example, see Pope et al's pain outcome described above). As the current study includes both troublesome and non-troublesome pain, it is not surprising that prevalence rates would be different. Whether prevalence rates would be *less* in the current study is another question, however. One might expect that the inclusion of *all* pains would lead to elevated prevalence rates for all pains. Why prevalence rates were less in the current study is therefore unknown. One explanation might be that, as discussed below (see Section 5.2) rather than recording rates of both non-troublesome and troublesome pain, it is likely that current pain outcome recorded less troublesome pain only.

This could partially (although not entirely) explain the lower prevalence rates in a variety of sites. These lower prevalence rates may also be related the methodological imitations of the current study, for example the response rate (see Section 5.4), and may reflect characteristics of a sample of responders that were not representative of the target population as a whole.

One recent study provides some data regarding a variety of different pains in a community sample using a less specific pain outcome (Bassols et al, 2002). In this study, participants were asked if they experienced "any pain complaint in the last six months [prior to the survey], regardless of its intensity and duration." As in the current study, location of pain was asked in a separate question. Table 5.3 shows that there is substantial agreement between prevalence rates observed by Bassols and colleagues and the current study, despite the difference in retrospective period (one month in the current study; six months in Bassols et al, 1999). Therefore, where a *non-specific* pain outcome is used to enquire about pain such as those used in both the current study and Bassols et al (1999), similar patterns emerge. It is important to reflect on aspects of the design of Bassols et al's study, however, before any firm conclusions can be drawn.

Table 5.3
Comparison of pain sites between Bassols et al (2002) and the current study

Pain categories observed by Bassols et al (2002)		*Pain categories observed in the current study*	
Pain site	% total of all reported pains	*Pain site*	*% total of all reported pains*
Back	30.3	*Back*	*25.8*
Head	23.8	*Head*	*26.1*
Abdomen	8	*Abdominal*	*11.6*
Legs	15	*Feet & ankles*	*3.1*
Teeth	6.8	*Limbs*	*5.6*
Neck	8.9	*Neck & shoulder*	*9.6*
Arms	5.7	*Joints*	*9.7*
Chest	1.2	*Chest area*	*1.9*
Face	0.3	*Face & mouth*	*4.1*
		Unspecified	*0.5*

Bassols et al (1999) randomly sampled participants from telephone directories, using names recorded in the most recent Spanish Census (1991). Several exclusion criteria were put in place. For example, individuals without a telephone, institutionalised individuals, the homeless and those who were unable (as a result of mental or physical disability) to participate in the interview over the phone were not included in the sample. Eight groups were created, stratifying individuals by age and gender. It is therefore less likely that these data could be said to be affected by selection bias or by the confounding effects of age and gender, as care was taken by the researchers to ensure that each of the eight groups had similar demographic characteristics (age, sex, area of residence) to the Catalan population they were aiming to represent.

Bassols et al (1999) first invited individuals to participate by letter (N = 2835), which they followed-up with a telephone call (2142 phone numbers for these individuals were available). Of the 2142 that were telephoned, 1964 (91.7%) agreed to participate. It could be argued, therefore, that Bassols et al's published prevalence rates may have been relatively unaffected by attrition bias, with such a high participation rate. However, it could also be argued that this participation rate could be seen as being somewhat inflated, given that those agreeing to participate constituted only 69.3% of those first contacted by letter. The authors give no explanation for the loss of 693 individuals between sending out the letter and the telephone call. More damaging perhaps, is the lack of information given about the representativeness of the remaining 2143 individuals. This is unfortunate, given the care taken to ensure that the original 2835 were representative of the target population. It may be that Bassols et al's prevalence rates were in fact affected by attrition bias, and given that they do not provide any non-responder information, it is difficult to evaluate impact of this potential bias. In the final sample, married individuals from urban areas, those with high levels of education, individuals in employment, and those identified as in the middle classes were over-represented in responders. The extent to which this was similar or different to the demographic characteristics of those who did not respond, however, is unclear.

In relation to the judgements of quality applied to the initial literature review (see Section 2.1(e)), it could be argued that the study by Bassols et al is of "lower quality" than many of the others studies in the current review. For example, these authors did not record previous pain symptoms or concurrent illness. Given that these have been seen to be related to the prevalence of recurrent pain and of incident pain (see Section 2.3), it is important that such characteristics are recorded so that their potential effect on pain reports can be quantified. In addition, the focus of Bassols et al's study was on general pain in a community sample, therefore the extent to which the interaction between work and pain was measured is minimal. While this is not a criticism per se (indeed this focus fits with the research aims of the study) it does mean that a measure of physical load was not taken or applied. Individuals were placed within particular socioeconomic groups (SEGs) in relation to specific job titles, and therefore level of exposure to physical load can be inferred to some extent. However, as described below (Section 5.2) membership of the SEG groups (as classified in relation to the manual, skilled and professional components of jobs) did not always correspond with actual or perceived reports of exposure to manual tasks or requirements of skill, or judgements about professional components of occupations. It may have been useful, therefore, for Bassols et al to have included another measure of physical load, to enable estimation of the level of physical exertion that their participants had been or were still regularly exposed to in their daily lives. Finally, although Bassols et al (1999) did adjust for sociodemographic confounders (to some extent by using the stratification techniques described above, as well as by logistic regression) the lack of information on previous symptoms and physical load meant that Bassols et al were unable to control for the confounding effect of factors other than age, gender and place of residence. The extent to which the prevalence rates published by Bassols et al (1999) therefore can be seen to be unaffected by the influence of other exposures (for example physical load and previous pain) is uncertain. Caution should therefore be applied in interpreting Bassols et al's prevalence rates as given in Table 5.3, as the extent to which pain reports may or may not have been affected by unmeasured variables is unclear.

It is important to point out that although there were many issues with the design of Bassols et al's study, there are also many criticisms that can be made of the current study. For example, the current study can also be criticised for being potentially open to attrition bias, as well as for having a lack of non-responder information with which to estimate the effects of this bias (see Section 5.4 below). It is possible, therefore, that the similarities between the current findings and those of

Bassols et al (1999) are related to the similarities in issues with study design, and that parity of findings between the two studies were related to systematic influences in both designs leading to a similar bias in responses.

Acknowledging the extent to which the current study can be compared to all research between 1980 and 2005, therefore, it is clear (and perhaps not surprising) that in the majority of cases, current findings do not appear to reflect prevalence rates reported elsewhere. There is some agreement between the current study and one other study of a similar design (that is, cross-sectional, using a similarly general pain outcome; Bassols et al, 1999). Therefore it could be that when a similar design is used, the discrepancy between current prevalence and other findings is reduced. However one cannot be certain that the similarities in findings between this study and that of Bassols et al (1999) reflect "true" in population prevalence rates, or are the result of similar exposure to attrition bias. Indeed it is possible that the similarities in both the outcome and the attrition rate could partially explain the parity in findings. Moreover, any similarities between their study and the current one should be reviewed in the knowledge of the issues raised regarding the design of Bassols et al's study, and the potential within their study for reports of pain prevalence to be biased by unmeasured factors.

(iii) *Prevalence of pain causes and pain types*

It was hypothesised that the prevalence of general aches and pains would differ in relation to pain type (H_2). Again this hypothesis can be accepted; as some pain types were more prevalent than others in current data (see Tables 5.2 and 5.3 above). Specifically, back pain and headache were substantially more prevalent than other pain types. The predominance of back pain and headache reflects findings in some previous studies examining different pain types (Chavalitsakulchai & Shahnavaz, 1991; Jacobsson et al, 1992; Skov et al, 1996; Starr, 1983), although not all (Ahlberg-Hulten et al, 1995; Birger-Hagen et al, 1998; Brulin et al, 1998; Engels et al, 1996; Lemasters et al, 1998).

Again, given the variety of pain measures, pain intervals and population types used in previous studies, one might expect some level of disagreement. However, as can be seen in Table 5.3 above, when pain is addressed from a general perspective, there is a notable similarity between the prevalence of general aches and pains in the current study and that observed by Bassols and colleagues (1999). Although there are differences in the way in which pain is categorised, overall, prevalence rates show similar trends: highest in back and head pain; and very low for face and chest pain. In light of the issues raised with Bassols et al's design above, however, caution should be applied when interpreting any similarities between their data and those of the current study.

One final issue that deserves mention relates to the prevalence of perceived causes in the current population. By far the most common response given to this question was "unknown cause" representing just less than one quarter of those who experienced pain. This is an important finding in that it shows that the rate of pain from unknown causes was high, highlighting the potential importance of examining pain in absence of pathology-specific criteria. According to current data, a considerable amount of pain experienced in the community existed beyond these pathology-specific criteria, certainly beyond any known to a substantial proportion of the sufferers. The implication of this is that there may be a lack of public awareness of pain causes, and that this is an area of research that requires attention (see Section 5.5 below).

Aside from pain of 'unknown' cause, in this study, the most common causes given for pain were 'short-term medical problems' (12%); 'recent injury'(14.9%) and 'life variables' (11.9). These are important to note, as all represent short-term or acute health issues, and therefore fall within what would be termed by conventional categorisation as "non-chronic" pain. These are the first prevalence rates of non-chronic, non-troublesome pain known to the author, and show that while general medical thinking would categorise these as potentially "trivial" (or at least "solvable") they account for a substantial proportion (one third in total) of pain experienced in the current sample. One of the key aims of this study was to examine non-chronic, non-serious pain. On the basis of current observations of perceived pain cause (and those discussed in Section 5.2 below in relation pain experience), it is suggested that the current study does in fact provide a commentary on non-chronic pain. The risk profiles for the prevalence of non-chronic pain are discussed in more detail below.

(b) Demographic factors, work variables and prevalence of general aches and pains

(i) Current findings for associations between demographic factors in relation to the literature

On the basis of previous literature, it was hypothesised that:

- pain prevalence would be higher in women, in older age groups, and in less privileged socioeconomic groups, and with co-morbid conditions (H_3);
- pain prevalence would differ in relation to marital status and family size (H_4);
- demographic factors will predict pain prevalence (H_5);

All of these hypotheses can only be partially confirmed by current data (see Table 5.4 below). Current data confirmed the hypothesis that female gender and having a chronic condition may be associated with higher pain prevalence. An association with gender is a common finding in articles examining a variety of pains in working or general populations (see Table 5.4 below). As can be seen, these findings are in agreement with the majority of the literature. Gender associations have been reported in several cross-sectional studies (Akesson et al, 2000; Al-Arfaj et al, 2003; Bingefors & Isacson, 2004; Cole et al, 2001; Cole et al, 2002; Croft et al, 1999; Failde et al, 2000; Gomez et al, 2003; Hagberg, Tornqvist & Toomingas, 2002; Moulin et al, 2002; Nordander et al, 1999; Omokhodion, 2004; Rustøen et al, 2004; Shehab et al, 2003; Soriano et al, 2002; Stranjalis et al, 2004; Strazdins & Bammer, 2004;Weiner et al, 2003), as well as in several case-control studies (Vingård et al, 2000; Müllersdorf & Söderback, 2000; Thorbjörnsson et al, 2000; Fredriksson et al, 2002; Mortimer & Ahlberg, 2003; Kostova & Koleva, 2001), and cohort studies (Ward & Kuzis, 2001; Viikari-Juntura et al 2001; Cassou et al, 2002; Gerr et al, 2002; Grooten et al 2004; Johnston et al 2003; Korhonen et al, 2003; Macfarlane et al, 1999; Xiang, Stallones & Keefe, 1999). In relation to study quality, as discussed in Section 2.1(e), evidence of relationships between all psychosocial factors and pain prevalence are generally viewed as "better" or more robust when derived from case-control or prospective designs (Higgins & Green, 2005). This is not to say that all studies of case-control or prospective design were of similar quality, however. Using the quality criteria discussed in Section 2.1(e), not all studies could be described as of "reasonable quality". Although many authors measure the extent to which their cohort was exposed to physical load (Viikari-Juntura et al 2001; Cassou et al, 2002; Gerr et al, 2002; Johnston et al 2003;

Korhonen et al, 2003; Macfarlane et al, 1999; Xiang, Stallones & Keefe, 1999); some authors are more specific about controlling for this exposure than others. Gerr et al (2002), for instance, include only individuals "newly hired into jobs requiring [more than or equal to] 15 hours of computer use every week". In addition, while many authors record the extent to which pain was previously a problem for their cohort (Korhonen et al, 2003; Macfarlane et al, 1999; Grooten et al 2004; Gerr et al, 2002; Cassou et al, 2002; Johnston et al 2003), not all make this clear (Ward & Kuzis, 2001; Xiang, Stallones & Keefe, 1999); and some do not measure previous pain at all (Viikari-Juntura et al 2001). As such, is not always clear the extent to which reported gender associations are affected by prior (and/or continued, unmeasured) exposure to previous pain, pain-related illness and physical exposure in the workplace.

In better quality studies, authors have excluded individuals with particular levels of previous pain experiences. Macfarlane et al, for example, included only individuals who were "free of forearm pain at baseline" in their follow-up questionnaire two years after baseline; and Grooten et al (2004) excluded individuals who had previously consulted (in the six months prior to the study) for neck/shoulder pain or lower back pain "in order to study a healthy population". These measures reduce the possibility of performance bias, and increase the extent to which authors can be more confident that the incident pain experienced between baseline and follow-up is related to the exposures recorded.

In addition to differences in inclusion and exclusion criteria, not all cohort studies had similar levels of follow-up. Although some had good response rates (for example 80% and above; Viikari-Juntura et al 2001; Ward & Kuzis, 2001; Cassou et al, 2002; Korhonen et al, 2003; Macfarlane et al, 1999); others may have been subject to attrition bias, with approximately only two-thirds of the cohort completing follow up (Johnston et al 2003). Grooten and colleagues (2004) report two-thirds of individuals completing at first follow-up (five years), but this was reduced to just over one quarter (28%) at final follow-up (six years). As such it is not entirely clear whether individuals at final follow-up were representative of those studied at baseline, and whether associations between gender and pain prevalence were biased by characteristics of those who replied at these times.

It is possible then that the findings of the current study reflect the evidence for an association between gender and pain prevalence that can be seen in studies elsewhere, many of which are of reasonable quality. In applying the quality criteria discussed in Section 2.1(e) above to the current study, it would be seen as "reasonable evidence", fulfilling four out of the five quality criteria (measure of previous pain, measure of physical exposure; adjustment for confounders and sample greater than 1000). However, this is not to say that the current study was not open to effects of bias and the current design can be criticised in several ways (see Section 5.4 below). First, it is argued above that evidence from non-cross-sectional studies is of "better quality", and this is problematic given that the current study was cross-sectional. Although it is also argued in Section 3.1 that no other design would have been appropriate given the inclusion of less troublesome pain, in the current study this remains a potential source of difficulty in interpreting findings. On reflection, due to the relative "success" of the GPQ experience measure in the current study (see Section 5.3), in fact there may have been an alternative to the cross-sectional approach to non-troublesome pain, and this is discussed in detail in relation to future research in Section 5.5.

It is also possible that the current study was affected by attrition bias (see Section 5.4 below). Responses rates were low, although where target population information was available from specific organisations, samples were seen to be reasonably representative of these organisations' populations. However, this approach does not allow a comparison between the characteristics of responders versus those of non-responders, and as such the level of bias that this high attrition rate may have caused cannot be estimated. Therefore, again this study could be criticised for being of "lesser" quality. These limitations are discussed in detail below (see Section 5.4). In truth, there is no way of knowing whether the current findings reflect the effects of bias or of "real" associations reported elsewhere. However, given that findings for interactions between gender and work factors are similar to those found elsewhere (see Section 5.1b (iii)); it is suggested that the gender-specificity found in more troublesome pain is observable to an extent in less troublesome pain. There is a great deal of discussion as to why a gender effect exists in pain, most of which relates to the complex combination of biological and psychosocial differences between gender groups (Unruh, 1996, see Section 5.2d below).

In the current study, the absence of a chronic condition was related to lower pain prevalence of pain, which, as can be seen in Table 5.4, was in agreement with many studies reporting associations between having a chronic condition and/or previous or co-morbid symptoms and a variety of different pains in a variety of populations. This was the case for cross-sectional (Lee et al, 2001; Weiner et al 2004) case-control (Feuerstein, Berkowitz & Huang,1999) and cohort designs (Müller et al, 1999; Kopec, Sayre & Esdaile, 2004; Viikari-Juntura et al 2001; Adams, Mannion & Dolan, 1999; Elders & Burdorf, 2004; Gerr et al, 2002; Hill et al, 2004; Shiels, Gabbay & Ford, 2004; Tubach et al, 2002). As with gender associations, these studies present a variety of evidence from a variety of designs, and as such should not be assessed as of equal quality. For example, one of these prospective studies does not adjust for physical load in their sample, whereby the extent to which physical load is affecting pain reports is not known (Shiels, Gabbay & Ford, 2004). The remaining seven prospective studies can be seen to be of "reasonable quality " and reduce or quantify the possibility of bias by documenting previous pain and exposure to physical load (Müller et al, 1999; Kopec, Sayre & Esdaile, 2004; Viikari-Juntura et al 2001; Adams, Mannion & Dolan, 1999; Elders & Burdorf, 2004; Gerr et al, 2002; Hill et al, 2004). In addition these studies adjust for many confounders in their analyses.

However, six of these studies base their observations on small samples, and report considerable loss of participants at follow-up (Müller et al, 1999; Adams, Mannion & Dolan, 1999; Viikari-Juntura et al 2001; Elders & Burdorf, 2004; Gerr et al, 2002; Hill et al, 2004). Elders and Burdorf (2004), for example, followed up 288 scaffolders for three years, and while the first follow-up is reasonably complete (73%); follow-up participation was reduced to 63% in the second year, and only 50% in the third year. This means that complete data for only 144 scaffolders was available for the entire follow-up period. One cannot be sure whether this attrition rate biased responses, such that those responding were qualitatively different from those who did not participate in follow-up. The authors' examination of non-responders at the time of the first follow-up showed a non-significant trend towards *non*-responders reporting a higher prevalence of low back pain at baseline than participants (Elders and Burdorf, 2004). It is possible, then, that reported associations between chronic condition and incident pain reflected a "Healthy Worker Effect", whereby reports of pain were biased towards those who were in pain and/or suffering from a concurrent condition *but still* *able to work as scaffolders.* Conversely, those with disabling pain and/or a serious concurrent condition were lost to follow-up. The authors attempt to quantify this bias by reporting the proportion of non-responders that left the company or changed jobs (49%, 43%, and 33% at each consecutive follow-up), and an additional proportion of non-responders that were lost to permanent disability (10%, 11%, and 22% of all non-responders in each consecutive follow-up). In addition, the authors state that of those who became permanently disabled during the three-year follow-up period, half were likely to be pain-related (Elders and Burdorf, 2004). There is some evidence therefore, that a "Healthy Worker Effect" was present, with at least half of all non-respondents either moving on to other jobs, or becoming permanently disabled.

The potential effect of attrition bias in these studies is important in interpreting the findings of the current study. As mentioned previously and below (Section 5.4) the low response rate in the current study presents the possibility that the current associations between chronic condition and pain reported here were affected by attrition bias. Although where demographic information was available, samples appeared to be generally representative of the target populations within organisations, the possibility of attrition bias, and indeed of a "Healthy Worker Effect" in current data cannot be ruled out.

One final study presenting prospective evidence of an association between having a chronic condition and pain deserves mention. Kopec, Sayre and Esdaile (2004) report an association between level of self-reported health and incident back pain in a large general population sample. This is a particularly strong study in that individuals who reported activity limitation due to back pain at baseline were excluded from their cohort, and follow-up of a large number of individuals (N= 10 007) was excellent (90.5%). Moreover, the authors report differences between responders and non-responders to be minimal (Kopec, Sayre & Esdaile, 2004). It is interesting to note that when analysis was split by gender, an adjusted relationship between self-rated health and greater likelihood of incident back was present in men, but not in women. This suggests an interaction between gender and chronic condition in relation to pain reports, a possibility that was also explored in current data (see Section 5.1b (iii) below).

It can therefore be concluded that current data are in agreement with the literature reporting an association between having a chronic condition and pain. Many of these studies present reasonable prospective evidence for this association, although it is possible that a proportion of current and published reports of pain and/or reports of chronic condition are biased by a "Healthy Worker Effect". In addition there may be some gender-specificity in relation to the association between chronic condition and pain (see Section 5.1b (iii) below).

Table 5.4 shows the extent to which current findings are in agreement with previous literature on other demographic variables and pain. There is a clear inconsistency between this study and those reporting an association between pain prevalence and age, SEG, and household variables (marital status, spouse employment status and family characteristics). For example, many authors have reported relationships between age and different pain types in cross-sectional (Al-Arfaj et al, 2003; Gerdle et al, 2004; Gomez et al, 2003; Miranda et al, 2001; Moulin et al, 2002; Soriano et al, 2002; Welch, Hunting & Nessel-Stephens, 1999), case-control (Feuerstein, 1999; Reigo, Tropp & Timpka, 2001) and prospective studies (Kopec, Sayre & Esdaile, 2004; Viikari-Juntura et al 2001; Cassou et al, 2002; Stevenson et al, 2001; Bonde et al, 2003; Elders & Burdorf, 2004; Gerr et al, 2002; Hill et al, 2004; Jansen, Morgenstern & Burdorf, 2004; Miranda et al, 2002; Shiels, Gabbay & Ford, 2004). The current study observed no notable associations, either before or after adjustment.

Similarly, where other authors report a relationship between less privileged socioeconomic circumstances and greater likelihood of pain in data gathered both cross-sectionally (Byrns, Agnew & Curbow, 2002), and prospectively (Shiels, Gabbay & Ford, 2004), the current study reports no such association. It is unclear why these discrepancies exist, and it is likely to be due to a combination of the methodological differences between these studies and the current one. First, the current study examines non-troublesome pain, whereas all other studies reporting associations between age and pain, as well socioeconomic group and pain focus on more troublesome pain. Aside from methodological differences, therefore, it may be that troublesome pain differs in relation to age-group and socioeconomic circumstances, whereas less-troublesome pain does not.

The limitations of the current study design may also have led to a misrepresentation of pain in age and socioeconomic groups. For example, certain groups were more represented in this study's sample than others. Specifically, the majority of individuals responding to the current questionnaire were aged between 26 and 45 (61.9% of those giving their ages); and were in socioeconomic group I, II or IIIN (79.2% of all those giving a job title and salary information). These percentages suggest that the current responder sample was biased towards being of younger age and in more privileged socioeconomic groups. In the context of a literature that reports greater likelihood of pain in those in middle-to older age, and in less privileged socioeconomic groups, this bias in the sample may very well explain the discrepancy between current findings and studies publishing associations between age and pain, and socioeconomic group and pain. Unfortunately the lack of non-responder information in the current study (see Limitations - Section 5.4 below) prevents any further analyses being done on these figures, and as such it is unclear whether the demographic characteristics in responders were comparable to those of non-responders. It can therefore be concluded, that in the context of most recent research, the current study is in agreement with the majority of articles reporting on gender and chronic condition, but conflicts with those reporting on other demographic factors.

(ii) Work variables and prevalence of general aches and pains in relation to the literature

On the basis of previous literature, it was hypothesised that:

- pain prevalence would be higher where: duration of employment was longer; control was lower; work demands were higher; stress was more common; and job satisfaction was lower (H_6);
- pain prevalence would differ in relation to different working conditions and between workgroups (H_7); and
- psychosocial work factors will predict pain prevalence (H_8).

These hypotheses were only partially confirmed. Associations between the majority of work factors and pain prevalence were not found (see Table 5.5 below), although the predicted association between a stressful workload and general aches and pains was confirmed by current data.

The relationship between stress and prevalence of general aches and pains was somewhat linear in nature, such that the more stressful an individual perceived their workload to be, the less likely they were to experience general aches and pains. This finding is in accordance with the majority of the literature, which reports higher job stress to be associated with higher pain prevalence in a variety of working and general populations (see Table 5.5). This association has been noted in: cross-sectional studies (Cole et al, 2001; Pope et al, 2001; Vasseljen, Holte & Westgaard 2001); case-control studies (Kaergaard & Andersen, 2000); and cohort studies (Harkness et al, 2003; Oleske et al, 2004; Viikari-Juntura et al 2001; Smedley et al, 2003; Gonge, Jensen & Bonde, 2001; Johnston et al 2003; Korhonen et al, 2003; Miranda et al, 2002; Nahit et al, 2003). In comparison to the evidence for associations between demographic factors and pain discussed above, the majority of prospective studies were of reasonable quality, meeting four out of the five quality criteria discussed in Section 2.1(e) (Viikari-Juntura et al 2001; Korhonen et al, 2003; Miranda et al, 2002; Nahit et al, 2003; Harkness et al, 2003), and three excellent quality studies met all five (Miranda et al, 2002; Nahit et al, 2003; Harkness et al, 2003). Therefore, where physical workload and previous pain are controlled for (and after adjustment for confounders) higher job stress was related to greater risk of incident knee pain in forestry workers followed-up over three intervals (N = 2122; response rates for three consecutive yearly follow-ups were 83%, 77%, and 90%, respectively; Miranda et al, 2002). In addition, higher stress was associated with various musculoskeletal pain types in individuals newly-employed into a variety of "at risk" occupations (N= 1081; response rate at one year 77%; Nahit et al, 2003). Finally, using the same population as Nahit et al (2003), but with a cohort free of shoulder-pain at baseline (response rates at 12 and 24 months 79% and 88% respectively) Harkness et al, 2003 report an association between higher stress and incident shoulder pain. As a result of this excellent evidence, it can be said with reasonable confidence that there is likely to be a relationship between higher stress and likelihood of more troublesome pain. The current study appears to confirm the existence of the relationship in less troublesome pain also, although this should be interpreted in light of the criticisms already raised about the current study and discussed in detail below (Limitations - Section 5.4).

There is further evidence of differences between the current study and published associations between work factors and pain. Table 5.5 below shows that for several work factors (workload demands, job satisfaction, teamwork/good work relationships; physical workload; and negative/restrictive work routine), in contrast to the current findings, the body of evidence is in support of an association between these work factors and greater likelihood of pain. Many of these studies present prospective evidence in support of these associations with pain: for high work demands (Fredriksson et al, 1999; Stevenson et al, 2001; Shannon et al, 2001; Bonde et al, 2003; Elders & Burdorf, 2004; Hoogendoorn et al, 2001; Hoogendoorn et al, 2002; Johnston et al 2003; Nahit et al, 2003; Eriksen, Bruusgaard & Knardahl, 2004; Leroux, Dionne & Bourbonnais 2004; Morgenstern & Burdorf, 2004); for job satisfaction (Macfarlane et al, 1999; Macfarlane et al, 2000; Johnston et al 2003; Miranda et al, 2002; Nahit et al, 2003; Eriksen, Bruusgaard & Knardahl, 2004; Jacob et al, 2004) for poor relationships (Macfarlane et al, 2000; Stevenson et al, 2001;Tubach et al, 2002; Bonde et al, 2003; Nahit et al, 2003; Eriksen, Bruusgaard & Knardahl, 2004; Kaila-Kangas et al, 2004; Leroux, Dionne & Bourbonnais 2004); and for high physical loads (Alcouffe et al, 1999; Fredriksson et al, 1999; Nahit et al, 2003; Elders & Burdorf, 2004). Many of these studies are of reasonable and excellent quality, therefore it is likely that they are recording "real" relationships between these work factors and likelihood of reporting pain.

In addition, evidence for an association between a variety of work factors and increased likelihood of various pains is published in several systematic reviews of the literature: for high work demands (Hoogendoorn et al 2000; Waddell & Burton, 2001); for job satisfaction (Hoogendoorn et al 2000; Waddell & Burton, 2001; Hansson & Jensen, 2004); for relationships at work (Hoogendoorn et al 2000; Hoogendoorn et al, 2001; Shaw, Pransky& Fitzgerald, 2001; Waddell & Burton, 2001; de Croon et al, 2004); and for higher physical workload (Devereux, Buckle & Vlachonikolis, 1999; Shaw, Pransky & Fitzgerald, 2001). Given the quality criteria applied for inclusion in these systematic reviews, it could be argued that they are also reporting reasonable evidence for a relationship between these psychosocial work factors and likelihood of pain.

It is unclear why the discrepancy between the current findings and those reported in the literature may have occurred. One explanation may be that work factors are *less associated* with less troublesome pain than they are with more troublesome pain. While this is not impossible, it is more likely that the limitations in the current design are the source of inconsistencies between results of this study and those discussed above (and Section 5.4 below).

It is worth mentioning, however, that despite what appears on the surface to be overwhelming evidence for a relationship between these psychosocial work factors and pain in Table 5.5, some evidence to the contrary does exist. Table 5.5 also shows that some authors measured several work factors and found no association with likelihood of pain: for high work demands (van der Windt et al, 2000; Mortimer & Ahlberg, 2003; Hartvigsen et al, 2004); for low job satisfaction (van der Windt et al, 2000; Kerr et al, 2001; Mortimer & Ahlberg, 2003; Hartvigsen et al, 2004); for poor relationships at work (van der Windt et al, 2000; Kerr et al, 2001; Kaila-Kangas et al, 2004; Hartvigsen et al, 2004); and for higher physical loads (Mortimer & Ahlberg, 2003; Suvinen et al, 2004). Evidence against an association between these work factors and pain is of reasonable quality, yielded from either case-control studies (Kerr et al, 2001; Mortimer & Ahlberg, 2003) or prospective studies (Kaila-Kangas et al, 2004).

Two articles present a lack of overall evidence for associations between some psychosocial work factors and pain from a systematic review of the literature in the area (Van der Windt et al, 2000; Hartvigsen et al, 2004). In their article, Van der Windt and colleagues reviewed twenty-nine studies on shoulder pain and work risk factors, and rated each work factor in relation to four observations: the extent to which an association with this risk factor was reported over time; methodological quality of studies (scored against all other studies in the review); the strength of the associations reported for that risk factor; and the extent to which results for that risk factor were consistent across studies,

Van der Windt et al (2000) report that although evidence for many associations between risk factors (psychological work demands; job control; social support; and job satisfaction) were from studies of reasonable quality, there were also some studies of reasonable quality reporting evidence *against* an association between each risk factor and shoulder pain. This is important, as these authors were not concluding that there was *no evidence* for an association between these work risk factors and shoulder pain, but that within the literature available, the evidence was "inconsistent". Hartvigsen and colleagues (2004) report similar results, concluding that the evidence for an association between several psychosocial work-related factors and back pain was also inconsistent. Hartvigsen et al included only prospective cohort studies in their review citing these as “the best observational design[s] for questions of aetiology and consequences evidence” (2004). Studies were reviewed by these authors in relation to nine quality criteria, which they describe as being related to “the study sample, the exposure and outcome measurements, and the statistical analysis and reporting.” Both of the systematic reviews published by Van der Windt et al (2000) and Hartvigsen et al (2004) show that when strict methodological criteria are placed upon studies publishing associations between psychosocial work factors and pain, their evidence can be seen as less convincing.

In conclusion, then, although single empirical studies appear to be in favour of a relationship between psychosocial work factors and pain, there is a certain level of inconsistency between the findings for some psychosocial work factors (work demands, job satisfaction, and poor relationships at work). Even between systematic reviews, conclusions are mixed, and not always based on review of the same studies. Section 2.1 (and Section 5.1 above) discussed the possibility that the current literature search terms were somewhat basic and may have led to the omission of some studies. Indeed the variation between the databases accessed, the terms used and the criteria applied to studies varies considerably between systematic reviews, and this may partially explain the variety of studies included and therefore the differing conclusions. Regardless of whether the evidence both for and against associations between pain and psychosocial work factors (other than stress) in the current review is incomplete (or not), clearly inconsistencies in findings exist. It can only be concluded, therefore that the current findings are reflective of some, but not all of the literature.

Table 5.4

Current findings in relation to previous and recent research on all demographic variables and pain included in the current study

Studies and reviews in agreement with the current finding: 1980 and 1998	Studies and reviews in agreement with the current finding: 1998 and 2005	Current finding	Studies and reviews in disagreement with the current finding: 1980 and 1998	Studies and reviews in disagreement with the current finding: 1998 and 2005
No evidence for an association between gender and prevalence of general aches and pains (Deyo & Tsui-wu, 1987; Rafnsson et al, 1989; Anderson, 1992; Feyer et al, 1992; Rotgoltz et al, 1992; Masset et al, 1994; Suadicani et al, 1994; Toroptsova et al, 1995; Ebeltoft et al, 1996; Miedema et al, 1998)	No evidence for an association between gender and prevalence of general aches and pains (Hartvigsen and colleagues, 2001)	***Association between female gender and higher prevalence of general aches and pains***	Evidence for elevated pain prevalence in *women* (Westerling & Jonsson, 1980; Sternbach, 1985; Biering-Sorensen et al, 1989; Pryse-Phillips, 1992; Andersson et al, 1993; Hasvold & Johnsen,1993; Bergenudd & Nilsson, 1994; Croft & Rigby, 1994; Hildebrandt et al, 1995; Leino et al, 1995; Manninen et al, 1995; Engels et al, 1996; Foppa & Noack, 1996; Harreby et al, 1996; Skov et al, 1996; Papageorgiou et al,1997; Brulin et al, 1998; Thorbjornsson et al,1998; Estlander et al, 1998; Heistaro et al, 1998)	Evidence for elevated pain prevalence in *women* (Croft et al, 1999; Macfarlane et al, 1999; Nordander et al, 1999; Xiang, Stallones & Keefe, 1999; Akesson et al, 2000; Failde et al, 2000; Müllersdorf & Söderback, 2000; Thorbjörnsson et al, 2000; Vingård et al, 2000; Cole et al, 2001; Kostova & Koleva, 2001; Ward & Kuzis, 2001; Viikari-Juntura et al 2001; Cassou et al, 2002; Crook et al, 2002; Cole et al, 2002; Gerr et al, 2002; Fredriksson et al, 2002; Hagberg, Tornqvist & Toomingas, 2002; Moulin et al, 2002; Soriano et al, 2002; Al-Arfaj et al, 2003; Gomez et al, 2003; Johnston et al 2003; Korhonen et al, 2003; Mortimer & Ahlberg, 2003; Shehab et al, 2003; Weiner et al, 2003; Bingefors & Isacson, 2004; Grooten et al 2004; Omokhodion, 2004; Rustøen et al, 2004; Stranjalis et al, 2004; Strazdins & Bammer, 2004)
No evidence for an association between elevated pain prevalence and the presence of a chronic condition, and/or previous or co-morbid symptoms (Klaber-Moffett et al, 1993; Brown et al, 1998)	No evidence for an association between elevated pain prevalence and the presence of a chronic condition, and/or previous or co-morbid symptoms (Hartvigsen and colleagues , 2001)	***Association between having a chronic condition and higher prevalence of general aches and pains***	Evidence for an association between elevated pain prevalence and the presence of a chronic condition, and/or previous or co-morbid symptoms (Bigos et al, 1991; Feyer et al, 1992; Helliwell et al, 1992; Westgaard & Jansen, 1992; Westgaard et al, 1993; Burdorf et al, 1998; Miedema et al, 1998; Lemasters et al, 1998; Van Poppel et al, 1998)	Evidence for an association between elevated pain prevalence and the presence of a chronic condition, and/or previous or co-morbid symptoms (Adams, Mannion & Dolan, 1999; Feuerstein, Berkowitz & Huang,1999; Müller et al, 1999; Hunter, 2001; Lee et al, 2001; Shaw, Pransky& Fitzgerald, 2001; Viikari-Juntura et al 2001; Crook et al, 2002; Gerr et al, 2002; Tubach et al, 2002; Elders & Burdorf, 2004; Hansson & Jensen, 2004; Shiels, Gabbay & Ford, 2004; Hill et al, 2004; Kopec, Sayre & Esdaile, 2004; Weiner et al 2004)
No evidence for an association between age and prevalence of various pains (Rafnsson et al, 1989; Bigos et al, 1991; Anderson, 1992; Helliwell et al, 1992; Feyer et al, 1992; Masset et al, 1994; Ahlberg-Hulten et al, 1995; Manninen et al,1995; Toroptsova et al, 1995; Ebeltoft et al, 1996; Skov et al, 1996; Miedema et al,1998; Van Poppel et al,1998)	-	***No current association between age and prevalence of general aches and pains***	Evidence for elevated pain prevalence in middle- to older-aged groups (Westerling & Jonsson, 1980; Sairanen et al,1981; Herberts et al ,1984; Videman, 1984; Sternbach, 1985;Deyo & Tsui-wu, 1987; Biering-Sorensen & Thomsen, 1983; Chiou & Wong, 1992; Holmstrom, Lindell & Moritz, 1992; Pryse-Phillips, 1992; Westgaard & Jansen, 1992; Andersen & Gaardboe, 1993; Andersson et al, 1993; Hasvold & Johnsen,1993; Moens et al, 1993; Westgaard et al, 1993; Bergenudd & Nilsson,1994; Suadicani et al, 1994; Fujimura et al, 1995; Leino et al, 1995; Engels et al, 1996; Foppa & Noack, 1996; Papageorgiou et al,1997; Hagen et al, 1998; Brulin et al, 1998; Burdorf et al, 1998; Lemasters et al, 1998; Niedhammer, 1998; Heistaro et al, 1998)	Evidence for elevated pain prevalence in middle- to older-aged groups (Feuerstein, 1999; Welch, Hunting & Nessel-Stephens, 1999; Kostova & Koleva, 2001; Miranda et al, 2001; Miranda et al, 2002; Reigo,Tropp & Timpka, 2001; Stevenson et al, 2001; Viikari-Juntura et al 2001Cassou et al, 2002; Gerr et al, 2002; Moulin et al, 2002; Soriano et al, 2002; Al-Arfaj et al, 2003; Bonde et al, 2003; Gomez et al, 2003; Elders & Burdorf, 2004; Gerdle et al, 2004; Hill et al, 2004; Jansen, Morgenstern & Burdorf, 2004; Kopec, Sayre & Esdaile, 2004; Shiels, Gabbay & Ford, 2004)
No evidence for an association between socioeconomic group and prevalence of various pains (Sternbach, 1985; Rafnsson et al, 1989; Bigos et al, 1991; Jacobsson et al, 1992; Andersen & Gaardboe, 1993; Croft & Rigby, 1994; Masset et al, 1994; Hildebrandt et al, 1995; Toroptsova et al, 1995; Foppa & Noack, 1996)	-	***No association between socioeconomic group and prevalence of general aches and pains***	Evidence for elevated pain prevalence in categories of social deprivation (Westerling & Jonsson, 1980; Biering-Sorensen & Thomsen, 1983; Andersson et al, 1993; Bergenudd & Nilsson, 1994; Leino et al, 1995; Harreby et al, 1996; Xu et al, 1996; Papageorgiou et al, 1997; Hagen et al, 1998; Heistaro et al, 1998; Niedhammer, 1998)	Evidence for elevated pain prevalence in categories of social deprivation (Byrns, Agnew & Curbow, 2002; Shiels, Gabbay & Ford, 2004);
No evidence for an association family variables and prevalence of various pains (Sairanen et al, 1981; Bigos et al, 1991; Holmstrom, Lindell & Moritz, 1992; Masset et al, 1994; Aherg-Hulten et al, 1995; Foppa & Noack, 1996)	-	***No association between family variables and prevalence of general aches and pains***	No evidence for an association family variables and prevalence of various pains (Videman, 1984 ; Westgaard & Jansen, 1992; Andersen & Gaardboe, 1993; Brulin et al, 1998)	Evidence for having children as a risk factor for various pains (Failde et al, 2000; Kaergaard & Andersen, 2000; Gerr et al, 2002; Strazdins & Bammer, 2004) and being the head of the household as a risk factor for musculoskeletal complaints (Harlow et al, 1999);
No evidence for marital status as a risk factor for pain (Sairanen et al (1981); Deyo & Tsui-wu, 1987; Bigos et al, 1991; Chiou & Wong, 1992; Holmstrom, Lindell & Moritz, 1992Westgaard & Jansen, 1992; Bergenudd & Nilsson, 1994; Masset et al, 1994; Aherg-Hulten et al, 1995; Manninen et al, 1995 Foppa & Noack, 1996; Harreby et al, 1996)	-	***No association between marital status and prevalence of general aches and pains***	Evidence for marital status as a risk factor for pain (Biering-Sorensen & Thomsen, 1983; Jacobsson et al, 1992; Toroptsova et al, 1995)	Evidence for being married as a risk factor for back pain (Al-(Arfaj et al, 2003)

Table 5.5

Current findings in relation to previous and recent research on all work variables and pain included in the current study

Studies and reviews in agreement with the current finding		***Current finding***	***Studies and reviews in disagreement with the current finding***	
1980 and 1998	1998 and 2005		1980 and 1998	1998 and 2005
No evidence associating work stress with pain prevalence (Ahlberg-Hulten et al, 1995; Manninen et al, 1995; Miedema et al, 1998)	-	***Association between more stressful workload and higher prevalence of general aches and pains***	Evidence for an association between elevated pain prevalence and work stress (Nagi, 1973; Gilchrist, 1976; Dehlin & Berg , 1977; Haenen, 1984; Sternbach, 1985; Ryden et al, 1989; Katilainen,1991; Makela & Heliovaara, 1991; Takala et al, 1991; Holmstrom, Lindell & Moritz, 1992; Burdorf et al, 1993; Moens et al, 1993; Vasseljen et al, 1995; Engels et al, 1996; Foppa & Noack, 1996; Huang et al, 1998; Wickstrom & Pentti, 1998)	Evidence for an association between elevated pain prevalence and work stress (Feuerstein, Berkowitz & Huang,1999; Haufler, Feuerstein & Huang, 2000; Kaergaard & Andersen, 2000; Cole et al, 2001; Gonge, Jensen & Bonde, 2001; Vasseljen, Holte & Westgaard 2001; Pope et al, 2001; Nahit et al, 2003; Shaw, Pransky & Fitzgerald, 2001; Viikari-Juntura et al 2001; Miranda et al, 2002; Harkness et al, 2003; Johnston et al 2003; Korhonen et al, 2003; Smedley et al, 2003; Oleske et al, 2004)
No evidence associating high work demands with pain prevalence (Josephson & Vingaard, 1998; Miedema et al, 1998)	No evidence for the pain risks associated with high work demands (van der Windt et al, 2000; Mortimer & Ahlberg, 2003; Hartvigsen et al, 2004)	***No association between demanding workloads and prevalence of general aches and pains***	Evidence for the pain risks associated with high work demands (Westerling & Jonsson, 1980; Holmstrom, Lindell & Moritz, 1992; Toomingas et al, 1992; Westgaard et al, 1992; Moens et al, 1993; Suadicani et al, 1994; Ahlberg-Hulten et al, 1995; Hultman et al, 1995; Leino et al, 1995; Foppa & Noack, 1996; Skov et al, 1996; Hagen et al, 1998; Wickstrom & Pentti, 1998)	Evidence for pain risks associated with high work demands (Fredriksson et al, 1999; Hoogendoorn et al 2000; Chorus et al, 2001; Cole et al, 2001; Elders & Burdorf , 2001; Hoogendoorn et al, 2001; Nahit et al, 2001; Shannon et al, 2001; Stevenson et al, 2001; Trinkoff, Storr & Lipscomb, 2001; Waddell & Burton, 2001; Andersen et al, 2003; Byrns, Agnew & Curbow, 2002; Hoogendoorn et al, 2002; Bonde et al, 2003; Ortiz-Hernández et al, 2003; Joksimovic et al, 2002; Johnston et al 2003; Nahit et al, 2003; Elders & Burdorf, 2004; Eriksen, Bruusgaard & Knardahl, 2004; Jansen, Morgenstern & Burdorf, 2004; Leroux, Dionne & Bourbonnais 2004; Van Nieuwenhuyse et al, 2004)
-	No evidence for pain risks associated with low job satisfaction (van der Windt et al, 2000; Kerr et al, 2001; Mortimer & Ahlberg, 2003; Hartvigsen et al, 2004)	***No association between job satisfaction and prevalence of general aches and pains***	Evidence for pain risks associated with low job satisfaction (Biering-Sorensen & Thomsen, 1983; Bigos et al, 1991; Holmstrom, Lindell & Moritz, 1992; Bergenudd & Nilsson, 1994; Ahlberg-Hulten et al, 1995; Vasseljen et al, 1995; Foppa & Noack, 1996; Papageorgiou et al,1997; Van Poppel et al, 1998)	Evidence for pain risks associated with low job satisfaction (Macfarlane et al, 1999; Hoogendoorn et al 2000; Vingård et al, 2000; Joshi, Menon & Kishore, 2001; Waddell & Burton, 2001; Yip, 2001; Miranda et al, 2002; Tsuboi et al, 2002; Johnston et al 2003; Macfarlane et al, 2000; Mortimer & Ahlberg, 2003; Nahit et al, 2003; Eriksen, Bruusgaard & Knardahl, 2004; Hansson & Jensen, 2004; Jacob et al, 2004)
No evidence associating poor relationships at work with pain prevalence (Smulders, 1990; Bergenudd & Nilsson, 1994; Ahlberg-Hulten et al, 1995; Hultman et al, 1995)	No evidence for pain risks associated with poor relationships at work (van der Windt et al, 2000; Kerr et al, 2001; Kaila-Kangas et al, 2004; Hartvigsen et al, 2004)	***No association between teamwork and prevalence of general aches and pains***	Evidence for pain risks associated with poor relationships at work (Pot et al, 1986; Kompler, 1988; Linton & Kamewendo, 1989; Bigos et al, 1991; Linton, 1990; Hopkins, 1990; Katilainen,1991; Makela & Heliovaara, 1991; Takala et al, 1991; Holmstrom, Lindell & Moritz, 1992; Toomingas et al, 1992; Veirsted & Westgaard, 1992; Leino et al, 1995; Vasseljen et al, 1995; Skov et al, 1996; Papageorgiou et al,1997; Thorbjornsson et al, 1998; Brulin et al, 1998; Estlander et al, 1998; Josephson & Vingaard, 1998; Wickstrom & Pentti, 1998)	Evidence for pain risks associated with poor relationships at work (Feuerstein, Berkowitz & Huang,1999; Kaergaard & Andersen, 2000; Hoogendoorn et al 2000; Thorbjörnsson et al, 2000; Macfarlane et al, 2000; Hoogendoorn et al, 2001; Kaneda, Shirai, Miyamoto, 2001; Lee et al, 2001; Nahit et al, 2001; Shaw, Pransky& Fitzgerald, 2001; Stevenson et al, 2001; Torp, Riise & Moen, 2001; Waddell & Burton, 2001; Byrns, Agnew & Curbow , 2002; Tsuboi et al, 2002; Tubach et al, 2002; Ortiz-Hernández et al, 2003; Bonde et al, 2003; Nahit et al, 2003; Byrns et al, 2004; de Croon et al, 2004; Eriksen, Bruusgaard & Knardahl, 2004; Kaila-Kangas et al, 2004; Leroux, Dionne & Bourbonnais 2004; Van Nieuwenhuyse et al, 2004)
No evidence associating higher physical loads with pain prevalence (Feyer et al, 1992; Burdorf et al, 1993)	No evidence for pain risks for workers with higher physical loads (Mortimer & Ahlberg, 2003; Suvinen et al, 2004)	***No association between aspects of physical workload and prevalence of general aches and pains***	Evidence for pain risks for workers with higher physical loads (Videman, 1984; Herberts et al ,1984; Harber et al ,1985; Feyer et al, 1992; Anderson, 1992; Rotgoltz et al, 1992; Holmstrom, Lindell & Moritz, 1992; Helliwell et al, 1992; Westgaard et al, 1992; Andersen & Gaardboe, 1993; Burdorf et al, 1993; Moens et al, 1993; Croft & Rigby, 1994; Hildebrandt et al, 1995;Hultman et al, 1995; Leino et al, 1995; Vasseljen et al, 1995; Foppa & Noack, 1996; Skov et al, 1996; Xu et al, 1996; Hagen et al, 1998; Wickstrom & Pentti, 1998)	Evidence for pain risks for workers with higher physical loads (Alcouffe et al, 1999; Devereux, Buckle & Vlachonikolis, 1999; Engström, Hanse & Kadefors, 1999; Fredriksson et al, 1999; Omokhodion, Umar & Ogunnowo, 2000; Thorbjörnsson et al, 2000; Lee et al, 2001; Vingård et al, 2000; Worku, 2000; Elders & Burdorf , 2001; Kerr et al, 2001; Lee et al, 2001; Miranda et al, 2001; Pope et al, GGG 2001; Reigo, Tropp & Timpka, 2001; Shaw, Pransky& Fitzgerald, 2001; Fredriksson et al, 2002; Tsuboi et al, 2002; Alexopoulos, Burdorf, & Kalokerinou, 2003; Nahit et al, 2003; Ortiz-Hernández et al, 2003; Pope et al, 2003; Alexopoulos, Stathi & Charizani , 2004; Elders & Burdorf, 2004;)
No evidence associating working conditions with pain prevalence (Bigos et al, 1991 ; Anderson, 1992; Brown et al, 1998; Fujimura et al, 1995; Engels et al, 1996)	-	***No association between a negative, restrictive work routine and prevalence of general aches and pains***	Evidence for the pain risks in poor working conditions (Westgaard et al, 1992; Westgaard & Jansen, 1992; Moens et al, 1993; Leino et al, 1995; Manninen et al, 1995; Harreby et al, 1996; Xu et al, 1996; Thorbjornsson et al, 1998; Josephson & Vingaard, 1998; Van Poppel et al, 1998)	Evidence for the pain risks in poor working conditions: *adverse working conditions* (Cassou et al, 2002); *career opportunities* (Chorus et al, 2001); *computer use* (Fredriksson et al, 2002; Gerr et al, 2002; Hagberg, Tornqvist & Toomingas, 2002; Ortiz-Hernández et al, 2003); *full-time work* (Engkvist et al, 2000; Lipscomb et al, 2004); *high work pace* (Hoogendoorn et al, 2000); *job insecurity* (Kivimäki et al, 2001) *job tenure* (Shaw, Pransky& Fitzgerald, 2001; Joshi, Menon & Kishore, 2001); *night work/shift work* (Eriksen, Bruusgaard & Knardahl, 2004; Grooten et al 2004); *opportunity to take a break* (Kaneda, Shirai, Miyamoto, 2001); *outdoor work* (Hildebrandt et al, 2002); *over-time work* (Fredriksson et al, 1999); *repetitive or monotonous work* (Vingård et al, 2000; Andersen et al, 2003; Harkness et al, 2003; Nahit et al, 2003; Strazdins & Bammer, 2004); and *working hours* (Haufler, Feuerstein & Huang, 2000; Shannon et al, 2001; Svendsen et al, 2004).
No evidence for differences in pain risk between job/industry types (Westgaard & Jansen, 1992 ; Josephson & Vingaard, 1998; Niedhammer, 1998)	No evidence for differences in pain risk between job/industry types (Kerr et al, 2001; McBride et al, 2004)	***Marginal association between job/industry type and prevalence of general aches and pains****	Evidence for differences in pain risk between job/industry types (Videman, 1984; Herberts et al ,1984; Harber et al ,1985; Feyer et al, 1992; Anderson, 1992; Rotgoltz et al, 1992; Holmstrom, Lindell & Moritz, 1992; Helliwell et al, 1992; Westgaard et al, 1992; Andersen & Gaardboe, 1993; Burdorf et al, 1993; Moens et al, 1993; Croft & Rigby, 1994; Hildebrandt et al, 1995;Hultman et al, 1995; Leino et al, 1995; Vasseljen et al, 1995; Foppa & Noack, 1996; Skov et al, 1996; Xu et al, 1996; Hagen et al, 1998; Wickstrom & Pentti, 1998)	Evidence for differences in pain risk between job/industry types (Alcouffe et al,1999; Fredriksson et al, 1999; Failde et al, 2000; Omokhodion, Umar & Ogunnowo, 2000; Turner & Franklin & Turk, 2000; Joshi, Menon & Kishore, 2001; Palmer et al, 2001; Pope et al, 2001; Hofmann et al, 2002; Al-Arfaj et al, 2003; Gomez et al, 2003; Morken et al, 2003; Eriksen, Bruusgaard & Knardahl, 2004; Gerdle et al, 2004; IJzelenberg , Molenaar & Burdorf , 2004; Omokhodion, 2004)

With the exception of those working in Higher Education who were more likely to experience pain (discussed in Section 52e below)

In the current study, a significant association was noted between individuals working in Higher Education and an increased likelihood of general aches and pains. While this is in agreement with many other studies reporting differences between industry types (see Table 5.5), this relationship appears on the surface to conflict with other observations regarding physical load at work (see below). Effects of job title or industry type on pain prevalence are reasonably common (see Table 5.5); however, in the majority of studies this refers to elevated prevalence or incidence of pain in industry groups where manual or physical loads are higher. One might assume that those working in the current category of 'Higher Education' may have been less likely to participate in manual tasks on a daily basis, and therefore one might expect that these individuals would have been *less* likely to experience general aches and pains. However, Figure 5.1 below shows show that this industry type represented a large variety of job titles that might traditionally be seen as comprising a higher physical load (e.g. 'cleaner'), as well as those that might traditionally be seen as comprising a lower physical load (e.g. 'Senior Administrator'). Therefore, it is unclear whether, as a whole, those working in the current industry category 'Higher Education' were in fact carrying out fewer manual tasks or not.

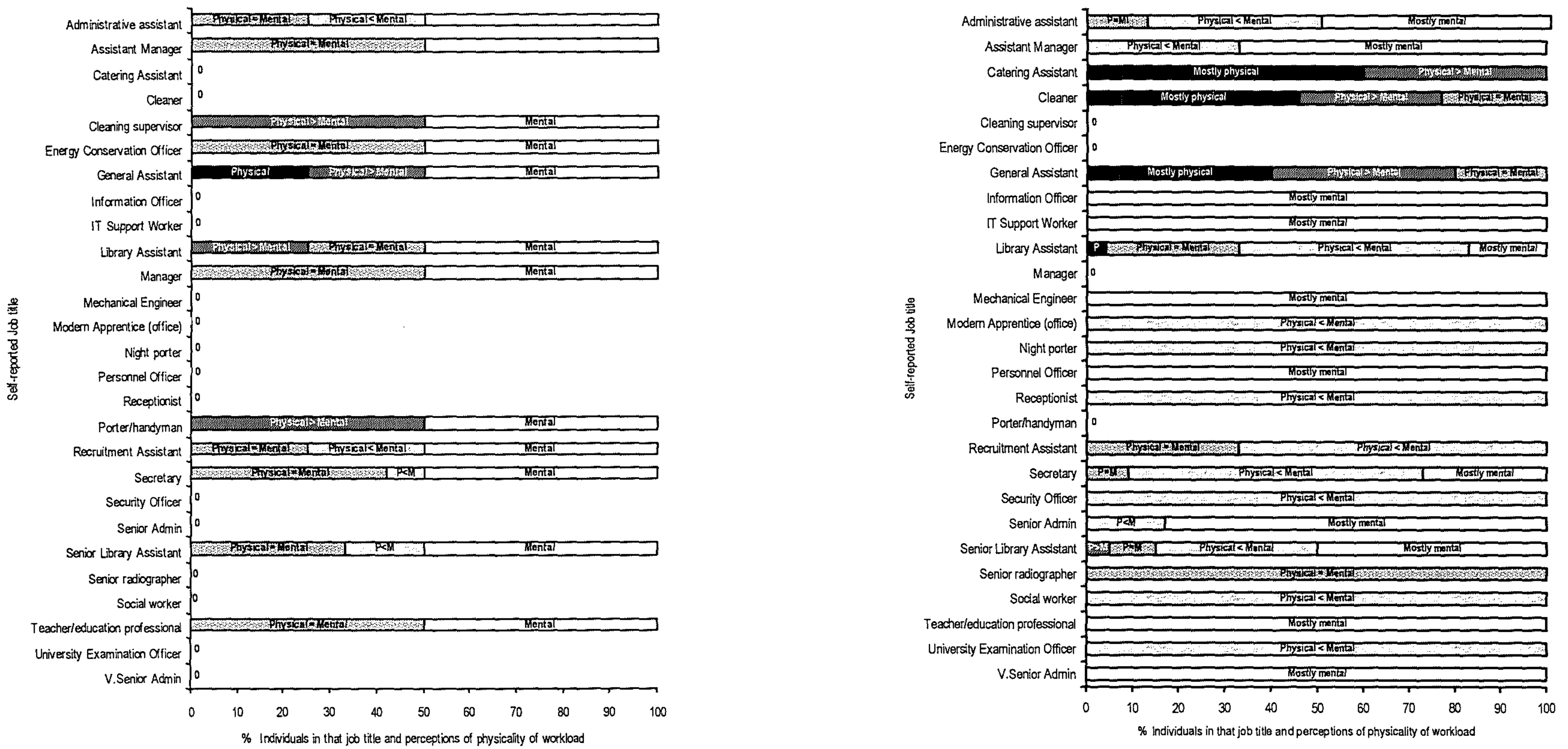
Examination of worker perceptions of physical workload in the current study shows that in general, the proportion of those with more physical workloads were in the minority, however, this does not appear to follow any 'traditional' assumptions one might make about certain job titles. For example, half of all 'porters/handymen' describe their jobs as 'Mostly mental effort' (Figure 5.1a); and two fifths of all 'recruitment assistants' describe their jobs as requiring 'Equally physical and mental effort'. Neither of these descriptions represents the physical workload that one might 'traditionally' expect individuals to report in these job titles. It is unclear whether these anomalies represent compromised reliability and representativeness of the physicality measure, or of the category 'Higher Education' (or indeed both). It is also important to point out that the category 'Higher Education' was somewhat arbitrary in nature, and related to the description of the whole industry group, rather than to specific physical tasks. As such, there may be some element of selection bias in these groupings, such that the physical aspects of jobs were not always reflected in the tasks carried out.

Figure 5.1

Summary of job titles in category 'Higher Education' and percentage of that job title describing physicality of workload given for those:

(a)Without pain

(b) With pain



In addition, if it were argued that the category of 'Higher Education' was an objective category, and therefore a reliable reflection of the jobs therein, then there is a discrepancy between the "objective" groupings of 'Higher Education' and the subjective measure of *perceived* level of physical tasks within this category. This could be a reflection of an *actual* discrepancy. It may be that (for very good reasons) individuals working in particular jobs perceive their jobs to be more or less physically- or mentally-demanding than an outsider might. The potential discrepancy between objective and subjective descriptions of work is an area of debate, and is often a source of bias in studies such as this one. However, it is argued in Section 5.5 below that it is possible that the discrepancy between objective and subjective descriptions of work may have the potential to inform the relationship between pain and work, if measured directly, as opposed to being minimised and/or adjusted/controlled for by design and/or analyses (see Section 5.5 below)

Finally, whether these samples were representative of the population of 'Higher Education' workers elsewhere is also unclear. Indeed observations made about the extent to which the current sample are representative of the target populations as a whole have already been raised (also see Section 5.4 below), whereby responders may have been biased towards reporting different levels of pain than non-responders. It is important to note, however, that the 'pain-free' workers in 'Higher Education' did not appear to describe their jobs as any more physical than those experiencing pain (comparing 'physicality' scores of those with and without pain within working in 'Higher Education': $Z=-0.22$; n.s.; see Figure 5.1).

It is possible, therefore, that the propensity of those working in Higher Education to experience more general aches and pains than other categories is not the result of physical workload, but of a combination of methodological issues, such as those described above. Regardless of the factors underlying the association between 'Higher Education' and general aches and pains, this issue points to the difficulties in creating occupational groups in studies such as the current one, the importance of accounting for confounders in analyses, and the potential for interaction between variables in relation to pain. This final point is discussed in more detail below.

(iii) Interactions between demographic factors, work variables and prevalence of general aches and pains

Current prevalence data, when split by gender, showed some similarities in both sexes, as well as some differences. A lower likelihood of pain was related to not having a chronic condition in both genders, as was a relationship between lower levels of perceived work stress and a lower likelihood of reporting general aches and pains.

In terms of the literature supporting a relationship between chronic condition and pain, the interaction between the influences of gender and chronic condition was not examined in many prospective studies of reasonable quality (see Section 5.1b(I) above; Müller et al, 1999; Tubach et al, 2002). Viikari-Juntura et al (2001), for example, examine the interaction between previous radiating neck pain and various work factors, showing that "working with hand above shoulder level for less than 0.5 hours (every) day" increased the risk of current pain in those with previous pain considerably. In addition although these authors report gender to interact with age after partial adjustment for confounders, this association disappeared once full adjustment was done, leaving only an association between age and pain. It is difficult to relate these findings to those of the current study, as although Viikari-Juntura et al (2001) analyse interactions, they are not the interactions found in the current study.

Some comparisons can be drawn, however, between current associations and those reported by Kopec, Sayre and Esdaile (2004) on back pain. In a study of high quality, these authors split data by gender, generating a different set of risk factors for the men and women. In women, having arthritis or rheumatism or experiencing "psychological trauma"; and "activity restriction" were associated with an increased risk of back pain. Although arthritis and rheumatism can be seen as measure of some types of chronic condition or propensity to experience pain, "psychological trauma" and "activity restriction" are, strictly speaking, not proxy measures of chronic ill-health. However given that chronic illness is often associated with psychological ill-health and changes to daily activities (Ogden, 2001; Pitts & Phillips, 1998; Morrison & Bennett, 2005) it could be argued that some overlap between these indices and having a chronic condition may be inferred. In Kopec, Sayre and Esdaile's data for men (2004), indicators for the impact of a chronic condition on risk of pain were much easier to interpret. Kopec, Sayre and Esdaile (2004) report self-rated health to be associated with an increased risk for back pain, particularly where health was rated as "fair". There was also a trend towards an increased risk for pain where health was rated as "poor" although the confidence interval for this odds ratio was wide and not significant (OR 3.39; 95% C.I. 0.26-43.92; taken from Kopec, Sayre & Esdaile, 2004). These findings can be related to the findings of the current study to a certain extent, suggesting that the effects of having a chronic condition and perceptions of ill-health can lead to an increased risk of pain in both men and women. Caution should be used in drawing this conclusion, however, as discussed above, the extent to which current measures of pain and of chronic condition can be compared to those used by Kopec, Sayre and Esdaile, (2004) is questionable. Moreover, the associations in the current study appear to be much stronger than those published by Kopec, Sayre and Esdaile, (2004).

The current data also showed that the influence of job stress on the propensity to report general aches and pain was similar in both sexes, although was slightly more complex in women. Both sexes were less likely to report pain when they described their jobs as "Quite easygoing" or "Very easygoing"; and additionally women were less likely to report pain where they described their jobs as "Equally stressful and easygoing". Again, many of the prospective studies reporting an association between stress and pain did not examine interactions between work factors and gender specifically (see above Section 5.1b(ii); Harkness et al, 2003; Miranda et al, 2002; Oleske et al, 2004). Korhonen et al (2003), however, reported a significant interaction between age and sex, and one between "mental stress" and frequency of physical exercise (high mental stress with less exercise). However, these authors report no interaction between gender and "mental stress". Given that this was a high quality prospective study, fulfilling all five out of the quality criteria used in the current review (see Section 2.1(e)), this evidence can be said to be of reasonable quality. Korhonen et al (2003) therefore confirm the current *lack* of interaction between gender and stress in relation to pain to a large extent, although the further complexity in the current relationship between female gender and work environments where workload was "Equally stressful and easygoing" is harder to interpret.

One study that might shed some light on this slight difference between men and women in relation to pain and work stress is that by Kopec, Sayre and Esdaile (2004). As in the current study these authors report that levels of stress increased the risk of neck pain in both sexes. However unlike the current study, risk of pain was associated with different types of stress in men and women. Men were more likely to experience pain when they reported a higher level of "Chronic Stress" (described by the authors as measuring "activity overload, financial difficulties, child-related stress, and problems with relationships in day-to-day encounters"). Women, on the other hand, were more likely to experience neck pain when they reported a higher level of "Personal Stress" (described by the authors as measuring the extent to which an individual was "trying to do too many things at once, too much is expected, too much pressure to be like other people, work at home not appreciated, people being too critical"). Not only was this study of excellent quality, but it also gives a valuable insight into the effects that different types of stress may have on men and on women. Assuming Kopec, Sayre and Esdaile's (2004) observations reflect real associations in their sample, it is possible that the current study was observing a similar association. As such, although stress was important in both sexes, perhaps the differences in the categories that were important in women found in the current study reflected the difference reported by Kopec, Sayre and Esdaile (2004). Men and women in the current study were both affected by work stress, hence reported less pain in the absence of it (where jobs were seen as "Quite easygoing" and "Very easygoing"); however women were also less likely to report pain where work was described in the middle category of "equally stressful and easygoing". Perhaps then, the presence or absence of stress at work may have a slightly different effect on men than it does on women. One of the criticisms that can be made of the current study is the fact that stress was not measured by a standardised instrument (see Section 5.4 below). As such, current measures did not permit differentiation between the different types of stress, assessing only "work stress". Therefore, it is impossible to examine whether the slight gender difference in the current study was related the *type* of stress to which individuals were exposed. Moreover, it is impossible to examine whether the type of stress that individuals brought to mind when responding to the item "do you find your job to be stressful/easygoing?" was measuring the same construct in both sexes. Clearly without the instruments with which to measure stress (for example the use of a measure for both life and work stress); it is difficult to make comparisons between the current study and that by Kopec, Sayre and

Esdaile's (2004). It is essential that standardised measures of stress are used in future studies in order to explore this issue in more depth (see Section 5.5 below).

There were also some differences likelihood of pain in relation to some work factors between both sexes in the current data. In women, an association was found between job enjoyment and pain; as well as part-time work and an increased likelihood of pain. Neither of these associations were found in men. Given the nature of current data, it is difficult to interpret the association between job satisfaction and pain in women (see Section 4). Other authors have reported the importance and influence of work factors to be different in men and women in studies of reasonable quality (Papageorgiou et al,. 1998; Thorbjornsson et al., 1998; and more recently Kopec, Sayre & Esdaile, 2004; see above). As discussed in Section 2.3, Papageorgiou and colleagues (1998) reported a relationship between gender and work factors, such that back pain was associated with different work factors in men and women (perceived inadequacy of income in men; and relationships with colleagues in women) when both were dissatisfied with their jobs. Although the current study did not find an effect of job satisfaction in men, it is possible that the interaction reported here reflects gender–specificity in susceptibility to the different risk factors reported by Papageorgiou and colleagues (1997). Obviously the patterns are not exactly the same in both studies, however the fact that the relationship between job satisfaction and pain has been shown to be complex in another study of reasonable quality suggests that this area may benefit from further research.

Finally, the interaction between part-time work, female gender and pain is difficult to interpret. Given the limitations and issues raised already with the current design, it is possible that this was a spurious finding. However, this does not mean that the relationship between part-time work, pain and female gender is not worthy of future research attention, and ways to explore these potential differences are suggested in Section 5.5 below.

(iv) Interpreting current findings for associations between demographic factors, work variables and prevalence of general aches and pains

As discussed in Section 5.1aiii and Section 5.2a below, the current study provides an overview of non-troublesome pain in the workplace. Where agreement with other studies is clear (for gender, chronic condition and stress), current findings suggest that associations between some psychosocial variables and troublesome pain may also extend to non-troublesome or non-chronic.

Some agreement between studies can be demonstrated, and to the extent that current methods can be compared with those used by other authors, this study appears to confirm an association between greater likelihood of pain reports in women, in individuals with a chronic condition, and in those exposed to work stress. Moreover, analysing men and women separately showed the independence of the association between chronic condition and pain and that between stress and pain appears to be indicated in other research. In this way, it would appear that the effects of chronic condition and stress may be similar in both genders, but that the influence of other factors (in this case job satisfaction and part-time work) on pain differ between men and women.

All of these conclusions should be considered in light of the differences between studies, outcome measures, designs and populations to which they refer, and to that end there are notable differences between current findings and other literature. Current data do not support nine of the twelve predictions made from previous literature, which are supported by a large proportion of the research from 1998 onwards (see Table 5.5). This inconsistency has also been reported where systematic reviews place strict methodological criteria on the quality of evidence. Limitations and differences in design may have added to inconsistency across studies, and in the current study may have led to an inaccurate representation of pain at work in the current population making comparisons unreliable or invalid (see Section 5.4 below).

It was argued earlier in this thesis that it is important to reflect on the focus of previous research on predicting pain at work, and that if one assumes that pain is a universal aspect of the human condition the search for the *aetiology* of pain at work (particularly in relation to general aches and pains) may not always be helpful. In this way, it was argued that the methods applied to the search for the aetiology of general aches and pains, while appropriate in many cases, may omit the study of a large proportion of pain experienced in working populations. The current study appears to confirm this observation, by showing a great deal of less troublesome pain occurring in a variety of working populations. Moreover, in the context of a literature that has focussed heavily on the study of the aetiology of pain that is more troublesome in nature, it is interesting to note that some associations between demographic, psychosocial and work factors and the prevalence of general aches and pains can be observed.

5.2 Pain Experience

(a) Nature of pain experience scores

It was hypothesised that pain experience scores (as denoted by the GPQ) for pain frequency, intensity and impact would be high (H_9). This hypothesis was rejected in Section 4.3, as was an exploratory hypothesis for pain coping and emotion scores when examining the nature of the sub-scores for coping with pain and pain emotions (EH_1). All GPQ scores were low, with the median scores for every aspect being close to four (out of a possible ten) or less. Figure 3.4 shows that with the exception of all pain frequency and pain impact, the majority of pain experience scores were either zero, or between zero and the median score.

The GPQ is a relatively new scale; consequently, there are few norms available with which to compare these data. However, Penny and colleagues (1999) published GPQ data from a community sample of individuals receiving regular prescriptions (N=3335), accessed through general practice registers. These authors report GPQ scores for Chronic Pain Grades 0 (no chronic pain) to IV ("high disability-severely limiting"), as denoted by the Chronic Pain Grade Scale (CPG) (Von Korff et al., 1992). Penny et al (1999) present a validation of this scale, citing reasonable correlations between CPG and GPQ scores, and the widely-used Quality of Life measure SF-36 as supporting evidence. Table 5.6a below compares CPG and GPQ data published by Penny et al with median GPQ sub-scores for those categorised as reporting "non-troublesome" pain (lower pain experience scores) versus those categorised as reporting "troublesome" pain (higher pain experience scores) in the current study (Table 5.6b).

Table 5.6
Median scores on the GPQ published by (a) Penny et al, 1999 compared to those in (b) the current study

(a)Median GPQ scores from Penny et al (1999)

	Frequency	*Intensity*	*Ability to cope*	*Emotion*	*Impact*
Chronic 0	0.0	0.0	0.0	0.0	0.0
Pain I	3.1	2.8	2.8	0.0	0.0
Grade II	5.8	5.3	5.3	2.8	2.2
III	5.8	5.3	5.3	4.4	5.4
IV	6.2	8.1	8.1	7.2	7.8

(b)Current Median GPQ scores

	Frequency		*Intensity*		*Ability to cope*		*Emotion*		*Impact*	
	0.77 (of all scores <median) *Non-troublesome*	***2.69*** (of all scores >median) *Troublesome*	***1.39*** (of all scores <median) *Non-troublesome*	***2.78*** (of all scores >median) *Troublesome*	***0*** (of all scores <median) *Non-troublesome*	***2.22*** (of all scores >median) *Troublesome*	***2*** (of all scores <median) *Non-troublesome*	***2.8*** (of all scores >median) *Troublesome*	***0*** (of all scores <median) *Non-troublesome*	***1.89*** (of all scores >median) *Troublesome*

On the whole, current "non-troublesome" scores appear to reflect GPQ scores yielded by Penny et al (1999) for CPG 0 (no pain). This is with the exception of Intensity scores, which are slightly higher (1.39), but not elevated enough to be close to the level of intensity that Penny and colleagues associate with CPG I (2.8). From this it is suggested that current "non-troublesome" scores are a reasonable approximation of pain with a low level of impact and disability for sufferers.

For current "troublesome" pain scores, median frequency, intensity and ability to cope scores (2.69, 2.78 and 2.22 respectively) correspond reasonably well with those for CPG I (at 3.1, 2.8, and 2.8 respectively, in Penny et al, 1999). However, current median scores for emotion and impact (2.8 and 1.89 respectively) appear closer to those yielded for CPG II (2.8 and 2.2 respectively). Therefore current scores for "troublesome" pain appear to comprise some aspects of both CPG I and II.

It is important to assess the extent to which Penny et al's data are an accurate representation of pain in their sample. Individuals were randomly sampled from two sources: a community health index (N = 5036) and a general practice register of those claiming prescriptions (N = 4175). Individuals selected for participation were screened by the General Practitioner, as the authors argue, "in order to preclude inappropriate or insensitive enquiry". While this is may have been appropriate for ethical reasons, it may have led to selection bias. The authors do not say whether GPs were blinded to the aims of the study or not, and therefore one cannot be sure whether there may have been some bias in pain reports related to those selected for participation. Indeed, one might presume that in order to assess the extent to which suggesting participation was "inappropriate or insensitive" might require prior knowledge of the study's aims. Moreover, the process by which the study was introduced to individuals was not made clear, and therefore there is no way of knowing whether individuals' prior knowledge of the study may have biased responses or reports of pain when participation took place. The authors do attempt to tackle the issue of potential selection bias by stratifying scores by age and gender, however it may also have been useful to have standardised their approach to selection, or if selection processes were standardised to have reported them in more detail.

Penny et al (1999) sent questionnaires to all potential participants, and response rates were reasonable for both the general population sample (N = 3605; 82%) and the prescription sample (N = 3335; 85.4%). Despite the high response rate, the authors do note that response rates differed in relation to age group, such that older individuals were more likely to respond than younger individuals. Although no formal analysis was reported comparing non-responders to responders, given that pain is known to differ in relation to age groups (see Section 2.3 and 5.2) it may be that differentiation across age groups led to differences in pain report

It is possible, then, that the samples examined by Penny et al (1999) were affected by bias, and without any further information, it is difficult to draw firm conclusions. However, it has already been argued that the current study may also have been affected by bias. The sources of bias, their potential influences, and the magnitude of their influence on findings are likely to have been very different. However, the design of both studies may cast doubt on their validity, and as such any comparison between the two should be made with caution.

Comparison is further complicated by the fact that Penny et al's data were derived from a community sample; therefore one might not expect current GPQ scores to entirely replicate their GPQ scores. Penny and colleagues do not provide any information on the employment status of their population, although it is possible that a proportion of their sample were work-disabled. Given that their sample was accessed via general practitioners, and/or focused on individuals in receipt of repeat prescriptions, one might expect this to be the case.

It is important also to reflect on the focus of Penny et al's study (1999), when comparing it to the current investigation. For example, one of the aims of the current study was to examine pain that had an impact but was not sufficiently disabling to prohibit work. As such, it has been argued that the current study appears to have achieved this aim. Thus the fact that GPQ scores are not exactly aligned with Penny et al's GPQ scores might actually have been expected, and may reflect the "Healthy Worker Effect" discussed in Section 5.2 above. Therefore, although scores higher than the median GPQ sub-scores are referred to as "troublesome" in the current study, it is important that these be interpreted as a description of pain that is "troublesome" to these working individuals, and should not be equated with severely disabling or chronic pain.

Taking account of the potential bias in this study and in Penny et al's study (1999), as well as the differences in design and of sample, it is difficult to conclude the extent to which they can be easily compared. However, the similarities between CPG and GPQ scores are a useful way to interpret the construct validity of current GPQ scores nonetheless, and they demonstrate that the GPQ may be a useful measure for examination of the pain experience (see Section 5.5 below). Combining these current observations on pain cause above (Section 5.1aiii), and bearing in mind some key differences in samples and design of the current study and that done by Penny et al (1999), it can be concluded that current data provide a reasonable illustration of "non-troublesome", "non-chronic" pain in a working population.

(b) Pain experience in relation to pain type and pain cause

It was predicted that GPQ scores and sub-scores for pain intensity, frequency and impact would differ in relation to pain type and/or pain cause (H_{10}). Additionally, Exploratory Hypothesis 2 examined the possibility that GPQ sub-scores for coping with pain and for pain emotions would differ in relation to pain type or pain cause. Section 4.3 reported that both of these hypotheses were at least partially confirmed, and that the experience of pain differed in relation to site and perceived cause.

(i) Pain experience in relation to pain type

Table 5.7 below summarises the main pain experience findings in relation to pain site. There were several interesting patterns in the data that are worthy of mention. First, non-troublesome pain in various body sites appeared to vary little in terms of experience profiles. Specifically, back pain was no more or no less intense, emotional or disruptive than other pain types.

Second, headache was associated with lower frequency scores than back pain. Examination of headache scores showed that forty percent of those reporting headache could not pinpoint a cause for their pain. It is possible that the lower frequency scores can been attributed to these individuals, as sixty-two percent of those experiencing headache of an unknown cause gave lower frequency scores, describing their pain as either "rare" or "occasional".

Table 5.7
Summary of associations between likelihood of pain experience scores and (a) pain cause after adjustment for age and gender; as well as (b) pain site after adjustment for age and gender. Significant associations are given in bold, and *significant trends (where 1.0 was either the lower or upper confidence limit) given in italics*

(a) All pain sites compared to back pain

Headache	*Lower Total GPQ*	**Lower frequency**				
Abdominal pain	**Higher Total GPQ**		No associations between any pain type and Pain Intensity	No associations between any pain type and Ability to cope with pain		No associations between any pain type and Pain Impact
Neck/shoulder pain		**Higher frequency**			*More emotional*	

(b) All pain causes compared to pain with no perceived cause

Life variables			*Higher intensity*			
Long-term medical problems	**Higher Total GPQ**	**Higher frequency**	**Higher intensity**	**More difficult to cope with**		**Greater impact**
Non-serious ailments			**Higher intensity**		**More emotional**	**Greater impact**
Old injury		**Higher frequency**				**Greater impact**
Pain problems	**Higher Total GPQ**	**Higher frequency**	**Higher intensity**			**Greater impact**
Recent injury	**Higher Total GPQ**	**Higher frequency**	**Higher intensity**	**More difficult to cope with**		**Greater impact**
Short-term medical problems	**Higher Total GPQ**	**Higher frequency**			**More emotional**	
Stress						
Work environment					*More emotional*	

Third, individuals with neck/shoulder pain were more likely to report higher frequency scores than individuals with back pain. Of those reporting neck/shoulder pain, 23% attributed it to 'unknown causes', and 23% to 'recent injury'. A further 22% of those suffering from neck/shoulder pain attributed it to their "work environment", of whom 56% cited 'work environment in general' as the cause of their pain, 37% blamed 'computer use', and 7% blamed their 'chair at work'. No individual attributing pain to their 'work environment in general' reported a high physical load at work, and most (73%) reported their jobs to require 'mostly mental' or 'more mental than physical' effort. This highlights an observed predominance of neck/shoulder pain in many non-manual/ computer based jobs that is discussed in more detail below in relation to work factors (Section 5.2eiv).

Finally, there was a trend towards abdominal pain having more of an emotional effect than back pain. Examination of abdominal pain scores shows that the majority of individuals attributed their abdominal pain to 'life variables', 92% of which was menstrual pain specifically. It is possible therefore that menstrual pain was skewing abdominal pain scores in this category, and also possible that the experience of non-menstrual abdominal pain was similar to that of pain in all other sites. The higher Total GPQ scores for abdominal pain could perhaps also be explained by the predominance of menstrual pain in the 'abdominal pain' category.

(ii) Pain experience in relation to pain cause

Table 5.7 shows that pain experience differed substantially in relation to pain cause. This confirms the latter part of Hypothesis 10 and Exploratory Hypothesis 2. There are many comments that can be made in relation to these findings, some of which are highlighted below.

Of all aspects of pain experience, adjusted pain impact appeared to be high regardless of perceived pain cause (see Table 5.7b). This was with the exception of pain attributed to work-, stress- or life-related pain, and pain from 'short-term medical problems'. In comparison to back pain, pain impact was likely to be substantially higher for pain attributed to 'long term medical problems', injury (old and recent, and those with 'pain problems' (see Table 5.7b and Table 5.8).

Pain attributed to 'short-term medical problems' was also associated with a more negative pain experience than pain for which there was no known cause. Moreover, pain attributed to 'non-medical' causes (stress, life variables and work environment) was associated with very few aspects of the pain experience. These findings have many implications for future research, which are discussed in Section 5.5 below. There were also some trends: life-related pain with higher intensity; and work-related pain with higher emotion.

Finally, pain attributed to 'pain problems' (see Table 5.8e for details) was only associated with higher frequency, intensity and impact scores. This is in contrast with pain attributed to 'long-term medical problems' (for which pain is a common symptom) that are not traditionally seen as 'chronic pain' conditions (see Table 5.8b), as well as pain from 'recent injury'. Pain attributed to either 'long-term medical problems' or 'recent injury' was likely to be more frequent, more intense, more emotional, less easy to cope with, and have greater impact than pain from all other causes.

Table 5.8

Grouped pain cause in relation to specific perceived pain causes given (verbatim) by participants

Grouped pain cause	Specific perceived pain cause
(a)Life variables [N=155; 12% of all specified causes]	'Age'[N=4; 3% of Life variables]
	'Being overweight'[N=2; 1% of Life variables]
	'Cold weather'[N=4; 3% of Life variables]
	'Dehydration'[N=2; 1% of Life variables]
	'Exercise'[N=38; 25% of Life variables]
	'Fatigue'[N=25; 16% of Life variables]
	'Period pain'[N=67; 43% of Life variables]
	'Poor posture'[N=2; 1% of Life variables]
	'Pregnancy'[N=4; 3% of Life variables]
	'Recent surgery'[N=1; 1% of Life variables]
	'Smoking'[N=1; 1% of Life variables]
	'Wear and tear/tiredness'[N=5; 3% of Life variables]
(b)Long-term medical problems [N=34; 3% of all specified causes]	'Chron's Disease'[N=2; 6% of Long-term medical problems]
	'Diverticulitis'[N=1; 3% of Long-term medical problems]
	'Eczema'[N=2; 6% of Long-term medical problems]
	'Endimetriosis'[N=5; 16% of Long-term medical problems]
	'Gout'[N=1; 3% of Long-term medical problems]
	'Heart problems'[N=2; 6% of Long-term medical problems]
	'Hypertension'[N=3; 9% of Long-term medical problems]
	'IBS'[N=7; 20% of Long-term medical problems]
	'Pituitary disease'[N=1; 1% of Long-term medical problems]
	'Ulcer'[N=9; 26% of Long-term medical problems]
	'Varicose veins'[N=1; 3% of Long-term medical problems]
(c)Non-serious ailments [N=93; 7% of all specified causes]	'Acid reflux'[N=2; 2% of Non-serious ailments]
	'Allergic reaction'[N=3; 3% of Non-serious ailments]
	'Blocked salivary gland'[N=1; 1% of Non-serious ailments]
	'Corns'[N=1; 1% of Non-serious ailments]
	'Cut'[N=1; 1% of Non-serious ailments]
	'Earache'[N=1; 1% of Non-serious ailments]
	'Fluid retention'[N=1; 1% of Non-serious ailments]
	'Haemorrhoids'[N=2; 2% of Non-serious ailments]
	'Hangover'[N=10; 11% of Non-serious ailments]
	'Hayfever'[N=1; 1% of Non-serious ailments]
	'Indigestion/Dyspepsia'[N=14; 15% of Non-serious ailments]
	'Ingrown toenails'[N=3; 3% of Non-serious ailments]
	'Migraine'[N=37; 40% of Non-serious ailments]
	'Mouth ulcer'[N=3; 3% of Non-serious ailments]
	'New shoes'[N=2; 2% of Non-serious ailments]
	'Side effect of medications'[N=1; 1% of Non-serious ailments]
	'Sinuses'[N=10; 11% of Non-serious ailments]
(d)Old injury [N=33; 3% of all specified causes]	'Old injury'[N=33; 100% of Old injury]
(e)Pain problems [N=113; 9% of all specified causes]	'Arthritis'[N=35; 31% of Pain problems]
	'Multiple Sclerosis'[N=2; 2% of Pain problems]
	'Neuralgia'[N=1; 1% of Pain problems]
	'Repetitive Strain Injury'[N=44; 39% of Pain problems]
	'Sciatica'[N=17; 15% of Pain problems]
	'Spinal problems'[N=8; 7% of Pain problems]
	'Spondylosis'[N=4; 4% of Pain problems]
	'Tendonitis'[N=1; 1% of Pain problems]
	'Tennis elbow'[N=1; 1% of Pain problems]
(f)Recent injury [N=194; 15% of all specified causes]	'Lifting/handling'[N=56; 29% of Recent injury]
	'Recent Injury'[N=138; 71% of Recent injury]
(g)Short-term medical problems [N=156; 12% of all specified causes]	'Anal fischer' (sic) [N=1; 1% of Short-term medical problems]
	'Asthma attack' [N=2; 1% of Short-term medical problems]
	'Biliary Obstruction' [N=1; 1% of Short-term medical problems]
	'Cystitis '[N=2; 1% of Short-term medical problems]
	'Dental abscess' [N=30; 19% of Short-term medical problems]
	'Flu' [N=45; 29% of Short-term medical problems]
	'Gallstones' [N=1; 1% of Short-term medical problems]
	'Gastric infection' [N=3; 2% of Short-term medical problems]
	'Hernia' [N=5; 3% of Short-term medical problems]
	'Infection' [N=28; 18% of Short-term medical problems]
	'Kidney infection' [N=4; 3% of Short-term medical problems]
	'Kidney stone' [N=2; 1% of Short-term medical problems]
	'Pleuracy' (sic) [N=1; 1% of Short-term medical problems]
	'Recent surgery' [N=9; 6% of Short-term medical problems]
	'Shingles' [N=2; 1% of Short-term medical problems]
	'Virus' [N=20; 13% of Short-term medical problems]
(h)Stress [N=73; 6% of all specified causes]	'Stress' or 'Stress/tension'[N=73; 100% of Stress]
(i)Unknown [N=319; 24% of all specified causes]	'Unknown' or 'Don't know'[N=319; 100% Unknown]
(j)Work environment [N=134; 10% of all specified causes]	'Chair at work'[N=12; 9% of Work environment]
	'Computer use'[N=33; 25% of Work environment]
	'Eye Strain'[N=7; 5% of Work environment]
	'Lights at work'[N=1; 1% of Work environment]
	'Management'[N=1; 1% of Work environment]
	'Office too hot'[N=2; 1% of Work environment]
	'Solvent use at work'[N=1; 1% of Work environment]
	'Standing long hours'[N=5; 4% of Work environment]
	'Typing'[N=1; 1% of Work environment]
	'Work environment'[N=71; 53% of Work environment]

(iii) Interpreting findings relating pain experience to pain type and pain cause

Findings relating pain experience to pain type and pain cause have some interesting implications with regard to the focus of other research (see Section 5.5 below), as well the focus of the current study.

It was argued in Section 2 that the current study would examine pain in the absence of site-specific criteria, and that a general approach to pain would be informative and useful. To the extent that current data can be said to be a valid representation of pain in the target populations, it would appear that this is the case, and that when the *experience* of many different pain types (as denoted by site) is compared, pain profiles are remarkably similar. In this way, although site- or type-specific studies of pain may be useful for informing of site- or type- specific recommendations or interventions, it may be that there are aspects of the pain experience that are common to all pain types. This observation adds credence to the utility of the general approach to pain, and together with examination of pain experience, provides the potential for a new perspective on pain in the workplace (see Section 5.5 below).

Assuming that current data can be said to be a valid representation of pain in the target populations, these findings show that pain cause appears to be a meaningful way of distinguishing between pain experiences for sufferers, as there was substantial variation between pain experience profiles in relation to cause. In the current study, this refers to *perceived* cause, as opposed to actual cause. This approach has the disadvantage of lack of verification of symptoms and/or cause, a method that is adapted by a large number of other authors in the field (Magnavita et al., 1999; Nordander et al., 1999; Kaergaard & Andersen, 2000; Latza et al., 2000; Punnett et al., 2000; Andersen et al., 2003; Cassou et al., 2002; Bonde et al., 2003; Nahit et al., 2003; Weiner et al, 2003; Jin et al., 2004; Lassen et al., 2004; Suvinen et al., 2004; Mortimer & Ahlberg, 2003; Weiner et al., 2004). On the other hand this approach has the advantage of recording the perceptions of pain as it occurs in the "*real world*", as is clear in the variety of 'causes' provided verbatim by participants (see Table 5.8). To date, no other study has collected similar data on such a large scale. The current study makes no assumptions that the perceived causes given were the *actual* causes of pain, and in the context of understanding the human experience of pain from the individual's perspective, did not seek to verify the actual causes. This may be seen as a criticism by some, given that this may have introduced the potential for bias in pain reports. However, it could also be argued that this potential for an observed discrepancy between perceived and actual cause of pain can be seen as a strength of the current approach. It may be that the *perceived* cause of pain (and/or that the propensity to attribute pain to a particular cause) is important information in itself, regardless of whether this perception can be verified or not. This approach may have a lot to offer the field of pain research, particularly when seen in the context of the psychological literature on the processes underlying attribution (see Section 5.5 below).

There were trends in current data suggesting a possible relationship between a negative pain experience where individuals perceived their pain to be the result of short-term medical problems, non-serious ailments and "non-medical" life- and work-related causes. Again these pain 'causes' tend to be overlooked or excluded from other studies, on the assumption that they are either "trivial" or are not relevant (see Literature Review, Section 2.4 above).

Perhaps the most striking observation regarding pain site and cause was the *lack* of association between pain experience scores and the areas of study that are the focus of the majority of pain at work research over the last two decades. Current data showed: that the experience of back and musculoskeletal pain was no more or less negative than that of other pain types; and that pain attributed to 'pain problems' was, on the whole, *less* negative than that of "non-pain" long-term medical problems and pain related to recent injury. Pain attributed to 'pain problems' was more likely to be negative on three aspects of pain experience, as was pain related to short-term medical problems and non-serious ailments. Although the nature of these experiences differs, it could be argued that the pain experience of non-serious ailments and short-term medical problems may be *just as* negative as pain attributed to pain problems. These findings are in conflict with a literature on pain in the workplace that continues to focus on: back or musculoskeletal pain; pain that is troublesome or chronic; and pain that is the result of a specific 'pain problem' such as a musculoskeletal disorder, arthritis or the umbrella term, 'chronic pain' (see Table 2.1 and 5.1). While the discrepancy between current findings versus those reported in other research could be a simple example of the "Healthy Worker Effect", and/or related to the methodological limitations that serve to undermine the validity of current observations, there is also the argument that the current perspective on pain is also be valid, and may be useful for future research (see Section 5.5 below).

One final observation of note regarding pain experience in relation to pain site and pain cause is the lack of effect of adjustment for gender and age on pain experience outcomes. Analyses in

Section 4 show that adjustment for age and gender altered the scores for pain sites and pain causes only very slightly. On the whole, adjustment made unclear associations and trends non-significant, and largely left crude associations unaffected. This would suggest that associations between pain experience and site and cause may be independent of the confounding effects of age and gender.

In interpreting these findings it is important to remember that although discernable associations and trends were observed in the current data, in general the pain experienced was relatively minor and experience scores were relatively low. As such, these observations are made on a limited proportion of the population and for a number of reasons (see Section 5.4) might not be representative of working populations as a whole. Moreover, given potential biases that may have influenced this study's findings (see Section 5.2 above and 5.4 below), it is unclear the extent to which current pain reports can be seen to be representative of the relevant working populations at all. These limitations in design need to be taken into consideration when drawing any conclusions from current data.

(c) Psychosocial variables and pain experience

Table 5.9 summarises the significant adjusted associations between demographic factors, work variables and different pain experiences. Although this was a novel approach to pain at work, relationships were as expected in relation to prevalence findings reported elsewhere. In general, more "positive" psychosocial and work environments tended to be related to a "less negative" pain experience. These findings are discussed in relation to specific hypotheses, and results from recent research below.

(i) Measurement of the pain experience in recent research

In order to evaluate the current findings in relation to other studies, it was necessary to explore the extent to which literature between 1998 and 2005 examined measures of pain experience other than pain prevalence. Although the majority of studies prior to 1998 examined pain prevalence, recent studies appear to have focused more on issues relating to aspects of the pain experience.

Of the papers identified in Table 5.1, for example, thirty-nine studies included some measure of pain experience other than prevalence in their design. In addition, the review was extended beyond the literature search strategy applied in Sections 2.1 and 5.1, to include any study between 1998 and 2005 examining the relationship between psychosocial variables and a specific aspect of the pain experience. This third literature search was done in MEDLINE and PsychINFO databases using the aspects of the pain experience measured by the GPQ. Specifically, this comprised the original terms of "pain" and "work", combined in separate literature searches including each of the additional following terms: "frequency"; "intensity"; "emotion"/"emot*"; "cope"/"coping"/"cop*"; and "impact". This was particularly useful in that the terms used in this third literature search were more specific, which is in contrast to the basic terms used in the first and second literature searches (see Section 2.1 and 5.1 above; as well as Section 5.4 below).

The inclusion of experience terms in the literature search also raised the possibility that the review would encompass pain in populations other than those in industrial settings. This was necessary to illustrate the relevance of current findings to a sample of the pain experience literature. There were simply no papers examining the pain experience in the working populations to the same extent as the current study to furnish any sizeable comparisons. Moreover, there are many useful parallels that can be drawn between pain experience studies in non-working populations and the current study. As such, the following review should be interpreted in full awareness of the possibility that other studies referred to may be examining non-working or clinical pain populations. Where this issue was particularly problematic, it is discussed in more detail.

Before reviewing these studies, it is important to highlight some methodological differences between recent pain experience literature and the current study. For instance, some studies examined the issue of pain frequency, but did so by focusing purely on proportions of their sample that reported pain most frequently (McBride et al, 2004); or by splitting their sample into categories using frequency as an *independent* variable (Harreby et al, 1996; Gamperiene & Stigum, 1999; Ehde et al, 2001; Bandell-Hoekstra et al, 2002; Juul-Kristensen et al, 2004; D'Amico, Genco & Perini, 2004; Verbeek & van der Beek 1999).

Second, some authors discuss pain severity as a composite measure of pain frequency and pain intensity (Bandell-Hoekstra et al, 2002; Trinkoff et al, 2002); and many authors measure both pain frequency and pain intensity but do not relate these to specific psychosocial risk factors (Gamperiene & Stigum, 1999; Harreby et al, 1996; Penny et al, 1999; Desbiens & Wu, 2000; Omokhodion, Umar & Ogunnowo, 2000; Turner , Jensen & Romano, 2000; Ehde et al, 2001 van den Brink, Bandell-Hoekstra & Abu-Saad 2001; Cole et al, 2002; Hoozemans et al 2002; Trinkoff et al, 2002; Chyuan et al, 2004; D'Amico, Genco & Perini, 2004; Miu , Chan & Chan 2004; Juul-Kristensen et al, 2004; Kumar, Moro & Narayan, 2004; McBride et al, 2004; Moulin et al, 2002; Violante et al, 2004; Henderson et al, 2005).

Third, the relationship between coping with pain and psychosocial risk factors was explored by a number of authors; however, the majority of these examined coping *strategy*, as opposed to 'Ability to Cope' with pain as measured by the current study (Affleck et al, 1999; Söderlund & Lindberg 1999; van Lankveld et al,1999; Watkins et al, 1999; Gibson & Helme, 2000; Svebak et al, 2004; Strahl, Kleinknecht & Dinnel, 2000; Turner Jensen & Romano, 2000; Davis, Zautra & Reich, 2001; Dekkers et al, 2001; Jensen, Turner & Romano; 2001; Persson & Lilja, 2001; Rollnik et al, 2001; Santavirta et al, 2001; Turner et al, 2001; Zachariae et al, 2001; Carroll et al, 2002; Ektor-Andersen, Orbaek & Isacsson, 2002; Keogh & Herdenfeldt, 2002; Manning & Fillingim, 2002; Elander & Barry, 2003; Evers et al, 2003; Jensen et al, 2004; McCracken & Eccleston, 2003; Morton, 2003; Raak, Hurtig & Wahren, 2003; de Croon et al, 2004; Eccleston et al, 2004; Ferrando et al, 2004; France et al, 2004; Heinberg et al, 2004; Keefe et al 2004; Logan & Rose, 2004; Peolsson & Gerdle, 2004; Petrovic et al, 2004; Dysvik et al, 2005; Henderson et al, 2005; Jackson et al, 2005; Ruehlman, Karoly & Newton, 2005; van Vuuren et al, 2005; Woby et al, 2005). As a result, many of the findings referring to coping theory or coping strategies have been left out of the following discussion.

Finally, as with pain prevalence research, recent pain experience studies tend to focus on site- and duration- specific definitions of pain, or "troublesome" pain that is work-disabling, or requires medical intervention. It is questionable the extent to which these studies, along with those focussing on the experience of experimental pain (Zachariae et al, 2001; Kállai, Barke & Voss, 2004; Jackson et al, 2005) are comparable to current data. However, given the exploratory nature of the current study, they are included where they are considered to be relevant.

(d) Demographic variables and pain experience

It was hypothesised that pain experience scores would differ in relation to demographic groups, and the possibility that demographic variables would predict different pain experience scores was explored using multivariate analysis. Both of these hypotheses were only partially confirmed.

(i) Gender and pain experience

In relation to gender, current findings show that for all aspects of the pain experience, women were more likely than men to have a negative pain experience. This appears to be in agreement with other studies in a variety of populations that observe women to report higher levels of: pain frequency (Müllersdorf & Söderback, 2000; Sandler et al, 2000; Zeichner et al, 2000; Moulin et al, 2002; Donald & Foy 2004; Gerdle et al, 2004; Stranjalis et al, 2004; Bunketorp, Stener-Victorin & Carlsson 2005); pain intensity or severity (Alcouffe et al, 1999; Sandler et al, 2000; Mortimer & Ahlberg 2003; Shehab et al, 2003; Bingefors & Isacson, 2004; Heinberg et al, 2004; Rustøen et al, 2004; Strazdins & Bammer 2004; Daniels et al, 2005); pain emotion (Unruh, Ritchie & Merskey, 1999); difficulty in coping with pain (Mercado et al, 2000; Raak & Wahren, 2001; Boonen et al, 2004); and pain impact (Cole et al, 2002; Roth & Geisser, 2002; Karjalainen et al, 2003).

Table 5.9

Summary of demographic and work characteristics of groups associated with different type of pain experience after adjustment. Significant associations are given in bold, and *significant trends (where 1.0 was either the lower or upper confidence limit) given in italics*

(a)Demographic and work characteristics of groups associated with a more negative pain experience after adjustment (by aspect of pain experience)

	Total GPQ	*Pain Frequency*	*Pain Intensity*	*Ability to Cope with Pain*	*Pain Emotion*	*Pain Impact*
Gender	**Women**	**Women**	**Women**	**Women**	**Women**	Women
Industry group		**-Emergency services** **-Media**		**-Emergency service** **-Local government & council business**		
Stress of workload		**Very easygoing**				

(b) Demographic and work characteristics of groups associated with a less negative pain experience after adjustment (by aspect of pain experience)

	Total GPQ	*Pain Frequency*	*Pain Intensity*	*Ability to Cope with Pain*	*Pain Emotion*	*Pain Impact*
Age		**Age (non-specific)**		***26-35; 56-65***		
Family size	**Smaller families**		**Smaller families**	**Smaller families**	**Smaller families**	
Chronic condtion	**No chronic condition**	**No chronic condition**	**No chronic condition**	**No chronic condition**	**No chronic condition**	**No chronic condition**
Industry group			**Higher Education**	**Food production & distribution**		
Income			**Over 55K**			
Manual/Non-manual	**-More non-manual than manual** **-Non-manual**					
Skilled/Unskilled	**Unskilled/Skilled (non-specific)**	**Skilled**	**Unskilled/Skilled (non-specific)**			**More unskilled than skilled**
Professional/Unprofessional					**Unprofessional/Professional (non-specific)**	
Hours/day	**8 hours/day and below**		**8 hours/day and below**			
Shift-work					**Never work shifts**	
Organisation of tasks		**-Organise tasks sometimes** **-Organise tasks always**				
Computer use					**Computer use sometimes**	
Physicality of workload				**-More mental than physical effort** **-Mostly mental effort**		**-Equally physical & mental effort** **-More mental than physical effort** **-Mostly mental effort**
Stress of workload	**-Quite stressful** **-Equally stressful & easygoing**		**-Equally stressful & easygoing** **-Quite easygoing**	**-Equally stressful & easygoing** **-Quite easygoing**		**-Equally stressful & easygoing** **-Quite easygoing**
Ability to cope with workload						**-Equally easy and difficult to cope with cope** **-Easy to cope a lot of the time**
Job enjoyment					**-Sometimes enjoy job** **-Always enjoy job**	
Desire to continue in job	**Wanted to continue in job**	**Wanted to continue in job**	**Wanted to continue in job**			

(c) Demographic and work characteristics of groups not associated with pain experience after adjustment

AutonomyTeamwork	Conventional hrs	Hours/wk	Length of breaks	Regularity breaks
Control of breaks	Full-time/ Part-time	Job security	Permanent/ Temporary	Socioeconomic group

These studies employ a variety of measures of pain experience, in many different populations, and therefore their evidence is likely to be of varying degrees of quality. As a result, their findings should not be given equal weight, and the extent to which they can be compared with the current study is questionable.

An example of this would be in the study done by Stranjalis and colleagues (2004) who report on the "frequency" of back pain in the Greek community that were randomly sampled from census records. These authors took great care to ensure that their sample was representative of Greek rural and urban populations, and achieved an excellent response rate of 92.3% to their cross-sectional questionnaire. These authors report a gender difference in pain frequency, such that pain was "more frequent" in women after adjustment for confounders. However, caution should be applied when interpreting these data. Although the authors discuss pain "frequency" in detail, in fact what they are referring to are reports of pain experienced by the sample in the last thirty days. In other words these authors are measuring period prevalence, but discuss it as pain "frequency" in their article. Indeed many of the "frequency" observations related to *statistical* frequency of pain (that is the occurrence or "counts" of pain) rather than aspects of the frequency of the pain once it occurs (for example, Müllersdorf & Söderback, 2000; Bunketorp, Stener-Victorin & Carlsson 2005). This differs considerably from the current measure of pain frequency, which was concerned with the temporal characteristics of pain across time ("pain rarely"; "occasional"; "often"; "frequently"; "all the time") rather than the occurrence of pain. These differences in methods limit the extent to which the current frequency findings can be compared with other studies.

However, it is not just in the differences in measures of frequency that discrepancies exist. For example, Unruh, Ritchie and Merskey (1999) report a difference in appraisal of pain in relation to emotional impact. The study by Unruh, Ritchie and Merskey (1999) differs from the current study in its measure of emotional aspect of pain. For instance, these authors used the single question, "How upset were you emotionally about the pain?", to which individuals were asked to indicate using a scale of 0 to 10, where "0" denoted "not at all" and "10" denoted "extremely". Unruh, Ritchie and Merskey (1999) report no gender differences in the extent to which individuals perceived the pain as emotionally upsetting. This differs from the current study, which found pain to be more upsetting in women than in men. However, Unruh, Ritchie and Merskey (1999) also used a measure of pain *appraisal* in their study (the Pain Appraisal Inventory; PAI; Unruh & Ritchie, 1989) which is described as measuring the extent to which an individual tends towards the appraisal of pain as a threat versus the appraisal of pain as a challenge. When this was included, the authors report a gender difference in the effect of the emotional upset caused by pain on threat appraisal, such that women were more likely to see their pain as a threat when it was emotionally upsetting. Such differentiation did not exist in men. In other words, it was not that women found pain *more emotional* than men, but that when the emotion of pain was experienced, women were more likely to interpret it as a threat than men. This finding differs from that of the current study, and could be explained in a number of ways. First, the current study focussed on pain in a working population, whereas Unruh, Ritchie and Merskey (1999) studied a community sample. As such, discrepancies in findings could be due to real population differences, whereby the emotionality of pain is interpreted differently by different groups of individuals. Second, although Unruh, Ritchie and Merskey (1999) used no inclusion criteria for individuals experiencing pain at a certain level of chronicity, a substantial proportion of those responding had chronic pain. This also differs from the current study in that very few individuals in the current sample reported pain that could have been viewed as being chronic (as shown by the comparison between this study and Penny et al's 1999 study; with see Section 5.3a above). Therefore, it could be that women do find less troublesome pain more upsetting than men, and that when pain is of a particular level of chronicity, the gender differences become less apparent. Third, taking on board the observations made by Unruh, Ritchie and Merskey (1999), it is possible that the current finding that pain was "more emotional" in women can be explained by the differences in appraisal. Although current GPQ items on emotion ("I felt upset by the pain"; "the pain got me down"; "pain has made me feel miserable; "I felt the pain was wearing me down") make no specific mention of threat or challenge as a result of pain, an affirmative answer convey more than the simple Likert scale used by Unruh, Ritchie and Merskey (1999). In this way, it is possible that GPQ emotion items were accessing an appraisal of this pain as well as its perceived emotion. As the current study did not use any standardised method of measuring appraisal, it is impossible to speculate on the extent to which appraisal of pain could have affected emotion or any other aspect of pain experience. This does however point to the importance of measuring the appraisal and attribution processes taking place in individuals experiencing pain, and the potential that experience measures such as the GPQ have in contributing to this research (see Section 5.5 below).

In an article published three years earlier than the one described above, Unruh (1996) carried out a review of the literature surrounding gender differences in what she referred to as "common recurrent pains". This was an exhaustive review of literature, including over one hundred gender comparisons of a variety of different pains, in a variety of different populations. Unruh cites evidence for gender differences as a result of biological differences in pain perception and pain report (Rasmussen 1993b; Jensen and Jensen 1993; Procacci et al. 1972; Goolkasian 1985; Rao et al. 1987; Hapidou and DeCatanzaro 1988; Solberg et al. 1979; Rieder et al. 1983), including a variation in pain perceptions at different times in the menstrual cycle (Berkley, 1993). Unruh reports that these biological differences are further confounded by gender differences in: cognitive appraisal of pain (Heloe and Heloe 1975; Davis 1981; Verbrugge 1985; Klonoff and Landrine, 1992); individual characteristics (Matthews et al. 1983; Leikin et al. 1988; Lazarus and Folkman 1984; Verbrugge 1985); and gender role expectations (Fuller et al. 1993).

As Unruh puts it:

> *"There are two reasons why one might expect to see gender variations in the appraisal of pain. The first reason is that women and men have somewhat different experiences of pain over a lifetime that may necessitate different constructs of pain meaning and related coping behaviours. Secondly, women and men are exposed to different social role expectations on the basis of their gender. As a result, a pain event may have different risks of interference on roles and responsibilities for women and men. Difference in social expectations related to gender may also influence emotional responses to pain."*
>
> *(Taken from Unruh, 1996; p.157)*

This leads Unruh to conclude that gender differences in pain experience make women attend to, report and respond to pain in a different way than men. As she states:

> *"In contrast, men have recurrent pains of lesser intensity, frequency, and duration than women; however, men are more likely to experience pain from injury, and acute and chronic life-threatening diseases. As a result, men may develop a construct of meaning focused primarily on pain as a symptom of tissue damage or underlying pathology. Men may be less likely than women to attend to pain that is*

of mild or moderate intensity since the underlying tissue damage may be insignificant. Women with multiple primary role responsibilities resulting from childcare or care for elderly parents, household management, and paid employment have more than one reason to appraise pain as threatening. They may attend to pain sooner in an effort to minimize its intrusiveness."

(Taken from Unruh, 1996; p.157)

In other words, pain experiences are gender-specific as a result of a complex array of biological, psychological and sociological factors, and these serve to vary the meaning of pain between the sexes (Fife 1994). Moreover these observations fit with Unruh, Ritchie & Merskey's later finding (1999) that gender differences in pain can be seen to be related to appraisal style.

The current study appears to be in agreement with Unruh's review of the literature, suggesting that these findings may be accessing a gender difference in the pain experience that is real and valid. Moreover, Unruh's conclusions are also in agreement with the current study in their identification of the lack of methodological comparability between epidemiological studies (diversity of pain measures, definitions of pain and populations examined) as a source of error at the beginning of her paper. It is important to take the methodological differences between the current study and those reporting gender differences in pain experiences elsewhere into consideration. The majority of studies reviewed by Unruh, for example focus on more "troublesome" pain in clinical or general populations, and therefore any gender effects are limited in the applicability of these findings to the current data. Moreover, there is disparity between studies that affects the quality of evidence provided by different designs. Clearly there are gender differences in pain across variety of measures, but the extent to which they can seen to be reflective of the measures included in the current study specifically (frequency, intensity, emotion, ability to cope, and impact) is not clear. In addition, this study extends these observations onto less troublesome pain, suggesting that even where pain is not as troublesome, and not work-disabling, a gender difference in pain experience is observable. This implies that when pain occurs, troublesome or non-troublesome, in the laboratory, at home or at work, it is a different experience for women than it is for men.

(ii) Age and pain experience

In relation to age effects, the current study showed minimal differences in the pain experience between age groups (see Table 5.9). This was with the exception of frequency and coping scores. Age was significantly associated with a lower pain frequency, however from the adjusted odds ratios it was difficult to see to which specific age groups this referred.

The results of this study support other published relationships between age and pain frequency in a variety of pains (Gamperiene & Stigum, 1999; Donald & Foy 2004; Gerdle et al, 2004; Stranjalis et al, 2004) and some authors suggest that pain frequency is higher in older individuals (Gamperiene & Stigum, 1999; Donald & Foy 2004; Gerdle et al, 2004; Stranjalis et al, 2004). There was a non-significant trend towards higher frequency scores in older age groups in current data, which is consistent with this relationship. Again it is useful to consider that many of these studies recording relationships with pain "frequency" were not reporting on the temporal aspects of pain, but on the occurrence of pain, and as such the extent to which they can be compared with the current study is limited.

It is also possible that age was interacting with another variable in relation to pain frequency, as interaction between age and gender are common in many pain prevalence studies (Le Resche, 1999). Analysis of interactions was not carried out on the current data for the current thesis (see Section 5.4); however had this been done, it may have been possible to pinpoint the nature of this association.

In the current study, pain was reported as being marginally easier to cope with in individuals aged between twenty-six and thirty-five, and in individuals aged between fifty-six and sixty-five. There is very little research with which to compare these findings, although some authors have observed a relationship between greater pain severity and passive or 'maladaptive' coping in older age groups (Mercado et al 2000). Watkins and colleagues (1999) compared the coping strategies utilised by individuals with mild Rheumatoid Arthritis (RA) versus those used by individuals with severe RA. These authors report an age effect for 'maladaptive' coping strategies in the context of mild RA, but not severe RA, such that older individuals were more likely to utilise 'maladaptive' coping strategies in mild RA, but not in severe RA (Watkins et al, 1999).

Although the current study compares *ability to cope with pain* as opposed to the theoretical constructs of 'maladaptive' versus 'active' coping strategies (Rosenstiel and Keefe, 1983), the study by Watkins and colleagues shows that there is some evidence for an association between age and coping with *mild* pain. This is further confirmed by the *lack* of relationship between age and the perceived effectiveness of various coping strategies in *chronic* pain sufferers reported by Keefe and Williams (1990). Therefore, although the extent to which these studies can be compared with the current one is limited by differing coping measures, it may be that some association between coping with pain and age is observable when pain is mild or less severe but less obvious where pain is more troublesome.

The *lack* of association between age and other aspects of the pain experience also deserves mention. After adjustment, no significant association was found between age and pain impact. This conflicts with other authors, who report an association between moderate-severe pain intensity and limitation in daily activities (Sandler et al, 2000). Blyth et al (2001) also report that their younger participants were more likely to experience pain that interfered with daily activities. It is unclear why the current study conflicts with the findings of other studies on pain impact or interference, however this discrepancy could be the result of the current study's focus on non-troublesome pain. For example, Blyth et al (2001) focused on chronic pain, defined as, "pain experienced every day for three months in the six months prior to interview". This differs considerably from less troublesome pain measured in the current study, and may partially account for the differences between findings.

(iii) Chronic condition and pain experience

In the current study the pain experience was substantially exacerbated by the presence of a chronic condition. There is very little research with which to compare these findings, however one study reports that individuals with co-morbid illness reported greater disability in the arm, shoulder and hand (Wolf & Green, 2002). These authors also report poorer general health in individuals with co-morbid illness, while others report associations between the prolonged impact of acute low back pain and health-related quality of life (Coste et al, 2004). Taken together, these findings appear to be in agreement with the current study, suggesting that the presence of co-morbid illness has the potential to affect the experience of pain. This interpretation should be viewed with caution, given the differences between these studies' definitions of pain, the designs used, and the populations they examined.

In the current study the presence of a chronic condition was included as a proxy for the presence or absence of a propensity to experience previous pain. It is interesting to note therefore, that the association between co-morbid illness and pain experience remained even where those attributing their current pain to 'pain problems' were taken out of the analysis. Unadjusted ORs for 'No chronic condition' after removal of all individuals attributing their current pain episode to a pain problem were as follows: for Pain frequency (OR 0.5 95% CI 0.4-0.7; X^2=18.92(1) $p<0.001$); for Pain intensity (OR 0.7 95% CI 0.5-0.9; X^2=5.77(1) $p<0.02$); for Ability to Cope (OR 0.6 95% CI 0.5-0.8; X^2=12.05 (1) $p<0.001$); for Pain emotion (OR 0.7 95% CI 0.5-0.9; X^2=7.13(1) $p<.008$); and for Pain impact (OR 0.6 95% CI 0.4-0.8; X^2=12.36(1) $p<.001$). However, allowing for the Bonferoni correction reducing the value at which demographic variables became significant from $p<0.05$ to $p<0.006$, this meant that the association between 'no chronic condition' and pain intensity, as well as that between 'no chronic condition' and pain emotion were non-significant.

Therefore, although all chronic conditions appeared to exacerbate all aspects of the pain experience, 'non-pain' chronic conditions were only related to pain frequency, ability to cope and impact. One might assume that the converse would be the case – that chronic pain conditions are particularly related to increased pain intensity and increased pain emotion. Obviously these are speculations made on the basis of current data, however they highlight the potential of the current approach in understanding the experience of pain in non-disabled populations, and in understanding the complex interaction between chronicity of condition versus chronicity of pain experience. In addition, these findings highlight the potential of experience measures in recording detailed aspects of the journey between acute and chronic pain, an issue that is discussed in detail in Section 5.5 below.

(iv) Other demographic variables and pain experience

The current data showed that having a smaller family was related to a less negative pain experience (see Table 5.9). Specifically, those with smaller families were more likely to report their pain as: less intense, easier to cope with, and less emotional. This can be related to some observations made regarding back pain (Alcouffe et al, 1999; Strazdins & Bammer 2004), even though both of these studies report the effect of family size as an interaction with gender. One study reports an association between having more children and severity of back pain in men only (Alcouffe et al, 1999), while the other reports such an association in women only (Strazdins & Bammer 2004). In addition, both of these studies report on severe pain, which is in contrast to current data (Alcouffe et al, 1999; Strazdins & Bammer 2004). It is difficult to speculate on this relationship, given the inconsistency in findings already discussed. Moreover, as a result of differing populations and methodologies, not all studies can be seen to be of the same quality, and therefore any generalisations made between findings are approximations only. There may be some association between family size and pain experience, but in the absence of any comparable data, it is difficult to make a confident conclusion about this.

Finally, the exploratory hypothesis that there may have been a relationship between socioeconomic circumstances and aspects of the pain experience was not confirmed in the current study. Admittedly, there is very little evidence in the literature to suggest that levels of deprivation are related to pain experience per se, although there appears to be a relationship between low levels of education and: increased back pain frequency (Dionne et al, 2001), more passive pain coping strategies (Mercado et al 2000; Carroll et al, 2002 Roth & Geisser, 2002) and pain impact (Dionne et al, 2001).

It is unclear why current findings should differ from these published studies. However, the extent to which lower levels of education can act as a proxy for socioeconomic circumstances is questionable. Indeed, given that the current study found no association between pain experience and a further measure of deprivation – the Carstairs Index – it is possible that the current study and those measuring deprivation by level of education were measuring different constructs. It is perfectly plausible that socioeconomic deprivation does not relate to pain experience, that educational deprivation does, and that socioeconomic deprivation does not necessarily relate to educational deprivation.

(e) Work variables and pain experience

It was hypothesised that pain experience scores would differ in relation to work factors, and the possibility that work variables would predict different pain experience scores was explored using multivariate analysis. Both of these hypotheses were partially confirmed.

(i) Working conditions and pain experience

The pain experience was related to few working conditions in the current study. Where relationships were found, the more negative the working conditions, the more negative the pain experience.

Income was only marginally related to the pain experience, such that pain intensity was likely to be lower in those in receipt of over £50 000 per annum. One might speculate that individuals in this earning bracket would have had more opportunity and flexibility when experiencing pain to receive treatment, or were perhaps more able to take time off work with less financial consequences. It is somewhat surprising, therefore, that intensity is the only aspect of the pain experience that was related to income. Overall, the relationship between income and pain experience in the current study was negligible, and therefore it is possible that the amount of money brought into a household had little bearing on the pain experience. It could be argued that this conclusion conflicts with the published evidence for more negative pain experiences in areas of deprivation (see Section 5.2div). However, it is useful to remember that the current study refers to a *non-troublesome* pain, and that all of the people in the current sample were working. Therefore, the current sample (deliberately) did not include individuals who were not in paid employment, and thus current measures of deprivation or income should be interpreted in the knowledge that the most deprived proportion of the population are not represented. Moreover, as current responders tended to be at the higher end of the salary scale (85.6% were earning over £10 000 per annum, 37.7% of which were earning £25 000 per annum), it may have been that there was a bias towards those in higher income brackets within the sample. This should all be interpreted in terms of the target population as a whole, and it possible (although somewhat unlikely) that these relative proportions represent the working population in Scotland. However, without non-responder information, it is implausible to deduce the extent to which these proportions were representative of target populations.

Total GPQ and pain intensity were lower where individuals worked eight hours or less every day. There is little evidence with which to compare these findings, although one study reports a relationship between hours worked in a year and higher pain intensity (Haufler, Feuerstein & Huang 2000). However, given that no relationship between *weekly* working hours and pain experience was found in the current study, it is unclear the extent to which these findings compare. Moreover, since Haufler, Feuerstein & Huang focused only on women, it is difficult to compare with the current mixed-gender sample of various job-types.

This study showed pain emotion to be higher where individuals used computers only 'sometimes'. Strazdins and Bammer measured computer use as an index of repetitive work in their analysis of Australian Public Service employees (2004). These authors report more problems with "musculoskeletal health" (a composite measure of pain site and duration; Browne, Nolan, and Faithfull, 1984) in women who carried out more repetitive work, including computer use. Some questions can be raised about the quality of Strazdins and Bammer's study (2004). For instance, their study was cross-sectional, based on a relatively small sample compared to others discussed in the current review (N = 737), and it is possible their low response rate (50%) could have left pain experience reports open to bias. However, Strazdins and Bammer's study (2004) does raise the possibility that increased computer use (and, as they argue, repetitive and monotonous work) can lead to a more negative experience of musculoskeletal pain. This possibility is discussed in more detail below (see Section 5.3).

In this study, several working conditions (working outwith a conventional 'nine-to-five' daily interval; whether an individual was permanent or temporary; and full-time or part-time) had no association with different aspects of the pain experience after adjustment. Control, regularity and length of breaks were also not associated with the pain experience, nor was the extent to which individuals believed their job to be secure. These findings conflict with observed relationships between severe and frequent musculoskeletal symptoms and longer job tenure (Cole et al, 2002) as well as severe musculoskeletal pain and job insecurity (Kivimäki et al, 2001). It is likely that the findings published by both of these sets of authors were from "higher quality" evidence than the current study, as both were based on prospective data, with Cole et al (2001) following up a cohort of newspaper workers, and Kivimäki et al (2001) following up a cohort of a variety of different occupations.

In conclusion, then, allowing for differences in design in relation to the populations studied (and therefore the extent to which studies can be compared) it would appear that the current findings for working conditions can be seen as consistent with result of the small amount of recent research done on working conditions and pain experience.

(ii) Job perceptions and pain experience

In the current study, individuals who believed their jobs to require more skill were less likely to report higher pain frequency scores, and higher impact scores. This is consistent with findings published by Björkstén and Talbäck (2001) who report an increased likelihood of severe musculoskeletal ailments in a group of unskilled female workers. Björkstén and Talbäck's study (2001) might be criticised for not being representative of its target population, as it was based only on the one-year-follow-up of a small proportion of this population (N = 117 of 200 originally contacted, and of 173 of those meeting inclusion criteria). This attrition rate may have led to some biases in those responding, and the authors suggest that there were differences between responders and non-responders, such that responders were less likely to give more positive evaluations of health status, and to be "cases" of musculoskeletal pain at cross-sectional baseline. This suggests a possible "Healthy Worker Effect" whereby their cohort was over-populated by individuals of better health, and may have led to an under-reporting of pain and/or bias in judgements of pain experience. In addition, unlike the current study, the focus of Björkstén & Talbäck's study (2001) was solely on women in unskilled occupations(workers in production, cleaning and catering). This limits the extent to which these authors' findings can be compared to current results.

Relationships in this study between job perceptions and Total GPQ scores; as well as job perceptions and lower pain intensity were complex. Although the variation across 'skilled/unskilled' categories was significant after adjustment, no single category was significantly associated with lower pain experience scores. It can only be concluded therefore, that the perceived level of skill required in a job is likely to be related to pain experience, but the nature of this relationship requires further clarification.

In general, the extent to which an individual perceived their job to be professional or not was not significantly related to pain experience in the current study. The variable 'Professional/Unprofessional' was related to pain emotion, however, once again this relationship was complex. While the entire variable 'Professional/Unprofessional' was related to the pain emotion outcome variables, no *specific* category was significantly related to higher or lower pain emotion scores. There was a trend towards higher pain emotion scores in those reporting their jobs to be 'Equally unprofessional and professional', and 'More professional than unprofessional" (see Section 4), however neither of these were significant. It is appropriate therefore to conclude that there may a relationship between perceived professional status of jobs and pain emotion, however on the basis of current data the nature of this relationship remains unclear.

The extent to which perceptions of skill and /or perceptions of professional status in work can be compared to recent research is questionable. In general, most studies use objective measures for these aspects of work (for example, standardised SEGs). This enables standardisation within and between studies and populations. The current study included perceived ratings of manual, skilled, and professional aspects of work out of interest, as well as for verification of SEG categories. As has been seen in the current study, perceptions of these aspects of work and the traditional categories were not always completely in agreement. Many would argue that as a result, perceptions of these aspects of work should be dismissed as invalid. It is interesting to note that when these data are split in relation to standardised SEG categories, little association between skill and professional status is observable. However when current data are split by *perceptions* of skill and professional status, some association exists. It may be then that the *perceptions* of manual labour, required skill and notions of professional status are more related to the pain experience than objective measures of manual labour, required skill and notions of professional status. Indeed it could also be argued that this may be a problem with the standardised groupings used here. Unfortunately the current study was able to analyse only one of the grouping methods available, as Carstairs Index data were incomplete (see Section 4), therefore it is difficult to interpret these findings without any further information. However they do raise an important issue regarding the discrepancy between perceptions of work and actual aspects of work, which has the potential to contribute considerably to future research (see Section 5.5 below).

In relation to perceptions of physical/manual load and pain experience, there were some associations of note in current data. First, total pain score was lower where individuals described their jobs as less manual. Second, jobs comprising 'more mental effort than physical' were related to lower pain intensity and lower pain impact. These findings agree with some observations in recent literature. For example, Daniels and colleagues (2005) found a relationship between high job-related-physical-demands and back pain severity. Similarly, other authors observed a relationship between pain intensity or severity and particular working positions, specifically: uncomfortable working positions and lifting weights in women (Alcouffe et al, 1999); awkward back postures (Elders & Burdorf, 2001); and moving and handling patients in nursing work (Eriksen, Bruusgaard & Knardahl 2004). These studies were generated by a variety of different designs, and therefore are based on evidence of differing quality. Nevertheless, it is possible (and indeed likely, given the findings for the predominance of pain in physical working population reported elsewhere) that current findings are reflective of a real relationship between perceived physical demands at work and more negative pain experience. This possible relationship between perceived physical demands at work and pain experience has the potential to shed light on the extent to which pain risks are associated with exposure to the physical (mechanical) demands of manual labour and/or the psychosocial aspects of life working in manual labour (see Section 5.5 below).

(iii) Workload control/demands/support and pain experience

In the current study, the extent to which an individual felt that they could cope with their workload was used as an indicator for work demands (see Section 3.2, and Section 5.4 below). Current data showed little association between this measure of work demands and pain experience. Only pain impact was related to this variable after adjustment, such that where individuals described their jobs as 'Equally easy and difficult to cope with' and 'Easy to cope with a lot of the time' the pain was less disruptive. This conflicts with the literature on disability and impact of pain at work (Elders & Burdorf 2001; Cole et al, 2002; Eriksen, Bruusgaard & Knardahl 2004), and conflicts with findings relating high work demands with: increased pain frequency (Cole et al, 2002); and increased pain intensity or severity (Elders & Burdorf 2001; Eriksen, Bruusgaard & Knardahl 2004).

One of the reasons for this discrepancy may be the measure of demands used in each study. All of these studies used standardised instruments to measure job demands and control, with two using the Job Content Questionnaire (JCQ; Karasek et al, 1981; used by Elders & Burdorf 2001; and Cole et al, 2002).; and Eriksen, Bruusgaard & Knardahl 2004 using the "General Nordic Questionnaire for Psychological and Social Factors at Work" (Dallner, Elo & Gamberale, 2000). All of these measures examine job demands and control as a multidimensional construct, whereas the current study measured job demands/control using a uni-dimensional single questionnaire item (see Limitations, Section 5.4 below). It is true that post-hoc analyses showed the current measures to provide a reasonable approximation of those assessed by the JCQ (see Section 4.1), however it is possible that clearer relationships between pain experience and demands/control may have been observable had the JCQ or a similar instrument been used in this study.

It is interesting to note that in the current unadjusted figures, ability to cope with workload was significantly associated with all aspects of the pain experience, with the exception of pain emotion (see Section 4). It was argued in Section 2 that the current measures of workload demand approximated the 'demands' construct of Karasek's "Demand-Control-Support" Model, which argues for a three-factor structure to job strain. As the current association between work demands and the majority of pain experience scores became non significant when other variables were considered, it is possible that the current measure was not accessing the demand construct adequately (see Section 5.4 below). The current study also approximated Karasek's measure of 'job control' using the items 'control of breaks' and 'organise own tasks'; and approximated Karasek's measure of 'support' using the measure 'autonomy /teamwork'. The unadjusted association between 'control of breaks' and all pain experience scores also disappeared after adjustment for other factors, as did the unadjusted association between 'autonomy/teamwork' and pain frequency. Individuals who organised their own tasks 'sometimes' and 'always' were marginally associated with differential pain experience, however, this was only in relation to lower pain intensity scores. In other words, although these items appeared to be identifying a relationship in the unadjusted data, this association may have been the result of a confounder that disappeared after adjustment for the other variables examined.

These findings (or lack thereof) conflict with evidence in the literature suggesting a relationship between demands/control/support at work and specific aspects of the pain experience: pain frequency (Cole et al, 2002); pain intensity or severity (Elders & Burdorf, 2001; Eriksen, Bruusgaard & Knardahl 2004; Kivimäki et al, 2001; Daniels et al, 2005); and coping with pain (Joksimovic et al, 2002). One might conclude that work demands, control and support are relatively unrelated to the experiences of more troublesome pain. However, given that all three of these constructs were only marginally associated with aspects of the pain experience in this study, it also likely that these measures were not accessing the model of job strain purported by Karasek, and another measure may have been more useful (see Section 5.4 below).

(iv) Stress and pain experience

In the current data, there was a relationship between pain experience and work stress. A negative pain experience (higher total GPQ, higher pain intensity, more difficulty coping with pain, and greater pain impact) was less likely where individuals perceived their jobs to lie between 'Very stressful' and 'Very easygoing' than it was where workload stress was high. This is similar to research reporting an association between higher pain intensity and higher pain impact in stressful occupations (Haufler, Feuerstein & Huang 2000), suggesting that where work stress is lower; the pain experience is less negative. Although comparing current data with that of Haufler, Feuerstein and Huang (2000) is difficult due to the specifications of their sample (all women in unskilled work), given the findings already discussed in relation to propensity to report pain in stressful work environments (see Section 5.2 above), it is possible that these studies are accessing a similar preponderance of negative pain experience when workers are exposed to stressful workloads.

There was one unexpected association in the current adjusted stress data. Pain frequency was higher where individuals reported their workloads to be 'Very easygoing'. This could have been an anomaly specific to pain frequency data, but there were also non-significant trends in other experience scores, suggesting that pain experience tended to be more negative where jobs are the least stressful. Closer analysis of data showed that perceived workload stress scores did not differ in relation to: gender (X^2=3.62 (4); n.s.); presence or absence of a chronic condition (X^2=8.13 (4); n.s.); pain type (X^2=38.02 (40); n.s.); or pain cause (X^2=20.15 (20); n.s.). On the other hand, stress of workload was associated with industry group (X^2=63.64 (36), $p<0.003$); and physicality of workload (X^2=34.731 (16) $p<0.001$). It is possible therefore, that tendency towards negative pain experience in those describing their jobs as 'Very easygoing' was related industry type or perceived physical workload in this group. Individuals who saw their work as 'Very easygoing' were most likely to work in the Computer Industry (41% of the 'Very easygoing' group), and were mostly likely to describe their workloads as "Mostly mental effort" (37%). Therefore it was unlikely that a negative pain experience could be explained by a higher physical workload in the 'Very easygoing' group. However, of those working in the Computer industry and reporting their jobs to be 'Very easygoing', two thirds (66.7%) were production operators working on assembly lines manufacturing computer components. While these jobs might not best be described as primarily manual in nature, it is likely that they were monotonous and repetitive.

The current study took no measure of repetition or monotony in jobs tasks (see Section 5.5), however recent research has uncovered an association between: monotonous work and musculoskeletal problems (Björkstén & Talbäck, 2001); as well as between repetitive workload and symptom severity (Strazdins & Bammer 2004). In particular, repetitive movements in the fingers have been shown to be related to an increased risk of musculoskeletal complaints (Gamperiene & Stigum, 1999), and repetitive arm movements have been shown to be related to increased risk of shoulder pain (Pope et al, 2001). It is possible therefore that the association between negative pain experience in those working in assembly lines in the Computer Industry was related to the monotonous nature of those reporting their jobs as 'Very easygoing'. Perhaps their jobs were too easygoing. Admittedly, the extent to which comparisons can be drawn between prevalence studies and the current study of pain experience is a potential source of debate. The wide variety of designs used and populations studied in these investigations prevents any definitive conclusions being drawn. Moreover, this "Very easygoing in the Computer Industry" group represents a very small proportion of a total study population that can be criticised for its lack of representativeness as a whole (see Section 5.4 below). Therefore whether individuals in this subgroup are representative of computer workers or indeed repetitive or assembly–line workers elsewhere is questionable. Despite these issues, however, this finding points to a possible area of future research whereby measures of pain experience could potentially be used to explore the relationship between perceived workload, attention/distraction and pain (see Section 5.5 below for details).

In conclusion, current stress findings appear to relate to previous observations, such that the experience of non-troublesome pain in the workplace is more negative where stress is very high, and/or very low. The extent to which current data can be said to confirm other observations, however, is limited due to differences in design between studies.

(v) Job satisfaction and pain experience

Recent evidence suggests that job dissatisfaction is related to higher pain frequency (Juul-Kristensen et al, 2002), as well as lower health-related quality of life in acute low back pain (Coste et al, 2004). In the current study, individuals who 'sometimes' or 'always' enjoyed their jobs were less likely to experience high pain emotion. Moreover, those who wanted to continue in their jobs were less likely to give higher overall GPQ scores, to have lower pain frequency, and lower pain intensity. It would seem therefore, that although other findings were generated from different populations using different designs, there is some degree of overlap between them and the current study.

(vi) Workgroup and pain experience

The current study reports that pain experience was only marginally different in relation to work or industry group. Specifically, individuals working in the Emergency Service were more likely to experience pain that was of high frequency, and more difficult to cope with. Higher frequency pain was also more likely in those working in media-based occupations. Pain was less easy to cope with where individuals worked in Local Government and Council Business, and *easier* to cope with when working in Food Production & Distribution. Finally, although prevalence data showed that pain was more likely in individuals working in Higher Education, pain experience scores showed that pain was of lower intensity when experienced by this group.

It is difficult to speculate on potential explanations for the variation in pain experience between industry groups, however, it is interesting to note that the majority of those working in the Emergency Service were fire fighters (80%) the physicality of which might account for the negativity of the pain experience in this group. However, higher pain frequency was also noted in those working in media-related jobs, within which the distribution of physical load is likely to have been much more varied.

One pattern that emerged was that back pain appeared to be the most prevalent pain in industry groups where pain was a more negative experience, whereas the distribution of pain types was not as polarised in other industry groups, particularly those where the pain experience was less negative (Media and Food production & distribution; see Table 5.10a below). Table 5.7b shows that no such pattern occurred in relation to perceived pain cause and industry group. It may be that particular pain types were influencing the pain experience in these cases. Therefore, although pain experience did not vary dramatically between pain types over all individuals (see Section 5.3b above), variability increased when industry groups were taken into consideration.

The most striking observation is the *lack* of difference between pain experience for industry groups and the referent category, Heavy Industry. Given the body of evidence to suggest that pain is more prevalent in more physical occupations (as discussed in Sections 2.2 and 5.2 above), one might have assumed that the pain experience would have automatically been more negative in manual jobs. Assuming this perspective, one might have expected all industry groups to be significantly less likely to have higher pain experience scores for all aspects. In fact, current data show that pain experience is less negative than in Heavy Industry for only a fraction of cases. However, this is not to say that the pain experience in Heavy Industry is more positive, as very few industry groups were *more* likely to report *lower* pain experience scores than those working in Heavy Industry.

Although comparisons of pain experience between different occupations in the literature are rare, two recent studies show similar findings to the current study. Karjalainen and colleagues (2003) report no relationship between type of occupation and pain intensity in a population of employed patients with sub-acute (duration of pain four-twelve weeks) daily low back pain. This prospective study can be seen as providing reasonable quality evidence, as although these observations were made on the basis of a small sample (N =164) their follow-up was relatively complete (97% at three months, and 98% at six months and twelve months). There are many differences between Karjalainen and colleagues' study (2003) and the current one. First, these authors measured pain intensity using a ten-point Likert scale, which differs from the GPQ. In addition, the main focus of the study by Karjalainen et al (2003) was on pain intensity as related to sick leave, as opposed the pain experience alone. Third, although Karjalainen and colleagues discuss a relationship between "type of occupation" and pain-related sick leave (as well of the lack of the relationship between "type of occupation" and the intensity of pain) they do not expand this notion of "type of occupation" in any great detail. The category "blue collar worker" is used, however no details as to how this category was derived or the specific occupations it comprised is given. Without any further information it is impossible to speculate on the extent to which Karjalainen et al's group of "blue collar" group were similar to the current category of "Heavy Industry" (or any other industry group for that matter). Moreover, as the current study compared a variety of occupations to 'Heavy Industry', whereas Karjalainen et al (2003) carried out a comparison of just two groups, the extent to which these authors' study can be compared to the current one is questionable.

McBride et al (2004) provide longitudinal questionnaire data from a general population, and report no differences in frequency and prevalence of low back pain when comparing professional, clerical, technical, production and trade occupations.

Table 5.10

Pain site and pain cause in relation to Industry Group. Largest proportions within Industry Groups are given in bold

(a) Pain site

	Heavy Industry [Number of individuals; % Heavy Industry]	Banks & financial services [Number of individuals; % Banks & financial services]	Computer industry [Number of individuals; % Computer industry]	Emergency service [Number of individuals; % Emergency service]	Food production & distribution [Number of individuals; % Food production & distribution]	Health services [Number of individuals; % Health services]	Higher Education [Number of individuals; % Higher Education]	Local government & council business [Number of individuals; % Local government & council business]	Pharmaceutical production & research [Number of individuals; % Pharmaceutical production & research]	Media [Number of individuals; % Media]
Back	**[25;29%]**	[20;16%]	**[86;23%]**	**[22;41%]**	**[13;22%]**	[14;18%]	[30;26%]	**[32;34%]**	**[67;27%]**	**[29;33%]**
Abdominal	[7;8%]	[22;18%]	[47;13%]	[5;9%]	[2;3%]	[9;12%]	[9;8%]	[16;17%]	[27;11%]	[8;9%]
Chest area	[1;1%]	[3;2%]	[6;2%]	[1;2%]	[1;2%]	[1;1%]	[3;3%]	[2;2%]	[6;2%]	[1;1%]
Ear nose or throat	[1;1%]	[1;1%]	[8;2%]	[1;2%]	[1;2%]	[0;0%]	[5;4%]	[0;0%]	[5;2%]	[5;6%]
Face and mouth	[7;8%]	[5;4%]	[18;5%]	[2;4%]	[1;2%]	[1;1%]	[2;2%]	[1;1%]	[14;6%]	[3;3%]
Feet or ankles	[2;2%]	[2;2%]	[10;3%]	[3;6%]	[7;12%]	[0;0%]	[2;2%]	[2;2%]	[10;4%]	[2;2%]
Head	[18;21%]	**[48;39%]**	**[86;23%]**	[7;13%]	[12;20%]	**[33;42%]**	**[41;36%]**	[20;22%]	[65;26%]	[12;14%]
Joints	[11;13%]	[3;2%]	[45;12%]	[10;19%]	[2;3%]	[7;9%]	[8;7%]	[11;12%]	[23;9%]	[7;8%]
Limbs	[6;7%]	[7;6%]	[19;5%]	[1;2%]	**[13;22%]**	[7;9%]	[7;6%]	[2;2%]	[9;4%]	[2;2%]
Neck & shoulder	[8;9%]	[12;10%]	[37;10%]	[2;4%]	[7;12%]	[6;8%]	[7;6%]	[7;8%]	[22;9%]	[18;21%]

(b) Pain cause

	Heavy Industry [Number of individuals; % Heavy Industry]	Banks & financial services [Number of individuals; % Banks & financial services]	Computer industry [Number of individuals; % Computer industry]	Emergency service [Number of individuals; % Emergency service]	Food production & distribution [Number of individuals; % Food production & distribution]	Health services [Number of individuals; % Health services]	Higher Education [Number of individuals; % Higher Education]	Local government & council business [Number of individuals; % Local government & council business]	Pharmaceutical production & research [Number of individuals; % Pharmaceutical production & research]	Media [Number of individuals; % Media]
Unknown	**[18;21%]**	[20;16%]	**[95;26%]**	[11;20%]	[9;15%]	**[17;22%]**	**[18;16%]**	**[25;27%]**	**[82;33%]**	**[24;28%]**
Life variables	[12;14%]	**[26;21%]**	[40;11%]	[5;9%]	[5;8%]	[8;10%]	[11;10%]	[16;17%]	[19;8%]	[13;15%]
Long-term medical problems	[3;3%]	[7;6%]	[9;2%]	[0;0%]	[1;2%]	[2;3%]	[3;3%]	[3;3%]	[5;2%]	[2;2%]
Non-serious ailments	[3;3%]	[12;10%]	[22;6%]	[7;13%]	[2;3%]	[6;8%]	[11;10%]	[9;10%]	[15;6%]	[6;7%]
Old injury	[4;5%]	[1;1%]	[8;2%]	[4;7%]	[1;2%]	[2;3%]	[3;3%]	[1;1%]	[7;3%]	[2;2%]
Pain problems	[6;7%]	[4;3%]	[41;11%]	[6;11%]	[7;12%]	[6;8%]	[13;12%]	[8;9%]	[14;6%]	[8;9%]
Recent injury	[14;16%]	[9;7%]	[51;14%]	**[13;24%]**	**[20;34%]**	[11;14%]	[11;10%]	[13;14%]	[39;16%]	[13;15%]
Short-term medical problems	[9;10%]	[17;14%]	[46;13%]	[3;6%]	[5;8%]	[11;14%]	[12;11%]	[10;11%]	[35;14%]	[8;9%]
Stress	[9;10%]	[9;7%]	[10;3%]	[3;6%]	[0;0%]	[7;9%]	[13;12%]	[3;3%]	[13;5%]	[6;7%]
Work environment	[9;10%]	[18;15%]	[43;12%]	[2;4%]	[9;15%]	[8;10%]	[17;15%]	[5;5%]	[18;7%]	[5;6%]

To the extent that these studies can be compared with current data, and the extent to which these industry groups can be seen to be valid representations of the work taking place within these industries (see Section 5.2 above, and Section 5.5 below) it would appear that although prevalence may differ in relation to industry group or job title, pain experience does may not vary dramatically.

(f) Interpreting current findings for associations between demographic factors, work variables and pain experience

In conclusion, to the extent that current data can be seen to be a valid representation of the working population in Scotland, it would appear that pain experience was more negative in women and in individuals with chronic conditions. This was the case for all aspects of the pain experience. Associations between other demographic variables and pain experience were less pronounced, and other literature in this area shows inconsistent associations.

Higher physical workload appeared to relate to a more negative pain experience, which is similar to some other articles. The difference in pain experience between those working in 'Heavy Industry' and that of those in other industry types was less pronounced than might have been anticipated.

Some psychosocial work factors appeared to relate to a more negative pain experience, particularly high work stress and low job satisfaction. A relationship between low stress and negative pain experience was also found, and this is likely to relate to the repetitive or monotonous nature of work tasks. Other work factors such as working conditions and industry type appeared to be only vaguely associated with pain experience. Notably, psychosocial factors of work demands, control and support were not related to experience either. These findings do not always reflect associations observed in the literature, and this is likely to be the result of the differing methodologies, pain outcomes, designs and populations used.

Overall it can be concluded that some association exists between a more negative pain experience and demographic and work factors. This is one of the first studies to relate demographic and psychosocial factors to general aches and pains in the workplace on such a scale, and reflects the potential contribution of examining non-troublesome pain using a measure other than pain prevalence (see Section 5.5 below). Moreover, these associations between psychosocial factors and non-troublesome pain are the first observations of their kind, and highlight the potential importance of psychosocial factors in non-troublesome pain.

5.3 Pain Response

(a) Nature of pain response scores

Table 5.11 below compares the current findings to those reported in the BMRB study in Section 2 of the current thesis (BMRB, 1997). As can be seen, current results are comparable to those in the BMRB study in that the most common responses were for individuals: to take a medicine that they already had; or to consult a doctor or dentist. Overall, actions taken in response to general aches and pains appear to be relatively similar to actions taken for other non-serious conditions. However, the current consultation rate appears to be slightly higher than that for other non-serious ailments, and rate of prescription medication use appears to be slightly lower than that for other non-serious ailments.

Table 5.11

Actions taken to deal with all (a) general aches and pains in the last month (current study) versus (b) actions taken to deal with all non-serious ailments in the last 2 weeks (BMRB study, 1997)

	(a) Current study								(b) BMRB study (1997)*							
	% of those taking action	*% Men*	*%Women*	*16-25*	*26-35*	*36-45*	*46-55*	*56-65*	% of those taking action	% Men	% Women	15-19	20-34	35-49	50-64	65+
Saw a doctor/dentist	*28*	*30*	*26*	*30*	*26*	*25*	*31*	*34*	16	16	18	10	14	16	18	16
Saw nurse/health visitor	*2*	*2*	*2*	*1*	*1*	*3*	*2*	*0*	2	2	2	2	2	0	2	2
Saw another health professional	*5*	*5*	*5*	*7*	*4*	*6*	*6*	*3*	4	4	4	2	4	6	6	4
Asked a pharmacist for advice	*4*	*2*	*4*	*2*	*3*	*2*	*5*	*6*	2	2	2	0	2	2	2	2
Used a prescription medicine that was already in the house	*12*	*11*	*12*	*11*	*11*	*12*	*14*	*13*	22	22	22	12	12	20	32	22
Bought a medicine you can buy without a prescription	*13*	*12*	*13*	*16*	*13*	*10*	*15*	*14*	16	14	18	24	20	14	14	16
Used a medicine you can buy that was already in the house	*32*	*31*	*32*	*28*	*33*	*38*	*24*	*23*	24	24	26	10	28	32	22	24
Used a home remedy	*4*	*2*	*5*	*2*	*6*	*3*	*3*	*0*	14	12	16	6	18	16	10	14

* (Sum not always equal to 100%; not clear from article – may include multiple actions)

It is debatable whether data regarding non-serious ailments is strictly comparable to that regarding non-serious pain alone, and without the raw data for the BMRB study, it is impossible to statistically compare these rates. However there is some level of consistency between studies that points to the potential for future research.

One study that presents data on pain responses specifically is the "Pain in Europe" study, carried out between 2002 and 2003 (Pain in Europe, no date). Based on interview data gathered in sixteen different European countries, this study reports on the pain in the last month in 3800 individuals in the U.K., 300 of whom were interviewed about a variety of pain-related issues, including medications taken to deal with their pain. Table 5.12 below summarises reported findings for the U.K. population in the 'Pain in Europe' study in relation to the current findings. As can be seen from Table 5.9, current data for medication use is, on the whole, similar to the U.K. figures published in the 'Pain in Europe' study. However, again issues can be raised regarding the extent to which these two studies can be compared. Although the 'Pain in Europe' study implies from its title that it takes a general approach to pain, in fact the focus is exclusively on chronic pain, and the authors use the terms "pain" and "chronic pain" interchangeably. This focus on chronic pain is implicit in the authors' inclusion criteria, which were to only include pain scoring "greater-than-five-to-ten on a visual analogue scale"; and pain of more than six months in duration. Given that the current study refers to non-troublesome pain (always less than four-out-of-ten on five separate visual analogue scales) it is interesting to note that the pattern of medication use in both populations bears more than a passing resemblance to one another.

Table 5.12

Responses to pain in (a) the current study versus (b) Pain in Europe Study (2004)

	(a) Current study	(b) Pain in Europe Study (2004)
Not treating pain in anyway (of those in pain)	*20%*	20%
Using an prescription med (of those in pain and using a medicine)	*31%*	47%
Using a non-prescription med (of those in pain and using a medicine)	*69%*	53%
Of those using a non-prescription med:		
Paracetamol	*45%*	47%*
NSAID	*44%*	63%*
Other (inc. weak opioids)	*11%*	9%*

* (Sum > 100%; not clear from article – may include multiple medications)

There is one discrepancy between the rates of NSAID use in both studies, however personal communication with the authors (2004) uncovered that this study did not distinguish between NSAID use for pain and NSAID use for other symptoms. This may have led to an elevated rate of NSAID use in the Pain in Europe study when compared to the current study, which examined rates of NSAID use for pain alone.

It can therefore be suggested that, despite the lack of evidence available (and with some important exceptions) the current results can be seen to bear some resemblance to illustrations of pain responses in U.K. populations published elsewhere. However, it is important to note that both the BMRB study and the Pain in Europe study were based on community samples, and while the effect of work was not ignored, it was not accounted for in the figures above. It is likely therefore that these samples represented a variety of individuals working and not working. This further limits the extent to which their findings can be compared with those in the current study. However, it also points to a potentially important finding – that consultation and medication use for general aches and pains in a working population could be similar to those in a general population. Evidence regarding the importance of work in relation to pain was presented in Section 2.3 of this thesis, from which one can speculate that medication use would be higher in those experiencing pain and being exposed to the demands of work. It may be that pain responses in the wider population compared to working populations are similar, regardless of work factors.

There is however an important criticism that can be made of the BMRB and Pain in Europe studies discussed above. Both were independent reports, one for a commercial organisation (the BMRB Study) and the other by a group of pain specialists that were supported by a commercial organisation (the Pain in Europe study). This is not to say that the mere commercial aspect of these studies could have influenced the findings (although technically it could have) but that the way in which the findings of these studies are written and/or disseminated is not the same as those described elsewhere in this thesis. The current author could find no reference, for example, to any publication of these results in peer-reviewed scientific articles on MEDLINE or PsychINFO databases. This does not mean that there are errors in the these studies, only that the information given on methodology and potential sources of bias are not as easy to interpret as in other studies. For example, no information on non-responders was available with which to assess the potential effect of attrition bias. Moreover, no details on the generation of groups is available in these publications with which to estimate the extent to which reports could have been affected by selection bias. Finally, and perhaps most importantly, both studies present only univariate, basic analyses of their data. Without adjustment for various confounders (such as the ones shown in this thesis to affect reports of pain and of pain experience) it is impossible to conclude whether responses to pain are related to the variables measured, a combination of the variables measured, or any unmeasured variable for that matter. This is not to dismiss these studies completely, but this issue highlights the crucial importance of giving a full, transparent account of research methods and the importance of taking methodological issues into consideration when making conclusions.

(b) Pain response in relation to pain type and pain cause

Current data confirmed Exploratory Hypothesis 6, such that rates of medication use, medication avoidance and healthcare consultation differed in relation to pain type and pain cause.

(i) Pain response in relation to pain type

After adjustment for age and gender, acting on pain was more likely for abdominal pain, ear nose or throat (ENT) pain, feet/ankle pain, neck/shoulder pain, and headache. Individuals suffering from ENT pain, face/mouth pain, and feet/ankle pain were also more likely to consult. Consulting a health professional was least likely for headache, after adjustment for age and gender.

Closer examination of current data (see Table 5.13 below) shows that of those experiencing pain for which action was more likely (abdominal pain, ENT pain, feet/ankle pain, neck/shoulder pain), the most common causes within each pain type were: life variables (39% of abdominal pain); short-term medical problems (63% of ENT pain); recent injury (28% of feet/ankle pain, and 23% of neck/shoulder pain); or unknown cause (23% of neck/shoulder pain).

Table 5.13
Cross-tabulation of pain site by pain cause for the whole pain sample. Figures referred to in the text are given in bold.

	Back	Abdominal	Chest area	ENT	Face/mouth	Feet/ankles	Head	Joints	Limbs	Neck/shoulder
Unknown										
% within Pain cause	31	6	2	1	1	2	42	4	3	9
% within Pain site	29	13	20	11	7	15	40	10	11	**23**
Life variables										
% within Pain cause	25	39	2	1	1	2	12	6	8	5
% within Pain site	11	**39**	12	4	2	8	5	8	18	6
Long-term medical problems										
% within Pain cause	3	57	6	3	0	6	11	9	3	3
% within Pain site	0	13	8	4	0	5	1	2	1	1
Non-serious ailments										
% within Pain cause	4	18	1	4	8	6	54	0	3	1
% within Pain site	1	11	4	15	13	15	15	0	4	1
Old injury										
% within Pain cause	55	3	0	0	0	6	0	12	6	18
% within Pain site	5	1	0	0	0	5	0	3	3	5
Pain problems										
% within Pain cause	32	0	0	0	0	4	4	37	13	10
% within Pain site	11	0	0	0	0	13	1	33	19	9
Recent injury										
% within Pain cause	42	1	2	0	1	6	4	20	10	14
% within Pain site	24	1	16	0	4	**28**	2	31	27	**23**
Short-term medical problems										
% within Pain cause	9	21	5	11	25	2	21	3	1	2
% within Pain site	4	20	32	**63**	**70**	8	9	3	3	2
Stress										
% within Pain cause	11	3	1	0	0	0	67	1	0	16
% within Pain site	2	1	4	0	0	0	14	1	0	10
Work environment										
% within Pain cause	29	0	1	1	2	2	30	8	8	20
% within Pain site	12	0	4	4	4	5	12	9	14	22

Of those suffering from pains that prompted consultation (ENT pain, face/mouth pain, and feet/ankle pain) the majority of those attributed their pain to short-term medical problems (70% of ENT pain and 63% of face/mouth pain) or recent injury (28% of feet/ankle pain and 23% of neck/shoulder pain) or unknown (23% of neck/shoulder pain). In other words, for pain types where action and/or consultation was more likely, pain was most commonly seen as the result of either transient or uncontrollable variables. There is little known about the attribution processes individuals make in relation to their pain, and how they may affect their report, experience or response to it. However, a greater understanding of how these attribution processes differ in relation to pain type (if indeed they do) could have implications for pain research and intervention in the future (see Section 5.5 below).

Table 5.14
Pain site and pain cause in relation to specific actions taken in response to pain. Largest proportions within pain types are given in bold.

(a) Pain site	Saw doctor or dentist	Saw nurse/health visitor	Saw another health professional	Asked a pharmacist for advice	Used a prescription medicine that was already in the house	Bought a medicine you can buy without a prescription	Used a medicine you can buy that was already in the house	Used a home remedy	Total
	[Number of individuals; *% of those with this pain type taking action*]	[Number of individuals; *% of those with this pain type taking action*]	[Number of individuals; *% of those with this pain type taking action*]	[Number of individuals; *% of those with this pain type taking action*]	[Number of individuals; *% of those with this pain type taking action*]	[Number of individuals; *% of those with this pain type taking action*]	[Number of individuals; *% of those with this pain type taking action*]	[Number of individuals; *% of those with this pain type taking action*]	[Number of individuals; *% of those with this pain type taking action*]
Back	**[63; 27%]**	[5; 2%]	[23; 10%]	[4; 2%]	[32; 14%]	[31; 13%]	**[66;28%]**	[85; 4%]	[233; 100%]
Abdominal	**[43; 33%]**	[0; 0%]	[4; 3%]	[6; 5%]	[16; 12%]	[19; 15%]	[34; 26%]	[9; 7%]	[131; 100%]
Chest area	**[10; 59%]**	[0; 0%]	[1; 6%]	[0; 0%]	[2; 12%]	[1; 6%]	[2; 12%]	[1; 6%]	[17; 100%]
ENT	**[14; 56%]**	[0; 0%]	[0; 0%]	[4; 16%]	[0; 0%]	[4; 16%]	[2; 8%]	[1; 4%]	[25; 100%]
Face and mouth	**[37; 77%]**	[0; 0%]	[1; 2%]	[2; 4%]	[3; 6%]	[1; 2%]	[4; 8%]	[0; 0%]	[48; 100%]
Feet or ankles	**[16; 53%]**	[0; 0%]	[2; 7%]	[2; 7%]	[3; 10%]	[1; 3%]	[5; 17%]	[1; 3%]	[30; 100%]
Head	[34; 11%]	[1; 0.3%]	[4; 1%]	[11; 4%]	[37; 12%]	[50; 16%]	**[159; 52%]**	[11; 4%]	[307; 100%]
Joints	**[27; 33%]**	[1; 1%]	[5; 6%]	[3; 4%]	[18; 22%]	[10; 12%]	[19; 23%]	[0; 0%]	[83; 100%]
Limbs	**[17; 40%]**	[2; 5%]	[5; 12%]	[0; 0%]	[2; 5%]	[3; 7%]	[12; 28%]	[2; 5%]	[43; 100%]
Neck & shoulder	**[28; 27%]**	[8; 8%]	[11; 11%]	[1; 1%]	[13; 13%]	[11; 11%]	**[28; 27%]**	[4; 4%]	[104; 100%]

(b) Pain cause	Saw doctor or dentist	Saw nurse/health visitor	Saw another health professional	Asked a pharmacist for advice	Used a prescription medicine that was already in the house	Bought a medicine you can buy without a prescription	Used a medicine you can buy that was already in the house	Used a home remedy	Total
	[Number of individuals; *% of those with this pain cause taking action*]	[Number of individuals; *% of those with this pain cause taking action*]	[Number of individuals; *% of those with this pain cause taking action*]	[Number of individuals; *% of those with this pain cause taking action*]	[Number of individuals; *% of those with this pain cause taking action*]	[Number of individuals; *% of those with this pain cause taking action*]	[Number of individuals; *% of those with this pain cause taking action*]	[Number of individuals; *% of those with this pain cause taking action*]	[Number of individuals; *% of those with this pain cause taking action*]
Unknown	[52; 22%]	[5; 2%]	[10; 4%]	[5; 2%]	[21; 9%]	[33; 14%]	**[102; 43%]**	[9; 4%]	[237; 100%]
Life variables	[20; 17%]	[0; 0%]	[5; 4%]	[1; 1%]	[8; 7%]	[21; 18%]	**[53; 45%]**	[10; 8%]	[118; 100%]
Long-term medical	**[13; 45%]**	[0; 0%]	[2; 7%]	[3; 10%]	[6; 21%]	[2; 7%]	[3; 10%]	[0; 0%]	[29; 100%]
Non-serious ailments	[17; 22%]	[0; 0%]	[2; 3%]	[2; 3%]	[18; 23%]	[14; 18%]	**[23; 29%]**	[3; 4%]	[79; 100%]
Old injury	**[9; 39%]**	[0; 0%]	[2; 9%]	[0; 0%]	[4; 17%]	[3; 13%]	[5; 22%]	[0; 0%]	[23; 100%]
Pain problems	**[32; 37%]**	[1; 1%]	[7; 8%]	[3; 3%]	[23; 26%]	[5; 6%]	[15; 17%]	[1; 1%]	[87; 100%]
Recent injury	**[53; 37%]**	[6; 4%]	[16; 11%]	[5; 3%]	[19; 13%]	[15; 10%]	[26; 18%]	[3; 2%]	[143; 100%]
Short-term medical	**[73; 49%]**	[0; 0%]	[5; 3%]	[12; 8%]	[12; 8%]	[14; 9%]	[29; 19%]	[4; 3%]	[149; 100%]
Stress	[11; 18%]	[2; 3%]	[1; 2%]	[0; 0%]	[6; 10%]	[11; 18%]	**[28; 45%]**	[3; 5%]	[62; 100%]
Work environment	[13; 14%]	[3; 3%]	[6; 6%]	[2; 2%]	[9; 9%]	[12; 13%]	**[45; 47%]**	[5; 5%]	[95; 100%]

Where acting on general aches and pains was most likely in current data, Table 5.14a below shows that (abdominal pain, face/mouth pain, ENT, feet/ankle pain and neck/shoulder pain) the most common action was to consult a doctor or dentist. This was with the exception of neck/shoulder pain, for which the same proportion of individuals consulted a doctor or a dentist as used over-the-counter (OTC) medicine that they already had available (see Table 5.14a).

Where consultation for general aches and pains was most likely in the current study (for face/mouth pain, ENT and feet/ankle pain), Table 5.14b below shows that the consultation of choice was a doctor or dentist. Although individuals suffering from headache were the least likely to consult, over half of the headaches were treated using an OTC medicine that was already in the house.

(ii) Pain response in relation to pain cause

In relation to pain cause, variability between pain responses was as one might have intuitively expected. Acting on pain was more likely where individuals perceived the cause of their pain to be the result of short-term medical problems, and the most common action for this pain cause was to seek help from a doctor or a dentist (73%, see Table 5.14b). Consultation for pain was more likely where the cause was not readily manageable by the individual themselves: recent injury; long-term medical problems; pain problems; or short-term medical problems. In all of these cases, the majority of individuals went to see a doctor or a dentist (see Table 5.14b)

One interesting finding was in relation to individuals who did nothing about their pain. Although the most common response in individuals with a pain problems was to consult a health professional, just under one quarter (23%) of those attributing their pain to a 'pain problem' did not act on their pain at all. For those not acting on pain problems, two-thirds stated that their reason for not treating their pain was that they 'thought [their pain] would get better by itself'. Only 12% stated that their pain 'could not be treated with anything'. The average number of sick days for those suffering from pain problems (5.4 days per annum) was less than the average number of sick days for the entire sample (7.8 days per annum), and substantially less than those who acted on a pain problem (11.7 days). The findings suggest that there was a proportion of individuals in the current sample suffering chronic pain, apparently doing nothing about it, but still managing to continue to work.

(iii) Interpreting findings relating pain response to pain type and pain cause

In this study, pain responses varied considerably in relation to pain site and pain cause. In general, patterns of pain responses appear sensible: where individuals believed their pain to be short-term and manageable, they were likely to act but not consult, and where they needed help with their pain they are likely to seek it.

A small proportion of individuals with chronic pain problems were able to manage their pain outwith clinical supervision, a smaller proportion of which did not do anything about their pain at all. The pain literature has recently focussed on the medico-legal aspects of chronic pain at work, as well as on discussing beliefs and attitudes about chronic pain (Chew & May, 1997; Kendall, Linton & Main, 1997; Main & Spanswick, 2000). As the details of this research relate to chronic pain, they are mostly beyond the scope of the current thesis. However, it suffices to say that there is substantial discussion regarding the intricacies of the practitioner/patient relationship in legitimising *not working* as a result of pain, and/or in the treatment of a work-disabled chronic pain population (Chew & May, 1997; Main & Spanswick, 2000). It is interesting to note, therefore, that the current study provides the first evidence suggesting that, in some cases, chronic pain sufferers *do nothing* and *continue to work*. Although these individuals represent a small proportion of individuals in a sample that may or may not be representative of the working population as a whole (see Section 5.4), in the interest of work retention and minimising healthcare costs, there may be some interesting issues surrounding coping with chronic pain problems outwith consultation that deserve further research attention.

(c) Pain experience and pain response

The purpose of Exploratory Hypothesis 7 was to record the potential relationship between pain response and pain experience. In this case the relationship was rather straightforward: the more negative the pain experience, the more likely an individual was to act on their pain or to consult for their pain. This is in agreement with other research in this area, reporting associations between: higher pain intensity or severity and increased likelihood of consulting (Riley et al, 1999;

Molano, Burdorf & Elders, 2001; Trinkoff et al, 2002; Zondervan et al, 1999; Bair et al, 2003; Mortimer & Ahlberg, 2003; Picavet & Schouten, 2003; Blyth et al, 2004; Gerdle at al, 2004; IJzelenberg & Burdorf, 2004; Severeijns et al, 2004; Walker, Muller & Grant, 2004); as well as higher pain intensity and increased use of pain medication (Elander & Barry 2003; Severeijns et al, 2004). The majority of these studies publish cross-sectional data (Riley et al, 1999; Molano, Burdorf & Elders, 2001; Zondervan et al, 1999; Bair et al, 2003; Picavet & Schouten, 2003; Blyth et al, 2004; Gerdle at al, 2004; IJzelenberg & Burdorf, 2004; Severeijns et al, 2004; Walker, Muller & Grant, 2004) however two present case-control data (Trinkoff et al, 2002; Mortimer & Ahlberg, 2003), taken from large samples with reasonable participations rates. It could be argued, therefore that current findings are relatively in agreement with previous findings: that the pain experience has a bearing on the decision to act on pain, or to consult for pain. In addition, the current study extends previous research in two ways.

First, these data provide further insight into the nature of the relationship between pain experience and health behaviours by providing pain information from five pain indices. In this study, individuals are more likely to act on pain where it was more intense, more emotional, and more disruptive. The decision to consult, however, was related to pain frequency and disruptiveness, but not to any other pain score. This is interesting, as one reason that has been given for care-seeking for pain is the inability to cope with the pain any longer (Hadler, 2005). Current data show that consulting for general aches and pains may have little relationship with ability to cope with pain.

Second, this study extends previous literature onto non-troublesome pain, suggesting that the relationship between the experience of non-troublesome pain and care-seeking may be similar to the relationship between the experience of troublesome pain and care-seeking. Although there are issues with the current methodology that prevent any firm conclusions being made, these findings point to the possibility of a relationship between the experience of non-troublesome pain and care-seeking that deserves further exploration (see Section 5.5 below).

(d) Demographic variables and pain response

As predicted, pain responses differed in relation to demographic groups (H_{13}), and demographic variables were associated with pain responses after adjustment (EH_8). Current data showed that acting on pain was more likely in women, but that gender had little effect on the decision to consult for pain. Recent reports of a gender effect in care-seeking for pain in women (Vingård et al, 2000; Blyth et al, 2004; Grooten et al, 2004; Walker, Muller & Grant, 2004) are in agreement with the current finding for acting on pain, but conflict with the finding for consulting for pain. It is unclear why this should be the case, but it is possible that this discrepancy is related to the differences in the current methodology in comparison to those applied previously. In addition, the differences in findings for consultation may be explained by the fact that this study focuses specifically on non-troublesome pain. It may be that fewer people overall consult for non-troublesome pain than for troublesome pain, however acting on non-troublesome pain (for example using an OTC) is more common in women. Therefore, women may be more likely to act on pain, and more likely to consult for troublesome pain, but less likely to consult for non-troublesome pain. Crucially, many of the studies report a gender effect on consultation in relation to other variables measured. Some authors report an effect when adjusting for gender while others report an interaction between gender and work factors (Vingård et al, 2000; Blyth et al, 2004; Grooten et al, 2004; Walker, Muller & Grant, 2004). There is every possibility therefore that a gender interaction exists between variables in relation to consultation for pain. Although analyses of interactions between variables in relation to pain response data were not done in this thesis, these are planned for the future (see Section 5.4 below).

In the adjusted results from this study, those aged between 26 and 35 as well as those aged between 46 and 55 were less likely to act on pain. There was no association, however, between age and consulting for pain. There is little evidence with which to compare current data, as the majority of studies examining the relationship between demographic factors and acting on pain treat age as a confounder, thereby adjusting for its influence through regression, or through age-stratified sampling or analysis (Vingård et al, 2000; Blyth et al, 2004; Grooten et al, 2004; Walker, Muller & Grant, 2004). As such, details of the nature or magnitude of associations between different age groups and pain responses are not always reported. Walker, Muller & Grant (2004) do provide some evidence that for older individuals, consulting a GP is the preferred action, however this is compared to choice of other healthcare providers, rather than to the decision not to consult, as in the current study. To this end, then, the current study appears to be at least partially in agreement with other literature on age and pain responses, however the extent to which these studies can be compared is limited due to differing methodologies.

An adjusted association between chronic condition and both pain responses was also found in the current data. Likelihood of acting and consulting was less where individuals did not have a chronic condition. Again, there is very little research with which to compare current findings. One study examines the effects of pre-morbid and episode-related factors on incident low back pain (Macfarlane et al, 1999), although as this study is limited only to those consulting for back pain, it is unclear the extent to which these authors' data are comparable to current data.

In general then, to the extent that current findings for the relationship between pain responses and demographic factors can be compared with other research, there appears to be at least partial consistency in findings. It is important to note, however, that the majority of other studies focus on more troublesome, site- and duration-specific pain as opposed to the current focus on non-troublesome general aches and pains. Therefore even if current response data could be seen to be representative of the target populations, the extent to which this study could be compared with other pain response studies is limited.

(e) Work variables and pain response

It was hypothesised that pain responses would differ in relation to work groups (H_{14}), and that work variables would be associated with pain responses after adjustment (EH_9). The hypotheses were partially confirmed by the current data.

Notably absent from the current data were associations between psychosocial work factors and pain responses. This conflicts with reports of a relationship between a poor psychosocial working environments and increased care–seeking for a variety of pains in a variety of reasonable quality non-cross-sectional studies (Papageorgiou et al, 1997; Vingård et al, 2000; Trinkoff, Storr & Lipscomb, 2001). Specifically, psychosocial work factors associated with increased care-seeking for pain include: poor job satisfaction (Papageorgiou et al, 1997; Vingård et al, 2000); increased levels of routine work (Vingård et al, 2000); and poor relationships/support at work (Papageorgiou et al, 1997).

In addition, this study conflicts with observations linking psychosocial working environments to increased use of pain medication (Trinkoff, Storr & Lipscomb, 2001). None of these variables were associated with acting on pain or consulting for pain in the current study. Again, the explanation for this discrepancy may lie in the type of pain examined. For example, the one study reporting no association between psychosocial work factors and care-seeking for back pain (Mortimer & Ahlberg, 2003) presents data on pain in relation to four pain grades, constructed from measures of pain intensity and disability. This allows for the inclusion of pain that is 'Low disability/Low intensity' (grades 1 and 2), both of which account for the majority of individuals in their sample. It is possible, therefore, that psychosocial risk factors have less influence on care-seeking where pain is less disabling or less troublesome.

One aspect of the current study that is consistent with other observations is the association between more manual/less professional work and pain response. Acting on pain was less likely where individuals described their jobs as more professional, and consulting for pain was less likely where individuals described their work as more non-manual. There are parallels between these findings and reports of higher levels of care-seeking where individuals are subject to higher physical demands at work (Vingård et al, 2000, Trinkoff, Storr & Lipscomb, 2001). To the extent that current measures of 'manual/non-manual' and 'professional/unprofessional' can be seen as indicative of the physical demands of current occupations, therefore, there may be similarities between this study and findings of other studies.

In relation to work factors, therefore, this study is in some agreement with other literature in the area, but many inconsistencies between current findings and those published elsewhere exist. It is likely that these can be partially explained by methodological differences between studies, not least the methodological weaknesses of the current study (see Section 5.4 below). It may be that many of these inconsistencies can be understood in terms of the current focus on less troublesome pain, and that unlike responses to more troublesome pain, responses to less troublesome pain may only be marginally related to psychosocial work factors, and more related to physical work factors.

(f) Interpreting current findings for associations between demographic factors, work variables and pain responses

Responses to general aches and pains in the current sample were varied, and two-thirds of the pain experience was not brought to the attention of a health care professional. A large proportion of non-consulters were self-medicating, and many reported not doing anything at all. Patterns of pain responses appeared to be related to some of the literature in this area, but by no means all. Responding to pain differed in relation to pain site, and to pain cause, however these differences did not appear to follow any particular pattern. Consultation was less likely for pain problems, suggesting that some individuals with chronic pain problems were managing their pain outwith regular clinical supervision and were continuing to work.

Acting on pain and consulting for pain were both more common where the pain experience was more negative, as expected, although the specific pain experience profiles for each of these actions differed. Surprisingly, the decision to act on or consult for pain was not related to the extent that the individual felt able to cope with their pain.

The relationship between demographic factors and pain response was also not clear-cut, and was not always in accordance with other literature. Women and those with a chronic condition were more likely to act on pain, but consultation was only more likely in those with a chronic condition. The current data also appeared to be related to observations of differential responses to pain in different age groups, although comparison with other studies is problematic.

In agreement with other literature, physical work factors were related to current pain responses such that acting on pain and consulting for pain were associated with the extent to which individuals perceived their jobs to be manual or professional.

There was little association between psychosocial work factors and pain responses, which conflicts with observations from other studies. Aside from methodological issues regarding the design and execution of the current study, it is possible that the discrepancy between these and published data are related to the fact that the current study focuses specifically on non-troublesome pain, for which, by definition, one might expect action or care-seeking to be less likely.

5.5 Limitations of the current study

Throughout the course of this Chapter (Sections 5.1-5.4) several issues have been raised relating to the design of the current study. These are discussed in detail below.

(a) Issues with the current response rate and selection bias

Despite two written reminders, response rate for the current study was low (24%). On the one hand this amounted to a group of individuals that was comparable to or larger than many working populations in other epidemiological studies (N=1888), and considerably larger than the expectation for most psychological studies (Field, 2001).

On the other hand, however, as this proportion amounted to only a quarter of all of those offered the opportunity to participate, it is unlikely that this sample was entirely representative of the population approached. The results can therefore only be said to be representative of the population as a whole who *saw fit to comment on their pain* (or lack thereof). This is a source of error and bias in all studies of this nature, but it is more so where the proportion of those not replying is substantially larger than the proportion of those replying. Attempts were made to lower the differential between these two proportions (see the Methods – Section 3) however, these were abandoned in favour of inclusion of a more varied working sample.

One of the main reasons for the poor participation rate in the current study could have been the questionnaire itself, although feedback was reasonably positive, and issues raised in piloting were dealt with before final data collection (see Methods – Section 3). Additional data collected from supervisors suggested that responder data were representative of the target population for each organisation, however supervisor questionnaire data in itself may have been biased due to a poor response rate. As a result comparison of non-responders with current responder data was impossible. It is unclear, therefore, whether the sample of responders could be seen to be characteristically any different from non-responders, as well as the extent to which these differences, if they existed, would have biased reports in any way.

Perhaps the most likely explanation for this was an overall disinterest in the current study conveyed by the organisations approached. Only a fraction of those approached actually participated (see Methods - Section 3), and in some cases organisations were explicit with regard to their misgivings about participation, one organisation even saying that pain "was not an idea they wanted to put in their employees' minds". At this point, it was decided to enlist the help of an outside body in canvassing for participants, in this case the East Ayrshire Employment Initiative.

Once the endorsement of this organisation was included in all correspondence, questionnaire distribution gathered pace. Involvement of the Employment Initiative had the potential to be an additional source of error. It then became impossible to tell whether participating organisations were doing so out of interest in the current study, eagerness to be seen to support an employee-centred project, or desire to maintain a good working relationship with the employment Initiative (or indeed a combination of all three).

Given the lack of interest in this issue conveyed by industry as a whole, it is recommended that any researcher planning to collect data in a multi-centred working population of this sort take similar steps for ease of distribution. One interesting observation was that participation was more likely where more than one person at differing levels of seniority in the company was approached. This was also a valuable lesson, and had this approach been adapted earlier, together with the involvement of Employment Initiative, questionnaire distribution may have been more successful, and the response rate may have been greater.

(ii) Methodological considerations

There were some issues within the data and the design used that may serve to limit the generalisability between the current findings and other research . These are discussed below.

(i) Limitations of the current literature search

As discussed in Section 2.3(e) above, there was substantial disagreement between the first literature search (1980-1988) and the published systematic reviews. In order to quantify the relative comprehensiveness of the original search, a second, extended post-hoc search was done using the same terms, "pain" and "work", however this time using the EBSCOhost research database, which allowed for the inclusion of studies citing "related words" as well as articles indexed in three additional databases (see Table 5.15 below).

Table 5.15
Comparison of (a) studies yielded by the original search of literature between 1980 and 1998; and (b) studies yielded by a post-hoc expanded literature between 1980 and 1998

	Original search of literature between 1980 & 1998 (cited in Table 2. 2)	*Post-hoc search of literature between 1980 & 1998*
Search terms	"Pain" and "work" (using "First search")	*"Pain" and "work" plus "related words" (using EBSCOhost)*
	MEDLINE & PsychInfo	*MEDLINE; PsychInfo; British Nursing Index; CINAHL Plus; Pre-CINAHL*
Date	Oct 1998	*Jan 2006*
Search parameters	(1980-1998)	*(Jan. 1980- Dec. 1998)*
Total studies (N)	3430	*3948*
Studies common to both searches (N)	1903	*1903*
Studies unique to this search (N)	1527	*2045*
Relevant studies common to both searches (N)	**277**	***277***
Relevant studies that were unique to this search (N)	46	*87*

The original search yielded 3430 titles in total, whereas the extended post-hoc search yielded a total 3948 titles (see Table 5.15). This meant that the post-hoc extended literature search yielded 518 more titles than the original search. Although this may have been expected with the inclusion of the extended terms and additional databases (British Nursing Index; CINAHL Plus; and Pre-CINAHL), these titles were not merely additional to those yielded in the original search. In fact, only 1903 papers were common to both literature searches (see Table 5.15). This meant that the extended post-hoc search yielded 2045 additional papers than the original search. Moreover, the original search yielded 1527 papers that were not identified by the post-hoc search.

It is unclear why there was such a sizeable difference between the results of both searches, although it may have been related to the fact that both searches were done eight years apart and using different search databases. However, the difference between search results points to a potential difference the literature discussed in Section 2 of this thesis.

In terms of systematic reviews identified by both searches, the second post-hoc literature search identified ten systematic reviews between 1980 and 1998. Five of these were the systematic reviews discussed in Section 2.1 of this thesis (Bongers et al., 1993; Borghouts et al., 1998; Burdorf, 1992; Leboeuf-Yde et al., 1996; Zaza, 1998) and the other five were not relevant, as they were related to systematic reviews of intervention techniques for pain (McQuay & Moore, 1998; Cheek et al, 1998; Turner, Loeser & Bell, 1995; and Waddell, Feder & Lewis, 1997; Zhang, Li & Po; 1998). This is important for two reasons. First, this could be taken as an indication of agreement between the two searches, suggesting that no further systematic reviews were available at this time. Second, this agreement also shows that when viewed in terms of in terms of *relevance to the current study*, it may be that there was more agreement than would appear at first glance at Table 5.16 above.

Section 2.1 of this thesis described the process by which 323 relevant titles examining any pain and any work variable were selected for review from the original 3430 titles identified. This process was repeated for the extended post-hoc literature search, using the same inclusion/relevance criteria outlined in Section 2.1 (see Table 2.1). Of the 3948 studies identified in the second literature search, 364 were relevant to the current study. This meant that of all studies identified by both literature searches, both searches were in agreement on 277 relevant studies. The first search identified 46 papers that were not identified by the second search, and the second search identified 87 papers that were not identified by the first. As such, it can be argued that although there would appear to be substantial differences between the results of the literature searches summarised in Table 5.16, when studies that were seen to be less relevant to the current review were removed, there was much greater agreement between the lists of studies identified. This is not to say that there was *no* disagreement between searches, but that when both searches were reviewed for relevance to the current study, disagreement was reduced.

There was however, some difference between the studies identified, and this should be viewed as a limitation of the current review. It is unclear the extent to which some relevant and important studies were missed in the first, original search of literature, although it is likely that many important papers were included. Moreover, given that the same search strategy was used in the search of literature between 1998 and 2005 (in Section 5 of this thesis), it is possible that some papers were also missed from the Discussion.

It may be that the source of differences in the current searches was the simplicity of the terms "pain" and "work". Had other terms such as "occupation"; "industry"; labour" and so on been used, then perhaps there would have been greater consensus between searches. Subsequent extension of the literature search between 1998 and 2005 was done to include experience-specific terms (see Discussion - Section 5), which led to a much more "manageable" literature that was more explicitly relevant to the specific research aims than the search between 1980 and 1998 (Table 2.2); and later between 1998 and 2005 (Table 5.1). This was an important lesson, and it is recommended that researchers use more specific terms in the future.

Although the current review (1980-2005) was never intended to be a *systematic* review, it is recommended that future researchers consider a systematic approach to this voluminous literature, in order to maximise the potential for inclusion of all relevant studies.

In interpreting the rationale for the current hypotheses, it is important to remember that the literature discussed in this study was only a selection of the literature on pain and work. As such, the articles reviewed in this thesis are likely to be illustrative of many of the issues within the current research, but are unlikely to comprise a comprehensive depiction of *all* the literature available in this area.

(ii) Limitations of the cross-sectional design

The use of the cross-sectional design in the current study limits the extent to which conclusions can be made with confidence in relation to specific variables. It is argued within this thesis that the research question, nature of pain, and the nature of population being addressed permitted no other design, however, the short-comings of the cross-sectional design are important to acknowledge. Inferring causality from cross-sectional associations is inappropriate, and this is a crucial limitation to bear in mind when comparing this data to other datasets. Given the findings of the current study, it is argued in Section 5.5 below that in fact an alternative design may have been used incorporating experience data into a longitudinal design.

(iii) Limitations of instruments applied in the current study

It is important to note the limitations in the reliability and validity of the work measures utilised in this study. Measures of stress, job satisfaction, demand, control and support were rather simplistic, and reliability and validity of the current work findings may have been increased by the use of more sophisticated and standardised instruments (for example the Perceived Stress Scale; Cohen, Kamarck, & Mermelstein, 1983, or the Job Content Questionnaire; Karasek et al, 1998) for measurement of work constructs. Although current measures of demand, support and control, approximated other standardised measures post-hoc (see Results - Section 4.1) the discrepancy between the findings for these measures and those from more standardised instruments (see Discussion – Section 5) it is unclear whether they were accessing the same constructs or not.

The extent to which current 'industry groups' or subjective ratings of 'physicality' were representative of the actual physical workload within different populations is also unclear. Indeed the variation between the type of work one might expect a specific Industry Group to carry out and reports of workload physicality is illustrated in the findings for individuals working in 'Higher Education' (see Discussion- Section 5.4). Consequently, any conclusions regarding physical load must be made with caution, and in the knowledge that physical load within groups may have been affected by bias.

(iv) Dichotomisation of pain experience variables

In the current study, pain experience outcomes were measured by splitting GPQ scores and sub-scores across the median, so that all scores above the median were "troublesome", and all those beneath and including the median (as well as zero-scores) were taken to be "non-troublesome". Other methods of dichotomisation were explored, however it was argued that in relation to the split of GPQ items around the median score, this was a meaningful categorisation to make (see Methods - Section 3). It could also be argued that dichotomising around the median of a scale is somewhat arbitrary in nature. Indeed, this dichotomisation was done post-hoc to enable the use of these variables as binary regression outcomes, and it had not been expected that scores would be so negatively skewed. Therefore, although the distribution of the data allowed little else, it is important that the findings are interpreted with the nature of this dichotomisation in mind.

(v) Proportion of variability "explained" by current logistic regression models (Nagelkerke R^2 values)

A further methodological consideration of note is that for the majority of logistic regression analyses, only a fraction of the variability between outcomes was explained by the included variables (less than 15% in every case). Although this is comparable to R^2 values in studies examining pain in the workplace published elsewhere (for example: Bigos et al, 1992; Deyo & Tsui-wu, 1987; Symonds et al., 1996; Byrns, Agnew & Curbow, 2002) It is important to acknowledge that, in every case, 85% of the variability between outcomes was not accounted for by the models examined.

In the case of pain experience outcomes, this may have been the result of the dichotomisation process and the low scores – in effect there may not have been enough variability between outcomes to speak of. In relation to pain prevalence and pain responses, low variability could be due to the lack inclusion of other factors, that is, the variables that contribute more to the variability between outcomes. In the current study, the focus was on work-related psychological variables (stress, job satisfaction and so on), but there is also considerable evidence to suggest that psychological constructs have a role in pain (Pincus et al., 2002; Keefe et al., 2004). Specifically these include, amongst others: personality (Weisberg & Vaillancourt, 1999; Asmundson, Norton & Norton, 1999; Vendrig, 2000; Weisberg, 2000); self-efficacy (Marks, 2001; Saunders, 2004; Marks, Allegrante & Lorig, 2005); and fear-avoidance (Asmundson, Norton & Norton, 1999; Vlaeyen & Linton, 2000). Had one of these constructs been included, it is possible that the proportion of variability explained by the models (that is the approximated R^2 values) would have been higher.

Indeed, some authors have reported greater R^2 values for models including beliefs about pain, than they have for models including perceptions of workload alone (Symonds et al., 1996; Byrns, Agnew & Curbow, 2002).

(vi) Omission of analysis of interactions

One final limitation of the current findings is the fact that interactions between variables were not analysed in relation to pain experience and pain response data in the current study. The reason for this was purely practical, given the large number of variables and the number of analyses already included in this thesis. It is fully intended that subsequent analysis of interactions is carried out prior to publication and dissemination of the current data. For the time being, it is important to acknowledge that the omission of analysis of interactions in the current analysis limits the extent to which any observed association can be attributed to that variable alone. For example interactions between gender and work variables are common in the literature on "troublesome" pain, therefore it is possible that a proportion of the variation between gender groups in current outcomes was related to work factors. The extent to which any conclusions can be confidently related to specific variables in the analysis is therefore limited.

5.5 Summary of findings and recommendations for future research

The main finding of the current study was that there is a relationship between psychosocial factors (specifically: gender, perception of chronic condition, and levels of perceived stress) and non-troublesome pain prevalence. In addition, associations were found between several psychosocial factors (both work- and non-work-related) and indices of less non-troublesome pain experience.

This study shows that the inclusion of less "traditional" indices ("non-troublesome" pain; pain experience; and inclusion of non-consulters) can be used to inform understanding of the relationship between pain, work and disability.

The extent to which the associations reported in this study and the current measures utilised have the potential to contribute to future research is discussed in detail below.

(a) Patterns of prevalence across pain site

One of the most salient findings of the current study is the discrepancy between current patterns of pain prevalence and findings reported elsewhere in the literature. For example, the current study provides evidence for a predominance of back and head pain, a pattern that is not always consistent with other research (see Section 2.2; and 5.1). Directions for future research are discussed below.

(i) Future research and prevalence of pain types – is non-chronic pain different from chronic pain?

It is argued above that discrepancy between current prevalence patterns across pain type and those reported in other studies is related to the focus of the current study. It may be that the current focus on pain as a generic phenomenon accesses a different pattern of pain prevalence than studies focussing specifically on the more "serious" or chronic end of the pain spectrum. As such, the current study provides an insight into *non-chronic* pain, and suggests that the pattern of prevalence across types of non-chronic pain type/site differs from those reported for chronic pain.

Should this be the case, this is an interesting observation, and may benefit from further research attention. Future research could also examine this discrepancy in more detail, investigating whether the differences in prevalence of pain types are related to specific populations, or specific pain sites. Could it be, for example, that neck pain is no more prevalent than back pain when the pain is short-lived or perceived as less serious? Moreover, is it that a predominance of neck pain over back pain may be discernable only in populations where the pain has persisted for a certain period of time? It would be easy to dismiss this discrepancy as an artefact of the current study and its limitations (see Section 5.4 above). However, a future comparison of pain site/type prevalence in differing populations (chronic versus non-chronic) might help to ascertain whether these differences do exist, and clarify their nature.

(ii) Future research and prevalence of pain types – are all pain types recalled in the same way?

The discrepancy between patterns of prevalence in the current study and those in other studies may also tell us something important about the way in which pain is perceived by the populations in which it is measured. The current study applied a general approach to pain, which was argued to be different from approaches applied elsewhere (see Section 2.4). This raises the question as to whether the discrepancy between the findings of this study and those of other studies are related to the specific wording used to enquire about pain (see Section 2.4). It might be that the current pattern of prevalence related to the general wording of the question, "did you experience any pain?" as opposed to a site-specific question, for example, "have you experienced any pain in the following areas: back, neck, head (and so on)". There is little research on the extent to which the wording of the "pain question" influences or biases recall, and this could be examined by future studies. For example, when individuals are asked to focus on specific pains do they recall them more readily? Or do they recall specific pain types more readily (for example back or head pain) when they are given no cues for recall? Should this be the case, does this tell us something about the nature of pain in specific sites? Or, indeed, does this tell us something (just as) important about the recall of pain? Future research could help to clarify the relationship between recall of pain site and pain question, with a comparison of the effects of different pain questions in the same or matched populations.

(b) Patterns of prevalence across pain cause

The key finding in relation to prevalence of pain cause was the substantial amount of pains that were attributed to "non-medical" and "unknown" causes. Together, pain attributed to the categories of "Life variables"; "Work environment", "Stress", and "Unknown" cause constituted nearly three-quarters (72%) of all pain reported in this study. Although there was some potential for overlap between many of these "non-medical" causes and "clinical" causes (for example: clinical stress disorders in "Stress"; physical aspects of work in "Work environment"; being overweight in "Life variables" and so on) the predominance of "non-medical" pain in current data was striking.

(i) Future research and perceived pain cause – the predominance of pain for which there is no known cause

One quarter (23%) of all pain in this study was attributed to "unknown" causes. This represented the largest proportion of all causes given, with the next closest category ("recent injury") representing only 15%. As discussed above in Section 5.2, it is unclear why "unknown" cause should be the most common response. On the assumption that this finding to be reflective of pain in other populations (see Limitations - Section 5.4), future research should explore pain of "unknown" cause. It may be that this finding is reflective of the current focus on less troublesome pain. For example, could it be that less troublesome, non-chronic pain occurs frequently without a discernable cause? Or does the fact that the pain is less troublesome makes the cause less obvious? Previous research would suggest that *not* knowing the cause of chronic pain is a barrier to recovery (Skevington, 1995; Main & Spanswick, 2000). However, experience data in this study suggests that pain of an unknown cause is no more negative an experience than that of a known (or at least perceived) cause (see Section 5.5e(i) below). Therefore, is it that knowing the cause of less troublesome pain is more or less important than knowing the cause of more troublesome pain? It would be interesting for future research to explore the relationship between living with different types of pain and knowing (or not knowing) its cause. One way would be to follow-up the current "unknown" pains to see whether the lack of cause had any influence on the persistence of pain. Is it that "unknown" pain is more or less likely to persist? Or is it that the persistence of pain is related to a known diagnosis? Moreover, is it that certain individuals are more likely to attribute their pain to a specific cause (or not) and that this increases (or decreases) the likelihood of their pain persisting? Prospectively tracking these unknown pains would enable the exploration of the interaction between perceived pain cause, individual factors, and resulting levels of chronicity. This would enhance current understanding of the development of chronic pain, and might shed light on the processes involved in attributing cause to pain throughout this journey.

(ii) Future research and perceived pain cause – the importance of perceived cause and of exploring "non-medical" pain

The current study challenged the assumption that only chronic, disabling pain was worthy of study. The inclusion of perceived cause in the current study enables the researcher to focus not only on the "true" (that is, objectively verifiable) causes of pain, but also on *what individuals think* caused the pain. Although it could be argued that the lack of objective verification of causes in this study leaves the current design open to criticism (see Section 5.4), the very subjectivity of current pain reports could also be argued that this is a strength of the this approach to pain.

Section 5.2b(ii) (Table 5.8) shows that when perceived cause is included in a study, the resulting variety of "causes" given by a population is often colourful, and provides a snapshot of pain in the workplace that corresponds with these individuals' "real-life" experience of pain. It would be interesting for future research to expand on this finding, exploring whether there are different individual factors relating to the attribution of pain to specific "causes".

A substantial proportion of the pain reported in this study would have been dismissed by other researchers in favour of "more medical", arguably "less trivial" pain, and/or to fulfil stringent inclusion/exclusion criteria. This study therefore shows that when exclusion criteria are relaxed, a different, and in some cases equally interesting picture of pain in the workplace emerges.

It is *not* recommended that future research abandon exclusion/inclusion criteria in *any* way – indeed the definition, rationale and implementation of valid criteria are crucial to the reduction of bias and to the recording of confounding variables (see Section 2.1 (f)). However, it is suggested that future researchers reflect on the current findings, and note both the advantages and disadvantages of a site- or duration-specific focus on pain. While one approach has the crucial benefits of minimising bias, the other has the potential to maximise ecological validity.

(iii) Future research and perceived pain cause – exploring the process of attributing pain cause

One further important potential direction for future research might be to explore the processes involved in attributing cause to pain. The inclusion of subjective, perceived causes in a study may enable the examination of the process of attribution itself. For example, future researchers could investigate whether certain groups or individuals are more likely to attribute pain to a specific cause, rather than to another. Might, for example, specific individual factors relate to a propensity to attribute pain to "medical" versus "non-medical" causes? In addition, to what extent does the verification of cause play a role in the attribution process? It would also be interesting to compare perceived causes with verifiable causes, and should discrepancies exist, to explore whether there are any patterns within and between particular populations.

This leads onto another potential area for exploration of attribution of pain causes. It would be useful for future research to clarify the relationship between the diagnostic process, attribution style and perceived cause. For example, do individuals attribute their pain to a "medical" cause in response to contact with health care services and/or a specific diagnosis? What role might individual, social and environmental factors play in reinforcing these attributions? The psychology of attribution style is a complex and varied field (Heider, 1958; Kelley, 1973); particularly in relation to the attributions individuals make in relation to health (Swartzman & Lees, 1996; Gudmundsdottir et al, 2001). However, little research has been done relation to attributing cause to pain in the workplace specifically. There is some evidence to support the role of beliefs about and attitudes towards pain in the development of chronicity and disability in general (Waddell, 1998; Main & Spanswick, 2000; Kendall, Linton & Main, 1997); and recent work underlines the importance of the process of blame and acceptance in learning to live with chronic pain (Eccleston et al, 1997; McCracken et al, 2004; McCracken, 2005; McCracken & Vowles, 2006) and the role of medico-legal accountability in returning to work after or while managing work-disabling pain (Kendall, Linton & Main, 1997; Main & Spanswick, 2000) has been documented. Taken together, it is possible that a greater understanding of the attribution processes surrounding pain could leader to greater prognosis for pain sufferers attempting to stay in work. This entire area presents an exciting and challenging avenue for future pain researchers.

(c) Psychosocial factors and pain prevalence

An important finding from the current study is the lack of association between psychosocial (work and demographic) factors and pain prevalence. This is the first finding of its kind in relation to non-troublesome pain, and contrasts considerably with research done in other working populations (see Sections 2.2 and 5.1).

(i) Future research on psychosocial factors and pain prevalence – examining psychosocial influences on pain prospectively using "non-troublesome" pain as a cohort baseline

It is argued above that the discrepancy between the psychosocial factors influencing "non-troublesome" pain in this study and those influencing "troublesome" pain reported in the literature may be related to the current generic focus on pain. Therefore, it may be that the associations between psychosocial factors and "non-troublesome", non-chronic pain are of a lesser magnitude than the associations between psychosocial factors and chronic pain. Indeed, this would fit with previous literature implicating the role of psychosocial variables in the progression from "normal" pain to disabling pain (Gatchel, Polatin, & Mayer, 1995; Fordyce, 1988; Loeser, 2000). In this way psychosocial factors may become more influential where pain has persisted for a long time and/or is chronic. It would be interesting for future research to explore the discrepancy in the magnitude of psychosocial influences between non-chronic and chronic pain in more detail.

An example of future research might be to prospectively follow a cohort of individuals experiencing "normal" or "non-troublesome" pain over a certain period of time (for example 12 months). This would enable researchers to chart the evolution of psychosocial influences, from where pain was perceived as "bearable" and manageable, to where pain becomes persistent and "chronic". This could also enable researchers to ascertain the psychosocial factors that become important, when they become influential, with whom, and in what circumstances. Moreover, examination of individuals in a "non-troublesome-pain-cohort" for whom pain did *not* persist would allow the researcher to examine the psychosocial factors that did *not* become important, whether they were influential at any point, with whom, and in what circumstances.

The use of a baseline cohort of individuals experiencing "normal" or "non-troublesome" pain differs from the "pain-free" cohorts commonly included in chronically-focused prospective pain studies (see Sections 2.2 and 5.1). In this study it was argued that a cohort study examining general non-troublesome pain would be problematic, as it would be implausible to expect to identify a sizeable cohort who were, and always had been, free of non-troublesome pain (Methods - Section 3.1). However, using a baseline level of non-troublesome pain as an inclusion criterion in a cohort study might be possible, provided a valid a reliable method of constructing this criterion was available (see Section 5.5(e) below). This would overcome some of the limitations of the current cross-sectional design (see Limitations - Section 5.4). This design was not applied in this study, as there was little information available to suggest that psychosocial factors would be related to non-troublesome pain prior to the collection of current data. Now that current data suggest there may be a relationship between psychosocial factors and less troublesome pain (all be it of less magnitude than that between psychosocial factors and more troublesome pain) this is one avenue for future research.

It is important to note that the formulation of a baseline cohort of individuals experiencing "normal" or "non-troublesome" pain would require future researchers to consider inclusion criteria extensively (a suggestion based on experiential criteria used in the current study is given below in Section 5.5(e)). Therefore, it is recommended that future research be carried out to establish these criteria. Issues might arise, for example, in that while accepting that cohort inclusion should not be restricted to those who were completely "pain-free", it would be important to ensure that cohort inclusion was restricted to those who were "chronic-pain-free". This would ensure that the *incidence* of chronic pain (or at least in this case the emergence of pain chronicity) was being recorded.

(ii) Future research on psychosocial factors and pain prevalence – exploring the associations between pain prevalence and: gender; concurrent condition; and perceived work stress

This study showed that the prevalence of general aches and pains was significantly associated with female gender, the presence of concurrent chronic condition and work stress after adjustment for other factors. In addition, examination of data for men and women separately revealed there was little variation between the influences of chronic condition and stress across both sexes. It is recommended that future researchers explore these associations in more detail. In the relationship between a concurrent condition and its influences on pain perception, for example, is it that the presence of a concurrent condition makes an individual more likely attend to painful stimuli? Or is it that they actually do experience painful stimuli in a different way? Or is there a predisposition unrelated to either of these issues that makes an individual more likely to experience, report, or be troubled by pain that also makes them more likely to experience, report, or be troubled by physical illness or symptoms as a whole? Recent work on somatisation shows a relationship between a propensity to attend to the physical self in general and a greater likelihood of reporting chronic pain (Nickel et al, 2002; Sherman et al, 2004; Hendriks et al, 2005; Aggarwal et al, 2006). It is possible that the propensity to attend to the physical self in general (to somatise) is the construct underlying both troublesome pain and concurrent illness. In this way, it could be that the more an individual is likely to somatise, the more they are likely to report chronic illness, and to attend to and report pain. This study did not take a measure of somatisation, and it is recommended that researchers explore the possibility of including a measure of this construct (for example, the Othmer and DeSouza test for Screening of Somatisation Disorder; Othmer & DeSouza, 1985) in future examinations of the risk factors for pain in the workplace.

This study also found a relationship between perceived high stress and prevalence of general aches and pains. Again this appeared to exist to a similar extent in both men and women. It would be interesting to explore this relationship further in relation to psychological theories of job stress (see Schabracq et al., 2001). For example, in relation to psychological theories of job stress (Schabracq et al., 2001), are individuals who are experiencing pain more likely to see their job as stressful? Or, conversely, does the fact that the individual is experiencing a stressful workload make the individual more likely to perceive pain? Could pain be seen as an additional stressor in itself? What specific factors of these workloads contribute as stressors? Does this differ between groups (demographic groups; job or industry type and so on)? Although previous studies have presented evidence on the relationship between pain and workload demands/control/support in relation to Karasek's Theory (Karasek & Theorell, 1990; see Section 2.3), none have addressed the nature of work *stress* and coping with stress from a theoretical viewpoint. It is recommended that researchers attempting to assess the relationship between stress and pain examine the Occupational Health Psychology literature (Schabracq et al., 2001) in order to familiarise themselves with recent developments in the measurement of stress in the workplace.

(iii) Future research on psychosocial factors and pain prevalence – exploring interactions between psychosocial variables

Current data showed that although the interaction between psychosocial factors and gender in current data was minimal, some aspects of work (working part-time; and job enjoyment) were related to an increased likelihood of reporting pain in women but not in men. Given that these two findings appear to contradict the dose-response hypothesis often postulated in published research (see Section 5.3) it is important that these relationships are examined in more detail. For example, it would be interesting to see whether this was a spurious finding, or whether these relationships exist in other populations.

If indeed women who work part-time are more likely to report pain, then it is important to understand why. For example, is a more negative pain experience in women working part-time reflective of a relationship between lower income and pain? Or is this finding reflective of the level of skill required for the job she is doing? Given the relationship between social and work support and pain prevalence (see Section 2.3 and 5.2), is it possible that working part-time is a proxy measure for less involvement in the workplace? If so, does working full-time have a protective effect on the risk for general aches and pains? Moreover, as this association differs from the "dose-response" findings of increased likelihood of chronic pain in *full-time* work, does this protective influence change as the pain persists? Or does pain make a woman less involved in her full-time job (for example, taking time off, altering work tasks and work environment) that undermines the protective influence of supervisor/co-worker support and hence makes the pain unbearable? These research questions are only speculative about the ways in which aspects of work might interact with one another to produce this gender-specific association. However, and all provide interesting avenues for future research.

One of the greatest challenges for future research in response to gender-specificity in the influence of psychosocial variables on pain is to explore why this specificity exists and how it is maintained. It is tempting to take the stereotypical view of a working woman, and make assumptions, for instance, that she may be working part-time to facilitate the fulfilment family commitments (for example, caring for children or elderly family members) which in turn may lead to greater overall stress level. However this study did not include any record of non-work or domestic commitments, and without such information one can only speculate. Recently authors have argued that the influence of work demands on pain perception can only be understood in the context of life demands (see Section 2.3 and 5.2), and as such it is important that future research quantifies perceived workload associated with non-work and domestic commitments, the interaction of these with other psychosocial demographic and work variables, and their combined influence on pain.

(d) Pain experience in relation to pain type

One of the most striking findings of experience data was that pain experience differed very little between pain types, but substantially between perceived pain causes. The implications of these observations in informing future research are discussed in detail below.

(i) Future research on pain experience – the lack of variability between pain sites

It is important to ascertain whether the lack of variability in pain experience between pain sites in this study reflects a lack of variability in pain experience between pain sites in other populations. Future research could use the Glasgow Pain Questionnaire (GPQ) to examine pain profiles in different pain populations, in order to ascertain whether there are any experiential differences within and between groups.

Current data suggest that there were little site-specific experiential differences for less troublesome pain, however it is unclear from current findings whether this is also the case for chronic pain. Future research could explore this possibility, and if there are any differences, what are they, and what does this tell us about chronic pain? If however there are few experiential differences across sites in all populations, does this tell us something important about chronic pain? Application of the GPQ in future research could inform current understanding of chronic pain considerably.

(e) Pain experience across pain cause

(i) Future research on pain experience – the experience of pain of "unknown" cause versus the experience of pain with a perceived cause

Section 5.5(b) above discusses the potential utility of perceived cause as a measure in future pain research. Particular attention is drawn to the utility of examining underlying attributions and exploring the extent to which perceived cause interacts with the process of obtaining and living with a pain diagnosis (or not) and working life. Current experience data reaffirm the utility of perceived cause as a measure for future research. It would seem, for example, that the experience of pain with an "unknown" cause is less negative than that for pain that has a perceived cause ('Long-term medical problems'; 'Pain problems'; 'Recent injury'). As mentioned above, this would seem to be in conflict with previous research on the importance of a diagnosis in living with pain (Skevington, 1995; Main & Spanswick, 2000), and as such merits further exploration. Is it that pain of an unknown cause is *really* less negative than pain of a known cause? Or is this finding characteristic of the less troublesome pain only? In other words, is "bearable" pain of an unknown cause less negative than "known" pain, and does this change when the pain becomes "less bearable" or if it persists for a long time? A case-control comparison between the experiences of individuals with chronic pain (cases) and the experiences of those with non-chronic pain (controls) might help to clarify this issue. Researchers are cautioned however, that establishing inclusion and exclusion criteria for both cases and controls would require substantial consideration. Moreover, reflection on the potential practical difficulties in establishing suitable controls, and the likely resource and practical implications (for example matching for site, individual and work factors) is advisable.

(ii) Future research on pain experience – the process of establishing pain cause and the evolution of pain "un-bearability" via measures of pain experience

The interaction between the "bearability" of pain and the diagnostic process could also be explored in more detail. To what extent is the perceived "bearability" of pain dependent on the diagnosis? Does pain become more or less bearable once a diagnosis is given? One way to assess this would be to carry out a cohort study with individuals presenting with their first ever episode of pain to Primary Care. At regular intervals, researchers could assess this cohort on indices of: pain experience (GPQ profiles); opinions of interaction with healthcare staff; as well as indicators of the individual's journey through healthcare services (for example: prescriptions; advice and information given; referrals elsewhere and so on). Clearly this is just a suggestion and would require more consideration, however a study in this area has the potential to shed some light on the evolution of the "un-bearability" of pain, and to inform patient care throughout their interaction with healthcare services.

(iii) Future research on pain experience – possible future applications of the Glasgow Pain Questionnaire (GPQ)

One of the main contributions of this study is in the potential use of the GPQ to distinguish between different experiences in less troublesome pain (see Section 5.3 and Penny et al, 1999). It would be interesting to explore the use of the GPQ other populations. Where this study has shown, to a certain extent, lower GPQ scores to be comparable to Von Korff's Chronic Pain Grades (CPGs) 0-III (see Section 5.3), it would be interesting to explore whether more troublesome pain, as indicated by higher GPQ scores, are comparable to the higher, more disabling CPGs.

In addition, the use of the GPQ in this study provides a highly useful standardised adjunct to traditional prevalence and incidence designs. There is no doubt that the current approach to recording the associations between pain experience and psychosocial environment has yielded substantial additional information about pain in the workplace that would not always be recorded in traditional prevalence- or incidence-based designs. The use of pain experience as an additional outcome variable is a useful endeavour that future researchers in this area should consider *(iv) Future research on pain experience – exploring the experience of non-chronic pain versus the experience of chronic pain, work disability and work retention*

This study's observed relationship between psychosocial factors and pain experience also deserves further research attention. Current data show a moderate association between psychosocial factors and specific aspects of the less troublesome pain experience. In order to understand this in greater detail, it would be interesting to record the relationship between psychosocial factors and the experience of *more* troublesome pain. This would be a useful focus for future research, such that a comparison between aspects of less and more troublesome pain experience would be useful in understanding the transition from one to the other, or indeed work retention in non-chronic pain. For instance, the current study revealed a small number of workers reporting highly negative experiences of pain, who were still managing to work. It would be useful to explore the experience of pain in a work-disabled population in comparison to a working population, and whether the experience of pain differs in relation to work status. Using a measure similar to the GPQ, future research could ask questions such as: does the work-retaining individual with chronic pain have a different experience of pain than the work-disabled chronic pain patient? If so, is this useful in the prevention of or intervention with work-disabled individuals with chronic pain? Given the burgeoning research underlining the importance of the cognitive processes underlying the formulation and maintenance of disability and persistent pain (Fordyce 1976; Keefe and Lefebvre 1994; Skevington, 1995; Turk & Gatchel, 1996; Eccleston et al, 1997; Kendall, Linton & Main, 1997;; Turk & Okifuji 1999; Main & Spanswick, 2000; Turner & Romano 200; Fordyce 2001; Flor et al. 2002; amongst others), it is no leap of faith to suggest that the subjective experience of pain could also be related to disability and persistent pain.

Finally, a measure such as the GPQ could provide many insights into the effects of work disability on the pain experience. Future researchers could ask, for example, do the pain experiences of compensated work-injured individuals differ from the pain experiences of individuals for whom compensation litigation is unresolved? Research evidence points to the importance of attitudes and beliefs about pain as presenting psychosocial risk factors or "flags" for long-term disability (Kendall, Linton & Main, 1997; Main & Spanswick, 2000), and it would be interesting to explore the possibility of experiential pain "flags" for long-term work disability.

(v) Future research on pain experience – pain experience informing the journey from non-chronic pain to chronic pain.

Section 5.5c(i) above considers the potential utility of a prospective study using a "normal pain" cohort, discussing in detail the strengths of this approach as an amendment to the traditional approach of using a "pain free" cohort. Ideas about inclusion and exclusion criteria were speculated upon in this section, although clearly exploration of these criteria is necessary in this area before any specific recommendations can be made. One avenue might be to utilise the GPQ measures in establishing this cohort, such that inclusion of only those with particular scores on all five pain indices would comprise a "normal" (or at least a "non-troublesome") pain cohort. In this study, dichotomisation was carried out at the median score, which appeared to distinguish between "less" and "more": pain frequency; pain intensity; pain emotion; difficulties in coping with pain; and impact of pain (see Methods - Section 3). Should this pattern exist in other populations, this may be a useful starting point in establishing a cohort that is experiencing "some pain", but not "troublesome" pain.

Evidently further research is required, however the use of the GPQ would enable future researchers to chart the experiential process of the journey between "bearable pain" and chronic ("un-bearable" pain). For example, in the evolution of "un-bearable" pain, are there changes in any of the pain aspects that are more salient than others? If so, can this information be used in an aspect-specific way to inform intervention, or ultimately, prevent pain becoming chronic? To speculate, if scores for the GPQ measure "ability to cope" were seen become progressively more negative throughout the prospective study suggested in Section 5.5c(i), could this imply that a coping-style intervention in the early stages of "less troublesome" pain would be useful?

(g) Demographic factors and pain experience

One of the main findings of this study was that there was some level of association between demographic factors (gender and chronic condition) and pain experience. In order to verify these findings it is essential that future researchers explore whether these replicate in other populations, accounting for the limitations of this study discussed in Section 5.4 above. Should these findings be accurate representations of the relationship between less troublesome pain and psychosocial circumstances, they present a variety of important opportunities for future research. These are discussed in detail below.

(i) Future research on pain experience – on being female and experiencing pain

The association between female gender and poorer pain experience is no new finding, however, it could benefit from further exploration. As mentioned in Section 5.3 above, many studies discuss explanations for gender-specificity in the pain experience, from the purely biological to the purely psychosocial (for example, Unruh, 1996). Future research could benefit from the exploration of the relationship between pain in the workplace and female gender. Drawing upon the observation made earlier regarding the interaction between work factors, female gender and pain prevalence (Section 5.4c(i)), is it the practical aspects of managing work and family life that serve to make the pain experience more negative? Or is this experience negative by processes of socialisation and the maintenance of expectations surrounding pain and pain responses? Is it that women actually *do* experience more pain than men? Or is it that they expect more pain, or attend to more pain, or report more pain, or see it as more appropriate to report pain than men? Many studies have published these observations as explanations in relation to the gender-specificity of pain, however few authors actually explore these possibilities in their research. Unfortunately the subjective nature of pain and of the experience of socialisation itself make designing the definitive study to address the role of socialisation in determining pain experience virtually impossible. However, it would be useful for future researchers to explore this area, by perhaps applying a social constructionist approach to pain narratives. Although most pain professionals around the globe would postulate the crucial role of sociological variables in the experience and management of pain, it is disappointing that a discernable "sociology of pain" has not emerged in the pain literature.

(ii) Future research on pain experience – the nature of "chronicity" and the pain experience

Another finding of this study was that individuals without a chronic condition were less likely to have a negative pain experience than those with a chronic condition. It is important to point out here that this referred to *any* chronic condition, and not only individuals with a chronic pain condition. It is important to understand this relationship in more detail. For example, researchers might ask whether there is "something about having a chronic condition" that makes an individual more likely to experience pain in a negative way. Section 5.5 (b) above discusses the potential role of somatisation in the recognition and reporting of diagnosed and non-diagnosed pain conditions, and equally it is possible that somatisation plays a role in the quality of the pain experience, and any judgements relating to the frequency, intensity, bearabilty, emotionality and impact of pain.

It is important to point out that in current data, identifying oneself as "having a chronic condition" was not necessarily related to the diagnosis of a chronic condition. Indeed, crosstabulation of "chronic condition" and "perceived pain cause" showed that over half (55%) of those attributing their pain to *any* chronic condition reported that they had no chronic condition when asked elsewhere in the questionnaire. Moreover, the same proportion (55%) of those attributing their pain to a chronic *pain* condition also did not report having this chronic condition when asked later in the questionnaire.

If one was to assume that the current questionnaire item relating to "chronic condition" was in fact a valid measure of a diagnosed chronic condition, then many individuals in the current sample were self-diagnosing and perceiving their pain to be related to a chronic condition, regardless of whether this had been verified or not. Admittedly the lack of verification for all "chronic conditions" in the current design makes drawing conclusions from this measure problematic. Furthermore, as both "chronic condition" and "perceived cause" are subjective dependent variables in current data, it is difficult to verify the "existence" of either. Limitations of the current design aside, these findings do lead to a potential area for further exploration. Does *perceived* chronicity of pain relate to *actual* verified chronicity of pain at all? What are the mediating variables (gender; age; contact with healthcare staff and so on)? If *perceived* chronicity of pain could be seen to be independent of actual verified chronicity of pain, does this provide us with more insight on the pains that become chronic? What is the role of the tendency to somatise in the development and maintenance of perceived chronicity (verified or otherwise)? Moreover, bearing in mind that these individuals were currently experiencing pain and working, how does perceived chronicity of pain and the verification of a chronic diagnosis relate to job retention? Finally, as in the discussion of perceived versus actual aspects of physical work above, it may be possible to explore the discrepancy between *perceived* versus *actual* cause (for example the analysis of attribution styles; or the investigation of tendency to attribute pain to particular causes; both mentioned in Sections 5.5(b) and 5.5(c)). In this way, rather than to automatically consider the lack of verification of cause in many designs as an additional source of potential bias, it might be useful to explore this influence by comparing perceived causes with actual causes (and all the intermediate variables therein) in future research.

(iii) Future research on pain experience – exploring the lack of variability in pain experience in relation to age-groups

This study showed there to be little variability across age groups in relation to pain experience. Where variability occurred, it was not in a clear pattern, and should therefore be explored in more detail. In particular, it is important to understand the relationship between the interaction of age, pain experience and changing demands at work. It may be that the lack of a discernable pattern between age groups in this study was related to a variable that was not obvious from the current analysis. Future exploration of age data is planned, and as a result future researchers should not be misguided by the absence of any age patterns in current findings. Aspects of pain experience have been shown to vary in relation to age elsewhere (Gamperiene & Stigum, 1999; Sandler et al, 2000; Blyth et al, 2001; Donald & Foy 2004; Gerdle et al, 2004; Stranjalis et al, 2004), as do attitudes to work and demands placed upon us throughout our working lives (see Section 5.3 above, and Schabracq et al, 2001). It is possible that there will be an interaction between the two.

It is also possible that the lack of association between age and pain experience in this study relates to the current focus on troublesome pain. It may be that there *is* little variation between age groups in less troublesome pain, and that the effect of age only becomes observable when pain is more troublesome. Future research could explore this issue.

(iv) Future research on pain experience – the lack of variability in pain experience in relation to levels of deprivation

One final interesting finding in relation to the current relationship between demographic variables and general aches and pains is the lack of relationship between deprivation and pain experience. Here, level of deprivation was indicated by income, socioeconomic grade, and Carstairs index (Carstairs & Morris, 1991). Pain experience was not related to any of these indices in the adjusted data, and not in any instance (adjusted or unadjusted) to related Carstairs deprivation scores. Reasons for this are speculated upon in Section 5.2, and it is important that future research seek clarification of this finding.

It could be that a lack of variation in relation to socioeconomic circumstances is characteristic of non-troublesome pain itself. However, it is important to bear in mind that current deprivation data was incomplete (particularly postcodes for calculation of Carstairs Scores), and without replication in a population for whom deprivation data is valid and accurate, it is impossible to draw any conclusions. To avoid this problem in the future, it is recommended that future researchers obtain deprivation data from a third party or objective source such as Human Resources departments or electoral rolls). This would have the added advantage of facilitating a comparison between background characteristics of responders versus non-responders.

(g) Psychosocial work factors and pain experience

Variability in pain experience was observed in relation to several psychosocial work factors. These associations and their utility in informing future research are discussed in detail below.

(i) Future research on pain experience – are work demands/control/support only influential when pain is more troublesome?

In this study there was a lack of association between perceived work demands/control/support and pain experience (see Section 5.3). This is in direct conflict with many published associations between different aspects of the pain experience and these factors (Elders & Burdorf 2001; Kivimäki et al, 2001; Cole et al, 2002; Joksimovic et al, 2002; Eriksen, Bruusgaard & Knardahl 2004; Daniels et al, 2005 amongst others).

As with many other observations already discussed above, it may be that in fact this lack of relationship between work demands/control/support and pain is characteristic of the experience of less troublesome pain. However, given the limitations of the current measures of work demands/control/support, it is vital that this relationship is clarified. It is recommended that future research apply a standardised measure such as the Karasek Job Content Questionnaire (JCQ; Karasek et al, 1998) in order to clarify whether the current findings are related to the measures used or otherwise.

If it is the case that work demands/control/support are *not* related to pain experience in non-troublesome pain, is there a particular threshold in the journey from non-troublesome to troublesome pain at which they do become associated? It is suggested above that the relationship between pain experience and chronic pain be explored prospectively, using a "non-troublesome-pain-cohort" as defined by experiential methods (the GPQ). To clarify the role of work demands/control/support in this process it would be useful to include Karasek's JCQ in the assessment battery.

(ii) Future research on pain experience – exploring the relationship of stressful work versus monotonous work and pain experience

Perhaps the most surprising current finding of this study was the relationship between perceived stress levels and pain experience. Pain experience was more negative where individuals perceived their jobs to be highly stressful *and highly easygoing* (for total GPQ, pain intensity, coping with pain, and pain impact) after adjustment for other factors. While a negative pain experience in highly stressful work environments might intuitively be expected, a negative pain experience in an *un-stressful* work environment is perhaps less easy to interpret. Section 5.3 accounted for this in terms of the monotonous work tasks that the majority of individuals in the "very easygoing" group carried out, particularly given the growing evidence to suggest a relationship between work task monotony and higher risk of chronic pain (Gamperiene & Stigum, 1999; Björkstén & Talbäck, 2001; Pope et al, 2001; Strazdins & Bammer 2004). It is vital that any researcher undertaking a study in relation to pain and work factors consider the potential influence of monotonous tasks. In fact, this is an area that could offer a great deal of insight into the nature of the relationship between perceived work tasks and pain in itself. Future researchers could explore the nature of this notion of "monotony" and how it relates to the experience of pain at work.

Indeed this area has the potential to inform understanding of the experience of pain in work as a whole. Given the research on the utility of distraction techniques for pain management (Turk & Gatchel, 1996, amongst others), is there a level of "optimal distraction" at which pain is "bearable" in the workplace? Is it that when workload is perceived to be above this level ("stressful"); or below this level ("monotonous") that pain becomes "unbearable"? If so, then does this "optimal level" of distraction differ between groups or between job titles? Future research in this area may benefit from drawing on the observations of Yerkes and Dodson (1908), who postulated a relationship between human work performance and levels of optimal stimulation (or arousal) versus lack of stimulation and over-stimulation (stress). Theories such as this could provide a valuable insight and operationalisation of "monotony" or "stress" with which to explore their relationship with pain at work.

In relation to the current study, on the assumption that the category "very easygoing" is a valid measure of monotony, it may be this negative view of one's workload and of one's pain could be indicative of a *general propensity* to describe a variety of experiences in more negative terms. Indeed, this chapter has discussed the importance of exploring attribution style in relation to pain (Sections 5.5(b) and (e) above), and attributions made about the level of stress in workload is no exception. It is important that future research tackle these difficult questions. For example, is the propensity to describe pain in negative terms related to the propensity to describe one's workload in negative terms? If so, is this related to other variables (for instance, perceived cause of pain; perceptions of chronicity; demographic factors; tendency to somatise)?

It is important however, in informing and exploring the current relationship between stress and pain experience that a clear distinction is drawn between this study's category "very easygoing" and "monotony" specifically. This item was intended to summarise the other end of the "stress spectrum" whereby it denoted an absence of stress, and was therefore intended as a positive value judgement. As such it is possible that individuals making this judgement were not describing their workload in negative terms at all. (In this case, this raises issues with the argument that there may be propensity to describe one's workload in negative terms). In truth, however, there is no way of knowing whether this item was in fact measuring "very easygoing" as absence of stress; or "very easygoing" as absence of stimulation. In order to clarify the nature of this observation, it is recommended that future researchers explore work stress and work monotony from a theoretical viewpoint such that a standardised measure of stress (for example, the Perceived Stress Scale; Cohen, Kamarck, & Mermelstein, 1983) and/or a standardised measure of work monotony be included in future designs.

(h) Pain Response

Several findings in relation to pain responses present opportunities for reflection on future research. These are discussed in detail below.

(i) Future research on pain response – examining individuals who do not normally act on pain

One of the main findings in relation to pain response was that many individuals (two-thirds in current data) choose not to do anything about their pain at all. Should this finding be reflective of populations elsewhere, it would be useful to investigate this phenomenon in more detail. For example, are there are any differences between groups in relation to this rate of non-response? It was reported in the current study that men were less likely to act on their pain, however it would be interesting to explore the extent to which gender interacts with other factors in relation to this tendency not to act. For instance, is it that women of a particular background are more or less likely to act on pain then men of a particular background? How does this interact with work and life in both genders? These analyses are possible from the current data and are planned for the future. It may be important for future researchers to include variables, however, that were not part of the current design. For example, Section 5.4 discusses the potential role of domestic workload in the pain experience. It is possible, even in practical terms, that if "non-work" life demands differ between genders, these demands may also influence the extent to which an individual is likely to consult for their pain, or to act on it.

(ii) Future research on pain response – the importance of pain experience in understanding pain responses

One of the main contributions of the current study was the extent to which using an experiential measure of pain can be seen to increase understanding of the responses to pain. As such, an experiential measure such as the GPQ provides insight into the nature of the relationship between five different aspects of the pain experience and a variety of pain-related health behaviours. For example, current data showed acting on pain to be related to intensity, emotionality, and impact of pain, and consulting for pain to be related to pain frequency and disruptiveness. It would be very interesting to explore the relationship between pain experience and pain response in more detail. For instance, why might pain intensity (and not frequency) be important in the decision to take medication? Moreover, why might pain frequency (and not intensity) be important in the decision to seek professional help for pain?

These findings also have the potential for informing research on pain interventions. For example, if pain impact is a key feature for pain that requires consultation, are interventions aimed at reducing pain impact more or less successful than those aimed at pain intensity? The insight provided by an experiential approach is of clear additional benefit to researchers and practitioners in this area, and should be considered by future investigators.

(iii) Future research on pain response – coping strategies of individuals <u>*not*</u> *acting on pain*

Following on from the recommendation above, the experiential measures of pain applied in this study can be seen to highlight other areas for future research, specifically, the relationship between coping and pain. Sections 2.3 and 5.4 discuss the view that care-seeking for pain may be related to an inability to cope with pain oneself (Hadler, 2005). However current data also show that the decision to consult was related to the frequency and disruptiveness of pain, both of which were more significantly associated with consulting than perceived inability to cope with pain after adjustment (see Section 4.4 and 5.4). This calls into question the view that consulting for pain is reflective of an inability to cope, and raises the possibility that it is reflective of a particular *style* of coping. This is a line of enquiry that future researchers could explore. For example, if consulting for pain can be seen as specific coping mechanism in itself, when people *do not* consult for pain, what other coping mechanisms do they use? Are there any patterns in the use of coping mechanisms for pain between groups? Indeed given the differences in consulting behaviour found between groups in this study (gender; age; chronic condition), it is possible that the propensity to use a specific coping mechanism differs in relation to individual characteristics.

The field of Health Psychology can provide invaluable insight into the understanding or operationalisation of such coping mechanisms. For example Folkman and Lazarus' "Ways of Coping" questionnaire (1986) is based on their theory that individuals have the propensity to use specific ways of coping (problem-focussed or emotion-focussed) when faced with stressful situations (Lazarus & Folkman, 1984). Exploration of this literature and inclusion of a measure such as the "Ways of Coping Questionnaire" is recommended for researchers wishing to examine coping strategies and pain in the workplace. This would have the benefit of drawing upon decades of psychological research into coping strategies and mechanisms, and would provide a theoretical framework within which to conceptualise highly complicated behaviours such as responding to and living with pain.

(iv) Future research on pain response – examining the strategies of individuals who <u>can</u> cope with pain (as opposed to those who cannot)

Where psychological theories of coping strategies have been applied in the field of pain research, the tendency has been to focus on the coping mechanisms used by clinical populations or consulters (see above). In other words, the focus has been on individuals who (under the assumption that consulting reflects an ability to cope as discussed above) have either not been able to successfully cope with their pain themselves, or are eliciting a specific coping mechanism (in this case, consulting). While this approach provides an insight into coping mechanisms amongst chronic pain patients or consulters, this does not provide a great deal of insight into the relationship between coping style and *not* consulting for pain. The relationship between coping style and *not doing anything* for pain has not been systematically addressed in any great detail. Current findings suggest that there are a proportion of individuals experiencing reasonably negative pain experiences that they are attributing to chronic and serious conditions without any help from outside sources. In understanding how to cope with pain at all levels, it is these very individuals that could provide great insight into current understanding of coping with pain. It is recommended therefore, that while future research continues to explore the coping mechanisms of those with chronic pain, additional investigation of those who are able to cope *successfully* in a working or *non-clinical* context (such as those who report doing nothing for their pain in the current study) is also undertaken.

(v) Future research on pain response – examining individuals who attribute their pain to a "pain problem", and do nothing about it

Current data showed that the most common response to pain attributed to a "pain problem" was to consult a health professional. However, just less than one quarter (23%) of those attributing their pain to a 'pain problem' did not act on their pain at all. These individuals were also more likely to state that their inaction was the result of the belief that the pain would get better by itself, or that the pain could not be treated with anything (see Section 5.4). Although these individuals represent only a small proportion of those experiencing pain in current data, they provide an opportunity to analyse the beliefs and attitudes to pain that may be related to the ability to cope with pain (as discussed in 5.5h(iv) above). It would be useful for future research to examine the pain-related beliefs and attitudes of individuals who identify themselves as having a "pain problem" and then do not present to healthcare services for related symptoms.

(vi) Future research on pain response – examining individuals who attribute their pain to a "pain problem", do nothing about it, and continue to work

In the current study, doing nothing about a pain attributed to a "pain problem" was related to less time off work. Recent literature emphasises the important contribution of the beliefs and attitudes about pain in generating and maintaining obstacles for recovery and towards long-term disability (Waddell, 1998; Main & Spanswick, 2000; Kendall, Linton & Main, 1997). However, little is known about the beliefs and attitudes towards pain that are related to the ability to successfully cope with pain and their relationship with work capacity. In an analysis of pain coping strategies, it may also be useful to include a beliefs and attitudes questionnaire (for example the Acute Low Back Pain Screening Questionnaire (ALBPSQ); Linton & Halldén, 1996). This would enable future research to explore the extent to which the beliefs and attitudes about pain and relevant psychosocial factors (in the ALBPSQ: attitudes and beliefs about pain; pain behaviours; level of activity; compensation issues; issues with diagnosis and treatment; emotions surrounding pain; family circumstances; and work issues) are related to the propensity to respond to pain in a specific way.

(vii) Future research on pain response – exploring the evolution of the association between work psychosocial factors and pain responses

The negligible relationship between work psychosocial factors and pain responses in this study conflicts with other literature describing psychosocial influences on pain responses (see Section 5.4). This raises questions as to whether this lack of relatedness is characteristic of non-troublesome pain, as well as the possibility that psychosocial factors become more influential on the pain response as pain persists or becomes more troublesome. A simple additional question in the prospective study described above regarding consulting behaviour might help to shed light on this issue. For example, is there a particular point in the evolution of the negative pain experience at which the likelihood of seeking help is increased? How does this differ between groups? In the pursuit of understanding the journey from "bearable" pain to "unbearable" pain, it is important that the factors determining the point where pain is perceived to require intervention are explored.

(viii) Future research on pain response – exploring the discrepancy between perceived (subjective) physical work factors versus actual (objective) physical work factors

Although in current data there little association between psychosocial factors and the likelihood of responses to pain, there was a significant relationship between the *physical* aspects of work and actions taken in response to pain. After adjustment, current data showed that working in what individuals perceived to be more professional jobs was associated with acting on pain; and working in what individuals perceived to be less manual jobs was associated with consulting for pain. It is unclear why this should be the case, as in the same data, after adjustment for other factors, these work factors were not significantly related to pain prevalence or any aspect of pain experience.

It is important to point out here that these refer to *perceptions* of manual- and professional-load, which, as has already been reported were not always in agreement with other "objective" measures of manual- and professional-load (for example, the standardised SEG classifications) in the same data. As such, it is unclear whether these groups were in fact involved in less manual or professional labour or not, however, the fact that they *perceived* themselves not to be may have made them less likely to act or consult for a pain problem.

This finding can inform future research in two ways. First, it would be useful to explore the relationship between *perceived* physicality of jobs and *actual* physicality of jobs. The ultimate goal of such exploration would be to minimise (if not eradicate) bias and quantify confounding such that the influence of physicality of work can be isolated from the influence of other factors. Indeed, past research has (understandably) treated the potential discrepancy between subjective perceptions and objective measures of work factors as a source of bias (and/or confounding effect, depending on measures included) that requires consideration when designing studies. It would be useful for future research to explore the most effective way in which to isolate the influence of physical work factors, or even to ask if this realistically possible in the work environment.

Second, reflecting on the potential for disagreement between subjective and objective measures of work factors for a moment, it could be that it is in this discrepancy that the answer to a very difficult question surrounding the contribution of work to pain lies. The discussion as to whether it is the physical aspects of manual labour or the psychosocial aspects surrounding manual labour that contribute to ill-health was raised in Section 2.2. This has prompted studies such as the current one, examining the relationship between the physical and psychosocial aspects of work. It is generally considered unrealistic to expect that the psychosocial aspects of work could ever be fully delineated from the physical aspects (Bongers et al, 1995; Crombie et al, 1999), and therefore attempts are made to "isolate" the influence of psychosocial aspects of work by controlling for physical aspects of work through participant selection, observation or statistical adjustment. These processes are competent and conservative research practice, and provide an excellent insight into the relationship between physical variables, psychosocial variables and pain. However, an alternative way of delineating the influence of physical and psychosocial factors might be to "capitalise" on the discrepancy between subjective and objective measures of physicality. Hypothetically, if researchers could cross-tabulate *perceived* physicality and *actual* physicality against a pain outcome, then they may be able to create a group of individuals who are *actually* in physical labour for comparison with a group who only *believe* themselves to be (but actually are not) in physical labour. In this way, it might be that *perceived* manual labour could be examined as a risk factor separately from *actual* manual labour. Moreover, in such a cross-tabulation, it might also be possible to identify a group of individuals who are involved manual labour, but do not perceive themselves to be, and to examine the pain profiles of these individuals. Admittedly, this direction for future research is somewhat ambitious in nature, and is likely to involve considerable resource implications for any researcher attempting to recruit a large enough sample for any meaningful comparison to be possible. However, the discrepancy between perceived and actual manual/physical labour presents a challenging arena within which future researchers could explore the relationship between work and pain in more detail.

6. Conclusions

6.1 Implications of the current findings

(a) Implications of the findings for what is known about pain and work

The findings of this study have several implications for what is currently known about pain and work, as well as the way that research into pain in the workplace is carried out. These should be considered in light of the limitations already raised about the current study (Section 5.4).

(i) There is a lot of pain occurring outwith clinical supervision or management

The results show that the prevalence of general aches and pains in the working community is high. Perceived causes of general aches and pains vary from biomedical to psychosocial, however, it is also common for individuals to experience pain that they do not know the cause of. Although a substantial proportion of individual's record pain in a four-week period, their experience of pain is not necessarily highly negative, and often bearable. A large proportion of this pain appears to be managed outwith clinical supervision, or through self-medication. This study is the first illustration of pain of this nature on a working population, and highlights pain as a human, non-clinical experience, and as a legitimate public health problem.

(ii) Demographic differences exist in relation to general aches and pains

The data show a consistent relationship between some demographic factors (female gender; having a chronic condition) and higher pain prevalence, more negative pain experience, and propensity to act on pain. Although this is not always is similar to literature elsewhere, these findings point to the possibility that differences in pain reporting, perceptions and behaviour across these demographic groups are as common in non-troublesome aches and pains as they are in troublesome pain, or specific pain types.

Associations between pain prevalence, pain experience and pain response and other demographic variables were less consistent.

(iii) General aches and pains differ in relation to physical load at work

Although there was little relationship between physical work factors and prevalence of general aches and pains, the current study provided evidence in support of a relationship between higher physical load and a more negative pain experience, as well as a relationship between higher physical demands and a propensity to act on pain responses. The relationship between physical work factors and general aches and pains in the current study is the first observation of its kind, as previous literature has tended to focus on psychosocial risk factors for more troublesome pain at work, or specific pain types. Nevertheless, current findings are similar to other observations on pain experience and pain response, suggesting that the observed relationship between physical work factors and "troublesome" pain may extend onto less troublesome general aches and pains.

(iv) The experience of general aches and pains differs in relation to psychosocial load at work

The observed relationships between psychosocial work factors and prevalence of general aches and pains and that between psychosocial work factors and pain responses were negligible in the current study. However, psychosocial work factors appeared to relate to a more negative pain *experience*. The relationship between psychosocial work factors and general aches and pains in the current study is also the first observation of this kind, as previous literature has tended to focus on psychosocial risk factors for more troublesome pain at work, or on specific pain types. Current findings are not dissimilar to observations on pain experience made elsewhere in the literature, suggesting that the relationship commonly observed between psychosocial work factors and "troublesome" pain may also extend to less troublesome general aches and pains.

(b) Summary of implications of the current study for future pain research

Assuming that the current study is an accurate representation of general pain at work in the Scottish working population (see Section 5.4 above), ideas and recommendations for future research were discussed in detail in Section 5.5. It is useful to summarise some key areas that have been identified in the current study that could benefit from future research.

(i) Changing the focus of pain research from prevalence studies of chronic pain to multidimensional studies of all pain

The current study argued against several assumptions made by previous pain research, and demonstrated these all to be important avenues for future work. Specifically, it is recommended that researchers consider focussing on the examination of:

- pain other than chronic pain and the insight this could lead to for *all* pain; and
- pain experience outcomes and pain response outcomes (*as well as* pain prevalence outcomes).

(ii) Exploring the nature of the variability between perceived and actual measures

The current study uncovered a number of inconsistencies between subjective and objective measures of individual factors. It was argued that while this discrepancy led to difficulties in interpreting findings, it also has the potential to add to current understanding of the relationship between pain and work in future research. It is recommended that researchers explore the following areas:

- perceived pain cause versus actual (diagnosed) causes;
- perceived exposure to psychosocial variables versus actual exposure; and
- perceived exposure to work variables versus actual exposure.

(iii) Exploring the journey from "non- troublesome" pain to "troublesome" pain

Future researchers should consider the inclusion of *all* pain in prospective studies in order to inform the relationship between pain that can be tolerated at work, and pain that cannot. Specifically, the following approaches are suggested:

- development of the use of a "normal" pain cohort, and the exploration of what this might comprise; as well as
- examination of the diagnosis process (including self-diagnosis) and the evolution of the chronicity of work-related pain.

This approach could be utilised to shed light on the individual psychosocial and work differences that may influence this journey from "non- troublesome" pain to "troublesome" pain.

(iv) Inclusion of Health Psychology theory in the examination of the relationship between pain and work

Finally, Section 5.5 discussed several areas of Health Psychology theory that may have the potential to increase understanding of the relationship between pain and work. Specifically it is recommended that future researchers explore the potential contribution of theories of:

- somatisation and its influence on pain and work;
- attribution, in relation to attributing cause to pain, and the interaction of psychosocial and work factors with this process;
- stress and coping, and their interaction with pain, work and individual factors.

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8. Appendices

8.1 Appendix A

(i) Piloting questionnaires: "Pain in the New Millennium"; and "Your Job in the New Millennium"

(ii) Preliminary research letter sent to supervisors of participants (Pilot and Final Study)

(iii) Information sheet

(iv) Final Questionnaire: "Pain in the Workplace"

(v) Further research information sent to supervisors

(vi) Supervisor Questionnaire

8.2 Appendix B

(i) Test-retest reliability analysis

(ii) Job Content Questionnaire (Karasek, 1985, reproduced with permission)

(iii) Coding of pain type

(iv) Coding of pain cause

8.1 Appendix A

(i) Piloting questionnaires: “Pain in the New Millennium”; and “Your Job in the New Millennium”

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Pain in the New Millennium

Recent research has shown that many more people are suffering from pain in their daily lives than has previously been thought. We are interested in understanding more about everyday pain and people's attitudes to it. The following questions will ask you about your experience of pain, and the actions that you normally take to deal with it.

Please as honest as possible, so that we can use your responses to improve our understanding of how people deal with pain on a day-to-day basis.

All information will held in the STRICTEST CONFIDENCE on computer, and can only be accessed by the researchers listed below.

If you agree to participate, please sign on the dotted line below. This page will be removed from your questionnaire when we receive it, and will not be used to identify you at any stage.

....

Joanne Rainey and Dr. A.J. Asbury
University of Glasgow
Dept of Anaesthesia
Western Infirmary
Glasgow G11 6NT

and

Prof. J. McEwen
University of Glasgow
Dept of Public Health
Lilybank Gardens
Glasgow G12 8RZ

If you would like to find out more about our work, please contact us at the addresses above.

THANK YOU FOR AGREEING TO TAKE PART

If you find any of this questionnaire confusing, or have any suggestions about how it could be improved, please write your comments beside each question

Section A - How you deal with pain

For office use only

1 Have you suffered from pain at any point in the last month?

Yes ☐ No ☐

If no → **Please fill in Section D ONLY**

If yes

2 For this pain, what did you do?
(Please tick ONE answer from ONE of the following three boxes)

(1)
- I saw a doctor or dentist ☐
- I saw a nurse/health visitor ☐
- I saw another health professional ☐
- I asked a pharmacist for advice ☐

If you did any of these, please fill in THIS section

(2)
- I used a prescription medicine that was already in the house ☐
- I bought a medicine/ treatment you can buy without a prescription ☐
- I used a medicine/treatment you can buy that was already in the house ☐
- I used a "Home Remedy" (e.g. a hot water bottle, hot milk) ☐
- Other *(please state)* ☐ ....

(3)
- I did not take any action ☐

If you did not treat the pain, please fill in THIS section

(a) What happened as a result of seeing this person?
- ☐ A medicine/treatment was prescribed
- ☐ I was told about a medicine I could buy over the counter
- ☐ I was given general advice about my lifestyle
- ☐ I was referred to another health professional
- ☐ I was told to come back if there was no improvement

(a) For what reason did you decide not to treat the pain?
- ☐ A health professional told me in the past not to use anything
- ☐ A pharmacist advised me not to use anything
- ☐ I thought it would get better by itself
- ☐ It was not serious enough
- ☐ It is not necessary to treat it
- ☐ It cannot be treated by anything
- ☐ I try to avoid medicines if I can

Now got to Section B

1 ☐
2 ☐☐
3 ☐☐
4 ☐☐
5 ☐☐

Section B - How you feel about your pain

For office use only

3 Below are some descriptions of different aspects of pain.
For each statement, tick the box under YES if you have had pain like that at any time in the last 2 weeks.
Tick the box under NO if you have not had pain like that described in the last 2 weeks.

PLEASE MAKE SURE YOU FILL IN ALL SECTIONS

1 Frequency of pain

		Yes	No
a	I rarely had any pain	☐	☐
b	I had occasional pain	☐	☐
c	I had some pain often	☐	☐
d	I had pain frequently	☐	☐
e	I had pain all the time	☐	☐

2 Intensity of pain

		Yes	No
a	The pain was mild	☐	☐
b	The pain was uncomfortable	☐	☐
c	The pain was moderate	☐	☐
d	I had some strong pain	☐	☐
e	The pain was severe	☐	☐
f	The pain was intense	☐	☐

3 Coping with pain

		Yes	No
a	The pain was difficult to cope with	☐	☐
b	At times the pain was a bit hard to bear	☐	☐
c	Sometimes I just couldn't stand the pain	☐	☐
d	The pain was unbearable at times	☐	☐

4 Emotional effects of pain

		Yes	No
a	I felt upset by the pain	☐	☐
b	The pain got me down	☐	☐
c	Pain has made me feel miserable	☐	☐
d	I felt the pain was wearing me down	☐	☐

5 Impact of pain

		Yes	No
a	Pain upset my normal routine	☐	☐
b	My social life was affected by pain	☐	☐
c	Pain stopped me from doing the things I wanted to do	☐	☐
d	I could hardly move for the pain	☐	☐
e	Pain made everything come to a standstill	☐	☐

6 Where was the pain?

(please answer)

....

7 What caused the pain?

....

Now go to Section C

(1) 6 7 8 9 10

(2) 11 12 13 14 15 16

(3) 17 18 19 20

(4) 21 22 23 24

(5) 25 26 27 28 29

30

31

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For office use only

Section C – The medicines you use for pain

4(1a) Did you use a medicine for your pain?

Yes ☐ No ☐ 32

If no → Please go to Section D

If yes ↓

(b) What was the name of this medicine?
(please try to answer)

.... 33 34

(c) Was this medicine:

Prescription ☐ Non-prescription ☐ 35

Other
(please state) ....

(d) Did you get this medicine yourself?

Yes ☐ No ☐ 36

If no → (e) Who got it?
(please answer)

.... 37

If yes ↓

4(2a) From which of these shops did you get the medicine you took?

- ☐ Boots
- ☐ Pharmacy within a supermarket
- ☐ Health shop
- ☐ Superdrug
- ☐ From a supermarket (on general shelves)
- ☐ Local confectioner/ tobacconist/newsagent
- ☐ Other chemist or pharmacy
- ☐ Local grocery shop
- ☐ Petrol Station

38

Other (please state)

....

Now turn over the page
(more questions overleaf)

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For office use only

(b) Why did you buy your medicine in this shop?

- ☐ Convenience/local to me
- ☐ Convenient to combine with other shopping in the same store
- ☐ Convenient to combine with shopping in shops nearby
- ☐ Was getting prescription at same time
- ☐ It's near the doctor's surgery
- ☐ Can't get this product elsewhere
- ☐ Wider range of medicines available there
- ☐ Familiarity/know my way around there
- ☐ Local pharmacist knows me
- ☐ Could get advice there
- ☐ More privacy when asking for advice
- ☐ Nobody asks you why you want it
- ☐ It was cheaper there
- ☐ Other (please state)

39 ☐ 40 ☐ 41 ☐ 42 ☐

4(3) How well did your medicine treat your pain?

Didn't make any difference	Made a little bit of a difference	Took the pain away
☐	☐	☐

43 ☐

4(4a) How easy were the instructions to understand?

- Easy ☐
- Difficult ☐
- I didn't read them ☐

44 ☐

(b) For how long have you taken the medicine?

- ☐ I took it once
- ☐ I took it twice
- ☐ For about one week
- ☐ For more than one week

45 ☐

(c) Are you still taking the medicine?

Yes ☐ No ☐

If yes → **Now go to Section D**

If no ↓

46 ☐

(d) Why did you stop taking the medicine?

- ☐ The pain got better
- ☐ The pain got no better, so I went to the doctor
- ☐ I only took it when the pain was really bad
- ☐ Other (please state)
- ☐ I ran out of medicine
- ☐ It didn't work
- ☐ I switched to a different medicine

....

47 ☐

Now go to Section D

Section D - Your views on treating pain

For office use only

5 Below are several statements about treating pain in general. Please indicate how much you agree/disagree with each statement by ticking ONE BOX ONLY on EACH line.

	Statement	Disagree strongly	Disagree slightly	Have no opinion	Agree slightly	Agree strongly	For office use only
1	"The chemist is a good source of advice/information about minor pain problems"	☐	☐	☐	☐	☐	48
2	"It is important to have medicines/treatments that you can buy to help relieve minor pain problems"	☐	☐	☐	☐	☐	49
3	"Advertising helps me to learn what types or brands of painkillers you can buy"	☐	☐	☐	☐	☐	50
4	"If I am at all unsure about a pain problem, I always look for professional medical advice"	☐	☐	☐	☐	☐	51
5	"You get good value for money from a doctor's prescription"	☐	☐	☐	☐	☐	52
6	"It is perfectly safe to take as many as you wish of the painkillers you can buy"	☐	☐	☐	☐	☐	53
7	"If you take the painkiller too often, it may not be effective when you really need it"	☐	☐	☐	☐	☐	54
8	"If I am in pain, I prefer to avoid taking any painkillers"	☐	☐	☐	☐	☐	55
9	"The painkillers you can buy are good value for money"	☐	☐	☐	☐	☐	56
10	"I read the instructions carefully before taking a painkiller for the first time"	☐	☐	☐	☐	☐	57
11	"People are less likely to bother their doctors with minor pain problems nowadays"	☐	☐	☐	☐	☐	58
12	"You cannot rely on the NHS for treatment for pain"	☐	☐	☐	☐	☐	59
13	"Doctors sometimes advise you to use a remedy you can buy from the chemist in order to save money for the NHS"	☐	☐	☐	☐	☐	60
14	"I feel that I've wasted the doctor's time when I am told to buy something you can get without a prescription"	☐	☐	☐	☐	☐	61

For office use only

		Disagree strongly	Disagree slightly	Have no opinion	Agree slightly	Agree strongly	
15	"If I am in pain, I am confident that I can decide what to buy to treat it"	☐	☐	☐	☐	☐	62 ☐
16	"It is much more convenient to ask the pharmacist for advice than to go to the doctor"	☐	☐	☐	☐	☐	63 ☐
17	"People should use pharmacists for advice more often rather than always going to the doctor"	☐	☐	☐	☐	☐	64 ☐
18	"I don't feel I know enough about the strong painkillers you can now buy without prescription to be confident of using them"	☐	☐	☐	☐	☐	65 ☐
19	"Usually I just try to keep on going when I'm in pain"	☐	☐	☐	☐	☐	66 ☐
20	"When I am in pain, I usually slow down straight away to give myself the best chance of recovery"	☐	☐	☐	☐	☐	67 ☐
21	"The amount of painkillers you can buy in shops should be restricted"	☐	☐	☐	☐	☐	68 ☐
22	"Anyone can take any type of painkiller they want"	☐	☐	☐	☐	☐	69 ☐

23 We are interested in finding out how easy it is for you to get to shops and amenities such as health centres or doctors' surgeries. To help us do this, please enter your postcode in the boxes below.

☐☐☐☐☐☐☐

70 ☐

24 a Do you suffer from any long-term or chronic conditions?

Yes ☐ No ☐

If no → End of questions

71 ☐

If yes

b What is this condition?

....

72 ☐

End of questions

THANK YOU VERY MUCH FOR YOUR TIME

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8.1 Appendix A

(iv) Final Questionnaire: "Pain in the Workplace"

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We are doing research about the way your job affects how you experience pain and use medicine.

Please fill in this questionnaire.

Your responses will help us to understand some of the difficulties many people face at work.

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of
GLASGOW

Part 1

Pain

Recent research has shown that many more people are suffering from pain in their daily lives than has previously been thought. We are interested in understanding more about everyday pain and people's attitudes to it. The following questions will ask you about your experience of pain, and the actions that you normally take to deal with it.

Please be as accurate as possible, so that we can use your responses to improve our understanding of how people deal with pain on a day-to-day basis.

All information will be remain CONFIDENTIAL on computer, and can only be accessed by the researchers listed below.

If you agree to participate, please sign on the dotted line below. We are asking you to do this, so that we know you have consented to give your information.

THIS PAGE WILL BE REMOVED FROM YOUR QUESTIONNAIRE WHEN WE RECEIVE IT, AND WILL NOT BE USED TO IDENTIFY YOU AT ANY STAGE

....

Joanne Rainey and Dr. A.J. Asbury
University of Glasgow
Dept of Anaesthesia
Western Infirmary
Glasgow G11 6NT

and

Prof. J. McEwen
University of Glasgow
Dept of Public Health
Lilybank Gardens
Glasgow G12 8RZ

If you would like to find out more about our work, please contact us at the addresses above.

Part 1 - Pain

THANK YOU FOR AGREEING TO TAKE PART

A - How you deal with pain

For office use only

1 Have you suffered from pain at any point in the last month?

Yes ☐ No ☐

If no → **Please fill in Part 2 ONLY**

If yes ↓

2 For this pain, what did you do?

(Please tick ONE answer from ONE of the following three boxes)

(1)

- I saw a doctor or dentist ☐
- I saw a nurse/health visitor ☐
- I saw another health professional ☐
- I asked a pharmacist for advice ☐

If you did any of these, please fill in THIS section

(2)

- I used a prescription medicine that was already in the house ☐
- I bought a medicine/ treatment you can buy without a prescription ☐
- I used a medicine/treatment you can buy that was already in the house ☐
- I used a "Home Remedy" (e.g. a hot water bottle, hot milk) ☐
- Other *(please state)* ☐ ....

(3)

- I did not take any action ☐

If you did not treat the pain, please fill in THIS section

(a) What happened as a result of seeing this person?

- ☐ A medicine/treatment was prescribed
- ☐ I was told about a medicine I could buy over the counter
- ☐ I was given general advice about my lifestyle
- ☐ I was referred to another health professional
- ☐ I was told to come back if there was no improvement

(a) For what reason did you decide not to treat the pain?

- ☐ A health professional told me in the past not to use anything
- ☐ A pharmacist advised me not to use anything
- ☐ I thought it would get better by itself
- ☐ It was not serious enough
- ☐ It is not necessary to treat it
- ☐ It cannot be treated by anything
- ☐ I try to avoid medicines if I can

Now got to Section B

All information will be held in the STRICTEST confidence on computer and will only be seen by the listed researchers

Part 1 - Pain

B - How you feel about your pain

3 Below are some descriptions of different aspects of pain.
For each statement, tick the box under YES if you have had pain like that at any time in the last 2 weeks.
Tick the box under NO if you have not had pain like that described in the last 2 weeks.

PLEASE MAKE SURE YOU TICK 'YES' OR 'NO' FOR ALL QUESTIONS

1 Frequency of pain

		Yes	No
a	I rarely had any pain	☐	☐
b	I had occasional pain	☐	☐
c	I had some pain often	☐	☐
d	I had pain frequently	☐	☐
e	I had pain all the time	☐	☐

2 Intensity of pain

		Yes	No
a	The pain was mild	☐	☐
b	The pain was uncomfortable	☐	☐
c	The pain was moderate	☐	☐
d	I had some strong pain	☐	☐
e	The pain was severe	☐	☐
f	The pain was intense	☐	☐

3 Coping with pain

		Yes	No
a	The pain was difficult to cope with	☐	☐
b	At times the pain was a bit hard to bear	☐	☐
c	Sometimes I just couldn't stand the pain	☐	☐
d	The pain was unbearable at times	☐	☐

4 Emotional effects of pain

		Yes	No
a	I felt upset by the pain	☐	☐
b	The pain got me down	☐	☐
c	Pain has made me feel miserable	☐	☐
d	I felt the pain was wearing me down	☐	☐

5 Impact of pain

		Yes	No
a	Pain upset my normal routine	☐	☐
b	My social life was affected by pain	☐	☐
x c	Pain stopped me from doing the things I wanted to do	☐	☐
d	I could hardly move for the pain	☐	☐
e	Pain made everything come to a standstill	☐	☐

6 Where was the pain?

(please answer)

....

7 What caused the pain?

....

Now go to Section C

For office use only

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Part 1 - Pain

C – The medicines you use for pain

For office use only

4(1a) Did you use a medicine for your pain?

Yes ☐ No ☐ 36

If no → **Please go to Part 2**

If yes ↓

(b) What was the name of this medicine?
(please try to answer)

.... 37 38

(c) Was this medicine:

Prescription ☐ Non-prescription ☐ 39

Other
(please state) 40

(d) Did you get this medicine yourself?

Yes ☐ No ☐ 41

If no → (e) Who got it?
(please answer)

.... 42

If yes ↓

4(2a) From which of these shops did you get the medicine you took?

☐ Boots	☐ Pharmacy within a supermarket	☐ Health shop
☐ Superdrug	☐ From a supermarket (on general shelves)	☐ Local confectioner/ tobacconist/newsagent
☐ Other chemist or pharmacy	☐ Local grocery shop	☐ Petrol Station

43

Other (please state)

.... 44

Now turn over the page
(more questions overleaf)

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Part 1 - Pain

For office use only

(b) Why did you buy your medicine in this shop?

- ☐ Convenience/local to me
- ☐ Convenient to combine with other shopping in the same store
- ☐ Convenient to combine with shopping in shops nearby
- ☐ Was getting prescription at same time
- ☐ It's near the doctor's surgery
- ☐ Can't get this product elsewhere
- ☐ Wider range of medicines available there
- ☐ Familiarity/know my way around there
- ☐ Local pharmacist knows me
- ☐ Could get advice there
- ☐ More privacy when asking for advice
- ☐ Nobody asks you why you want it
- ☐ It was cheaper there
- ☐ Other (please state)

....

45 46 47 48

4(3) How well did your medicine treat your pain?

Didn't make any difference	Made a little bit of a difference	Took the pain away
☐	☐	☐

49

4(4a) How easy were the instructions to understand?

- Easy ☐
- Difficult ☐
- I didn't read them ☐

50

(b) For how long have you taken the medicine?

- ☐ I took it once
- ☐ I took it twice
- ☐ For about one week
- ☐ For more than one week

51

(c) Are you still taking the medicine?

Yes ☐ No ☐

52

If yes

Now go to Part 2

If no

(d) Why did you stop taking the medicine?

- ☐ The pain got better
- ☐ The pain got no better, so I went to the doctor
- ☐ I only took it when the pain was really bad
- ☐ Other (please state)
- ☐ I ran out of medicine
- ☐ It didn't work
- ☐ I switched to a different medicine

....

53 54

End of Part 1

Now go to Part 2

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Part 2

Work

People spend a large part of their lives at work, so it is very important to understand how they feel about their job. We are interested in different aspects of your working life, as well as how your job affects your life outside work, and your health. This short questionnaire is designed to ask you a few simple, unobtrusive questions about your job.

Please be as accurate as possible, so that we can use your responses to improve our understanding of people in the workplace.

STOP

Once again, all information will be remain CONFIDENTIAL on computer, and can only be accessed by the listed researchers.

Part 2 - Work

D – Your Job

For office use only

55

1 At the moment, are you:

Employed ☐ Unemployed ☐

Other
(please state)
....

2a Have you been unemployed in the last 12 months?

Yes ☐ No ☐

If no → **Please go to Qu.3**

If yes ↓

56

2b For how long?

☐☐ months

57

3 What is your current job title?
(If you have more than one job, please answer for ONLY ONE OF THEM)

....

58

4
a Is your job:
(please tick ONE BOX ONLY)

- Mostly manual ☐
- More manual than non-manual ☐
- Roughly equal amount manual, and non-manual ☐
- More non-manual than manual ☐
- Mostly non-manual ☐

59

b Is your job:
(please tick ONE BOX ONLY)

- Mostly unskilled ☐
- More unskilled than skilled ☐
- Roughly equal amount unskilled, and skilled ☐
- More skilled than unskilled ☐
- Mostly skilled ☐

60

c Is your job:
(please tick ONE BOX ONLY)

- Mostly non-professional ☐
- More non-professional than professional ☐
- Roughly equal amount non-professional and professional ☐
- More professional than non-professional ☐
- Mostly professional ☐

61

5 In an average year, do you earn:

Under £10,000	£10,000 – £25,000	£25,000- £40,000	£40,000 – £55,000	Over £55,000
☐	☐	☐	☐	☐

62

Now go to Section E

Part 2 - Work

E – Your Work Routine

For office use only

6 How many hours do you work:
a on an average day ☐☐ hours
b in an average week ☐☐ hours

7 Do you work shifts?
Never ☐ Sometimes ☐ Always ☐

8 Is your job:
a Permanent ☐ Temporary ☐
Other
(please state)
……………………………………………………

b Full-time ☐ Part-time ☐
Other
(please state)
……………………………………………………

9 Do you work 'conventional' office hours (9am –6pm approx.)?
None of the time ☐ Some of the time ☐ All of the time ☐

10 To what extent do you organise your own daily tasks:
None of the time ☐ Some of the time ☐ All of the time ☐

11 Do you use a computer in your job:
None of the time ☐ Some of the time ☐ All of the time ☐

62 ☐☐
63 ☐☐
64 ☐
65 ☐
66 ☐
67 ☐
68 ☐
69 ☐
70 ☐
71 ☐

F – Your life

12 What age are you?
16-25 ☐ 26-35 ☐ 36-45 ☐ 46-55 ☐ 56-65 ☐ Over 65 ☐

13 Are you:
Male ☐ Female ☐

14 How many children do you have? *(please answer)*
☐☐

15 a Are you married or living with your partner?
Yes ☐ No ☐

If yes

b Does your spouse/partner work?
Yes ☐ No ☐

If no

Now please go to Section G

72 ☐
73 ☐
74 ☐☐
75 ☐
76 ☐

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Part 2 - Work

For office use only

G – Your views about your job

16

a Is your workplace: *(please tick ONE BOX ONLY)*
- Always physical effort
- More physical effort than mental effort
- Roughly equal amounts of physical and mental effort
- More mental effort than physical effort
- Always mental effort

b Is your workplace: *(please tick ONE BOX ONLY)*
- Very stressful
- Quite stressful
- Sometimes stressful, sometimes easygoing
- Quite easygoing
- Very easygoing

c Is your workplace: *(please tick ONE BOX ONLY)*
- Beyond my capabilities
- Difficult to cope with a lot of the time
- Sometimes easy, sometimes difficult to cope with
- Easy to cope with a lot of the time
- Well within my capabilities

d Is your workplace: *(please tick ONE BOX ONLY)*
- Working on my own all of the time
- Working on my own a large part of the time
- Roughly equal amounts of working on my own and as a team
- Working in a team a large part of the time
- Working in a team all of the time

77

78

79

80

17 Do you enjoy your work:

None of the time | Some of the time | All of the time

81

18 Would you say that your job is secure?

Yes | No

19 Would you like to continue in your current job in the future?

Yes | No

82

83

H – Your health at work

20 Do you receive sick pay?

Yes | No

21 How many days did you take off due to sickness last year?

Approx. ☐☐☐ days

84

85

22 Do you experience pain as a direct result of your job?

None of the time | Some of the time | All of the time

86

23 Do you take painkillers at work?

None of the time | Some of the time | All of the time

87

Please turn over the page
(more questions overleaf)

Part 2 - Work

24 During the day:
(please tick ONE BOX ONLY in EACH column)

a
- Someone else tells me when I can take a break ☐
- Sometimes someone else tells me when I can take a break, sometimes I can take one when I need one ☐
- I can take a break whenever I need one ☐

b
- I have a break at the same time every day ☐
- Sometimes my breaks are regular, sometimes not ☐
- I can never guarantee when I will get a break ☐

c
- My breaks are short: less then 15 min. every 4 hours ☐
- My breaks are sometimes short, sometimes long ☐
- My breaks are long: more then 15 min. every 4 hours ☐

25 If you needed a painkiller at work, where would you go to get one?
(you may tick more than one box)

Medical centre/ medical staff	Supervisor	A colleague	Shop nearby	I always carry some with me	I never take painkillers at work
☐	☐	☐	☐	☐	☐

26 For which of these reasons would you take time off work:
(you may tick more than one box)

Migraine	Cold/Flu	Stomach upset	Hayfever	Hangover	Period pain	None of these
☐	☐	☐	☐	☐	☐	☐

Other *(please state)*

....

27 Could you do your job without taking a painkiller?

None of the time	Some of the time	All of the time
☐	☐	☐

28 Do you take painkillers to prevent pain at work?

None of the time	Some of the time	All of the time
☐	☐	☐

29 We are interested in finding out how easy it is for you to get to shops and amenities such as health centres or doctors' surgeries. To help us do this, please enter your HOME postcode in the boxes below.

☐☐☐☐☐☐☐

30a Do you suffer from any long-term or chronic conditions?

Yes ☐ No ☐

if no → **End of questions**

b **What is this condition?**

....

→ **End of questions**

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88 ☐
89 ☐
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111 ☐☐☐
112 ☐

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THANK YOU VERY MUCH FOR YOUR TIME

Please return your questionnaire to us in the envelope provided AS SOON AS POSSIBLE

Joanne Rainey BA(Hons) MRes
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Fax

FAO:	**Ross Hutton**	**From:**	Joanne Rainey
Fax:	01475 896 043	**Pages:**	8
Phone:	01475 892 000	**Date:**	April 5th 2001
Re:	Pain in the Workplace Research	**CC:**	

☐ **Urgent** ☐ **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

Dear Mr. Hutton,

Further to our phone conversation earlier, I have attached a copy of our questionnaire, "Pain in the Workplace" to this fax. The actual questionnaire is A4 sized, and double sided. I have also included some information about the background of the research, and what will be asked of you, should you decide to take part. We have tried to make it so that the study requires minimal effort from organisations, and we are very flexible about how the questionnaire is distributed.

If you decide to participate, we will provide you with some general feedback in the form of a report, corresponding to the information we receive. This can provide data about job satisfaction issues, schedules of sickness absence, and so on. Most importantly, this feedback can be tailored to you own needs and interests. As I mentioned on the phone, this feedback may also be useful to you Occupational Health Department, and we can discuss this in more detail nearer the time.

I understand that you may have several considerations about taking part, least of all the way in which you wish questionnaires to be distributed. Therefore, I will happy to meet with you, or the appropriate member of staff at any time to discuss the study in more detail.

In the meantime, please look over the attached information, and I will contact you in the next few days to find out what you think.

Thank you very much for all your help.

Regards,

J Rainey

8.1 Appendix A

(vi) Supervisor Questionnaire

Your workforce

Thank you very much for your participation in our research. Please take a short time to answer the questions below as accurately as possible. This information is very important to us, as it will help us to measure the data we receive in relation to your company's overall workforce population. By putting the responses we receive in context with your workforce overall, you may find out some interesting information about your staff.

Your name	
Your job title	
Organisation	
Total number of employees	

Gender distribution *(no. of employees)* ____ male ____ female

Average age of staff ____ years

Details of how questionnaires were distributed in your organisation

Details of different jobs in your organisation

Job title	Salary bracket *(please tick appropriate box)*	Approx. no. of employees
	☐ *Under 10K* ☐ *10K – 25K* ☐ *25K – 40K* ☐ *40K – 55k* ☐ *Over 55k*	
	☐ *Under 10K* ☐ *10K – 25K* ☐ *25K – 40K* ☐ *40K – 55k* ☐ *Over 55k*	
	☐ *Under 10K* ☐ *10K – 25K* ☐ *25K – 40K* ☐ *40K – 55k* ☐ *Over 55k*	
	☐ *Under 10K* ☐ *10K – 25K* ☐ *25K – 40K* ☐ *40K – 55k* ☐ *Over 55k*	
	☐ *Under 10K* ☐ *10K – 25K* ☐ *25K – 40K* ☐ *40K – 55k* ☐ *Over 55k*	

If there are anymore jobs, please continue overleaf

THANK YOU FOR YOUR TIME
Please return this in the envelope provided as soon as possible

Organisation 1 - Blood transfusion service (all)
0865 – 1257

Data provided by Personnel Officer			Data from current sample			
Total no. employees	385		Given out		400	
			No. returned (response rate)		95 (23.8)	
Males	90 (23.4%)		Male	21	(22%)	
Females	296 (76.6%)		Female	73	(78%)	
Average age	40.75		Age 16-25	9	9.6	
			26-35	20	21.3	
			36-45	39	41.5	
			46-55	22	23.4	
			56-65	4	4.3	
			Over 65	0		
Income Under 10K	97	25.2	Income Under 10K	24	25.5	
10-25K	184	47.8	10 - 24K	52	55.3	
26-40K	100	26.0	25 - 39K	14	14.9	
41-55K	1	0.3	40 - 54K	2	2.1	
Over 55K	3	0.8	Over 55K	2	2.1	
Associate specialist	1		Professional	24		
Consultant	3					
Medics	5					
Scientist A	2					
Scientist B/C	6					
Senior manager (2-6)	4					
Specialist registrar	6					
MLA	35		Managerial & Intermediate	33		
MLSO (1-4)	63		Non-manual skilled	7		
MTO (1-5)	3					
A+C 2	14					
A+C 3-6	26					
Driver	9		Manual skilled	11		
Driver	13					
Nursing A	116					
Nursing B	62					
Maintenance	3		Partly skilled	19		
Domestic	15		Unskilled	0		

Organisation 2 - Bakery (1 branch out of 4)
For Glasgow only 1673 – 2060

Data provided by Personnel Manager		*Data from current sample*		
Total no. employees	451	*Given out*		*388*
		No. returned (response rate)		*62 (16%)*
Males	376 (83.4%)	*Males*	54	87.1
Females	75 (16.6%)	*Females*	8	12.9
Average age	42	*Age 16-25*	1	1.6
		26-35	15	24.2
		36-45	20	32.3
		46-55	17	27.4
		56-65	9	14.5
		over 65	1	24.2
Details given for one branch only		*Details given for one branch only*		
Scientist B/C	6	*Professional*	*5*	
Managers	27	*Managerial & Intermediate*	*3*	
Production	89	*Manual skilled*	*13*	
Despatch	102			
Security	4			
Distribution	70			
Vehicle services	16			
Admin	19	*Non-manual skilled*	*1*	
Maintenance	26	*Partly skilled*	*0*	
Hygiene	26	*Unskilled*	*0*	
Stores	8			

Organisation 3 - Aircraft & defence manufacturer
3851– 4050

Data provided by OH&S and Security officer (approx. numbers)			Data from current sample			
	Total no. employees	680		Given out		300
				No. returned (response rate)		32 (10.67)
	Males	80%		Males	24	75
	Females	20%		Females	8	25
	Average age	35	Age	16-25	1	3.1
				26-35	6	18.8
				36-45	9	28.1
				46-55	14	43.8
				56-65	2	6.3
				Over 65		
Income	Under 10K	20	Income	Under 10K	1	3.1
	10-25K	150		10 - 24K	9	28.1
	26-40K	530		25 - 39K	16	50.0
	41-55K	15-25		40 - 54K	5	15.6
	Over 55K	0		Over 55K	1	3.1
	Professional	150		Professional	23	71.9
	Director	15-25		Managerial & Intermediate	3	9.4
	Managerial	150		Manual skilled	3	9.4
	Technical skilled	380		Non-manual skilled	2	6.3
				Partly skilled	1	3.1
	Unskilled	20		Unskilled	0	

Organisation 4 – DFLS

Data provided by resourcing advisor			Data from current sample			
Total no. employees	462			Given out		500
				No. returned (response rate)		136 (26.9)
Males	140	30.3%		Male	41	31
Females	322	69.7%		Female	93	69
				Missing	2	
Average age	35		Age	16-25	49	36.6
				26-35	56	41.8
				36-45	16	11.9
				46-55	13	9.7
				Over 65		

No numbers of staff given – only job titles.

8.2 Appendix B

(i) Test-retest reliability analysis

Individuals paired by postcode, then pain comparing score at T1 with score at T2

	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI of the Difference	
						Lower	Upper
Autonomy/Teamwork	0.31	69	0.76	0.05	0.15	-0.24	0.34
Average sick days per annum	-0.49	69	0.62	-1.01	2.06	-5.12	3.09
Chronic condition?	0.30	68	0.77	0.03	0.11	-0.19	0.25
Control of breaks	-1.16	69	0.25	-0.10	0.09	-0.28	0.07
Could you do your job without taking a painkiller?	1.06	69	0.29	0.13	0.13	-0.12	0.39
Do you enjoy your work?	0.57	69	0.57	0.07	0.11	-0.16	0.29
Do you feel pain as a result of your job?	-0.31	69	0.76	-0.04	0.13	-0.31	0.22
Do you organise your daily tasks?	-0.50	69	0.62	-0.05	0.10	-0.26	0.15
Do you receive sick pay?	0.87	68	0.39	0.09	0.10	-0.11	0.29
Do you take painkillers at work?	-0.96	69	0.34	-0.13	0.13	-0.39	0.14
Do you take painkillers to prevent feeling pain at work?	-0.37	69	0.71	-0.04	0.12	-0.28	0.19
Do you use a computer?	1.32	69	0.19	0.17	0.13	-0.09	0.43
Do you work conventional hours?	-0.13	69	0.90	-0.02	0.13	-0.28	0.25
Do you work shifts?	-0.18	69	0.86	-0.01	0.07	-0.15	0.12
Easy/Difficult to cope	-0.86	69	0.39	-0.17	0.20	-0.57	0.23
Gender	0.02	68	0.98	0.00	0.11	-0.21	0.22
Hours/day?	-0.02	69	0.98	-0.01	0.32	-0.65	0.64
Hours/week?	0.02	69	0.98	0.05	2.32	-4.58	4.68
How much do you earn?	-0.02	69	0.98	0.00	0.20	-0.39	0.38
Is your job secure?	0.50	69	0.62	0.05	0.10	-0.15	0.26
Is your job? (FT/PT)	0.13	69	0.90	0.01	0.08	-0.15	0.17
Is your job? (perm/temp)	0.99	69	0.32	0.09	0.09	-0.09	0.27
Job Title	-1.02	68	0.31	-9.62	9.48	-28.54	9.29
Length of breaks	-0.33	69	0.74	-0.05	0.15	-0.34	0.24
Manual Component	0.22	69	0.83	0.05	0.22	-0.39	0.49
Marital status before correction	0.30	69	0.76	0.04	0.12	-0.19	0.26
No. of kids	-0.12	69	0.90	-0.03	0.23	-0.49	0.43
Physical component	-0.91	69	0.37	-0.17	0.19	-0.54	0.20
Professional Component	-0.51	69	0.61	-0.10	0.20	-0.49	0.29
Reason to call in sick (1)	-0.66	69	0.51	-0.36	0.55	-1.46	0.74
Regularity of breaks	0.02	69	0.98	0.00	0.12	-0.24	0.25
SEG (interval)	1.75	66	0.08	0.19	0.11	-0.03	0.42
Skilled component	-0.67	69	0.51	-0.09	0.13	-0.36	0.18
Spouse work before correction	0.32	45	0.75	0.03	0.09	-0.16	0.21
Stress Level	-0.29	69	0.77	-0.06	0.21	-0.47	0.35
What age are you?	-0.76	69	0.45	-0.17	0.23	-0.62	0.28
Where do you get painkillers? (1)	-0.09	69	0.93	-0.02	0.25	-0.53	0.48
Would you like to continue in your current job?	0.81	69	0.42	0.08	0.10	-0.12	0.28

8.2 Appendix B

(ii) Job Content Questionnaire (Karasek, 1985, reproduced with permission)

Job Content Questionnaire

		strongly disagree	disagree	agree	strongly agree
1	My job requires that I learn new things	1	2	3	4
2	My job involves a lot of repetitive work	1	2	3	4
3	My job requires me to be creative	1	2	3	4
4	My job allows me to make a lot of decisions on my own	1	2	3	4
5	My job requires a high level of skill	1	2	3	4
6	On my job, I am given little freedom to decide how I do my work	1	2	3	4
7	I get to do a variety of things on my job	1	2	3	4
8	I have a lot to say about what happens on my job	1	2	3	4
9	I have an opportunity to develop my own abilities	1	2	3	4
10	My job requires working very fast	1	2	3	4
11	My job requires working very hard	1	2	3	4
12	My job requires lots of physical effort	1	2	3	4
13	I am not asked to do an excessive amount of work	1	2	3	4
14	I have enough time to get the job done	1	2	3	4
15	My job requires lifting heavy loads	1	2	3	4
16	My job requires rapid physical activity	1	2	3	4
17	I am free from conflicting demands others make	1	2	3	4
18	My job requires intense concentration	1	2	3	4
19	Often my job tasks are interrupted	1	2	3	4
20	My job is hectic	1	2	3	4
21	My job requires awkward body positions	1	2	3	4
22	My job requires awkward arm positions	1	2	3	4
23	I often wait on others in my job	1	2	3	4

		regular & steady	seasonal	frequent layoffs	both seasonal & frequent layoffs	other
24	How steady is your work?	1	4	4	4	9

		strongly disagree	disagree	agree	strongly agree
25	My job security is good	1	2	3	4

Please remember to fill in both sides of this questionnaire

		never	faced possibility once	faced possibility more than once	constantly	actually laid off
26	During the past year, how often were you in a situation where you faced job loss or layoff?	1	2	3	4	5

		not at all likely	not too likely	somewhat likely	very likely
27	Sometimes people permanently lose jobs they want to keep. How likely is it that during the next couple of years you will lose your present job with your employer?	1	2	3	4

		strongly disagree	disagree	agree	strongly agree
28	I have many career possibilities in my current position	1	2	3	4
29	My organisation sees my skills as valuable	1	2	3	4
30	My supervisor is concerned about the welfare of those under him/her	1	2	3	4
31	My supervisor pays attention to what you are saying	1	2	3	4
32	My supervisor is hostile	1	2	3	4
33	My supervisor is helpful in getting the job done	1	2	3	4
34	My supervisor is a good organiser	1	2	3	4
35	People I work with are competent in doing their jobs	1	2	3	4
36	People I work with take a personal interest in me	1	2	3	4
37	People I work with are hostile	1	2	3	4
38	People I work with are friendly	1	2	3	4
39	People I work with often work together	1	2	3	4
40	People I work with are helpful in getting the job done	1	2	3	4

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THANK YOU VERY MUCH FOR YOUR TIME

Please return your questionnaire to us in the envelope provided AS SOON AS POSSIBLE

8.2 Appendix B

(iii) Coding of pain type

Codings for pain site

Code given (by researcher)	Verbatim site (by participant)
Back	*Back*
Head	*Head*
Joints	*Hands* *Hip* *Joints* *Wrist*
Chest area	*Ribs* *Chest* *Lungs*
Face and mouth	*Dental* *Eye* *Mouth* *Jaw* *Face*
Limbs	*Arm* *Lower leg/Ankle* *Legs*
Abdominal	*Stomach/Abdomen* *Side* *Kidneys* *Genitals* *Groin* *Anus* *Bladder*
Neck & shoulder	*Neck* *Shoulders*
Feet or ankles	*Feet*
Ear nose or throat	*Ear* *Throat* *Sinuses* *Total*
Unspecified	*Skin* *Everywhere*

Codings for pain cause

Code given (by researcher)	Verbatim cause (by participant)
Unknown	Unknown Don't know
Recent injury	Lifting/handling Recent Injury
Stress	Stress or tension
Work environment	Chair at work Office too hot Eye Strain Work environment Lights at work Computer use Standing long hours Management Typing Solvent use at work
Pain problems	Spinal problems Arthritis RSI Spondylosis Sciatica Neuralgia Tennis elbow MS Tendonitis
Non-serious ailments	Migraine Earache Sinuses Fluid retention Corns Indigestion/Dyspepsia Hayfever Hangover New shoes Mouth ulcer Acid reflux Side effect of meds Ingrown toenails Allergic reaction Blocked salivary gland Cut Haemorrhoids

Codings for pain cause (contd.)

Code given (by researcher)	Verbatim cause (by participant)
Short-term medical problems	Flu
	Dental abscess
	Virus
	Recent surgery
	Gallstones
	Biliary Obstruction
	Shingles
	Infection
	Kidney infection
	Pleuracy
	Gastric infection
	Hernia
	Asthma attack
	Kidney stone
	Anal fischer
	Cystitis
Long-term medical problems	Ulcer
	Pituitary disease
	Gout
	Hypertension
	Endimetriosis
	IBS
	Varicose veins
	Eczema
	Chron's Disease
	Heart problems
	Diverticulitis
Life variables	Period pain
	Fatigue
	Recent surgery
	Exercise
	Dehydration
	Cold weather
	Age
	Smoking
	Pregnancy
	Poor posture
	Being overweight
	Wear and tear/tiredness
Old injury	Old injury