The first ever episode of non-specific low back pain: advancing knowledge of lay definitions, causal theories and attributions for primary prevention

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ABSTRACT

Low back pain is a major health and socio-economic problem in Western countries. It is important therefore to learn more about its cause for prevention. To date, research has focused upon identifying risk factors that play a role in recurrent episodes of low back pain to further knowledge for secondary prevention. It can be argued however that it is more important to prevent the very first episode of low back pain from occurring by learning about the primary causative mechanisms. The aim of this thesis therefore is to advance theories about the possible causes of the first ever episode of low back pain for primary prevention.

The qualitative, in-depth interview study presented in this thesis approaches the study of the first ever episode of low back pain, its antecedents and causal attributions from the perspective of subtle realism. Thirty participants presenting to NHS hospital physiotherapy and medical outpatient clinics were recruited for interview. The interview data were transcribed verbatim, and the data managed and analysed using Framework, a method developed by the National Centre for Social Research.

The study's findings advance knowledge about the possible role of psychological distress involving loss, anger, low mood and social withdrawal, and 'pushing worries to the back of the mind' in the genesis of non-specific symptoms including low back pain. If confirmed by further research, preventive strategies may need to address the perception that low back pain is not a stress-related condition and gender differences in the conceptualisation of stress. An area for new research is a perceived disposition to physical activity since childhood and a lifestyle described as active before the first ever episode of low back pain. Lay definitions of 'real' low back pain may assist the design of this research.

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CHAPTER ONE: INTRODUCTION

This thesis is concerned with generating a greater understanding of the aetiology of low back pain to further knowledge for primary prevention i.e. to prevent the first ever episode of low back pain.

Low back pain is a major health and socio-economic problem in Western countries. Estimates suggest that most people will experience low back pain during their lifetime (Speed 2004). The pain has been defined as an 'unpleasant sensory and emotional experience…' (IASP 1979) highlighting the interaction between the physical sensation of pain and its subjective perception (Unruh et al 2002). This involvement of psychological processes, in addition to the physical sensation of pain, disability and lost work days, can have a profound effect upon the wellbeing of the person. Most people have episodes of non-specific low back pain that are not attributable to any specific pathology such as infection, tumour, osteoporosis, ankylosing spondylitis, fracture, inflammation, radicular syndrome or cauda equina syndrome (Burton et al 2004). Paradoxically, not only is there no close relationship between the pain and any known pathology but also there is no close relationship between the pain and any disability (Waddell 2004a). Consequently, the cause, the episodic nature and the disability associated with low back pain are not well understood.

Epidemiology has sought to further knowledge about the cause, the episodic nature and the consequences of non-specific low back pain for prevention and management. *Chapter two, the epidemiology of low back pain* places this knowledge in context, by discussing the evidence that has shaped the current understanding of low back pain with regards to its incidence and prevalence; its distribution in different populations; and its determinants and consequences. Implicit in this discussion is the need to prevent low back pain and thereby reduce its impact on both the individual and society.

The prevention of non-specific low back pain, hereafter referred to as ‘low back pain’ or ‘back pain’, is contingent upon understanding its cause (Leboeuf-Yde et al 1997). To date, epidemiological research has focused on identifying factors that may play a role in the episodic course of low back pain for secondary prevention i.e. preventing recurrence of the pain and its consequences e.g. disability, work loss and care seeking, rather than on preventing the incidence i.e. the first ever episode of low back pain (Burton et al 2004). Given the high lifetime prevalence and the self-limiting nature of back pain in most people, and the methodological difficulties defining the incidence of low back pain, some researchers have questioned whether preventing the first ever episode of low back pain is either a realistic or a practical goal because the primary causative mechanisms of low back pain remain undetermined (Coste et al 1994, Frank et al 1996a, Burton 1997, Burton 2005).

It is argued within this thesis however, that it is important to learn about the primary causative mechanisms to increase the opportunities for prevention. In this way primary prevention may become a realistic and practical goal. This argument is based on strong research evidence indicating that an episode of low back pain is the most marked predictor of future back pain and is correlated with other risk factors (Troup et al 1987, Burton et al 1989, Bigos et al 1991, Maul et al 2003). It is possible therefore that low back pain cannot be reversed once it has occurred (Wedderkopp and Leboeuf-Yde 2008). Consequently, Wedderkopp and Leboeuf-Yde (2008) suggest that primary prevention should be the goal (Wedderkopp and Leboeuf-Yde 2008). It follows that primary prevention, if successful, may ameliorate the suffering and the socio-economic consequences of recurrent and persistent episodes of low back pain.

Chapter three, *studying causal (risk) factors for the first ever episode of low back pain*, serves as a primer for chapter four. It discusses the need to

distinguish the antecedent factors that may play an aetiological role from those that may follow the onset of low back pain and dispose to recurring and persisting episodes of pain. This need to identify the antecedents of low back pain that may play an aetiological role has been identified by the Arthritis and Rheumatology Council -ARC- the fourth largest medical charity in the United Kingdom now known as Arthritis Research UK (Macfarlane 2005, Arthritis Research Campaign 2008).

Until now, epidemiological research appears to have studied the antecedents of the first ever episode of low back pain from a positivist perspective using quantitative methods. From this positivist perspective the most appropriate type of study design is the prospective cohort study from which it is possible to determine whether there is a predictive association between exposure to a hypothesised causal (risk) factor and low back pain. Evaluating evidence of causality from these studies however is not straightforward. Philosophical considerations and causal criteria (Bradford Hill 1965), in addition to methodological difficulties such as recruiting a cohort without a history of low back pain and defining the first ever episode of low back pain are discussed within chapter three.

Chapter four, a *systematic review of the hypothesised causal (risk) factors in the incidence of low back pain,* presents a comprehensive synthesis of the knowledge gained from prospective cohort studies about the hypothesised causal (risk) factors in the aetiology of low back pain; and provides estimates of the cumulative incidence of low back pain in different populations. Knowledge of the proportion of people who may benefit from preventive strategies is important for policy and service delivery. By virtue of their design and underlying positivist philosophy however prospective cohort studies cannot answer all research questions relating to causality. Therefore, there is a need for additional study designs and methodologies based on different philosophical perspectives.

Since pain is a matter of self-perception, one different philosophical approach to advancing knowledge about the possible cause of low back pain is to adopt an interpretive (qualitative) perspective from which to listen and learn about people's accounts of life before low back pain and their own causal theories. Accordingly, this approach to studying low back pain was adopted for the study presented in chapters five to seven.

Chapter five, *the study,* documents the study's goal, to advance knowledge of the perceived causes of low back pain for primary prevention by studying lay perceptions of the first ever episode of low back pain, its antecedents and lay causal attributions. The methods by which these objectives were met are described within this chapter. They include the recruitment of participants from NHS hospital physiotherapy and medical outpatient clinics; the selection of in-depth interviews to collect the data; and the data management and analysis using Framework, a method developed by the National Centre for Social Research (Ritchie and Spencer 1994, Ritchie et al 2003a).

Chapter six presents *the study's findings* from the participant's accounts. In turn, these findings are discussed in relation to the literature and the study's aims in Chapter seven. Chapter eight concludes the thesis with a summary of how the study has advanced knowledge for the primary prevention of low back pain and provided new insights and directions for future research.

CHAPTER TWO: THE EPIDEMIOLOGY OF LOW BACK PAIN

INTRODUCTION

The purpose of this chapter is to define key terms and place the content of this thesis in context by providing a narrative review of the epidemiological literature that has shaped the current understanding of low back pain.

Epidemiology is the scientific study of factors determining and influencing the *frequency*, *distribution* and *determinants* of disease, injury or health related events. In contrast to healthcare, where the emphasis is on the individual, epidemiology examines patterns of disease in groups of people (populations) with the purpose of identifying strategies for prevention and management (Hennekens and Buring 1987, Greenberg et al 2005).

The salient words in this definition – *frequency, distribution, determinants* – underpin all epidemiological principles and methods. Frequency involves quantifying the occurrence of the disease, injury, or health-related event, in the population. Distribution seeks to answer questions regarding who in the population is likely to get the disease as well as where does the disease occur and when does it occur? The determinants of the disease (risk factors) are derived from testing hypotheses to identify the nature of the disease and its causal factors. These hypotheses are formed from the knowledge gained about the frequency and distribution i.e. the patterns of the disease (Hennekens and Buring 1987, Greenberg et al 2005).

The frequency, distribution and determinants of disease are studied in different populations such as the general population, the working population, patients in primary care and / or in the hospital or specialist setting. Each specific population provides different information about the nature of the

disease. The following sections discuss current knowledge about the frequency, distribution and determinants of low back pain in these different populations.

FREQUENCY OF LOW BACK PAIN

DEFINITION OF TERMS

The frequency of low back pain is usually described in terms of its incidence and prevalence.

Incidence conveys information about the risk of experiencing low back pain for the first time. It is defined as the proportion (percentage) of 'new cases' occurring during a given period of time among a group initially symptom-free. The 'lifetime incidence' is the total number of people who have or have had low back pain during their lifetime (Hennekens and Buring 1987).

Prevalence conveys information about the number of 'existing cases' in a population i.e. how widespread low back pain is and the likelihood (risk) of an individual suffering from it. It is defined as the proportion (percentage) of the population that experience low back pain during a past period of time (period prevalence) such as in the past month, year or lifetime; or at a specified point in time (point prevalence) e.g. the proportion of people reporting low back pain on the day of a survey (Hennekens and Buring 1987, Skovron 1992, Manek and MacGregor 2005).

Deyo and Tsui-Wu (1987) use the term 'cumulative lifetime prevalence' rather than 'cumulative incidence' indicating some confusion in the literature with regard to the use of the terms 'lifetime prevalence' and 'lifetime incidence'.

Incidence

Only a few studies have estimated the incidence of low back pain (van Tulder et al 2002) and no systematic review of these studies appears to have been carried out. Shekelle (1997) suggests that the annual incidence rate ranges from 1.4 to 4.9% on the basis of his informal review of studies published between 1969 and 1995. Some incidence estimates published after Shekelle's (1997) review also fall within this range. For example, Croft et al (1995), Hillman et al (1996), Waxman et al (2000) and Walker et al (2004) identified annual incidence rates in the general population of 4%, 4.7%, 4% and 8% respectively. Other studies however have reported higher annual incidence rates such as 18.4% in an urban population (Jacob 2006) and 20 to 28% in scaffolders (Elders and Burdorf 2004). Waddell (2004b) suggests that the widely differing figures for incidence are associated with methodological difficulties including the lack of an agreed definition of what constitutes a 'new case' of low back pain. These difficulties are further discussed in chapter three.

Prevalence

Prevalence rates have been more widely estimated than incidence rates. They reveal that most people experience back pain during their life. Reviews of international surveys reveal that the lifetime prevalence of low back pain ranges widely from 59% to 84%; the annual prevalence ranges from 27% to 65%; the monthly prevalence ranges from 19% to 43%; and the point prevalence ranges from 12% to 33% (Walker 2000, Waddell 2004b).

In Britain, the most frequently cited population surveys show a life time prevalence of 58% (Walsh et al 1992), a point prevalence of 14% (Mason 1994) and an annual prevalence rate of 36% (Walsh et al 1992) and 37% (Mason 1994). Maniadakis and Gray (2000) suggest that the percentage difference between these two annual prevalence estimates may be because of the difference in age range between the studies: those taking part in the

earlier survey by Walsh et al (1992) were between 20 to 59 years of age and those in the later survey by Mason (1994) were 16 years of age and above. These prevalence rates are similar to those found in two national surveys in which 40% of adults reported having back pain in the past year (Dodd 1996, Department of Health 1999). Waddell (1994) however points out that mean estimates such as these obscure considerable variations within different groups, for example by age.

It is generally assumed that the prevalence of low back pain has remained stable during the past fifty five years (Manninen et al 1996, Croft 2000, Waddell 2004b). Empirical evidence challenging this assumption however has been published by Palmer et al (2000). Palmer and his colleagues (2000) compared the data from two surveys carried out in the ten years between 1988 (Walsh et al 1992) and 1999 (Palmer et al 2000) and found that the annual prevalence rate of low back pain had risen from 36.4% to 49.1% i.e. to half the adult population. Wang (2000) questioned the validity of this finding on the basis of the low response rates (respectively 59% and 57%) in the two surveys. A response rate in population surveys lower than 66% is insufficient to generalise the estimates to the whole population from which the sample is drawn (Marshall 1987). Moreover, Macfarlane et al (2000) draw attention to two surveys with higher response rates i.e. 75% (Croft et al 1993) and 84% (Garrow et al 2000) that suggest a slight decrease in prevalence occurred between 1991 and 1998. Croft (2000) appraised the issue in an editorial and carefully considered the explanation favoured by Palmer et al (2000) that their findings may reflect a cultural shift, an increase in symptom reporting. He concluded that there is little evidence to challenge the status quo i.e. to suggest that back pain is becoming more common (Croft 2000). Other authors (e.g. Waddell 1994, Leboeuf-Yde and Lauritsen 1995) however question whether it is possible to conclude whether or not the prevalence of back pain is increasing because of the methodological differences between the surveys. The study carried out by

Leino et al (1994), however, did not show an increase in prevalence despite using the same methods for 14 successive years.

METHODOLOGICAL CONSIDERATIONS

It is generally agreed that the differing incidence and prevalence rates of low back pain are a function of methodological differences and in some studies a lack of rigour. A fundamental problem is that there is no consensus as to what constitutes a 'new case' of low back pain or 'low back pain' per se (Von Korff 1994, de Vet et al 2002). Loney and Stratford's (1999) systematic review highlights the diverse range of definitions of 'low back pain' in terms of its anatomical location, the frequency of the episodes, and their severity and duration. In one study, low back pain may need to be present for most days in a two week period whereas in another study it may only need to be present for one day. Consequently, a person with low back pain may be included as a 'prevalent case' in one study but not in another. Furthermore, individuals with recurrent and longer episodes of low back pain are more likely to be represented in prevalence data (Skovron 1992).

A second problem involves deficiencies in the validity and reliability of instruments (interviews, questionnaires) used to document low back pain. Non-specific low back pain is necessarily based on self-report given the lack of any identifiable pathology. However, these reports can be inaccurate. In Biering-Sorensen and Hilden's (1984) study, for example, 16% of the sample inconsistently answered questions of ever having had back pain, and Walsh and Coggon (1991) found 11% of their sample inconsistently reported low back pain.

A third problem is that period prevalence and incidence estimates may be biased by poor recall. Evidence suggests that the lack of recall may occur as early as four months after an episode (Carey et al 1995) and ten percent of

people may forget an episode of back pain reported three years earlier (Waxman et al 2000). The longer a period of time has elapsed since an episode of low back pain, the greater the likelihood an individual will forget the event. This likelihood is increased where the back pain is of short duration and infrequent (Biering-Sorensen 1984a). Poor recall of back pain results in an under estimation of incidence and prevalence rates. Some authors (e.g. Carey et al 1995), however, point out that the consequences of 'recall bias' are countered by 'forward telescoping', the tendency to recollect events as occurring more recently than is actually the case. 'Forward telescoping' tends to increase the prevalence estimates in a specified time period (Volinn 1997).

Estimates of point prevalence are not biased by poor recall and consequently are favoured by some authors e.g. Loney and Stratford (1999). Nonetheless, like period prevalence, point prevalence estimates can be biased by the difficulties of definition discussed above and by other methodological issues such as: (1) studying different populations that have significant differences in (risk) factors associated with low back pain (Walker 2000); (2) omitting to document age-specific prevalence for comparison (Walker 2000); (3) grouping data from the general population with data from specific populations e.g. general practice patients (van Tulder et al 2002); (4) omitting to consider attrition rates and the reasons for the losses to follow-up (Hennekens and Buring 1987); (5) omitting to consider that people with low back pain are more likely to participate in a study which may lead to their over representation in the sample (Walker 2000) and (6) the phrasing of questions about whether someone has low back pain may influence the response (Walker 2000, van Tulder et al 2002). van Tulder et al (2002) provide examples of the various questions asked to measure incidence and prevalence in epidemiological studies. Asking someone about low back pain on the day of the survey is likely to underestimate the true recent occurrence

of the symptom, given its episodic nature, duration and severity from day to day (Papageorgiou et al 1995).

Bearing these caveats in mind it is possible to understand the variation in incidence and prevalence estimates. The conclusion from the prevalence estimates is that low back is a common condition in Western countries (van Tulder et al 2002) and that most people will experience low back pain during their lifetime.

COURSE OF THE INCIDENCE AND PREVALENCE OF LOW BACK PAIN

The relatively low incidence to prevalence of low back pain suggests that the symptom waxes and wanes over time. Croft et al (1998) described the course of low back pain as '…a chronic problem with an untidy pattern of grumbling symptoms and periods of relative freedom from pain and disability interspersed with acute episodes, exacerbations and recurrences'. The evidence to support this view stems from the research findings that most people experience low back pain in their life; the episodes usually settle but residual symptoms are common; an episode of low back pain is the strongest predictor of further episodes; and recurrences are common (Papageorgiou et al 1996, Croft et al 1998). Also, the nature of the pain changes over time (Cedraschi et al 1999, Waxman et al 2000, Hestbaek et al 2003a, 2003b).

Cedraschi et al (1999) found 18% of a small population (n=252) had chronic low back pain (duration of pain greater than three months) at baseline and 19% had chronic low back pain three years later. Chronicity however was present both times in only 8% of the population indicating that the same individuals do not necessarily have chronic low back pain at two different points in time. In a larger population (n=813), Hestbaek et al (2003b) surveyed low back pain sufferers at three points in time over five years. The

population was divided into three groups: no pain, short term pain, and long lasting/recurring pain. Transitions between the groups were common except between the no pain and the long lasting/recurring pain groups. One third of all the study's subjects remained in the same group over the three survey points. Only 10% reported long lasting/recurring low back pain at all three surveys, a finding remarkably similar to Cedraschi et al (1999) despite Hestbaek et al (2003b) utilising a broader definition of chronic low back pain.

This contemporary view of the course of low back pain is superseding the traditional view that the course of low back pain comprises a large number of acute episodes that resolve spontaneously in the majority of people and only persist in the minority. The traditional pre-fixes of 'acute' and 'chronic' low back pain however continue to be used in clinical practice and research although their definition varies. This classification of back pain as 'acute' or 'chronic' may be convenient clinically but, as Waddell (2004a, 2004b) points out, it does not provide an accurate picture of the course of low back pain. Consequently, the traditional view of the course of low back pain has been found wanting because it is difficult to reconcile research findings with the belief that in the majority of people low back pain is a benign short lived condition with a favourable course.

Dixon's (1973) study appears to be partly responsible for the belief that 90% of low back pain episodes resolve spontaneously within a month (Hestbaek et al 2003a). However it is difficult to reconcile Dixon's (1973) finding with those from the two British population surveys (Walsh et al 1992, Mason 1994) suggesting 38% of adults report a substantive episode of low back pain in one year and a third of these people experienced the symptom for more than four weeks (Croft et al 1998). Furthermore, there appears to be some confusion regarding what constitutes 'recovery'. Dixon (1973) actually reported that 90% of patients stopped consulting their medical practitioner for low back pain within one month. Consulting cessation however does not

necessarily mean that an individual's pain has resolved as exemplified by the Manchester study of Croft et al (1998). In this study most people (75%) experienced pain one year after consultation despite having stopped consulting with symptoms within three months (Croft et al 1998). The systematic review by Hestbaek et al (2003a) also showed that 62% (range 42% to 75%) of patients experience pain after 12 months, again dispelling the belief that 90% of low back pain episodes resolve spontaneously within one month.

Waddell's (1987) research findings also appear to have been misconstrued: they are frequently cited as reporting that 80% to 90% of episodes resolve within six weeks irrespective of treatment (Croft et al 1998, Hestbaek et al 2003a). Again, it is difficult to reconcile this with the findings of the studies noted above. Like Dixon (1973), Waddell (1987) did not actually refer to the resolution of symptoms. He referred to return to work. Return to work provides an incomplete view of recovery because patients may return to work despite still having back pain, return to physically less demanding employment, change jobs, and / or reduce their workload (Fishbain et al 1996, Hestbaek et al 2003a).

Given the confusion in the literature regarding the variations in the definitions of low back pain and recovery, Hestbaek et al (2003a) investigated the long-term course of the incident and prevalent cases of low back pain by reviewing the literature systematically. The results of the review confirmed that low back pain does not resolve spontaneously.

DISTRIBUTION OF LOW BACK PAIN (PATTERNS OF OCCURRENCE)

AGE

The onset of back pain is common in children and young people under twenty years of age (Jones and Macfarlane 2005). Its prevalence increases

with age and peaks in adults between the ages of 45 to 59 years (Papageorgiou et al 1995, Balague et al 1999). Paradoxically, it appears to fall slightly thereafter (Bressler et al 1999, Dionne et al 2006). It is uncommon for back pain to occur for the first time after the mid-50s (Burton and Waddell 2004).

Little was known about the incidence and prevalence of back pain in children and adolescents until relatively recently: they did not seek healthcare for the pain and consequently it was perceived to be unimportant (Jones and Macfarlane 2005). Epidemiological studies, however, challenge the traditional view. They suggest that the incidence and prevalence of back pain in young people is higher than previously thought (e.g. Brattberg 1994, 2004, Burton et al 1996a, Balague et al 1999, Nachemson and Vingard 2000). Burton and Waddell (2004) however caution against attaching undue significance to these findings for methodological reasons. They recommended that back pain in younger people be considered ‘a normal life experience’ whilst acknowledging that it is plausible for the search for causes of back pain to start in children and adolescence. Since Burton and Waddell’s (2004) caution evidence has been published suggesting a correlation between low back pain in childhood/adolescence and back pain in adulthood. This evidence stems from a study following 9600 twins on the Danish Twin Register, the most comprehensive population-based twin register in the world (Hestbaek et al 2006).

GENDER

Population surveys (Consumers' Association 1985, Mason 1994, Papageorgiou et al 1995), with the exception of the survey by Walsh et al (1992), suggest that there is a slightly higher prevalence of back pain in women compared with men. These findings are consistent with the finding that women generally report more symptoms than men (Main 1983). Consequently, it is thought unlikely that the higher prevalence is due to any

physical difference (Burton and Waddell 2004) apart from during pregnancy. Many women experience back pain during pregnancy (Mogren and Pohjanen 2005). However it is not thought to have lasting effects (Burton and Waddell 2004).

ETHNIC GROUPS

The incidence and prevalence of back pain among the different ethnic groups living in the UK does not appear to have been estimated (Njobvu et al 1999). There is some evidence to suggest that musculoskeletal symptoms are slightly more prevalent among people from ethnic minority groups (South Asian and Caribbean communities) than among the white population, and that widespread pain is considerably more common among the ethnic minority groups (Allison et al 2002, Macfarlane et al 2005). It is not clear however whether these findings stem from an increase in morbidity, differences in perception of pain and / or symptom reporting (Njobvu et al 1999). The prevalence of musculoskeletal symptoms in the South Asian countries are largely unknown and consequently few comparisons can be made with the UK data (Njobvu et al 1999). One study that suggests low back symptoms are more common in Pakistani people living in England compared to those living in Pakistan (Hameed and Gibson 1997).

COMORBIDITY

Epidemiological studies reveal back pain is frequently distributed among people with other health conditions. This is consistent with the high prevalence of back pain and its ranking as the third most common symptom after headache and fatigue (Waddell 2004b).

The Nuprin pain report found 90% of people with frequent episodes of back pain had multiple pains although the low back pain was the ‘most troublesome’ (Taylor and Curran 1985). Multiple pains have also been

reported by patients in primary and secondary care. In primary care, Porter and Hibbert (1986) found men with back pain were eight times more likely to report neck pain. In secondary care, Frank et al (2000) found 205/538 (38%) of patients with back pain also reported other musculoskeletal pain complaints (neck pain, thoracic pain, peripheral joint arthritis and soft tissue rheumatism). Hagen et al (2006) also found a high prevalence of musculoskeletal pain complaints (neck pain, upper back pain, pain in feet, headache and migraine) in people sick listed for back pain compared with a normal reference population. Makela et al (1993) studied the relationship between the musculoskeletal pains and found the strongest association was between back pain and neck pain and osteoarthritis of the hips and knees. Inflammatory joint disease however was quite distinct. Cote et al (2000) also noted the relationship between back and neck pain and other painful disorders, and the tendency for them to cluster in some individuals. Croft et al (2003) questioned whether this clustering of symptoms occurred because of a shared pathophysiological mechanism. They hypothesised that this would be unlikely if any one syndrome retained its distinctiveness over time and proceeded to carry out a 25 year follow-up study of 10,073 women. Distinct patterns of pain complaints over time were found: back pain was associated with musculoskeletal pain complaints recorded 15 to 25 years earlier in the women's general practice notes. Also, 'any pain' was associated with musculoskeletal illness and mental disorders (mainly non psychotic anxiety and depression) 15 to 25 years earlier albeit more markedly in women with widespread compared with regional pain. Croft et al (2003) therefore concluded that the genesis of the symptom clusters does not lie in a common pathophysiological mechanism.

Musculoskeletal pain is also distributed frequently in people with symptoms from bodily systems apart from the musculoskeletal system, and there is evidence to suggest that the greater the number of the musculoskeletal complaints the greater number of other health complaints (Hagen et al

2006). The systematic review by Hestbaek et al (2003c) documents the nature of the complaints in systems other than the musculoskeletal system. They include cardiovascular disease, respiratory disorders, headaches/migraines, poor general health and various specific diseases (gynaecological disease, irritable bowel syndrome, allergy, constipation and neck pain) with the exception of diabetes.

Hestbaek et al (2003c) like Croft's team (2003) suggest research into comorbidity may result in a greater understanding of the underlying mechanism for low back pain.

GEOGRAPHICAL LOCATION

Studies of the prevalence of low back pain discussed in this chapter so far have mainly been conducted in high income countries as defined by the World Bank (World Bank 1993, Walker 2000) comprising less than 15% of the world's population, (Volinn 1997). In an attempt to learn about the prevalence of back pain in the majority of the world's population Volinn (1997) searched the literature systematically and found seventeen estimates in low and middle income countries had been published between 1975 and 1994. These estimates suggest that the urban prevalence rates of back pain in low and middle income countries are similar to those in the high income countries. Counter intuitively however there appears to be a lower prevalence in the rural populations of low income countries, where physical labour is more common, compared with the high income countries associated with urbanisation and more sedentary lifestyle. Volinn (1997) reported these findings tentatively because of the methodological concerns about estimating prevalence noted above, and as Kent and Keating (2005) point out, demographic and cultural factors including variations in the reporting of pain may have played a role.

Further studies estimating prevalence in low and middle income countries need to be carried out not only as the means to determine the need for healthcare provision within the different countries but also to see if there is a 'real' difference in prevalence rates between them as Volinn's (1997) study suggests (Walker 2000). The ability to compare prevalence rates between different populations is important because it may reveal useful insights into potential aetiological factors in back pain. Volinn's (1997) finding of a lower prevalence rate of back pain in rural populations in low income countries compared with more urban populations in high income countries, for example, suggests factors associated with urban life and not physical labour, which is more prevalent in low income countries, may play a greater role in the genesis of low back pain. Furthermore, Volinn's (1997) review suggests that industrialisation may be associated with the aetiology of low back pain given the 'sharply' higher prevalence rate among workers based in 'enclosed workshops', a term used to refer to workshops, factories and storage facilities. In an attempt to explain this finding, Volinn (1997) drew upon a study of sewing machine operators carried out in India by Nag et al (1992) linking working posture with the operators' back pain: the operators sat on a stool without a back rest with the body inclined forwards for prolonged periods of time. Furthermore, the tedious and closely supervised working conditions may have influenced the perception of pain.

In a brief review of Volinn's (1997) study, Deyo (1997) postulated that increased prevalence of low back pain in urban compared with rural populations may indicate that tension, stress and loss of autonomy are more closely linked with back pain than the physical demands of a job.

If the conclusions of Volinn's (1997) review are valid, it is reasonable to expect an increase in the incidence of low back pain to occur in countries that are rapidly becoming more urban and industrialised such as China and India (Volinn 1997).

An initiative to fill the gap in knowledge about the prevalence of low back pain in low and middle income countries, comprising the majority of the world's population, was launched by the World Health Organisation and the International League of Associations for Rheumatology in 1980 (Brooks 2006, Darmawan 2007). Known as the Community Oriented Programme for Control of Rheumatic Diseases, or COPCORD for short, useful data is beginning to emerge from community surveys (Brooks 2006). These data suggest that the prevalence of back pain in low and middle income countries is common. Community surveys in Bangladesh (Haq et al 2005), India (Chopra et al 2002), Malaysia (Veerapen et al 2007), South East China (Zeng et al 2004), North East Queensland -aboriginal Australians- (Minaur et al 2004) and Cuba (Llerena et al 2000) respectively report point prevalence rates of 9%, 11%, 12%, 12%, 13% and 14% which are similar to those in high income countries. Such knowledge needs to be expanded in the forthcoming years.

DETERMINANTS OF LOW BACK PAIN (RISK FACTORS)

Given the high prevalence of low back pain, a large number of epidemiological studies have sought to identify the determinants of back pain. Many of the earlier studies, e.g. Burton and Tillotson (1991), were cross sectional in design, testing hypotheses for statistical associations between the prevalence of reported symptoms and physical characteristics (variables). Variables found to be associated with back pain were frequently referred to as risk factors when, strictly speaking, they were risk markers i.e. factors associated with the risk of experiencing a disease, injury or health-related event that do not necessarily play a causal role (Burton and Waddell 2004, Yarnell 2007).

In recent years, the need for longitudinal studies, particularly prospective cohort studies, to identify physical and psychosocial risk factors, and any predictive association between them and the incidence of low back pain has

been recognised by epidemiologists (Nachemson 2000). Risk factors for the incidence of back pain are the closest to what can be considered possible causes of back pain (van Tulder et al 2002, Burton and Waddell 2004). No review of these studies however appears to have been carried out. This gap in the literature is addressed in chapter four of this thesis which provides a synthesis of the findings from prospective cohort studies examining the risk factors for the incidence of low back pain. Methodological issues relating to studying the incidence of low back pain are discussed in chapter three which serves as a primer for chapter four.

Until now, evidence regarding the causal (risk) factors for low back pain has been obtained from studies associated with the onset of new episodes of back pain and not necessarily the first ever episode of low back pain i.e. the true incidence of low back pain in people with no history of the symptom. Burton and Waddell (2004), for example, summarised the evidence on the strength of risk factors from eight reviews published by Burdorf and Sorock (1997), Hoogendoorn et al (1999, 2000), Linton (2000), Nachemson and Vingard (2000), National Research Council (2001), National Research Council and Institute of Medicine (2001) and National Institute for Occupational Safety and Health (1997). They concluded that there was:

- *Strong evidence* that a previous episode of back pain has a large effect on the risk of a subsequent episode occurring; manual handling and lifting having a moderate (possibly variable) effect; bending and twisting, driving and whole body vibration having a small to moderate effect; emotional distress, job dissatisfaction, and low social support having a small effect; body build, height, weight, leg length inequality, static work postures and sitting, leisure activities, and (most) sports having no effect; and gender, age, and social class and education (men) having a variable effect.

- *Moderate (possibly strong) evidence* for genetic / familial factors having a variable effect on back pain.

- *Moderate evidence* for physical fitness having no effect on back pain.

- *Inconsistent evidence* on smoking having a small effect; high job demands, pace of work and poor job content having no effect; and repetitive movements and job strain unproven effects.

- *Limited evidence* on work stress having a small effect.

CONSEQUENCES OF LOW BACK PAIN

DISABILITY

Where activity aggravates the back pain and the individual avoids or reduces their activities, the pain may lead to disability (reduced function / performance). Low back pain is commonly associated with disability, particularly in adults of working age. The prevalence of the disability however is not directly proportional to the prevalence of low back pain. Some people with back pain experience no disability whilst others find they are mildly or severely restricted in their daily activity. Permanent disability associated with low back pain is rare (Waddell 2004a).

Surveys carried out in 1991-1992 and 1994 respectively revealed that 11.9% (Eurostat 1995) and 11% (Mason 1994) of adults in the UK reported activity limitations. These estimates are similar to the proportion of people with self reported disability in other EU countries (Eurostat 1995) and in America (Taylor and Curran 1985). The proportion of people in receipt of disability pensions is also similar throughout Europe (Eurostat 1995). In the UK 2.8% of adults were in receipt of disability pensions in 1991-1992 (Eurostat 1995). Such estimates are lower than the self-reported disability rates because the pensions are only available to people less than 60 years of age who meet specific criteria.

The disability associated with low back pain appears to have increased more quickly than disability associated with any other condition. The UK Labour Force Survey suggests it rose from 10 to 14% between 1984 and 1998 placing increasing demands on the NHS and Department for Work and Pensions (Labour Force Survey 1998). Changing attitudes, a greater awareness and reporting of disability, an increase in the workforce and the wording of survey questions (Waddell 2004b) appear to have played a role rather than any 'real' change in disability (Labour Force Survey 1998).

INCAPACITY FOR WORK

An important consequence of disability is the incapacity for work. It impacts upon the individual and the family in terms of loss of earnings, social standing and self-respect amongst other factors, and upon employers, the economy and social costs. Epidemiological studies estimate the prevalence of the incapacity to work either through self-report or by proxy utilising sickness records, certificates and social benefits.

The annual prevalence of self-reported work loss in the surveys by Walsh et al (1992) and Hillman et al (1996) were found to be 8% and 6.4% respectively. Walsh et al (1992) further suggested that men were more likely than women (men = 9.5% vs. women = 6.5%) to take time off work during any one year, a finding similar to Santos-Eggiman et al (2000), and also to take more time off work over a lifetime. The lifetime prevalence of having taken time off work by the age of 50 years was reported by 40% of men and 30% of women (Walsh et al 1992). It is possible however that these findings reflect the social roles of men and women in the workplace. For many years, low back pain disability was considered a male problem (Waddell and Allan 2004). Statistics from the Department of Social Security (now the Department for Work and Pensions), however, reveal that by the 1990s the female sickness and invalidity benefit claims for back incapacities were catching up with those claimed by men (Waddell 2004b). This seems largely

due to more women working and becoming entitled to benefits (Burton and Waddell 2004).

The most recent statistics show the dramatic increase in sick certificates and social security benefits between the 1950s and the 1990s has been reversed (Waddell et al 2002). Since 1994/5 there has been a 42% fall in new awards for back pain compared with a 25% fall in new awards for all conditions. This suggests that just over half the fall in benefits may be accounted for by changes in the social security system, and that less than half is unique to back pain. This fall has coincided with the more active clinical management of back pain and socio-cultural changes including initiatives to get people off benefits and back to work (Waddell et al 2002, Waddell 2004b).

Presently, back pain accounts for 13.5% of all incapacity benefits in the UK. This estimate relates to people with more severe disability because individuals may not receive the benefits until they have been off work for 28 days (Waddell et al 2002, Waddell 2004b). Also, benefits depend on entitlement: people may be off work but not entitled to benefits and therefore excluded from the official statistics. Others may be at work but undertaking lighter duties and are consequently less productive (Waddell et al 2002, Waddell 2004b).

HEALTHCARE UTILISATION

Consultation behaviour

Most people with episodes of low back pain appear to cope with the pain themselves without any need for healthcare: they do not see the back pain as a medical condition. Where consultation does occur, women consult slightly more than men as they do for all health complaints (Papageorgiou et al 1996, Waddell 2004c) including painful disorders in parts of the body apart from the lower back (Derbyshire 2008).

The Consumers' Association survey (1985) found that approximately one third of back pain sufferers had never sought any help, one third had sought treatment at some time in the past and one third had sought treatment within the past year. The finding that one third of people had sought help within the past year is similar to the contemporary findings from the Working Back Scotland Surveys (Waddell 2004c) although slightly lower than a national survey (Department of Health 1999*)* where some 39% of back pain sufferers reported consulting their GP within the past year. When people consult their GP they do not necessarily do so immediately they experience the pain. In a large population survey of people living in South Manchester, for example, approximately one third of the back pain sufferers consulted their GP within one week of the onset of the back pain while two thirds waited for one month (Croft et al 1998).

The decision to seek care is thought to be associated with many factors that may change over time (Hurwitz and Morgenstern 1999). Studies of healthcare utilisation among back pain patients suggest that the nature of the pain plays a role in the decision to seek care. Specifically, this includes higher levels of pain (Wright et al 1995, Carey et al 1995), pain lasting two or more weeks, pain extending down the leg (Carey et al 1995), pain severity in the two weeks after onset (Waxman et al 1998), and severe and longer episodes of pain (Consumers' Association 1985, Taylor and Curran 1985). The South Manchester study however is said to have found little difference in the nature of the pain between 'consulters' and 'non-consulters' (Waddell 1994).

In addition to the nature of the pain, several other factors appear to influence the decision to seek care. These include: higher levels of stress (Taylor and Curran 1985), pain behaviour (Mechanic 1968), fear that back pain may impair life in the future (Carey et al 1995), increased disability, externalised beliefs about pain management, depressive symptoms (Waxman et al 1998),

psychiatric morbidity (Wright et al 1995), distress (Croft et al 1995), cultural factors (Carey et al 1995), the occurrence of pain at work (Carey et al 1995), and disability (Mortimer et al 2003). Conversely, people may decide not to seek care for their back pain if they have other conditions perceived to be more disabling and / or more amenable to care (Hurwitz and Morgenstern 1999).

Socio-cultural factors may also play a role in consulting behaviour. Evidence from national surveys suggest that South Asian children and adults consistently attend general practices more frequently than other populations (Johnson et al 1983, Balarajan 1989, Modood 1997, Cooper et al 1998) and are less likely to be referred to hospital inpatient and outpatient services (Smaje and Le Grand 1997, Cooper et al 1998, Saxena et al 2002).

The findings from a number of local studies are consistent with the findings from the national studies (Smaje and Le Grand 1997). Furthermore, one of these studies, by Gillam et al (1989), specifically reported that South Asian patients had higher GP consultation rates for low back pain and other non-specific symptoms compared with British and Southern Irish patients attending the same practice. This GP practice, located in Brent, is adjacent to the Borough of Harrow where the data for this thesis was collected.

There is little information to explain the more frequent GP attendance pattern amongst the South Asian population. Consequently, it is not known whether it is because of a real difference in health or differing perceptions of illness (Gillam et al 1989, Njobvu et al 1999). Also, the reason for the lower GP referral rate of South Asian patients to outpatient services is unclear. Nvobju et al (1999) suggest that it may indicate that GPs manage and / or interpret symptoms differently in this group of patients.

Costs

Accurate costs for low back pain are difficult to obtain (Waddell 2004c): several estimates that vary widely have been published (e.g. Coyle and Richardson 1994, Klaber Moffett et al 1995, Maniadakis and Gray 2000). Nonetheless, they reveal the huge economic burden that back pain poses to society.

The most recent estimate of the direct cost of low back pain to the NHS in 1998 was £1623 million. One hundred and forty one million pounds (64%) of the total was estimated to have been spent on GP consultations and £251.2 million (37%) was estimated to have been spent on NHS (£150.7 million) and £100.5 million on private physiotherapy services (Maniadakis and Gray 2000).

The direct costs of back pain appear insignificant compared with the indirect costs from sick leave resulting in loss of productivity, sickness and social care benefits, estimated to total some £10688 million in 1998 (Maniadakis and Gray 2000). Nearly 5 million working days were lost as a result of back pain in 2003-2004. This meant that on any one day during the year, one percent of the working population was on sick leave with a back problem (Health and Safety Executive 1999). GP sickness records suggest the annual prevalence for work loss due to back pain is approximately 8% of the adult population (Office of Population Censuses and Surveys 1996, Watson et al 1998). GP records provide more accurate estimates than population surveys where back pain consultations may be confounded with consultations for comorbid conditions (Maniadakis and Gray 2000). Most people return to work within four to six weeks although they may still be symptomatic (Watson et al 1998). The longer a person is off work with back pain the lower the chance that they will return to work. After some six months there is a 50% chance of returning to work which falls to 25% at one year and 10% at two years (British Society of Rehabilitation Medicine 2000).

Once unemployed, the person is disadvantaged further with regard to returning to work and likely to be in receipt of social benefits (Waddell et al 2002).

The direct and indirect costs do not consider the personal financial costs that the person with back pain may face. Broadly, these personal costs fall into two categories namely loss of income and extra expenditure (Health and Safety Executive 1999). The loss of income may result from inability to work whilst the extra expenditure may be incurred as a result of treatment e.g. the need to buy extra medicine, and extra living expenses e.g. the need to purchase goods in accessible but more costly, convenience stores (Health and Safety Executive 1999). The human costs in terms of the impact of back pain on the individual's quality of life, and wellbeing, and on family and social relationships cannot be quantified.

SUMMARY

Given the high prevalence of low back pain and its costs to society and the individual, epidemiologists have sought to understand the frequency, distribution and determinants of low back pain and its consequences. This research has shaped the current understanding of low back pain and provided useful information for secondary prevention and management. Relatively, little is known, however, about the incidence of low back pain despite the observation that the determinants (risk factors) of the incidence of low back pain are the closest to what can be considered possible causes of low back pain (van Tulder et al 2002, Burton and Waddell 2004). The need to learn more about the possible causes of low back pain has been recognised by epidemiologists (White and Gordon 1982, Nachemson 2000, Coggon 2005). This need is addressed in subsequent chapters in order to advance knowledge for primary prevention.

CHAPTER THREE: STUDYING CAUSAL (RISK) FACTORS FOR THE FIRST EVER EPISODE OF LOW BACK PAIN

INTRODUCTION

Before an optimal primary preventive strategy can be designed, research is needed to generate a better aetiological understanding of the relationship between risk factors, any interactions between them, and the first ever episode of low back pain. Presently, these primary aetiological mechanisms remain largely unknown. It has been proposed, however, that the mechanisms that play a role in the first ever episode of low back pain may differ from the factors that maintain it, that is cause it to recur or persist after onset (Burton et al 1996b, Frank et al 1996a, 1996b, Linton 2000, 2001). Consequently, it is necessary to make a clear distinction between the risk factors for the development of the first ever episode of back pain, the onset of recurrent episodes and persistence of symptoms, and the prediction of outcome (Bongers et al 1993). In other words, it is necessary to disentangle the antecedent factors that may play a role in the aetiology of back pain from those that may play a role in its consequences and dispose to recurring episodes and persisting symptoms. Rothman (2002) suggests that these antecedent factors may comprise an antecedent event, condition or characteristic.

Insufficient attention has been paid to identifying and investigating the antecedents of low back pain that may play a role in its aetiology (Linton 2000). Nachemson and Vingard (2000) and Sieben et al (2002) suggest this is because it is impossible to differentiate the antecedents of the first ever episode of back pain from the antecedents of recurring episodes and persisting symptoms. Chapter four in this thesis however demonstrates that it is possible to differentiate the antecedents of recurring episodes from the antecedents of the very first episode of low back pain. The need to

distinguish the antecedents for the first ever episode from the antecedents of recurring episodes of back pain is important to further knowledge of the aetiology of low back pain (Garg and Moore 1992, Bongers et al 1993).

The need to distinguish the antecedents of back pain from its consequences is exemplified by the review of comorbid symptoms and back pain by Hestbaek et al (2003c). Hestbaek et al (2003c) found that researchers have not sufficiently questioned whether the symptoms of ill-health, frequently reported by people with back pain, antecede or follow the first onset of back pain, and studied their temporal development accordingly. If the symptoms are found to antecede the first onset of low back pain, it is possible that they may play a role in its genesis whereas if they follow the onset of the pain they may be a consequence of it. Alternatively, if there is no consistent pattern, the symptoms may simply co-exist and / or share an underlying cause. Research into the temporal development of symptoms of ill-health before the first onset of back pain may therefore result in greater understanding of the underlying aetiological mechanism of low back pain. Such research, from a qualitative perspective, forms part of this thesis.

Parallel work is being carried out by researchers elsewhere in an attempt to disentangle the antecedents of chronic pain from its consequences and thereby learn more about its genesis. For example, since Dworkin (1991) first drew attention to the need to learn more about the relationship between depression and chronic pain, researchers (e.g. Fishbain et al 1997, Worz 2003) have been endeavouring to resolve the debate as to whether the symptom of depression is a cause or a consequence of chronic pain.

PROSPECTIVE COHORT STUDIES

To-date, epidemiological research has studied the antecedents of the very first episode of low back pain from a positivist perspective using quantitative

methods. Interpretive perspectives using qualitative methods do not appear to have been utilised. From this positivist perspective, researchers identifying the antecedents of low back pain that may play an aetiological role utilise longitudinal study designs by which it is possible to determine whether or not a hypothesised causal (risk) factor antecedes the onset of back pain in time. The most robust type of longitudinal study design to achieve this is the prospective cohort study sometimes referred to as a prospective study, a cohort study, or follow-up study for short (Hennekens and Buring 1987).

Epidemiologists, some twenty five years ago, recognised the need for prospective cohort studies, using multivariate data analysis techniques (see below), to identify the antecedents of back pain that may play an aetiological role (White and Gordon 1982). Since then, however, few prospective cohort studies have been carried out (van Tulder et al 2002). For example, only forty prospective cohort studies investigating work-related psychosocial factors in the genesis of low back pain appear to have been published between 1990 and 2002 (Hartvigsen et al 2004) and no systematic review of prospective cohort studies investigating hypothesised causal (risk) factors of the first ever episode of low back pain has been published.

PROSPECTIVE COHORT STUDY DESIGN

In prospective cohort studies, subjects are classified on the presence or absence of exposure to a hypothesised causal (risk) factor and followed over a period of time to determine the incidence of low back pain in each exposure group. The outcome i.e. the incidence rate provides stronger evidence for causal inference than the results of other observational study designs such as case-control and cross sectional studies because the temporal order of events is clearly established (Bombardier et al 1994). However, prospective cohort studies are expensive to conduct, sensitive to attrition and, depending on the length of follow-up, can take a long time to generate useful data (Hennekens and Buring 1987).

The period of time or ‘follow-up’ must be of sufficient length to allow an adequate number of participants to develop the condition being studied so meaningful outcomes can be made between the exposed and non-exposed groups. Specifically, in back pain what constitutes an appropriate time interval for ‘follow-up’ depends upon the hypothesised causal mechanism. An acute model suggests the time lag between exposure and outcome (i.e. back pain) be relatively close (hours to days). This model relates the onset of back pain to incidents such as slips and falls, or activities such as bending and lifting just prior to the pain. A chronic cumulative model sees the time to onset of back pain related to the prolonged exposure to activities such as driving or lifting, and requires a longer time lag between the measure of exposure and outcome (Nuwayhid et al 1993, Davis and Heaney 2000). In Davis and Heaney’s (2000) review of psychosocial work characteristics, for example, the majority of prospective cohort studies used a time lag of two years or more with the shortest time lag being six months between exposure to psychosocial work characteristics and the onset of back pain. In this model, measurements of exposures at multiple points in time are required if the exposures to hypothesised causal factors are expected to change over time. This may happen where an individual changes job or the where the nature of a particular job changes because of changes in technology, market pressures, organisational changes and personnel (Davis and Heaney 2000). In Davis and Heaney’s review (2000) however only three out of sixty six studies collected exposure data at more than one point in time.

Typically, in prospective cohort studies, data on a large quantity, sometimes several dozen, hypothesised causal factors (variables) are collected. Each variable is then subjected, in turn, to univariate, sometimes referred to as bivariate, analysis to determine whether or not it is associated with the onset (incidence) of back pain, and to estimate the strength of any association. The most strongly associated variables are retained thus reducing the variables to a smaller quantity. These variables are then entered into a

mathematical model, a regression equation (multivariate analysis). Regression analysis attempts to predict the onset (incidence) of back pain (outcome) from the known values of one or more hypothesised causal (explanatory) factors. If a statistical association between a hypothesised causal factor is artificial, i.e. brought about by a confounding or a third factor, it may be removed with multivariate analysis (Leboeuf-Yde 2000a). Biering-Sorensen and Thomsen (1986), for example, analysed sixty eight medical, social and occupational variables hypothesised to play an aetiological role in back pain. During their univariate analysis they found nine of the sixty eight variables predicted the onset of a first ever episode of back pain but following the regression analysis only five of the variables continued to be statistically significant indicators i.e. predictors of the onset of a first ever episode of low back pain. These predictors of the first ever episode of low back pain are discussed further in chapter four.

The type of regression analysis is determined by the number of the hypothesised causal factors (independent variables) and the outcome (dependent) variable(s) used to define the incidence of back pain, in addition to their level of measurement i.e. whether the data is classified as nominal, ordinal (ranked) or ratio data.

If it is concluded that a valid statistically significant association exists in a given study and that chance, bias (systematic errors in collecting or interpreting data) and confounding (effects of additional variables) are unlikely alternative explanations for the association, it is necessary to consider whether the relationship is one of cause and effect.

EVALUATING EVIDENCE OF CAUSALITY

PHILOSOPHICAL CONSIDERATIONS

Causality is defined as the relationship between one event, the cause, and another event, the effect, which is the consequence of the first event (Random House 2006). This understanding in everyday usage is straightforward. However, philosophical debate and discussion about how best to understand and define causality stretches back over several centuries.

Much of the learning that underpins the scientific method (the nature of knowledge, evidence, experience, and causation) was developed by David Hume (1711-1776), a member of the Scottish Enlightenment. Like Berkeley (1685-1753), a near contemporary and immaterialist, who raised the question of causation, Hume argued, in his treatise first published in 1739-40, that if one event (A) always antecedes another event (B) then it is to be expected that A is always followed by B in a linear fashion. Hume considered three elements essential for causation. Firstly, contiguity in time and space i.e. a chain of contiguous events must be specified which link one observation to another. Secondly, there must always be a necessary connection. Hume's notion of necessity lies in the reasoning of the observer. Thirdly, A must antecede B. This is based on the assumption that 'the course of nature always continues uniformly the same' (Hume 1978). Recent evidence however suggests Hume's third element is ill founded: certain laws of nature (quantum physics) are now known not to have always been the same and may not be the same all over the universe (Murphy et al 1998). Murphy et al (1998) however consider that Hume's assumption regarding the course of nature is sufficient to treat conjunction as causal for everyday purposes.

Hume's (1740) concept of causation in terms of an invariable pattern of succession is referred to as the regularity theory or approach to causation. It

holds that it is impossible directly to observe causation only the ‘constant conjunction’ of events (Hume 1978). It therefore treats the actual process of causality as a ‘black box’ and focuses on discovering whether there is a statistical as well as deterministic relationship between inputs and outputs (Mohr 1996). This conception formed the philosophical basis of quantitative research during the 20th century and arguably remains the dominant position today (Maxwell 2004a).

The Humean regularity conception of causality however presents difficulties to epidemiologists because causes are not invariably followed by their effects (Anon 2002). In back pain, for example, lifting a heavy weight (A) may antecede back pain (B) but back pain (B) may or may not occur after lifting the heavy weight (A). Furthermore, back pain (B) may even occur in the absence of lifting the heavy weight (A). Consequently, epidemiologists have turned to a notion of probabilistic causation (Anon 2002) as exemplified in texts by Hennekens and Buring (1987), Greenberg et al (2005), Cran and Patterson (2007). Probabilistic causation designates a group of philosophical theories that aim to characterise the relationship between cause and effect using the tools of probability theory (Anon 2002). The central tenet of this theory is that causes raise the probability of their effects. An effect may still occur in the absence of a cause or fail to occur in its presence. Here, A probabilistically causes B if exposure to A increases the probability of B or, to put it another way, if exposure to lifting increases the likelihood of the outcome, in this case back pain occurring. However, a probabilistic understanding of causality acknowledges that certain parts of the explanation are still missing (Anon 2007). Since probabilistic theories of causation require only that a cause raise the probability of its effect these theories are compatible with indeterminism: if an event is not determined to occur then no event can be part of a sufficient condition for that event (Anon 2002).

BRADFORD HILL'S CAUSAL CRITERIA

In contemporary epidemiology, evaluating whether an association is casual extends beyond the validity of any one study. It requires consideration of the findings of a particular study in the context of what is already known about a disease, disorder or health-related event. Bombardier et al (1994) presented criteria to summarise and evaluate evidence of causality based on Bradford Hill's (1965) seminal work. These criteria, discussed below in relation to back pain, are the strength of the association; biologic plausibility; specificity of the risk factor for health outcome; consistency with other investigations; temporal sequence of exposure and effect; dose-response relationship and reversibility.

The *strength of the association* is a primary criterion in evaluating whether a suspected causal (risk) factor causes back pain. The strength of the association is indicated by the distance of the risk ratio (relative risk) or odds ratio from the null value. When the association is very strong, it is likely that the association is 'real' and cannot be explained by chance. Weak associations, however, may be causal indicating a lower risk of experiencing the onset (incidence) of back pain. With any association the *consistency with other investigations* needs to be considered. If other investigators studying different populations in different settings find similar results a causal explanation may be supported. Some epidemiologists regard this consistency of findings as the most persuasive evidence of a cause – effect relationship (e.g. Hennekens and Buring 1987). Inconsistent findings, however, concerning a suspected cause should be interpreted with caution. Hennekens and Buring (1987) suggest that such results are more likely to represent chance fluctuations in data rather than true increased susceptibility.

The hypothesised causal (risk) factor should be consistent with what is known about the aetiology of back pain. This is referred to as *biological*

plausibility. Where the proposed cause and effect relationship does not 'fit' current knowledge, causality may be questioned. However, a statistical association that does not seem biologically credible at the time may eventually prove to be so, thereby advancing knowledge of the pathophysiological mechanisms.

The criterion of *specificity of the risk factor for health outcome* requires that a single cause leads to one and not multiple effects. Whether this is a valid criterion is debated in the literature. Weiss (2002), for example, argues that some causal hypotheses can be distinguished from non causal hypotheses whereas Rothman and Greenland (2005) disagree on the grounds that the cause of a given effect cannot be expected to lack all other effects. Furthermore, causality is frequently multiple. Back pain, for example, is generally regarded to have multiple causes and so it is highly unlikely that that a one to one cause – effect relationship will be found. Consequently this criterion is not considered further within this thesis.

The *dose-response relationship* refers to the gradient of risk associated with the degree of exposure: increased exposures lead to increased risk and, conversely, decreased exposures result in reduced risk and possibly indicate a protective effect. Hennekens and Buring (1987), however, draw attention to three difficulties using this criterion. Firstly, the presence of a dose-response relationship does not necessarily mean the association is one of cause and effect: it is possible that an observed dose-response relationship may reflect the effect of an uncontrolled confounding factor. Secondly, the dose-response relationship may be hidden by the inability of the study design to distinguish between risks associated with different levels of exposure. Thirdly, there may be a threshold phenomenon whereby no effect is observed until a certain level of exposure is attained. Consequently, Hennekens and Buring (1987) recommend that the presence or absence of

a dose-response relationship must always be carefully considered in the context of other alternative explanations and criteria.

The temporal sequence between cause and effect is important: exposure to the causal factor must always antecede the incidence of back pain in time. If a particular movement, for example, is causal it is necessary for that movement to occur before the very first episode of low back pain. This temporal relationship can only be explored in a prospective cohort study where the exposure to the activity is measured and the person followed over time to see if it has an effect i.e. whether low back pain occurs for the very first time (Hennekens and Buring 1987, Greenberg et al 2005, Yarnell 2007).

Reversibility is the criterion by which the modification or removal of the hypothesised causal factor reduces its effect i.e. back pain. Greenberg et al (2005) however point out that in practice this criterion cannot necessarily be met: some causal factors may trigger a chain of events which, once established, may not need the initial factor to maintain the condition. It has been suggested that in back pain the factors that trigger new episodes may differ from those that trigger the first ever episode (Burton et al 1996b, Frank et al 1996a, 1996b). A previous episode of low back pain for example is the greatest risk factor for a subsequent episode (Troup et al 1987, Burton et al 1989, Bigos et al 1991, Maul et al 2003).

In summary, whilst Bradford Hill's (1965) criteria are used in contemporary practice and described in epidemiological texts (e.g. Bombardier et al 1994) they are not beyond criticism. Lanes and Poole (1984) have even questioned whether it is detrimental to cloud the inferential process by continuing to use them. Yarnell and Evans (2007) however conclude that Bradford Hill's (1965) criteria to evaluate causality are the best available in epidemiology until new techniques become available.

Hume's (1978) and Bradford Hill's (1965) concepts of causation are two approaches to causation in epidemiology. In terms of epistemology, however, they differ from the ways of thinking about causality in the social sciences where there is a greater emphasis on lay explanations associated with subjective interpretation of phenomena. In both epidemiology and the social sciences there has been debate and discussion how best to understand causality. This debate is relevant to the study in this thesis and discussed further in chapter five.

METHODOLOGICAL DIFFICULTIES

RECRUITING A COHORT WITHOUT A HISTORY OF LOW BACK PAIN

One difficulty for researchers wishing to study the first ever episode of back pain is the high prevalence of back pain. This makes it difficult for researchers to recruit a sufficient number of subjects without a history of back pain. Carroll et al (2004), for example, did not distinguish 'first onsets' from 'recurrences' in their investigation of depression as a potential predictor of troublesome low back pain to ensure they recruited a sufficient number of participants. Both Carroll et al (2004) and de Vet et al (2002) express their concern that studying risk factors for back pain in a population that has never had low back pain before is likely to be a small population and a young one since most people have experienced an episode of back pain by early adulthood. Their concern is illustrated by the difficulties Stevenson et al (2001) had recruiting spinning operators without a history of low back pain. Stevenson et al (2001) found imposing the criterion of 'no history of low back pain' resulted in their recruiting an unacceptably small sample size of 83 /373 employees. Consequently, they had to widen their criteria to include employees with 'minimal' low back pain to achieve an adequate sample of 149 employees.

INTERPRETING SYMPTOMS

A further difficulty associated with studying back symptoms is that the onset of back ache, or pain, is highly subjective being dependent on the individual's interpretation of the experience and its meaning. Waddell (1987) illustrates this when he recounts the tale of nurses going home with the onset of a dull ache at the end of a long shift. The dull ache was not considered an incident by the nurses, was not reported as such and did not show up in an analysis of incident reports. This illustration is consistent with the literature, in chapter two, that not all back related symptoms are considered a health problem. Even where a person does report the onset of back pain, it is possible that it may be discounted by the healthcare practitioner. For example, when young people report onset of back pain, Burton et al (1996a) suggests that it is considered a 'normal life experience'. These observations lead to questions such as how do people define the first ever onset (incidence) of back pain? When is back ache or pain a normal life experience? When do symptoms become a health problem? Remarkably, people's definitions of the first onset (incidence) of low back pain do not appear to have been studied and will form part of the study reported in this thesis.

DEFINING THE INCIDENCE OF LOW BACK PAIN

The onset (incidence) of health related conditions and events such as a fever or fractured hip following a fall can be clearly defined (Papageorgiou 2002). Accordingly, the number of new cases during a given period of time, among a group of people initially symptom free, can be estimated and monitored in a straightforward manner. Utilising this definition however to estimate the onset (incidence) of episodic conditions such as back pain is not straightforward: 'a new case or first episode of back pain however defined is rarely the first ever episode that the person has experienced' (Papageorgiou 2002). With a few notable exceptions (e.g. Croft et al 1997, de Vet et al 2002, Papageorgiou 2002), however, researchers do not discuss the difficulties of defining the onset (incidence) of low back pain in any depth.

Waddell (2004b), for example, states that there are the methodological difficulties of defining the onset of back pain resulting in widely varying incidence figures. Abenhaim et al (1988) and Smedley et al (1998) explain the difficulties giving a little more detail. They draw attention to the fact that there is no objective way to determine precisely when an episode of back pain begins or ends, and when subsequent symptoms represent a new episode rather than a continuation of earlier symptoms. These problems are compounded by problems associated with the interpretation of the symptoms, and their recall discussed earlier. Garcy et al (1996) suggest that symptom-report in the same anatomical area as an earlier episode is considered a recurrence while symptoms in a different anatomical area should be considered a new or a first episode. Abenhaim et al (1988), on the other hand, recommends that every episode is considered a recurrent episode.

Most authors attempt to resolve the difficulty by defining a ‘new case’ or ‘new episode’ of back pain as one that occurs in people who have been ‘pain free’ for a given period of time. Frequently, this episode of back pain is referred to as the first episode because it is the first within the given period of time, but it is not necessarily the first ever episode. Frequently, a ‘pain free’ period of one year is selected (e.g. Linton 2000, 2005). However, there is no consensus and the choice of one year is arbitrary. Other authors prefer to define a new episode of back pain as one that occurs following a pain free period of one week (Kujala et al 1996), one month (e.g. de Vet et al 2002, Hartvigsen and Christensen 2007), two months (e.g. Sundarajan et al 1998, Carey et al 1995) three months (e.g. Eriksen et al 2004) four months (e.g. Jarvik et al 2005) and six months (e.g. Krismer and van Tulder 2007).

Few authors justify the pain free time period selected for their particular study of a ‘new case’ or ‘new episode’ of back pain (de Vet et al 2002). Research evidence suggests that, in the short term, up to one year, previous

low back symptoms, particularly those lasting more than a month are a significant predictor of future symptoms (Gyntelberg 1974, Pedersen 1981, Biering-Sorensen 1983, Symmons et al 1991, Smedley et al 1997). However, there is also research evidence to suggest that defining 'pain free' as freedom from pain for up to and including two years is too short to eliminate recurrent cases. Abenhaim et al (1988) observed that 14.3% of their study population had a first recurrence in the second year of follow-up. Maul et al (2003) also found recurrence of back pain did not take place until the second year of follow-up. In the long term, Symmons et al (1991) found 72% of the population had recurring back pain after nine years. Few researchers however have studied the effects of an earlier history of back pain (Smedley et al 1997) on long term recurrence (Symmons et al 1991).

The convention of recruiting people who are pain free for a given period of time, irrespective of back pain history, results in the majority of prospective cohort studies including subjects with and without a history of low back pain. Most authors appear to follow this convention without questioning it. van Poppel et al (1998) however refer to it as 'contaminating' the studies with subjects suffering from recurrent episodes, and Shekelle (1997) likens it to studying 'apples and pears'. van Poppel et al (1998) and Shekelle (1997) both recognise that the inclusion of subjects with and without a history of back pain introduces bias and renders it impossible to speculate on the temporal relationship between potential risk factors and the incidence of back pain. Job dissatisfaction, for example, as van Poppel et al (1998) point out, has been hypothesised to be an antecedent and a consequence of back pain: the job may aggravate the back symptoms which, in turn, may adversely affect performance making the job more onerous and arduous, resulting in dissatisfaction. Consequently, if people with and without a history of back pain are included in the analysis, it is impossible to identify whether the job dissatisfaction antecedes or follows the onset of the back symptoms (van Poppel et al 1998). In other words, it is not possible to tell whether the

job dissatisfaction is a primary cause or a secondary effect (Kujala et al 1996), a cause or a consequence of back pain.

A further issue related to the inclusion of subjects with and without a history of back pain is that, in contrast to the subjects with no history, those with a history of back pain may have changed their role at work and / or, how they performed certain activities to avoid aggravating their symptom. This is especially relevant in studies that recruit subjects from occupational settings e.g. industry. It follows therefore that any occupational factors that may play a role in the genesis of back pain in these settings may be underestimated in studies including subjects with a history of back symptoms. Conversely, there is the potential to overestimate risk factors for back symptoms in occupations regarded as unrelated to back problems. This is because workers with back pain may have changed employment to these occupations in the hope that the reduced performance demands of the new job will ameliorate their symptoms (Macfarlane et al 1997). In both scenarios the ecological validity of studies where employment and performance–related variables are being studied may be adversely affected.

For the reasons discussed above it appears that it is essential to study subjects with and without a history of back pain separately. Certainly, in prospective cohort studies that seek to identify causal factors for the first ever episode of back pain the participants need to be free from a history of back pain on recruitment to the study. Accordingly, the systematic review of the literature presented in the next chapter focuses on prospective cohort studies that recruited people with no history of low back pain.

CHAPTER FOUR: SYSTEMATIC REVIEW OF THE HYPOTHESISED CAUSAL (RISK) FACTORS IN THE INCIDENCE OF LOW BACK PAIN

OBJECTIVES

The objectives of this review were two-fold. The first objective was to provide a comprehensive up-to-date synthesis of the findings from prospective cohort studies examining the hypothesised causal (risk) factors in the aetiology of non-specific low back pain. The second objective was to determine the true incidence rates of non-specific low back pain in different populations i.e. the incidence rates relating to the very first episode of back pain as opposed to new or subsequent episodes of low back pain. A systematic search of the literature (see below) suggests neither objective has been met before. This review therefore aimed to further knowledge for epidemiology and public health, in its own right, in addition to providing contextual information, from which the research questions were derived, for the study presented in the subsequent chapters of this thesis.

Where reference is made to the incidence of low back pain in this chapter it should be taken to refer to the true incidence of low back pain i.e. the very first episode of low back pain.

ELIGIBILITY CRITERIA FOR INCLUSION OF STUDIES WITHIN THE REVIEW

To be included in the review, papers had to report the findings from prospective cohort studies seeking to identify hypothesised causal (risk) factors for the first ever episode of non-specific low back pain in population based samples and samples of working populations with no history of back pain.

It was considered axiomatic that to be included in the review the studies needed to utilise a definition of low back pain that permitted the first ever episode of back pain to be identified during the specified follow-up period. Studies where this did not occur were excluded. The study by Poussa et al (2005), for example, was excluded because the participants were asked, at the end of eight years of follow-up, whether or not they had had back pain 'in the past year' thus leaving seven of the eight years of follow-up uncounted for, and during which time some participants may have experienced their first ever episode of back pain. Consequently, Poussa et al (2005) could not know whether the episode of pain occurring 'in the past year' was the first ever or a recurrent episode of back pain.

Research papers were excluded from the review if they did not report findings from studies that specifically recruited or restricted data analysis to samples with no history of low back pain. Also, papers focusing solely on the antecedents of specific low back pain i.e. back pain due to disc prolapse, osteoporosis, cancer, trauma, pregnancy or other specific causes were excluded from the review as were papers written in languages other than English, and the gray literature.

SEARCH STRATEGY

Every effort was made to identify all relevant research papers published in peer-reviewed scientific journals by searching six on-line bibliographic databases: CINAHL, Medline, PsycARTICLES, PsycINFO and SPORTDiscus published by EBSCOhost; and OSH-UPDATE published by Sheila Pantry Associates Ltd. The full names of these databases are listed below together with the years of each search, and the Medical subject headings (National Library for Medicine 2009) and keywords used. A truncation symbol, an asterisk, was placed at the end of the root of each heading / keyword in order to find all forms of that word. For example, 'stud*' found the words 'study' and 'studies'.

CINAHL (Cumulative Index to Nursing and Allied Health Literature) 1976 to December 2009

'prospective stud* and back pain' and 'prospective cohort stud* and back pain'.

In CINAHL, the heading 'prospective stud*' is used for cohort study/studies; follow-up study/studies; incidence study/studies; longitudinal study/studies; and prospective research.

Records duplicated in Medline were excluded from the search of CINAHL.

Medline (Medical Literature Analysis and Retrieval System Online) 1946 to December 2009

'cohort stud* and back pain'; 'follow-up stud* and back pain'; 'longitudinal stud* and back pain'; 'prospective stud* and back pain'; 'prospective cohort stud* and back pain'.

In Medline, the heading 'cohort stud*' is used for incidence study/studies.

Occupational Safety and Health (OSH) - UPDATE (International Bibliographic; International Full Text Collection; Occupational Health and Safety Institute, Quebec (IRSST); US National Institute for Occupational Safety and Health (NIOSHTIC2) databases and Ryerson International Labour Occupational Safety and Health (RILOSH) archive, 1950 to December 2009

'cohort stud* and back pain'; 'follow-up stud* and back pain'; 'longitudinal stud* and back pain'; 'prospective stud* and back pain'; 'prospective cohort stud* and back pain'.

PsycARTICLES 1894 to December 2009

'cohort stud* and back pain'; 'follow-up stud* and back pain'; 'longitudinal stud* and back pain'; 'prospective stud* and back pain'; 'prospective cohort stud* and back pain'.

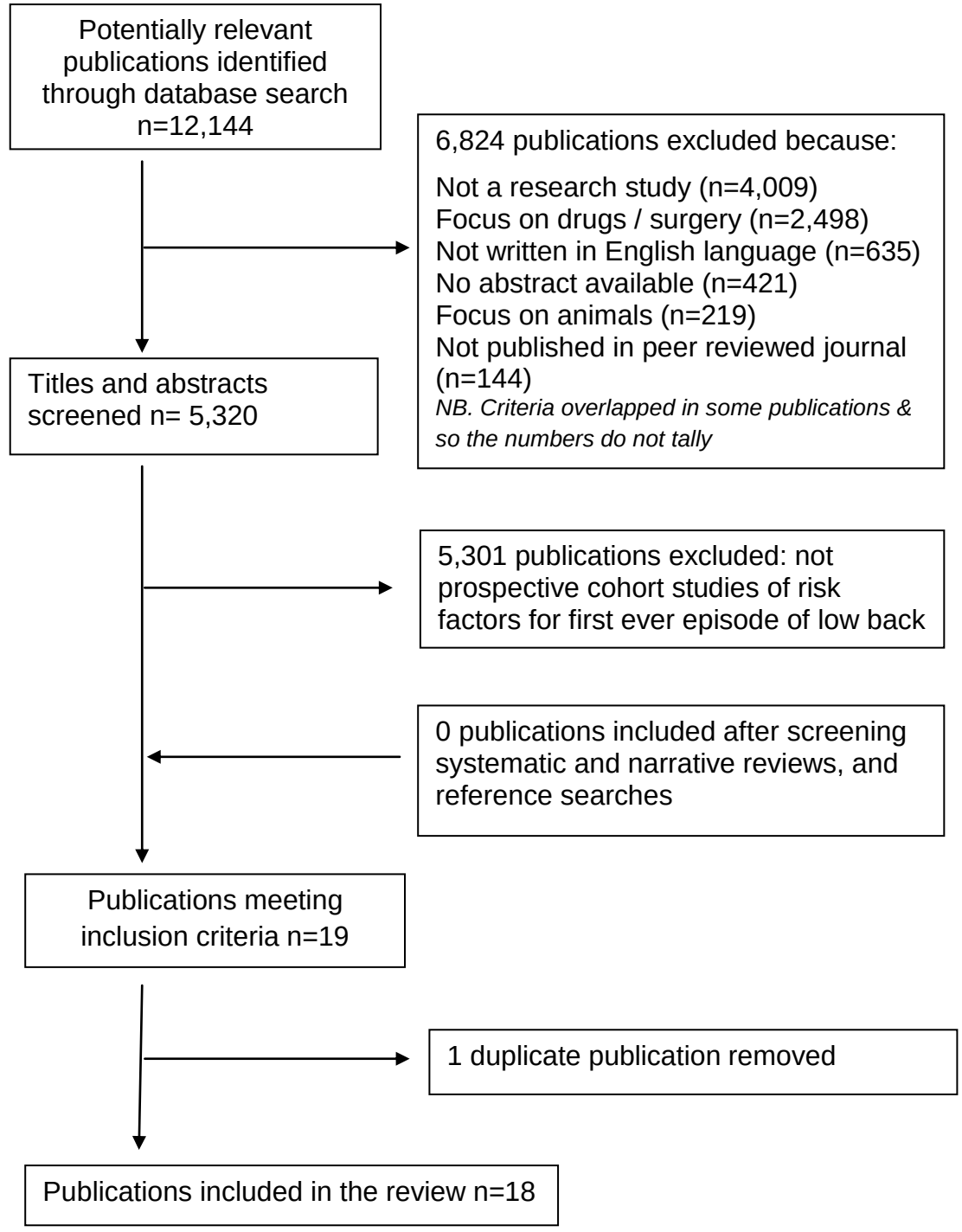
PsycINFO 1887 to December 2009
'cohort stud* and back pain'; 'follow-up stud* and back pain'; 'longitudinal stud* and back pain'; 'prospective stud* and back pain'; 'prospective cohort stud* and back pain'.

SPORTDiscus 1930 to December 2009
'cohort stud* and back pain'; 'follow-up stud* and back pain'; 'longitudinal stud* and back pain'; 'prospective stud* and back pain'; 'prospective cohort stud* and back pain'.

In addition, systematic and narrative reviews of risk factors for low back pain were screened for prospective cohort studies in populations with no history of low back pain. These reviews were published by Bongers et al (1993), Garzillo and Garzillo (1994), Simmonds et al (1996), Burdorf and Sorock (1997), van Tulder et al (1997), Hoozemans et al (1998), Zitting and Vanharanta (1998), Bovenzi and Hulshof (1999), Hoogendoorn et al (1999), Kuiper et al (1999), Leboeuf-Yde (1999), Lings and Leboeuf-Yde (1999), Goldberg et al (2000), Hartvigsen et al (2000), Hoogendoorn et al (2000), Leboeuf-Yde (2000a, 2000b), Linton (2000, 2001), Dionne et al (2001), Lotters et al (2003), Hartvigsen et al (2004), Sherehiy et al (2004), Weevers et al (2005), McHardy et al (2006), Hamberg-van Reenen et al (2007) and Waters et al (2008). These reviews were identified through a search of the databases named above using the text words 'systematic review' and 'back pain'.

Finally, the reference lists of the research papers identified through the search described above were screened carefully in the endeavour to locate any additional papers. A flow chart of the selection process can be seen in Figure 4.1.

Figure 4.1 Flow chart of literature search process



IDENTIFYING RESEARCH PAPERS AND CONTEXTUAL INFORMATION

Eighteen of the 12,144 research papers identified by the search strategy described above fulfilled the eligibility criteria and were selected for inclusion in the review. These papers were published by Biering-Sorensen (1984a), Aro and Leino (1985), Biering-Sorensen and Thomsen (1986), Troup et al (1987), Symmons et al (1991), Pietri et al (1992), Von Korff et al (1993), Nissinen et al (1994), Croft et al (1995), Burdorf et al (1996), Macfarlane et al (1997), Masset et al (1998), van Poppel et al (1998), Croft et al (1999), Lake et al (2000), Power et al (2001), Ogon et al (2001) and Mustard et al (2005).

These studies were selected following a thorough screening (Figure 4.1) of all the papers identified by the search described above. The titles and abstracts of five thousand three hundred and twenty papers were read carefully to determine which studies fulfilled the inclusion criteria. Where the title and abstract indicated the study may meet the inclusion criteria a copy of the paper was obtained and the methodology section was read. This was necessary because the titles and abstracts of the identified papers rarely stated whether the subjects had had a history of back pain nor gave an unambiguous definition of a ‘new’, ‘incident’ or ‘first’ episode of back pain. Frequently, the first episode of back pain was found to be the first episode within a specified period of time as opposed to the first ever episode of back pain. Also, it was necessary to check that the first ever episode of back pain was the first ever episode reported by the subjects and not a proxy measure such as the first ever visit to a GP because of back pain or the very first period of sick leave from work which is not necessarily the same as the first ever episode of back pain.

Frequently, a research paper found to fulfil the inclusion criteria was one of several papers derived from the same study. Where this was the case, the

other papers were obtained in order to obtain contextual and detailed information about the aspects of the particular study. A paper by Malchaire and Masset (1995), for example, provided details of the tests of physical capacity that were helpful in understanding the findings from the tests published in a later paper by Masset et al (1998) that was included in the review (see below). Furthermore, one paper, written by Bildt et al (2000) was excluded from the review on the basis of information found in a thesis from which the paper was derived (Thorbjornsson 1999). This thesis revealed that the data in Bildt et al (2000) had been collected retrospectively and consequently did not meet the inclusion criteria.

Background information about the studies written in languages other than English was not obtained because funding was unavailable for their translation. Details about Aro and Leino's (1985) methods, for example, appeared in an earlier publication (METELI 1975) written in Finnish and consequently no attempt was made to obtain them.

Two papers reported identical data from the same study (Biering-Sorensen, 1984a, 1984b). Therefore, only one of these papers was selected for inclusion in the review. Biering-Sorensen (1984a) was selected in preference to Biering-Sorensen (1984b) for two reasons. Firstly, its publication date preceded that of the excluded paper (March 1984 vs. October 1984). Secondly, the coverage of the study, particularly its methodology and statistical analyses, was more comprehensive and transparent in Biering-Sorensen's (1984a) earlier publication.

SELECTING CRITERIA TO APPRAISE THE LITERATURE

The use of criteria to appraise the literature in a systematic and objective manner, and make the process explicit to other people has been advocated by a number of authorities (e.g. Oxman 1994, Gray 1997, Greenhalgh 1997,

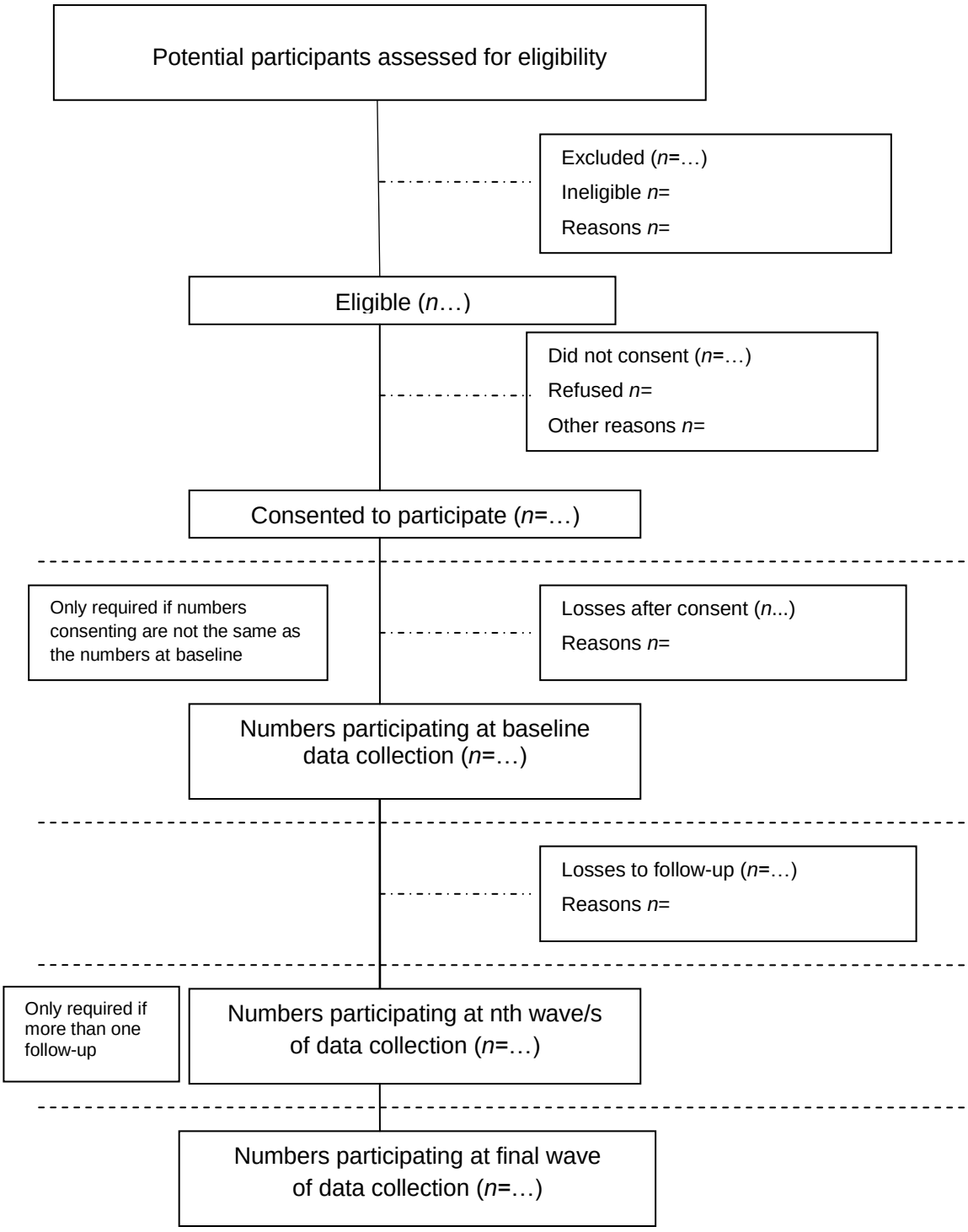
Tooth et al 2005). For this review, the NHS Critical Appraisal Skills Programme –CASP- (NHS Public Health Resource Unit 2007) criteria in the form of a checklist were selected to appraise the studies included in the review (Appendix 1). The CASP checklist was identified during a literature search. Designed to appraise cohort studies for systematic reviews such as this one it was selected in preference to the SIGN (Scottish Intercollegiate Group Network 2004) and NICE (National Institute for Health and Clinical Excellence 2006) checklists which were specifically designed to appraise cohort studies for guideline development.

To ensure sufficient knowledge to appraise the papers in as rigorous and objective manner as possible, an extensive period of reading relevant material was undertaken. This material included theoretical papers (e.g. Grimes and Schulz 2002a, 2002b, Mamdani et al 2005, Normand et al 2005, Rochon et al 2005, Tooth et al 2005), statistical information (e.g. Lang and Secic 2006), books (e.g. Hennekens and Buring 1987, Greenberg et al 2005, Yarnell 2007), guidelines for authors (e.g. Lang 2007), and the standards developed by the STROBE initiative (Von Elm et al 2008). The STROBE initiative is an acronym standing for: STrengthening the Reporting of OBservational studies in Epidemiology.

DATA RETRIEVAL AND ANALYSIS

Data relating to the effect of the hypothesised causal (risk) factors were abstracted from the text and tables of the original research papers. To assist the process of abstracting the data a flow chart developed by Tooth et al (2005) -Figure 4.2- was utilised. This flow chart permitted non-participation and any loss to follow-up to be assimilated more swiftly than the often complex textual descriptions of the attrition rates at each stage of the recruitment and follow-up processes. The attrition rate is a potential threat to internal and external validity (Hennekens and Buring 1987, Deeg 2002).

Figure 4.2 Flow chart used to summarise participant recruitment, eligibility, consent, reasons for non consent, timing and number of follow-up periods, and attrition (Tooth et al 2005)



The abstracted data comprised information about each study's author(s), year of publication and country of origin; population details including the percentage of participants completing the follow-up period and sample size; period of follow-up (years); incidence and its calculation; outcome measure and definition of back pain where given; exposure (risk factor) under study; statistics either from discriminant function or regression analysis with p-value and confidence interval, where given; confounders adjusted for; and the instrument used to measure exposure (risk). Where the authors did not estimate the incidence of back pain although the data was available in the research paper the incidence rate was calculated by the researcher and placed in italics alongside the numerator and denominator of the calculation. The incidence (percentage) was calculated by dividing the number of persons with a first ever episode of back pain by the number of persons with no pre-baseline history of back pain. This method has been used previously to estimate incidence rates from prospective cohort study data (Eaton et al 1989, Von Korff et al 1993). Also, where available, the data was used to check the accuracy of the authors' calculations. Any errors such as that in incidence calculation performed by Burdorf et al (1996) and the calculation of the percentage of participants remaining at the end of the one year follow-up period carried out by Lake et al (2000) were corrected.

The abstracted data were placed in one of two tables according to the statistical approach from which the effect of the hypothesised causal factors (risk estimates) were derived. The test statistics derived from discriminant function analysis were entered in Table 4.1 and the risk estimates derived from regression analysis were entered in Table 4.2. To minimise bias, where unadjusted and adjusted risk estimates were presented in a particular paper, only the adjusted risk estimates were entered in Table 4.2.

The statistics presented in Table 4.1 are expressed as the F statistic (Wilks' Lambda). These statistics, derived from discriminant function analysis, provide information about the hypothesised causal (risk) factors that distinguish the first ever episode from recurrent episodes of low back pain (Biering-Sorensen 1984a) and from better, same (mild), same (chronic) and worse (mild to chronic) episodes of back pain in the follow-up year(s) (Troup et al 1987). Today, discriminant function analysis has largely been replaced by regression analysis to generate the risk estimates presented in Table 4.2. The advantage of regression analysis is that it requires fewer underlying theoretical assumptions about the nature of the data, is statistically more robust, and easier to use and understand (Lea 1997, Garson 2007).

The risk estimates in Table 4.2 are expressed either as the relative risk (RR) or the odds ratio (OR). These statistics, derived from regression analysis, are presented as the estimates of the risk of experiencing back pain for the very first time during the specified follow-up period.

The risk ratio (relative risk) describes the ratio of the risk of an event (back pain) occurring for the first time in one group compared with that of another group. It is calculated using the formula that that the probability that an event will occur in the exposed group compared with the non-exposed group (Lang and Secic 2006).

The odds ratio describes the ratio of the odds of an event (back pain) occurring for the first time in one group compared with that of another. The ratio of the odds is calculated using the formula that the probability (odds) that an event will occur divided by the probability (odds) that it will not occur (Lang and Secic 2006). The odds ratio is reported where the statistical analysis corrects for confounding factors in regression analysis (Crichton

2001). Risk estimates unadjusted for confounding factors may lead to a biased estimate of a certain risk factor (Greenland 1987).

Where a risk estimate of one, known as ‘unity’ or ‘the point of no effect’, appears in Table 4.2 the exposure to the hypothesised causal (risk) factor is considered to have a similar effect in those who experience back pain for the very first time compared with those who do not. A risk estimate less than one is considered to indicate either a reduced risk of back pain following exposure to the hypothesised causal (risk) factor or, possibly, a protective mechanism reducing the likelihood of back pain occurring where $p \leq 0.05$. Conversely, a risk estimate greater than one is considered to indicate an increased risk of the exposure to the hypothesised causal (risk) factor leading to the onset (incidence) of low back pain (Lang and Secic 2006).

It is acknowledged that the odds ratio and risk ratio are similar when they are close to 1 (Crichton 2001). As they move away from unity (i.e. 1) however the odds ratio is further away than the risk ratio (relative risk). Should the risk of back pain increase, for example, the odds ratio and the risk ratio will both be greater than 1 but the odds ratio will be larger than the risk ratio. Conversely, should the risk of back pain decrease both the odds ratio and the risk ratio will be less than 1 but the odds ratio will be smaller than the risk ratio.

Where given, confidence intervals were abstracted from each paper and entered in Table 4.2. All the authors adopted the convention of calculating a 95% confidence interval. The 95% confidence interval refers to the range of values surrounding the risk estimate within which 95% of the true value is expected to be found. Also, the confidence interval provides information about statistical significance (King and Gissane 2000). An estimated risk greater than 1 (unity) indicates a statistically significant association ($p \leq 0.05$)

provided that the lower boundary of the 95% confidence interval exceeds 1 (>1). For ease of identification, these statistically significant risk estimates are shown in red in Table 4.2. A risk estimate greater or less than 1 (unity) is considered statistically non significant ($p>0.05$) when it is surrounded by a 95% confidence interval with both its lower and upper boundaries straddling 1. These estimates are shown in black in Table 4.2. A risk estimate less than 1 (unity) indicates a statistically significant ($p\leq0.05$) protective effect provided the upper and boundaries of the 95% confidence intervals are below 1 (< 1). These risk estimates are shown in blue in Table 4.2.

P values were reported in a minority of studies and consequently only a few p values were abstracted from the papers and entered in Table 4.2. Traditionally, p values are said to be statistically significant if they are equal to or less than 0.05 ($p\leq0.05$). The lower the p value, the more likely the hypothesised causal (risk) factor is associated with the incidence of the very first episode of low back pain and the less likely that the result occurred by chance.

To ensure an objective and unbiased review all findings irrespective of strength of association and statistical significance are presented either in Table 4.1 or Table 4.2. Statistically non significant ($p>0.05$) findings indicating that hypothesised causal (risk) factors are unlikely to be associated with the incidence of low back pain were further evaluated as to see whether or not errors in study design may have biased the results resulting in a statistically non significant result. A small sample size, for example is a major cause of a statistically non significant association (Kuiper et al 1999).

Tables 4.1 and 4.2 constitute the best available evidence of the potential causes of the very first episode of low back pain. The risk estimates in the

Tables however need to be considered in the context of their production. Some estimates, for example, may be spurious because of weaknesses in the study's methods from which they were derived (see discussion below). Furthermore, many estimates do not attain statistical significance and may therefore have occurred by chance. The risk estimates are represented in Appendix 2 to enable the number and the range of risk estimates for each variable to be seen at a glance.

Table 4.1 Summary of prospective cohort studies using discriminant function analysis to test for an association between exposure to hypothesised causal (risk) factors and first ever episode of low back pain

Key: cumulative incidence in italics where calculated by reviewer; red ink: statistically significant increased risk; black ink: statistically non-significant data; NR: data not reported in original research paper; ♂ men ♀ women; level of statistical significance 5% (p≤0.05)

Author, year, country	Population	Follow-up	Cumulative incidence	Outcome measure & definition, if given	Exposure (risk)	Discriminant analyses	Instrument / method used
Biering-Sorensen 1984a Denmark	920 (99%) inhabitants of Copenhagen, suburb, 30 to 70yrs of age Analysis restricted to 353 persons with no history of low back trouble	1yr	*58/353* (16.4%)* *♂ 28/168* (16.7%)* *♀ 30/185 (16.2%)* ** 2 non-responders to follow-up*	Self-report low back trouble (postal or telephone questionnaire) 'Have you / ever / within the last 12 months / had pain or other trouble with the lower part of your back?' Low back trouble associated with menstruation alone excluded	♂ Increased flexibility & shorter isometric endurance of back muscles discriminate men with incident low back trouble from men who have never had low back trouble	F(3.139) = 6.34 p<0.001	Modified Schober's test & keeping unsupported upper body horizontal while prone (seconds)
					♀ younger age, less maximum voluntary extension of trunk & longer isometric endurance of back muscles discriminate women with incident low back trouble from women who have never had low back trouble	F(3.139)=5.01 p<0.002	Strain-gauge dynamometer; keeping unsupported upper body horizontal while prone (seconds)
Troup et al 1987 UK	2564 (88.7%) blue & white collar workers from a number of occupations. Analysis restricted to 1014 persons with no history of low back pain.	1yr	*220/1014* (21.7%)* ** up to 31 non-responders to follow-up*	Self-report (postal questionnaire) 'Have you ever had back pain?' Dates of 1st & most recent episode asked for; & 'Do you have back pain now?' Also, information sought on duration of sickness absence, treatment & occurrence of injuries	Extension; flexion & extension range; dynamic trunk flexion; acceptable lifting strength; acceptable & maximum isometric strength	NR p>0.05	Goniometer; sit-ups; perception of comfortable load; holding acceptable & maximum loads steady with hands at knee & waist height

Table 4.2 Summary of prospective cohort studies using regression analysis to test for an association between exposure to hypothesised causal (risk) factors and first ever episode of low back pain. Risk estimated as odds ratio (OR) or relative risk (RR), (confidence interval) & p value where given

Key: cumulative incidence in italics where calculated by reviewer; red ink: statistically significant increased risk; blue ink: statistically protective effect; black ink: statistically non-significant data; NR: data not reported in original research paper; ISOM: maximum isometric strength of trunk; BMI: body mass index; ♂ men ♀ women; ?: insufficient data to calculate the statistic; level of statistical significance 5% (p≤0.05) except for study by Masset et al (1998) where alpha is 1% (p≤0.01) for some variables as stated

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
Aro & Leino 1985 Finland	654 (73%) white & blue-collar metal industry workers in employment for >14 months Analysis restricted to 565 persons with no history of lumbo-sacral disorders	10yrs	*93/565 (16.5%)*	Self-report lumbosacral disorder (postal questionnaire) 'Have you at present any permanent illness or impairment?' If yes, asked to write down the illness. Answer checked by physician during medical examination, year of onset noted & a second question asked: 'Have you had any of the following illnesses?' The checklist included sciatica	**Occupational status** (blue collar vs. white collar)	2.0 RR p<0.05	Sex, age, relative weight	Self-report (questionnaire)
					Overweight (relative weight: ratio actual weight to normal weight x 100)	0.6 RR p>0.05	Sex, age, occupational status	Measurements during medical examination
Biering-Sorensen & Thomsen 1986 Denmark	920 (99%) residents of a Copenhagen suburb, 30 to 70yrs of age Analysis restricted to 353 persons with no history of low back trouble	1yr	*58/353* (16.4%)* *♂ 28/168* (16.7%)* *♀ 30/185 (16.2%)* ** 2 non-responders for distance to work*	Self-report low back trouble (postal questionnaire) 'Have you ever / within the last 12 months had pain or other trouble with the lower part of your back?' Low back trouble related to menstruation alone excluded	**Epigastric pain history**	NR p≤0.05	All exposures	Self-report (questionnaire checked at health examination & un-answered questions repeated verbatim to obtain an answer)
					Previous hospitalisations	NR p≤0.05		
					Previous operations (in & out patient)	NR p≤0.05		
					Smoking daily	NR p≤0.05		
					Longer distance home to work (km)	NR p≤0.05		
Symmons et al 1991 Netherlands	742 (74%) middle-aged Dutch women (45 to 64yrs of age) from general population Analysis restricted to 241 women with no history of back pain	9yrs	58/241 (24.1%)	Self-report back pain (postal questionnaire). 'Are you suffering from back pain now?' Have you suffered from back pain In the past?'	**Joint pains**	2.72 (1.38-5.37) p=0.005	Age, hip/knee gelling on sitting, hip/knee pain on standing	Self-report (questionnaire)

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
Pietri et al 1992 France	1115 (81%) commercial travellers Analysis restricted to 627 persons with no history of low back pain	1yr	*84/627* (13.4%)* *♂ 65/514 (12.6%)* *♀19/113 (16.8%)* ** 26 non responders to follow- up*	Self-report low back pain (interview during annual medical examination)	**Age (years)**		All exposures	Self-report (interview during annual medical examination)
					<35	1		
					35-44	0.7 (0.4-1.2)		
					≥ 45	0.6 (0.3-1.2)		
					Gender			
					Men	1		
					Women	1.5 (0.8-2.9)		
					Time driving / week (hrs)			
					<10	1		
					10 to 14	4.0 (1.1-14.3)		
					15 to 19	4.8 (1.4-16.4)		
					20 to 24	3.3 (0.9-12.0)		
					≥ 25	3.7 (0.9-14.0)		
					Comfortable car seat			
					Yes	1		
					No	1.9 (1.0-3.7)		
					Carrying loads at work			
					No	1		
					Yes	0.9 (0.5-1.5)		
					Standing at work			
					No	1		

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
					Yes	0.8 (0.5-1.4)		
					Smoking			
					Non smokers	1		
					Smokers & ex-smokers	1.3 (0.8-2.1)		
					Non-specific symptoms			Questions derived from screening question-aire (Langner 1962)
					0	1		
					1 or 2	1.1 (0.6-1.8)		
					3 or 4	2.5 (1.2-5.1)		
					5 or more	0.8 (0.2-4.0)		
Von Korff et al 1993 USA	803 (85%) members, Health Maintenance Organisation Analysis restricted to 271 persons without a history of back pain	3yrs	48/271 (17.7%)	Self-report back pain (interview)	**Painful conditions**		All exposures	Self-report (interview)
					0	1		
					1 or more	2.09 p<0.05		
					Depression severity			Symptom check-list 90 revised (SCL-90-R) Depression Scale (Derogatis 1983)
					Normal	1		
					Moderate	0.23 p>0.05		
					Severe	0.28 p>0.05		
					Age			Self-report (interview)
					18-44 years	1		
					45-64 years	0.39 p>0.05		
					65-74 years	0.9 p>0.05		
					Gender			

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
					Male	1		
					Female	0.92 p>0.05		
					Education			
					High school or less	1		
					Some college	0.59 p>0.05		
					College graduate	1.01 p>0.05		
Nissinen et al 1994 Finland	894 (84%) 4th grade school children, mean age 11.8 to 13.8yrs Analysis restricted to 859 children with no history of low back pain at mean age of 12.8yrs	1yr	151/859 (17.6%) ♂: 76/451 (16.9%) ♀: 75/408 (18.4%)	Self-report low back pain (questionnaire) 'Have you ever had pain in your lower back pain?' If so, asked whether the pain occurred over or less than a year ago, during the past month, week or day The anatomic site of the lower back was shown individually to the children	**Sitting height (cm)**	1.24 (1.03-1.46) p=0.03	All exposures	Measured by school nurses
					Trunk asymmetry	1.19 (1.00-1.39) p=0.04		Forward bending test
					BMI (kg/m^2)	1.00 (0.81-1.21) p=0.99		Measured by school nurses
					Growth of BMI (kg/m^2)	1.22 (0.93-1.57) p=0.1		
					Kyphosis	1.04 (0.82-1.27) p=0.72		Sagittal spinal profile measured by spinal pantograph in relaxed standing position
					Increase of kyphosis	1.07 (0.85-1.29) p=0.53		
Croft et al 1995 UK	1638 (64%) adults aged 18 to 75yrs registered with two general practices in Manchester Analysis restricted to 968 persons with no history of low back pain	1yr	*254/968 (26.2%)* *CI for those who answered:* *questionnaire 201/968 (20.8%)* *consulted GP 53/968 (5.5%)*	Self-report low back pain (identified by postal questionnaire if did not consult GP; & computerised record system if consulted GP) Low back pain defined as any ache or pain lasting longer than 24 hours in the area bordered at the top by the 12th rib & at the bottom by the gluteal fold	**Psychological distress scores in those who consulted GP**		Age, gender, social status	12-item General Health Questionnaire (Goldberg and Williams 1988)
					Lowest third	1		
					Middle	1.04 (0.51-2.12)		
					Highest third	2.17 (1.12-4.21)		
					Psychological distress scores in those who did not consult GP		Age, gender, social status, car ownership, health rating	
					Lowest third	1		
					Middle	1.26 (0.86-1.83)		

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
					Highest third	1.95 (1.33-2.87)		
Burdorf et al 1996 Netherlands	196 (89%) male novice golfers aged 20 to 60yrs Analysis restricted to 72 golfers with no history of back pain	1yr	6/72 (8.3%)	Self-report back pain (postal questionnaire) 'Have you ever experienced a spell of back pain?' 'Have you experienced more than one spell of back pain?' 'Have you ever experienced back pain in the past month?' 'Do you have back pain now?' (Valkenburg & Haanen 1982)	**Age**	NR p>0.05	All exposures	Self-report (questionnaire)
					Educational level	NR p>0.05		
					Physical education	NR p>0.05		
					Physical activity at work (prolonged sitting, standing or walking)	NR p>0.05		
					Sports participation	NR p>0.05		
					Frequency playing golf	NR p>0.05		
					No. golf lessons	NR p>0.05		
					Golf handicap	NR p>0.05		
					Warm up before golf	NR p>0.05		
Macfarlane et al 1997 UK	847 (60%) adults aged 18 to 75yrs in employment & registered with two general practices in Manchester Analysis restricted to 468 persons with no history of low back pain	1yr	*119/468 (25.4%)* *♂ 49/226 (21.7%)* *♀70/242 (28.9%)*	Self-report low back pain (identified by postal questionnaire if did not consult GP; & computerised record system if consulted GP) Low back pain defined as any ache or pain lasting longer than 24 hours in the area bordered at the top by the 12th rib & at the bottom by the gluteal fold.	**♂ 18-75yrs Standing / walking >2hr at work**		Age	Self-report (questionnaire)
					No	1		
					Yes	1.6 (0.8-3.3)		
					♀ 18-75yrs Standing / walking >2hr at work			
					No	1		
					Yes	2.9 (1.5-5.5)		
					♂ 18-44yrs Standing / walking >2hr at work			
					No	1		
					Yes	1.8 (0.8-3.9)		
					♀ 18-44yrs Standing / walking >2hr at work			

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
					No	1		
					Yes	1.6 (0.8-3.2)		
					♂ **45-75yrs Standing / walking >2hr at work**			
					No	1		
					Yes	NR		
					♀ **45-75yrs Standing / walking >2hr at work**			
					No	1		
					Yes	NR		
					♂ **Standing / walking for >2 hours**			
					Never	1		
					1-7yrs	2.0 (1.1-2.7)		
					8-18yrs	1.4 (0.7-3.0)		
					>18yrs	1.3 (0.6-2.9)		
					♀ **Standing / walking for >2 hours**			
					Never	1		
					1-7yrs	1.6 (0.9-2.9)		
					8-18yrs	2.2 (1.2-4.1)		
					>18yrs	2.0 (1.0-4.2)		
					♂ **Sitting >2hr**			
					No	1		
					Yes	0.9 (0.1-1.5)		

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
					♀ **Sitting >2hr**			
					No	1		
					Yes	0.4 (0.2-0.7)		
					♂ **Digging or shovelling**			
					No	1		
					Yes	1.1 (0.3-3.6)		
					♀ **Digging or shovelling**			
					No	1		
					Yes	4.8 (0.4-5.4)		
					♂ **Driving a car >4hr**			
					No	1		
					Yes	1.1 (0.5-2.7)		
					♀ **Driving a car >4hr**			
					No	1		
					Yes	4.8 (0.4-54)		
					♂ **Driving a truck**			
					No	1		
					Yes	0.5 (0.1-4.0)		
					♀ **Driving a truck**			
					No	1		
					Yes	0		

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
					♂**18-75yrs Lifting / moving >25lb (11kg)**			
					No	1		
					Yes	1.5 (0.8-2.8)		
					♀ **18-75yrs Lifting / moving >25lb (11kg)**			
					No	1		
					Yes	2.0 (1.01-4.0)		
					♂ **18-44yrs Lifting / moving heavy weights >25lb (11kg)**			
					No	1		
					Yes	1.6 (0.8-3.2)		
					♀ **18-44yrs Lifting / moving heavy weights >25lb (11kg)**			
					No	1		
					Yes	2.8 (1.3-5.9)		
					♂ **45-75yrs Lifting / moving heavy weights >25lb (11kg)**			
					No	1		
					Yes	NR		
					♀**45-75yrs Lifting / moving heavy weights >25lb (11kg)**			
					No	1		
					Yes	NR		
					♂ **Lifting / moving weights ≥25lb (11kg)**			
					Never	1		
					1-7yrs	2.0 (1.0-3.8)		

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
					8-17yrs	1.5 (0.8-2.8)		
					>17yrs	1.3 (0.7-2.4)		
					♀ **Lifting / moving weights ≥25lb (11kg)**			
					Never	1		
					1-7yrs	1.5 (0.8-2.8)		
					8-17yrs	2.7 (1.5-5.1)		
					>17yrs	1.0 (0.4-2.6)		
Masset et al 1998 Belgium	287 (?%) male blue-collar steel workers, under 40yrs of age, with no history of a back disorder & free from inguinal hernia, respiratory, cardio-vascular, metabolic & orthopaedic problems	2yrs	*25/287* (8.7%) end of 1st year* *21/208** (10.1%) end of 2nd year* ** 54 & ** 18 non-responders*	Self-report back pain in previous year (interview using questionnaire at end of 1st & 2nd year)	**Perception of heavy lifting efforts at work**	2.26 (1.12-4.55) p=0.02	All exposures	Self-report (questionnaire)
					Trunk imbalance frontal plane (mm)	1.74 (1.15-2.64)		Deviation from theoretical alignment of the spine
					Heavier body weight (kg)	0.95 (0.92-0.98) P=0.001		Measurement during clinical examination
					Physical capacity of trunk			Isostation B200 dynamometer
					Maximum velocity (alpha set at p≤0.01)			
					25% ISOM rotation	1.76 (1.18-2.63) p=0.005		
					25% ISOM lateral flexion	1.65 (1.17-2.33) p=0.01		
					25% ISOM flexion	1.39 (0.94-2.04) p=0.1		
					25% ISOM extension	1.22 (0.87-1.72) p=0.26		
					50% ISOM rotation	2.29 (1.51-3.46) p=0.001		
					50% ISOM flexion	1.42 (0.99-2.06) p=0.06		
					50% ISOM extension	1.30 (0.90-1.88) p=0.16		
					50% ISOM lateral flexion	1.55 (1.07-2.23) p=0.02		

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
					Torque (alpha set at p≤0.01)			Isostation B200 dynamometer
					25% ISOM rotation	0.69 (0.46-1.05) p=0.09		
					25% ISOM flexion	1.24 (0.76-2.02) p=0.41		
					25% ISOM extension	1.08 (0.66-1.78) p=0.78		
					25% ISOM lateral flexion	1.06 (0.69-1.61) p=0.79		
					50% ISOM rotation	0.89 (0.60-1.33) p=0.58		
					50% ISOM flexion	1.71 (1.04-2.82) p=0.04		
					50% ISOM extension	1.69 (1.04-2.76) p=0.05		
					50% ISOM lateral flexion	1.19 (0.81-1.75) p=0.39		
					Max. ISOM rotation	0.84 (0.55-1.28) p=0.42		
					Max. ISOM flexion	1.60 (1.01-2.55) p=0.08		
					Max. ISOM extension	1.14 (0.81-1.61) p=0.4		
					Max ISOM lateral flexion	1.0 (0.64-1.55) p=0.97		
van Poppel et al1998 Netherlands	238 (76%) manual handling workers in an airport cargo department. (236 ♂ & 2 ♀) Analysis restricted to 130 workers with no history of back pain	1yr	N/R	Self-report back pain (postal questionnaire) monthly for 6 months & then at 9th and 12th month during follow-up. Asked about sick leave due to back pain & no. days with back pain & / or sick leave due to back pain	**Low job satisfaction**	1.4 (1.1-2.0) p=0.03	Age, intervention group	25 item job satisfaction questionnaire (Dijkstra et al 1981)
					Less time riding fork-lift truck (hrs/week)	0.7 (0.5-0.99) p=0.04		Self-report (questionnaire)
Croft et al 1999 UK	1649 (61%) adults, 18 to 75yrs of age, registered with two general practices in Manchester & free from low back pain for one month	1yr	*254/1055 (24.1%)* ♂ *92/474 (19.4%)* ♀ *162/581 (27.9%)*	Self-report low back pain (identified by postal questionnaire if did not consult GP; & computerised record system if consulted GP). Low back pain defined as any ache or pain lasting longer than 24 hours in the area bordered at the top by the 12th rib & at the	♂ **Age (years)**		Self-rated health, psychological distress -12-item General Health Questionnaire- (Goldberg and Williams 1988)	Self-report (questionnaire). Height & weight data compared with direct measurement in a sub-sample to establish validity
					18-29	1		
					30-44	0.8 RR (0.5-1.5)		
					45-59	1.1 RR (0.6-2.0)		

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
	Analysis restricted to 1055 persons with no history of low back pain			bottom by the gluteal fold.	60-75	0.6 RR (0.3-1.1)		
					♀ **Age (years)**			
					18-29	1		
					30-44	0.9 RR (0.6-1.4)		
					45-59	1.1 RR (0.7-1.7)		
					60-75	0.6 RR (0.4-0.9		
					♂ **Smoking**		Age, self-rated health, psychological distress -12-item General Health Questionnaire- (Goldberg and Williams 1988)	
					Never	1		
					Current	1.2 RR (0.7-1.9)		
					Ex-smoker	1.1 RR (0.6-1.8)		
					♀ **Smoking**			
					Never	1		
					Current	1.2 RR (0.9-1.7)		
					Ex-smoker	1.1 RR (0.8-1.7)		
					♂ **Self-rated health compared to peers**		Age, psychological distress -12-item General Health Questionnaire- (Goldberg and Williams 1988)	
					Excellent	1		
					Good	1.2 RR (0.7-2.1)		
					Fair	1.6 RR (0.8-3.0)		
					Poor	2.1 RR (0.8-5.3)		
					♀ **Self-rated health compared to peers**			
					Excellent	1		

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
					Good	1.0 RR (0.7-1.6)		
					Fair	1.8 RR (1.1-2.9)		
					Poor	2.1 RR (0.8-5.0)		
					♂ **Height (m)**		Age, self-rated health & psychological distress (12-item General Health Questionnaire, Goldberg et al 1988)	
					≤1.65	1		
					1.66-1.70	0.8 (0.4-1.7)		
					1.71-1.75	0.8 (0.4-1.7)		
					1.76-1.80	0.9 (0.5-1.9)		
					≥1.81	1.0 (0.5-2.2)		
					♀ **Height (m)**			
					≤1.65	1		
					1.66-1.70	1.6 (0.9-2.9)		
					1.71-1.75	1.5 (0.8-2.8)		
					1.76-1.80	1.6 (0.9-3.1)		
					≥1.81	1.8 (0.9-3.5)		
					♂ **Weight (kg)**			
					<66.2	1		
					66.3-71.7	1.4 RR (0.8-2.7)		
					71.8-78.0	1.0 RR (0.5-2.0)		
					78.1-85.3	1.2 RR (0.6-2.5)		
					>85.4	1.0 RR (0.5-2.0)		

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
					♀ **Weight (kg)**			
					<66.2	1		
					66.3-71.7	0.8 RR (0.5-1.4)		
					71.8-78.0	1.4 RR (0.9-2.3)		
					78.1-85.3	1.5 RR (0.9-2.4)		
					>85.4	1.8 RR (1.1-3.0)		
					♂ **BMI (kg/m^2)**			
					<21.3	1		
					21.4-23.3	0.9 RR (0.5-1.8)		
					23.4-25.1	1.0 RR (0.5-1.9)		
					25.2-27.7	1.0 RR (0.5-1.9)		
					>28.8	0.7 RR (0.3-1.6)		
					♀ **BMI (kg/m^2)**			
					<21.3	1		
					21.4-23.3	1.2 RR (0.8-1.9)		
					23.4-25.1	1.2 RR (0.7-2.0)		
					25.2-27.7	1.3 RR (0.8-2.2)		
					>28.8	1.8 RR (1.1-2.8)		
					♂ **Physical activity compared to peers**			
					More active	1		
					Same	1.1 RR (0.6-1.5)		

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
					Less active	1.1 RR (0.6-2.0)		
					♀ **Physical activity compared to peers**			
					More active	1		
					Same	1.1 RR (0.7-1.6)		
					Less active	1.3 RR (0.8-2.0)		
					♂ **Regular sport**			
					No	1		
					Yes	1.2 RR (0.8-1.9)		
					♀ **Regular sport**			
					No	1		
					Yes	1.3 RR (1.0-1.9)		
					♂ **Walking each day**			
					<30 min	1		
					>30 min	1.1 RR (0.8-1.7)		
					♀ **Walking each day**			
					<30 min	1		
					>30 min	1.2 RR (0.8-1.6)		
					♂ **Watching TV daily**			
					< 3hr	1		
					>3 hr	1.1 RR (0.7-1.6)		
					♀ **Watching TV daily**			

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
					< 3hr	1		
					>3 hr	1.1 RR (0.8-1.6)		
					♂ **Lifting (non-work)**			
					No	1		
					Yes	1.3 RR (0.9-2.0)		
					♀ **Lifting (non-work)**			
					No	1		
					Yes	1.0 RR (0.7-1.5)		
					♂ **Gardening**			
					Never / hardly ever	1		
					Weekly	1.0 RR (0.7-1.5)		
					♀ **Gardening**			
					Never / hardly ever	1		
					Weekly	1.0 RR (0.7-1.4)		
					♂ **DIY**			
					Never	1		
					Occasionally	0.9 RR (0.5-1.5)		
					Often	1.2 RR (0.7-2.1)		
					♀ **DIY**			
					Never	1		
					Occasionally	1.0 RR (0.7-1.5)		

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
					Often	0.7 RR (0.4-1.5)		
Lake et al 2000 UK	11,407 (64%) 1958 British birth cohort members, 33yrs of age Analysis restricted to 8863 persons with no history of low back pain before 23yrs of age	10yrs	Incidence at: 32-33yrs of age 549/8863 (6.2%) ♂ 302/4395 (6.9%) ♀ 247/4468 (5.5%) 23-31yrs of age 1563/8863 (17.6) ♂ 870/4395 (19.8%) ♀ 693/4468 (15.5%) 23-33yrs of age 2112/8863 (23.8%) ♂1172/4395(26.7%) ♀ 940/4468 (21.0%)	Self-report low back pain (interview) At 33 years of age asked 'Have you ever had back pain in the area shaded in this picture [12th rib to gluteal folds], that is pain which lasted for more than one day, but not counting the kind of pain you can get with flu or [if female] with periods & pregnancy?'	♂ **BMI (kg/m^2)**		BMI at 7yrs of age, social class, psychological distress at 23yrs of age	Measurements taken at 7 & 33yrs of age & from self-report at 23yrs of age. BMI centile groups: thin <15th; under-weight 15th to 39th; normal weight 40th-60th; overweight 61st to 85th; obese >85th
					At 7yrs of age, thin, underweight, overweight, obese	NR for incidence at 23-31; 23-33; 32-33yrs of age		
					At 23yrs of age, thin, underweight, overweight, obese	NR for incidence at 23-31; 23-33; 32-33yrs of age		
					♀ **BMI (kg/m^2)**			
					At 7yrs of age, thin, underweight, overweight, obese	NR for incidence at 23-31; 23-33; 32-33yrs of age		
					At 23yrs of age, thin, underweight, overweight, obese	NR for incidence at 23-31yrs of age		
					At 23yrs of age, thin, underweight, overweight	NR for incidence at 23-33yrs of age		
					At 23yrs of age obese	1.47 (1.08-1.98) at 23-33yrs of age		
					At 23yrs of age, thin	0.98 (0.57-1.67) at 32-33yrs of age		
					At 23yrs of age, underweight	0.79 (0.49-1.29) at 32-33yrs of age		
					At 23yrs of age, overweight	1.42 (0.91-2.23) at 32-33yrs of age		
					At 23yrs of age, obese	1.78 (1.07-2.95) at 32-33yrs of age		

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
Power et al 2001 UK	11407 (65.5%) 1958 British birth cohort members aged 33 years Analysis restricted to 5781 persons with no history of low back pain	1yr	Incidence at 32-33yrs of age: All: 571/5781 (9.9%) ♂ 311/2825 (11.0%) ♀ 260/2956 (8.8%)	Self-report low back pain (interview). Do you often have backache?' (Malaise Inventory, Rutter et al 1970); 'Have you ever had back pain in the area shaded in this picture [12th rib to gluteal folds], that is pain which lasted for more than one day, but not counting the kind of pain you can get with flu or [if female] with periods & pregnancy'	**Manual social class at birth**	1.21 (0.92-1.60)	All exposures	1950 British Registrar General's classification
					Manual social class age 23yrs	1.15 (0.86-1.53)		1980 British registrar General's classification
					Gender			Self-report (interview)
					Male	1		
					Female	0.72 (0.55-0.94)		
					Psychological status at 7 & 16yrs of age	1.03 (0.70-1.52)		Assessed by teacher using Bristol Social Adjustment Score (Stott 1963) at 7yrs of age, & Behaviour Score at 16yrs of age (Rutter 1967)
					BMI (kg/m^2)			Calculated from self-report height and weight (interview). Low BMI: <15th centile, high BMI: >70th centile.
					Low at 23yrs of age	1.37 (0.98-1.91) at 32-33yrs of age		
					High at 23yrs of age	1.22 (0.93-1.61) at 32-33yrs of age		
					Psychological distress aged 23yrs of age	2.52 (1.65-3.86) at 32-33yrs of age		Malaise inventory (Rutter et al 1970)
					Smoking commenced before 16yrs of age & continued to smoke moderately or heavily	1.63 (1.23-2.17) at 32-33yrs of age		Self-report (interview)
Ogon et al 2001 Austria	120 (100%) student athletes, aged 14 to 20yrs, selected for elite training in alpine skiing & without a history of low back pain	2yrs	15/120 (12.5%)	Low back pain assessed by: 1. Self-report (diary) audited by trainer & supervised by researcher 2. Physical therapy records	Severe anterior end plate lesion	3.8 p=0.04	All exposures	Lumbar radiographs evaluated for abnormalities by two independent observers
					Moderate anterior end plate lesion	0.3 p=0.27		

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
					Schmorl's node	1.8 p=0.44		
					Posterior end plate lesion	1.7 p=0.67		
Mustard et al 2005 Canada	1928 (67%) members of the Ontario Child Health Study aged 21 to 34yrs Analysis restricted to 1053 persons with no history of back pain.	1yr	143/1053* (13.6%) * 14 non-responders	Self-report (survey questionnaire) 'Have you ever had back pain which lasted for more than 1 day?' 'Do not count the type of pain you can get with the flu or with menstrual periods or pregnancy?' 'How old were you when you first had back pain lasting more than one day?' 'Have you ever had back pain lasting for more than 1 day at any time in the past 12 months?'	**Gender**		All exposures	Self-report (questionnaire)
					Male	1		
					Female	1.19 (0.77-1.83)		
					Age (yrs)			Self-report (questionnaire)
					21-25	1		
					26-35	0.69 (0.44-1.06)		
					Parental education			Self-report (Questionnaire, parent with higher educational level)
					University/college	1		
					High school or less	1.72 (1.06-2.80)		
					Emotional / behavioural disorder in early life			Parents & teachers provided information on status at 4-11yrs of age & parents & youth respondents provided information for children aged 12-16yrs
					Absent	1		
					Present	1.87 (1.02-3.41)		
					Functional limitations in early life			≥1 limitations in activities of daily living for > 6 months
					Absent	1		
					Present	0.39 (0.12-1.30)		
					Chronic medical conditions in early life			Medical problem or condition lasting ≥ 6 months
					Absent	1		
					Present	1.01 (0.56-1.82)		

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
					Personal social support			Quartile with least frequent / problematic relationships with family & friends derived from ordinal scale
					Infrequent contact	1.04 (0.84-1.30)		
					Problematic relationships	1.00 (0.83-1.20)		
					Number of children			Self-report (questionnaire)
					0-2	1		
					≥3	1.81 (0.79-4.13)		
					BMI (kg/m^2)			
					<70th percentile	1		
					70th -85th percentile	0.45 (0.20-0.99)		
					>85th percentile	1.61 (0.94-2.76)		
					Physical job demands			Borg (1982) scale
					Not working full-time	1		
					Least/ less demanding	NR		
					More/most demanding	1.53 (0.97-2.43)		
					Psychosocial work conditions			Job Content Questionnaire (Karasek 1985)
					Not high strain/ not working	1		
					High strain	0.83 (0.46-1.51)		
					Work social support			Scale created from 8 questions relating to support from co-supervisors and co-workers (Karasek
					High support/not working	1		
					Low work support (lowest	1.13 (0.67-1.93)		

Author, year, country	Population	Follow-up	Cumulative incidence (CI)	Outcome measure & definition, if given	Exposure (risk)	Risk estimate (OR given unless RR stated)	Confounders adjusted for	Instrument / method used
					quartile)			1985)
					Job satisfaction			Created from 3 items in the Job Content Questionnaire (Karasek 1985)
					Satisfied or not working	1		
					Dissatisfied (bottom quintile)	1.11 (0.63-1.94)		
					Psychological status			Derived from 5 items in SF-36 health quest-ionnaire. Including 1 item from 4 major mental health dimensions i.e. anxiety behavioural /emotional control; depression; psychological distress (Ware et al 1993)
					No distress	1		
					Low distress	1.86 (1.14-3.03)		
					Moderate / high distress	1.85 (1.07-3.20)		
					Smoking status			Self-report (questionnaire)
					Non-smoker	1		
					Current light smoker (1-9 cigarettes/day)	1.63 (0.92-2.91)		
					Current heavy smoker (≥ 10 cigarettes/day)	1.85 (1.10-3.10)		
					Education			
					University degree	1		
					No university degree	1.08 (0.65-1.80)		

DESCRIPTION OF THE PROSPECTIVE COHORT STUDIES

The eighteen papers that met the inclusion criteria were derived from thirteen prospective cohort studies published between 1984 and 2005. All the studies sought to further knowledge of the causes of low back pain in populations with no history of the symptom.

The papers reported the risk estimates from cohorts of the general population living in high income countries (World Bank 1993, Walker 2000) who were registered with healthcare providers (Von Korff et al 1993, Croft et al 1995, 1999); who participated in health surveys (Biering-Sorensen 1984a, Biering-Sorensen and Thomsen 1986, Symmons et al 1991) including the National Child Development Study derived from the 1958 British Birth Cohort (Lake et al 2000, Power et al 2001) and the Ontario Child Health Study (Mustard et al 2005); and who worked in a variety of occupations (Troup et al 1987, Macfarlane et al 1997). Specific working populations included commercial travellers (Pietri et al 1992), metal industry workers (Aro and Leino 1985), steel industry workers (Masset et al 1998), and airport cargo department manual handling workers (van Poppel et al 1998). School children in full time education (Nissinen et al 1994), novice golfers (Burdorf et al 1996), and athlete skiers (Ogon et al 2001) were also represented in the data.

These cohorts comprised populations from different age groups, and consequently, the estimates within the papers provide information about the risk of the very first ever episode of low back pain occurring in members of the general population between 17 and 45 years of age (Croft et al 1995), 30 and 60 years of age (Biering-Sorensen 1984a, Biering-Sorensen and Thomsen 1986), and 18 and 75 years of age (Von Korff et al 1993, Macfarlane et al 1997, Croft et al 1999). In addition, the estimates provide information about the risk of the first ever episode of low back pain occurring at specific life stages: school children between 12.8 and 13.8 years of age

(Nissinen et al 1994); student athlete skiers between 14 and 20 years (Ogon et al 2001); young adults between 22 and 33 years of age (Lake et al 2000, Power et al 2001), and 21 and 34 years of age (Mustard et al 2004); and middle aged women between 45 and 64 years of age (Symmons et al 1991). With the exception of Aro and Leino's (1985) cohort of metal workers between 18 and 64 years of age, the employees in specific working populations tended to form younger cohorts. For example, the commercial travellers and the airport cargo department manual handling workers in the cohorts recruited by Pietri et al (1992) and van Poppel et al (1998) had a mean age of 38.2 years SD 9.5, and 34.3 years SD 7.1 respectively; and the steel workers recruited by Masset et al (1998) were all under 40 years of age. The age of the cohort of novice golfers (Burdorf et al 1996) ranged from 20 to 60 years of age.

The majority of the prospective cohort studies comprised men and women with four notable exceptions. The exceptions were Symmons et al (1991) who only recruited female participants and Burdorf et al (1996), and Masset et al (1998) who only recruited male participants. van Poppel et al (1998) predominantly recruited male participants (236 men and 2 women).

The studies investigated a number of hypothesised causal (risk) factors for the incidence of low back pain including anthropometric characteristics (Biering-Sorensen 1984a, Nissinen et al 1994), anthropometric and functional characteristics (Masset et al 1998), and body weight (Aro and Leino 1985, Lake et al 2000); physical factors related to employment (Troup et al 1987, Macfarlane et al 1997), physical and psychosocial factors related to employment (van Poppel et al 1998), working conditions, health and social factors (Pietri et al 1992, Biering-Sorensen and Thomsen 1986), pre-work and early life factors (Power et al 2001, Mustard et al 2005); depression (Von Korff et al 1993), psychological distress (Croft et al 1995), physical activity during leisure and sporting activities (Croft et al 1999), including

playing golf (Burdorf et al 1996); radiological abnormalities (Ogon et al 2001), and radiological changes of the lumbar spine (Symmons et al 1991).

The terms used to refer to back pain varied between the different studies. The majority of studies referred either to low back pain (Symmons et al 1991, Pietri et al 1992, Nissinen et al 1994, Croft et al 1995, Macfarlane et al 1997, Croft et al 1999, Lake et al 2000, Power et al 2001, Ogon et al 2001) or back pain (Troup et al 1987, Von Korff et al 1993, Burdorf et al 1996, Masset et al 1998, van Poppel et al 1998, Mustard et al 2005). The two earliest studies however referred to low back trouble (Biering-Sorensen 1984a, Biering-Sorensen and Thomsen 1986), and lumbosacral disorder (Aro and Leino 1985). For the sake of coherence and consistency the term low back pain is used throughout this review unless a specific paper is being discussed in which case the particular term in the paper is used.

FINDINGS FROM THE PROSPECTIVE COHORT STUDIES

In keeping with published reviews (e.g. Burdorf and Sorock 1997, Hoogendoorn et al 1999, Burton and Waddell 2004) the potential causes of low back pain studied in the prospective cohort studies described above are classified below either as individual (intrinsic) or environmental (extrinsic) factors. This classification is adopted for heuristic purposes. In using this classification, it is acknowledged that there may be an interaction within and between sub-categories. For example, it is possible that one or more individual (intrinsic) risk factors may render an individual more susceptible to the effects of an environmental (extrinsic) risk factor.

INDIVIDUAL RISK FACTORS IN THE INCIDENCE OF LOW BACK PAIN

Age, gender and socio-economic status

Seven research groups explored whether any particular age group increased the likelihood of the first ever episode of low back pain occurring (Symmons

et al 1991, Pietri et al 1992, Von Korff et al 1993, Burdorf et al 1996, van Poppel et al 1998, Croft et al 1999, Mustard et al 2005). All the research groups concluded that age did not predict the first ever episode of low back pain. Furthermore, evidence (RR 0.6, 95%CI 0.4 to 0.9) from the study by Croft et al (1999) suggests that being an older woman, between 60 and 75 years of age, confers protection against having back pain for the very first time. This protective effect does not appear to apply to the men of the same age (RR 0.6, 95%CI 0.3 to 1.1). Croft et al (1999) however do not discuss this finding.

The hypothesised role of gender in the first ever episode of low back pain was studied by four research groups: Pietri et al (1992), Von Korff et al (1993), Power et al (2001) and Mustard et al (2005). Each group concluded that the probability of reporting the first ever episode of low back pain was not predicted by gender. Furthermore, the risk estimate and the confidence interval surrounding it (OR 0.72, 95%CI 0.55 to 0.94) presented by Power et al (2001) suggests that being a woman may confer protection from the first ever episode of low back pain. This risk estimate however may be an anomaly because it is generally accepted that women report more symptoms of ill-health than men (Papageorgiou et al 1995, Burton and Waddell 2004).

The hypothesised role of lower socio-economic status in the genesis of low back pain was investigated in four studies (Von Korff et al 1993, Burdorf et al 1996, Power et al 2001, Mustard et al 2005). All the studies' findings suggest that socio-economic status in adults, classified by the participant's educational attainment, is not an independent predictor of the incidence of low back pain.

Power et al (2001) and Mustard et al (2005) also studied the effects of socio-economic status early in life on the incidence of back pain. Power et al

(2001) found lower socio-economic status (manual social class at birth) was not an independent predictor of low back pain in early adulthood (OR 1.21, 95%CI 0.92 to 1.60) while Mustard et al (2005) found that lower socio-economic status (parental educational attainment during early life) was an independent predictor of back pain in young adults between 21 and 34 years of age (OR 1.72, 95%CI 1.06 to 2.80).

In the studies by Power et al (2001) and Mustard et al (2005), the unadjusted risk of incident back pain associated with lower socio-economic status attenuated following adjustment for other factors in childhood and in early adulthood such as emotional and behavioural disorders, psychological distress, smoking and physical job demands. This suggests that lower socio-economic status may contribute to these factors which, in turn, affect the risk of incident pain (Power et al 2001, Mustard et al 2005). Furthermore, the effect of socio-economic status in early adulthood attenuated even further following adjustment for early childhood socio-economic status based on parental educational attainment in the study by Mustard et al (2005). This suggests that socio-economic status in early life may be a more important risk factor than socio-economic status in young adults between 21 and 34 years of age.

Childhood emotional and behavioural disorders

Mustard et al (2005) discussed their finding of a predictive association between lower socio-economic status, based on parental educational attainment, and back pain, with their finding that emotional and behavioural disorders (hyperactivity, conduct disorder or emotional disorder) in childhood predicted incident back pain in young adults between 21 and 34 years of age (OR 1.87, 95%CI 1.02 to 3.41). On the basis of these findings, they concluded that the incidence of back pain may be associated with the latent effects of childhood experiences and / or, set the child on a trajectory that may partially determine exposures to risk factors and increase the chance of

back pain occurring for the very first time in young adulthood (Mustard et al 2005).

Number of children

Mustard et al (2005) also investigated whether having a greater number of children (≥3) increased the risk of incident back pain in young adults (24 to 31 years of age). No predictive association was found however (OR 1.81, 95%CI 0.79 to 4.13) and the rationale for testing the hypothesis was not discussed.

Ill-health

Nine studies (Biering-Sorensen and Thomsen 1986, Symmons et al 1991, Pietri et al 1992, Von Korff et al 1993, Croft et al 1995, Masset et al 1998, Croft et al 1999, Power et al 2001, Mustard et al 2005) were found to have investigated whether ill-health predicts the incidence of low back pain. These studies add to the body of knowledge about poor general health, non-specific symptoms, painful conditions apart from low back pain, depression and psychological distress before the first ever episode of low back pain. Each is considered, in turn, below.

Poor general health

Biering-Sorensen and Thomsen (1986) found adults in the community between 30 and 60 years of age had significantly poorer health before experiencing low back trouble for the very first time because of frequent abdominal pain, admissions to hospital and operations (Table 4.2). Poor health, including the more frequent use of health resources, has also been shown to correlate with the prevalence of low back pain in cross sectional studies (e.g. Nagi et al 1973, Gyntelberg 1974, Svensson et al 1983). Biering-Sorensen's and Thomsen's (1986) study however was the first prospective cohort study to implicate these variables in the incidence of low back trouble. All the health-related variables in Biering-Sorensen and

Thomsen's (1996) study showed a statistically significant association which they suggest strengthens their finding that generally people have more health problems before the first ever episode of low back trouble compared to people without low back trouble.

Croft et al (1999) also reported that the risk of experiencing a first ever episode of low back pain was increased in members of the general population who rated their health as poorer than their peers, although the finding only reached statistical significance for women who rated their health as 'fair' (RR 1.8, 95%CI 1.1 to 2.9).

In contrast, Masset et al (1998) did not find that the perception of poor general health, or chronic cough, predicted the first ever episode of low back pain in young (<40 years of age) male blue-collar steel workers. It is likely however that these steel workers constituted a healthy group by the very nature of their employment. Furthermore, for safety reasons Masset et al (1998) excluded a number of steel workers from their investigation of reduced physical capacity in the genesis of back pain, if they had any cardiovascular, respiratory or metabolic disorders, orthopaedic problems or abdominal weakness (inguinal hernia).

The incidence of back pain in young adults (21 to 34 years of age) did not appear to be related either to chronic medical conditions (OR 1.01, 95%CI 0.56 to 1.82) or to functional limitations in childhood such as trouble bending, lifting or stooping -OR 0.39, 95%CI 0.12 to 1.30- (Mustard et al 2005).

Non-specific symptoms

Pietri et al (1992) provided evidence about the nature of the poor health that may predict the incidence of the first ever episode of low back pain. They

observed that three or four non-specific symptoms, referred to as psychosomatic symptoms (Biering-Sorensen and Thomsen 1986), were predictive of the first ever episode of low back pain in commercial travellers (OR 2.5, 95%CI 1.2 to 5.1). The travellers were asked to report any headaches; migraines; difficulties getting to sleep or staying asleep; tetany; spasmophilia; good or low spirits; nervousness (irritability, fidgety, tense); fast heart rate; worries inducing physical illness, negative thoughts, a sense of things not being worthwhile; and work creating problems with marital or family life. No information however is provided about whether any particular symptom was reported more frequently than another by the travellers. Furthermore, Pietri et al (1992) did not discuss their finding that three or four symptoms predicted low back pain (OR 2.5, 95%CI 1.2 to 5.1) whereas five or more symptoms did not (OR 0.8, 95%CI 0.2 to 4.0). This finding does not meet Bradford Hill's (1965) causal criterion of a dose-response relationship. It is possible therefore that it is the presence rather than the number of non-specific symptoms that is important in the genesis of back pain or that non-specific symptoms are a risk marker and not a risk factor for low back pain.

Painful conditions

The year after Pietri et al (1992) published their study, Von Korff et al (1993) also provided information about the nature of the poor health that may predict the first ever episode of back pain in people with no history of the symptom. They found that adults, registered with an American Health Maintenance Organisation, who had one or more painful conditions, were more likely to report their first ever episode of back pain during the three year follow-up period (OR 2.09, $p<0.05$). These adults with one or more painful conditions at baseline were also more likely to experience the onset of other pain conditions during the follow-up period (adjusted odds ratio of 1.39 $p>0.05$ for chest pain, 3.69 $p<0.01$ for temporomandibular pain, 4.29 $p<0.01$ for headache and 6.25 $p<0.05$ for abdominal pain). No particular pain condition however was found to predict the onset of the first ever episode of back pain although temporomandibular disorder at baseline was most

closely associated with the report of the first ever episode of back pain relative to persons with the other pain conditions at baseline. However, the finding did not reach statistical significance (38.9% vs. 20.5%, x^2=2.7, df=1, p=0.10). Severe headache was associated with the reduced likelihood of the first ever episode of back pain occurring (subjects with severe headache vs. subjects with a painful condition other than headache at baseline: 13.7% vs. 34.9%, x^2 =5.9, df=1, p=0.02). Masset et al (1998) also found headaches did not predict a first ever episode of back pain.

These findings suggest that the presence of painful conditions and not any one specific painful condition is predictive of the incidence of another painful condition at a different anatomical site. Von Korff et al (1993) suggested that this may be due to a common cause such as poor aerobic fitness, sleep deprivation or a trait of attending to dysphoric physical symptoms. Alternatively, it may be a methodological artefact of response set in answering questions about pain history i.e. people who report pain at one anatomical site may be more likely to report pain at a different anatomical site and consequently the findings may represent the memory for pain rather than for pain onset per se (Von Korff et al 1993). Von Korff et al (1993) discounted the possibility of the specific effect of one pain condition causing pain onset at another specific anatomical site because the risk of onset of back pain, headache, chest pain, abdominal pain and temporomandibular pain were not significantly increased by the presence of any one pain condition.

Unlike Von Korff et al (1993) who restricted their study to five pain conditions Symmons et al (1991) asked middle-aged women (45 to 64 years of age) to report their medical history, rheumatic and back complaints, headaches and menstrual complaints. Stepwise logistic regression showed that joint pain elsewhere was the only independent predictor of the first ever episode of low back pain nine years later (OR 2.72, 95%CI 1.38 to 5.37, p=0.005).

Moreover the univariate analysis suggested that hip and knee pain on standing (RR 2.07, 95%CI 1.16 to 3.69) and gelling of the hip or knee on sitting (RR 2.65, 95%CI 1.65 to 4.33) were associated with the first ever episode of low back pain and continuing pain in those with no history of the symptom. It is important to remember, however, that these findings had not been adjusted for confounding factors and may therefore overestimate the effect. Also, the study only involved middle-aged women. Further research is therefore needed to assess whether or not the results can be generalised to the whole adult population. Symmons et al (1991) suggested that the similar findings in incident and continuing pain may be because the women had a predominance of osteoarthritis of the apophysial joint which cannot be viewed adequately on a lateral x-ray. An alternative explanation is that women may be more vulnerable to and likely to develop different musculoskeletal pains in different anatomical parts of the body (Nagi et al 1973, Frymoyer et al 1985, Eriksen et al 1999). Von Korff et al (1993) argue however that the phenomenon of developing pain in different parts of the body is not unique to women.

Depression

In the study by Von Korff et al (1993), the presence of a pain condition at baseline was a more consistent predictor of back pain onset rates than the presence of depressive symptoms. Depressive scores obtained using the Symptom Checklist 90-Revised (SCL-90-R) Depression Scale (Derogatis 1983) did not exceed population norms among those with a first ever episode of back pain and no association was found between depressive status (chronicity) and incidence rates for back pain in the univariate analysis. The data for the severity of depression were entered into the multivariate analysis and it was found that the odds ratio for the incidence of back pain in people with moderately severe depression was 0.23 ($p>0.05$) and the odds ratio for the incidence of back pain in people who were severely depressed was 0.28 ($p>0.05$). In the same study, the odds ratio for the onset of chest pain and severe headache were 1.7 to 2.0 times greater

for depressed persons relative to non-depressed persons, and the odds were increased for the onset of temporomandibular pain although they did not reach statistical significance. However, as Von Korff et al (1993) point out the effects of depression were inconsistent across different pain sites and did not become stronger with increasing severity. This suggests depressive illness does not have a specific effect on the subsequent risk of first ever back pain onset. Firm conclusions however cannot be drawn on the basis of evidence provided by a single study (Hartvigsen et al 2004).

Psychological distress

Psychological distress is an ill-defined concept contextually associated with the strain and stress (Ridner 2004) that may occur as a consequence of back pain. Some authors (e.g. Jorgensen et al 2000) however are questioning whether psychosocial distress may be an antecedent of low back pain and play an aetiological role. Three prospective cohort studies (Croft et al 1995, Power et al 2001, Mustard et al 2005) attempted to answer this question and concluded that psychological distress does predict the onset of the first ever episode of low back pain in the general population. The potential pathophysiological mechanisms are discussed later in this chapter.

Croft et al (1995) utilised the 12-item version of the General Health Questionnaire (GHQ), a well-validated instrument for identifying psychological distress (depression and anxiety) of recent onset in the general population (Goldberg and Williams 1988). The GHQ has been criticised in the past because the presence of physical illness can influence the score. To overcome this potential limitation, Croft et al (1995) measured self-rated physical health at baseline and found that after adjusting for poor health, the GHQ score continued to predict the incidence of the first ever episode of low back pain. This suggests that psychological distress identified by the GHQ is a more important predictor of the first ever episode of low

back pain than the concurrent influence of poor physical health. Other phenomena that may lead to psychological distress such as unemployment, inability to work because of chronic ill-health, and factors associated with age, gender, socio-economic status and smoking were also adjusted for in the regression analysis. Following this adjustment for confounding factors, the GHQ score continued to predict the onset of back pain, an outcome that Croft et al (1995) suggest cannot be dismissed on the grounds of methodological bias.

The finding that psychological distress may predict the incidence of low back pain (Croft et al 1995), while depression does not appear to predict back pain (Von Korff et al 1993) raises questions about the contrasting findings between the two studies (Croft et al 1995). Croft et al (1995) offered three explanations to account for the contrasting findings. Firstly, Croft et al (1995) used the GHQ to screen their whole population for distress whereas Von Korff et al (1993) focused on a sub group of their population who had clinical depression with one third probably meeting the criteria for chronic depression as measured at baseline by the Symptom Checklist 90-Revised (SCL-90-R) Depression Scale (Von Korff 1991, Von Korff et al 1993). Had this chronically depressed group been screened using the GHQ it is likely that they may have had a lower score on the GHQ than the cohort studied by Croft et al (1995), indicative of the symptom of depression. The GHQ is well validated as a screening instrument for psychiatric illness in the general population (Goldberg and Williams 1988). Secondly, the definition of back pain was broader in the study by Von Korff et al (1993) compared with the study by Croft et al (1995). Von Korff et al (1993) studied a number of pain conditions whereas Croft et al (1995) focused solely on low back pain. Thirdly the period of follow-up in the two studies was dissimilar which may have presented different problems relating to recall. Von Korff et al (1993) followed participants for a period of three years requiring them to have a longer recall of incident back pain than Croft et al (1995) who followed their

cohort for one year. As Croft et al (1995) point out, and as discussed earlier in chapter two the shorter the period of follow-up the more reliable the estimate. Walsh and Coggon (1991), for example, have demonstrated that there is a good recall for back pain over a 12 month interval.

In the prospective study by Power et al (2001), psychological distress assessed using the Malaise Inventory (Rutter et al 1970) at 23 years of age predicted a two-fold increase in the onset of low back pain between 32 and 33 years of age (OR 2.52, 95%CI 1.65 to 3.86). Moreover, the incidence of the first ever episode of low back pain increased with the number of symptoms reported on the Malaise inventory, a self-report 24-item checklist of symptoms of depression, anxiety and somatic illness (Rutter et al 1970) considered to have acceptable internal consistency and validity (Rodgers et al 1999). The rate of increase was greatest for those reporting more than seven symptoms of distress on the Malaise inventory i.e. a high level of psychological distress. This risk appears unaffected by adjustment for other hypothesised causal (risk) factors. Evidence from the univariate analysis in this and other publications derived from the same cohort study suggest that psychological distress in early adulthood is in part associated with circumstances in childhood such as poorer socio-economic circumstances and lower educational attainment which, in turn, may affect the risk of pain onset (Power et al 1991, 2001, 2002). In searching for alternative explanations for their finding, Power et al (2001) questioned whether the participants' negative affect may have led to the increased reporting of back pain and concluded that it is impossible to refute the possibility given the observation that psychological distress appeared to be a characteristic trait of the person during the follow-up period. Also, it is possible that negative affect may have also led to an increased reporting of the incidence of low back pain in the study by Croft et al (1995) -see above-. It is not known however whether negative affect increases the reporting of the very first episode of back pain in a similar manner to the generally accepted increased

reporting of new i.e. subsequent episodes of back pain in states of negative affect. Further information is needed before any conclusions can be drawn.

Mustard et al (2005) found that the risk of incident back pain was associated with both low (OR 1.86, 95%CI 1.14 to 3.03) and moderate / high levels of psychological distress (OR 1.85, 95%CI 1.07 to 3.20). Here psychological distress was measured using five items from the SF-36. These five items included at least one item from each of the four major mental health dimensions: anxiety, depression, behavioural / emotional control and psychological wellbeing (Mustard et al 2005).

Masset and his co-workers (1998) did not find 'psychological status' predicted low back pain occurring for the very first time in male blue collar steel workers (< 40 years of age). This finding however is not considered further for two reasons. Firstly, the nature of the 'psychological status', apart from irritable temperament, is ill-defined. Secondly, the finding may be the result of selection bias: they argued that young steel workers (<40 years of age) in Belgium are unlikely to remain at work if they are psychologically disturbed (Masset et al 1998). The reasons why they might leave the workforce are not discussed.

Personal social support

Social support is thought to 'buffer' the effects of psychological distress and therefore be conducive to health and wellbeing. Conversely, a low level of social support is hypothesised to increase the risk of ill-health including musculoskeletal pain (Johansson 1995, Karasek 1998). Mustard et al (2005) studied this hypothesis in young adults (21 to 34 years of age) but did not find any association between low levels of social support and the very first onset of back pain occurring during the following year. In their study, lack of social support was defined by two variables: 'infrequent contact' with family

and friends (OR 1.04, 95%CI 0.84 to 1.30) and 'problematic relationships' with family and friends -OR 1.00, 95%CI 0.83 to 1.20- (Mustard et al 2005).

Smoking

Smoking has repeatedly been studied over many years in an attempt to understand its role, if any, in the genesis of back pain. As a result of experimental studies it has been hypothesised that smoking may render the back more vulnerable to mechanical stresses through direct physical effects such as the reduction of the mineral content of the lumbar vertebrae leading to osteoporosis and micro fractures; and the diminution of blood flow and tissue nutrition via vasoconstriction, atheroma, impaired fibrinolysis, increased blood viscosity and reduced tissue oxygen uptake, a consequence of carboxyhaemoglobin (Battie et al 1991, Ernst 1993, Goldberg et al 2000). The mechanical effects of coughing and the effects of nicotine on receptors in the neuromuscular system have also been implicated in the genesis of back pain (Goldberg et al 2000). Other theories suggest that smoking may be an indicator or a risk marker of other factors affecting pain onset such as psychosocial problems, physical (in)activity and overeating. Smoking is known to vary with socio-economic status, education and employment and may be an indicator of a complex interplay of demographic, psychosocial and lifestyle factors (Burton and Waddell 2004).

Seven studies (Biering-Sorensen and Thomsen 1986, Symmons et al 1991, Pietri et al 1992, Masset et al 1998, Croft et al 1999, Power et al 2001, Mustard et al 2005) were identified for this review all of which sought to further knowledge about the predictive value of smoking in the genesis of the first ever episode of low back pain.

Three of the seven prospective cohort studies found a predictive association between smoking and the incidence of low back pain occurring in the

general population (Table 4.2: Biering-Sorensen and Thomsen 1986, Power et al 2001, Mustard et al 2005). Furthermore, Power et al (2001) and Mustard et al (2005) found that there may be a dose-response relationship. In the study by Power et al (2001), the participants who started smoking before they were 16 years of age and continued to smoke moderately or heavily until they were 33 years of age had an increased risk of incident back pain suggesting that the longer the person smokes the higher the risk for developing back pain nine years later (OR 1.63, 95%CI 1.23 to 2.17). In the study by Mustard et al (2005) participants who smoked heavily i.e. ≥ 10 cigarettes daily had an increased risk of developing back pain for the very first time (OR 1.85, 95%CI 1.10 to 3.10) compared with participants who smoked lightly i.e. <10 cigarettes daily (OR 1.63, 95% CI 0.92 to 2.91). No conclusion regarding a dose-response relationship however can be drawn from the other studies i.e. Biering-Sorensen and Thomsen (1986), Symmons et al (1991), Pietri et al (1992), Croft et al (1999). This is because they measured the predictive value of 'past', 'current' or 'daily' smoking none of which provide sufficient information about the quantity of tobacco consumption in a given time period. Masset et al (1998) do not state how they measured smoking.

Four of the seven cohort studies found that smoking is not a predictor of the first ever episode of low back pain in middle-aged women (Symmons et al 1991), commercial travellers (Pietri et al 1992), male steel workers under 40 years of age (Masset et al 1998) and the general population (Croft et al 1999).

One possible explanation for the inconsistent findings amongst the seven studies is the confounding influence of poor health. People with poor health are more likely to smoke and vice versa (Vogt et al 2002). However, this explanation is unlikely given the fact that Biering-Sorensen and Thomsen (1986), Pietri et al (1992), Croft et al (1999), Power et al (2001), and Mustard

et al (2005) all controlled for the confounding effects of poor physical and / or mental health in their statistical analyses. Power et al (2001), for example, found the increased risk of the first ever episode of low back pain occurred in those who commenced smoking before they were 16 years old and who continued to smoke after poor health (psychological distress) and other risk factors had been taken into account in the multivariate analysis. Residual confounding however cannot be discounted and needs to be considered in future studies (see below).

It is relevant to note that following adjustment for confounding, smoking appeared to be a weaker predictor of the first ever episode of back pain compared with the aspects of poor health measured in the studies by Biering-Sorensen and Thomsen (1986), Pietri et al (1992), Croft et al (1999) and Power et al (2001) but not in the study by Mustard et al (2005). Mustard et al (2005) adjusted for the confounding effect of specific chronic medical conditions (>6 months) in early life whereas the other studies adjusted for the confounding effects of non-specific health in adults i.e. psychological distress (Power et al 2001), poor general health (Croft et al 1999) and non-specific symptoms (Pietri et al 1992). These findings therefore suggest that non-specific ill-health may possibly be a marker or a more important predictor of back pain occurring for the very first time than smoking.

These inconsistent findings regarding the role of smoking in the incidence of the first ever episode of back pain concur with those of other reviews by Leboeuf-Yde (1999) and Goldberg et al (2000). These reviews of cross-sectional and longitudinal studies of new episodes of low back pain also found that some studies reported statistically significant associations between smoking and the prevalence of back pain whilst others did not. In addition, there appears to be some evidence suggesting that stopping smoking reduces the frequency of new episodes of low back pain (Leboeuf-Yde 1999) fulfilling Bradford Hill's (1965) criterion of reversibility. Some

authors (e.g. Burton and Waddell 2004) however disagree with this observation. Consequently, it is not known whether any causal inference can be made or whether people who cease smoking have less back pain for some other reason. Also, it is important to remember that the causes of new episodes of back pain are not necessarily the same as the first ever episode of back pain (Burton et al 1996b, Frank et al 1996a, 1996b, Linton 2000, 2001).

Anthropometric characteristics

Four prospective cohort studies focused on identifying whether the size and proportions of the body (anthropometry) play a role in the incidence of the first ever episode of low back pain (Biering-Sorensen 1984a, Nissinen et al 1994, van Poppel et al 1998, Masset et al 1998).

Height, femur epicondylar width, leg length, hamstring length

Biering-Sorensen (1984a) appears to have been the first to recognise the need for longitudinal studies to fill the gap in knowledge about the potential role of anthropometry in the genesis of low back pain, an observation confirmed by van Poppel et al (1998). In adult members of the general population, between 30 and 60 years of age, Biering-Sorensen (1984a) found the following anthropometric measurements were unrelated to the first ever episode of back pain in the univariate analysis: height, femur epicondylar width, leg length, unequal leg length and length of hamstring muscles.

Sitting height (skeletal size)

Ten years later Nissinen et al (1994) drew attention to the findings of cross sectional studies suggesting anthropometry may account for the high prevalence of low back pain in the growing adolescent spine. Like Biering-Sorensen (1984a) they drew attention to the lack of longitudinal studies and proceeded to study all the fourth grade school children in a district of Helsinki

prospectively. Sitting height, an indicator of skeletal size, at 12.8 years was a statistically significant predictor of first ever low back pain in the children one year later (OR 1.24, 95%CI 1.03 to 1.46). As Nissinen et al (1994) point out, this finding is consistent with the results from the case control study by Fairbank et al (1984) identifying sitting height as a potential risk factor for incident back pain but only in boys. The growth of sitting height, however, was not significant for either boys or girls (Nissinen et al 1994). This suggests that skeletal growth does not play a role in the incidence of back pain during adolescence.

Trunk asymmetry

Nissinen et al (1994) also found trunk asymmetry at 12.8 years was a statistically significant predictor of the first ever episode of low back pain one year later (OR 1.19, 95%CI 1.00 to 1.39). This finding, implicating trunk asymmetry in incident back pain, contrasts with the findings from a cross-sectional study suggesting that adults with scoliosis and trunk asymmetry do not experience low back pain more than control subjects (Weinstein et al 1981). This suggests that it may be the development of the asymmetric trunk during the adolescent growth spurts that might cause the pain although an earlier prospective study of young adults counters this argument (Dieck et al 1985) as Nissinen et al (1994) point out.

The other explanatory variables identified as potential risk factors in the univariate analysis performed by Nissinen et al (1994) did not have statistical significance in the multivariate model. These variables were kyphosis, increase of kyphosis, body mass index and growth of body mass index the latter two of which are discussed further below.

Nissinen et al (1989, 1994) suggest that the representativeness of their cohort and high participation rate (86.5%) mean that their results may be

generalised to all children. However, the results need to be replicated before any firm conclusions can be drawn.

Trunk imbalance (frontal plane)

Masset et al (1998) found that a greater imbalance of the trunk on the pelvis in the frontal plane predicted the first ever episode of low back pain occurring in young (<40 years) male blue collar steel workers during the following two years (OR 1.74, 95%CI 1.15 to 2.64). The imbalance was calculated by measuring the deviation (mm) in the frontal and sagittal planes in relation to theoretical vertical alignments of the most posterior part of the lumbar region of the spine (T7 or T8) and the level of S2. The researchers suggested that this imbalance leads to uneven constraints upon the spinal tissue resulting in pain.

Body weight

Ten studies investigated whether body weight plays a role in the first ever episode of low back pain (Biering-Sorensen 1984a, Aro and Leino 1985, Symmons et al 1991, Pietri et al 1992, Nissinen et al 1994, van Poppel et al 1998, Croft et al 1999, Lake et al 2000, Power et al 2001, Mustard et al 2005). Weight is hypothesised to cause back pain by physically increasing the load placed on the spine disposing it to 'wear and tear' and osteoarthritis (Leboeuf-Yde 2000a, Dieppe and Lohmander 2005).

Croft et al (1999) found that, in women, the risk of low back pain rose with increasing weight (Table 4.2): women in the heaviest quintile (>85.4kg) had a statistically significant higher risk of having back pain for the very first time compared with women in the lightest quintile (< 66.2kg) (RR 1.8, 95%CI 1.1 to 3.0). Similarly, when weight was considered in relation to height, and Quetlet's body mass index (BMI) calculated (weight [kg] ÷ height $[m]^2$), the risk of the very first episode of back pain was increased across the BMI

quintiles with women in the heaviest BMI quintile (>28.8kg/m^2) having a statistically significant increased risk compared with women in the lightest BMI quintile (<21.3kg/m^2) (RR 1.8, 95%CI 1.1 to 2.8). Garzillo and Garzillo (1994) place this BMI in context: a woman with a BMI of 29 who is 1.75m tall will weigh 88.8 kg.

Lake et al (2000) also found BMI was associated with the incidence of the first ever episode of low back pain in women: the BMI at 23 years of age, but not at 7 years of age, increased the likelihood of incident back pain between 32 to 33 years of age. Women in the heaviest BMI centile (>85th centile i.e. >24.9kg/m^2) considered 'obese' were at increased risk of back pain compared with women in the lightest BMI centile considered 'thin' (<15th centile i.e. <19.2kg/m^2) (OR 1.78, 95%CI 1.07 to 2.95). A similar, albeit slightly weaker, result was found for women deemed obese at 23 years of age and back pain occurring for the very first time between 23 and 33 years of age (OR 1.47, 95%CI 1.08 to 1.98) after adjustment for the confounding factors recorded at 23 years of age i.e. body mass index at 7 years old, social class and psychological distress at age 23. Also, the authors noted that there was a similar but slightly weaker link between BMI at 23 years of age and the first ever episode of back pain between 24 and 32 years of age. However they did not present the statistics in their research paper.

Croft et al (1999) and Lake et al (2000) both found that, in men, the incidence of the first ever episode of low back pain was unrelated to weight irrespective of the body weight indices used. These findings suggest that men and women may have a different susceptibility to the loading placed by weight on the spine.

In a separate analysis of BMI, Power, a co-author with Lake et al (2000) found that a smaller sample from the National Child Development Study

were at increased risk of low back pain occurring for the very first time between 32 and 33 years of age if they were overweight (>70th percentile) at the age of 23 years (Power et al 2001). However, this risk attenuated following adjustment for confounding factors in the multivariate analysis, and while those who were overweight (>70th percentile) continued to have an increased (non significant) risk of back pain (OR 1.22, 95%CI 0.93 to 1.61) those who were underweight, (<15th percentile) became at greater (non significant) risk (OR 1.37, 95%CI 0.98 to 1.91). Power et al (2001) refer to the non significant finding as 'borderline'.

Nissinen et al (1994) studied adolescents and found that the BMI and the growth of the BMI between 12.8 and13.8 years of age did not appear to increase the risk of developing back pain during that year. There was a modest increase in the growth of body mass index and incident back pain (OR 1.22, 95%CI 0.93 to 1.57) following adjustment for confounding factors that did not reach statistical significance. Body mass index per se did not appear to increase the risk of incident back pain (OR 1.0, 95%CI 0.81 to 1.21, p=0.99). Whether or not these findings can be generalised to all adolescents is open to question. The observation that there was not a female dominance in low back pain occurrence suggests the population may have been atypical although the authors argue that the high response rate (86.5%) allows generalisation of the results. Furthermore, in the multivariate analysis the researchers did not adjust for psychosocial distress, a potential confounding factor (see below).

The five remaining studies all found that the first ever episode of low back pain was unrelated to weight in univariate analysis (Aro and Leino 1985, Symmons et al 1991, Pietri et al 1992, van Poppel et al 1998) and discriminant analysis (Biering-Sorensen 1984a). Consequently, the indices of weight including kilograms, BMI and Rohrer's ponderal index were not

entered into the multivariate logistic regression analysis or, in the case of Biering-Sorensen (1984a), into the discriminant function analysis.

Masset et al (1998) and Mustard et al (2005) both reported anomalous findings: an inverse association between weight and the incidence of the first ever episode of back pain i.e. heavier weight appeared to confer a protective effect in young (<40 years of age) male blue collar steel company employees (Masset et al 1998) (kg: OR 0.95, 95%CI 0.92 to 0.98, p=0.001) and in young adults between 21 and 34 years of age -BMI 70th to 85th percentile: OR 0.45, 95%CI 0.20 to 0.99- (Mustard et al 2005).

Physical capacity

Anatomical and biomechanical studies suggest that the trunk muscles stabilise the spinal structures (Floyd and Silver 1955, Goel et al 1993) and protect the lumbar spine from the compressive and shear forces associated with the raised intra-abdominal pressure that occurs during everyday activities such as heavy lifting, running and jumping (Cholewicki et al 1999). This protective effect is associated with physical fitness (Biering-Sorensen 1984a). Conversely, the reduced muscular capacity of the lumbar spine to withstand the forces it is subjected to is associated with the increased risk of back pain occurring (Chaffin et al 1978, Keyserling et al 1980, Masset et al 1998). This observation is supported by evidence from studies demonstrating an association between reduced muscular capacity and the prevalence of low back pain (Beimborn and Morrisey 1988, Hamberg-van Reenen et al 2007). What is not clear, however, is whether trunk muscle weakness contributes to the very first episode of low back pain (Lee et al 1999).

Four prospective cohort studies (Biering-Sorensen 1984a, Troup et al 1987, Masset et al 1998, van Poppel et al 1998) investigated indices of reduced

physical capacity in the first ever episode of low back pain using five proxy measures: trunk muscle strength, trunk muscle endurance, movement velocity, lifting capacity and spinal movement. Each is considered, in turn, below.

Trunk muscle strength

Three studies reported by Troup et al (1987), van Poppel et al (1998) and Biering-Sorensen (1984a) suggest that the first ever episode of back pain is unrelated to trunk muscle strength i.e. the ability to exert force. Specifically, Troup et al (1987) found trunk flexor strength (sit ups) did not predict the first ever episode of low back pain ($p>0.05$); and van Poppel et al (1998) found no association between abdominal muscle strength (complete and slow curled-trunk sit ups from a supine position with the legs extended) and the first ever episode of low back pain in the univariate analysis ($p>0.2$). Also, Biering-Sorensen (1984a) found no association between dynamic muscle strength tests (sit up and leg lowering tests) and static muscle strength tests (flexion and extension) and the first ever episode of back pain ($p>0.10$). The trunk muscles appeared to be weaker among those who experienced recurrent low back trouble but no clear finding was observed for those with first ever back trouble. The leg lowering test from 90° hip flexion in the supine position involved measuring the angle between the extended legs and the couch immediately the pelvis started to tilt anteriorly and / or the low back started to arch from the couch.

It is relevant to note that Masset et al (1998) studied trunk movement (torque) values using the B-200 dynamometer and found the results were equivocal. The torque value relating to movement (flexion and extension) in the sagittal plane at 50% maximum isometric strength of the trunk were predictive of the first ever episode of back pain while the maximal isometric capacity of the workers were not (Table 4.2). Masset et al (1998) also performed isoinertial (dynamic) tests. However, the results were not

corrected for gravitational effects, as required, and consequently no conclusions about trunk muscle strength can be drawn from them (Masset et al 1998, Colloca et al 2005).

Trunk muscle endurance

Two studies (Biering-Sorensen 1984a, van Poppel et al 1998) explored whether trunk muscle endurance, the ability to exert force repeatedly, predicted the first ever episode of low back pain. The results were equivocal.

Biering-Sorensen (1984a) found reduced isometric back muscle endurance predicted the first ever episode of low back trouble in men. (Men with first ever low back trouble vs. men with no low back trouble: mean 176 seconds vs. 198 seconds $p=0.029$). In women however, greater isometric back muscle endurance predicted the very first ever episode of low back trouble although this finding did not reach statistical significance. (Women with first ever low back trouble vs. women with no low back trouble: mean 210 seconds vs. 197 seconds $p=0.34$).

There is no clear reason why longer trunk muscle endurance in all age groups is associated with the onset of first ever back pain in the women, a contradictory finding to that in men (Mann Whitney rank sum tests $p \leq 0.0012$). Biering-Sorensen (1984a) suggests three possible explanations for the finding. Firstly, the measurement of endurance may have been affected by each subject's level of motivation. During the test subjects are in a prone position with only the lower part of the body supported by the couch: the buttocks and legs are fixed to the couch by three wide straps and the arms folded across the chest while the upper part of the body, from the upper border of the iliac crest is held horizontal until too tired to continue. Secondly, the finding may be partially explained by anthropometric differences. The women with longer endurance times were lighter and had smaller femoral

epicondylar width than the men. Thirdly, it is possible that the women excluded from the analysis because of missing data resulted in the anomalous finding. Also, it is relevant to note that none of the one-dimensional (marginal) t tests had p values below 0.05 and yet the authors proceeded to perform discriminant analysis on the data. Troup et al (1987) consider the testing draconian and question whether it should be permitted.

van Poppel et al (1998) found abdominal muscle and back muscle endurance were not related to the first ever episode of low back pain in the univariate analysis ($p>0.2$) of data from their cohort of cargo workers (236 male, 2 female). Consequently, the data relating to these variables were not entered into the multivariate analysis.

Movement velocity

Masset et al (1998) investigated whether movement velocity predicted the first ever onset of low back pain during isoinertial (dynamic) tests in each of three planes, sagittal (flexion and extension), rotational, and frontal (lateral flexion) against resistances set at 25% and 50% of the maximum isometric torques in the corresponding planes. Each dynamic test in a particular plane comprised five complete movements at maximum velocity, against the relative resistances.

The odds ratios derived from the tests can be seen in Table 4.2. All the odds ratios are systematically greater than 1 indicating that young (< 40 years of age) male steel workers performing faster dynamic tests on the dynamometer are at greater risk of experiencing a first ever episode of low back pain in the following year. The finding is statistically significant for velocity in the rotational planes against resistances set at 25% (OR 1.76, 95%CI 1.18 to 2.63, $p=0.005$) and 50% (OR 2.29, 95%CI 1.51 to 3.46, $p=0.001$) and in the frontal plane against resistance set at 25% (OR 1.65,

95%CI 1.17 to 2.33, p=0.01) but not in the sagittal plane. The odds ratios in the sagittal planes are considered statistically non significant because Masset et al (1998) set the level of significance at p=0.01 to avoid a type 1 error occurring as a result of multiple hypothesis testing i.e. concluding the hypothesised causal (risk) factor (movement velocity) caused the outcome (back pain) when it is likely to have occurred by chance.

The finding that workers performing faster dynamic tests on the dynamometer are at greater risk for a first ever episode of back pain is contrary to the hypothesis that the risk of back pain is greater in people with reduced physical capacity. Masset et al (1998) proposed three explanations to account for this finding. Their first explanation is that of the 'healthy worker effect' i.e. only workers with the highest capacity are employed in a blue collar capacity in the steel industry. However, 'the healthy worker effect' is unlikely to be of such magnitude to invert the findings. Consequently, Masset et al (1998) conclude it is only partially the case. Their second explanation is that the steel workers' performance on the dynamometer reflects risk taking and not functional capacity thus the individual working faster during the dynamic tests is more likely to work faster and consequently to experience back pain. Their third explanation is that the tests performed on the dynamometer do not reflect the working conditions within the steel industry and consequently are not relevant to predicting the risk of low back pain in the workplace (Masset et al 1998).

Lifting capacity

Troup et al (1987) utilised a battery of tests to evaluate whether reduced lifting capacity predicted future low back pain and could be used for pre-employment medical screening. None of the tests however were found to be of value in predicting low back pain (Table 4.1) and consequently are not considered further in this review. The battery of tests comprised the (1) maximal isometric lifting strength test (MILS) with the hands at knee level:

subjects were asked to increase force over a period of three seconds and then to hold it at a maximum for four seconds, the maximum force being the average force held during three of the four seconds (2) rating of acceptable load (RAL) developed by Griffin et al (1984): subjects were asked to select the maximum weight they anticipated would be comfortable to lift from the floor to the table at five minute intervals throughout the working day (3) acceptable isometric lifting force (AILF) developed by Foreman et al (1984) and modified by Baxter et al (1985): subjects were offered three attempts to select the comfortable level of force at knee and waist level imagined to induce no feeling of strain while holding it steady for ten seconds.

Spinal movement

Alterations in spinal mobility are thought to be associated with current and past episodes of low back pain (Kulig et al 2007). These alterations include restrictive, excessive and poorly controlled movement of the spinal muscles (Mayer et al 2000, Panjabi 2003, Abbott et al 2006). In clinical practice and research the range of spinal movement is therefore measured to assess any impairment (McGregor et al 1995, Littlewood and May 2007). Three research groups (Biering-Sorensen 1984a, Troup et al 1987, Masset et al 1998) questioned and subsequently explored whether any alteration in spinal movement is associated with the onset of the first ever episode of low back pain in the general population (Biering-Sorensen et al 1984a), in the general population in gainful employment (Troup et al 1987) and in steel industry workers (Masset et al 1998).

Biering-Sorensen (1984a) estimated spinal flexibility using two measures, the finger tip to floor test (Perrett et al 2001), and the modified Schober test (Macrae and Wright 1969, Tousignant et al 2005). The fingertip to floor test did not prove to be of predictive value of the first ever onset of back pain. In this test the measurement from the tips of the middle fingers to the floor were taken whilst the participant, in stockings or bare feet, bent forwards

maximally with the feet together and the knees straight. The results from the modified Schober test, however, revealed that greater lumbar flexion predicted the first ever onset of back pain in men but not in women (Table 4.1). Masset et al (1998) also used the modified Schober test but found that, in contrast to Biering-Sorensen's (1984a) study, lumbar flexion was not predictive of low back pain in men under 40 years of age (non low back pain mean= 22.3mm SD 0.9 vs. low back pain mean= 22.2mm SD 0.8, univariate $p>0.05$). The study by Masset et al (1998) provides no information about lumbar flexion in women given their insufficient number in the steel industry.

The modified Schober test involves each person standing upright with both feet flat on the floor while a horizontal line is marked in ink on the skin at the level of the dimples of Venus which approximates to the lumbosacral junction. Further marks are inked on the skin 5cm below and 10cm above the first mark. The participant is then asked to bend forward maximally and the distance between the lower and the upper marks are measured in millimetres (Biering-Sorensen 1984a). First described in 1937 by Dr Paul Schober, a German physician, the test became known as the modified Schober test following Macrae and Wright's (1969) recommendation that the 5cm mark be inked on the skin in addition to the 10cm mark.

Troup et al (1987) found a greater flexion–extension range in subjects developing 'new' but not specifically the first ever episode of back pain compared with those not developing pain. In contrast, two other prospective studies found reduced lumbar flexion among subjects developing new as opposed to first ever episodes of low back pain (Mayer et al 1984, Takala and Vikari-Juntara 2000).

In conclusion, there is inconclusive and insufficient evidence to come to any decision about the role of spinal flexion in the incidence of back pain.

Radiological changes and abnormalities

Two studies (Symmons et al 1991, Ogon et al 2001) examined radiographs to evaluate whether they revealed any lumbar spine changes or abnormalities that might be used to predict the incidence of low back pain.

Symmons et al (1991) examined the lateral radiographs of the lumbar spines of middle-aged women (45 to 65 years of age). Their univariate analysis revealed that neither the presence of disc degeneration nor osteoporotic vertebral collapse at the onset of the study, nor the development and deterioration of disc degeneration and incident fractures during the nine year follow-up, predicted the first ever episode of low back pain. They concluded that their finding supported those of earlier authors (e.g. Gibson et al 1980, LaRocca and Macnab 1969) that radiology is of no value in predicting future (first ever and subsequent) episodes of low back pain in adults, except in the presence of certain sinister features.

Ogon et al (2001) examined the plain anteroposterior (AP) and lateral radiographs of young athletes (skiers), between 14 and 20 years of age, to evaluate whether lumbar spine abnormalities associated with developmental changes (scoliosis, spina bifida occulta) and degenerative changes (anterior end plate lesions, Schmorl's nodes, posterior end plate lesions, spondylolysis) predict the first ever episode of low back pain. Young people, particularly those participating in sports at a competitive level, are considered to be at higher risk of low back pain (Balague et al 1994, Taimela et al 1997, Jones and Macfarlane 2005) especially after the cessation of the sports activity (Koichi and Shinsuke 2000). Hence the young skiers in the study by Ogon et al (2001) study underwent routine medical evaluation including radiological screening for low back pain before admission to elite level training.

Ogon et al (2001) found that in the young skiers the presence of severe anterior endplate lesions (>18% vertebral body height) increased the odds (OR 3.8, p=0.04) of the first ever episode of low back pain occurring during high performance training during the 2-year follow-up period. Schmorl's nodes (OR 1.8, p=0.44) and posterior endplate lesions (OR 1.7, p=0.67) were also associated with an increased risk. However, they were statistically non significant. Moderate anterior endplate lesions (<18% vertebral body height) reduced the risk of low back pain occurring for the very first time (OR 0.3, p=0.27). This finding is an anomaly and likely to be due to chance. Spondylolysis, scoliosis and spina bifida occulta were also unrelated to the incidence of the first ever episode of back pain.

These findings neither confirm nor refute the possibility that endplate lesions are associated with the first ever episode of low back pain in young people performing sport at a high level. They do however indicate the need for anterior endplate lesions to be distinguished from moderate end plate lesions (Ogon et al 2001). Recent evidence suggests that the degenerative processes of the vertebral endplates can be retarded or reversed. Consequently the role of the vertebral endplate in low back pain remains 'an enigma' (Moore 2006).

In summary, it appears that, in adults, radiological changes do not appear to predict who will develop low back pain (Symmons et al 1991). In young elite skiers the results are not so clear cut. The findings from the study by Ogon et al (2001) suggest severe anterior endplate lesions may possibly play a role in the first ever episode of low back pain. On the basis of this one finding however it is difficult to justify routine radiological screening in young sports persons given the risks from irradiation. Currently, radiological and magnetic resonance imaging are considered ineffective screening tools because they do not distinguish people with low back pain from those without on the basis of the degenerative changes and abnormalities in the lumbar spine

discussed above (Deyo et al 1985, Coste et al 1991, Tertii et al 1991, Harreby et al 1995, Waddell 2004d).

ENVIRONMENTAL RISK FACTORS: PHYSICAL

Work-related activity

Level of physical exertion

Mustard et al (2005) investigated whether the physical demands of a job play a causal role in the aetiology of back pain. They concluded that young adults (21 to 34 years of age) who perceived their job to be 'more or most demanding' were not at increased risk of back pain (OR 1.53, 95%CI 0.97 to 2.43) compared with those who were either not working or perceived their job to be 'least or less demanding' (data not reported). The young adults were classified into either the 'more or most physically demanding group' or the 'least / less physically demanding group' on the basis of their responses to the Borg scale ranging from 0 -very very light- to 14 -very very heavy- (Borg 1982).

Manual materials handling

Manual materials handling involves various combinations of lifting, lowering, moving (pulling and pushing), and carrying and handling physical loads (Hoozemans et al 1998, Waddell 2004e). Initially studied in industrial settings, it soon became recognised that these movements occur in other work settings such as healthcare settings involving the movement of people, and in leisure settings beyond the workplace e.g. DIY in the home and exercise in the gymnasium. There is strong and consistent biological and physiological evidence that workers with jobs involving manual handling report more back pain (Burdorf and Sorock 1997). Most of this evidence however comes from cross sectional studies. The challenge therefore is to see if the evidence from prospective cohort studies concurs with that from the cross sectional studies (Kuiper et al 1999).

Two prospective cohort studies (Aro and Leino 1985, Power et al 2001) examined whether involvement in manual materials handling predicts the first ever episode of low back pain. The findings suggest further evidence is needed before any firm conclusions can be drawn.

In the first study, Aro and Leino (1985) found blue-collar compared with white-collar workers in the metal industry had a twofold risk of experiencing lumbosacral disorder for the first time during the ten year follow-up period (RR 2.0, $p<0.05$). In the second study, however, Power et al (2001) found people belonging to 'manual social class', an indicator of manual work at 23 years of age, only had a weak non significant (OR 1.15, 95%CI 0.86 to 1.53) effect on the incidence of low back pain occurring during the following year. Adjustment for the potential confounding factors of psychological distress and smoking, that are associated with poorer socio-economic circumstances, reduced the odds ratio from 1.61 to 1.32, and further adjustment for other factors reduced the odds of manual social class playing a role in the incidence of a first ever episode of low back pain to 1.15. This suggests that factors such as psychological distress and smoking may possibly be more important than manual handling in the incidence of low back pain (Power et al 2001).

In summary, the evidence from the two prospective cohort studies (Aro and Leino 1985, Power et al 2001) is inconsistent regarding the role of manual materials handling in the very first episode of low back pain.

In addition to studying the construct of manual materials handling attempts have been made to identify the relative contribution of the different components of manual materials handling in the development of back pain. Distinguishing between the movements which may occur simultaneously during a particular task is difficult and assessments of exposure must be

made accurately to draw valid conclusions. Nonetheless, reviews of studies, considered to have an acceptable design, suggest that pulling and pushing (Hoozemans et al 1998) lifting, and lifting in combination with bending and twisting (Burdorf and Sorock 1997, Kuiper et al 1999) are associated with low back pain. Burdorf and Sorock (1997) found an association with bending and twisting and back pain in 9/10 studies with risk estimates of between 1.29 and 2.80 with an outlier of 8.09; and a positive association between lifting and carrying a load and back pain in 16/19 studies with risk estimates varying between 1.12 and 3.07. Kuiper et al (1999) found a positive relationship between lifting and back pain in 15/16 studies with 18 risk estimates varying from 1.3 to 4.2.

Lifting and moving objects

It is generally agreed that there is sufficient biomechanical and physiological evidence to meet Bradford Hill's (1965) causal criterion of 'biological plausibility' i.e. to suggest that lifting and moving objects may play a role in the aetiology of low back pain (Hoozemans et al 1998, Cole and Grimshaw 2003). Insufficient knowledge however exists to fulfil Bradford Hill's (1965) other criteria necessary for a causal relationship. Five prospective cohort studies (Troup et al 1987, Macfarlane et al 1997, Masset et al 1998, van Poppel et al 1998, Pietri et al 1992) were found that address this gap in knowledge by providing information about the temporal sequence of events between lifting and moving and back pain, and the frequency and rate of the lifting and moving required.

Macfarlane et al (1997) appear to have been the first research group to study the risk of lifting and moving (pulling and pushing objects) in the incidence of the first ever episode of low back pain in the working population and provide information about the 'dose-response relationship' that may be involved. Lifting and moving heavy weights of more than 25lbs (approximately 11kg) at work increased the likelihood of the first ever

episode of low back pain occurring. This association was stronger in women (OR 2.0, 95% CI 1.01 to 4.0) than in men where it was non significant (OR 1.5, 95% CI 0.8 to 2.8). Also, digging and shovelling at work increased the risk of the first ever episode of back pain. This non significant association was stronger in women (OR 4.8, 95% CI 0.4 to 5.4) than in men (OR 1.1, 95% CI 0.3 to 3.6). On the basis of this finding Macfarlane et al (1997) suggest that when women are exposed to lifting and moving heavy loads they are more likely than men to experience their first ever episode of low back pain. However, this finding was statistically non significant and may therefore have occurred by chance.

Macfarlane et al (1997) further divided their cohort into a younger (18 to 44 years of age) and an older (45 to 75 years of age) group of employees. The increased risk of back pain occurring for the very first time was entirely limited to the younger group for lifting / moving heavy weights (men OR 1.6, 95%CI 0.8 to 3.2; women OR 2.8, 95%CI 1.3 to 5.9). This increased risk was unrelated to the cumulative exposure (number of years) to lifting and moving (Table 4.2). Information about the risk of lifting and moving in young employees is also available from the study of male steel workers (<40 years of age) carried out by Masset et al (1998). The young men who perceived that their work entailed heavy lifting effort were more likely to experience back pain for the very first time during the two year follow-up period (OR 2.26, 95%CI 1.12 to 4.55). This strong relationship could not be explained by other factors such as weight distribution, an indicator of body build and size, because weight distributions were the same among those perceiving their lifting efforts as light or heavy (Student's t test non significant).

Macfarlane and co-workers' (1997) observation that older employees (45 to 75 years of age), with longer exposure to years of lifting and moving objects at work, had a lower risk of experiencing back pain for the very first time requires consideration (Table 4.2). One possible explanation is that

employees with a history of back pain may have changed jobs or work activities, particularly if they considered their work was responsible for their back pain. Consequently, Macfarlane et al (1997) may have recruited a group of older employees who were not susceptible to back problems, a phenomenon known as 'the healthy worker effect'. van Poppel et al (1998) like Macfarlane et al (1997) found length of exposure in terms of hours (rather than years) performing manual lifting tasks per week was unrelated to incident pain (univariate $p>0.2$). Short term effects therefore seem more important than cumulative exposure.

In contrast to the findings from the study by Macfarlane et al (1997), Troup et al (1987) found tests of lifting capacity in the laboratory did not predict the first ever episode of low back pain occurring (Table 4.1). Also, Pietri et al (1992) found lifting loads at work was unrelated to incident back pain among commercial travellers (OR 0.9, 95%CI 0.5 to 1.5). The statistical power for Pietri and his colleagues' (1992) study was checked by Kuiper et al (1999) using Lwanga and Lemeshow's (1991) manual for determining sample size and found to be sufficient. Consequently, one explanation for the finding is that the effect of carrying loads was reduced by the presence of a larger odds ratio for whole body vibration in the multivariate model (Pietri et al 1992, Kuiper et al 1999). A hypothesised causal factor may not appear to increase the risk of low back pain in addition to the effects of other factors in the multivariate analysis that have larger risk estimates (Burdorf and Sorock 1997). Consequently, Burdorf and Sorock (1997) recommend the finding from the study by Pietri et al (1992) be considered inconclusive.

In summary, women exposed to lifting and moving heavy loads (> 25lbs) appear to be at greater risk than men of experiencing low back pain for the very first time (Macfarlane et al 1997). The increased risk in the younger women (18 to 44 years of age) may be due to the 'healthy worker effect' (Macfarlane et al 1997). The short term effects of lifting a heavy load (>25lb)

seem more important than the cumulative effect of the activity (Macfarlane et al 1997). Methodological and statistical reasons may explain why tests of lifting loads in a laboratory (Troup et al 1987) and the effects of lifting loads (Pietri et al 1992) in the workplace found no predictive association with low back pain (Kuiper et al 1999) respectively. It is recommended that the findings from the study by Pietri et al (1992) be considered inconclusive (Burdorf and Sorock 1997).

Driving

Driving has been implicated in the onset of back pain because it involves static and sometimes awkward positions, in addition to forces from accelerating and decelerating, whole body vibration and jarring from uneven roads all of which increase the mechanical stresses upon the spine (Bovenzi and Hulshof 1999, Waters et al 2008).

Five studies (Biering-Sorensen and Thomsen 1986, Pietri et al 1992, van Poppel et al 1998, Macfarlane et al 1997, Masset et al 1998) provide evidence about the hypothesised role of driving in the incidence of low back pain.

One focus of these studies has been the amount of the exposure to the hypothesised risk either in terms of the distance driven or the time spent driving. Biering-Sorensen and Thomsen (1986) found that the longer distance driven between home and work (mean: 12.1 vs. 7.6 km) was an independent predictor of back pain occurring for the very first time in the general population ($p<0.05$). Masset et al (1998) however found no association between the distance driven per year and the onset of the first ever episode of low back pain. Pietri et al (1992) studied the time commercial travellers spent driving per week and found it a strong predictor of the incidence of low back pain. The commercial travellers who drove

between 10 to 20 hours a week, but not less or more had a four to fivefold increase risk of low back pain occurring for the very first time the following year (Table 4.2: 10 to 14 hours OR 4.0, 95%CI 1.1 to 14.3; 15 to 19 hours OR 4.8, 95%CI 1.4 to 16.4). This finding is partially supported by the findings from the study carried out by Macfarlane et al (1997): members of the general population who drove a car for more than 4 hours per week were found to have an increased risk of back pain. However, the finding was statistically non significant and may therefore have occurred by chance (men OR 1.1, 95%CI 0.5 to 2.7; women: OR 4.8, 95%CI 0.4 to 5.4). Conversely, Macfarlane et al (1997) found that truck driving reduced the risk of experiencing back pain for the very first time (men: OR 0.5, 95%CI 0.1 to 4.0). Again, the finding was statistically non significant. The insufficient number of female truck drivers rendered it impossible to calculate their risk.

Operating a forklift truck was found to protect airport cargo handling workers from back pain during the following year -OR 0.7, 95%CI 0.5 to 0.99- (van Poppel et al 1998). The reason for this is not clear. van Poppel et al (1998) suggested that it may be because it reduces the amount of time spent performing heavy physical tasks. It is possible that this explanation may also account for the non significant finding, in the study by Macfarlane et al (1998), that truck driving reduces the incidence of back pain in men with no history of the symptom (OR 0.5, 95%CI 0.1 to 4.0).

A second focus of the reviewed studies has been on the car seat. The commercial travellers, studied by Pietri et al (1992), who found their car seat uncomfortable were more likely to experience back pain for the very first time (OR 1.9, 95%CI 1.0 to 3.7). These findings however need to be considered in context. During the 1990s efforts were made to develop car seats that offered better support and damped the exposure to whole body vibration (Vingard and Nachemson 2000). The finding by Masset et al (1998), that

exposure to whole body vibration did not predict back pain occurring for the very first time may reflect the effort to improve car design during the 1990s.

Standing, walking and sitting

Macfarlane et al (1997) found that men and women who stood or walked for prolonged periods of time (>2 hours) at work had increased odds of experiencing an episode of back pain for the very first time during the following year. The association was moderate (non significant) in men (OR 1.6, 95%CI 0.8 to 3.3) and strong in women (OR 2.9, 95%CI 1.5 to 5.5). Furthermore, the increased risk was almost entirely found in the younger members of the cohort between 18 and 44 years of age (men: OR 1.8, 95%CI 0.8 to 3.9; women: OR 1.6, 95%CI 0.8 to 3.2). These younger members of the cohort also had an increased risk of experiencing back pain for the very first time following exposure to lifting a heavy weight (<25lb) discussed earlier where it was suggested that it may be due to the 'healthy worker effect'. The increased risk from standing or walking for prolonged periods (>2 hours) at work was not related to cumulative exposure i.e. the number of years employed in occupations requiring the need to stand or walk for prolonged periods of time (>2 hours). For men, the excess risk over those not exposed decreased over the years while for women the excess risk increased up to 17 years and decreased thereafter (Macfarlane et al 1997). Women who sat for prolonged periods of time (>2 hours) at work had a reduced risk of back pain suggesting that sitting down at work is protective (OR 0.4, 95%CI 0.2 to 0.7). Men only had a slightly reduced non significant risk of incident (first ever) low back pain if they sat working for prolonged periods lasting more than two hours (OR 0.9, 95%CI 0.1 to 1.5).

In contrast to the study by Macfarlane et al (1997), Pietri et al (1992) found standing at work reduced the risk of back pain occurring for the very first time (OR 0.8, 95%CI 0.5 to 1.4). Pietri et al (1992) however provide no information about the duration of time spent standing at work and, like

Macfarlane et al (1997), provide no information about the nature of activities, if any, performed while standing and walking. The participants in the study by Pietri et al (1992) were commercial drivers and therefore, it is unlikely that they stood for long periods of time on a regular basis compared with some members of the general population in employment recruited to the study by Macfarlane et al (1997).

In summary, the findings appear inconsistent regarding the potential role of standing and walking in the genesis of the first ever episode of low back pain. Sitting may possibly reduce the risk of low back pain in occupational settings. Further information however is required about the nature of the work activities carried out while walking, standing and sitting.

Leisure-related activity

Certain leisure time activities, particularly in people who are unfit, are hypothesised to cause low back pain through the physical stresses they place upon the spine. Two research groups (Croft et al 1999, Burdorf et al 1996) studied the short term risk of such activities that had not been studied prospectively before. Croft et al (1999) studied the level of activity, walking, sitting, DIY, gardening, and sport in the general population while Burdorf et al (1996) studied golf in men who had recently taken up the sport. The findings from these studies are discussed, in turn, below. On the basis of these findings it can be concluded that, in the short term i.e. during the following year, physical activity outside the workplace does not appear to play a major role in the development of low back pain (Croft et al 1999).

Level of activity

Croft et al (1999) found that the risk of experiencing low back pain for the very first time was very slightly increased (statistically non significant) for the men and women who perceived their level of activity the same as their peers

(men: RR 1.1, 95%CI 0.6 to 1.5; women: RR 1.1, 95%CI 0.7 to 1.6), and for the men who perceived themselves to be less active than their peers (RR 1.1, 95%CI 0.6 to 2.0). For the women who perceived themselves less active than their peers the risk of back pain occurring for the very first time was slightly higher than for the men although this finding remained non significant and therefore may also have occurred by chance (RR 1.3, 95%CI 0.8 to 2.0).

Walking and sitting

Croft et al (1999) observed that men and women who walked daily for more than thirty minutes had a very slightly increased risk (statistically non significant) of experiencing back pain for the very time during the follow-up year (men: RR 1.1, 95%CI 0.8 to 1.7; women: RR 1.2, 95%CI 0.8 to 1.6). Sitting watching the TV for more than three hours did not reduce the risk of incident back pain in men (RR 1.1, 95%CI 0.7 to 1.6) and it only reduced it very slightly (non significant) in women (RR 1.1, 95%CI 0.8 to 1.6). This suggests walking does not fully meet Bradford Hill's (1965) criteria of causality for reversibility i.e. that removal of the hypothesised causal factor reduces its effect (Bradford Hill 1965, Bombardier et al 1994).

DIY and gardening

Croft et al (1999) studied DIY and gardening in the general population. In men the incidence of back pain increased with the frequency of participating in DIY although the risk was not statistically significant (DIY occasionally: RR 0.9, 95%CI 0.5 to 1.5; DIY often: RR 1.2, 95%CI 0.7 to 2.1) following adjustment for age. Furthermore, those men who did DIY 'occasionally' were less likely to experience low back for the very first time compared with the men who 'never' did DIY (DIY 'occasionally': RR 0.9, 95%CI 0.5 to 1.5; DIY 'never': unity i.e. 1.0). In the women, the risk of low back pain occurring for the very first time was the same for those women who 'never' and 'occasionally' carried out DIY activities ('never': unity i.e. 1.0; occasionally RR 1.0, 95%CI 0.7 to 1.5). The risk however was reduced in the women who

reported carrying out DIY activities ‘often’ compared with those never carrying out any DIY (DIY ‘often’: RR 0.7, 95%CI 0.4 to1.5; DIY ‘never’: unity i.e. 1.0). This evidence suggests that DIY and gardening do not appear to play an important role in the aetiology of low back pain. Weekly gardening did not appear to be linked with the onset of back pain for either the male (RR 1.0, 95%CI 0.7 to 1.5) or female (RR 1.0, 95%CI 0.7 to 1.4) members of the general population.

Sport

In addition to the potential role of the leisure activities discussed above, Croft et al (1999) questioned whether participating in general sporting activities regularly increases the physical stresses upon the spine and thereby triggers low back pain for the very first time. They found that, in the short term i.e. during the follow-up year, the women but not the men who played sport regularly had a moderately increased risk of experiencing back pain for the very first time (women RR 1.3, 95%CI 1.0 to 1.9; men RR 1.2, 95%CI 0.8 to 1.9).

Golf

Burdorf et al (1996) studied the anecdotal hypothesis that golf may play a role in the genesis of back pain. However, there did not appear to be any significant association between the following variables and back pain occurring for the very first time: playing golf (‘yes’/’no’), the frequency of playing golf, the number of golf lessons, the handicap achieved and warming up regularly (‘yes’/’no’). The risk estimates were not presented in the paper and consequently cannot be discussed further. The descriptive statistics present in the paper however indicate that the incidence of back pain was higher among men who only played golf than among those who played golf and other sports, 13% and 5% respectively. This may mean that men who take up golf after a long period of low physical activity at work i.e. a sedentary job for more than 5 years and in leisure time (no sports

participation for 5 years) are at increased risk of back pain (Burdorf et al 1996). However, these findings need to be considered with caution given the limited statistical power of the study.

ENVIRONMENTAL RISK FACTORS: PSYCHOSOCIAL

Hemingway and Marmot (1999) define a psychosocial factor as 'a measurement that potentially relates psychological phenomena to the social environment and to pathophysiological changes'. The precise mechanisms, by which psychosocial factors may cause musculoskeletal disorders such as back pain, are speculative (Hartvigsen et al 2004). Various mechanisms have been suggested. They include: increased biomechanical load through changes in posture, movement patterns and external forces (Hoogendoorn et al 2000, Bonde et al 2005) resulting in increased muscle tone (Bongers et al 1993, Burton and Waddell 2004, Bonde et al 2005) and duration of increased muscle tone (Palmer et al 2005); modified pain perception (Burton and Waddell 2004, Bonde et al 2005) through alterations in the processing of nocioceptive stimuli to intensify pain perception (Palmer et al 2005); sustained activation of small low-threshold units leading to degenerative processes and tissue damage (Lundberg 1999); and alterations in neuroendocrine activity including pituitary-adrenocortical and sympatho-adrenomedullary activity that may influence metabolic activity in the lower back. In particular, the perception of lack of wellbeing is associated with the high secretion of cortisol from pituitary-adrenocortical activity (National Institute for Occupational Safety and Health 1997, Burton and Waddell 2004).

To date, several cross sectional studies have explored whether there is an association between psychosocial factors and the report of back pain. These psychosocial factors include job dissatisfaction; job strain, from high demand with low control; social support; monotony from repetitive work; and negative

psychological factors in addition to the less defined exposures such as job stresses (Burdorf and Sorock 1997, Vingard and Nachemson 2000).

Job dissatisfaction

Low job satisfaction is the exposure with the most consistent evidence for an association with reports of back pain (Vingard and Nachemson 2000). Two research groups (van Poppel et al 1998, Mustard et al 2005) utilised a prospective cohort design to answer the question of whether job dissatisfaction plays an aetiological role in the incidence of low back pain. van Poppel et al (1998) found that in the short term, up to one year, job dissatisfaction predicted the incidence of back pain in a cohort of airport cargo workers following adjustment for age and 'intervention group' (OR 1.4, 95%CI 1.1 to 2.0, p=0.03). The adjustment for 'intervention group' was necessary because the study originated as a randomised controlled trial. However, the researchers did not adjust for the potentially confounding influence of the physical demands of the work undertaken by the cargo workers. A high correlation between physical demands and psychosocial factors has been found in other studies suggesting that it may be a confounding factor (Hoogendoorn et al 2000). Consequently, the finding from the study by van Poppel et al (1998) needs to be viewed with caution. Mustard et al (2005) found no association between job dissatisfaction and back pain occurring for the very first time (OR 1.11, 95%CI 0.63 to 1.94).

Job strain

Work environments, where the demands of a job are high and the employee has little control over his / her activities and skills usage is thought to have adverse effects on health. The adverse effects include fatigue, anxiety, depression and physical illness such as musculoskeletal disorders (Karasek 1998). Mustard et al (2005) however found no association between job strain and the incidence of back pain in young adults aged between 21 and 34 years (OR 0.83, 95%CI 0.46 to 1.51).

Work social support

Social support is thought to 'buffer' the effects of high job demands with low control over activities and skills usage thereby reducing the risk of illness. Conversely, low social support is thought to increase the risk of ill-health (Karasek 1998, Johansson 1995). Mustard et al (2005), however, found no statistically significant association between low support at work and back pain occurring for the very first time during the following year in young adults between 21 and 34 year of age (OR 1.13, 95%CI 0.67 to 1.93).

SUMMARY OF EVIDENCE RELATING TO CAUSALITY

By their very nature all the reviewed prospective cohort studies permit Bradford Hill's (1965) criterion for a temporal sequence between cause and effect to be met. Furthermore, all the studies focused on hypothesised causal (risk) factors that were explicable and consistent with current knowledge about the aetiology of low back pain meeting Bradford Hill's (1965) criterion for biological plausibility. The evidence generated from these cohort studies therefore is summarised below in relation to Bradford Hill's (1965) other criteria for causality i.e. dose-response relationship and reversibility, where studied; strength of association and consistency in findings.

The strength of association is classified by Hemingway and Marmot's (1999) criteria for summarising risk ratios, later adopted by Hartvigsen et al (2004) for summarising odds ratios viz.

- Strong evidence of an association: where an odds ratio (OR) or relative risk (RR) ≥2 is surrounded by a 95%CI with the lower boundary above 1.00 and / or p≤0.05.

- Moderate evidence of an association: where an OR or RR >1 <2 is surrounded by a 95%CI with the lower boundary above 1.00 and / or p≤0.05.

In addition to these criteria a protective effect is considered to occur where:

- OR or RR <1 is surrounded by a 95%CI with both the lower and upper boundary below 1 and / or p≤0.05 (Leboeuf-Yde et al 1997).

Finally, a statistically non significant association was considered to occur where:

- OR or RR <1 or >1 is surrounded by a 95%CI with the lower and upper boundaries straddling 1.00 and / or p>0.05.

All the reviewed studies set the alpha level i.e. the level of statistical significance at the 5% level i.e. p≤0.05 with the exception of Masset et al (1998) who set alpha at the 1% level i.e. p≤0.01 for some variables for reasons associated with multiple statistical testing that are discussed later.

Where summary statistics were presented in the original papers in lieu of risk estimates these summary statistics and / or p values are given. This occurred in three of the earlier papers written by Biering-Sorensen (1984a), Biering-Sorensen and Thomsen (1986) and Troup et al (1987).

Given the paucity of evidence it is also necessary to consider whether or not there is a sufficient level of evidence from which to draw any conclusions about causality and whether or not the evidence is consistent. For this purpose the following classification adapted from Hartvigsen et al (2004) was used:

- Sufficient evidence: consistent findings provided by two or more studies in different settings using different methods.

- Insufficient evidence: provided by a single study.

- Inconsistent evidence: provided from two or more studies.

Findings identified as anomalous in the body of the review are excluded from the summary of findings set out below.

SUFFICIENT LEVEL OF EVIDENCE

Psychological distress

Evidence is present in the literature to suggest that there is a moderate ($p \leq 0.05$, OR >1 <2) to strong ($p \leq 0.05$, OR ≥2) association between exposure to psychological distress and low back pain occurring for the very first time subsequently. The incidence of back pain was found to occur up to one year later in members of the general population between 18 and 75 years of age (Croft et al 1995, Mustard et al 2005) and up to ten years later in young adults aged 23 years (Power et al 2001).

This evidence emanates from three studies in different populations using different methods. Consequently, the strength of the association and the consistency of findings are considered sufficient to support the possibility of an aetiological role between psychological distress and the incidence of low back pain (Bradford Hill 1965).

INSUFFICIENT LEVEL OF EVIDENCE

Where evidence from a single study suggests a predictive association between an hypothesised causal (risk) factor and the incidence of back pain it is insufficient to draw any firm conclusions about whether or not exposure to a particular risk factor plays a role in the genesis of back pain until further evidence becomes available (Hartvigsen et al 2004). Listed below are the hypothesised causal (risk) factors for which there is insufficient evidence together with their strength of association.

Childhood emotional and behavioural disorders

Evidence of a moderate association ($p \leq 0.05$, OR >1 <2) from a single study suggests that:

- hyperactivity, conduct disorder and emotional disorder in childhood predicts the incidence of back pain in young adults -21 to 34 years of age- (Mustard et al 2005).

Ill-health: non-specific symptoms, painful conditions, joint pains, poor general health, use of hospital resources

Strong evidence ($p \leq 0.05$, OR ≥2) from a single study suggests that reporting:

- three or four non-specific symptoms predicts the incidence of low back pain up to three years later in commercial drivers (Pietri et al 1992).

- one or more painful conditions predicts the incidence of back pain during the following year in members of the population registered with a Health Maintenance Organisation (Von Korff et al 1993).

- joint pains in different parts of the body apart from the back predict low back pain during the following nine years in middle-aged women between 45 and 64 years of age (Symmons et al 1991).

No painful condition in any one anatomical location appears to predict incident back pain with the possible exception of abdominal pain (Biering-Sorensen and Thomsen 1986, Symmons et al 1991, Von Korff et al 1993, Masset et al 1998). Inconsistent evidence was found regarding abdominal pain: Biering-Sorensen and Thomsen (1986) found that a history of abdominal pain was associated with incident back pain whilst Von Korff et al (1993) did not.

Moderate evidence (p≤0.05, OR or RR >1 <2) from a single study suggests that:

- women but not men who rate their health as 'fair' compared with their peers' health are more likely to experience incident low back pain during the following year (Croft et al 1999).

In addition, the use of hospital resources in terms of being admitted and undergoing in and out patient operations predicts incident low back pain during the following year –summary data not presented, p≤0.05- (Biering-Sorensen and Thomsen 1986).

Anthropometric characteristics: sitting height, trunk asymmetry, trunk imbalance

Moderate evidence (p≤0.05, OR >1 < 2) from a single study suggests that:

- sitting height, an indicator of skeletal size at 12.8 years predicts the incidence of low back during the following year (Nissinen et al 1994).

- trunk asymmetry at 12.8 years predicts low back pain during the following year (Nissinen et al 1994).

- frontal imbalance of the trunk predicts the incidence of low back pain during the following year in young (<40 years of age) male blue collar steel industry workers (Masset et al 1998).

Heavy lifting effort

Strong evidence (p≤0.05, OR ≥2) from a single study suggests that:

- the perception of heavy lifting effort at work predicts incident back pain in young men (<40 years of age) who are blue collar workers in the steel industry (Masset et al 1998).

Uncomfortable car seat
Moderate evidence (p≤0.05, RR >1 <2) from a single study suggests that:

- an uncomfortable car seat predicts the incidence of low back pain in commercial travellers during the following year (Pietri et al 1992).

Sport (women)
Moderate evidence (p≤0.05, RR >1 <2) from a single study suggests that:

- playing sport regularly predicts the incidence of low back pain in women during the following year (Croft et al 1999).

INCONSISTENT EVIDENCE
The reviewed studies provide inconsistent evidence with regard to the hypothesised casual (risk) factors listed below. There are two possible explanations for the inconsistent evidence. The first is that the risk factors are not in fact causal. The second is that the inconsistencies in the data may arise from the methodological differences and weaknesses discussed later in this chapter.

Socio-economic status (early life)
Evidence from a single study (Mustard et al 2005) suggests that there is a moderate association (p≤0.05, OR >1 <2) between lower socio-economic status (lower parental educational attainment) early in life and back pain occurring for the very first time between 21 and 34 years of age. In the study by Power et al (2001) however the increased risk of incidence of low back pain in early adulthood associated with lower socio-economic status (manual social class at birth) was statistically non significant and may therefore have occurred by chance. For reasons discussed earlier lower socio-economic status may contribute to other risk factors which, in turn, affect the risk of incident pain.

Smoking

Evidence from three studies suggests that smoking daily between 30 and 70 years of age (Biering-Sorensen and Thomsen 1986); smoking before sixteen years of age and continuing to smoke moderately or heavily until 33 years of age (Power et al 2001) and smoking heavily i.e. ≥ 10 cigarettes daily between 20 and 33 years of age (Mustard et al 2005) predicts back pain. In the latter two studies this evidence can be classified as 'moderate' ($p \leq 0.05$, OR or RR >1 <2). Conversely, evidence from four studies suggests that being a former or current smoker does not predict the incidence of low back pain in middle-aged women (Symmons et al 1991), commercial drivers (Pietri et al 1992), male steel workers under 40 years of age (Masset et al 1998) and the general public (Croft et al 1999).

Body weight

Two studies provide moderate evidence ($p \leq 0.05$, OR or RR >1 <2) that being overweight (Croft et al 1999) or obese (Lake et al 2000) predicts incident low back pain in women but not in men. A greater number of studies however suggest that heavier body weight is unlikely to predict low back pain either in children (Nissinen et al 1994) or in adults (Biering-Sorensen 1984a, Aro and Leino 1985, Symmons et al 1991, Pietri et al 1992, van Poppel 1998).

Trunk muscle endurance

Shorter trunk muscle endurance appears to discriminate male members of the general population who experience back pain for the very first time from those who do not (Biering-Sorensen et al 1984a). Conversely, trunk muscle endurance did not appear to predict low back pain in a predominantly male cohort of cargo workers -236 men, 2 women- (van Poppel et al 1998). Methodological reasons may explain why reduced trunk muscle endurance did not predict low back pain in women in Biering-Sorensen's (1984a) study.

Spinal movement

Using the modified Schober test, increased lumbar flexion was found to predict the incidence of low back trouble in the men but not the women between 30 and 70 years of age in Biering-Sorensen's (1984a) study of suburban residents (Table 4.1). In contrast, increased lumbar flexion measured by the modified Schober test in the study by Masset et al (1998) did not predict the incidence of back pain in young men (< 40years of age) working in the steel industry. In addition, the fingertip to floor test in the study by Biering-Sorensen (1984a) and the lumbar flexion – extension range in the study of blue and white collar workers by Troup et al (1987) did not predict the incidence of back pain (Tables 4.1 and 4.2).

Radiological changes and abnormalities

Strong evidence ($p \leq 0.05$, OR >2) from a single study, was found to implicate severe anterior endplate lesions (<18% vertebral body height) in the incidence of back pain in young elite skiers during the following year (Ogon et al 2001). In contrast, no evidence was found to support the role of: (1) moderate anterior end plate lesions (<18% vertebral body height), posterior end plate lesions or Schmorl's nodes in back pain in young skiers (Ogon et al 2001) or (2) the development and presence of disc degeneration and its deterioration; osteoporotic collapse and fractures in the incidence of low back pain in middle-aged women (Symmons et al 1991).

Manual materials handling

Strong evidence ($p \leq 0.05$, RR ≥2) suggests that manual work predicts incident lumbosacral disorders (Aro and Leino 1985). In contrast however, Power et al (2001) found no evidence ($p > 0.05$, OR <1) that manual social class, an indicator of manual work, was associated with low back pain.

Lifting and moving objects

Strong evidence (p≤0.05, OR ≥2) from a single study suggests that lifting and moving heavy weights (>25lb) at work is associated with incident low back pain in women but not in men (Macfarlane et al 1997). The increased risk appears to be greater in younger women (18 to 44 years of age) compared with older women (45 to 75 years of age) possibly because of the 'healthy worker effect'. Moreover, the risk appears unrelated to the cumulative exposure (years) (Table 4.2). van Poppel (1998) also found length of exposure performing manual lifting tasks unrelated to back pain. This lack of a dose-response relationship suggests either that a dose-response relationship is not required or that the finding may not be causal (Bradford Hill 1965). In contrast to the findings from the study by Macfarlane et al (1997), no evidence was found to suggest that carrying loads at work predicted incident low back pain in commercial travellers (Pietri et al 1992). Statistical reasons discussed earlier may explain Pietri and co-workers' (1992) findings.

Driving

The longer the distance driven between work and home predicted incident back pain in Biering-Sorensen and Thomsen's (1986) study suggesting a dose-response relationship, a necessary criterion for causality (Bradford Hill 1965). In contrast, Masset et al (1998) found no relationship between the distance driven each year and incident back pain. Similarly Pietri et al (1992) found no evidence to support a dose-response relationship. Instead their study provides strong evidence (p≤0.05, OR ≥2) that driving a car between 10 and 20 hours a week but not more or less is associated with incident back pain in commercial travellers (Table 4.2).

Standing, walking and sitting at work

Strong evidence (p≤0.05, OR ≥2) from a single study suggests that standing and walking (> 2 hours) at work is associated with the incidence of low back

pain in women (Macfarlane et al 1997). Conversely, sitting at work (>2 hours) appears to reduce and may even protect women from low back pain (Macfarlane et al 1997). This finding supports Bradford Hill's (1965) criteria for reversibility. The excess risk is largely in younger women between 18 and 45 years of age. Cumulative exposure i.e. the number of years carrying out these activities at work however does not appear important (Macfarlane et al 1997) thereby fulfilling Bradford Hill's (1965) criterion of a dose-response relationship.

In men, standing and walking (>2 hours) at work and sitting (>2hours) at work increases and reduces the incidence of low back pain respectively. However, neither finding is statistically significant (Macfarlane et al 1997). Similarly, prolonged sitting, standing or walking during the average workday was not statistically predictive in men (Burdorf et al 1996).

In contrast, to the findings from the studies by Macfarlane et al (1996) and Burdorf et al (1996), evidence from the study by Pietri et al (1992) suggests that standing at work is associated with a reduced incidence of low back pain in male and female commercial travellers. However, the finding was statistically non significant and may have occurred by chance.

Job dissatisfaction

Moderate evidence ($p<0.05$ OR $>1 <2$) from a single study suggests job dissatisfaction is associated with the incidence of low back pain (van Poppel et al 1998). For reasons associated with the inadequate adjustment for confounding factors however this finding should be viewed with caution.

SUMMARY OF FACTORS UNRELATED TO CAUSALITY

SUFFICIENT LEVEL OF EVIDENCE

Age, gender and socio-economic status

Age (Symmons et al 1991, Pietri et al 1992, Von Korff et al 1993, Burdorf et al 1996, van Poppel et al 1998, Croft et al 1999, Mustard et al 2005), gender (Pietri et al 1992, Von Korff et al 1993, Power et al 2001, Mustard et al 2005) and socio-economic status in adults (Von Korff et al 1993, Burdorf et al 1996, Power et al 2001, Mustard et al 2005) do not appear to predict the incidence of low back pain.

Trunk muscle strength

Reduced trunk muscle strength assessed by sit-ups, slow curled sit ups from a supine position with legs extended, leg lowering test, holding the trunk in flexion and extension do not appear to be associated with incident back pain (Biering-Sorensen 1984a, Troup et al 1987, van Poppel et al 1998).

Anthropometric characteristic: height

Evidence was found to suggest that height does not appear to play a role in the incidence of low back pain (Biering-Sorensen 1984a, Croft et al 1999).

INSUFFICIENT LEVEL OF EVIDENCE

Where evidence from a single study suggests there is no predictive association between an hypothesised causal (risk) factor and the incidence of back pain it is insufficient to draw any firm conclusions about whether or not exposure to a particular risk factor plays a role in the genesis of back pain until further evidence becomes available (Hartvigsen et al 2004).

Number of children

Having three or more children does not appear to predict the incidence of back pain in young adults -21 to 34 years of age- (Mustard et al 2005).

Depression

Depression does not appear to be associated with the incidence of back pain (Von Korff et al 1993). Methodological reasons associated with the definition of exposure (depression) and outcome (incident back pain) may explain this finding (Croft et al 1999). Consequently it should be viewed with caution.

Personal social support

Low levels of social support from family and friends do not appear to increase the risk of back pain occurring for the very first time during the following year in young adults -21 to 34 years of age- (Mustard et al 2005).

Anthropometric characteristics: femur epicondylar width, leg length, hamstring length, kyphosis, growth of kyphosis, growth of sitting height (skeletal size)

Evidence was found to suggest that the following characteristics do not appear to play a role in the incidence of low back pain: femur epicondylar width, leg length, unequal leg length, and hamstring length in adults between 30 and 70 years of age (Biering-Sorensen 1984a); and kyphosis, an increase in kyphosis and an increase in sitting height (skeletal size) in children between 12.8 and 13.8 years of age (Nissinen et al 1994).

Level of physical exertion

The perception of physical exertion at work does not appear to predict the incidence of low back pain during the following year in young adults between 21 and 34 years of age (Mustard et al 2005).

Digging and shovelling at work

These activities do not appear to be associated with the incidence of low back pain either in men or women (Macfarlane et al 1997).

Leisure activity: level of activity, walking and sitting, DIY and gardening, sport (men), golf (men)

Evidence suggests that the following activities do not predict the incidence of low back pain in the short term i.e. during the following year: physical activity perceived as the same or less than peers; performing DIY activities occasionally or often; gardening weekly; participating in general sporting activities –men- (Croft et al 1999); Learning to playing golf –men- (Burdorf et al 1996) and walking for more than thirty minutes daily (Croft et al 1999). The latter finding is supported by the observation that sitting watching television for more than 3 hours daily does not reduce the incidence of low back pain (Croft et al 1999) thereby meeting Bradford Hill's (1965) criteria for reversibility.

Job strain

Job strain does not appear to predict the incidence of back pain during the following year in adults between 21 and 34 years of age (Mustard et al 2005).

Work social support

Low levels of social support from work colleagues does not appear to increase the risk of back pain occurring for the very first time during the following year in young adults -21 to 34 years of age- (Mustard et al 2005).

SUMMARY OF FACTORS CONFERRING PROTECTION

INSUFFICIENT LEVEL OF EVIDENCE

Older age (women)

Older age i.e. 60 to 70 years of age appears to protect women (RR 0.6, 95%CI 0.4 to 0.9) but not men (RR 0.6, 95%CI 0.3 to 1.1) from experiencing back pain for the very first time during the following year (Croft et al 1999).

Operating a forklift truck

Operating a forklift truck may protect airport cargo handling workers from back pain during the following year (OR 0.7, 95%CI 0.5 to 0.99) (van Poppel et al 1998).

Sitting (women)

Sitting for more than 2 hours daily at work appears to protect women (OR 0.4, 95%CI 0.2 to 0.7) but not men (OR 0.9, 95%CI 0.1 to 1.5) from low back pain occurring for the very first time during the following year (Macfarlane et al 1997).

ESTIMATES OF THE CUMULATIVE INCIDENCE OF LOW BACK PAIN

The second objective of this review was to determine the cumulative incidence of back pain in different populations i.e. the proportion of individuals in each population who experienced back pain for the very first time during the specified follow-up period (Hennekens and Buring 1987). Knowledge of the proportion of individuals who may benefit from primary prevention is important for policy development and service provision. In addition, estimates of the cumulative incidence may provide researchers and statisticians with useful information for study design, in particular for sampling considerations and power calculations.

The cumulative incidence (%) and / or the statistics to calculate the cumulative incidence were presented in all the reviewed papers with the exception of the paper by van Poppel et al (1998). The method for calculating the cumulative incidence (%) however differed between the papers: the research groups either included or excluded losses to follow-up from the denominator of the percentage calculation. The effect of excluding losses to follow-up from the denominator of the percentage calculation is to inflate the cumulative incidence. To ensure uniformity and comparison

between studies therefore the cumulative incidence was calculated, where necessary, by the reviewer using the method described by Eaton et al (1989) and Von Korff et al (1993) i.e. including losses to follow-up: the number of persons with a first ever episode of back pain (the numerator) was divided by the number of persons with no pre-baseline history of back pain (the denominator).

Table 4.3 presents the cumulative incidence i.e. the percentage of individuals in each population who experienced back pain for the very first time during the specified time period. Table 4.4 presents the cumulative incidence of back pain by gender.

In considering the data entered in Tables 4.3 and 4.4 it is important to note that: (1) some research groups reported the cumulative incidence for more than one time period. Lake et al (2000), for example, calculated the cumulative incidence (%) during one year, nine year and ten year follow-up periods and, consequently, the cumulative incidence is presented for each epoch; (2) the incidence figures for particular studies were derived from the same cohort: Lake et al (2000) and Power et al (2001) derived their incidence statistics from the National Child Development Study; and Croft et al (1995, 1999) and Macfarlane et al (1997) derived their statistics from the South Manchester study. Biering-Sorensen 1984a and Biering-Sorensen and Thomsen's (1986) incidence statistics were calculated from the same population of suburban residents.

There were an insufficient number of data sets in Tables 4.3 and 4.4 to permit the presentation of appropriate summary statistics i.e. the median and inter-quartile range (Lang and Secic 2006). Nonetheless, a limited number of observations can be made about the cumulative incidence of back pain.

Table 4.3 reveals that where the cumulative incidence of back pain from one cohort was reported for more than one time period the incidence of back pain increased concomitantly with the number of years of follow-up. In the study by Masset et al (1998), for example, 8.7% of blue collar steel workers reported incident low back pain during the first year of follow-up which increased, in the second year of follow-up, to 10.1%; and, in the sample Lake et al (2000) derived from the National Child Development Study, 6.2% of participants reported incident back pain during the first year of follow-up, 17.6% reported incident back pain during the following 9 years and 23.8% of participants reported incident back pain during the 10 years of follow-up. This percentage increase in the cumulative incidence of back pain over an increasing number of years is to be expected. Between studies however the incidence of back pain did not necessarily increase with the number of years of follow-up: 26.2% of participants reported their first ever episode of back pain in a one year period in the study by Croft et al (1995), for example, while only 16.5% of participants reported their first ever episode in a ten year period in Aro and Leino's (1985) study. This inconsistent finding between studies suggests that the estimates of cumulative incidence presented in Tables 4.3 and 4.4 may be influenced by aspects of study design and methods used (see below).

Generally, the cohorts of the general population in Table 4.3 appear to have a higher annual cumulative incidence than the cohorts of working populations although there is an overlap between the general and working populations. Moreover the blue collar steel workers appear to be amongst the groups reporting the lowest percentage of first ever back pain (Masset et al 1998). This observation is counter intuitive. It suggests that members of the general population are more likely to experience back pain for the very first time compared with people involved in unskilled physical labour. One possible explanation for this is the phenomenon known as the 'healthy worker effect' which is discussed later in this chapter.

Table 4.3 Percentage of participants reporting their first ever episode of low back pain in the specified time period

Key: Data derived from [1] South Manchester Study; [2] National Child Development Study. *1st year of follow-up, ** 2nd year of follow-up

	Cumulative incidence (%)	Time period (yrs)	Prospective cohort study
General population			
Suburban residents 30 to 70yrs	16.4	1	Biering-Sorensen 1984a; Biering-Sorensen & Thomsen 1986
General practice registrants 18 to 75yrs	24.1	1	Croft et al 1999[1]
General practice registrants 18 to 75yrs	26.2	1	Croft et al 1995[1]
Health maintenance organisation members >18yrs	17.7	3	Von Korff et al 1993
Specific age groups			
32yrs	6.2	1	Lake et al 2000[2]
32yrs	9.9	1	Power et al 2001[2]
21 to 34yrs	13.6	1	Mustard et al 2005
12.8yrs	17.6	1	Nissinen et al 1994
23yrs	17.6	9	Lake et al 2000[2]
45 to 64yrs (women)	24.1	9	Symmons et al 1991
23yrs	23.8	10	Lake et al 2000[2]
Occupations			
Blue collar workers <40yrs	8.7	1*	Masset et al 1998
Blue collar workers <40yrs	10.1	1**	Masset et al 1998
Commercial travellers	13.4	1	Pietri et al 1992
White & blue collar workers	21.7	1	Troup et al 1987
General practice registrants in employment 18 to 75yrs	25.4	1	Macfarlane et al 1997[1]
White & blue collar workers	16.5	10	Aro & Leino 1985
Sports			
Novice golfers (men)	8.3	1	Burdorf et al 1996
Student athletes (skiers) 14 to 20yrs	12.5	2	Ogon et al 2001

Table 4.3 also reveals that the annual incidence of back pain in adult members of the general population ranges from 16.4% to 26.2% (Biering-Sorensen 1984a, Biering-Sorensen and Thomsen 1986, Croft et al 1995). Furthermore, children with a mean age of 12.8 to 13.8 years appear to have a higher annual incidence of low back pain than young adults. This finding is consistent with the observation that the onset of back pain is common in children (Jones and Macfarlane 2005). However, it is not consistent with the view that the prevalence of back pain increases with age and peaks in adults between 45 to 59 years of age (Papageorgiou et al 1995, Balague et al 1999) discussed previously in chapter two.

None of the research groups who calculated the cumulative incidence of back pain discussed their finding, with the exception of Masset et al (1998). Masset et al (1998) considered that the incidence rate was high in their sample of young (<40 years of age) blue collar steel workers (Table 4.3) although they do not discuss the reason why. It is relevant to note that Masset et al (1998) excluded steel workers lost to follow-up from the denominator of their cumulative incidence (%) calculation, giving an incidence of 10.7% and 11.1% respectively during the first and second years of follow-up, and a mean cumulative incidence of 10.9% during the two years of follow-up. When these statistics are re-calculated using the method described by Eaton et al (1989) and Von Korff et al (1993) i.e. including losses to follow-up however the cumulative incidence for the first and second years of follow-up are respectively 8.7% and 10.1%, and the mean incidence for the two year follow-up period is 9.4%.

With regards to the cumulative incidence of back pain in men and women, eight publications provide information that can be seen in Table 4.4. The findings, from samples derived from commercial travellers (Pietri et al (1992), children (Nissinen et al 1994) and, the South Manchester study.

Table 4.4 Percentage of male and female participants reporting their first ever episode of low back pain in the specified time period

Key: Data derived from [1]South Manchester study; [2]National Child Development Study

	Cumulative incidence (%)		Time period (yrs)	Prospective cohort study
	Male	**Female**		
General population				
Suburban residents 30 to 70yrs	16.7	16.2	1	Biering-Sorensen 1984a; Biering-Sorensen & Thomsen 1986
General practice registrants 18 to 75yrs	19.4	27.9	1	Croft et al 1999[1]
Specific age groups (years)				
12.8yrs	16.9	18.4	1	Nissinen et al 1994
32yrs	11.0	8.8	1	Power et al 2001[2]
32yrs	6.9	5.5	1	Lake et al 2000[2]
23yrs	19.8	15.5	9	Lake et al 2000[2]
23yrs	26.7	21.0	10	Lake et al 2000[2]
Occupations				
Commercial travellers	12.6	16.8	1	Pietri et al 1992
General practice registrants in employment 18 to 75yrs	21.7	28.9	1	Macfarlane et al 1997[1]

(Macfarlane et al 1997, Croft et al 1999), indicate that women have a higher annual incidence of back pain than men. In contrast, the findings from samples derived from the National Child Development Study (Lake et al 2000, Power et al 2001) and a suburban population (Biering-Sorensen 1984a, Biering-Sorensen and Thomsen 1986) indicate that men have a higher incidence of back pain. The findings therefore are equivocal and further research is needed to determine whether or not women report a higher incidence of back pain. It cannot be assumed that because population surveys suggest that women report a higher prevalence of back pain, as discussed in chapter two, that they also report a higher incidence of back pain. The increased reporting of prevalent back pain by women is not thought to be associated with any physical difference (Papageorgiou et al 1995, Burton and Waddell 2004).

The small number of female participants in one of the reviewed studies prevented the analysis of data for men and women being carried out separately (van Poppel et al 1998). In other studies there were no statistically significant differences between the male and female participants and so the data were not analyse separately (Pietri et al 1992, Mustard et al 2005).

DISCUSSION

This chapter furthers knowledge of the antecedent factors that may play a role in the aetiology of low back pain and provides estimates of the incidence of low back pain. It is necessary however to consider the findings with caution given the small number of studies selected for the review and their heterogeneity. Heterogeneity concerns the variations in the studies' findings which may be due to the populations studied; the number of years of follow-up; the methods of measuring exposure to hypothesised causal (risk) factors and incident back pain; and the statistical analyses including any adjustment for confounding factors. This heterogeneity rendered it inappropriate to

perform a meta-analysis of the data to draw stronger conclusions about particular hypothesised causal (risk) factors in the genesis of back pain (Egger and Davey Smith 1997, Egger et al 1997). A narrative synthesis of the literature was carried out instead (Centre for Reviews and Dissemination 2009). Inherently, a narrative synthesis yields a more subjective appraisal of the evidence than that afforded by meta-analysis (Egger et al 1997). Therefore, every effort was made to make the review process as transparent and rigorous as possible by following recommended procedures to minimise bias i.e. to keep any methodological weaknesses that may have influenced the review's findings to the minimum.

In addition to the paucity of literature and its heterogeneity, three factors may have influenced the outcome of the review: (1) the search strategy; (2) publication bias; and (3) the methodological quality of the reviewed studies. These factors are considered below, in turn.

SEARCH STRATEGY

Restricting the review to scientific papers that had been subject to peer review and published in English language journals may have resulted in a number of relevant studies being excluded thereby influencing the review's findings. The decision to restrict the review to scientific papers published in peer review journals and written in the English language was based on the view that more important findings derived from sound methods are published in these journals (Leboeuf-Yde and Lauritsen 1995). Also, funding for translation was unavailable.

It is possible that a number of relevant studies may have been overlooked either because they used alternative MESH headings and keywords and / or had unclear abstracts with ill-defined keywords such as what constituted a 'new' or a 'first' episode of low back pain. Steps to minimise this potential

bias included the utilisation of a broad search strategy to identify as many studies as possible from journals indexed in international databases covering physical, psychosocial and sports–related factors hypothesised to play a causal role in back pain. In addition, the search covered all the years since the inception of the databases i.e. the maximum number of years possible. All original papers were obtained and read where the relevance of a particular study could not be ascertained from its abstract. Systematic reviews of hypothesised causal (risk) factors were also screened for relevant prospective cohort studies. These reviews were identified systematically from a database search using keywords. Finally, the reference lists of the research papers identified by the search were screened carefully to locate any additional papers.

PUBLICATION BIAS

Generally, published studies are more likely to report positive (statistically significant) findings while unpublished studies are more likely to report negative (statistically non-significant) findings, a phenomenon known as publication bias (Stern and Simes 1997). Whether publication bias applies to this review cannot be known because its presence is difficult to ascertain. It is relevant to note however that only two (Troup et al 1987, Burdorf et al 1996) of the eighteen papers reviewed reported wholly negative findings. This suggests that this form of publication bias may have influenced the findings of the review.

A clear example of publication bias is provided by van Poppel et al (1998). Originally their study was designed as a randomised controlled trial of three interventions. None of the interventions however were found to influence either incident back pain or sick leave from back pain and the randomised controlled trial was not published. Instead, van Poppel et al (1998) re-analysed the data focusing on risk factors for the onset of new episodes of pain while controlling for the intervention.

MULTIPLE STATISTICAL TESTING

An alternative explanation for the majority of the reviewed studies reporting one or more positive findings is that of multiple statistical testing, sometimes called multiple hypothesis testing. Where many hypotheses are tested there is the probability that one in twenty statistically significant results will have occurred by chance assuming the level of statistical significance is set at the 5% level -p≤0.05- (Ottenbacher 1998, Lang and Secic 2006). As noted earlier, only one research group, namely Masset et al (1998) set the level of statistical significance at 1% (p≤0.01) to avoid a type 1 (alpha) error occurring as a result of multiple hypothesis testing i.e. concluding that the hypothesised causal (risk) factor is associated with the incidence of back pain when it is likely to have occurred by chance. The other seventeen studies set alpha, the level of statistical significance, at the 5% level i.e. p≤0.05. Croft et al (1999) acknowledged that multiple hypothesis testing might explain their findings that isolated leisure activities, namely DIY activities in men and sporting activity in women, were associated with the incidence of low back pain (Table 4.2). Accordingly, they recommended that a strong emphasis should not be placed on isolated findings from multiple hypothesis testing. For this reason they concluded that generally leisure activities do not appear to predict incident low back pain.

METHODOLOGICAL QUALITY OF THE REVIEWED STUDIES

Internal validity

In appraising whether the incidence of low back pain may be attributed to the hypothesised causal (risk) factors it was necessary to consider the extent to which each study's conclusions were accurate for the participants under investigation (Greenberg et al 2005). Accordingly, the quality of each study was critically appraised using the NHS Critical Appraisal Skills Programme (NHS Public Health Resource Unit 2007) criteria (Appendix 1) to identify any potential sources of bias i.e. errors in design or methods that may have resulted in inaccurate risk estimates (van Tulder et al 1997, Rochon et al 2005).

Population

Representative study population

Confidence in the internal validity of findings is enhanced where a study population is considered representative of the theoretical cohort of all eligible participants, and for whom accurate and complete information can be collected (Ponsonby et al 1996, Gail and Benichou 2000). In reality however, it is unlikely that any study population can be considered wholly representative because people who decline to participate in a particular study or are lost to follow-up may differ in certain important characteristics influencing the outcome of the study (Gail and Benichou 2000, Deeg 2002, Yarnell 2007). For these reasons, prospective cohort studies are vulnerable to sampling bias resulting in a risk estimate different to that which would have occurred had all people theoretically eligible to participate in the study been included in the analysis (Rochon et al 2005).

With a few notable exceptions, (Masset et al 1999, Ogon et al 2001), the authors of the reviewed papers did consider whether their original study population was likely to be representative. Details however were frequently published in earlier papers (viz. Biering-Sorensen 1984a, Biering-Sorensen and Thomson 1986, Von Korff et al 1993, Power et al 2001) that were not necessarily written in the English language (viz. Aro and Leino 1985). The representativeness of the original study populations however is not important in the context of this review which, in the majority of studies, focuses on the analysis of data from population sub-groups i.e. cohorts with no history of back pain each derived from one of the original populations.

The term population sub-group is used to avoid semantics associated with the term ‘subgroup’ which assumes that the data analysis is not pre-specified in the design of a study but carried out post hoc (Guillemin 2007). With the exception of the data analysis performed by van Poppel et al (1998), which appears to have been carried out post hoc, it is unclear

whether the data analysis relating to the other cohorts with no history of back pain was determined apriori or post hoc i.e. whether patterns were sought in the data after the data collection was concluded. Generally, it is agreed that the findings from post hoc subgroup analysis should be considered exploratory and the findings interpreted more cautiously than where the analysis is specified apriori (Guillemin 2007).

Healthy worker effect

A concept related to some of the populations in this review is the 'healthy worker effect'. Generally, people in employment are healthier than those in the general population since the latter includes people who are unable to work because of illness and disability (Gail and Benichou 2000). Consequently, findings in working populations are subject to bias by the 'healthy worker effect' (Leboeuf-Yde 2000a). The extent to which this phenomenon influenced the findings of the reviewed studies is difficult to ascertain. It is relevant to note however that the one year incidence rate of low back pain in the prospective cohort studies of working populations was lower than those in general populations (median: working population 13.5% vs. general population 24.1% (Table 4.3). While this finding needs to be viewed with caution given the very small number of studies and the individual characteristics of the different populations, it is consistent with the general observation that people in employment are healthier than those who are not.

The 'healthy worker effect' may explain Macfarlane and colleagues' (1997) finding that younger compared with older people in employment appear to be at higher risk of incident back pain. This is because the older people may comprise a group that is not susceptible to back pain and consequently have no particular need to change job or work activities. Also, 'the healthy worker effect' may explain Masset and his co-workers' (1998) observation that Belgian steel workers are unlikely to be strongly disturbed psychologically.

Sample size

All the study populations were restricted to people with no history of low back pain. This led to the sample sizes being reduced thus limiting the statistical power of each study. In the cohort of 196 novice golfers recruited by Burdorf et al (1996), for example, the analysis was restricted to 72 men with no history of back pain, six of whom proceeded to report incident back pain (Table 4.2). The relative risk of a hypothesised factor resulting in incident back pain was therefore only calculated for six participants. This limited statistical power is likely to have increased the probability of a type II (beta) error occurring i.e. the erroneous conclusion that a hypothesised risk factor appears to have no effect statistically when in truth it may be associated with incident back pain (Lang and Secic 2006). As Leboeuf-Yde (2000a) points out a true but small association may be statistically non significant in small study samples.

Follow-up

The majority of studies investigated the short term risk of exposures to hypothesised causal (risk) factors on the incidence of low back pain by following their cohorts prospectively for one year. The minority of studies that investigated the longer term effects of exposures to hypothesised causal (risk) factors on the incidence of low back pain followed their cohorts prospectively for two years (Ogon et al 2001), three years (Von Korff et al 1993), nine years (Symmons et al 1991) and ten years (Aro and Leino 1985, Lake et al 2000). The rationale for selecting a particular length of follow-up i.e. number of years was discussed rarely by the researchers. One possible reason for the lack of discussion is that little is known about the temporal development of pain: it is possible that different hypothesised causal (risk) factors have different effects at different points in time (Linton 2000).

From a positivist perspective, the longer the period of follow-up the greater the reliance on recall of pain onset. Biering-Sorensen (1984a), for example,

found that the recall of previous low back trouble was answered consistently by 84% of participants after an interval of approximately six months (Biering-Sorensen and Hilden 1984). Only van Poppel et al (1998) however attempted to minimise recall bias by asking participants to recall whether or not they had experienced the onset of back pain at monthly intervals during the first six months of the study and then again at nine and twelve months after the baseline measurements. Von Korff et al (1993) recommended that future studies should ask participants about the onset of back pain at least once every three months.

It is possible therefore that the studies' findings were subject to recall bias i.e. to participants forgetting their very first episode of back pain. The consequence of forgetfulness in relation to this review is that it may have led to an under-estimation of the incidence of the very first episode of back pain and an under-reporting of the antecedent factors that may possibly play a role in its genesis.

Loss to follow-up

The greatest potential source of bias in prospective cohort studies is the loss of one or more people during the follow-up period resulting in missing data for those people (Hennekens and Buring 1987, Deeg 2002). As a result, the statistical power of a particular study is diminished and the risk estimate is likely to be biased where those who are lost to follow-up differ from those who are not with respect to both the exposure to the hypothesised causal (risk) factor and outcome i.e. incidence of low back pain (Hennekens and Buring 1987, Deeg 2002).

The percentage of participants with no history of low back pain who were lost to follow-up in five studies can be seen in Tables 4.1 and 4.2 (column 4). The percentage loss ranged from 0.6% (Biering-Sorensen 1984a, Biering-

Sorensen and Thomson 1986) through 3% (Troup et al 1987) and 4% (Pietri et al 1992) to 25% (Masset et al 1998). Where the percentage loss is large i.e. 20% (Henderson and Page 2007) or 30% to 40% (Hennekens and Buring 1987) questions should be raised about the validity of the study's findings. Masset et al (1998) questioned the validity of their findings by examining whether there were any differences of exposure between their young (<40 years of age) male blue collar steel workers who 'dropped out' of the study and those who did not. They found that the 'dropout group' were less senior and less satisfied with their working life but did not differ significantly in age, height and weight, education or psychosocial background. It cannot be known, however, whether or not this difference is related to the incidence of back pain resulting in a biased estimate of the association with incident back pain.

Generally, where the other thirteen research groups considered loss to follow-up they focused on the attrition from the whole cohort from which their sample of participants with no history of back pain was derived and not specifically on the loss to follow-up of their participants with no history of low back pain. This attrition from the whole cohort however, as Croft et al (1999) point out, should not influence the findings of a study concerned with comparisons internal to the cohort i.e. risks associated with incident low back pain. All the research groups except one utilised an internal comparison group whereby a cohort with a particular exposure was compared with members of the same cohort who were either unexposed or had a different level of exposure. The exceptional research group was that of Burdorf et al (1996) who utilised an external comparison group of men with comparable ages and educational level.

It is remarkable that there were no losses to follow-up in some studies. In the study by Lake et al (2000), for example, the analysis focused on the data from 8863 persons with no history of back pain all of whom appeared to

complete the ten year follow-up period. This suggests that the regression analysis and incidence calculation was restricted to those persons for whom there was a complete data i.e. people with incomplete data sets were excluded from the analysis. This will have biased the study's findings where it occurred.

In other studies persons lost to follow-up were included in the data analysis. For example, in the study by Masset et al (1998), 58/287 (20%) of the men with no history of low back pain were lost to follow-up during the first year of follow-up.

Classification of any history of low back pain, exposure and outcome

A potential source of error in all the reviewed cohort studies is the degree of accuracy with which participants were classified with respect to any history of low back pain on entry to the study, and any exposure to a given hypothesised causal (risk) factor and outcome i.e. whether or not they experienced incident back pain subsequently. For the reasons discussed below individual studies are unlikely to have classified all participants correctly which may account for the random and anomalous associations in some studies and the variations of findings between studies.

History of low back pain

All the studies investigated cohorts with no history of low back pain. This required the potential recruits to the studies to decide whether or not they had experienced one or more episodes of low back pain previously which may have been difficult for some people given that none of the studies defined a 'first ever' episode. Some potential recruits to the studies therefore may have been left to draw upon their own understanding of what a 'first ever' episode of low back pain was before deciding whether or not they had experienced such an episode. Consequently it is possible that some people

were classified as having no history of low back pain incorrectly. Information about how people define their very first episode of low back pain is important for clinical practice and research, and forms part of the study in this thesis (see below).

Hypothesised causal (risk) factors

Exposure to a hypothesised causal (risk) factor was operationalised in two ways. Researchers screened whether or not participants had been exposed to a particular hypothetical causal (risk) factor in a dichotomous manner ('yes / no') and / or quantified the level of exposure in terms of its magnitude, frequency and / or duration (Tables 4.1 and 4.2). Evidence suggests that it may be the level of exposure that is more important in the aetiology of back pain (Lotters et al 2003) a finding that is consistent with Bradford Hill's (1965) criterion that a dose-response relationship is necessary for causality. Arguably however, many measures were sub-optimal with regard to quantifying the level of exposure. 'Daily smoking' (Biering-Sorensen and Thomsen 1986), for example, provides no information about the brand of the cigarette, the number of cigarettes smoked daily or the amount of each cigarette smoked. Moreover, where the level of exposure was quantified there were often differences in the definition of a hypothesised causal (risk) factor with the same name. Obesity, for example, was defined as a body mass index greater than the 70th percentile and the 85th percentile in the studies by Power et al (2001) and Lake et al (2000) respectively. In both these studies the participants were derived from the National Child Development Study.

The exposure to a particular hypothesised causal (risk) factor was measured in one of two ways: either by self report (subjective) measures or by direct (objective) measurement (Tables 4.1 and 4.2).

Self-report was the most frequently used method for classifying exposure to a hypothesised causal (risk) factor. While self-report is advantageous in terms of its practicality, low cost and ease of administration to large populations in short time periods, limitations associated with the method may result in measurement error (Gorber et al 2007). Masset et al (1998), for example, asked steel workers to assess the lifting requirements of their job. This subjective assessment of severe lifting efforts however may have reflected either heavier job requirements or a reduced capacity of the worker. In other studies, smoking may have been under reported (viz. Biering-Sorensen & Thomsen 1986, Pietri et al 1992, Croft et al 1999); and weight under estimated (viz. Croft et al 1999, Lake et al 2000) because of the tendency to forget (recall bias) and to under report behaviour perceived as undesirable or sensitive (response bias). It is generally agreed that self-report results in body weight being under-estimated particularly in females (Gorber et al 2007, Shields et al 2008) and to height being over-estimated (Gorber et al 2007). The over-estimation of height rises with age and is most notable in people over 65 years of age where it is associated with the ageing process and loss of stature, yet the height is reported as it was when younger (Shields 2008). Consequently, misclassification may have occurred where body mass index (BMI) categories were calculated from self-report height and weight data. Croft et al (1999) were the only research group to attempt to validate their self-report BMI data by comparing it with direct measurements of height and weight in a sub-sample of participants. The outcome of this analysis, however, is not reported.

The data obtained by self-report was collected either by interview and / or questionnaire. Where researchers formulated their own questions they did not report any validation procedures and so it is not known whether they elicited accurate information regarding exposure to a hypothesised causal (risk) factor. Six research groups utilised published questionnaires to quantify exposure to affective responses. These questionnaires were

Langner's (1962) screening questionnaire for non-specific symptoms (Pietri et al 1992); Derogatis' (1983) symptom check list 90 revised (SCLR-90) - depression scale (Von Korff et al 1993); Goldberg and William's (1988) general health questionnaire (Croft et al 1995); Dijkstra and colleagues' (1981) questionnaire on working conditions (van Poppel et al 1998); Stott's (1963) Bristol social readjustment score, Rutter's (1967) behaviour score and Rutter and co-workers' (1970) Malaise Inventory (Power et al 2001); Ware and co-workers' (1993) SF-36 health questionnaire and Karasek's (1985) job content questionnaire (Mustard et al 2005). Such measurement tools usually have published data concerning their validity and reliability. None of the researchers however considered this information in their methodology nor discussed it in defence of their findings with the exception of Croft et al (1995).

Measurement error may have occurred where participants did not follow the instructions to complete a questionnaire fully and accurately. Only Biering-Sorensen and Thomsen (1986) appeared to verify participant's responses at a health examination giving the opportunity for any un-answered questions to be repeated verbatim.

Measurements of anthropometric characteristics were mainly obtained by direct physical measurement. Generally, such measurements are considered to provide more precise estimates than self-report because they remove the potential bias associated with recall and response bias (Prince et al 2008).

Measurements of physical capacity were also obtained by direct measurement during specific tests. There is some debate in the literature however regarding their validity and reliability. The modified Schober test used in the studies by Biering-Sorensen (1984a) and Masset et al (1998), for example, is considered a reliable measure of lumbar flexion by some experts

e.g. Waddell (2004d), Tousignant et al (2005) but not by others e.g. Adams et al (2002). Furthermore, as the research groups themselves suggest the tests of lifting capacity in a laboratory performed by Troup et al (1987) may not reflect lifting in the workplace; tests of muscle strength (Biering-Sorensen et al 1984a, Troup et al 1987, van Poppel et al 1998) and muscle endurance (Biering-Sorensen 1984a) may have been affected by motivation and the tests of movement velocity, performed by Masset et al (1998) using a dynamometer, may have reflected risk taking behaviour. In addition, Masset et al (1998) acknowledge that their dynamic tests of trunk strength were performed incorrectly and consequently no conclusions could be drawn from them. The measurement of physical capacity therefore may have biased the study's findings.

The radiographs to assess spinal abnormalities in the studies by Symmons et al (1991) and Ogon et al (2001) are known to be observer dependent and inexact (van Tulder et al 1997). Accordingly, both research groups employed two independent observers to read the lumbar spine films using predefined criteria. In addition, they both calculated the inter-observer reliability using the kappa statistic concluding that there was a high inter-observer reliability.

Prospective cohort studies permit repeated exposure measurements to be made during the specified follow-up period. Thus any changes in exposure to a hypothesised causal (risk) factor can be measured more effectively and measurement error reduced (White et al 1998). In Aro and Leino's (1985) study, for example, it is possible, that a person's occupational status and weight may have altered during the ten year follow-up period. Neither Aro and Leino (1985) however nor any of the other research groups considered this issue where it was appropriate to do so in their study design. It is taken as axiomatic that there is no need to repeat exposure measurements during the follow-up period where the exposure to a hypothesised causal (risk) factor is fixed or reasonably stable over a period of time such as gender and

certain anthropometric characteristics in adults e.g. height until loss of stature associated with the ageing process. In children, Nissinen et al (1994) selected the age (12.8 to 13.8 years) when measurements are likely to alter during a growth spurt.

Low back pain

All the reviewed studies determined the incidence of low back pain in people with no history of the symptom by self-report. Self-report is considered the 'gold standard' for classifying painful symptoms because it is more closely associated with the definition of pain being a subjective experience than alternative measures such as observation and physiological measurement (Strong et al 2002). Questionnaires, administered by post, telephone and interview, were used to record the self-report in all the studies except the study by Ogon et al (2001) where participant's kept a daily diary. Completed prospectively, information recorded daily in a diary is less likely to be subject to the recall error that can occur in response to questions asked during an interview or on paper particularly during periods of follow-up where longer term recall of pain onset is relied upon. Further, Ogon et al (2001) endeavoured to ensure the validity of the participant's self-report in their daily diaries through audit and supervision.

As mentioned earlier in this chapter, the outcome variables recorded in the questionnaires and the diary were 'low back pain' (Symmons et al 1991, Pietri et al 1992, Nissinen et al 1994, Croft et al 1995, Macfarlane et al 1997, Croft et al 1999, Lake et al 2000, Power et al 2001, Ogon et al 2001), 'back pain' (Troup et al 1987, Von Korff et al 1993, Burdorf et al 1996, Masset et al 1998, van Poppel et al 1998, Mustard et al 2005), 'low back trouble' (Biering-Sorensen 1984a, Biering-Sorensen and Thomsen 1986) and 'lumbosacral disorder' (Aro and Leino 1985). Definitions of these symptomatic disorders, however, were only given in half of the reviewed papers leaving the participants who participated in the studies reported in the remaining papers

to draw upon their own varied experiences and definitions of what constitutes low back pain.

Where back pain was defined by the researchers there was no consensus: the location, severity, duration and exclusion of back pain associated with menstruation, pregnancy and flu, for example, differed between studies (Tables 4.1 and 4.2). This diversity makes it difficult to interpret and compare the findings from the eighteen papers and may partially explain the inconsistent findings for several of the hypothesised causal (risk) factors. As Leboeuf-Yde et al (1997) point out: the effect of a particular risk factor may vary amongst as yet unidentified sub-groups of non-specific low back pain.

Aro and Leino (1985) acknowledged that their diagnosis of lumbosacral disorder was 'subject to error'. This was because their methods did not permit the accurate diagnosis and subgroup analysis of back disorders. Hence their choice of a pooled diagnosis of lumbosacral disorder included people with sciatic pain. No information is provided about the nature of the sciatic pain and so it cannot be known whether there was any specific pathological basis for it. Similarly, it cannot be known whether the small proportion (6%) of steel workers with sciatic pain in the study by Masset et al (1998) had a specific pathological cause for their back pain. Usually sciatic pain i.e. back pain radiating to the leg is not the result of a specific cause such as a prolapsed disc pressing on a nerve root (Waddell 2004d). Nonetheless, it is acknowledged that some of the participants in the reviewed studies may have had specific low back pain and that this may have influenced the findings of this review.

Adjustment for confounding

Another potential source of bias is confounding which results in a biased estimate (relative risk or odds ratio) of the effect of exposure to a

hypothesised causal (risk) factor on the incidence of back pain (McNamee 2003). This biased estimate occurs because of the association of the exposure with other factors, known as confounding factors, which influence the incidence of back pain. Because confounding may distort the risk estimate and lead to erroneous conclusions about causality it should be 'controlled' for or 'adjusted' in the analysis (van Tulder et al 1997, McNamee 2005).

All the reviewed studies appear to have adjusted for confounding using restriction and / or regression analysis, specifically: logistic regression, multiple regression and Cox proportional hazards regression analysis. Restriction, as its name suggests, restricts recruitment to a particular study to limit exposure to one or more potential confounding factors. All the studies, for example, restricted their analysis to people with no history of back pain to control for the confounding effect of a previous episode of back pain. Also, individual studies further restricted recruitment to limit exposure to confounding factors. Masset et al (1998), for example, recruited young (<40 years of age) men to limit the potential confounding by age and gender. One of the limitations of restriction, discussed earlier, however is that it reduces the number of participants and the statistical power of a study (Greenberg et al 2005). Regression analysis permits the estimate (relative risk and odds ratio) of association to be calculated while controlling for a number of confounding factors simultaneously. In investigating the effect of body mass index on the incidence of back pain at 23 years of age, for example, Lake et al (2000) adjusted for the confounding effects of body mass index at 7 years of age, socio-economic status and psychological distress (Table 4.2).

Controlling for confounding at the analytic stage requires researchers to select potential confounders during the design phase of their study judiciously. This ensures adequate data are collected. Generally, the list of

potential confounders in such studies is limited to established risk factors known to be confounders (Greenberg et al 2005). This creates a particular problem for researchers studying the incidence of back pain because it assumes that the researchers know which risk factors are confounders. This is not necessarily the case, however, because the risk factors for the very first episode of low back pain may differ from the risk factors for subsequent episodes (Bongers et al 1993, Burton et al 1996b, Frank et al 1996a, Greenberg et al 2005). Moreover, given the multi-factorial nature of back pain it is probably not possible to collect data on every potential confounding factor. Also, the confounding factors may not have been measured as accurately as possible which reduces the ability to control for their effects by statistical methods (McNamee 2005). None of the researchers however considered these issues explicitly in the reviewed papers nor stated how they identified potential confounders in the design of their study with the exception of Lake et al (2000). Lake et al (2000) identified potential confounders from a literature search of risk factors for new episodes of back pain. As discussed earlier in this paragraph, however, the risk factors for a new episode of low back pain may not necessarily be the same as risk factors for the very first episode of low back pain (Bongers et al 1993, Burton et al 1996b, Frank et al 1996a, Greenberg et al 2005).

The confounding factors selected by the researchers can be seen in Table 4.2, column 8 which enables a number of observations to be made.

Age and gender were controlled for in all the studies with the exception of Biering-Sorensen and Thomsen's (1986) study. This is likely to have resulted in a biased risk estimate in their study because whilst age and gender are not necessarily causal in themselves they are generally regarded to be related to the presence and level of many exposures associated with health outcomes such as back pain. Age, for example, is related to exposures that are time-related (Hennekens and Buring 1987, Consonni et al 1997). In the

reviewed studies time was associated with the latent period between exposure to a hypothesised causal risk factor and the manifestation of incident back pain; the duration of exposure e.g. prolonged periods of sitting (Croft et al 1999) and the exposure to the cumulative effects over a number of years e.g. lifting (Macfarlane et al 1997). Generally, it is assumed that individuals with higher cumulative exposure will be older and have higher morbidity that those with lower levels of exposure because of the ageing process (Consonni et al 1997). This assumption is consistent with Bradford Hill's (1965) criterion of a dose-response relationship for a causal relationship. The study by Macfarlane et al (1997) however suggests that a dose-response relationship may not be necessary for a causal relationship: the incidence of low back pain was unrelated to the number of years of exposure to lifting and moving. Moreover, the increased risk of back pain occurring for the very first time was entirely limited to the younger employees between 18 and 44 years of age who lifted and moved heavy weights (>25lbs).

Socio-economic status is another potential confounder that is commonly adjusted for although few of the reviewed studies did so with the exception of: Croft et al (1995) in their analysis of the role of psychosocial distress in the aetiology of back pain and Lake et al (2000) and Power et al (2001) in their analysis of the role of body mass index in incident back pain.

Physical load is another potential confounder where the association between psychosocial variables in the work place such as job satisfaction and incident back pain is studied (Bongers et al 1993). Table 4.2 however indicates that van Poppel et al (1998) omitted to adjust for physical load. Consequently, their finding that low job satisfaction is associated with the incidence of back pain (OR 1.4, 95%CI 1.1 to 2.0, p=0.03) may over estimate the risk of loading in manual handling workers. It is relevant to note that van Poppel et al (1998) did not select potential confounding factors

during the design of their study of predominantly male manual handling workers because originally it was designed as a randomised controlled trial with three intervention groups and a control group. The interventions, however, had no effect on the incidence of back pain and so the data was re-analysed focusing on risk factors for back pain adjusting for age and intervention.

Table 4.2 also reveals that where studies investigated a particular hypothesised causal (risk) factor they did not necessarily adjust for the same confounding factor(s). With regard to investigating the effect of body mass index on the incidence of back pain, for example, psychological distress was identified as a confounding factor and adjusted for in the analyses performed by Croft et al (1999), Lake et al (2000) and Power et al (2001) but not in the analysis performed by Masset et al (1998). A further example is where Power et al (2001) adjusted for the confounding effects of smoking while Croft et al (1999) and Lake et al (2000) did not.

It can be concluded from the discussion above that confounding variables are not always known, measurable or adjusted for. It is likely therefore that residual confounding i.e. incompletely controlled confounding may have influenced the findings of individual studies and hence the outcome of the review. Residual confounding can result in either an underestimation or an overestimation of the effect of the exposure (McNamee 2003).

External validity (generalisability)

External validity refers to the extent to which a study's findings can be generalised to persons, settings and time periods beyond those studied (Greenberg et al 2005, Lang and Secic 2006). It is taken as axiomatic that before a study's findings can be generalised, they have to be (internally) valid i.e. free from any significant selection bias, measurement error and

residual confounding (Ponsonby et al 1996, Tooth et al 2005). The value of generalisability therefore is to make valid predictions about what might happen in the future i.e. to estimate who might report low back pain for the very first time and the reasons why (Altman and Bland 1998, Deeg et al 2002). This knowledge is necessary to develop policy and strategies for primary prevention.

The restrictive nature of the inclusion criteria in the reviewed studies, however, limits the extent to which their findings may be generalised (Rochon et al 2005). This is because the hypothesised causal (risk) factors may have different effects in groups of people defined differently by back pain, occupation, gender, age, time period and setting at baseline. Obese people, for example, may place a greater strain upon their back and be at increased risk of incident back pain if they work in a setting that entails heavy physical work compared with people working in a sedentary setting. Consequently, the findings from the working population cannot be generalised to the sedentary population and vice versa. The findings therefore may be valid only for a population with similar characteristics to those investigated in the individual study.

The extent to which it is appropriate to generalise has to be considered in individual studies although, as Altman and Bland (1998) point out, there may not be a consensus. van Poppel et al (1998) concluded that the association between job satisfaction and low back pain is ‘probably’ valid for workers in populations other than cargo workers; Masset et al (1998) concluded that their findings were applicable to populations of active workers in industries similar to the steel industry; and Troup et al (1987) had ‘some confidence’ in the applicability of their findings to people in employment. However, given the participants in the study by Troup et al (1987) were volunteers from a restricted number of occupations it can be argued that their population may not be representative of people in employment and consequently that their

findings cannot be generalised to people in employment (Leboeuf-Yde and Yashin 1995). Nissinen et al (1994) thought that the representativeness of their cohort of children and high participation rate permitted generalisation and Macfarlane et al (1997) concluded that their findings could be 'confirmed on a population basis'. None of the research groups however questioned whether their findings were sufficiently valid i.e. free from selection bias, measurement error and residual confounding to permit generalisation.

The finding that the restrictive nature of the inclusion criteria limits the generalisation of the individual studies in this review exemplifies Egger and Davey Smith's (1997) point that generalisability 'can rarely be dealt with satisfactorily in any one study'. A greater number of studies therefore need to be carried out in different populations. Should similar results be obtained from these studies then it may be concluded that the effect of a particular hypothesised causal (risk) factor has some generality (Egger and Davey Smith 1997). Currently, only three studies from different populations report similar results suggesting that psychological distress may play a role in the genesis of low back pain up to ten years later in young people who are 23 years of age at baseline (Power et al 2001) and up to one year later in members of the general population between 18 and 75 years of age (Croft et al 1995, Mustard et al 2005).

LIMITATIONS OF CURRENT KNOWLEDGE AND DIRECTIONS FOR FUTURE RESEARCH

From a positivist (quantitative) perspective, prospective cohort studies are the most robust form of study design to determine whether hypothesised causal (risk) factors play a role in the genesis of back pain (Hennekens and Buring 1987, Grimes and Schulz 2002a). Current knowledge emanating from these studies however is limited. There are four main reasons for this.

Firstly, relatively few prospective cohort studies have attempted to identify causal (risk) factors in the genesis of back pain.

Secondly, given the heterogeneous nature of the studies that have been published, caution is necessary in drawing any firm conclusions about causality. Clearly, a greater number of prospective cohort studies need to be carried out to further knowledge of the causes of low back pain. It is recommended that the design of these studies address the heterogeneity and weaknesses of the published studies. In particular, close attention needs to be paid to the recruitment of a representative sample of the population with sufficient statistical power; to ensure that the period of follow-up is associated with the hypothesised causal mechanism; that losses to follow-up are kept to the minimum; that potential confounders are selected judiciously during the design of the study and adjusted for in the statistical analyses; that exposure to risk factors is classified using clearly defined terms and standardised measures and that the exposure is measured at different points in time where it is expected to change over time; and to classify outcome i.e. back pain using clearly defined terms delineating subgroups. Unless subgroups are identified and analysed separately, any strong association between a causal factor and an as yet unidentified type of low back pain will remain obscure (Leboeuf-Yde 1999). Multiple statistical testing and post hoc analysis should be avoided.

Thirdly, the appraisal of the strengths and weaknesses of the prospective cohort studies selected for this review has been impeded by incomplete and inadequate reporting of the studies particularly in the older studies. It is recommended that in future researchers follow the STROBE initiative's guidance (Von Elm et al 2008). The STROBE initiative has been developed in response to the recognised need to strengthen the standards for reporting prospective cohort studies (Grimes and Schulz 2002a).

Fourthly, by virtue of their design and underlying positivist philosophy, prospective cohort studies cannot answer certain research questions relating to causality. For example, prospective cohort studies:

- conceptualise a linear relationship between exposure to a given hypothesised risk (causal) factor and outcome i.e. back pain. It is possible however that back pain cannot be explained by a linear process of cause and effect but by more complex interactions (Croft et al 1995).

- seek an association between a single risk factor and low back pain. Any association however between a particular risk factor and low back pain may go undetected or appear very weak if, as is generally believed, the aetiology of low back pain is multi-factorial (Leboeuf-Yde 1999).

- remove risk factors from the natural setting in which they occur. This restricts knowledge of the effects of risk factors in different settings. Obesity, for example, may have a different effect in people who have a manual as opposed to a sedentary job. Also, it limits information that may point to the potential mechanisms and processes by which the risk factors may play a role in the genesis of back pain.

- generate knowledge about potential causal (risk) factors at the population level which may not necessarily have any relationship with cause and effect at the individual level. In other words, cohort studies may tell the investigator nothing about what happens in individuals (Charlton 1995) nor about the individual person's beliefs regarding the cause of back pain (van Poppel et al 1998).

The inability of the reviewed prospective cohort studies to answer certain research questions relating to causality from a positivist (quantitative) perspective does not lessen their value but highlights the need for additional

study designs and methodologies based on different ontological perspectives to further knowledge of the aetiology of low back pain (Linton 2000). One approach is to adopt an interpretive (qualitative) stance from which to study the antecedents of low back pain using in-depth interviews. 'Since pain is quintessentially a matter of self-perception' (Sen 2002) it can be argued that primary prevention should correspond with a person's beliefs and experiences about the cause of back pain (van Poppel et al 1998). Accordingly, it is important to listen to people, to learn from their accounts of life before back pain, how they define their very first episode of back pain and their attributions for the pain. This information may answer the research questions that the prospective cohort studies cannot address.

To date, lay accounts have provided valuable information about various aspects of living with back pain such as the nature of the painful experience (De Souza and Frank 2006) and its impact on the person, the spouse and the family (Rowat and Knafl 1985, Chew and May 1997, Borkan et al 1995, Skelton et al 1996). These accounts document people's views of the transition from being well to being a pain-afflicted person (Holloway et al 2000), of loss (Walker et al 1999), the redefinition of the self and of the future (Borkan et al 1995) including the meaning of recovery (Hush et al 2009) and the perceived threat of disability (Tarasuk and Eakin 1994). The subjective experience of disability and emotional distress is also documented (De Souza and Frank 2006). Other accounts document the reasons that motivate people to seek help from pain clinics, complementary therapists and general practitioners (McPhillips-Tangum et al 1998), their expectations of treatment (Verbeek et al 2004) and their experiences of the treatment they received including medical care and rehabilitation (Chew and May 1997, Walker et al 1999, Cook and Hassenkamp 2000, Ong and Hooper 2006). Yet other accounts provide information about people's need to know the cause of their back pain (McPhillips-Tangum et al 1998), how they account for their pain (Borkan et al 1995), and the strategies they adopted to prevent subsequent

episodes of back pain i.e. strategies for secondary prevention (Skelton et al 1996).

Lay accounts of the antecedents of back pain and lay definitions of the very first episode of low back pain and attributions for the pain do not appear to have been studied before now. This approach to studying the incidence of low back pain is important because it may reveal useful insights into unrecognised causal relationships and generate hypotheses for investigation in subsequent research studies (Chalmers 1995, Sinuff et al 2007). Hitherto, hypotheses have been generated by health professionals and health service researchers, and not by lay persons with relevant and specialised knowledge. The involvement of lay personnel is contemporaneous with social and political trends manifest in UK government policy: public health initiatives and research are considered a democratic and collaborative process wherein lay persons play an active role (Department of Health 2009, National Institute for Health Research 2009). Moreover, the knowledge gained from lay participation may inform the primary prevention of low back pain and contribute to the UK Government's shift in emphasis from treating illness to promoting health and preventing ill-health (Department of Health 2004, 2006, Yarnell 2007).

CHAPTER FIVE: THE STUDY

AIMS OF THE STUDY

The aims of this study were to learn more about the antecedents of non-specific low back pain that may play a role in its aetiology by exploring how people with non-specific low back pain define their first ever episode; how they perceive their life before its onset with specific reference to their social circumstances, health and performance of everyday activities; and how they explain its occurrence and account for its onset.

These aims formed part of a larger study that also sought to learn more about the antecedents of subsequent episodes of non-specific low back pain and explanations for their occurrence.

RESEARCH GOVERNANCE AND ETHICAL CONSIDERATIONS

The study was designed and conducted in accordance with the standards that govern research in health and social care (Department of Health 2001, 2005). This included obtaining a positive ethical opinion from the Harrow Research Ethics Committee (reference number EC2636) and permission from the North West London Hospitals NHS Trust to carry out the research in Northwick Park Hospital. Brunel University sponsored the research project. The project was one of ten percent of projects randomly selected for audit under research governance procedures with a favourable outcome (Department of Health 2001, 2005).

The specific ethical considerations that were addressed during the design and conduct of the study are discussed at appropriate places in the text below.

PHILOSOPHICAL CONSIDERATIONS AND ASSUMPTIONS

ONTOLOGICAL POSITION

There are many different perspectives about the reality of the social world and how it is constituted (ontology). Consequently, it is necessary to state the ontological beliefs underpinning a research study explicitly at the outset (Guba 1981, Altheide and Johnson 1994). The ontological position adopted in this study is that of subtle realism as defined by Hammersley (1992). Hammersley (1992) proposed that there is a social world that exists independently of subjective understanding but that it is only accessible through people's perceptions and interpretations of it. It is accepted that people have different points of view. Consequently, it is possible to obtain diverse but equally valid descriptions and explanations of the same phenomenon. These diverse perceptions reflect the complex, multi-faceted (rich) nature of social reality (Snape and Spencer 2003). The goal of a research study therefore is to capture and represent this reality as closely as possible.

EPISTEMOLOGICAL POSITION

In addition to ontological assumptions it is necessary to state the epistemological beliefs that underpin the study i.e. views about the nature of knowledge and how it is possible to know about the social world.

Key epistemological issues relate to the significance of the researcher's relationship with the participants, the relationship between facts and values, the extent to which knowledge can be certain, and the kinds of methods that are appropriate for studying the social world (Spencer et al 2003a, Finlay 2006).

Epistemological views with regard to these issues were formed whilst studying at the National Centre for Social Research. They were shaped by

the researcher's background in occupational therapy education and practice; in NHS research posts using quantitative methodologies; and in the need to justify the study's methodology to people working in the NHS setting in which the study was carried out. In this NHS setting the dominant research paradigm is positivist (quantitative) based on the tenets of the natural sciences. From this positivist perspective, phenomena are seen as objective and independent of the researcher. Consequently, it was decided to adopt aspects of this scientific method at the outset i.e. that as far as possible, every effort should made to be objective and neutral (i.e. non judgemental) in the collection, selection, interpretation and presentation of data. Whilst aspiring to attain objectivity and neutrality through the methods described in this chapter it is acknowledged however that this ideal can never be attained fully in interpretive (qualitative) research. This is because the researcher inextricably forms part of the social world being studied (Hammersley and Atkinson 1995). Research findings, for example, are either mediated through the researcher, as in the study in this thesis, or discussed and agreed upon by the researcher and participant. Sensitivity (reflexivity) to the ways in which the researcher and the research process may shape the study and its findings is therefore important. Reflexive analysis engages the researcher in the conscious endeavour to identify and analyse the ways in which prior assumptions and beliefs, and the research process itself may affect a study's findings (Finlay 2002). The documentation of this analysis, providing an audit trail, permits scrutiny of the objectivity and neutrality of the investigation. Here, it is relevant to note that the researcher has no professional or personal experience of episodic low back pain that may influence the objectivity and neutrality of the investigation.

With regard to the kind of methods that are appropriate for studying the social world, it is taken as axiomatic that no one method is superior to another but that the method(s) employed should be congruent with the research objectives. For example, in the study presented in this thesis, it was

necessary to select a method capable of capturing detailed accounts of people's lives before their very first episode of low back pain and their attributions for its onset. Such accounts are embedded in the context in which they are produced and not evaluated in terms of the likelihood that the person is recalling the truth. In reporting the detailed accounts of people's lives both the literal content of the accounts and what can be inferred from them i.e. the researcher's interpretations, are considered. Deeper insights can be gained by assimilating, inter-relating and comparing data from a number of participant's accounts. Reflexive analysis i.e. consideration of the role of the researcher in the data production, is important (Finlay 2002).

The philosophical assumptions underpinning this study are consonant with the view that its quality should be assessed by criteria that are fundamental to its purpose, nature and conduct and not by positivist (quantitative) criteria such as validity and reliability. From a subtle realist perspective, several authors (e.g. Hammersley 1992, Murphy et al 1998, Mays and Pope 2000) recommend that modified forms of positivist criteria, such as validity and relevance, be used to assess the quality of qualitative research.

Validity or credibility in qualitative research is defined as the extent to which research findings accurately represent phenomena. In adopting a subtle realist position the accurate representation of social phenomena is the intended goal (Hammersley 1990, Murphy et al 1998). While it is possible to endeavour to produce findings that represent experienced reality as closely as possible, it is acknowledged that it is impossible to be absolutely certain that this goal has been attained. A study's findings therefore need to be regarded as provisional and possibly in need of further refinement as new findings emerge (Lewis and Ritchie 2003).

Not only is it important for a study's findings to be valid, but to contribute to knowledge and to increase the confidence with which existing knowledge is regarded, they also need to be relevant (Hammersley 1992). One of the key issues with regard to the relevance of a study is whether, and to what extent, the research findings can be generalised (transferred) beyond the particular setting in which they were generated (Patton 1990). Generally, it is acknowledged that the meaning of generalisability in qualitative research differs from that in quantitative research: it is conceptual and not numerical (Fitzpatrick and Boulton 1994). Quantitative studies focus on hypothesis testing and inference based on statistical logic whereas qualitative studies focus on theory development with detailed description of phenomena and inference based on theoretical concepts (Olson 2001). Specific details regarding the generalisability of a particular qualitative study's findings however must be understood in the context of the chosen ontological and epistemological perspective.

The ontological and epistemological stance underpinning this study supports three means of drawing wider inference: (1) the application of findings from qualitative studies to the parent or wider population from which the sample was drawn; (2) the applicability of findings to other settings and contexts; and (3) the application of theoretical propositions from the findings (Lewis and Ritchie 2003) Each is discussed, in turn, below.

Firstly, it is considered appropriate to generalise the range of phenomena and the contextual factors that shape them to the wider population from which the sample was drawn. Specifically, inferences may be made about categories, concepts and explanations. An individual's particular circumstances, experiences or views are likely to be found in the wider population. This perspective concurs with that held by researchers at the National Centre for Social Research (Lewis and Ritchie 2003).

Secondly, the potential to generalise evidence from a study's setting to other settings and contexts is considered important if the research findings are to be relevant. The consensus is that this is best seen as the 'fit' between one setting and another to which the concepts and conclusions may be applied (Lewis and Ritchie 2003). Accordingly, it is incumbent on the researcher to provide 'thick' description i.e. detailed information about a particular study's setting (Geertz 1973) to enable others to assess whether a particular study's findings are transferable to their own or other settings. Any inferences rest as a working hypothesis about what might occur in the other setting. By necessity, the onus is placed upon readers and researchers to evaluate the relevance of the research findings in their particular setting. This is because it would be impossible for any one researcher to have sufficient knowledge about all the other settings to which the findings could potentially be generalised.

Thirdly, inferences from a study's findings can contribute to knowledge about processes and structures underlying a particular phenomenon, and help explain, for example, people's behaviour, attitudes and / or beliefs. This contribution to theoretical knowledge may be used to build on existing knowledge through evaluating whether or not the data from a qualitative study 'fits' the existing knowledge and how far any newly found variations are able to explain people's behaviour, attitudes and / or beliefs. Thus new or refined theory in the form of working hypotheses may be generated for empirical testing using quantitative methodologies (Morse 2001). Theory generation, the goal of the study in this thesis, is one of the strengths of qualitative inquiry (Murphy et al 1998). It is considered important that the relevance of any new or refined theory be tested in further research using quantitative methodologies (Seale 1999).

It is self-evident that there needs to be some degree of confidence in the validity of research findings before any inference can be drawn from them. In other words, the quality of any inferences depends upon the accurate representation of the data i.e. its validity which, in turn, depends upon the quality of the data collection and its analysis (Lewis and Ritchie 2003).

The view that is appropriate to draw wider inference is based upon the notion that the replication of a study's findings 'has to matter' (Lewis and Ritchie 2003). Lewis and Ritchie (2003) explicitly state 'unless there is a belief that a finding would be repeated if another similar sample were studied (and another, and another) then there must be some doubt about the significance of 'phenomena' as identified in its original form. This is not to question the existence of the phenomena themselves but rather to acknowledge that other factors may exist which will affect their potential for replication (for example, some bias within the original sample or some 'location bound' phenomena)'.

Given this study's objective to further knowledge for the primary prevention of non-specific low back pain, it is important to enable readers of this thesis to appraise the evidence upon which claims derived from the research are based. The strategies adopted to ensure the quality of the study with regards to its objectivity and neutrality; validity and relevance are summarised in Table 5.1.

The criteria in Table 5.1 are discussed further in chapter seven where the quality of the study presented in this thesis is appraised.

Table 5.1 Strategies for ensuring the objectivity and neutrality, the validity and the relevance of qualitative inquiry

(Murphy et al 1998, Lewis and Ritchie 2003)

Objectivity and neutrality

Reflexivity
Sensitivity to the ways in which the researcher & research process may shape a study

Audit trail (decision trail or paper trail)
Detailed account of how the research was conducted including tracking the decisions made in recruiting participants, collecting data, and the analytic approach by which the findings were derived from the data. Permits external audit

Validity (credibility)

Clear account of data collection processes

Clear account of processes for data analyses

Reflexivity

Attention to negative cases
Search for disconfirming cases, inconsistencies, alternative interpretations & explanations

Fair dealing
Equitable representation of each participant's perspective

Relevance* (*generalisation, transferability)

Thick description (rich description)
Detailed information about a particular study's setting. Enables readers & researchers to assess whether a study's findings are transferable to their own or other settings.

METHOD

A qualitative research study based on in-depth interviews using a topic guide was carried out to answer the research questions and thereby meet the research objectives.

QUALITATIVE RESEARCH: RATIONALE FOR SELECTION

Qualitative research is an umbrella term that refers to a range of research methodologies and approaches including but not limited to action research, discourse analysis, ethnography, ethology, grounded theory, phenomenology, case study and narrative inquiry. Such methodologies and approaches share certain assumptions and characteristics that are well established in the social sciences.

Qualitative methods became recognised and employed in the health sciences as a result of the post-modern shift in the philosophy of science during the 1990s and were in widespread use by the turn of the 21st century (Mays and Pope 2000, Eakin and Mykhalovskiy 2005). During this time, healthcare practitioners and researchers increasingly became aware of the limitations of quantitative research (positivism) in answering research questions about experiential phenomena about which little was known; and in understanding patients' behaviour, actions and ideas in the physical, sociocultural and economic context in which they occurred. To understand pain better, for example, healthcare practitioners came to recognise the need to pay more attention to patients' subjective experiences, and to extend the biomedical view of pain from that of a purely physical phenomenon to encompass the mind and the social context in which pain occurs i.e. to adopt a biopsychosocial perspective (Alderson 1998, Foster et al 2003, Eakin and Mykhalovskiy 2005). Today, the valuable contribution of the qualitative approach to musculoskeletal research including back pain is recognised (Ong and Coady 2006, Ong and Richardson 2006).

Qualitative rather than quantitative methods were selected for this study because they were the most appropriate means by which to answer the research questions and fulfil the study's aims. Qualitative methods focus on how people make sense of experience. Compared with the more remote quantitative research methods, qualitative methods enable the researcher to get closer to individual's perspectives through detailed interviewing (see below), observation and other fieldwork approaches (Denzin and Lincoln 2003).

The characteristics of qualitative research are summarised in Table 5.2. For illustrative purposes the characteristics of quantitative and qualitative inquiry appear dichotomous in Table 5.2. However, it is important to note that a rigid dichotomy is not always appropriate such as where mixed methods are used to generate qualitative and quantitative data to answer a research question.

The relative attributes of qualitative and quantitative research are largely uncontested. However, shifts in the understanding of causality in the past fifty years have led to debate about its role in qualitative inquiry (Maxwell 2004a, 2004b).

With a few notable exceptions, for example Rossi and Berk (1991), researchers adopting a positivist (quantitative) perspective believe that qualitative inquiry is valuable for suggesting causal hypotheses but cannot by itself be used to establish causal relationships (Shavelson and Towne 2002, Maxwell 2004a, 2004b). This positivist perspective can be traced back to Hume's theory of causality that underpins the scientific method and in which he argued that beyond the observed regularities of events the process of cause and effect cannot be *seen* directly. Consequently to gain knowledge

Table 5.2 Overview of the characteristics of qualitative and quantitative inquiry

(Greenhalgh and Taylor 1997, Holloway and Wheeler 2002, Patton 2002)

	Qualitative Inquiry	**Quantitative Inquiry**
Philosophical background	Social constructivism	Positivism
Mode of inquiry	Naturalistic	Scientific
Perspective	Emic (insider) Subjective	Etic (external) Objective
Reasoning	Inductive	Deductive
Research question	Explores a research question Describes & understands a setting or phenomenon	Tests a hypothesis Demonstrates association, correlation, & cause & effect
Research process	Researcher is the data gathering instrument	Researcher uses tools e.g. questionnaires & equipment to collect data
Sampling	Purposeful. Aim to select information rich 'cases' to gain insight about a setting or phenomenon	Statistical. Aim to generalise from a sample to a population
Methods	Interviews, field observation, documents	Surveys, tests, experiments, secondary data
Data	Words, pictures, objects	Numbers & statistics
Analytic strategies	Places findings in a social, historical & temporal context Holistic. Focus on complex relationships. Explanations at the level of meaning rather than cause Consideration of the influences of the researcher's perspectives Research relationship close	Removes contextual detail Reductionist. Data reduced to a few discrete variables & linear, cause effect relation-ships Limited researcher involvement Research relationship distant

about causality beyond the observed regularities of events, positivist researchers conduct investigations, such as the prospective cohort studies reviewed in chapter four, to ascertain the likelihood of an effect occurring following exposure to the presence of a hypothesised causal (risk) factor whilst eliminating contextual factors and controlling for potential confounding factors. From this positivist perspective, one of the main criticisms of qualitative research lies in its inability to provide a counterfactual statement i.e. what would happen in the absence of the presumed causal (risk) factor (Shadish et al 2002). Nonetheless, it is recognised that if epidemiology is to fulfil its full potential in improving public health it needs to extend its research methods to include qualitative methods that add conceptual and theoretical depth to knowledge by answering research questions that the quantitative research methods cannot address (Popay 2003). Specifically, in back pain, Linton (2000) has drawn attention to the need to extend the range of epidemiological study designs to advance knowledge of the aetiology of low back pain. Introducing qualitative methods to study the antecedents of the first ever episode of low back pain may therefore provide new insights and advance understanding of the aetiology of low back pain.

Among qualitative researchers there is a range of views about causal explanation. At one end of the spectrum are qualitative researchers who seek to explain cause in terms of universal deterministic causes (Spencer et al 2003b). At the other end are qualitative researchers who argue that the social world is not conceptualised in the same way as the natural world and so the concept of cause and effect does not exist, except by 'imputation' (Guba and Lincoln 1989). In-between these views are those views of qualitative researchers including Lofland and Lofland (1995), Patton (2002), and Spencer et al (2003b) who concur with most quantitative researchers, that qualitative research is valuable in suggesting causal hypotheses, but cannot establish cause and effect. Some qualitative researchers (e.g. Miles and Huberman 1994, Maxwell, 2004a, 2004b), however, regard this

perspective as unduly restrictive. Maxwell (2004a, 2004b), for example, challenges the quantitative perspective when he asserts that cause and effect can indeed be observed in certain types of qualitative research.

Qualitative researchers perceive the limitations of the quantitative approach to be the strengths of the qualitative approach in terms of causal explanation. Miles and Huberman (1994), for example, point out that while the quantitative approach may deduce the probability of a cause having a particular effect, unlike the qualitative approach it doesn't provide any information about what went on in the 'black box' i.e. why or how the effect happened. In other words, it may not provide any information about the actual mechanism of cause and effect. Other strengths of the qualitative approach to causality that are overlooked by most quantitative approaches include the emphasis on studying phenomena in their natural setting and attempting to understand the phenomena in terms of the meanings that people bring to them (Denzin and Lincoln 1994). Hence the importance that qualitative researchers assign to meaning. In some circumstances it may be more important to explain phenomena in terms of the meaning they have for people rather than in terms of objective cause and effect (Hughes and Sharrock 1997). People's behaviour in the proximity of traffic lights, for example, may be better understood by the meaning that the lights have for them in their everyday setting rather than the cause in the deterministic sense (Hughes and Sharrock 1997, Spencer et al 2003b).

The epistemological view regarding causality in this thesis follows that of philosophers from Hume onwards who believed that causal explanations involved the concept of time: the study is concerned with lay perspectives of the antecedents of the very first episode of low back pain. Consequently, causal explanation has to be achieved retrospectively. Scriven (1967) coined the phrase 'modus operandi' for this retrospective approach. The goal of this approach, in the context of this study, is to identify the antecedents of the

very first episode of low back pain with a view to clarifying their nature and inter-relationships in the endeavour to explain how they may have contributed to the very first episode of low back pain.

IN-DEPTH INTERVIEWS: RATIONALE FOR SELECTION

Interviewing was selected as the means of learning about life before back pain thereby answering the research question in this study because the ontological position underpinning the study suggests that social reality can only be accessed by talking to people about their experiences of it.

Interviews are commonly used in research (Mays and Pope 2000). Typically researchers distinguish structured from unstructured interviews (e.g. Fontana and Frey 1994). Mason (2005) however points out that it is misleading to refer to unstructured interviews because some structure is needed if the research objective is to be met. Richardson et al (1965) argue that it is more accurate to see interviews as ranging across a continuum. Britten (1995), for example, distinguishes between structured, semi-structured and in-depth interviews:

- Structured interviews involve the administration of structured tools e.g. questionnaires to collect data. Frequently, the researcher is trained to ask the questions in a standardised manner and 'fixed choice' questions invite a pre-determined response e.g. is your back pain better, worse or the same? Structured interviews are more frequently chosen by researchers adopting a positivist (quantitative) perspective who seek to minimise social interaction and therefore potential bias, to 'unearth' and collect a body of facts.

- Semi-structured interviews have a less rigid structure than structured interviews. A set of open ended questions that encourage a detailed response rather than 'yes', 'no' or one word

answers are asked initially. Supplementary questions may follow to understand a topic or issue in greater detail.

- In-depth interviews, in turn, are less structured than semi-structured interviews. A topic guide rather than a set of questions is employed to structure the interview and different questioning techniques are used to generate the data.

Out of the three forms of interviewing in-depth and semi-structured interviews are more frequently utilised in interpretive (qualitative) research that seeks to generate theories and research questions which, in turn, can be subjected to hypothesis generation and testing (Mays and Pope 2000, Morse 2001).

In-depth rather than semi-structured interviews were chosen for this study because they offer the opportunity to ask questions that are meaningful and relevant to individual participants and obtain the detailed information necessary to understand the complexities of people's experiences and views. At the same time, in-depth interviews permit participants to raise issues and uncover knowledge not considered previously or anticipated by the researcher (Denzin and Lincoln 2003). Knowledge is placed in context and participant's definitions and interpretations necessary to understand phenomena form part of the inquiry. The data generated are more likely to be a fairer and fuller representation of the participant's perspectives because this form of interviewing gives the participant more freedom and control than that permitted with the more structured approaches to interviewing (Kvale 1996).

While in-depth interviews have many attributes, it is conceded that they also have potential limitations. For example, the depth of the information gathered

is dependent not only upon the researcher's skills in study design and interviewing but also on the participant's capacity to speak, articulate views and experiences, interact, conceptualise and remember. Meaning and understanding are created in the interaction between the researcher and each participant (Kvale 1996).

TOPIC GUIDE

A topic guide was designed for use in the in-depth interviews (Appendix 3). Its purpose was two-fold. Firstly, it served to delineate in advance the key topics and sub topics that would be explored systematically with each participant, whilst permitting some flexibility to explore in detail salient issues raised by each individual. Secondly, it served to document the fieldwork thereby making the research process as transparent as possible.

The term topic guide is used because it describes the content of the guide precisely i.e. topics were documented in it (Arthur and Nazroo 2003). Alternative terms include interview guide (Miller and Crabtree 1999, Patton 2002), interview guidelines (King 2000), interview agenda (Holloway and Wheeler 2002), aide memoire (Holloway and Wheeler 2002), and interview schedule (Arthur and Nazroo 2003).

Topics and not questions were documented in the guide (Appendix 3) so that the interview could take the form of a natural conversation rather than a question and answer session. This conversational style is commensurate with the interviewer being responsive to what the participant is saying and the language used. Participants are encouraged to talk freely about their experiences of each topic and views, and explore salient issues raised by the individual.

The key topics and subtopics in the guide were consonant with the study objectives and apriori issues in the literature that needed to be explored. They were decided upon following a preliminary review of the literature.

The topic guide was designed bearing in mind the sequence in which the topics might usefully be addressed during each interview. The guide started with the study's objectives to serve as a reminder of the study's purpose and the need to address issues regarding confidentiality, timing and tape recording. It concluded with the reminder to inquire if there was anything the participant wished to add, and finally to thank the participant (Arthur and Nazroo 2003).

The body of the guide contained sections each divided into sub-sections with an indication of the specific topics that should be explored with each participant where appropriate. These topics were derived from the preliminary review of the literature and were consonant with the study objectives and apriori issues in the literature that needed to be explored. The penultimate bullet point, seeking information on useful strategies for prevention and management, was included to introduce a positive note to the conclusion of the interview. Single words and phrases were used so questions could be worded freely by the interviewer and facilitate the conversational style about each topic using the same language as the participant. The relative importance of sections were noted on the guide as Arthur and Nazroo (2003) recommend this to allow for contingencies such as a participant having a lot to say on specific topics or less time than requested for the interview.

The key topics were placed in chronological order to enable participants to relate the events and experiences they spoke about in time and to help recall. Generally, topics seeking general descriptive information were placed

before topics seeking specific information such as participant's attributions for their pain. There were two reasons for this. The first was to introduce topics considered most likely to be discussed with ease, and the second was to provide contextual information for the topics discussed subsequently (Arthur and Nazroo 2003).

Attention was paid to the layout of the guide so it could be read at a glance and annotated during the field work. For example, key sections were identified using headings in a bold typeface; topics and subtopics were indicated by a series of different levels of bullet points and instructions were placed in italics (Arthur and Nazroo 2003).

The length of the topic guide was determined using Arthur and Nazroo's (2003) 'rule of thumb' for interviews of between one and two hours in length. Accordingly the guide was divided into discrete sections each with sub-sections, taking up less than five pages. In Arthur and Nazroo's (2003) experience topic guides longer than five pages in length are more likely to yield superficial (breadth) rather than depth of information.

SAMPLING AND SELECTION OF PARTICIPANTS

In contrast to statistical sampling in quantitative research, which is used to generate representative samples, sampling in qualitative research uses non-probability methods including purposive sampling. Patton (1990, 2002), considered by many authors (e.g. Flick 1998, Kuzel 1999, Ritchie et al 2003b, Holloway and Wheeler 2002), to be an authority on the topic summarises sixteen approaches to purposeful sampling. Each approach serves a specific purpose whilst not necessarily being mutually exclusive. The common principle underlying these sixteen approaches is selecting 'information-rich cases' i.e. participants from whom a great deal can be learnt in order to meet the research objectives.

In this study, an approach to purposeful sampling, known as 'criterion sampling' was selected (Patton 1990, 2002). Participants were selected according to specific criteria that enabled them to describe their lives before the onset of acute non-specific low back pain. The criteria can be seen in Table 5.3.

'Acute' was defined as acute or sub-acute low back pain of less than three months duration -<3/12- (Spitzer 1987); 'non-specific' was defined by the Quebec Task Force (QTF) classification as low back pain without radiation (QTF1), or with radiation to (QTF 2) or below the knee (QTF 3) but no neurological signs (Spitzer 1987); and 'low back pain' was defined as back pain occurring between the lowest ribs and the inferior gluteal folds (Waddell 2004b). In addition, participants were required to be able to recall the first ever episode of pain and their life before it, to have experienced at least two episodes of the pain, to be between 18 and 70 years of age, and to be able to speak English fluently. Participants were required to speak English fluently because in the multi-lingual hospital environment it was not feasible to employ translators in the many languages necessary to translate the information sheets and consent forms, and interpret the interview responses.

The feasibility of recruiting a sufficient number of participants fulfilling these criteria was ascertained through discussion with the staff involved in the assessment and management of back pain in the hospital where the participants were recruited, and on the basis of the results of an earlier survey in the hospital (Frank et al 2000).

Table 5.3 Inclusion and exclusion criteria

Inclusion Criteria

Main complaint is acute (< 3/12) episodic non-specific low back pain (Quebec Task Force Criteria -QTF- 1 to 3, -Spitzer 1987-)

QTF 1: low back pain without radiation. No neurological signs
QTF 2: low back pain with radiation to knee. No neurological signs
QTF 3: low back pain with radiation below knee. No neurological signs

Can recall first ever episode of low back pain

Can recall life before first ever episode of low back pain clearly

At least two episodes of the low back pain

English spoken fluently

18 to 70 years of age

Exclusion criteria

Episodes of specific low back pain (Quebec Task Force Criteria -QTF- 4 to 11, -Spitzer 1987-)

QTF 4: low back pain radiating to leg. Neurological signs present (focal muscular weakness; asymmetry of reflexes; sensory loss in a dermatome; specific loss of intestinal, bladder or sexual function)
QTF 5: spinal root compression presumed
QTF 6: spinal root compression confirmed by imagery
QTF 7: spinal stenosis confirmed by imagery
QTF 8: < 6/12 after surgery
QTF 9: > 6/12 after surgery
QTF 10: chronic pain syndrome
QTF 11: all other diagnoses e.g. metastases, visceral disease, compression fracture, spondylitis

Low back pain associated with:

Pregnancy & childbirth

Violent trauma e.g. road traffic accident, fall from height

Litigation about a health matter at any time

Patients were not invited to participate in the study if they had a specific cause for their back pain i.e. QTF 4 to 11 (Table 5.3), and if they had other any specific condition known to dispose to low back pain such as pregnancy (Perkins et al 1998), direct trauma (Rainville et al 1997, Ciccone et al 1999) and osteoporosis (Speed 2004). Also, patients who had been or were involved in litigation and / or compensation claims were excluded as this may bias self-report (Menard 1996).

The Quebec Task Force (QTF) classification –Spitzer 1987- (Table 5.3) was selected for this study because it closely relates to diagnostic triage in practice and is the most reliable classification available (Waddell 2004a).

The recruitment of suitable participants continued using the criteria in Table 5.3 until 'saturation' was reached. Saturation is considered the 'gold standard' by which purposive sample sizes are determined in health services research (Guest et al 2006). In this study saturation was operationalised as the point in data collection and analysis where the information gathered in the latter interviews added little to the insights gained from the earlier interviews. Accordingly, saturation was considered to have occurred towards the conclusion of thirty interviews. The indexing and charting of the data confirmed this (see below). New themes did not emerge from the data during the indexing and charting of the latter compared with the earlier interviews despite being sought. This finding concurs with that of researchers at the National Centre for Social Research (e.g. Finch 1988, Spencer et al 1988, Ritchie 1990).

'Saturation' is most commonly associated with Glaser and Strauss's (1967) 'grounded theory' in which (theoretical) sampling continues until all the main characteristics of a particular phenomenon have been identified and incorporated in the emerging theory i.e. 'theoretical saturation' is achieved

(Holloway and Wheeler 2002). Ritchie et al (2003b) however argue that that the concept of ‘saturation’ can be used in studies such as this one that are based on other philosophical assumptions such as subtle realism. Morse (1995) views ‘saturation’ as an ‘elastic concept’ because as Guest et al (2006) point out the term has been used so frequently that there are now various types of ‘saturation’ most of which are ill-defined in the literature. This highlights the need for researchers to define and operationalise the concept.

There are no practical guidelines or tests to estimate the sample size for saturation (Morse 1995). Morse (1995) however suggests that the researcher can identify when saturation has been achieved by the quality of the theory and Holloway and Wheeler (2002) add that saturation occurs at a different stage in each study and cannot be predicted at the outset. Guest et al (2006) struck by Morse’s (1995) observation that there are no practical guidelines or tests to estimate the sample size for saturation to occur studied the phenomenon and found that ‘theoretical saturation’ occurred within the first twelve interviews. However, Guest and his colleagues (2006) point out the concept of saturation is poorly defined and until their recent finding that saturation occurred within the first twelve interviews in studies based on ‘grounded theory’ there were no practical guidelines or tests to estimate the sample size required for saturation to occur (Guest et al 2006, Morse 1995).

It is relevant to note that at the outset it had been proposed to use a sampling frame (Appendix 4) to recruit potential participants purposively. However, the insufficient number of potential participants (see below) rendered this proposition impractical. Sampling frames are frequently used in qualitative research (Ritchie et al 2003b, Mason 2005). They involve setting quotas to define the characteristics of the parent population (e.g. patients with acute episodes of low back pain) best able to fulfil the research objectives. The quotas in the sampling frame, determined in consultation

with staff at the National Centre for Social Research, were intended to generate a range of experiences and attitudes from men and women from different age groups and from difference socio-economic backgrounds.

In addition, at the request of the NHS Research Committee, it had been intended to select participants who had experienced their first ever episode of acute non-specific low back pain within the past ten years. The insufficient number of potential participants (see below) however prevented this. Moreover, it transpired during the interviews that the ability of the participants to recount events and experiences were not necessarily related to the number of years that had passed since the first ever episode of low back pain but to complex dynamics such as the frequency, nature and duration of an event, the emotions it engendered and the personal interpretation and value placed on it. This observation concurs with that of other authors (e.g. Offer et al 2000). Also, it highlights an important epistemological issue for consideration. The Research Committee's suggestion to recruit participants within ten years of their first ever episode of low back pain appears to have been based on the ontological assumption that there is a single reality apart from perception.

DESCRIPTION OF PARTICIPANTS

Thirty people, twenty women and ten men volunteered to participate in the study and were interviewed. The ratio of women to men reflects the numbers who volunteered.

The participants had a mean age of 36 years, SD 12.27 (range 16 to 66 years) when they perceived their first ever episode of low back pain. The self-reported ethnic background of the participants was as follows: Indian - 14 participants; British - 11 participants; Caribbean - 2 participants; Australian - 1 participant; Chinese - 1 participant and Polish – 1 participant.

Specific information about each participant's gender, age and ethnic background can be seen in Table 5.4. These factors may influence the fieldwork dynamics and consequently the data generated from the interviews (Miller and Glassner 2004). For example, it has been demonstrated that male participants say different things to female compared to male researchers (Willems and Heikes 1993). Consequently, such factors need to be documented and considered reflexively in the data analysis.

A further eight people (seven men and one woman) volunteered and signed their consent to participate in the study. However, they were not interviewed. Five were too busy and could not spare the time, two did not keep their interview appointment and one could not be contacted at the given address.

RECRUITMENT

The participants were recruited from two physiotherapy clinics and one medical clinic located in an acute NHS hospital serving a population from diverse ethnic backgrounds. Initially, recruitment took place in the physiotherapy Spinal Triage Clinic. However, the number of suitable patients attending this clinic was inadequate. This difficulty of recruiting a sufficient number of people with acute episodes of non-specific low back pain has been found in other NHS hospitals (Newton-John et al 2001; Wand et al 2004). As a consequence, and with permission from the Harrow Research Ethics Committee and the NHS Trust's Research and Development Committee, recruitment was extended to patients referred to physiotherapy by GPs (the GP Open Access Clinic); and towards the end of the study to patients referred to the Rheumatology Back Pain Clinic in the medical out-

Table 5.4 Demographic information

Key: *Estimated from description of timing of first episode; **Self-assigned using the Office for National Statistics (2001) Classification of Ethnic Groups

Participant (Pseudonym)	**Gender**	**Age***	**Ethnic background**** (Country of birth if outside UK / years in UK, where applicable)	**Occupation**
Usha	Female	29yr 6m	Indian	Accounts clerk
Margaret	Female	48yr 3m	British	Teacher (primary)
Elka	Female	39yr 0m	Polish (Poland / 22yrs)	Design assistant
Gita	Female	37yr 9m	Indian (Kenya / 55yrs)	Hospital technician
Priti	Female	30yr 0m	Indian (Kenya / 23yrs)	Home-keeper
Amy	Female	21yr 0m	British	Nursery nurse
Adil	Male	46yr 0m	Indian (Uganda / 32yrs)	Computer support
Irene	Female	60yr 4m	British	Home-keeper
Dinesh	Male	26yr 6m	Indian	Surveyor
Kevin	Male	25yr 6m	British	Railway signal man
Sirina	Female	22yr 9m	Pakistani	Administrator (NHS)
Nipa	Female	44yr 9m	Indian (Uganda / 10yrs)	Supermarket cashier
Lalit	Female	42yr 8m	Indian (India / 30yrs)	Complementary therapist
Chandra	Female	39yr 6m	Indian (Kenya / 22yrs)	Medical receptionist
Rushani	Female	20yr 6m	Sri Lankan (Kenya / 30yrs)	Nurse
Rahul	Male	21yr 6m	Indian (Uganda / 26yrs)	Supermarket clerk
Jane	Female	31yr 0m	British	Certified accountant
Linford	Male	24yr 6m	Caribbean	Loss adjustor
Angela	Female	48yr 9m	British	Hairdresser
Tina	Female	41yr 0m	British	Supermarket assistant
Hazel	Female	31yr 0m	British	Home-keeper
Denise	Female	45yr 0m	British	Home-keeper, former print room manager
Joan	Female	66yr 2m	British	Claim investigator
Tom	Male	27yr 0m	British	Builder
Oditi	Female	32yr 8m	Indian (Uganda / 10yrs)	Book keeper
Lee	Male	16yr 2m	Chinese (Hong Kong / 15yrs)	School student
Brenda	Female	56yr 1m	Australian (Australia / 35yrs)	Bank employee
Ashok	Male	44yr 11m	Caribbean (Jamaica / 37yrs)	Train mechanic
Tariq	Male	29yr 10m	Pakistani (Pakistan /4yrs)	Restaurant manager & University student
Vijay	Male	42yr 7m	Indian (India / 16yrs)	Bank employee

patient department. Twenty eight participants were recruited from the GP Open Access Clinic, and one each from the Spinal Triage and the Rheumatology Clinics.

The procedures for recruiting from each of these clinics can be seen below.

Spinal Triage Clinic (physiotherapy outpatient department)

At the outset it was intended to recruit all participants through this service. For the reason given above, however, only one patient was recruited from this clinic. This female patient, identified as meeting the study's inclusion criteria (Table 5.3) during the physiotherapist's assessment, was asked, by the physiotherapist, if, in principle, she was interested in participating in the study. She expressed an interest and the study was fully explained to her by the physiotherapist. She was then invited to read the information sheet that had been sent with her physiotherapy appointment, and to sign the research project consent form once her questions about the study had been answered. A copy of the signed consent form and the information sheet, including the researcher's contact details, were given to her, and the original signed consent form placed in her hospital notes. With the patient's permission, a second copy of the signed consent form, the information sheet and a letter were sent to her GP informing him of her participation in the study.

After an appropriate interval this patient was approached by telephone. She confirmed that she was still willing to participate in the study and arrangements were made for the interview to be held at a place and time that was convenient for her.

The physiotherapist's involvement in the recruitment process was necessary to comply with the Data Protection Act (1998). The interpretation of this Act

means that a researcher should not know the identity of individuals until they have expressed an interest in participating in a study and agreed to their details being passed to the researcher.

GP Open Access Clinic (physiotherapy outpatient department)

Twenty eight patients were recruited from this clinic. New patients identified as meeting the study's inclusion criteria (Table 5.3) during the physiotherapist's assessment were asked by the physiotherapist if, in principle, they would consider participating in the research project i.e. to being interviewed about their life before back pain. Each patient who agreed was introduced to the researcher who fully explained the study and invited them to read the information sheet. Any questions were answered. Those who agreed to take part in the study were asked to sign the research project consent form (Appendix 5). A copy of this form and the information sheet (Appendix 6) were handed to the person to keep. With each person's permission, a second copy of the signed consent form, the information sheet and a letter was sent to the person's GP informing them of the person's participation in the study (Appendix 7). The original copy of the signed consent form was placed in the person's hospital notes. After an appropriate interval each person was approached by telephone and asked to confirm if they were still willing to participate in the study in which case arrangements were made for the interview to be held at a place and time that was convenient with them.

The research project consent form (Appendix 5), information sheet (Appendix 6) and GP letter (Appendix 7) used in this clinic were similar to those used in the Spinal Triage Clinic (see above) and the Rheumatology Clinic (see below).

Rheumatology Clinic (medical outpatient department)

New patients meeting the study's inclusion criteria (Table 5.3) were identified and asked if, in principle, they would consider participating in the research project i.e. to being interviewed about their life before back pain, by the consultant physician. Each person who agreed to consider taking part in the study was told that, with their permission, their name and address would be passed to the researcher who would contact them. Their agreement with this plan was recorded in their hospital notes.

On receiving each patient's name and address the researcher sent them the information sheet about the study and a covering letter. After an appropriate interval each patient was telephoned. Any questions were answered and the person was asked if they agreed to take part in the study. One woman agreed to participate and arrangements were made for the interview to be held at a time, and at a place convenient for her. Her GP was informed with her permission. At the start of the interview she was asked to sign the research project consent form. A copy of this signed form was handed to her to keep and the original signed form placed in her hospital notes. A copy of the signed consent form was sent to her GP.

Irrespective of which clinic a participant was recruited from, the researcher introduced herself as a university lecturer who taught occupational therapy and physiotherapy students, and who was carrying out the study in collaboration with staff at the hospital. This information was also partially evident from the information sheet handed to the participants (Appendix 6). Its relevance is that such knowledge may influence the participant's responses to the researcher. For example, the information given will reflect that which the participant considers it appropriate to give a lecturer / health professional. Other variables such as age and gender may also have an impact on the data made available and needs to be taken into account in the presentation of the research findings. (Murphy et al 1998).

DATA COLLECTION

Pilot study interviews

The first four interviews formed the pilot study. These interviews enabled the researcher to become familiar with and evaluate the suitability of the topic guide –Appendix 3- (if it was consistent with the research objectives and the purpose of each section on the guide); the interview process (the length, language used and ways of addressing and ordering topics) and the use of the audio-tape recording equipment in the field. The recording equipment consisted of a Marantz audio-tape recorder and lapel microphones. Subsequently, the interview data was transcribed by the researcher using a standard Sony tape transcriber with foot pedal. The transcripts were reviewed by two experienced qualitative researchers who gave positive feedback with no recommendations for any amendments. One of the reviewers however questioned the feasibility of analysing and managing the amount of data generated from the interviews using Framework (Ritchie and Spencer 1994, Ritchie et al 2003a). Consequently, a third reviewer with expertise of using Framework reviewed the transcripts. This reviewer did not anticipate any difficulty, and commented on their power. As a result of this review the data from the four pilot study interviews were included in the data set. Van Teijlingen and Hundley (2001) and Arthur and Nazroo (2003) confirm that it is appropriate to include pilot study interview data in the main study unless the research objectives are modified or the data collection methods altered.

Main study: interview conduct

Location and timing of interviews

Interviews were held at a place and time convenient for each participant. Fifteen participants chose to be interviewed at home, ten during the day and five in the evening; thirteen participants asked to be interviewed in the hospital, eleven during the day and two in the evening; and two participants chose to be interviewed at their workplace.

Where the interview was conducted in the home or the workplace the suitability of the venue was checked beforehand with each participant. This was to ensure that the environment would be adequately quiet and private so the interview could proceed without interruption as far as possible. In the hospital the interviews took place in a small meeting room in the physiotherapy department.

Each interview involved six stages (Legard et al 2003).

Stage one: arrival

From the outset every effort was made to create an atmosphere in which each participant felt at ease, safe and able to talk freely about past experiences and feelings. Tea, coffee or a soft drink were offered to participants in the hospital where the researcher played the role of host. Where the interview took place elsewhere i.e. in the home or workplace the researcher assumed the role of a guest. Conversation was made in a quietly confident manner avoiding the research topic until the person seemed comfortable and ready to begin the interview.

The successful management of this stage was recognised as being crucial to the development of the relationship first established while recruiting each participant, and ultimately to the success of the interview (Kvale 1996, Legard et al 2003). Miller and Glassner (2004) have pointed out that building rapport by establishing trust, showing genuine interest, and not being judgemental is important to generate knowledge of the social world.

Stage two: introducing the research

Once each participant seemed comfortable and at relative ease the research topic was introduced. Each participant was reminded of the nature and purpose of the research and informed that their role was to give as much

information as possible as opposed to giving short answers. Confidentiality was re-affirmed and permission sought to audio-tape the interview.

Stage three: beginning the interview

The opening questions asked each participant for background information such as who they lived with, how they spent their days and what they did for a living. Holloway and Wheeler (2002) recommend this information is sought at an early stage because participants generally find talking about familiar topics enables them to settle down. Also, it provides contextual information to help the interviewer follow who is being talked about when, for example, names are mentioned, thus avoiding the need to break the flow of the interview and ask for factual information at a later stage (Legard et al 2003).

Initial responses to these questions indicated the degree to which each participant found it easy to talk about him or herself. Where participants appeared reticent, time was taken to enable them to talk more freely by spending more time asking for descriptive information, emphasising the value of their views, providing re-assurance that there were no right or wrong answers and acknowledging that some people find it easier to talk about themselves than others. Other techniques to encourage reticent participants to 'open up' included asking open questions and showing an interest in what they were saying through non-verbal means such as an enquiring glance or nodding and smiling encouragement (Robson 2002).

Stage four: considerations during the interview

As each interview progressed the participant was taken from the more superficial level of everyday conversation to a deeper level focusing on the issues set out in the topic guide (Appendix 3), and on any new issues and insights that emerged. Also, topics raised in earlier interviews were explored with subsequent participants if the participants did not raise them spontaneously. For example, in the early interviews participants spoke about

their disposition to activity. Consequently this topic was added to the topic guide (Appendix 3) and explored in subsequent interviews.

Verbal and non-verbal means were used to ascertain the relevance of the topics in the guide (Appendix 3) and to gain a fuller understanding of the person's experiences, responses, thoughts and feelings about the topics and issues.

Where the responses to the initial questions about a particular topic lacked sufficient detail follow-up questions were asked. These questions were worded in such a way as to amplify, explore, seek reasons for, and clarify the responses (Legard et al 2003). Legard et al (2003) refer to these types of questions as 'probes'. Seidman (1998) however prefers the term 'exploratory questions' because of the unfortunate connotations of the word 'probe'.

In forming and articulating these questions every attempt was made to ensure that the questions were determined by the participant's response to the previous question and not to one determined in advance. At the same time a conscious effort was made to keep the questions short and unambiguous, mirroring the language used by the participant.

Closed questions and leading questions were used where appropriate. Closed questions, for example, were used to affirm the relevance of a topic to the person before using open questions seeking detailed description. Legard et al (2003) support the use of closed questions in this way. Leading questions were used, for example, to check the consistency and reliability of a participant's responses, and to verify the interviewer's understanding of what had been said (Kvale 1996). Contrary to some researchers, Kvale (1996) believes the appropriate use of leading questions in these ways may

enhance the interview and should be used more often. He suggests ‘naïve empiricism’ is the basis of the arguments against the use of leading questions and the belief that there is an objective social reality independent of the interviewer that can be unearthed rather than reconstructed.

Other strategies used to gain detailed information included recapitulation, and asking participants to reconstruct their experiences (Holloway and Wheeler 2002). Double questions, timing questions poorly, thereby leaving participants insufficient time to respond, and extraneous remarks such as ‘ok’ that might indicate to the participant that they had provided sufficient information were avoided, where possible.

Non verbal prompts to elicit detailed information were also utilised. These included using eye contact, posture and gestures e.g. inclining one’s head forward in such a way as to indicate particular interest and the need for further information. The value of using of pauses to elicit information was acknowledged and incorporated (Sorrell and Redmond 1995).

Stage five: ending the interview

Participants were informed that the end of the interview was approaching through the use of a phrase such as ‘there is one more thing I would like to discuss…’ and ‘just before we finish….’. Subsequently, as the interview drew to its conclusion each participant was asked if there was any topic they would like to return to or if there was anything new they would like to add or raise. Frequently, participants raised a new issue towards the end of the interview or as they were leaving the room. Robson (2002) refers to this as the ‘hand on the door phenomenon’. Where this phenomenon extended the length of the interview beyond 90 minutes the participant’s agreement to continue was obtained.

The median length of time taken by the thirty interviews was 99 minutes (inter quartile range 90 to 110 minutes). The shortest interview took 65 minutes to complete and the longest interview 141 minutes. All the interviews, except the interview with Gita, were completed during one appointment. The exception occurred because Gita had guests staying and needed to return home part way through the interview. She returned the following week to complete the interview.

Stage six: after the interview

Each participant was given the opportunity to talk following the interview. When the social interaction suggested the person had no more to say and was ready to conclude the meeting the participant was thanked and re-assured that the information they had provided would be treated confidentially.

All transport costs were reimbursed and a signature requested to confirm the receipt of the cash.

Each person was reminded that their interview transcript would be posted to them to keep, together with a letter and form (Appendix 8) giving them the opportunity to add or amend any information if they wished to complete and return the form in the stamped addressed envelope.

Each participant was telephoned prior to their transcript being posted to ensure the contents of the transcript remained confidential in transit. Each participant was asked where they would like the transcript to be sent and their preferred method of delivery (e.g. by hand, post or email). Twenty five participants asked for their transcript to be sent by postal delivery to their home address; three participants asked for their transcripts to be sent by

'special delivery' to their home address so they knew the approximate time it would arrive and arrange to be at home to receive it; one participant asked for her transcript to be sent to her work address and one transcript was delivered by hand to a participant who worked in the hospital. All participants were informed that the envelopes containing the transcripts would be marked 'private and confidential'. In addition, one participant specifically asked that her envelope be marked 'strictly private and confidential' and another participant, who had asked for her transcript to be sent to her work address, asked for her envelope to be marked 'to be opened by addressee only'. Forbat and Henderson (2005) have drawn attention to the important ethical implications associated with sending transcripts through the post and note that it is rarely addressed in research papers.

Ten of the thirty participants returned the form (Appendix 8) sent with the transcript. None took the opportunity to make, add or change any information to their transcript. One participant however considered withdrawing her transcript from the study because she felt she had been indiscreet. Questions were answered on how her anonymity would be ensured and a published example of how data was used was sent to her. Subsequently, she gave permission for her data to be included in the study. Two participants wrote on the form. Margaret wrote *'I didn't know I had said so much'* indicating a disjuncture between her initial impression of the interview and its representation in the transcript. Denise briefly wrote about her progress: she had lost weight, taken up more exercise and had a more positive attitude.

Field notes

Non-verbal communication and general impressions were recorded following each interview to build up a clear picture of the interaction and enhance reflection (Burnard and Morrison 1994). The notes included a description of the physical setting in which the interview took place and the social

interactions that occurred both in and outside its immediate context. For example, several participants provided useful insights after the tape recorder had been switched off and quotations, or as near as possible recall of direct quotations, were written down immediately and placed in the field notes later. Observations and feelings about the dynamics of the interview; ideas and working hypotheses for possible inclusion in subsequent interviews and their analysis were also included in the notes. In keeping with Patton's (2002) recommendation the notes contained sufficient detail in an endeavour to leave nothing to future recall. In contrast to Patton's (2002) recommendations and qualitative methodologies e.g. ethnographic research (Lofland and Lofland 1995) the field notes were not treated as raw data having been processed through the researcher's mind and selected for their potential usefulness at later stages given the focus of the study and interests of the researcher (Ritchie et al 2003a).

DATA MANAGEMENT AND ANALYSIS

The transcripts noted above were transcribed verbatim. Each transcript was checked against the audio-tape recording for accuracy and revised where necessary.

Framework

The transcribed interview data was analysed using a method called Framework. Developed at the National Centre for Social Research, Framework is not linked with any particular school of thought or research tradition, but derived from the Centre's need, in the 1980's, to provide information for social policy and decision-making, and to demonstrate to those from a quantitative background that the information was rigorously collected and analysed. Consequently the analytic method tends to be more structured than many other methods and more strongly influenced by apriori reasoning (Ritchie and Spencer 1994, Ritchie et al 2003a). Increasingly, Framework is being used by qualitative researchers who wish to add to the body of knowledge in healthcare and improve service provision. For

example, Framework has been used in studies identifying health professionals' attitudes (Barrett and Harper 2000, Marshall et al 2002) and views (Dumelow et al 2000, Willems et al 2005); and in studies exploring service users' needs (Leydon et al 2000, Chew-Graham et al 2002, Wolf 2004a, 2004b), understanding (Hoddinott and Pill 1999, Barrett and Wellings 2002) and decision making (Carnes et al 2007), views (Burns et al 2001, Gilbertson et al 2003, Tarrant et al 2003, Westwood 2003), beliefs (Smith et al 2003), experiences (Neale 2001, Tod et al 2002, Walters et al 2003) and expectations (Anderson 2004, Hird et al 2004, Palfreyman et al 2004). Specifically in back pain, Framework has been used to further knowledge of services users' experiences of pain (De Souza & Frank 2006, 2007, May 2007); views on aspects of care (Roach 2004) including physiotherapy (May 2007) and satisfaction with physiotherapy (May 2001); and perceptions of recovery (De Souza and Frank 2007, Hush et al 2009).

As its name suggests, Framework is a matrix-based analytic method. It facilitates rigorous and transparent data management and analysis in key stages (Figure 5.1).

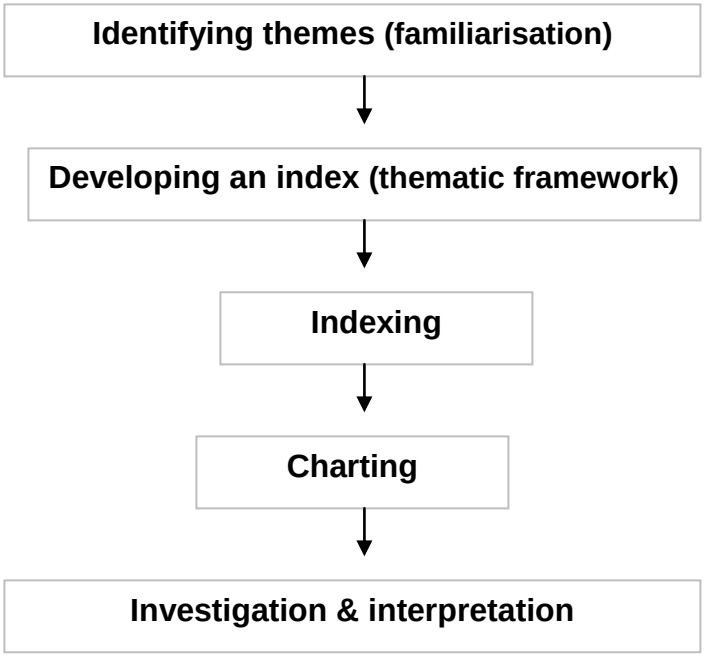
Identifying themes (familiarisation)

The purpose of familiarisation is to gain an overview of the raw data and identify key ideas and recurring themes by which the data will be sorted, labelled and charted. Ritchie et al (2003a) draw attention to the importance of this stage for the subsequent stages, and liken the process to 'conceptual scaffolding', whereby it forms the foundation of the structure. If the foundation is 'ill-conceived or incomplete… it may jeopardise the integrity of the construction or at worst bring the whole structure crashing to the ground'.

In this study the familiarisation process began during the data collection and transcription with the researcher recognising patterns in the data, identifying

Figure 5.1 Framework: the five stages

(Ritchie and Spencer 1994, Ritchie et al 2003b)



potential themes and forming ideas about the direction the analysis might take. At the same time typing the field notes, whilst not strictly raw data, enabled the researcher to become further immersed in the data.

Once the interview data collection and transcription had been completed the familiarisation took on a more structured form. Following the recommendations of Ritchie et al (2003a), the research objectives and a judicious selection of raw data in the form of audio-tapes and transcripts were reviewed reflexively and in-depth. In this way it was possible to further examine and verify the patterns and themes generated deductively from apriori issues introduced into the interviews through the topic guide, and the themes generated inductively during the fieldwork. This included looking for supporting evidence for the themes, searching for issues that may have

been overlooked, and seeking alternative explanations and patterns inconsistent with earlier insights (Borkan 1999).

As the themes were identified they were listed on a large sheet of paper. This continued until it was felt that the diversity of the participant's circumstances, experiences and views had been understood.

Developing an index (thematic framework)

The next step was to develop an index drawing upon the themes that emerged from the data and from the issues introduced into the interviews through the topic guide. The themes were grouped and sorted so the index (Appendix 9) had a hierarchy of main and sub-themes. This was carried out by writing the themes on 'post it' notes and grouping and regrouping them until there was a workable structure (Ritchie et al 2003a).

The index contained themes grouped under main headings (Appendix 9). An 'other' category was inserted at the end of each section for issues arising during the indexing stage. Numbers were then assigned to differentiate the individual categories and the themes within them. Some index categories contained new topics that had emerged from the data e.g. '2.2 lifestyle / level of activity', whilst other categories (e.g. '2.5 performance' of daily activity and '2.6 health') were similar to areas of questioning documented on the original topic guide (Appendix 3). This is in keeping both with the method (Ritchie and Spencer 1994, 2002) and Patton's (2002) view that if a topic guide has been carefully conceived it constitutes a descriptive analytical framework for analysis.

Indexing

Each transcript was taken in turn. Its phrases, sentences and paragraphs were read carefully in order to determine which part(s) of the index were applicable to them. The index numbers were then written in the margin adjacent to the data they related to (Appendix 10).

Before each transcript was indexed in this way, a time line was drawn up placing the significant events in the transcript in chronological order. An extract from a time line can be seen in Appendix 11. This served as a useful reference point during the indexing where the sequences of events in a transcript were not immediately clear. Margaret, for example, spoke of having investigations for facial pain but it was not clear from the short paragraph being indexed whether this facial pain preceded the first ever (Appendix 9: index numbers 2.6 and 2.7) or subsequent episodes (Appendix 9: index number 6.3) of low back pain. A glimpse at the time line (Appendix 11) revealed that the facial pain had occurred before the first ever episode of low back pain. Consequently, the correct index numbers (2.6 and 2.7, Appendix 9) could be applied to the transcript without the need to search for the information elsewhere in the transcript on this and the other occasions it frequently occurred. The need for this time line highlights the fact that participants did not necessarily fully discuss one topic before moving on to another but frequently 'jumped around' referring back to items mentioned previously, breaking off mid sentence, and introducing new topics.

During the indexing of the transcripts it was observed that a greater number of index numbers were written in the margins of some pages compared to others. Also, two or three index numbers were sometimes interspersed in the margin beside the text. Ritchie et al (2003a) suggest that a greater number of index numbers are likely to occur where the description is complex, of importance to the person or emotional. Conversely, where fewer index numbers appear in the margin it is likely that one issue is being discussed in

depth and / or the topic was less emotive. The juxtaposition of two or three index numbers in the margin may be an indication of some inter-connection between themes that should be noted for later analyses. Alternatively, it may simply reflect related subject matter. In this study, for example, when participants described the onset of back pain (Appendix 9: index number 3.3) they frequently described the nature of the pain (Appendix 9: index number 3.4) that occurred at the time and consequently the index numbers were frequently adjacent to each other.

Charting

A set of eight thematic charts were constructed. The number and heading of each chart corresponded with the eight index categories (Appendix 9) i.e. chart 1: personal information; chart 2: before the first ever episode of low back pain; chart 3: first episode of low back pain; chart 4: after the first ever episode of low back pain settled; chart 5: subsequent episodes of low back pain; chart 6: before subsequent episodes of low back pain; chart 7: present; chart 8: issues not noted elsewhere. The data from charts 1 to 3 and 8 were analysed to address the aims of the study presented in this thesis (see below).

Each sub-theme was allocated a column with the index number and name of the sub-theme at its head e.g. 1.i country of birth / year (age) came to UK / ethnicity if different to country of birth. The first column was reserved for the participant's ID number, gender and age at interview. The final column in each chart was reserved for 'notes / comments' and provided space for observations to be noted as the charting progressed. The provision of the separate column enabled these notes to be distinguished from the participants' data. An example of charted data can be seen in Appendix 12.

The charts were constructed using Microsoft Excel. The height of the rows and the width of the columns were the same within each chart so that later it would be possible to look across the rows at each participant's data and down each column across 'cases' to summarise each sub-theme (within case and across case analysis). The relative width of each column depended on the anticipated amount of data for each sub-theme. Each participant was allocated the same chronological position on every chart so the charts could be placed next to each other and the various sub-themes compared for that person.

Each participant's transcript was taken and the indexed pieces of text synthesised and placed in the corresponding cells of the matrix. The principle was followed of entering sufficient data into the matrices to avoid the need to return to the transcripts but not so much data that the process became unmanageable. The context of the synthesised data was retained.

Charting the data from each participant's transcript, in turn, permits the researcher to become familiar with each participant's unique experiences and views, and ensure that no data goes uncharted before searching for patterns within the themes and sub-themes (Eisenhardt 2002, Ritchie et al 2003a).

The conventions for charting data were followed (Ritchie et al 2003a):

- The page reference for each piece of synthesised data was placed in brackets so the charts became 'a window into the data set' and, if required, could be returned to to examine the data in its original setting.

- The language of the participant was retained wherever possible.

- Quotations that might be used later to illustrate points being made were identified by placing the letter ‘Q’ next to the page number. Short quotations were typed in italics alongside their page number where the space in the cells of the framework permitted.

- Other abbreviations used were: ‘bp’ back pain; ‘lbp’ low back pain; ‘<lbp’ before first episode of low back pain; ‘>lbp’ after first episode of low back pain and ‘(2.1)’ see chart 2 column 1.

The alternative approach to charting is synthesising and indexing pieces of text for one sub-theme for all participants before moving on to the next sub-theme. Whilst this approach permits a deeper understanding of parts of the interview data, Ritchie et al (2003a) argue that it is really only appropriate where researchers work in teams because one person needs to keep an overview of the whole data set and ensure that any links and relationships are made, and that no data is missed.

INVESTIGATION AND INTERPRETATION

Investigation and interpretation of the charted data were carried out to provide descriptive and explanatory accounts.

Descriptive accounts

These accounts explored the range of experiences and views, and the dimensions of each theme. To ensure their derivation remained visible and could be re-visited each column containing charted data for a particular sub-theme was cut and pasted onto large sheets of A3 paper taped together. The descriptive accounts were then obtained using one of two different approaches.

In the first approach two columns were drawn adjacent to the first column containing the data for the particular sub-theme and the descriptive accounts derived for the particular sub-theme using three steps: (1) detection (2) categorisation and (3) classification (Ritchie et al 2003a). 'Detection' involved looking within each theme i.e. reading down the column across all 'cases' several times to identify the substantive content and dimensions of that particular theme. The elements and dimensions of the theme in the first column were noted in the order identified in the chart in the second column. In the third column the key dimensions were grouped to form categories. The data was then assigned to these new categories.

In the second approach, having read down the column across all 'cases' and identified the substantive content and dimensions of each theme, all the different elements were listed in blocks of a similar kind on the large sheets of A3 paper. This second approach was used more frequently than the first approach. It was particularly useful where there were hundreds of elements to consider for description and analysis.

Ritchie et al 2003a consider these steps essential because they allow the details by which the original data were reduced to be seen, a necessary prerequisite for the processes of description and explanation. They warn that if abstraction occurs at too early a stage then the researcher may only return to conceptualised categories or the full text at later stages of analysis neither of which is satisfactory.

The recurrence of phenomena and numerical counts were not considered primary findings because they have no statistical value. However, if many participants mentioned a particular issue then this information was used to find an explanation for why this was the case.

Explanatory accounts

These accounts attempted to explain why patterns of association observed in the data occurred.

A modified form of analytic induction was used to generate hypotheses. First formulated in 1934 by Florian Znaniek, analytic induction was used to determine universal propositions and causal laws. Its refinement over the years, however, has led analysts to favouring its use in generating theory in qualitative inquiry (Ratcliff 2008). Given these refinements, Bogdan and Bliken (1992) suggest it is referred to as a modified form of analytic induction. The process of analytic induction starts with a tentative hypothesis. Next, the data from a single participant is considered to see whether or not it supports the hypothesis, or whether the hypothesis needs refining to fit the emerging interpretations of the data. This process is repeated using the data from each participant, in turn, thereby giving greater credence to the evolving hypotheses. Throughout the process the researcher actively seeks evidence to reject the evolving hypothesis through negative case analysis i.e. searching for and discussing elements of the data that do not support or contradict the emerging theory (Patton 2002).

APPRAISING THE QUALITY OF THE STUDY

Selecting criteria (standards) to appraise the quality of a research study presents many challenges to the qualitative researcher. One reason is that the definition of quality, and even whether it is possible to establish criteria (standards) for appraising quality in qualitative research, is strongly contested in the literature (Murphy et al 1998, Spencer et al 2003a). This contention is, in part, due to the many philosophical assumptions underpinning qualitative research making it difficult for authors to identify, let alone agree upon, specific criteria. Some authors (e.g. Smith 1984, 1990) reject the need for criteria altogether. However this argument poses a problem in healthcare research: if there are no standards how can quality be

assured? Other authors (e.g. Morse et al 2002) argue the case for retaining concepts such as validity, reliability and objectivity drawn from quantitative research. Yet others argue the need to develop criteria specifically for qualitative research. Perhaps the best known example of the latter can be found in Guba and Lincoln's (Guba and Lincoln 1981, 1982, Lincoln and Guba 1985) seminal work where they substituted validity and reliability with the concept of trustworthiness comprising credibility, transferability, dependability and confirmability; and set out strategies to ensure trustworthiness. The concept of trustworthiness is frequently cited in health and social care as a means of appraising qualitative research studies although not all reviews of the concept have been favourable (Whittemore et al 2001).

Given the contention in the literature and the observation that there are no explicit standards for ensuring the quality of qualitative research, the National Centre for Social Research was commissioned by the Government's Chief Social Researcher's Office to develop criteria to guide and appraise the quality of the government's qualitative research (Spencer et al 2003a). These criteria were selected to guide and appraise the quality of the research presented in this thesis for two reasons. Firstly, the criteria are consistent with the philosophical assumptions on which the study is based i.e. that qualitative research should be assessed on its own terms i.e. according to its remit, nature and conduct (Snape and Spencer 2003). Secondly, the criteria are founded on robust and rigorous research evidence and build upon existing methods of assessing quality: the criteria were derived from a systematic review of the literature, including a review of twenty nine existing methods of assessing quality; in-depth interviews with a selection of commissioners, funders, academics, research practitioners and users with a specific interest in ensuring quality; and a workshop piloting the initial questions. In parenthesis, it is interesting to note that twenty five of the twenty nine existing frameworks reviewed came from healthcare research

indicating the emphasis on quality assurance in this area (Spencer et al 2003a).

The criteria (Spencer et al 2003a) take the form of eighteen open ended questions (Table 5.5). The questions cover the key aspects and processes of the research undertaken. They begin with the assessment of the study's findings before moving on to address the different stages of the study (design, sampling, data collection, analysis and reporting), and conclude with general features namely reflexivity and neutrality, ethics and audibility. The procedurally illogical order of the questions is consistent with the authors' recommendation that the findings of an inquiry are evaluated first because the evidence presented assists in the evaluation of the research process and the design of the study including the logic of the analytic method.

In addition to the appraisal questions, there is a list of quality indicators (Appendix 14) that provide guidance on how the questions can be utilised to appraise the study in this thesis and evaluate whether the standards have been met. It is acknowledged that the studies are context specific and the context will determine the relevance of the indicators. Consequently, some indicators may be irrelevant in some studies whilst other indicators many need to be included for other studies. Spencer et al (2003a) recommend that the quality indicators are applied with discretion emphasising their view that 'judgements remain at the heart of quality'.

Table 5.5 Appraisal questions

(Spencer 2003a)

1. How credible are the findings?
2. How has knowledge / understanding been extended by the research?
3. How well does the evaluation address its original aims & purpose?
4. Scope for drawing wider inference – how well is this explained?
5. How clear is the basis of evaluative appraisal?
6. How defensible is the research design?
7. How well defended is the sample design / target selection of cases / documents?
8. Sample composition / case inclusion: how well is the eventual coverage described?
9. How well was the data collection carried out?
10. How well has the approach to & formulation of the analysis been conveyed?
11. Contexts of data sources – how well are they retained and portrayed?
12. How well has diversity of perspective & content been employed?
13. How well has detail, depth & complexity (i.e. richness) of the data been conveyed?
14. How clear are the links between data, interpretation and conclusions?
15. How clear & coherent is the reporting?
16. How clear are the assumptions / theoretical perspectives / values that have shaped the form & output of the evaluation?
17. What evidence is there of attention to ethical issues?
18. How adequately has the research process been documented?

Questions (Q)1 to 5 relate to study findings; Q6 relates to design; Q7 & 8 to sample; Q9 to data collection; Q10 to 13 to analysis; Q14 & 15 to reporting; Q16 to reflexivity & neutrality; Q17 to ethics & Q18 to audibility.

CHAPTER SIX: THE STUDY'S FINDINGS

INTRODUCTION

This chapter presents the findings from the study's in-depth interviews, the methodology of which was described in chapter five. The objective of this study was to further knowledge of the perceived causes of non-specific low back pain for primary prevention by exploring the participants' (1) definitions of their first ever episode of low back pain (2) descriptions of life before their first ever episode of low back pain and (3) causal attributions for their first ever episode of low back pain. A feature of the participants' endeavour to account for their first ever episode of low back pain was the elimination of factors that they did not think were causal. Accordingly, this is reflected in the content of this chapter.

Eleven major themes and twenty-nine sub-themes were generated inductively from each participant's interview data (Table 6.1). These themes and sub-themes are presented in the text below. They are illustrated by extracts from each participant's interview data, followed by each participant's pseudonym, in parentheses. While these themes and sub-themes were conceived as separate entities, reflecting the various dimensions of the participants' definitions of their first ever episode of low back pain and their lives before their first ever episode, the themes and sub-themes are closely interwoven.

The male and female participants conceptualised some aspects of life before the first ever episode of low back pain differently. Accordingly, some of the sub-themes specifically relate either to the male or the female participants (Table 6.1). The participants' different age groups and ethnic backgrounds provided 'rich' and varied descriptions of life before their first ever episode of low back pain but did not seem to influence the conception of the themes and sub-themes.

Table 6.1 Overview of the themes and sub-themes that emerged from the inductive analysis of the in-depth interview data

Key: *includes causal attributions

Theme	***Sub-theme***
Defining the first ever episode of low back pain	
Means of recall A normal experience Realisation of the first ever episode of low back pain A health problem	Onset of the first ever episode* End of the first ever episode
Antecedents of the first ever episode of low back pain*	
Stressful circumstances	Life in general (men) Changes in lifestyle (women) Bereavement (women) Relationship problems (women) Job dissatisfaction (women) The role of stress* (women)
Coping with stressful circumstances	Emotional & behavioural responses (women) Difficulty coping with physical activity (women) Reduced levels of physical fitness* (men) Pushing worries to the back of the mind Support from friends and family Smoking
Participating in physical activity	Disposition to activity Keeping going and overdoing it Doing things in a hurry Goal setting Inability to be still Active lifestyle Participating in sporting activities*
Health problems	Past health problems (men) Past health problems (women) Health problems in the five years before the first ever episode (women) Health problems attributed to stress (women) Co-occurring health problems (women) Health problems not attributed to stress (women)
Getting older*	
Familial influences*	
Body-build	Height* (men) Weight*

DEFINING THE FIRST EVER EPISODE OF LOW BACK PAIN

On recruitment to the study all thirty participants (twenty women and ten men) confirmed that they could recall their first ever episode of back pain thus enabling their definitions of the very first episode of low back pain to be explored. All the participants defined their first ever episode as occurring when they were adults apart from Lee who recalled experiencing low back pain for the very first time when he was fourteen years of age.

MEANS OF RECALL

The participants recalled when their first ever episode of low back pain occurred in one or more ways: by recalling their age (years) when it occurred; the year it occurred; the number of years since it occurred or by remembering the setting in which it occurred. An example of the latter can be seen in Tina's account:

> *…it was around Christmas because we were preparing stuffing for Christmas at work so it was around winter time. It was either 2000 or 2001 because I know it was when I was working at [name of supermarket]. I don't remember it being the millennium year so it probably was 2001. I'd been at this job a year, probably 2001. (Tina, female)*

Other participants could recall when their first ever episode occurred more clearly:

> *August 2002. It was the bank holiday and we were set to do a lot of gardening on that day. We went to the garden centre and we bought a bag of compost and I was taking it out of the car and that's when I sustained the injury. I sort of like pulled it out of the boot and twisted…I must have pulled something in my back…that was the first time it kicked in. (Sirina, female)*

Like Sirina the participants frequently referred to an *'injury'* where the cause of the first ever episode of low back pain was perceived to be an external agent.

A NORMAL EXPERIENCE

Physical sensations in the lower back including *'niggles'*, *'aches'*, *'pains'*, *'stiffness'*, *'soreness'* and a *'tiredness of the back'* sometimes occurred before the episode of low back defined by participants as their *'first ever'*. When physical sensations such as these were associated with monthly periods and pregnancy, or were secondary to other painful conditions they were considered '*normal'* and not a '*real'* episode of low back pain:

> *I've had back pains before [first ever episode], you know, like labour, I always got back pain with labour and…when I got bad periods I always got back pains…[Also] it used to be around the times that I was due periods…[I'd] get a niggle at the bottom of [my] back and I'd [think] oh I'm due a period. (Tina, female)*
>
> *…at the age of eight I started getting pains in my knees, particularly my left knee so I didn't always walk evenly. My back and legs are connected. When I was in my late teens I remember [my knees] locking and then my back being very painful. (Brenda, female)*

In addition to the *'normal'* physical sensations that were associated with monthly periods and pregnancy, or secondary to other painful conditions, physical sensations in the lower back that came with certain activities were also thought to be a *'normal'* experience and not a *'real'* episode of low back pain. These activities included working too hard; standing for long periods of time, particularly in wet and cold conditions; physical stress such as gardening or bending over at the cricket crease for prolonged periods of time; and a long tiring day standing and working hard.

Where these activities precipitated physical sensations in the lower back that went with rest and / or a warm bath the physical sensations were disregarded, they were not considered to be the first ever episode of low back pain:

> *I do remember when I used to watch my younger daughter play hockey…three or four years ago….if I'd been standing up watching her for like about an hour and a half…my back would hurt. But it didn't last. I just remember standing there and saying 'oh my back is playing me up' but then I'd go home and sit down and it would be ok. I wouldn't even think about it the next day. (Margaret, female)*

> *I used to play cricket.. for…at least a couple of hours every day and [at] weekends for a full day…..I was keeping my back in one position [batting] for very long that's why I was having it….so I wouldn't say it was a back problem… I'd just rest and it went. (Tariq, male)*

> *Sometimes if you're working in the garden for half a day or if you catch cold you get a little bit of back pain…and hot water bottles and things like that and go in the bath, have a salty bath and afterwards it goes away. (Kevin, male)*

Physical sensations in the lower back caused by excessive physical effort were also perceived to be a *'normal'* experience. Kevin, for example, described his adversarial approach to digging the garden. The consequent back pain was considered *'*a *good pain'* which he believed he had *'a right to feel'* because it was *'self-inflicted'*, a natural and explicable consequence of excessive physical exertion*:*

> *I dug over the whole garden pretty much everything, Ground Force Special* and I totally killed my back. It was hurting when I was digging but I just carried on digging from, pretty much from 10 o'clock in the morning 'til it got dark, all the way through. Stop and have a cup of tea, bite to eat and then back in the garden. I was totally aching all over, my back was killing me. Next day I could hardly move. By the end of the day I still had aches and pains in my arms and legs and including my back. And probably the day after the aches and pain were there for…because I'd strained my body so much probably the whole of me was aching for the best part of three, four days including*

my back. It all sort of went together but the back was very painful. (Kevin, male)

* a television programme in which a garden is remade against the clock

The participants explained that they thought that their physical sensations were a *'normal'* experience when they came with particular activities and went with rest because they were commensurate with the level of activity and to be expected:

I thought it's a normal reaction when I came from the gym. It's like when you work too hard on your arms you feel sore…It comes and goes. (Lee, male)

I just thought it was a natural ache that was going to happen after doing certain activities. It didn't infringe my life at all. (Jane, female)

If I had a long day standing and working hard and things like that I'd have back pain….that's normal…because when I relax it goes away you see. Let's say if I was working hard all day and I'm tired I don't sit on the sofa but lie down flat for ten, fifteen minutes, just breathing nicely and just relax. After about fifteen minutes with a little bit of stretching….it goes away. That's what I call tiredness of the back. (Lalit, female)

It was assumed that everyone experienced physical sensations in their back:

..my other friends [who] used to play cricket they used to have back pain [too]. (Tariq, male)

Like everyone [I've] had odd times in [my] life [when I've] thought I've done my back in, you know. But it was never a problem. (Denise, female)

Minor *'niggles'* of short duration were also discounted:

There were…times when it would….niggle but it wouldn't come to anything…I didn't really count that as an episode [of back pain]

because it was only a couple of hours. It would just be like after [standing watching] a hockey game. (Margaret, female)

It was only with the benefit of hindsight that some participants recognised that their *'back trouble'* had been concealed by other aches and pains:

I knew I'd been bending down and straining [my back] too much by digging and lifting things, lifting like heavy lumps of concrete and probably not doing it properly. As I say it went away so maybe my back started twingeing when I was playing squash but of course it's all masked within general aches and pains you normally get. (Kevin, male)

I used to be an IT trainer and [one] Saturday morning I had a terrible pain here [points to lower back]. So I was taken to hospital…They checked everything and said nothing….they x-rayed my back and all that and said 'you might have some infected kidneys' and nothing was taken further… once the pain came back very severely and so I went to see my doctor. I still thought it was a kidney problem anyway and the doctor said 'no'…you see I didn't know whether it was my kidneys or my back or my spine or my muscles. I didn't know what was happening. (Adil, male)

At the time however, the participants did not take much notice of their minor aches and pains because unlike Adil's *'terrible pain'* they were not considered a problem:

First time it is difficult to pin point…[it] must have been coming and going. I ignored it….(Adil, male)

[I] ignored it because I still didn't see real problem that I have. Maybe I just felt sore and that was all…Didn't really care about it, ignored it. (Lee, male)

I'm someone who tends to just ignore pain or just think that I'll work it off, it'll go away. (Denise, female)

I used to get it in the winter after I'd played tennis. [I] thought it was just because it was cold and obviously you sit out between sets while other people are finishing theirs so you get a bit stiff…and it was when

I was sitting down afterwards I just got a bit sore, and that went on for ages. It would go away the next day so I'd ignore it and then it started getting worse. (Jane, female)

Ignoring phenomena was a strategy frequently used by participants not only when dealing with physical aches and pains but also when dealing with emotionally upsetting circumstances (see below).

REALISATION OF THE FIRST EVER EPISODE OF LOW BACK PAIN

It was not until the physical sensations started '*getting worse'* that the participants began to take notice of them. *'Getting worse'* meant that the physical sensations in the lower back did not necessarily come with activity and go away with rest as they had once done:

… one day when I was sitting at work….I could feel it at the bottom of my back and it just got worse and worse and worse and I was just so uncomfortable that no position I could get in to would ease it or make it go away. (Jane, female)

The quality of the first ever episode of low back pain was described variously by the participants as a '*dull'*, *'throbbing'* or a *'sharp* ache'; a *'sharp'*, *'stabbing'*, *'deep'*, *'real'*, *'sharp'* or *'pulling pain'*; a *'discomfort'*, *'soreness'*, *'stiffness'*, '*uncomfortable feeling'*, or *'twinges'* and *'spasms'.* Other sensations were described as:

It literally felt like something popped and then there was this rush of heat up my side and after that I just remember coming in and sitting down over there, because I couldn't get to the settee and we've just got stand alone chairs there. So, I sat there and I was just trying to gather my thoughts and think about what had just happened, because it was a really weird sensation and then there was just a lot of pain. (Sirina, female)

I woke up in the morning stiff as a board… I couldn't move. Really, really stiff. It was…uncomfortable to bend down, it was very

uncomfortable. Very, very uncomfortable, very stiff. I felt wooden in fact. Not nice at all. (Linford, male)

[it is like] a rubber band breaks it's exactly… and it's happened to me a few times, that's exactly what it felt like. And it sort of made you jump. You were expecting to just jump and say oh what was that? But you couldn't move, you couldn't jump up 'cause you couldn't move. (Denise, female)

These extracts illustrate that there was no consensus regarding the quality of the physical sensations experienced by the participants. Some participants, who had difficulty describing their physical sensations, used simile. This use of simile has been described previously by De Souza and Frank (2006).

Onset of the first ever episode

A significant feature of the participants' recall of the sensations that they defined as their first ever episode of low back pain was the timing of their onset. They either woke in the morning with the pain or became aware of the pain during or towards the end of the day.

Where participants woke with their first ever episode of low back pain they thought that their manner of sleeping and a soft mattress might have played a role in its genesis, although there was no certainty:

In the morning I would have the pain and it would go, you know shortly after I got up…I remember that when it started…I decided to change my mattress because I thought that, well maybe I need a firmer one…I think for a while it [helped] but then it would happen again so I'm not sure whether it helped or not. (Elka, female)

Lifting a wheelchair the previous day and a weak back were also mentioned as possible causes of waking with back pain for the very first time.

Physical activities carried out during the day were thought to have triggered the very first episode of low back pain by the majority of the participants. Standing up after bending over to pick up and / or move an object was repeatedly described as the trigger of the low back pain. While a few participants remembered lifting and moving relatively heavy weights such as a bag of compost, a television set and a patient, participants frequently reported picking up lighter objects such as a weed in the garden or a bar of soap from the shower floor. Swivelling or twisting while bending over or *'bending the wrong way'* i.e. bending from the waist and lifting with a rounded back instead of squatting and lifting with a straight back were thought to have played a role in some cases. Other triggers recalled by individual participants were twisting and stretching backwards; walking on hard concrete in thin soled shoes; sitting for too long with an unsupported back; standing up having sat out in-between sets of tennis in the cold winter air; and standing doing nothing. The extracts below illustrate some of these triggers that were associated with the first ever episode of low back pain:

> *I remember… we had a very, very, very heavy patient. I never took any notice at that time but I remember two… one Filipino girl and myself we were small…I was eight stone, less than eight stone at that time, two of us trying to shift this big woman out of bed onto a chair. I remember going home because we all live in the same nurse home talking about it and said how much it hurt to lift this person. I never stopped working, I carried on working but I could feel I've done something or something happened. I strained myself. That was the very first [time].It was a sharp… I was bending down and I tried to come up again it was a sharp, sharp pain. But after a few minutes it went off. Just like I pulled something. It's the same spot I keep getting the pain. (Rushani, female)*

> *I went for a shower and I remember bending down to pick up some soap and I felt a little twinge when I…stood up and thought nothing of it, but when I tried to get out of the shower, when you try and put your leg over the shower I found that it wasn't as easy as it should be. Then when I went and dried myself, I went and put on some clothes and I could feel the pain in my back. (Dinesh, male)*

I was stretching hard to put something in the bin, a piece of paper in the bin and that's when I felt a twinge…I was sitting down and stretching backwards…I was scared…that a simple activity like this could cause back pain…I mean I was in fact hoping that I would have back pain by doing something really silly like lifting weight or lifting very heavy bags or something and then at least I could apportion the blame to that activity. (Vijay, male)

I was on holiday walking. I had this pain and I stopped and when I stopped it stopped. Then I'd walk a bit further on and it'd be fine then it'd hurt again. And then I'd sit down for maybe three minutes and [it went] and this was the pattern really it went on for a long time. (Hazel, female)

I was working actually in the supermarket, when it first started, not lifting anything, it just came all of a sudden…The first pain…[I was] just standing. (Rahul, male)

It was only when the computers came in… some days you'd be like this [moves to sit on edge of chair] thinking, oh I have to get out of here, your bottom would get numb. And I always think, thinking back that was the start of my back problems because prior to that I used to be up and down. You'd have to go see the typist or you'd have to go down the office and see someone. So you did sit down some of the time but you were also on the move quite a lot. And I found after the computers it was sitting…longer and you were concentrating and you'd sit in one position and sometimes you'd just perch on the edge and you never supported your back. (Joan, female)

It is evident from the above extracts that the activities that triggered the first ever episode of pain occurred in different settings e.g. in the home, at work and on holiday. Moreover, it was recognised that the activity that triggered the pain was not necessarily unique to the setting in which it occurred. Joan, for example, who thought that her back pain was caused at work by prolonged sitting at a computer with her back unsupported pointed out that it could also have happened when she was not at work:

You go into some restaurants and the table's here and you're back here somewhere and you can't get near enough. So you're sitting

perched on the end [of your chair] like this, you're not comfortable. You've got nothing supporting your back. (Joan, female)

Where low back pain occurred gradually towards the end of the day, it was in the absence of any specific trigger. In an attempt to account for the pain therefore the participants recalled what they had been doing that day and concluded that their first ever episode had been due to handling and lifting objects, and to over-exertion during sport:

I just think when I lifting this [15 litre can of] oil and then back pain start, before I am not lifting too much…'cause sometimes my husband is at home that time of day, they are not at home… [so] I just lift, I just lift. (Nipa, female)

I was [working] in [name of restaurant] the first time it happen and I remember I lift some weight that day… I didn't feel anything at that time, I mean I finish my work, I went back [home] normally and everything was OK. Only lately in the night I realise that it's hurting at my back…basically it was the pans [used to] make the pizzas and they were on the floor and I just pick them up and put them on the table, that's it. (Tariq, male)

I think it must have been a sporting activity or something…'cause in the evening it was hurting, next day it was aching really bad…I'm pretty certain it was [sport] it was because of something I did which caused the back problem, self-inflicted…I'm one of those people who'll carry on playing past the point of pain if I'm having fun. (Kevin, male)

The incidence of back pain, however, was not always attributed to activity as Lee and Usha pointed out:

Don't know why it happened then. Didn't do anything different…it was just waiting to happen. (Lee, male)

It's [not] like some people they lift something awkward and their back catches them. It's nothing like that. I could lift the same thing again and again and nothing happens…so it's never been like that, any

particular way of moving or any particular way of doing a thing. It's never been like that. (Usha, female)

Participants who could not vividly recall the onset of their first ever episode of low back pain were in the minority. However, some aspects of memory were nevertheless preserved and they were able to recall where they were when their first ever episode occurred. Margaret, for example, remembered being at work and Oditi recalled being at her parent-in-law's house:

…the first time I got it. I don't remember what triggered it off, but I remember being at work and it was for about five days and I can't remember whether it started suddenly that time or whether it was gradual, but I remember that it got bad enough to go to the doctor. (Margaret, female)

I don't know why, how it triggered. It just… The first time it did start three, four years back when I was living with my in-laws but it disappeared in three, four days. (Oditi, female)

Trying to understand why the first ever episode of low back pain occurred was enigmatic:

It's mind-blowing, why, what causes it and you know and I know there was something that happened that day that triggered it, but you can't understand what. (Irene, female)

In particular, the participants found it difficult to explain why a particular circumstance or activity carried out many times before should now trigger the first ever episode of low back pain. *'I don't know'*, *'no single cause'*, *'getting older'* and *'heredity'* were common responses to questions about causality. *'Getting older'* and *'heredity'*, which was also referred to as a *'family weakness'*, are discussed later in this chapter.

In addition, there were some idiosyncratic responses. Lalit, for example, thought that her first ever episode of low back pain might have been due to a lack of vitamins amongst other factors. Tom thought he had probably done *'something silly'*. Irene thought that her back pain, triggered by gardening, might have stemmed from her childhood when she slept on damp mattresses in air raid shelters. Her father had always talked about dampness causing aching bones.

End of the first ever episode

Defining the end of the very first episode of low back pain was difficult for the participants as exemplified by Amy when she said *'I can't say exactly'*. Usually, participants recalled the end of the first ever episode by giving an indication of how long the pain had lasted. This ranged from a few seconds up to six weeks. The back pain had either *'gradually got better' or 'just disappeared'.* The cognitive aspects of the painful episode however lasted for a longer period of time: Sirina's physical pain had subsided after four to six weeks, for example, but it had taken a good three months *'to get out of [her] mindset'*. Priti and Denise explained:

> *It slowed me down, because at the back of my mind I was still like thinking when I go to pick something up. You know, you when you get conscious about it whether it is going to come back. (Priti, female)*
>
> *Gradually it goes, you just forget, pain disappears in your head…after a while you forget about it. (Denise, female)*

A HEALTH PROBLEM

The very first episode of low back pain was perceived to be a health problem requiring professional assistance by approximately half the participants. Usually, the participants who regarded their very first episode of low back pain to be a health problem consulted their GP although a school doctor, an osteopath, a hospital accident and emergency (A&E) doctor, and an

orthopaedic consultant identified via the Yellow Pages, were consulted in individual cases.

The severity of the very first episode of low back pain, the level of disability associated with the pain and the need to take time off work distinguished the participants who regarded their first ever episode of low back pain as a health problem from those who did not.

The participants who regarded their first ever episode of low back pain to be a health problem recalled their low back pain being very painful or severe to the extent that the pain limited or stopped them carrying out their daily activities, particularly those activities involving bending at the waist, walking, sitting, and standing. Also, the pain interfered with sleeping. Other individuals recalled the pain bringing tears to the eyes and making them cry. Fears were expressed about not getting better and of not knowing how to cope with the pain. The inability to cope with the pain resulted in Tariq going to A&E for help.

In contrast, participants who did not regard their very first episode of low back pain to be a health problem recollected that the pain had not stopped them from doing anything or, in a very few cases, had made them perform activities more carefully and avoid lifting objects.

An inability to go to work for up to three weeks, because of pain and disability, were recalled by a greater proportion of participants in paid employment who perceived their first ever episode of low back pain to be a health-related problem compared with those that did not. Only Kevin, who did not consider his very first episode of low back pain to be a health problem, recalled taking time off work. His work in a signal box required him

to lean forward on demand which he was keen to avoid because the movement aggravated his pain.

While physical factors associated with the pain and disability played a major role in whether or not participants took sick leave they were not the only determinant: social and economic factors were also recalled as playing a role. Rushani, for example did not take any days off work from her job nursing older people, because she feared it would go on her record and reduce her chances of getting a work permit:

> *I wasn't sick during my training. I never took any days off sick. I wasn't sick because you have that fear if you go off sick and it goes on your record and you have less chance of getting a job. Because I had a Sri Lankan passport at the time, you had to apply for the work permit in those days so you're always scared of taking off sick. So you fight it, you don't give up, you just go with the pain.*

By fighting the pain and not giving in to it she meant:

> *You try to move your body, move your muscles without straining the area that hurts. And you're extremely careful not to use those muscles. You sit down carefully, you move careful, you bend carefully and you try not to lift when it's still hurting. (Rushani, female)*

Implicit in this description is the assumption that if Rushani surrendered to the back pain and did not 'fight it' the pain would win. This concept of back pain as an adversary that needs to be fought and won is commensurate with the use of military metaphors when talking about and understanding ill-health in western cultures e.g. invasion by disease, fighting illness, a magic bullet (Knowles and Moon 2006). Other examples of the participant's use of military metaphors are given later in this chapter.

PERCEIVED ANTECEDENTS OF THE FIRST EVER EPISODE OF LOW BACK PAIN

STRESSFUL CIRCUMSTANCES

Life in general (men)

Initially, the men recalled life before their first ever episode of low back pain as *'good'* with few pressures or worries at home or work. During the course of each interview, however, some of the men 'opened up' in response to exploratory questions about their personal circumstances. Their descriptions of life focused on the positive and negative aspects of their work. The latter included travelling difficulties; a stressful working environment; staff shortage; redundancy; working longer hours; taking work home and the boring nature of work. Other events recalled included coming to boarding school in England from Hong Kong; moving from manual to office work; buying a house and taking on the responsibility for paying a mortgage; caring for a sick wife; meeting a girlfriend, now wife, with a family history of Huntingdon's disease; and coming to live in England and divorcing within one year of marriage. With the exception of Adil, however, whose wife had recently been diagnosed with a brain tumour (see below), none of the men considered that their circumstances had contributed to their first ever episode of low back pain.

The view of the majority of the men was represented by Dinesh:

> *I wouldn't have thought it [life before back pain] would have been any different. I'm in a happy relationship; I've got no stresses with that. I've got a very close supportive family. I'm financially sound, not in any debt apart from my mortgage. (Dinesh, male)*

Dinesh and Kevin also stated explicitly that their first ever episode of low back pain was unrelated to any circumstances:

> *I see back pain as a totally isolated incident to any underlying problems. (Kevin, male)*

> *There wasn't anything leading up to it, there wasn't anything going on in my life. (Dinesh, male)*

In addition, Dinesh asserted:

> *I don't think you're any better off considering my experiences in trying to understand why people get backache, because of the line of questioning...I don't think in my particular instance that has really helped you because there wasn't anything leading up to it, there was nothing going on in my life. (Dinesh, male)*

The men's reticence to discuss personal issues including health concerns (see below) may, amongst other factors, have been associated with the need to protect the masculine self when being interviewed by a woman. As Schwalbe and Wolkomir (2001) point out 'gender filters knowledge'. This issue is relevant to all the knowledge gained from the male and female participants in this study and is discussed further in the next chapter.

In contrast to the men, most of the women talked at relative length about their difficult and stressful lives before their first ever episode of low back pain. In particular, they spoke about how their lives had been deeply affected by changes in lifestyle, bereavement, relationships, and by difficulties at work interwoven with other problems. The unifying theme in these accounts of life before the first ever episode of low back pain is one of loss.

Changes in lifestyle (women)

Several women talked about the huge lifestyle change involved in coming to live in London. They spoke about the *'sunny'* life they had had in East Africa (Kenya, Tanzania and Uganda) that, in most cases, included a happy childhood climbing in the mango trees, servants to do the housework, and the friendly, relaxed way of life in the warm climate where there was no need to budget, no responsibilities, sellers came to the door and there was time for a social life. In contrast, they found living in London *'traumatic'* and *'stressful'* and they spoke at some length about the *'cold'* climate, and adapting to a lower standard of living. They had had to learn how things

worked in the capital such as how to travel on the tube, how to find work and how to budget and deal with money for the very first time. Some of the women had travelled to England with their parents to visit relatives and had found themselves married within a short space of time such as two and a half weeks in Priti's case. Other women were already married when they came to live in London. All these women found themselves living in extended families, frequently feeling lonely, worried about and missing their own families and friends.

Combining housekeeping including shopping, cooking and cleaning, for up to seven people, caring for older sometimes sick relatives and children usually while working full time with insufficient support at home both in practical and financial terms was an important issue for the women. They described the hectic lifestyle, the hard work, the financial difficulties, including bankruptcy, the lost independence, the lost social life and the lack of space and privacy that was the consequence of entering an extended family. Frequently, there were unresolved tensions within the household. One woman, Priti, struggled to open a shop, to get out of the house during the day. The venture failed however because the uninsured stock was stolen and another shop opened nearby taking her business. She recalled, *'it was like losing a baby'.* Another woman, Chandra, lost her home. Living in an extended family was so stressful that she moved out with her husband to start again leaving their home to his mother. It was such an unhappy time for her that she advised her daughters against marrying an elder son to avoid the tradition of looking after parents-in-law.

Travelling to England, finding a husband, and combining work and housekeeping were not unique to the women who had come from East Africa to live in England. Brenda had travelled from Australia with her parents, and had met and become engaged to a second cousin during the trip, although she was to return alone to Australia for two years before

marrying him and returning to live in London. She questioned whether '*coming over here and changing lifestyle'* triggered her back pain adding *'[I] know it sounds crazy*…*never worked out what it was'*. Angela, a hairdresser who worked from home, also spoke of difficulties combining work and keeping home for her husband and two children, with no support while caring for her elderly parents who lived nearby and sometimes needed her during the night. To get out of the house she had found a Saturday job working as a receptionist for a local business and instructed her family not to contact her there.

Bereavement (women)

Bereavement and its consequences were experienced by some of the women before the first ever episode of low back pain. Hazel spoke about the emotional '*pain'* she still felt having lost her grandson and niece from leukaemia and meningitis respectively some six years earlier, and how she and her family's life had never been the same thereafter. Irene spoke about the good life she had had until her husband's unexpected death driving his van five years earlier, which was swiftly followed by her sister's death from lung cancer. She thought she was going *'round the bend'* and would never get over her husband's death. In an attempt to feel better, she had spent all the money her husband left her on her cat. Lalit spoke about her mother's illness and death eighteen months before her first ever episode of low back pain and how her brothers had taken their mother's money and property during her illness leaving her none:

> *She had a stroke, she had a first stroke and then she died of another stroke in hospital…[it] is a bit of a sad story. In my family it affected me more than any other people I suppose because I was the closest person to her…it affect me because this is all like a society and culture and families do have problems…[when] my mother was in hospital my brothers they didn't want me near my mother…it's just that my brothers were not getting along with me even when my mother was alive…they were looking after my mother's finance and everything. My parent's finance and they've taken everything…all the*

properties, all the money everything they have taken it….My mother didn't want these things to happen…they were worried I would say something [to mother] but I [didn't] because I didn't want anything. I didn't want a row or anything…There are a lot of other things, family, life problems…they're earning here, they're getting benefits here...(Lalit, female)

Lalit's story is returned to later in this chapter where she recalls how she tried to cope by ignoring her brothers when she saw them in the street and pushing the emotional upset to the *'back of [my] mind'.*

Denise recalled her father and younger brother's deaths some years before and how close she had grown to her mother as a result. Consequently, when her mother died unexpectedly three months before her very first episode of low back pain it had *'knocked* her'. In particular, it had been '*traumatic'* because there was no time to get over *'mum going'* before everything crowded in on her: she took in her sister to care for her alongside her two adopted *'kids'* and the '*chap'* she had already taken in. All four of them had special needs. She worried how she and her husband would manage, with no support from social services and insufficient space, in addition to caring for her mother-in-law with Alzheimer's disease who lived nearby. Also, the sleeping arrangements were inconvenient because her husband did shift work and only managed to get a couple of hours sleep when they were all out during the daytime:

My mum collapsed and died without any warning in March…I already had two children with special needs I adopted at six months who by then were seven and five. I had a chap with Down's syndrome who was in his mid forties who had come to stay with us for two weeks [when his mother died] and… ended up staying for fifteen years! [After] mum died I [took] on my sister who also had Down's syndrome because she had no one, she'd been living with my mum. So I had really not a bad year but a very hectic year leading up to [back pain]…It was hectic in as much as we were having to move around rooms to have yet another person live with us. It was emotionally

hectic because of the shock. So it was hectic in lots of ways but not to the point where it was a major problem really, and…Well I had to go rushing up to Birmingham which is where my mum lived. I'd been up there two or three days which had meant making sure things were all right at home because they [the children] were still quite small. Then I'd brought my sister back and then we were actually living in a very, very tiny three bed roomed house at the time. We had already put both the children in one room to give [name] the Down's chap a bedroom and then I arrived back with my sister so it was a case of what the hell do we do now? So we had to move everything round again. She had to go in our bedroom and we had to rush out and buy a blow-up bed and things so my husband [a shift worker] and I could sleep… So we had been sleeping on the lounge floor on a blow-up bed which probably hadn't helped. (Denise, female)

Relationship problems (women)

Relationship problems before the first ever episode of low back pain took one of two forms, either separation from a partner or unresolved tensions within the home.

Usha, Tina and Elka recalled separating from their partners shortly before experiencing their first ever episode of low back pain. In Usha's case the difficulties had been accompanied by physical abuse. She described trying to make her marriage work, of *'giving up'* work to avoid her husband who worked for the same company and of *'losing hope'* that things would work out before finally separating from her husband and moving back home to live with her parents. She recalled:

The build up had been going on for about five years before then. But it got worse when my daughter was born because there was a lot of physical stuff within my marriage and I always thought… if he is older than me, you know things, once he has had his own child he will calm down…you have to try that a hundred percent but then it got to a state where I thought it was scaring my daughter and then I sort of had to decide within myself that is not what I want for my daughter to grow up to think that this is [a] normal thing that a man does, especially as a girl. So that's when I took the final step and moved out…It was just

one of those things you just get on with…until I actually separated.. it [the back pain] just hit me then. (Usha, female)

Tina recalled her partner moving out the year before she had back pain for the very first time. Circumstances had forced them to stay together:

I got pregnant with [daughter's name] and [with] my mum having the brain haemorrhage and my nan dying everything sort of all happened so we were like forced more to stay together. And then I think because the kids got used to having him around you don't want to…I don't want to split up, didn't want to be one of those mums all different blokes are coming round all the time so you just plod along and accept things. We never got married or anything we both just accepted it and we just did our own thing really. (Tina, female)

Elka described parting and reconciliation with her partner before her first ever episode of low back pain:

I had a bit of a break up with my partner and things got a bit er…at that time we were together sort of ten or eleven years or so and got a bit of problems and yes, so disagreements with his mother and things like that and it came to a head so. That was a bit upsetting. I was given some pills, I was given, I think Prozac, although I stayed on it only for probably three weeks because I found that I couldn't sleep and then when I went to the doctor he says 'well take this for sleeping' and at that point I thought to myself 'well hold on this is just not going to work'. If I am going to take something to take something during the day and something to sleep, I stopped. I stopped there and then and didn't take anything. I took sleeping tablets for probably a week because I had problems being able to sleep but that was it. After that I stopped taking all the medication and just decided I'd have to handle it myself and then things got better. We got back together again and that was it.

Elsewhere in her account she talks further about the impact the separation had upon her including:

[I] was very upset, very tearful…dwelling on things…I was depressed…very low about [myself] and about the whole situation.

Feeling how unfair life was…I just wasn't hungry. [I] took three or four weeks off work...I didn't feel like going out or doing anything'. (Elka, female)

It was uncommon for the women to speak openly about current relationship problems although the women commonly referred to tensions within the extended family and a perceived lack of support which is discussed later in this chapter. Margaret was an exception when she spoke about being *'stuck in the middle' o*f her partner and pregnant daughter and boyfriend who were staying with them; and subsequently, of missing her two daughters and grandsons when they left home to live on the south coast; and of her partner's redundancy.

Job dissatisfaction (women)

Paid employment was an important feature of most women's lives. Accordingly, the women discussed various aspects of their work before experiencing back pain for the very first time. Few women recalled the positive aspects of their work such as a stress free environment, the ability to pace tasks and enjoying work for its own sake. Instead, they focused on the negative aspects of their working lives. These included difficulties travelling to and from work; unsupportive colleagues; a stressful environment; non stop pressure; covering for staff shortage; bureaucracy; poor pay; an increasing amount of paperwork; an increasing number of deadlines; working longer hours; and constant problem solving; to the point that work was tiring; and had to be taken home. Being *'on the go'* all the time, either because of difficulties travelling to and from work, or because of the nature of the work was a common feature of the participants' accounts.

Difficulties travelling to and from work by train and tube had a negative impact upon the participants' wellbeing. Moreover, Gita questioned whether her travelling difficulties across London by train had contributed to her first

ever episode of low back pain. She thought that her travelling difficulties may have led to her overdoing things because she was *'all the time on the go'*. This was in the context of working full time, housekeeping for an extended family, caring for her small son who did not sleep at night, and having no time to herself at weekends because she drove her parents to religious and social events:

> *Travelling was hectic then because they were changing all these new signals and they were re-doing [the] footpaths and so obviously there were delays. So I was always running…literally I used to leave my house door running to the bus stop, get the bus, then run down the stairs [at the] station…and I had to change trains. So there were different platforms… one was across the other side. So I had to run up the stairs, back again if those doors shut on me…so it was a lot of running around…even [at] lunchtime I was always running around shopping [going] to this market and that market so I was basically all the time on the go. So I don't know whether that was the reason why I got back ache or maybe I just overdid it. I was always getting late for work so that big stress was in me and every time I go there I was five minutes late or ten minutes late and she would be just getting annoyed that 'you'd better look for another job' and it was all that sort of stress. Travelling was too far for me. It was a bad journey because there is no straight line from where I live. (Gita, female)*

Being *'on the go'* all the time was also recalled by other participants as being linked to the nature of their employment that entailed *'running up and down the stairs'*, *'running around'* and *'lifting and moving objects'* with frequent alterations in posture. These participants worked in nursery nursing, nursing, teaching, administration, building, engineering, technical support and shop keeping.

Amy and Margaret questioned whether their first ever episode of low back pain was due to the physical aspects of being *'on the go'* all the time in their work as a nursery nurse and primary school teacher respectively. In particular, they spoke about their tiring work, being on their feet all day,

picking up children, moving objects, bending over to be on the children's level and poor posture from sitting in tiny chairs with no back support as contributory factors. In addition, Amy, one of the younger participants in the study, spoke about moving water and sand trays without any help because she was too impatient to ask for it, although she knew she should:

> *You're constantly moving around. Your sitting on little tables and chairs and you are lifting sand trays and water trays and you're always bending down to be at the children's height…so it is a lot of moving around and bending down and picking things up. I think it is… the moving of things and the bending down and not sitting properly…being on the children's level affected it a lot which I don't mind but…I think that's what has brought it on just being lower down all the time….I was sort of picking up the children as well in the day nursery because they were a lot smaller and things like that. So perhaps it was just sort of working its way up from that sort of thing but it is nothing that I did that sort of put my back out and gave me a lot of pain. It was just…a sort of gradual thing from what I'd been doing really. That's the only reason I can think. (Amy, female)*

> *The only thing I can think of would be my posture. I spent many years on my feet bending over, sitting in tiny chairs this high [indicates the low height of the chair] with no support for my back…(Margaret, female)*

Margaret, who was one of the older participants in the study, thought ageing may have played a contributory role in her back pain and explained why she had not experienced low back pain sooner. She also spoke about being dissatisfied with teaching, a job once enjoyed, and a stressful school inspection before the onset of the first ever episode of low back pain:

> *[The job] was a huge burden for me…for the last couple of years I actually knew that I shouldn't be doing the job anymore because I've got so many negative feelings about it….I was having to do things that I didn't believe in and that was quite a big burden and one of the reasons…the job wasn't enjoyable anymore. (Margaret, female)*

As noted previously, the unifying theme in these accounts of life before back pain is one of loss: the loss of lifestyle, loved ones, money, the marriage and the job once enjoyed amongst other ongoing events. Nevertheless, while loss featured in the women's accounts of life before the onset of their first ever episode of low back pain, the women did not identify loss as a cause of low back pain.

The role of stress (women)

In recalling their difficult circumstances, metaphors were used to convey the means by which such circumstances, perceived as stressful, might play a role in the aetiology of low back pain.

These metaphors, implicated '*traumatic'* events in the genesis of the first ever episode of low back pain and of individuals being either '*hit', 'knocked' or 'kicked and injured'* by circumstances considered a '*burden'.* The metaphorical burdens included having worries *'on [the] brain'*; being *'under a lot of stress'* and of the stressful circumstances either *'getting on top'* or being *'put on'* them by others. Usha recalled that her circumstances were *'crashing'* around her and that they had *'brought [her] down'.* Similarly, Priti recalled that her circumstances had been of sufficient magnitude to *'break'* her. Chandra, whose first ever episode of low back pain was a sharp spasmodic pain in the right side of her lower back, perceived her sister-in-law to be *'a thorn in the side'.*

The women's use of metaphors indicated that they had difficulty describing their experiences explicitly. Consequently, it was necessary for them to use these metaphorical expressions to communicate their experiences in 'recognisable' terms (Lascaratou 2007). The emotions associated with the stressful circumstances were conceptualised by the women as weapons, instruments and burdens with the power to inflict physical damage and

trauma. In creating relationships between the concepts of stressful circumstances and back pain in this way the participants appeared to attribute the cause of their low back pain to an extrinsic physical agent that was capable of hurting them (Leary 1994). Moreover, Chandra's metaphorical representation of her pain as *'a thorn in the side'* enabled the quality of her painful experience to be articulated. Lascaratou (2007) suggests that representations such as this should make it easier to understand the damage causing the pain. Musculoskeletal pain, for example, is likely to be described as a 'spasm' 'throbbing' or 'aching' whereas nerve root pain is more likely to be described as 'stabbing' or 'shooting' (Cohen et al 2009).

While many women perceived their lives to be stressful and used metaphors to implicate their stressful circumstances in the genesis of their back pain, only Usha, Gita and Priti attributed their very first episode of low back pain to their stressful circumstances explicitly. The reason for this discrepancy can only be surmised. It is possible that the women had not admitted the effects of the stressful circumstances to themselves or did not volunteer the belief explicitly because they feared that their views would appear nonsensical and irrational to the health professional interviewing them (Kleinman 1988). They may have been conscious that in the health sciences non-specific low back pain is frequently seen as a physical and biomechanical disorder (Waddell 2004f).

With regard to the women who did perceive their first ever episode of low back pain to be the consequence of stressful circumstances, Usha questioned whether her problem lay in her brain or in her back:

> *Maybe it's all to do with my brain. Maybe my back isn't as bad as it is but maybe that's why, it is my way of taking away my stress through my back…It is just my mind which I can't make sense of. (Usha, female)*

Usha reasoned that her low back pain was stress-related because the pain had become worse as she became more stressed. In addition, she suggested that stress may heighten the sensation of pain or that low back pain may be the physical manifestation of mental phenomena:

> *I feel that now as my stress is getting higher my back pain is getting worse. It seems to amount to the same, not that…something happens and the back pain comes, it is nothing like that. It's not a trigger. But it is just within my mind that maybe because I am so stressed I can feel my back worse or maybe that's my way of letting it go, taking it out of me. (Usha, female)*

Priti likened her back pain to *'a breakdown'* because of her stressful circumstances during the year leading up to her first ever episode of low back pain:

> *I was going through a lot of stress. One was being with extended families. Second thing was work [and] the third was being left out because hubby went out in the morning, came in the evening and I felt like I was not doing enough in life and ..I was at the breakdown time…it just got to a point where I was breaking down.*

She added,

> *People don't realise back pain is stress-related… the media has said that it has got to be a slipped disc...(Priti, female)*

These women who associated their stressful circumstances with their very first episode of low back pain did so partly because of the timing of the two events. The degree of certainty with which they attributed their low back pain to their stressful circumstances however varied as can be seen in the extracts below:

> *I had a very stressful life and I think…that's what caused my back ache...I told you how stressful I was then but I didn't do anything different so I am not sure. (Gita, female)*

> *I just thought it was stress and strain...I couldn't put it down to anything else…it was all around the same time...I had recently*

separated and…the court cases had started and the back pain so I always associated it with the same thing. (Usha, female)

Once I know I've got some different things going on in my life or I've got some new responsibilities on my head everything seems to start apart from my irritable bowel. I slow down, I can't work fast, I can't get up in the morning, my back pain is back. So that's why I think it is all [to do] with stress and it's not once, twice. It has happened too often... I am…99.9% sure it's stress-related. (Priti, female)

Priti further described how her low back pain occurred when her muscles were affected by stress. Her personal theory of the underlying physical process by which stress caused her back pain implicated muscle tension, shallow breathing and being in *'scared…mode'* with a dry mouth. From a biomedical perspective this is suggestive of altered sympathetic / parasympathetic activity in the genesis of her back pain:

I haven't got a lot of weak muscles. It is just the way I am playing with my muscles when I am stressed that...is bringing the back pain on…The minute I get pressure of work, pressure of kids [or] I get other mentally related things I lock my system. My muscles just tighten and my back pain comes...it won't show the same day. In the morning I will not be able to get up…when I've locked myself up...I am so tight…(patting chest) I am [in] scared kind of mode…I…[stop] breathing properly...because [I am] holding everything so tight…my stomach's tight…my mind is tight and I am stopping [breathing]...I am [breathing] but not deeply because my muscles are tight…and my mouth [goes] dry. (Priti, female)

Conversely, she explained:

When I am breathing deeply I can relax, I've released my stomach muscles and my chest is alright and I had this when I was younger as well. I just think it is something that I've been a born worrier kind of thing. [Can't] say no to anyone. (Priti, female)

These women who attributed their low back pain to stress excluded certain physical factors from playing a role in their very first episode. Reasoning why these factors did not play a role in their pain appeared to verify their view that their back pain was caused by stress (Table 6.2).

Table 6.2 Potential causes of low back pain and explanations why they were not perceived to be causal in Usha, Gita and Priti's first ever episode of low back pain

Potential cause	**Explanation for not being causal**
Shifting & moving items	*'I don't do anything physically like shifting or moving things' (Priti)*
Housework	*'because it is shared' (Priti)*
Driving	*'I do drive but that's only a minimum in the morning' (Priti)*
Aerobics	*'I don't do any physical aerobics' (Priti)*
Straining the back	*'I've never strained [my back]' (Usha)*
Epidural	*'I've never had an epidural which a lot of people relate to back pain' (Usha)*
Body weight	*'my weight isn't a problem …because I have always been this size' (Usha)*
Trapped nerve, bone problems, slipped discs weak muscles	*'I haven't got a trapped nerve, I haven't got any bone problems or any slipped discs, I haven't got a lot of weak muscles' (Usha)* *'Dad lost his muscles because he had a trapped nerve...because he couldn't walk. I haven't pain down my leg' (Priti)*
Falling	*'One time…I was running…and I fell down but I got up straight away…and I didn't notice [back pain] for a long time [afterwards]' (Gita)*
Osteoporosis	*'I don't think it is that because calcium and everything is alright' (Gita)* *'I've just had my bone density done and that is good' (Priti)*

Several women, who acknowledged their stressful circumstances before their first ever episode of low back pain, questioned whether stress could possibly have played a role in its genesis. Brenda and Angela, for example, questioned whether a change in lifestyle and tension could have caused the first ever episode of low back pain:

> *I don't know what triggered it in my twenties, whether it was, I don't know if it was coming over [to England]. I know this sounds crazy, I don't know if it was coming over here and changing lifestyle a bit. I just don't know. (Brenda, female)*

> *Yes I coped with it [working full time, looking after the home and caring for children and elderly relatives] but there are days when I said how I feel, like I feel like panicky. I think oh I can't cope with that, can't do that or I get headaches. It's all tension and possibly the back can be… I don't know if you can…You can, 'cause you can tighten up can't you? I mean the pain in the back could be all tension, I don't know. Although, it was always when I sort of woke up in the morning that I used to get that back pain so after relaxing all night maybe it's not tension, I don't know. (Angela, female)*

It is clear from these women's accounts however, that following some deliberation, back pain was not attributed to stress explicitly by the majority of the women.

An inconsistent temporal relationship that had been experienced between stressful circumstances and low back pain led some women to conclude that stressful circumstances had not played a role in their first ever episode:

> *It always takes me by surprise. I think why has it started? I haven't always been particularly stressed before it starts. (Margaret, female)*

> *I can't believe it's stress-related…why would it [first episodes] be every morning. If you're stressed, you're stressed. When you're sleeping subconsciously you might [be stressed]. But you're also stressed in the day so why hasn't it come in the daytime…Have I*

been stressed over the past few months? I am sure I must have been at some point and I haven't had any back pain. (Angela, female)

I don't think I was stressed anymore than normal when I had it first. (Tina, female)

I'm not sure stress will wear your parts out. Stress is a mental thing…it may affect you and you may get aches and pains through stress but I think when the stress is lifted those particular aches and pains should go away. I think it should go away when the stress got less. (Hazel, female)

Hazel initially thought her first ever episode of low back pain was due to stress in the form of emotional *'pain'* following her grandson and niece's deaths but had since altered her mind. She reasoned that if stressed muscles tighten and ache they wouldn't do permanent damage and cause her to continue to have episodes of back pain. Consequently, she concluded that back pain is a *physical thing* and that stress does not make the body ache. Implicit in her reasoning, and in contrast to some accounts, is the dualist perception that *'pain'* emanating from the mind and body are different entities. It is relevant to note that her explanation for her back pain was modified by her experience of subsequent episodes of back pain. At the time she experienced her first episode of low back pain she recalled thinking it was caused by stress.

A second reason for thinking low back pain was unrelated to stressful circumstances was given by Lalit: she thought she had dealt with the problems created by her brothers taking her inheritance by the time she had low back pain for the very first time:

'It didn't have anything to do with problems or anything. I'd left them alone. I don't put them in my mind. I don't take it in my mind'. (Lalit, female)

Elsewhere in her account she explicitly states dealing with the problem by *'pushing it to the back of [my] mind'.* This coping strategy of pushing upsetting thoughts to the back of the mind was evident in other narratives and is discussed further below.

A third reason for participants thinking that low back pain was unrelated to stressful circumstances was that stress was thought to affect the upper back rather than the lower back. Margaret, for example, thought stress affected the upper back because she felt muscular pain in her head and shoulder area when stressed and tired:

> *I wouldn't have put [low back pain] down to stress because I know when I feel stressed or when I am tired that I do get pain in the top of my back but it's very short lived…I always think that stress is being around your head, shoulders, that sort of area. (Margaret, female)*

Similarly, Tina said:

> *You just don't think of back ache to do with stress do you? When you're stressed you're thinking a lot. You just think it would be more to do with things in your head like depression or migraines or something like that. (Tina, female)*

Hazel added:

> *If you're stressed out I don't think it's going to give you what can I say? A rheumatic condition? Might give you a heart attack because stress will raise your blood pressure and things like that. I am not sure if blood pressure will give you rheumatism. Heart attack maybe. (Hazel, female)*

The belief that stress was associated with health problems other than low back pain was a common feature of the participants' accounts and is discussed further below.

The stressful circumstances discussed above either occurred in the immediate context of the very first episode of low back pain or shaped the women's lives in which the first ever low back pain occurred. It is important to note, however, that some of the women's difficult circumstances were resolving before the very first episode of low back pain occurred. Life was judged as easier for Elka, for example, who had been reconciled with her partner shortly before experiencing back pain for the very first time. Also, life had improved for Gita: she felt supported for the first time by her mother and mother-in-law following several stressful years which had culminated in her father's death some fourteen months earlier.

The first ever episode of low back pain as recalled by the younger participants, however, did not necessarily occur in the context of past, recent or resolving stressful circumstances. Amy, for example, had been working in a nursery for five years and couldn't recall any particular changes before experiencing low back pain for the very first time. Sirina had recently started a new administrative job that she enjoyed and in which she was trying to impress her employer. Rushani enjoyed working as a nurse with older people.

COPING WITH STRESSFUL CIRCUMSTANCES

In addition to describing their lives before experiencing low back pain for the very first time, participants recalled how they had coped with adverse circumstances. The proportion of male and female participants who felt they had either coped or had difficulty coping was similar. Where participants felt they had coped with their daily life, little discussion ensued suggesting that it was unimportant to them. In contrast, participants who recalled difficulties coping spoke at relative length about their situation. The nature of the coping difficulties was conceptualised differently by the men and the women. The women spoke about their difficulties in terms of their emotional and behavioural responses to stressful circumstances whilst the men spoke

about difficulty coping in terms of reduced levels of physical fitness. This conceptual difference between the men and the women is consistent with the defining aspects of masculine and feminine self-concepts in western culture. Men more than women have their self-concept invested in physical strength and endurance amongst other masculine traits. Any loss of physical fitness may therefore threaten a man's self-concept and be perceived as a stressor. Men are thought to be particularly sensitive to this during middle age when the biological processes of ageing have to be faced (Eisler and Skidmore 1987, Eisler and Ragsdale 1992). This sensitivity may have been relevant to half the men in this study who were middle-aged at the time of their interview.

Emotional and behavioural responses (women)

The women who felt they had difficulty coping with their circumstances before their first ever episode of low back pain recalled a loss of volition and interest in doing things. Individuals described wanting to '*withdraw'* from everyone by staying in their room; of wanting to '*crawl into a corner'* and of losing the will and ability to get up, to go out and do things. Also, individuals described being *'brought down'*; *'going downhill'*; neglecting themselves; feeling tired and exhausted; lacking stamina; wanting to stop and sit, or lie down; being worried; dwelling on events; being upset; *'dull'*; losing hope; and of being low and tearful at times. These women associated their coping difficulties with their circumstances immediately before their first ever episode of low back pain. For example, Usha had recently separated from her husband:

> *I had a child and I had somebody else to think about apart from me. That brought me down more than anything else….I think you give up hope more than anything. Before the problems you have hope that it is going to get better, it is going to get better but then once…I think my final thing was the hope and when….it still hadn't got better then you just sort of give up and say ugh. That's when it sort of comes crashing round you. (Usha, female)*

Denise's mother had recently died leaving her to take in her sister in addition to caring for her two children and a middle-aged man, all four of whom had special needs:

> *I actually just want[ed] to worry about myself for a little while but I couldn't, [I] wanted to go and crawl away in a corner and cry for a month but [I] couldn't because everyone else wanted you. So you tended to get on. And so that was more emotional I think than physical. (Denise, female)*

Priti had found herself married within two and a half weeks of coming to London and adapting to life in an extended family of seven people, where it was her duty to look after the home, a young son, a husband going through bankruptcy proceedings and a sick grandfather-in-law who threw his food around and upset the neighbours by knocking on the wall. She resented the fact that her sister-in-law did nothing to help:

> *Yeah I went very quiet. I go… if I am worried or stressed I go very quiet. I, I withdraw from everyone and I started withdrawing from everyone. I started staying a lot in my room and didn't come down when his sisters came or anyone. I was like…I didn't want to see people and wanted to be left alone and then I started having tension at the back of my head as well which I thought was like taking a lot on board. (Priti, female)*

These extracts illustrate that some women recalled a low mood and withdrew from social interaction before having low back pain for the very first time.

Despite the difficulties coping the women did not necessarily back off from activities and stop doing things. Gita and Denise, for example, carried on because they had other people to look after whereas Margaret and Elka reached a point where they could not carry on: they found themselves

unable to get up and go to work. Subsequently, they were diagnosed with clinical depression (see below).

'I coped physically' was a phrase used by some women to indicate that they could carry out all their routine activities. Margaret, for example could do everything she needed to do physically and so she thought she was coping. It was only with the passage of time that she realised she had been stressed emotionally before experiencing low back pain for the very first time:

> *I supposed I was stressed but I didn't think that I was…I worried, I did worry and I suppose I was stressed but…it didn't stop me functioning really. So as far as I was concerned I thought I wasn't [stressed] because I was going to work every day, doing my job properly, everything like that so I suppose that I thought I was ok because I'd never really thought that I suffered from stress but then…I imagined If I was stressed I wouldn't be able to function…I was functioning perfectly normally… (Margaret, female)*

The emotional and behavioural responses were not necessarily perceived as a consequence of stressful circumstances before experiencing low back pain for the first ever time:

> *I'd had the [facial/ear] pain on and off and people knew…I went to school and somebody said to me 'how is your ear?' and I just burst into tears…I don't know if it was them asking me or whether I would have done it anyway…I was taken by surprise about that because I wouldn't ever have normally done that…I didn't understand why I reacted like that and it took me by surprise. (Margaret, female)*

In addition, there was an element of irritability and anger which took different forms as depicted in the extracts below. Briefly, Irene was angry that her husband had left her (died); Usha took her anger out on her child, slapping and pushing her away; Chandra was stressed at work and took it home with her and Priti couldn't *'speak out'* about the problems in her extended family:

Sad, angry as well…because of my husband. It's just an angry feeling, why did you ever go and leave me, you know… Everyone who loses a husband or wife it affects them differently. (Irene, female)

My daughter…poor thing she got the whole lot…because I wasn't feeling right. I would be getting angry on her or pushing her away or taking my stress on her…I got angry on her or give her a slap or two…although it's not her fault really or anything but because I would be getting worked up…all she wanted was to be with me because she didn't see me all day and because I didn't have time I would be pushing her away and say 'look, I've got work to do'. (Usha, female)

I can lash out at somebody, you know and the things I can say can be very hurting. At that time [before first ever episode of low back pain] I wouldn't even think about it twice but when I cool down, I think oh god did I say that, did I do that and similarly that episode that happened with my sister-in-law when I chucked her out of the house, that was something I did in anger. I was stressed at work, came home and saw her there and that's it… (Chandra, female)

I couldn't say anything [about problems in the extended family], I was too quiet. I was very quiet and I think this all build up in me and when it came out it came out as stress and anger as well because I started snapping and I started being angry…I just rebelled…I was rebelling a lot. His [husband] parents were very patient. I don't think they ever once shouted at me. They started getting concerned, they started taking on more tasks and I felt more guilty….I wasn't myself…I've always wanted to be good with everyone and I think that stressed me more out because I was not being what I wanted to be. (Priti, female)

Priti added: *it was all adding up to stress when I look back now.*

Ashok's account provides some insight into why the women may not have perceived mental stress at the time it occurred:

Initially…you don't see the mental stress you see the physical one but I think the two go hand-in-hand that if you're mentally tired and your body's physically tired and you start shortening, cutting [corners] doing things wrongly then the only way you're going to know about it is when you physically hurt yourself. (Ashok, male)

Other women believed they had difficulty recognising stress:

> *On the surface I always cope with everything ok so I assume I'm not stressed because I can't see it. (Margaret, female)*
>
> *If I am really stressed I know about it but I am not sure that I am always aware of it. (Elka, female)*
>
> *I don't understand what...stress is to be honest because I've never been aware of it. (Denise, female)*

None of the women however attributed their very first episode of low back pain to difficulties of coping per se. Moreover, two of the women recalled being better able to cope before their very first episode of low back pain than they had once done. These women were amongst the younger participants when they first experienced low back pain for the very first time. Amy had recently started working as a nursery nurse and her confidence in her ability to cope was growing. Also, Rushani thought she had started to cope better before having low back pain for the very first time: '*when you are younger you can cope better'.*

Difficulty coping with physical activity

Difficulty coping with physical activities was uncommon. Tina was the one participant to recall difficulty carrying out physical activities because of her weight. For example, she had difficulty walking up and down stairs at the supermarket where she worked in the staff canteen. This was an ongoing problem for her hence her use of the present tense in the extract below:

> *… going up and down the stairs I find difficult. So if I can delegate that job [at work] to somebody else that'll do it for me. I mean I do anything that needs to be done on the lower levels and get somebody else to do whatever on the upper levels. And as I say I feel conscious all the time of it I always have to say first about my weight to people. It does affect my everyday life being overweight it does. (Tina, female)*

Tina's physical disability was in addition to her difficulties performing other activities because of her low self-esteem and health problems including agoraphobia which are discussed further below.

Reduced levels of physical fitness (men)

The men who perceived a reduced ability to cope with everyday activities recalled that they were either unfit or less fit than they had once been before having low back pain for the very first time. Individuals defined being less fit in terms of being more tired; lethargic; being short of breath on exertion such as running for a train; less energetic; less motivated to take exercise; having reduced ability to use time efficiently: taking longer to carry out activities such as writing a report and learning how to use a software package, for example. They attributed their loss of fitness to an unhealthy lifestyle; ageing and playing less sport.

Ashok spoke of his unhealthy lifestyle associated with working overtime and forcing himself on to do things when he was feeling lethargic and too tired. He believed this could lead to back pain:

> *From being mentally tired you tend to make the wrong decision. cutting corners, doing things wrongly, and that could lead to…physical injury caused from the mental stress. But initially…you don't see the mental stress you see the physical one but I think the two goes hand in hand that if you're mentally tired and your body's physically tired and you start shortening, cutting [corners], doing things wrongly then the only way you're going to know about it is when you physically hurt yourself…that last incident, the last time I hurt my back…last time I was tired, I decide not to have my rest. Therefore the decision was wrongly taken on the overtime shift for a start and then the outcome was…the physical injury. (Ashok, male)*

Also, Adil felt he had an unhealthy lifestyle because he worked long hours with difficult travelling arrangements, kept house for and cared for his young

son and sick wife, and spent the weekends adapting the home to meet his wife's needs. He no longer played any sport because his squash partner had moved away:

> *I've got fitness problems….and the fitness problems affect my mental capacity, my sleep pattern, my back ache. My back ache was because of my fitness problem….Fitness is related to my lifestyle and my lifestyle is related to my fitness. My lifestyle is related to my family. My lifestyle is related to my health. It is all interlinked. Fitness, money, family and my lifestyle. (Adil, male)*

Adil explained, that his *'fitness problems'* meant that his muscles were not strong enough to support his sitting and sleeping positions and his lifting objects. Unlike Kevin, who had done something about his unhealthy lifestyle before experiencing low back pain for the very first time by cutting Mars bars out of his diet and going to the gymnasium, Adil said that he had lost the motivation to take any exercise. Evident within Adil's narrative is the view that the cause of his back pain was multi-factorial:

> *…it was three or four factors [fitness, money, family, lifestyle] that came together...if those three or four factors had not come together then obviously I don't think I would have the back ache I have now…it is like all the factors …I wasn't giving my body or myself a chance to recover…I think it is…because as I said lack of fitness and…trying to overdo things which I am not supposed to be doing. (Adil, male)*

Adil's tendency to *'overdo things'* related mainly to his DIY activities. Overdoing things was a recurrent theme which is discussed further below.

Pushing worries to the back of the mind

One common strategy used to cope with worries was to try to *'ignore them'* and *'put'* or *'push'* them *'to the back of the mind'*. Frequently, participants spoke of worries in the back of their mind. It appeared that they pushed the worries and unwelcome thoughts to the back of the mind because they were

unable or reluctant to face past events and wanted to put them behind them and to get on with their life. Hazel illustrated this when she spoke about the death of her grandson and niece within a short space of time:

> *What you feel about loss and everything is put to the back of your mind because if you thought about it all the time you'd end up in a mental institution…I expect if you asked anybody about that…you can't walk around your whole life thinking about tragedy. (Hazel, female)*

Other accounts reveal the psychological and physiological consequences of trying to ignore and push things to the back of the mind. Lalit, for example, described trying to ignore her brothers and their stealing of her inheritance because focusing on these issues gave her physical sensations:

> *Lalit: I don't talk about them. I don't remember them now. None of my friends talk about them with me…They live their life. It's like I don't know you. I don't talk about you because I don't know you. I leave them on the side. Let them live their life.*
>
> *Interviewer: Do they ever come into your mind in the day time?*
>
> *Lalit: Sometimes…but I just…our family try to ignore them.*
>
> *Interviewer: Do you manage to do that?*
>
> *Lalit: I try, yes.*
>
> *Interviewer: You try?*
>
> *Lalit: Yes, sometimes you have a feeling.*
>
> *Interviewer: What's that feeling?*
>
> *Lalit: Just a hard feeling in there [points to chest] and it just goes away.*
>
> *Interviewer: Can you tell me what it's like?*
>
> *Lalit: You feel heavy.*
>
> *Interviewer: Heavy, where?*
>
> *Lalit: In the throat and chest a little bit and in the mind…*

Lalit's extract illustrates how the recollection of upsetting circumstances i.e. bringing them to the fore led to physical complaints.

Margaret recalled that she always had lots of worries in back of her mind so she was never really well and able to cope with everything:

> *I am never a hundred percent because I'm not the sort of person that can just cope with anything like… there will be little things in the back of my mind all the time that worry me. So I'm never a hundred percent. (Margaret, female)*

Other participants had developed the strategy of ignoring their feelings in order to cope and not go *'to pieces'* as Denise explained following her mother's death three months before her first ever episode of low back pain:

> *It's almost like you switch off your inside, what you're feeling and just get on with what other people are needing. There wasn't any other way of doing it really than to just totally ignore yourself… and I think I've always done that until my sister died [when] I did not cope, I went on anti-depressants. But that's the way I've always done things. Whether it's because I've had a fair few tragedies with my Dad early, my brothers….I suppose if you hadn't taught yourself to cope you could have gone to pieces and there were all these things that were happening to you. So [I] just developed a strategy for coping that stays with you for life. (Denise, female)*

The participants also spoke about ignoring aches and pains before the episode of back pain they considered their 'first ever' and of ignoring subsequent episodes of low back pain:

> *I'm someone who tends to just ignore pain or just think that I'll work it off, it'll go away. (Denise, female)*

These extracts suggest that the strategy of ignoring and pushing painful and upsetting phenomena to the back of the mind did not only occur before the very first episode of low back pain but may have been developed as a means of coping with adverse circumstances earlier in life.

Support from friends and family

When recalling the support they had received from friends and family during adverse circumstances before their first ever episode of low back pain the participants fell into one of four groups.

The first group recalled being well supported:

> *I've got a very close supportive family.. a good group of friends. My friends were coming every weekend, it was summer. We'd work* [DIY] *for a few hours, have a few drinks, sit around, have a barbie and everything. (Dinesh, male)*

The second group felt that they supported others but received nothing back. Occasionally this was because they acknowledged that they did not ask for help. The perceived lack of support was either accepted because *'it was just part of the way we had been brought up'* or it led to deep resentment:

> *My husband was very strong [during the bankruptcy case]…and I think I gave him a lot of backing and every time he fell back it was like he was leaning on me and I had to push him back. (Priti, female)*

> *A lot of people…come and ask me for support…I feel I can support* people…*Sometimes I feel I haven't had very much support but that isn't necessarily true. I have got support but I don't really ask for it. (Margaret, female)*

> *Sometimes…I feel like I make the effort all the time. Sometimes [with] all my friends and nothing being given back…it was my birthday and I was just cleaning and everyone else was having fun and I just stormed off and cried and it was like my friends hadn't 'phoned me on my birthday and they 'phoned later but it was like they hadn't phoned*

that morning…I am always being 'phoned for babysitting and things like that and that is the only 'phone call I actually got on my birthday [morning]. It was like can you baby sit and it was like you know you feel a bit rubbish….Sometimes you think you give a lot and don't get a lot back. (Amy, female)

It's just little things that are all being put on to me because my husband can't do it he just goes to work and that's it. That's all men can do. I believe they can only just go to work, they can't do anything else other than that. That's what they do and can't have another added pressure to them…I think it is because I am too capable, my father always used to say to me don't be too capable. It's too late isn't it? You are what you are…what support is there for me? I don't have any support really. (Angela, female)

The third group described finding alternative sources of support. Rushani, for example, had no close family when she came to England from Sri Lanka and so the *'old people'* she worked with became her family:

I was very friendly with the old peoples I used to enjoy just being there. They were like mothers and grandmothers to me…Oh [I] loved it. Because for me it was like replacing my family I didn't have anyone close and they became like the family. (Rushani, female)

Similarly, Priti had no support when she first came to England because she was *'too proud'* to ask for it and had experienced *'rejection'* from her husband previously. She thought it wrong to confide in a counsellor recommended by her GP finding solace at her temple instead:

I… thought that it was family issues, I shouldn't be talking outside about those and it was always at the back of my mind. I never even [spoke] to his [i.e. husband's] relatives, his friends I never spoken about it to my sisters, to my mum and dad. I thought this is my problem. I got married and I don't have a problem with my husband so why should I have a problem with… it is only his family and as long as he's ok with me it doesn't really matter. Yeah, but my doctor saw that I should have, I should go counselling and then she told me to meditate in the mornings and… but I sort of believed my faith in God and that's what it was. I always believe in that whatever he does is right so…if

I'm really stressed at home I go to the temple for an hour and I sit there and I am completely relaxed and when I come back I'm like a new person. I mean even if mum [in-law] said something or I don't agree with her I just walk away from it. I don't know. Maybe I have been brought up like that. May be not in public. I said I keep everything inside. If I cry in public or may be when my family is there it would be much better. (Priti, female)

The fourth group felt unsupported and had no one to confide in. Usha, for example, had separated from her husband and returned home to live with her parents:

I'm not a person to go out. Don't make friends easily. Don't have friends come round…nothing like that. (Usha, female)

Gita couldn't ask for help or tell anyone her problems. She felt she had *'no right to speak up'*, a legacy of being an only child brought up by an aunt in an authoritarian household while her mother looked after her parents in another country and her father was a distant figure:

I can't speak up…I tend to bottle up…I used to say 'I never had time to sit down in my own house…it upset [me] I wish someone would help me but I wouldn't tell them to. Like all my friends said 'why didn't you 'phone us? We could have run for you, to help you. But…I thought it's not nice to get other people involved in your problems so I never did…I wish I had brothers or sisters to help me or share with me. (Gita, female)

Adil, whose wife was sick with a brain tumour, had no friends living nearby and so he had no one to rely on or help him if he had a problem:

I keep everything inside…Don't tell anyone my problems…I don't tell my wife. She has got enough problems of her own so I don't tell her that. And she gets angry with me and says that I don't share things. (Adil, male)

It is relevant to note that Usha, Gita and Priti, who did not have another person to confide in, attributed their first ever episode of low back pain to their stressful circumstances. Similarly, Adil, the one man admitting to *'keep everything inside'* attributed his first ever episode of low back pain to his unhealthy lifestyle associated with his difficult circumstances caring for his sick wife and son while working long hours amongst his other problems. The lack of support to buffer the effects of stressful circumstances therefore appears to be associated with the attribution of the first ever episode of low back pain to stressful circumstances. Generally, however the participants were not uniformly lacking support from friends and family.

Smoking

Smoking before the first ever episode of low back pain was described by a few participants as being used as a means to control weight and cope with bereavement:

> *I smoke.. I'm not supposed to smoke…I've always smoked. I have given it up before but I put on so much weight, nearly to 11 stone. [After husband's death] I had to start [smoking] again. I was so down…before my husband died I'd only smoke about 10 or 15 [a day] but since he died I've smoked more… (Irene, female)*

Irene was of the few participants to recall smoking either regularly or socially before having low back pain for the first ever time. The majority of the participants had either never smoked or had given up smoking. Irrespective of their smoking status, however, the participants had little to say about smoking suggesting that it was either too sensitive a topic to discuss with the interviewer, a health professional and / or that in the context of low back pain it was unimportant. Smoking was perceived to be more important in the genesis of heart disease whilst other activities such as lugging boxes around were seen to be more important in the genesis of back pain:

We all smoke and think we're not going to get heart disease it'll happen to somebody else. And we all think well I can lug that my back's fine. I've got a really strong back. We all think it's not going to happen to us, don't we? It's always going to happen to the man up the road or something. All these warnings about be careful how to use your back, don't smoke, don't drink, don't do that they're talking to other people they're not talking to us 'cause we're immune in our own little minds. (Denise, female)

PARTICIPATING IN PHYSICAL ACTIVITY

Participating in physical activity was a dominant and recurring theme that emerged from the participant's accounts of life before the first ever episode of low back pain. In particular, the participants spoke about their disposition to physical activity which appeared to be a personality trait and of a particularly active lifestyle in the weeks and days leading up to their first ever episode of low back pain.

Disposition to physical activity

The disposition to participating in physical activity was recalled by all the participants except Elka and Irene (see below). The elements of this disposition to physical activity are presented in Table 6.3.

Table 6.3 Elements of the disposition to physical activity before the first ever episode of low back pain

Elements of the disposition to physical activity
• Keeping going and overdoing it
• Doings things in a hurry
• Goal setting
• Inability to be still

The disposition towards activity was thought by some participants to have been part of their personality since they were young. Growing up in a warmer climate more conducive to outdoor activities; genetic factors; having an active parent and learning from that parent were reasons given to explain the active disposition. The two extracts below illustrate this perceived disposition to physical activity and reveal that growing up in a warmer country was not seen as essential for its development: Rushani and Tom grew up in Sri Lanka and West London respectively:

> *My father made us exercise from the age of four. From five o'clock in the morning till six thirty we had exercises. Up to six o'clock exercise and then six to six thirty we had to run…to the well and back…so it's an hour an a half of physical activity. We were used to exertion. We grew up with that kind of exercise…we were made to walk; we did a lot of walking, climbing trees, lifting, shifting. Life was different there because it's very much outdoor life because of the warm weather climate. Gardening, lot of weeding, digging. We did a lot of that. So life was different. We weren't pampered. We had to work. We had to do our own washing because we didn't have washing machine when we were growing up… We had to clean the house each six of us children we had to take it in turn to clean the house. Cooking we had a lady who comes and did the cooking. The cleaning lady always looked after the baby, the youngest one….and we all had to look after ourselves. We had to walk about twenty minutes to get to the bus stop, had to catch the bus and then walk again to the school another twenty minutes. So it's a lot of walking every day. (Rushani, female)*

> *I have always been energetic person. So I suppose because I have been brought up quite…my dad's always been quite an energetic guy and he's in his sixties now he's still bouncing about….I suppose I can be hyper sometimes. I like to do things you know like…I've always liked the open life, I've always liked outside. I suppose that is why I was in the building trade… and even friends sometimes say calm down…sometimes I get a little overactive...(Tom, male)*

Tom defined his disposition to over activity, by comparing his level of activity with that of his peers, a common feature of the participants' accounts.

Amy also recalled being overactive as a child which she thought was part of her *'make up':*

> *…when I was little I wasn't allowed all the food colouring in you know like all the sweets the e colours because it made me hyperactive so I never had any of that because I was very hyperactive and it was like through the… all the colouring in the sweets as well so I was never allowed any of that. So I've always been like that…Just must be in my make up. It must be what I am like, yeah. (Amy, female)*

The liking to do things was clearly articulated. This included being *'out and about'* rather than staying in, of getting involved and doing things for other people even if it meant going out of the way and of taking on duties such as cooking for fifty people at the temple, or taking fifty people with Down's syndrome on holiday. Taking short cuts such as buying ready meals or driving to the shops instead of walking to them twice daily were not an option for individual participants who described themselves as physically active.

Summertime was favoured because it meant more activities could be fitted into each day. Apart from paid employment, these activities included walking, DIY, gardening, sport, housework, socialising, dancing and cooking. Implicit in the selection of these activities is the preference for participating in physical activities. This preference was also stated explicitly. Joan, for example, said *'I like [doing] things that are physical, physical things'* while Adil described himself as *'a physical person'* because he enjoyed decorating and gardening.

The women's disposition to physical activity was exemplified by their approach to housework. Moreover, the extracts below reveal what was expected of the women and what they expected of themselves. Employing a cleaner was difficult for the women who felt they could do the cleaning better themselves:

I have to be up and doing I'm always doing something…I do the housework and I go round to my daughter's and do housework round there as well. Ironing and stuff for her and … just to fill in the day as it were….I've had cleaners before and I've cleaned up after they've gone I said there's certain things you have to do, can't just not do it… I have to do everything, I just… the house has to be just so, I know it's wrong and I try to [change] but you can't change can you? You are what you are…I've been told…that I'm too independent that I want to do everything myself which to a certain extent is true. I think I tend to feel that I can do it better myself which perhaps is the wrong attitude in life. (Joan, female)

I do all my own housework, I've got quite a big house. It's very hard to clean it's all white. I do all my own washing, I do all my ironing, I do all my own cooking and I'm not one of these people that buy ready made, my husband's of the generation I don't want that stuff in a packet. [the house is] sparkly clean the children are scared to come in! ...I'm very particular. [Before back pain] I was one of those crazy women that would hoover every day; there are some of us in the world like that. And everything had to be done every day. (Hazel, female)

….so I wouldn't have much time to clear here. And that would get on top of me. I'd think oh God the house is a mess or I haven't cleaned… Now I've got a cleaner. You just sort of make things easier for yourself. I mean I hate cleaners, I always feel they haven't done what you want them to do or as well as you've done it. But you learn to turn a blind eye and think well you know I can't cope with it now so it will just have to be. (Angela, female)

Keeping going and overdoing it

The ability to carry on in the face fatigue, ill-health, domestic problems, and stressful circumstances was a further dimension of the participant's personalities that emerged from the narratives. Having the energy and stamina to carrying on to the point of dropping, not taking sick leave and carrying on through the night and working the next day were recalled by participants:

I just keep going and keep going until I drop. (Chandra, female)

I have got to keep going…I can't let stress take over. (Priti, female)

If I'm doing something I want to keep on doing it…once I get going I won't stop. (Tom, male)

I knew I had flu and I still had to go to work because I didn't take sick leave in those days. I thought 'no it is not nice to take sick leave'. (Gita, female)

I was always tired but it didn't stop me doing things…I'll push myself to do things like…well just general things that need doing here like you know anything. Clearing out things that need to be done. If I feel in that state I won't just sit down I'll still think no I've got to do that or I must do it or I've got to go there and I will do it unless of course I'm having a panic attack. I won't do anything when I feel panicky. If I just feel exhausted I can't sit down [I] sort of just carry on…But with that panic I can still push myself to go to my mum if I need to because I think oh she needs me…I just do have that drive to push myself. It doesn't really matter how tired I am. But obviously that makes you more tired. It's quite strenuous to actually get yourself going and pushing yourself but I do it because that's my nature. That's how I am. (Angela, female)

I don't rest I just try to carry on and then the next morning I'll be very tired. (Oditi, female)

I am very active I can carry [on] through the night and I carry on the whole day next day and then I'll have a break. (Gita, female)

I was decorating my house, I was on nights. So I got up in the morning and did lots of decorating in the house, did a night shift and of course stayed awake through the night. And then come home, twiddled my thumbs for a bit thinking I should go to sleep or I've got this decorating to do. Carry on decorating and then to work the following night…(Kevin, male)

The women kept going for four reasons. Firstly, they thought it was in their nature to do so. Secondly, there was a sense of duty to look after other family members. Thirdly, there were financial reasons and fourthly, there was no time to think about themselves and question whether they should *'back off'* because usually they were too tired to do so:

I didn't really give in to it because I thought I must get this done. I must get that done, you know, and I suppose I was probably quite exhausted but I look at my sister now, and I can see myself in her now…I was there the other day when she got back from school and I saw [her] sit down. Gradually, her eyes were closing and she wasn't really concentrating on what I was saying to her but then she got up and said 'right I have to go and get tea' or 'I have to go and do this'…so she just got up and did it which is what I would have done…I see how tired she is. But I couldn't see it in myself…I was prepared to just get on and do it and also…I don't think I had the time to think much about myself at all so I never questioned well am I too tired to do this. I suppose I just did it. (Margaret, female)

Other participants thought keeping going was a question of 'mind over matter'. Ashok gave an example of how he forced himself to combine shift work plus overtime maintaining and repairing trains with a second job, decorating:

[the work] just sometimes makes you lethargic, mentally and physically. And as I said you will mind over the matter you think, yes, I've got the energy to do it and you force yourself to do things that your body just hasn't got the energy to do….like for instance going to do that shift work I wasn't supposed to do. Getting up early and thinking, yeah let me go and do that. Well I suppose I had a mental way of overcoming it. I thought yeah I'll go and do that and I could come back and go to sleep in my bed tonight. (Ashok, male)

'Moonlighting' was not uncommon, particularly amongst the men.

The disposition to keeping going and overdoing it led some participants to believe that they had carried themselves on beyond their physical capacity. Examples of this can be seen in descriptions given earlier in this chapter such as Kevin's adversarial approach to gardening that 'killed' his back; Gita's difficulties travelling to and from work that led to her being *'on the go'* all the time and possibly overdoing things; and Adil's approach to DIY

activities (see below). Later in this chapter, the men describe over-exerting themselves during sporting activities and pushing on past the point of pain to which they attribute their first ever episode of low back pain.

Doing things in a hurry

According to many participants, it was in their nature to rush. Rushing included the need to get on with things. Tom, for example, said *'I can't wait around for things…I've got to do [them]*'. Also, there was the need to complete tasks quickly. Hazel illustrated this by describing how she rushed to get the shopping done by 10am even though she had all day to do it. Others spoke about a lack of patience, of not waiting for someone to give them a hand, of doing something immediately, getting it out of the way, of taking over to get something done more quickly and of the need to finish a task once started. Cooking a meal for guests was considered a waste of time because it took all day. This impatience extended to an inability to wait for a bus and an inability to walk slowly:

> *I love walking, I do walk a hell of a lot. Obviously, I walk to work and walk home. I walk everywhere even with… my mum and dad live in Uxbridge. I walk there and back. I've always, I hate waiting for buses so I just walk. (Tom, male)*

> *I just don't walk slow. I can't walk slow…I suppose if I put my mind to it I can but if I've got something to do I get on… and do it. (Ashok, male)*

Adil, Nipa and Tom all said that other people namely friends, wife and doctor respectively, had told them to either *'calm down'* or to *'go more slowly'*. Nipa's GP had told her not to worry if she did not finish her housework because it stressed her so much.

Setting and achieving goals

Setting goals was a strategy employed by some of the participants to motivate themselves, to ensure they fitted everything into their busy schedule, complete tasks on time and gain a sense of achievement from doing so. Adil gave himself two weeks to build a large rockery, for example, and make it look beautiful even though he knew that he should have taken longer and broken the tasks down into smaller chunks:

> *I had rockery garden at the back and [DIY projects in] my house and my garage. I should have done a small chunk of those jobs…Divided [them] into small chunks…rather than…giving myself two weeks to finish [the rockery]. I should have taken longer. [I set] heavy targets…because I want to get things done quickly or make sure it looks nice and beautiful so I am damaging myself indirectly…the wife tells me to slow down or lift a little bit…she is always telling me not to lift as heavy as I can...I am also a qualified health and safety officer so I have been through all this lifting stuff that teaches people how to lift stuff yet I am not doing it myself. (Adil, male)*

Goal setting was also employed as a strategy to complete tasks as efficiently as possible:

> *If you leave tasks, let them pend it's always sort of niggling at the back of your head it needs doing. So, I set myself a target, right, I am going to do it on that day…and I'll plan my route…and make sure…I get the most out of my day. (Sirina, female)*

Inability to be still

The inability to sit and lie still was repeatedly mentioned by participants who described themselves as a *'restless'*, or *'fidgety'*, person, unable to stop twitching their hands or toes, or fiddling with something. Tom and Brenda described themselves as *'a fidget pot'* and *'a wriggle bum'* respectively. Consequently, lying by a swimming pool on holiday, browsing in shops, lying awake in bed, sitting doing nothing, reading or watching the TV proved challenging for them:

> *I can't sit down like people sit down…and relax, watch the TV or read a newspaper. I have to be up and doing. I'm always doing something…My daughter says 'I never come in mum when you're sitting'. (Joan, female)*
>
> *I can't sit still…even if it's something I'm actually watching I'll start looking over and there's some mail which needs sorting [I'll] start doing that, or if there's a cup, I put that in the kitchen. It's my wife who it just annoys something chronic. Whereas she'll be quite happy sitting there and I'll be fidgeting… she'll be able to tell that I've got my mind on something else, just wanting to do something other than just like lie there...in front of the TV and I'll be looking around and she'll go 'don't even think about it, just lie here don't move'. (Kevin, male)*

These extracts illustrate that other people noticed the inability to be still and drew the individual's attention to it. Initially, they had needed to be told about their restlessness before becoming aware of it and on occasions they needed to be reminded of its effects on others. Chandra's daughter usually said '*chill mum… don't stress yourself and don't stress everybody else around you'.*

Embedded in the participant's narratives is the view that lying awake in bed, sitting doing nothing or watching the TV is time wasting and pointless: '*if there's a job to be done it must be done'*. Furthermore, there is a certain annoyance and intolerance of other people, referred to as *'layabouts'*, *'couch potatoes',* and *'cabbages',* who do sit around and watch TV:

> *…it annoys me when someone is sitting there watching [TV] and I am thinking 'why are you wasting your time' but that's their way of unwinding. I don't unwind. (Priti, female)*

Other explanations for the inability to sit included a difficulty in relaxing and switching off, a dislike of the boredom and sleepiness associated with doing nothing, and of having a short attention span. Angela wouldn't go to bed if chores needed doing while Kevin positively looked for chores to do at

bedtime. Watching TV could serve one useful purpose however which was to prevent worries playing on the mind. As Hazel explained:

> *Television is an emotional cover up if you're feeling stressed or upset or anything. If you're concentrating on this moronic image in front of you it occupies your mind, you're distracted. (Hazel, female)*

Enforced rest such as that experienced by Tom and Brenda following a knee injury and surgery for a ruptured ovarian cyst respectively was a source of great frustration.

Active lifestyle

An active lifestyle in the weeks and days before the first ever episode of low back pain was a recurrent theme reported by all the participants except for Elka and Irene (see below). The language used to represent this active lifestyle are presented in Figure 6.1

Figure 6.1 Language used to describe the active lifestyle before the first ever episode of low back pain

'hectic'	*'fast'*	*'energetic'*	*'busy'*
'running around'	*'rushing around'*		*' flying around'*
'*always on the go'*	'*running backwards & forwards'*		*'always on the move'*

In addition, participants spoke about working harder and of working long or longer hours than they had once done; of taking on a lot; getting on with things; pushing themselves physically and of keeping going. Keeping busy socially was also used as a means of avoiding boredom and loneliness. Fitting in a lot conferred a sense of achievement, and multi-tasking was one

way the women could fit a lot in and get the most out of each day. Joan, for example, did the crossword and the ironing at the same time. As discussed previously, a preference for doing things for themselves rather than employing other people to do things for them e.g. housework, was expressed.

This active lifestyle was related to the social circumstances described earlier in this chapter. The lifestyle was viewed negatively by many but not necessarily all the participants. Angela, for example, thought that there must be more to life than *'running backwards and forwards'* to her elderly parents whereas Hazel was happy to run around doing her housework like a *'crazy woman'* and be *'on call'* for her children and grandchildren. Her husband, however, thought they *'put upon her'* and that she shouldn't do so much.

Relatively few participants raised issues relating to the consequences of their active lifestyle. When they did however they spoke about there being insufficient spare time to sit down and think; to do things for themselves; to look after themselves and to participate in leisure activities. Being tired at the end of the day interfered with their taking any exercise after work. Brenda said *'I neglected myself'.*

The possibility of an active lifestyle playing a role in the genesis of low back pain was questioned by some participants. Denise, for example, questioned whether her *'emotionally hectic'* lifestyle in the days leading up to her first ever episode of low back pain may have played a role in its incidence. Her mother had recently died. She had taken in her sister and she was looking after four people with special needs and preparing to take 50 people with Down's syndrome on holiday when she bent down in the garden to move a pot, an activity that she thought triggered her first ever episode of low back pain. Other participants, however, did not question whether there was any

link suggesting that it had not crossed their minds. Sirina, for example, needed to get her parent's gardening done in time to take a former boyfriend back to prison by the required time and without her parents knowing. Her back pain was triggered when she lifted a bag of compost out of the boot of the car.

Elka and Irene did not regard themselves as naturally disposed to physical activity and did not recall an active lifestyle before experiencing back pain for the very first time. Elka explained that this was because she had never gone swimming, to exercise classes or to a gymnasium. During the week she used her car to drive two minutes up the road to get something. At weekends she might go for a drive or a walk but nothing strenuous. This contrasted with her more active lifestyle, growing up in Poland. Irene also explained that she had never regarded herself as an active or an energetic type of person. She had danced as a teenager but nothing really energetic. She did not think that she had been a hardworking sort of person because she had given up piece work in a paint brush factory to bring up her two sons. In contrast to the other participants, who reported an inability to sit still, both Elka and Irene enjoyed watching TV and sitting curled up with a book respectively. The reasons why these two women may have differed from the other participants with regard to participating in physical activity is discussed in the next chapter.

Participating in sporting activities

Sport symbolised the men's enjoyment of physical activity. Sport had played an important role in all their lives during their school years. Before they experienced their very first episode of low back pain, the majority of the men participated in a range of sporting activities including cycling, cricket, football, exercising in a gymnasium, rugby, running, golf, tennis, squash, and karate.

The men who had either cut down or given up sports in-between school and experiencing their very first episode of low back pain had done so because of domestic and work commitments. Loss of motivation from fatigue at the end of the working day was also thought to have played a role.

Adil, who had lost the motivation to take any exercise because of his personal and work circumstances, attributed his very first episode of back pain to his loss of physical fitness. He explained that his reduced muscle strength had, in turn, reduced his capacity to lift objects and support alterations in his sitting and sleeping postures. In contrast, Linford, Kevin and Lee who continued to participate in sporting activities, attributed their very first episode of low back pain to over-exertion, pushing themselves beyond their physical capacity:

> *I can really…only put it down to the gym really, I lifted too much weight in the gym before doing…squats and the next day I couldn't move…what I tried to do…[was to] increase the weight like an idiot...so I think I probably lifted too much weight, not correct formal technique and it just hurt my back. (Linford, male)*
>
> *..it was because I over exerted myself playing tennis or something like that or golf…I injured the back as it were…I'm one of these people who'll carry on past the point of pain…even though commonsense will tell anyone if you've got an injury you don't keep playing on*. *(Kevin, male)*
>
> *I was playing rugby and…maybe it was due to the sports that I was doing. As I said I always felt myself not physically competitive with the other boys [weaker and skinner]. So I always tried too hard…going into tackles and didn't really care. (Lee, male)*

Pushing on past the body's physical capacity was not confined to sporting activities. Earlier in this chapter an extract from Kevin's account illustrates, for example, how he pushed himself beyond his limits whilst gardening and *'killed'* his back.

It was uncommon for the women to have participated in any sporting or strenuous physical activity either at school or afterwards indicating that it was not as important for their self-concept as it was for the men. Angela enjoyed playing netball at school; Margaret played a lot of sport at school and later at teacher training college but not thereafter. Hazel gave up dancing professionally at 20 years of age to raise a family; and Priti and Rushani gave up sport when they came to England. Jane was the only woman to continue to play tennis having given up netball and football after university, although she stopped going to the gym shortly before experiencing low back pain for the very first time. Tennis was the one sphere of her life in which she considered herself to be an active person and to which she attributed her first ever episode of low back pain in addition to getting older:

> *Jane: The only conclusion that I could come to is that it is from playing tennis 'cause that was when it happened constantly. Well not constantly but after every time I played. I don't know whether it was because I'd done something while playing once and it didn't get time to heal properly…or whether it's…because of doing repetitive movements*
>
> *Interviewer: Why didn't you get it before when you played tennis before?*
>
> *Jane: Probably because I was younger…your body copes a bit better with injuries I think...I do get more tired now than I used to when I played before…just not feeling you could go on and play another couple of sets afterwards and that's about as far as you could play in an evening.*
>
> *Interviewer: And you think that's due to age?*
>
> *Jane: To a certain extent. Can't think if anything else I've done differently apart from get older.*
>
> *Interviewer: Do you think you're as fit or less fit?*
>
> *Jane: I'd say probably... not as fit.*
>
> *Interviewer: Why?*

Jane: Probably after I stopped going to the gym. But I don't think it was a major difference. I think it's also…playing tennis after you've done a day's work and rushed home and worried about whether you're going to get there on time…

Interviewer: How do you feel when you rush?

Jane: It's like a mild panic I guess when it's a match because you can lose points.

Interviewer: What happens to you when you have this mild panic?

Jane: …Start to sweat a bit…feel anxious…jumpy...stomach turns...breathing...quicker.

This extract suggests that Jane plays tennis in the context of mild panic suggestive, from a biomedical perspective, of faster breathing and altered sympathetic / parasympathetic activity resembling Priti's recall of the mechanism by which she thought that stress caused her first ever episode of low back pain described earlier in this chapter.

HEALTH PROBLEMS

Past health problems (men)

Initially, good health was reported by all the men before their very first episode of low back pain. Individuals recalled taking their health for granted and being physically fit. None reported any discernible changes in health immediately before their very first episode of low back pain. According to these participants, nothing was wrong with them, and they had not been to see a doctor, if they had one; they had not had any operations, they were not taking any medication and at the most only had a minor illness such as a cold or flu. As each interview progressed, however, some of the men revealed health concerns and problems that are summarised in Table 6.4. Table 6.4 shows that apart from overweight the men recalled specific and non-specific health problems involving aches, pains and other physical sensations such as a low threshold to pins and needles, and cramp.

Table 6.4 Health problems recalled by the men before their first ever episode of low back pain

Key: *medical investigation: nothing abnormal found. ‡ diagnosed as worn ligaments & cartilage

Gastrointestinal	Severe abdominal pain (Adil*)
General	Overweight (Kevin,Tariq)
Genito-urinary	Kidney stone pain (Tariq)
Musculoskeletal	Cramp in different parts of the body (Dinesh) pins & needles (Dinesh) sports injuries e.g. broken arm, bruising & twisting ankle (Lee) knee pain & loss of sensation in leg (Ashok‡)

Adil and Tariq recalled collapsing with severe pain requiring urgent hospital admission 21 and 9 months before their very first episode of low back pain respectively. Medical investigations found no specific cause to explain Adil's pain: appendicitis and kidney stones were excluded. A kidney stone however was considered responsible for Tariq's severe pain, a problem that recurred after his very first episode of low back pain and at which time blood was found in his urine supporting the diagnosis. Painful sporting injuries such as bruises, twisting an ankle and a broken arm were recalled by Lee while Tariq spoke about the impact sport had had on the ligaments and cartilage of his painful knee resulting in temporary loss of sensation in his foot. Dinesh spoke about the *'excruciating cramp'* he experienced in many different parts of his body including his tongue, jaw, top of shoulders and fingers after activities such as cricket, gardening and computing. He felt he had a lower threshold to pins and needles compared with his friends. None of the men, however, related any of their health problems explicitly or in a causal way to their first ever episode of low back pain.

Past health problems (women)

In contrast to the men, and with the exception of Rushani and Sirina, (two of the younger participants, who did not recall any problems), the women spoke at length about their health concerns.

The women recalled all the health problems they had ever had before their first ever episode of low back pain (Table 6.5). Non-specific musculoskeletal aches, pains and other physical sensations e.g. cramp in parts of the body other than the lower back were common problems. This profile (Table 6.5) was not dissimilar to the men's musculoskeletal complaints (Table 6.4). Both the men and the women reported cramp and pins and needles, for example.

It can be seen from Table 6.5 that, according to the participants' accounts, the first ever episode of non-specific low back pain commonly occurred in women with a history of one or more episodic non-specific musculoskeletal problems in parts of the body other than the lower back; low mood states (feeling low, down and / or depressed); poor general health including feeling run down; headaches; and respiratory disorders (asthma and panic attacks) amongst other problems.

Table 6.5 All the health problems the women recalled experiencing before their first ever episode of low back pain grouped by body systems

Key: † long-standing condition i.e. > 5years; ‡ diagnosed as stress-related by neurologist;
* investigated and nothing abnormal found

Bodily system	**Health problem**
Cardiovascular	Congenital heart murmur (Irene†) hypertension (Angela†)
Endocrine	Under-active thyroid (Hazel)
Gastrointestinal	Crohn's disease (Irene) irritable bowel syndrome (Gita†,Priti†)
General	Poor general health [Usha] run down (Margaret,Gita,Amy,Angela†) dizziness (Amy*) overweight (Tina†) in-growing toenails (Denise)
Immune	Hay fever (Tina†)
Mental health	Low not depressed (Amy†) nervous (Tina†) feeling down (Irene,Denise) depression (Irene,Elka,Margaret,Tina†) pain (Hazel†) agoraphobia (Tina†)
Musculoskeletal	Intermittent right shoulder ache since 8yrs old (Amy†) knee pain in adulthood (Priti,Chandra†) knee pain in childhood (Brenda*) toothache (Hazel) numb tingly white fingers when cold (Angela†*) woken at night by numb fingers feeling like fat sausages (Angela†*) swollen fingers during panic attacks (Tina) broken foot (Joan) neck pain (Hazel) cramp in mouth (Lalit) pins & needles in hands (Lalit) shaky hands (Lalit) ache at top of back (Margaret†) severe facial pain (Margaret‡*) numb arm (Margaret*)
Neurological	Headaches (Margaret†,Priti†,Hazel†,Lalit) migraines (Elka†)
Reproductive	Ovarian cyst (Denise) hysterectomy (Lalit) menopausal symptoms (Angela) bad periods (Tina†) infertility (Oditi†*)
Respiratory	Allergy asthma (Irene †Tina†) asthma attacks (Usha,Nipa) panic attack (Irene,Angela†,Tina†) mild panic (Jane†)
Other	TB (Lalit) breast cancer (Joan) typhoid fever (Gita)

Some women recalled that some of their health problems had resolved more than five years before they experienced low back pain for the very first time. These were mainly specific health problems or procedures (Figure 6.2).

Figure 6.2 Health procedures and problems that had resolved more than five years before the first ever episode of low back pain (women)

Key: * investigated and nothing abnormal found

Resolved health procedures and problems

Broken foot (Joan) neck pain (Hazel) ovarian cyst (Denise) hysterectomy (Lalit) TB (Lalit) in-growing toe nails removed (Denise) knee pain in childhood (Brenda*)

Health problems in the five years before the first ever episode of low back pain (women)

Table 6.6 represents the health problems that the women recalled experiencing during the five years preceding their very first episode of low back pain. They comprised an equal proportion of longstanding (more than five years) and short standing (equal to or less than five years) problems. Irrespective of the duration of the health problems, the majority of the problems were non-specific and episodic in nature like the non-specific low back pain they preceded (Table 6.6). Low mood states (feeling low, down, depressed); musculoskeletal aches, pains and other physical sensations in parts of the body other than the lower back; and poor general health, including feeling run down, commonly occurred during the five years preceding the first ever episode of low back pain.

It can also be seen from Table 6.6 that some women experienced more than one musculoskeletal disorder. Margaret, for example, recalled left sided facial pain and a numb arm within a short period of time before experiencing

low back pain for the very first time. Her facial pain had been so severe that she had consulted a neurologist privately who told her that the facial pain was stress-related. She found this difficult to accept. The pain had been so severe that she thought she had a brain tumour i.e. a physical cause. She said: '*If I had a pain there was something wrong with me physically'.* Nonetheless, she did experience an ache at the top of her back when tired and she did accept that this was stress-related. This exemplifies the difficulty participants had understanding the complex nature of the aches and pains they experienced.

Table 6.6 also shows that some women recalled health problems emanating from different body systems and not just one system. However, there appeared to be no particular pattern or combination of health problems preceding the first ever episode of low back pain.

In addition to describing their health problems in the five years before experiencing low back pain for the very first time the women recalled the timing of the onset of their health problems in relation to their first ever episode of low back pain. Table 6.7 presents the very first onset of each health problem and any recurrence in each of the five years prior to the first ever episode of low back pain.

Table 6.6 The health problems the women recalled experiencing during the five years before their first ever episode of low back pain grouped by body systems

Key:† long-standing condition i.e. > 5 years; ‡diagnosed as stress-related by neurologist; *investigated and nothing abnormal found

Bodily system	**Health problem**
Cardiovascular	Congenital heart murmur (Irene†) hypertension (Angela†)
Endocrine	Under-active thyroid (Hazel)
Gastrointestinal	Crohn's disease (Irene) irritable bowel syndrome (Gita†Priti†)
General	Poor general health (Usha,Priti) run down(Margaret,Gita,Amy, Angela†) dizziness (Amy*) overweight (Tina†)
Immune	Hay fever (Tina†)
Mental health	Low not depressed (Amy†) nervous (Tina†) feeling down (Irene,Denise) depression (Irene,Elka,Margaret,Tina†) pain (Hazel) agoraphobia (Tina†)
Musculoskeletal	Intermittent right shoulder ache since 8yrs old (Amy†) knee pain in adulthood (Priti,Chandra†) toothache (Hazel) numb tingly white fingers when cold (Angela†*) woken at night by numb fingers feeling like fat sausages (Angela†*) swollen fingers during panic attacks (Tina) cramp in mouth (Lalit) pins & needles in hands (Lalit) shaky hands (Lalit) ache at top of back (Margaret†) severe facial pain (Margaret‡*) numb arm (Margaret*)
Neurological	Headaches (Margaret†,Priti†,Hazel†,Lalit) migraines (Elka†)
Reproductive	menopausal symptoms (Angela) bad periods (Tina) infertility (Oditi†*)
Respiratory	Allergy asthma (Irene†Tina†) asthma attacks (Usha,Nipa) panic attack (Irene,Angela†,Tina†) mild panic (Jane†)
Other	breast cancer (Joan) typhoid fever (Gita)

Table 6.7 First ever onset and recurrence of health problems in each of the five years before the first ever episode of low back pain grouped by body systems (women)

	5 years	*4 years*	*3 years*	*2 years*	*1 year*
Endocrine					Under-active thyroid (Hazel)
Gastrointestinal	Crohn's disease (Irene)				
General				Run down (Gita)	Run down (Margaret, Gita,Amy) dizziness (Amy)
Mental health		Depression (Irene)			Depression (Margaret, Elka) feeling down (Irene, Denise)
Musculosketal				Cramp in mouth(Lalit) pins & needles in hands (Lalit) shaky hands (Lalit)	Facial / ear pain (Margaret) numb arm (Margaret) knee pain (Priti) cramp in mouth(Lalit) pins & needles in hands (Lalit) shaky hands (Lalit) toothache (Hazel)
Neurological					Headaches (Lalit)
Reproductive				Menopause (Angela)	Menopause (Angela)
Respiratory		Panic attacks (Irene)		Asthma (Usha)	Asthma (Nipa) panic attacks(Irene)
Other			Breast cancer (Joan)		Typhoid Fever (Gita)

It can be seen from Table 6.7 that a greater number of health problems occurred for the very first time in the year before the women experienced low back pain for the very first time than in any of the other years in the five year period. Episodic non-specific health problems associated with the musculoskeletal system (ache, pain and other physical sensations), low mood states (feeling down and depressed) and poor general health including

feeling run down were the problems most commonly recalled during the year before the first ever episode of low back pain.

In summary, the findings from Tables 6.5, 6.6 and 6.7 reveal that the women's first ever episode of low back pain commonly occurred in the context of previous non-specific episodic musculoskeletal problems (aches, pains and other physical sensations) in parts of the body other than the back; low mood states (feeling down and depressed) and poor general health including feeling run down irrespective of whether the health problem was a long standing problem (greater than five years) or one of more recent onset. The greatest number of health problems were recounted from the year before the first ever episode of low back pain.

Health problems attributed to stress (women)

The women recalled their health in the days before their first ever episode of low back pain as *'good'* or getting worse i.e. there was no consensus.

The women who described their health as *'good'* justified their response by saying nothing had been wrong with them at the time. Individuals couldn't remember going to their doctor for anything, or taking time off work. They only had the odd cold now and again. Irene and Priti recalled that their Crohn's disease and irritable bowel syndrome respectively were neither in an active phase nor causing a problem when they had low back pain for the very first time.

The women who thought their general health was getting worse before low back pain linked the deterioration with their stressful circumstances. Usha, for example, recalled an *'asthmatic attack'* shortly before she experienced her first ever episode of low back pain:

Usha: Just very shortness of breath, couldn't breathe, very dizzy. So I was taken to hospital, given the nebulisers and the oxygen but after a couple of days I was fine.

Interviewer: What were you doing when you had the asthma attack?

Usha: Nothing really, I was having problems at home with my married life at the time and so I think that was the trigger. Nothing else.

She added

I think my health has gone down since the problems [at home]*'. (Usha, female)*

Angela recalled being exhausted:

I was running backwards and forwards to my mum and my dad and probably working much harder than [now]. I think that was just generally not giving myself anytime and working whenever anybody wanted. (Angela, female)

Irrespective of whether the women perceived their health as *'good'* or getting worse in the days before their first ever episode of low back pain, the majority of the women recalled having episodic non-specific health problems that occurred when they were stressed before their first ever episode of low back pain (Table 6.8). Irritable bowel syndrome, asthmatic attacks, panic attacks, agoraphobia, feeling run down, down and depressed and headaches were universally attributed to stress by the women who suffered from them. There were three main reasons why these women attributed these problems to stress.

Table 6.8 The health problems the women recalled experiencing during the five years before their first ever episode of low back pain grouped by attribution to stress and body systems

Key:† long-standing condition i.e. > 5 years; ‡diagnosed as stress-related by neurologist; *investigated and nothing abnormal found

Attributed to stress	
Gastrointestinal	Irritable bowel syndrome (Gita†,Priti†)
General	Poor general health (Usha,Priti) run down (Margaret,Gita,Amy,Angela†)
Mental health	Nervous (Tina†) feeling down (Irene,Denis) depression (Irene,Elka,Margaret,Tina†) pain (Hazel†)
Musculoskeletal	Cramp in mouth (Lalit) pins & needles in hands (Lalit) shaky hands (Lalit) ache at top of back (Margaret†) severe facial pain (Margaret‡*) numb arm (Margaret*) swollen fingers during panic attacks (Tina)
Neurological	Headaches (Margaret†,Priti†,Hazel†,Lalit) migraines (Elka†)
Respiratory	Panic attacks (Irene,Angela†,Tina†) agoraphobia (Tina†) mild panic (Jane†) asthma attacks (Usha,Nipa)
Other	Typhoid fever (Gita)
Not attributed to stress	
Cardiovascular	Congenital heart murmur (Irene†) hypertension (Angela†)
Endocrine	Under-active thyroid (Hazel)
Gastrointestinal	Crohn's disease (Irene)
General	Overweight (Tina†) in-growing toenails (Denise) dizziness (Amy*)
Immune	Hay fever (Tina†)
Mental health	Low not depressed (Amy†)
Musculoskeletal	Intermittent right shoulder ache since 8yrs old (Amy†) knee pain in adulthood (Priti,Chandra†) knee pain in childhood (Brenda*) toothache (Hazel) numb tingly white fingers when cold (Angela†*) woken at night by numb fingers feeling like fat sausages (Angela†*) broken foot (Joan) neck pain (Hazel)
Reproductive	Ovarian cyst (Denise) hysterectomy (Lalit) menopausal symptoms (Angela) bad periods (Tina†) infertility (Oditi*)
Respiratory	Allergy asthma (Irene†Tina†)
Other	TB (Lalit) breast cancer (Joan)

Firstly, the health problems occurred in the context of stressful circumstances as illustrated in the extracts below:

> *I was £30,000 in debt by then with the bank loans and my accountant's fees and all that…it was because of that I would think that my health was deteriorating a lot. I was in a tight corner and I couldn't see a way out because my husband's business wasn't doing that well. (Priti, female)*

> *I was bottling it in because I didn't want to tell my parents anything…when I am worried or stressed or I'm concerned about something I go very tight with my stomach muscles and then I used to find…this pain at the back as well. For some reason…I just hold my stomach in and…I even stop myself breathing…you know…when you are holding your stomach really tight and your ribs are…your mouth is going dry…every time I was worried I got the runs, or if I was stressed I got bloated. (Priti, female)*

> *When I get stressed my stomach goes….I am very sensitive...I can't speak up…I tend to bottle up but then my stomach just feels funny, you know, like you feel as it is turning inside out...because you can't say something you want to…I've always been like that because…since I was little…I had no rights to speak up. (Gita, female)*

As discussed earlier, Gita and Priti, had no one to confide in.

Secondly, the health problems were triggered by circumstances perceived as stressful. Panic attacks, for example, were perceived to be stress-related because they occurred in the immediate context of stressful circumstances such as being late for an appointment or having too much to do and feeling unable to cope:

> *I get them if I get a build up of stress or I've got a lot to do and I'm thinking I can't cope with this because I can't, I can't… I just physically can't do all I've got to do today. And then I will get panicky...the feeling is I think it's just all up here (touches head) and you know you get giddy…and you get clammy and you think oh I am going to faint.*

It's that sort of…it was that panic. Of course I never did faint. And you sort of hyperventilate, you think I can't breathe properly, I've got pains everywhere. (Angela, female)

Panic attacks were associated with depression. Irene, for example experienced them when she was depressed shortly after her husband's death:

I was on the bus once and I used to get panics attacks and I had to get off...I told the Dr. and she said 'panic attack' and sometime if I was indoors I felt like my head was very hot, you know and I felt I had to go for a walk. (Irene, female)

Panic attacks were also associated with agoraphobia:

If I was in shops and getting shopping and then one [panic attack] come on all of a sudden I'd have to leave the shopping in the trolley in the middle of the shop and just get out of there. Even now if I am in a queue in the shops and I can feel one coming on if the queue doesn't go down quick or there's a lot of people causing problems in front I just have to go and just leave it…I just have to go and leave whatever I've got….I wouldn't go to concerts or anything like that or anything that restricts [me]…I wouldn't go out to like big restaurants where there's a lot of things going on, a lot of people and you'd have to queue and wait and stuff. I'm not good in queues…Now the shops are open twenty four hours I'll do like food shopping like two o'clock in the morning or something when it's quiet. (Tina, female)

Similarly, headaches were perceived to be stress-related because they were thought to be triggered by general stress, work deadlines, tensions within the extended family, and eating certain foods:

…it could be stress of work because we've got fairly stressful work. I mean it can get stressful. It can get stressful. (Elka, female)

In contrast, the women who perceived their headaches as stress-related did not perceive their first ever episode of low back pain as stress related. Instead, they saw the first ever episode of low back pain as having been triggered by physical and mechanical factors: alterations in posture, weakness, walking in thin soled shoes on concrete, sleeping on a soft mattress and a trapped nerve.

Thirdly, to be regarded as stress related the health problem had to occur in a part of the body thought to be affected by stress. Stress-related health conditions, for example, were thought to affect the head and the shoulder areas of the body, and the stomach:

> *Headaches are stress-related usually and I know that you get very tense in your neck and shoulders because…if someone has tried to massage my neck here it is so painful…they say they are doing a gentle massage and I go ouch they say that's because your muscles are so [tense] so I know that and I know that…the top of my back can ache…[from] what I've read is [that] if you are stressed and you are tense that way you can get them. (Margaret, female)*
>
> *Every time my stomach is tense my back seems to be [tense] with it. (Priti, female)*
>
> *I know people who have a bad stomach due to nervousness but I've never been like that. (Margaret, female)*

As discussed previously, the first ever episode of low back pain was not considered stress related by some participants because the lower back was not perceived to be an area of the body affected by stress.

Co-occurring health problems (women)

The health problems perceived as stress related (Table 6.8) did not occur at the same time as the first ever episode of low back pain with one exception. Amy recalled low back pain occurring with her monthly period and with her

intermittent shoulder pain although she thought the latter was probably a coincidence:

> *Amy: I do feel like that but it is a lot of time [back aches] with my period I think. Just get very temperamental and ratty and sometimes it can be the back pain comes along with it as well…I think it was like last week they [back and shoulder] both sort of ached.*
>
> *Interviewer: They ached together?*
>
> *Amy: They did that time. Usually they don't. My shoulder sort of used to ache on its own and I never had the shoulder pain with the back pain. But yeah, just last week I think it was.*

It is important to note, however, that some women acknowledged that they did not necessarily reflect on the co-occurrence of their health problems. Consequently any relationship may have gone unnoticed:

> *I just accept…I actually don't always think why, about why. I am not the sort of person that would actually stop to think about it, no not really. (Margaret, female)*
>
> *I wouldn't actually think about it. It is only because you are here that it's made me think. (Angela, female)*
>
> *Even if I had on the same day a migraine and back pain I would never think that one had any relationship to the other…You see my problem is I really don't pay much attention to what, you know, what is relating to what…I ignore things…if I have a back pain alright I had a back pain, it's gone, fine, next thing, and I don't pay much attention to the fact that it happened or why it happened. I am just glad it's gone and that is it is the same with the migraine. It comes, ok, what do we do with it, take a tablet, helps, yes or no, sleep it off, yes or no, and the next thing and I don't seem to think oh why did it happen or what did I do so that's why I you know it's more difficult to get any connections with things. (Elka, female)*

These extracts further illustrate the tendency to ignore problems, a phenomenon discussed earlier in this chapter. Frequently, someone else had to make the connection for them:

> *I don't notice certain things. I mean I was getting… it became apparent at some stage that with my periods came bad moods. It had to be a third person to tell me that because I never put the two together. Because as far as I was concerned the fact that I was irritable was just because someone was making me irritable and nothing to do with anything else, and it was only a friend of mine that sort of said to me, 'you know, you are getting irritable at that time'. I thought, well strange and then I started paying attention to it and I thought, yes, not always but I was more likely to probably be… my reaction would be perhaps more out of proportion at that time than it would have been otherwise. So there was but as I say I didn't notice that. (Elka, female)*
>
> *My husband says it [headache] is [from] stress. (Hazel, female)*

Health problems not attributed to stress (women)

The health problems considered unrelated to stressful circumstances were mainly specific health complaints (Table 6.8). The non-specific health problems considered unrelated to stress during the five years before the first ever episode of low back pain were mainly longstanding physical sensations that had defied medical explanation. Descriptions of these physical sensations are given below because they illustrate that the first ever episode occurred in people with low mood and a history of physical sensations that did not necessarily meet diagnostic criteria found in medical textbooks.

Amy spoke about feeling low and run down:

> *I have always…had problems like feeling low and things like that…I am not depressed or anything just sometimes I feel quite low about things… Things get on top of me… I don't know how to describe it. I am not very good at describing. Just not happy in life. I like my job and things like that, just sometimes in general I feel a bit crappy….You know when you have a period you just feel really ah*

and everyone is getting on your nerves and everything is…even the little things that go wrong [seem] major and they are not really.

She also recalled her right shoulder aching since she was eight years old which only her *'nan'* could make better:

It just aches occasionally… sometimes I won't feel it for a long time but recently…it was last week I felt it, but it could be months without feeling anything….it has never been constant. It sort of just comes and goes very occasionally but it has got a lot better. It hurt more when I little. It used to hurt a lot more because my nan she is like…well she says she had got healing hands and she tried to…she can sort of take the pain away and she did it when I was little and she said there was something there she could feel it sort of coming out so yeah, my shoulders always ached. I don't know why though. (Amy, female)

Brenda recalled knee pain since she was eight years old. This knee pain attenuated in her early twenties when she experienced her first ever episode of low back pain. However, she did not notice any connection between the two painful conditions:

At the age of eight I started getting pains in my knees, particularly my left knee so I didn't always walk evenly…I remember …running around school and then every so often I couldn't. I'd either fall over or I'd get so much pain I'd have to stop. [People said] growing pains, [I'd] imagined it, snap out of it girl. I wasn't imagining it, it did hurt. It did hurt. But then it'd ease off and I'd be off again so it was an awkward one for people to judge. When it hurt I stopped, when it didn't I carried on with whatever I was doing…I'm not sure it's psychological…I could go six months with no problem and then I'd get another six months every couple of months getting a problem and it might last a week it might last a month the niggles… So it was a weird thing. It wasn't permanent. I think after a time if I had a bit of pain I got so used to it I didn't notice it anymore. I remember…I got stuck coming back from the bus, you feel a right lemon standing there gazing round and everyone's looking…and they hurt too much to walk…I just had to wait to try and get them to relax a bit and then go again. (Brenda, female)

Angela recalled sensations in her fingers:

> *My fingers feel like they're swollen, they feel like they're rigor mortis. I really have to get my fingers going. Um.. it's really weird because I would say the last two weeks it hasn't happened to me but the weeks before that I'll get a day where it happens then I'll go two days without the next day I'll wake up… It's horrible. But I have been to every specialist about my fingers. I've had the carpel tunnel's test. I've been to rheumatologists. I've had Doppler scans to make sure that the blood's running down OK. I mean because it's a horrible feeling but I've had it for years and years…I've learnt to live with it. I had it long before menopause. It's strange that nobody can find out what it is…Well each specialist you see says oh well it's not that, it's not that (laughs). And then you think oh I'll go away and maybe if it happens again I'll go back to… I can't be bothered to be honest. It happened and I think well I'm still alive so it can't be anything terrible. But it is awful, it's horrible. In the wintertime when it's very, very cold my fingers will go numb and tingly. Don't get the tingly so much anymore but then it hasn't really been that cold. But that'll happen in the daytime. It's at night time… they feel like they could be fat sausages…But I can't switch the light on to see 'cause there's no feeling in them. You know when you sleep on your arm and your arm's dead well if I go to…flick the light on I can't 'cause there's no pressure and I've got to do this and by the time I've done that and put the light on they're back to normal. (Angela, female)*

GETTING OLDER

Low back pain was in part attributed to getting older by some women. The median age of these women when they experienced low back pain for the very first time was 44 years of age, interquartile range 31 to 58 years of age.

Getting older was associated with *'weakness'*, *'wear and tear'*, *'degenerative changes'*, *'general stiffness'*, *'degeneration of [the space] in-between the joints'*, *'deterioration of the bones'*, muscles and joints, including *'calcium deposits'* around the joints. Also, the older body was perceived to heal more slowly following injury.

Certain work related activities such as dancing professionally from a young age and managing a print room, lugging boxes of paper around for many years, were thought to have accelerated the ageing process:

> *Maybe I did put too much strain on my body as a younger person. You wear certain parts of your body out. As I say, it [dancing] certainly…spoilt my feet but that is something that happens. I've put off having two operations, can't face it!...Maybe some people …aren't as agile as others and perhaps [they] don't wear as much…maybe the bones and gristle don't get so worn. It's difficult to say really isn't it? (Hazel, female)*

> *I think I'd always abused my back quiet honestly. I worked, I had a management job but I worked in printing, I'd spent my whole working life lugging boxes of paper around…doing a heavy job. If paper needed to be brought up for an urgent job from the basement because it was my responsibility and there was no porter I'd go down and bring it up. So I think I just abused it. A doctor once told me it'd done ninety years work that was its only problem. (Brenda, female)*

In turn, the older back was considered less able to cope with the demands of sustained work-related activities. Joan, who was approaching retirement, for example, thought that degenerative changes triggered her back pain when she sat for prolonged periods of time at a computer with her back unsupported. Similarly, Margaret who was also approaching retirement thought that her ageing joints may have caused her back pain because of the cumulative effects of working with young children:

> *I think was the start of my problems to be quite honest…in old age…it has to be degenerative I'm sure of it. (Joan, female)*

> *Perhaps it is to do with the fact that I am older and that my joints are not exactly, you know, they're not young. (Margaret, female)*

Getting older also explained why an activity carried out many times before should now suddenly trigger the first ever episode of low back pain. The older body was thought to cope less well with injuries. Jane, for example,

who experienced her first ever episode of low back pain when she was 31 years of age said:

> *The only conclusion I could come to is that it's from playing tennis 'cause that was when it happened constantly. Well not constantly but after every time I played…I don't know whether it was because I'd done something while playing once and it didn't get time to heal properly. That's my amateur conclusion(!) or whether it's just something that's…because of doing repetitive movements. (Jane, female)*

Jane thought that her body was getting older because she was more tired after playing tennis than she used to be.

Attributing low back pain to the ageing process appeared independent of whether or not the women had had an x-ray, and whether any wear and tear or degenerative changes had been revealed on the x-ray.

Other people's views on ageing and back pain were important as Jane and Irene pointed out:

> *It's just what other people say to you isn't it. Whenever you get an ache [they say] Oh you're getting old. Maybe sometimes you take that on board. (Jane, female)*
>
> *…every time you say you've got an ache when you're my age, oh you're getting old. That's what people say. (Irene, female)*

Irene however questioned the role of ageing in back pain having talked to her physiotherapist:

> *I just thought I was getting old and I told [name of physiotherapist] that…and she laughed, she said don't take any notice of what people say, because she said there's young people with back trouble and I*

said, I know my son's friend's only 38 and he's got a dreadful bad back. (Irene, female)

In contrast, Hazel's physiotherapist had told her that her back pain was due to wear and tear and that she should expect *'wear and tear, it happens with age'.* This led Hazel to reason that her back pain would get worse. *'It has to* [get worse] *as you get older, it has to if it is wear and tear, I suppose nothing of you lasts forever'.* However, Hazel did preface her comments with *'if it is wear and tear'* suggesting that there was some doubt in her mind. Doubt and uncertainty characterised the participant's accounts.

In the men, ageing was thought to be associated with a loss of physical fitness, which, in turn, was thought to contribute to the first ever episode of low back pain. Getting older was also thought to impact on the tendency to carry on beyond their physical capacity. Kevin, for example, no longer pushed on through the pain barrier for the sake of it because he thought that his pain threshold had altered as he got older: knocks and bruises seemed to hurt more than they once did.

FAMILIAL INFLUENCES

Having a close relative with low back pain led some participants to suggest that familial factors had determined their first ever episode of low back pain. The extracts below illustrate that genetic factors alone and the interaction of genetic and environmental factors were thought to have played a role:

Well, I think it's all in your genes…I am a great believer in fate…I think a lot of things are predetermined for us. I believe totally in fate. (Denise, female)

I don't know, just… everybody's genetically different so where someone might go to the gym and build up quite quickly I take quite a while to build up. I have to work quite hard and someone else might

have to work a bit harder, I work quite hard. So it could be something the way my body's made could be that really. I haven't thought about that but yeah, I suppose, I probably see it like that, haven't really thought why me and not him. It is how my body's made up probably just could be that. Yeah, just that. Can't think of any other reason. (Kevin, male)

Maybe my bones and muscles aren't as strong as somebody else's. Maybe it's generic, genetic. Who knows? My mother suffered with her back. My sister suffers with her back. Who knows? Maybe it's genetic, it could be I suppose, I don't know, and maybe some people…aren't as agile as others and don't wear as much, maybe the bones and gristle don't get so worn, it's difficult to say really isn't it? (Hazel, female)

As a former dancer Hazel inferred that her back was more susceptible to becoming worn because she was more agile than other people.

Dinesh thought his first ever episode of low back pain must be due to an inherent weakness in his back because his brother also had low back pain. He excluded occupation and body-build as possible causative factors because his brother, a labourer was short and stocky whereas he was a *'pen and paper man'* who was taller and leaner.

Lee also thought that he had inherited a weak back because of his Chinese ethnic background that was vulnerable to damage from sporting activities because he drove himself to compete at the same level as the heavier built British boys:

I was competing with English boys and as you know English boys are more physically built than me. Because when I actually came [from Hong Kong] I was fourteen. I was very skinny and really weak. But I was very interested in sports so I pushed myself a bit harder just to…well to have this level grounding with them…I'd be really determined, more determined, more determined to go to the gym than

other boys. Some boys they just don't bother with the gym they just do training in the afternoon with the school but I would actually go to the gym as well and do my best…at the time I really thought [it] was caused by the [school] bed …but maybe it was due to the sports that I was doing…I always tried too hard maybe in going in to any tackles and I didn't really care. So maybe that caused it a bit at the time. (Lee, male)

Lee had deliberately given up playing squash during his teenage years because both his brothers had developed low back pain playing the sport. The failure of this preventative strategy together with the observation that he and his brothers had low back pain whilst their parents did not led him to conclude that, in part, low back pain was either genetic or due to the way he and his brothers had been brought up:

But neither my father or mother had a back problem so it's somehow it came to us but it's… That's why I wouldn't say anything except that genetically [or] maybe just how we were brought up maybe, don't know. It happen that three of us have back problem. (Lee, male)

BODY-BUILD

Height (men)

Kevin recalled *'bad back days'* when he had to lean over a control panel in the railway signal box where he worked:

If I was having a bad back day say at work leaning over would hurt…I'm probably taller than a lot of people at work. Whereas [shorter] people might stand up all the time I'm sitting down, standing up, sitting down. May be it was my body make up that leaning down [was] causing the pain…if I was shorter I wouldn't have to lean over so much I was constantly looking down. (Kevin, male)

He thought the reason some tall people have back pain whilst others do not is analogous to the need to wear glasses: *some people have [poor] eyesight and need glasses and others don't*

Rahul recalled his doctor telling him that:

> *Because you are tall, sometimes the muscles pull or something and you get a problem. (Rahul, male)*

However, Rahul said he could not explain his first ever episode of low back pain that occurred whilst he was leading an active life in Tanzania and why back pain should happen to him and not other people.

Weight

It was uncommon for participants to attribute their first ever episode of low back pain to their weight. Oditi and Tina however did think that their weight played a role because they were under and overweight respectively:

> *I was seven and a half stone…[I've] always been like that. I've always been thin and skinny and all that…I was feeling healthy basically but he [consultant rheumatologist] said that my body weight is not that much and I' trying to more than…because…the weight of the body cannot lift or cope [with] what I'm doing …so that might trigger…overdoing something. (Oditi, female)*

> *I just put it down to…everything down to my weight all the time 'cause I was overweight then as well…probably about 18 stone… when you read any weight things all the problems they list were all like your joints hurt, your back goes, you find it hard going, breathlessness and all that lot, all the symptoms that I get. (Tina, female)*

Implicit in these extracts is the belief that the underweight body may have insufficient strength to lift or cope with daily activity while the overweight body may place an excessive load on the structures of the joints of the body and the back. Not all the women however agreed that being overweight could cause low back pain. Usha for example disagreed because her weight had not altered before experiencing low back pain for the first ever time:

> *I've always been this way; you know it is subconsciously in me. I've always been this size. This is not my problem…my back or anything isn't a problem because of my weight because I have always been this size. Everybody else says it's a problem because you've got too much weight…I was born at 11lbs. I have always been this size. If I had a back problem it should have been there from the beginning. But my doctor says no, weight. My…family…says…weight as well…As I've said I've never been thin. Do you understand? So I can't see that suddenly I've put on weight and I've got back pain. I've always been like this. (Usha, female)*

Some men recalled being overweight because they were physically unfit and, in addition, overate from boredom at work. Kevin was concerned about his weight because he found he couldn't run for the train whereas implicit in Adil's account was his belief that his first ever episode of low back pain was caused by loss of muscle tone:

> *I have got a big stomach now. I used to have a very thin stomach. I have got a funny feeling that this stomach is pulling my back muscles…My target is to sort of tone all my muscles and I think my back pain will go. (Adil, male)*

KEY FINDINGS

The findings of this study reveal the complex and subjective nature of the first ever episode of low back pain and the factors that participants believed may have played an aetiological role. A summary of the key findings is presented below in relation to the study's first two aims. Causal attributions are noted where relevant.

DEFINING THE FIRST EVER EPISODE OF LOW BACK PAIN

Physical sensations in the lower back including *'niggles'*, *'aches'*, *'pains'*, *'stiffness'*, 'soreness' and a *'tiredness in the back'* sometimes occurred before the episode of low back pain defined by participants as their 'first

ever'. These physical sensations were perceived to be *'normal'* and not a *'real'* episode of low back pain when they were:

- associated with monthly periods and / or childbirth
- linked with activities perceived as tiring, involving hard work and / or physical effort; and attenuating with rest, or a warm bath
- associated with fatigue
- accompanied by a viral infection and fever
- secondary to other painful conditions e.g. unexplained childhood knee pain
- short-lived
- commensurate with the level of activity partaken e.g. it was thought normal to have pain after a session at the gymnasium
- self-inflicted i.e. occurred as a result of excessive physical exertion, pushing on past the pain threshold.

Consequently, these physical sensations were ignored, and were not considered a problem. It was thought that everyone experienced them.

The first ever episode of low back pain was realised when the physical sensations got worse and did not necessarily come with activity and go with rest as they had once done.

With the benefit of hindsight it was recognised that the 'back trouble' may have been masked by other *'normal'* aches and pains.

The first ever episode of low back pain was commonly described as triggered by activities carried out during the daytime and to which the majority of participants could specifically and meaningfully attribute their pain. In a minority of participants, however, the first ever episode of low back pain was recalled as occurring either on waking in the morning or towards the end of the day in the absence of any identifiable trigger. Where the pain occurred on waking, a poor sleeping posture or mattress was held responsible for the first ever episode, although there was no certainty. Where the first ever episode of pain occurred towards the end of the day activities that had occurred during the day were considered responsible for the pain e.g. lifting weights or overexertion during sport.

Understanding why the first ever episode of low back pain occurred was enigmatic. In particular, participants found it hard to understand why an activity carried out many times before now triggered low back pain and why it should occur in the absence of particular activities which they associated with low back pain.

The severity of the first ever episode of low back pain, the level of disability associated with the pain and the need to take time off work mainly determined whether or not the first ever episode of low back pain was perceived as a health problem.

ANTECEDENTS OF THE FIRST EVER EPISODE OF LOW BACK PAIN

The antecedents of the first ever episode of low back pain that emerged from the lay accounts are summarised below. They were not necessarily judged to be causal by the participants. Causal attributions are however noted where relevant.

Stressful circumstances

- The women's first ever episode of low back pain commonly occurred in the context of difficult and stressful lives affected by changes in lifestyle, bereavement, relationship problems and dissatisfaction with paid work. The unifying theme was one of loss.

- the men were more reticent than the women to discuss personal circumstances other than those relating to paid employment.

Coping with stressful circumstances

- Difficulties coping with adverse circumstances were conceptualised differently by the men and women.

The women spoke in terms of emotional and behavioural responses to stressful circumstances such as bursting in to tears for no particular reason, irritability and anger with other people, and low mood and withdrawal from social interaction.

The men mostly conceptualised any difficulties coping in terms of reduced physical fitness. The loss of fitness was attributed to an unhealthy lifestyle, ageing and playing less sport. Irritability and anger with other people were also recalled.

Pushing worries to the back of the mind

- Ignoring problems and pushing worries to the back of the mind was a strategy used by both the men and the women to cope with physical sensations such as aches and pains and emotional upset. This strategy of ignoring phenomena and pushing painful sensations and worries to the back of the mind may have been developed as a means of coping with adverse circumstances earlier in life.

Smoking

- Smoking was used to control weight and cope with bereavement by very few participants. Its role in the genesis of ill-health was thought to be related to cardiovascular disease and not low back pain.

Attribution to stressful circumstances

- Although stressful events were a common feature of the women's accounts of their lives before low back pain, their beliefs regarding whether or not the first ever episode of low back pain was due to stress differed amongst the women. Where the first ever episode of low back pain was attributed to stress, the setting and / or the trigger of the first ever episode of low back pain were perceived as stressful, and the lower back was perceived as a part of the body that could be affected by stress and vice versa. It was unusual however for the women openly to volunteer the belief that their first ever episode of low back pain was due to stress.

- The women who did not volunteer the belief that stress caused their back pain nevertheless used metaphorical expressions implicating stress in the genesis of their first ever episode of low back pain. This may have been either because they did not recognise stress or they feared that their views would appear nonsensical to the health professional interviewing them. They may have been aware that in the health services non-specific low back pain is generally regarded as a biomechanical and physical disorder (Waddell 2004f).

- The men did not attribute their first ever episode of low back pain to stress directly. Indirectly, the first ever episode of low back pain was attributed to the unhealthy lifestyle and reduced physical fitness that were secondary to stressful circumstances. The reduced physical fitness was manifest in fatigue, lethargy, shortness of breath on exertion, reduced energy,

reduced motivation to take exercise, and the reduced ability to perform certain activities: writing a report and learning new skills such as how to use a software package, for example, took much longer than they had once done.

- The attribution of the first ever episode of low back pain to stressful circumstances (women) and an unhealthy lifestyle (men) was associated with having no one to confide in.

Lay theories of potential pathophysiological mechanisms

- Lay theories of the mechanisms by which stress played a role in the aetiology of low back pain involved alterations in breathing and muscle tension in the women. The breathing was described as being shallower and quicker while the chest and the other muscles felt *'tight'* and as if they were *'holding everything in'*. The women also recalled being in a state of *'mild panic'* or *'scared kind of mode'*, with a dry mouth, *'anxious'*, *'jumpy'* and *'sweating'*, suggestive, from a biomedical perspective, of altered sympathetic / parasympathetic activity.

- The reduced physical fitness was perceived by the men to be associated with a loss of muscle tone and strength. In turn, the weakened muscles were thought to be unable to support the demands that daily activities placed upon them, particularly activities involving alterations in posture and lifting objects. In addition, a large stomach from being unfit was thought to pull on the weakened back muscles resulting in pain.

Health (women)

- the first ever episode of non-specific low back pain typically occurred in women who described a history of episodic non-specific health problems,

commonly musculoskeletal aches and pains and other physical sensations; low mood states (feeling low, down and depressed) and poor general health including feeling run down.

- The episodic non-specific health problems that occurred before the first ever episode of non-specific low back pain were described as emanating from one or more body systems. There was no pattern or consistent relationship amongst the non-specific health problems that were recalled as occurring either before, or co-occurring with, the first ever episode of low back pain. This suggests that the women's first ever episode of low back pain was experienced as part of a general episodic non-specific disorder.

- The recalled incidence of the episodic non-specific health problems was higher in the year before the first ever episode of low back pain compared with any other year in the five years before the first ever episode of low back pain.

- Episodic non-specific health problems including irritable bowel syndrome, asthmatic attacks, panic attacks, poor general health including feeling run down before the first ever episode of low back pain were universally attributed to stress by the women who suffered from them. This was because these health problems occurred in the context of and were consistently triggered by circumstances perceived as stressful. Moreover, they were experienced as occurring in a part of the body thought to be affected by stress i.e. the head and shoulder area, and the stomach. Generally, these health problems were not recalled as occurring at the same time as the first ever episode of low back pain.

Participating in physical activity

Disposition to physical activity

- Participants perceived that the first ever episode of low back pain occurred in the context of a disposition to participating in physical activity. This was a recurrent and near universal theme. This disposition appeared to be a personality trait. The elements of this disposition emerging from the data were doing things in a hurry, goal setting an inability to be still and keeping going and overdoing it. Overdoing it led some participants to push themselves beyond their physical capacity i.e. past the point of pain.

Active lifestyle

- An active lifestyle before the first ever episode of low back pain was also a recurrent and near universal theme. This lifestyle encompassed a preference for physical activity including DIY, gardening, dancing, walking and participating in sporting activities.

- Sporting activities played an important role in the men's lives and the first ever episode of low back pain was attributed to over-exertion during sporting activities by some men. Sporting activities were less important in the women's lives and the first ever episode of low back pain was attributed by one woman to repetitive movements with insufficient time for healing processes to occur in-between games of tennis.

Getting older

- Ageing was thought to play a role in the first ever episode of low back pain by the women who associated it with *'wear and tear'* and degenerative changes. In addition, the body was perceived to heal more slowly following injury.

- The concept of accelerated ageing was also invoked as a cause of the first ever episode of low back pain. This was perceived to be the consequence of straining the body when younger and / or the cumulative effects of abusing the back.

- The ageing process was invoked by some participants to explain why an activity that had been carried out many times before should now trigger low back pain for the very first time.

- Ageing was associated with a reduction in physical fitness by some men and, thereby contributed in their view to the first ever episode of low back pain.

Familial influences

- Inheriting a weak back and the interaction of the inheritance with environmental factors were thought to have played a role in the first ever episode of low back pain by some participants.

Body build

Height

- It was unusual for the men to suggest that their height played a role in the genesis of low back pain. None of the women thought it might play a role in their first ever episode.

Weight

- Generally weight was a minor concern to the women: although being either over or underweight was thought to play a role in the first ever episode of low back pain in individual cases. Being underweight was thought to indicate that the back was insufficiently strong to lift objects and

cope with the demands of everyday activities whilst being overweight was thought to place an excessive load upon the back.

- Weight was also a minor concern to the men although it was thought that being overweight with a large stomach was the consequence of being physically unfit. In turn, the large stomach was thought to be associated with the first ever episode of low back pain because it pulled on the back muscles.

These key findings are discussed further in the next chapter.

CHAPTER SEVEN: DISCUSSION

INTRODUCTION

The objective of the qualitative, in-depth interview study presented in this thesis was to further knowledge about the first ever episode of low back pain for primary prevention. Three aims were developed to meet this objective. The first aim was to understand how the participants' defined their first ever episode of low back pain. Understanding the participants' definitions of their first ever episode of low back pain was important, not only for advancing knowledge, but also for enabling the study's second and third aims to be met. The study's second aim was to explore the participants' descriptions of life before the first ever episode of low back pain and to identify any antecedents that may possibly play a causal role (see below). The study's third aim was to learn about the participants' causal attributions for their first ever episode of low back pain. Knowledge of these antecedents and causal attributions may represent a useful resource for the primary prevention of low back pain.

The study's findings relating to these aims are discussed, in turn, below in relation to the literature and further explored from a social constructionist perspective in Appendix 13. Given that the first ever episode of low back pain, its antecedents and causal attributions do not appear to have been studied before from an interpretive perspective, the findings in this chapter are discussed in relation to the existing literature i.e. the prospective cohort studies reviewed in chapter four. In discussing the study's findings in relation to the prospective cohort studies, it is acknowledged that the research groups who carried out the prospective cohort studies utilised a nomothetic approach to advance knowledge about the cause of low back pain using positivist (quantitative) methods, whilst the study presented in this thesis adopted an idiographic approach to advance knowledge from an interpretive –qualitative perspective- (Table 5.2). Some of the findings from the individual

participants represented in chapter six therefore constitute lay theories about causes at the individual level, whilst the epidemiologists' and health professionals' studies of hypothesised causal (risk) factors reviewed in chapter four provide estimates of the effects of hypothesised causal (risk) factors at the population level. The estimates of causal effect emanating from these prospective cohort studies do not suggest that either the relative risk or odds ratio is consistent across individuals nor that the risk estimate represents reality for any one person (Rockhill 2005). A risk ratio of 1.2, for example, does not mean that all individuals will be at increased risk of low back pain from a particular risk factor: some individuals may be at increased risk while other individuals may be at reduced risk. In other words, any association between a risk factor and the incidence of low back pain at the population level may obscure a large heterogeneity at the individual level (Rockhill 2005). Consequently, it is inappropriate to draw any inferences about individuals on the basis of aggregate statistics, termed an ecological inference fallacy (Rockhill 2005, Lang and Secic 2006). The lay theories however do represent reality for these individuals (Rockhill 2005), and may suggest further hypotheses.

There are no exemplars about how best to discuss qualitative research findings in relation to the literature emanating from positivist (quantitative) research (Bryman 2006). Consequently, each researcher needs to decide upon and justify their approach, bearing in mind that it should be consonant with the research purpose, and the ontology and epistemology underpinning the particular study (Sandelowski 1998). Given the ontological and epistemological position underpinning this study (see chapter five) and its purpose to advance knowledge it was decided that the study's key findings i.e. the lay theories may be used to build upon existing knowledge. In addition, the findings may point to previously unrecognised causal relationships and thereby generate research questions for further study (Sinuff et al 2007). Accordingly, the study's findings are discussed below in

relation to how well they ‘fit’ and extend the knowledge gained from the prospective cohort studies reviewed in chapter four and provide new insights into the possible causes of the first ever episode of low back pain.

It was decided that it was inappropriate to discuss the study’s findings in relation to possible causal (risk) factors for the onset of subsequent episodes of low back pain since the mechanisms that cause back pain to recur or persist may differ from the factors that may play a role in its genesis (Burton et al 1996b, Frank et al 1996a, 1996b, Linton 2000, 2001).

Where relevant, the knowledge gained from the qualitative interview study regarding research design and methods is included within this chapter for two reasons. Firstly, aspects of the study design and methods may have influenced the study’s findings and secondly, this knowledge may assist researchers studying the first ever episode of low back pain in the future.

As with all single studies, it is recommended that the knowledge and the new insights gained from this, the first qualitative, in-depth interview study into the possible causes of the first ever episode of low back pain is regarded as provisional and possibly in need of revision in the light of new knowledge from further research. Recommendations for further research are made towards the end of the chapter.

Where the term ‘incidence’ is used in this chapter it should be taken to refer to the true incidence of low back pain i.e. the first ever episode of low back pain.

STUDY'S FIRST AIM: LAY DEFINITIONS OF THE FIRST EVER EPISODE OF LOW BACK PAIN

The study's first aim was to understand how the participants perceived their first ever episode of low back pain. The findings presented in chapter six provide new insights into the participants' perceptions of their first ever episode of low back pain not documented in the literature hitherto.

The participant's representations of their first ever episode of low back pain revealed multiple perspectives about the nature and qualities of their first ever episode of low back pain. In particular, the participants recollected their first ever episode of low back pain by describing how they perceived the nature of their pain, its severity and duration; the timing of its onset and conclusion; the nature of any trigger; and any consequent disability and need for healthcare.

A key feature of the participants' accounts was the perception of physical sensations in the lower back before the episode of low back pain considered to be the 'first ever' episode. These sensations were considered to be a 'normal' experience and not a 'real' episode of low back pain for the reasons summarised in Table 7.1. It can be seen from Table 7.1, that while some participants considered low back pain associated with monthly periods and childbirth to be a 'normal' experience and not a 'real' episode of low back pain they omitted to consider low back pain associated with pregnancy. One likely explanation for this omission was that women with a history of low back pain associated with pregnancy were excluded from the study (Table 5.3).

Table 7.1 Summary of the physical sensations in the lower back perceived to be a *'normal'* experience and not a *'real'* episode of low back pain

Physical sensations in the lower back including *'niggles'*, *'aches'*, *'pains'*, *'stiffness'*, *'soreness'* & a *'tiredness in the back'* sometimes occurred before the episode of low back pain defined by participants as the *'first ever'* episode

These physical sensations were perceived to be a *'normal'* experience and not a *'real'* episode of low back pain when they were:

- associated with monthly periods & childbirth
- linked with activities that were tiring, involved hard work & / or physical effort; & attenuated with rest, or a warm bath
- associated with fatigue
- accompanied by a viral infection & fever
- secondary to other painful conditions e.g. unexplained childhood knee pain
- short-lived
- commensurate with the level of activity partaken
- self-inflicted i.e. occurred as a result of excessive physical exertion, pushing on past the pain threshold.

The participants who had experienced physical sensations in their lower back before their first ever episode assumed that everyone experienced similar physical sensations. Their perception of the episode of low back pain that they acknowledged to be their 'first ever' episode did not occur until the low back pain started getting worse: it no longer came with physical activities involving effort, for example, and no longer disappeared with rest or a warm bath as it had once done.

With the passage of time and the benefit of hindsight that appeared to afford greater clarity of perspective, some of these participants felt that their first ever episode of low back pain may have been concealed by previous aches and pains. Kevin, for example, thought that his first ever episode of low back pain was masked by the normal aches and pains of everyday life, while Adil initially thought that his low back pain was the consequence of kidney stones. In addition, some participants acknowledged their tendency to ignore the physical sensations before their first ever episode of low back pain because they did not consider them to be a problem. These physical sensations were commonly experienced by the participants during physical activities, such as when competing either with themselves to complete a task or with others during sporting activities. This finding appears analogous to the observation that athletes commonly ignore physical sensations and injuries that non-athletes may interpret negatively and be distressed by (Cioffi 1996). Cioffi (1996) suggests that because the athletes' higher order interpretations i.e. their attributions, motivations, mood, goals and monitoring strategies are viewed positively the physical aches and pains are interpreted benignly. Kevin exemplified this when he recalled digging the whole of his garden and feeling aches and pains in his lower back, arms and legs for three or four days thereafter. He considered this low back pain to be a *'good pain'* that he had a *'right to feel'* because it was self inflicted and a *'normal'* experience following excessive physical exertion. It was not until he had to take time off work because of low back pain that he perceived himself as having had his first ever episode of low back pain. It appears from Kevin's and the other participants' accounts therefore that there comes a threshold when the 'normal' physical sensations are perceived as 'abnormal' and thereby a 'real' episode of low back pain.

Differentiating between a 'normal experience' and a *'real'* episode of low back pain was not unique to the participants. Experts have suggested that back pain in young people should be considered a *'normal life experience'*

and not a *'real'* episode of low back pain (Burton and Waddell 2004). Evidence from research studies (e.g. Brattberg 1994, 2004, Burton et al 1996a, Balague et al 1999, Nachemson and Vingard 2000) and the Danish Twin register (Hestbaek et al 2006) however suggests that there is a correlation between low back pain in childhood / adolescence and back pain in adulthood. The weight of the evidence therefore suggests that the incidence i.e. the first ever episode of low back pain in young people is 'real' and higher than previously thought.

The study's finding that some participants did not believe that low back pain was associated with menstruation and flu; or that pain of short duration was *'real'* low back pain (Table 7.1) 'fits' some researchers' definitions of low back pain utilised in the prospective cohort studies reviewed in chapter four (Tables 4.1, 4.2). Study members solely reporting pain in the lumbar region of the back associated with menstruation (Biering-Sorensen 1984a, Biering-Sorensen and Thomsen 1986) and flu (Lake et al 2000, Power et al 2001, Mustard et al 2005); or minor aches and pains of short duration (Croft et al 1995, Macfarlane et al 1997, Croft et al 1999, Lake et al 2000, Power et al 2001, Mustard et al 2005) did not consider themselves to have had a 'real' episode of non-specific low back pain.

From the eighteen papers reviewed in chapter four, only nine papers defined low back pain (Biering-Sorensen 1984a, Biering-Sorensen and Thomsen 1986, Nissinen et al 1994, Croft et al 1995, Macfarlane et al 1997, Croft et al 1999, Lake et al 2000, Power et al 2001, Mustard et al 2005). Where low back pain was defined, the definitions differed between the research groups. Furthermore, none of the research groups defined the 'first ever' episode (Tables 4.1, 4.2, column 5). This left the potential recruits to the cohort studies and the study participants to draw upon their own, possibly idiosyncratic, understanding of what a 'first ever' episode of low back pain may be before deciding whether they had experienced such an episode.

From a positivist perspective, and as discussed in chapter four, this may have influenced the internal validity of the cohort studies and may partially explain the inconsistent findings for several hypothesised causal (risk) factors and the discrepancies in the estimates of the cumulative incidence of low back pain (Tables 4.1, 4.2, 4.3, Appendix 2).

Given that self-report is the 'gold standard' for understanding people's subjective experience of pain (Strong et al 2002), the findings from this research study may be utilised to improve study design irrespective of research paradigm. Future prospective cohort studies, for example, need to ensure that the first ever episode of low back pain is defined clearly and consistently to ensure the internal validity of such studies, and to facilitate the comparison of findings between them.

The findings from the qualitative study presented in this thesis offers insights into people's subjective experiences of the first ever episode of low back pain that can assist researchers' from a positivist background to define the first ever episode of low back pain in subsequent studies and thereby improve the knowledge gained from them. In particular, it is recommended that these researchers consider that:

- some people may have physical sensations in their lower back before the episode of low back pain that they consider their first ever episode. These physical sensations may be considered 'normal' and not a 'real' episode of low back pain when associated with the phenomena in Table 7.1. Researchers utilising a positivist perspective may therefore exclude physical sensations associated with the phenomena in Table 7.1 from their definitions of low back pain on the grounds that they are not 'real' episodes.

- Physical sensations i.e. aches and pains in the lower back and other parts of the body may conceal a 'real' episode of low back pain or be associated with another health condition e.g. kidney stones. Appropriate questions may elicit this information and ensure that only individuals with 'real' low back pain are included in research studies based on a positivist paradigm.

- Low back pain which is considered a 'normal' experience may be 'ignored' because it is not perceived to be a problem.

Until now, recall bias, considered to be a threat to the validity of prospective cohort studies by researchers from a positivist background, has focused upon the inability of study participants to recall a particular event such as a previous episode of low back pain (Carey et al 1995, Waxman et al 2000). The findings from this study, that low back pain considered a 'normal' experience may be 'ignored' because it is not considered a problem, reveals that some people do not necessarily forget having had an episode of low back pain but that they may not have fully committed the painful episode to memory in the first place, and may not have defined it as such. These people were aware, however, that they 'ignored' the pain and they were able to give a description of the painful episode albeit less clearly than their counterparts who did not recall 'ignoring' the pain. This suggests some aspects of memory were preserved. Appropriate questions should identify people who tend to 'ignore' pain. The tendency to 'ignore' phenomena is discussed further below where some participants recalled 'ignoring' and 'pushing worries to the back of the mind'.

STUDY'S SECOND AIM: LAY PERCEPTIONS OF THE ANTECEDENTS OF THE FIRST EVER EPISODE OF LOW BACK PAIN

The study's second aim was to explore descriptions of the participant's lives before their first ever episode of low back pain with a view to identifying any

antecedents of the first ever episode of low back pain that may possibly play an aetiological role. This aim was met by asking the participants to describe the onset of their first ever episode and its timing towards the beginning of each interview. In this way it was possible to place the phenomena that were discussed during the interview in context and identify whether they anteceded or followed the first ever episode of low back pain.

The antecedents of the first ever episode of low back pain were largely embedded in the interview transcripts and had to be inferred from the transcripts through inductive analysis. Iteration made the themes in Table 6.1 identifiable (DeSantis and Ugarriza 2000). These themes relating to stressful circumstances, physical activity and health, and their sub-themes are discussed below in relation to the evidence provided by the prospective cohort studies. The remaining themes in Table 6.1 i.e. getting older, familial influences and body build were discussed explicitly because they were perceived by participants to have caused the first ever episode of low back pain. Accordingly, these themes are discussed in relation to the study's third aim which was to learn about the participants' causal attributions.

STRESSFUL CIRCUMSTANCES

Psychological distress

The most robust positivist (quantitative) evidence to date regarding the possible antecedents of low back pain that may play a causal role is the evidence relating to psychological distress, contextually associated with strain and stress. Sufficient evidence was found in the literature, reviewed in chapter four, to suggest that there is a moderate ($p \leq 0.05$, $OR > 1 < 2$) to strong ($p \leq 0.05$, $OR \geq 2$) association between psychological distress and low back pain occurring for the very first time up to one year later in members of the general population between 18 and 74 years of age (Croft et al 1995); up to ten years later in young adults between 21 and 34 years of age (Mustard et al 2005) and in young people who were 23 years of age at baseline

(Power et al 2001). Potentially, the findings from these studies are important because, as Coggon (2005) points out, it is unusual for a risk estimate affecting large numbers of people to be confirmed as having a relative risk >2. The odds ratio of 2.52 in the study carried out by Power et al (2001) - Table 4.2 – is similar to a relative risk of >2 although it does need to be borne in mind that, as the risk estimate moves away from unity (i.e.1), the odds ratio will be greater than the relative risk (Crichton 2001).

The cohort studies suggesting that there is a moderate to strong association between psychological distress and the genesis of the first ever episode of low back pain used the following questionnaires to measure the aspects of psychological distress given below:

- General Health Questionnaire -anxiety and depression- (Croft et al 1995)
- SF-36 –anxiety, depression, behavioural / emotional control and psychological wellbeing- (Power et al 2001)
- Malaise Inventory -anxiety, depression, non-specific illness- (Mustard et al 2005).

The findings from the women's accounts presented in chapter six of this thesis resonate with these aspects of psychological distress: the women, who had a median age of 40 years (interquartile range, 31 to 49 years of age), commonly recalled feeling *'low'*, *'down'* and *'depressed'* and anxious before their first ever episode of low back pain although they did not necessarily use the word 'anxious'. Tina, for example, used the synonym *'nervous'.* In addition, the women commonly recalled non-specific symptoms: irritable bowel syndrome, headaches, asthmatic attacks, panic attacks and agoraphobia before their first ever episode of low back pain occurred. These non-specific symptoms were universally attributed to stressful circumstances.

In summary, it appears that psychological distress predicts the first ever episode of low back pain at the population level (Croft et al 1995, Power et al 2001, Mustard et al 2005) and it was also relevant to individual women participating in the interview study. However, for reasons discussed later (see third aim, below), it was unusual for the women to openly attribute their first ever episode of non-specific low back pain to emotional distress associated with their stressful circumstances.

The findings from the women's accounts not only resonate with the findings from the prospective cohort studies relating to psychological distress but they also advance knowledge in two ways. Firstly, the findings from the women's accounts suggest that their psychological distress may be associated with loss. The unifying theme of the women's accounts of their stressful circumstances before the first ever episode of low back pain was one of loss associated with changes in lifestyle, bereavement, relationship problems and job dissatisfaction. Secondly, the study's findings reveal lay theories regarding the potential pathophysiological mechanisms by which stress may cause the first ever episode of low back pain. These lay theories implicate alterations in breathing patterns and muscle tension. The breathing was described as being shallower and quicker, whilst the chest and other muscles felt *'tight'* as if they were *'holding everything in'*. States of *'mild panic'*, and being in a *'scared kind of mode'* with a dry mouth, *'sweating' and* feeling *'anxious',* and *'jumpy'* were also described. From a biomedical perspective, these states implicate alterations in neuroendocrine activity in the genesis of low back pain. Neuroendocrine activity affecting the metabolic activity in the back has been implicated in the genesis of low back pain previously although the precise mechanisms remain speculative (National Institute for Occupational Safety and Health 1997, Burton and Waddell 2004).

The men conceptualised aspects of their lives differently to the women. Instead of recalling any emotional distress associated with stressful circumstances, for example, they recalled an unhealthy lifestyle and reduced physical fitness because of their difficult circumstances (see below).

In addition to advancing knowledge about the women's and men's stressful and difficult circumstances respectively their accounts provide novel insights into how they dealt with their circumstances. These insights reveal that ignoring and pushing worries to the back of the mind; low mood and social withdrawal; irritation and anger; and having no one to confide in anteceded the first ever episode of low back pain. Further research is needed to determine whether these are general responses to stressful and difficult circumstances or play a causal role in back pain.

Pushing worries to the back of the mind

Ignoring psychological distress and either 'putting' or 'pushing worries to the back of the mind' emerged as strategies used to deal with emotional distress associated with stressful circumstances. It appeared from the lay accounts that the worries and unwelcome thoughts were either ignored or pushed to the back of the mind because the individual participants did not wish to dwell upon them, preferring instead to put the worries behind them and to get on with their life. The metaphorical expression, 'pushing worries to the back of the mind', suggests that repressing the worries shifted the emotional tension to the back possibly with the capacity to induce pathophysiological changes.

Usha, for example, who described pushing worries to the back of her mind, believed that her back pain was her body's way of taking away her worries and that her problem may lie in her mind and not her back. She reasoned that there was a link between her back and her brain because her pain got worse when she became more stressed and vice versa. Accordingly, she

thought that if she could make sense of her mind then she would no longer suffer from back pain.

Another woman, Lalit, stated explicitly that she pushed worries to the back of her mind to avoid feeling physical sensations in other parts of her body i.e. a heavy sensation in her throat and chest and to a lesser extent in her mind. These physical sensations occurred when she recalled emotional upset associated with her brothers stealing her inheritance.

The strategy of ignoring and pushing worries to the back of the mind was perceived to have been developed as a means of coping with adverse circumstances earlier in life. As discussed below, Mustard et al (2005) suggested that childhood conditions may shape exposure to causal (risk) factors for pain in adulthood. It follows therefore that one area for further research is the role, if any, of ignoring and pushing worries to the back of the mind and whether it is a trait acquired in childhood.

Low mood and social withdrawal (women)

The women who had difficulty coping with their stressful circumstances described going *'downhill'*, being *'low'* and of wanting to *'withdraw'* from everyone by staying in their room or wanting to 'crawl into a corner'; and of losing the volition to get up, to go out and do things. A tendency to low mood and social withdrawal is a recognised risk factor for chronic low back pain (Main and de Williams 2002). Healthcare professionals consider it a 'yellow flag' i.e. a psychosocial risk factor that identifies people who should be offered cognitive and behavioural management because they are at increased risk of developing chronic low back pain and disability (Kendall et al 1997, Waddell and van Tulder 2004). The finding in this study therefore, that the first ever episode of low back pain occurred in the context of low mood and social withdrawal, suggests that the phenomenon may occur

earlier than previously thought and is not necessarily solely a consequence of low back pain or a contributor to chronicity.

Irritation and anger

Other aspects of the perceived inability to cope before the first ever episode of low back pain included bursting into tears for no apparent reason, and becoming easily irritated and angry, particularly when feeling overworked and / or tired. Anger, ranging from mild irritation to hostility, is commonly observed among people complaining of pain (Fernandez and Turk 1995). From a biomedical perspective, the physiological effects are thought to be mediated through neuroendocrine activity i.e. sympatho-adrenomedullary and pituitary-adrenocortical activity that prepares the person for action and increases muscle tension (Fernandez and Turk 1995). Moreover, the importance of anger in pain is considered an area for further investigation (Fernandez and Turk 1995). The finding in this study suggests that, like low mood and social withdrawal, anger may occur earlier than once thought and may not only be a consequence of low back pain.

Lack of a confidante

A low level of social support is hypothesised to increase the risk of musculoskeletal disorder including low back pain (Johansson 1995, Karasek 1998). The prospective cohort study by Mustard et al (2005), however, found no predictive association between low levels of personal social support and social support at work and the first ever episode of low back pain.

The findings from the interview study presented in chapter six offer a tentative explanation why low levels of social support did not predict the first ever episode of low back pain in the cohort studied by Mustard et al (2005): the participants who attributed their first ever episode of low back pain to stressful circumstances (women) or an unhealthy lifestyle associated with

difficult circumstances (men) universally recalled having no one person to confide in. Having no one to confide in to 'buffer' the effects of psychological distress may therefore be the means by which low levels of social support increase the risk of musculoskeletal disorder.

It is possible that Mustard et al (2005) found no predictive association between low levels of social support and the first ever episode of low back pain because of the methods they used to measure the construct of social support. Instead of assessing whether participants had a confidante, personal social support was operationalised as 'infrequent contact' and 'problematic relationships with friends and with family' while social support at work was defined from a scale containing eight questions that inquired about social support received from co-workers and supervisors (Karasek 1985). Also, it is relevant to note that, in contrast to the positivist (quantitative) approach adopted by Mustard et al (2005), the interpretive (qualitative) approach utilised in the interview study permitted the exploration of individual differences in social support. Low levels of social support appeared more important to some participants (i.e. to those who had no confidante) compared to others (i.e. to those who had a confidante).

Reduced physical fitness (men)

This is thought to reduce the muscular capacity of the lumbar spine to withstand the forces it is subjected to during daily activities and thereby playing a role in the incidence of low back pain (Chaffin et al 1978, Keyserling et al 1980, Biering-Sorensen 1984a, Masset et al 1998). Accordingly, four research groups were found to have studied indices of physical capacity in the endeavour to ascertain whether reduced muscular capacity may play a role in the incidence of low back pain (Biering-Sorensen 1984a, Troup et al 1987, Masset et al 1998, van Poppel et al 1998). The evidence emanating from the four cohort studies was found to be inconsistent regarding the role, if any, of shorter trunk muscle endurance

(van Poppel et al 1998, Biering-Sorensen 1984a) and reduced spinal movement (Biering-Sorensen 1984a, Troup et al 1987, Masset et al 1998) in the incidence of low back pain in men. Furthermore, reduced spinal movement did not appear to play a role in women (Biering-Sorensen 1984a) and reduced trunk muscle strength did not appear to play a role in the incidence of low back pain either in men or women (Biering-Sorensen 1984a, Troup et al 1987, van Poppel et al 1998).

Similarly to the four research groups in the above paragraph i.e. Biering-Sorensen (1984a), Troup et al (1987), Masset et al (1998) and van Poppel et al (1998) who carried out the prospective cohort studies, some men participating in this interview study believed that their first ever episode of low back pain may have been caused by reduced muscular capacity. In particular, the men spoke about a perceived loss of muscle tone and muscle weakness resulting in their back muscles being unable to support alterations in posture and movement during daily activity. Moreover, the findings from the men's interviews offer one possible explanation why the indices of physical capacity i.e. spinal movement, trunk muscle endurance and strength might not predict an association with the incidence of low back pain consistently. The men's theory was that they had a more general reduction of physical capacity that included, but was not restricted to, the musculature and was secondary to difficult circumstances. The reduced physical capacity was described as a loss of physical fitness characterised by fatigue, lethargy, shortness of breath on exertion, reduced energy and motivation to take exercise, and of a reduced ability to use time efficiently. This loss of fitness was attributed to an unhealthy lifestyle, ageing and playing less sport. In addition, it was thought that the reduced fitness resulted in the tendency to be more prone to injury.

Sporting activities

Sport and keeping fit were central to the men's lives prior to low back pain and seemed to define their concept of being a man. The Lombardian ethic that 'winning isn't everything, it is the only thing' (Messner 1995) appeared to hold true in that some men thought that they had caused their own back pain by pushing themselves on past the pain threshold irrespective of whether they were competing in team sports e.g. football or with themselves in the gymnasium. Furthermore, the ethic of pushing on past the pain threshold appeared to spill over into other activities such as gardening and DIY. Kevin, for example, recalled *'killing'* his back in the garden and Adil described *'damaging'* his back by setting himself heavy targets to complete building a rockery. These findings from the interview study, however, do not 'fit' the findings from the cohort studies: participating in sporting activities (Burdorf et al 1996), playing sport regularly, gardening weekly and participating occasionally or frequently in DIY activities did not appear to predict the first ever episode of low back pain in men at the population level (Croft et al 1999). This highlights the point made earlier that cohort studies may reveal knowledge at the population level which may not necessarily have any relationship with cause and effect at the individual level, nor with the individual person's beliefs regarding the cause of their back pain (Charlton 1995, van Poppel et al 1998).

The men's theory, that they caused their own back pain may possibly explain why the cohort studies found participation or non-participation in sport and frequency of participation did not predict the incidence of low back pain at the population level (Table 4.2). It may possibly be the manner in which an activity is carried out that is the important factor. A person's physical capacity relative to the physical demands they place upon their back may therefore be an area for further research.

It is also possible that the gendered context of the interview, whereby the men were interviewed by a female researcher, may have resulted in the men exaggerating their commitment to sport or fitness when making attributional claims for their first ever episode of low back pain, a topic discussed further below.

With regards to women, the evidence from the cohort studies, reviewed in chapter four, was similar to that for the men: gardening and DIY activities did not appear to predict the first ever episode of low back pain (Croft et al 1999). In contrast to the results from the men, however, a moderate level of evidence ($p \leq 0.05$, $RR > 1 < 2$) from a single study by Croft et al (1999) suggests that playing sport regularly predicts the incidence of low back pain in women. Women in the western world are less likely than men to participate in sporting activities (Klomsten et al 2005) and concomitantly it was uncommon for the women in the interview study to recall participating in sporting activities before their first ever episode of low back pain. Nonetheless, Jane thought that her low back pain was caused by sport because her first ever and subsequent episodes of low back pain coincided with playing tennis. Similarly to the men, she thought overdoing activity may have caused her back pain, but in terms of repetitive movements with insufficient time for healing processes to occur in-between tennis matches. Also, she thought, getting older and being less fit physically having stopped exercising in a gymnasium reduced her physical capacity so that her body took longer to recover from any damage. Thus a multi-factorial explanation was offered.

Perceived disposition to physical activity and an active lifestyle

The participants' perceived disposition to physical activity and an active lifestyle in the weeks and days leading up to the first ever episode of low back pain was a shared experience, recalled by all but two of the participants (see below). The elements of the disposition to physical activity included:

keeping going and overdoing it; doing things in a hurry; setting and achieving goals and an inability to be still. Similarly, the perceived active lifestyle in the weeks and days leading up to the first ever episode of low back pain appeared to share some of the characteristics of the disposition to activity. The perceived active lifestyle included working harder, and working long or longer hours than once done, getting on with things, pushing on with physical activities; fitting a lot in and being *'on the go'* all the time. Being *'on the go'* all the time, either because of difficulties travelling to and from work, or because of the nature of the work were, like all the elements of the disposition to activity, conspicuous features of the participants' accounts of life before they experienced low back pain for the very first time. None of the participants, however, explicitly attributed their first ever episode of low back pain to their high level of activity.

The literature, reviewed in chapter four, suggests that neither a disposition to activity nor an active lifestyle are commonly regarded by epidemiologists and health professionals as possible risk factors for the incidence of low back pain. Only two cohort studies studied perceived levels of activity in the genesis of low back pain. These studies investigated whether the perception of greater physical job demands (Mustard et al 2005), and the perception of lower levels of physical activity during leisure time associated with loss of fitness (Croft et al 1999), predicted the incidence of low back pain. Both studies found the hypothesised causal (risk) factors increased risk of low back pain but the findings were statistically non significant and may therefore have occurred by chance (Table 4.2).

Given that the cause of low back pain is generally understood by epidemiologists to have a multi-factorial aetiology, it was remarkable to find the participants' near universal recall of a disposition to participating in physical activity and an active lifestyle before the first ever episode of low back pain. This raises the question of whether the perceived disposition to

activity and / or an active lifestyle could possibly be risk markers (i.e. factors associated with the risk of experiencing the first ever episode of low back pain that do not necessarily play a causal role) or risk factors that play a causal role (Burton and Waddell 2004, Yarnell 2007). With regard to the latter, it may be that the many factors hypothesised to cause low back pain only trigger back pain in certain settings. This perceived disposition to physical activity and an active lifestyle before the first ever episode of low back pain therefore warrant further investigation. Furthermore, it is not known whether the perceived disposition to physical activity and the active lifestyle are alterations of perception with the passage of time or 'real'.

The disposition to activity was perceived by the participants to have been part of their personality since they were young. Hereditary and acquired factors such as having active parents and learning from them, were all thought to be associated with the development and enjoyment of the active lifestyle and the preference for physical activities. Hyperactivity, associated with emotional and behavioural problems, although uncommon, was recalled in childhood. Tom, for example, talked about being *'hyper'* and not settling down to work at school, while Amy recalled not being allowed certain food colours because they made her hyperactive. In addition, Amy spoke about her emotional problems such as feeling low and *'stroppy'* and storming off when upset by friends and family.

Mustard et al (2005) found that emotional and behavioural disorders (hyperactivity, conduct disorder or emotional disorder) in childhood predicted incidence low back pain in young adults aged between 21 and 34 years of age, the same age as Tom and Amy when they experienced their first ever episode of low back pain. On the basis of this finding, Mustard et al (2005) concluded that the incidence of low back pain may either be associated with the latent effects of childhood experiences or set the child on a trajectory that determines exposure to settings and causal (risk) factors for incident low

back pain in adulthood. It is possible therefore that the perceived disposition to and the participation in activity may be one of the latent effects of childhood experiences and / or childhood conditions that shape exposure to causal (risk) factors in adulthood (Mustard et al 2005).

The participants' preference for physical activity is not apparent in the literature relating to causal factors in the incidence of back pain. It is relevant to note, however, that their paid work (Table 5.4), home-keeping responsibilities and / or leisure time activities frequently involved physical activity e.g. sports, DIY, gardening. With the exception of Elka and Irene (see below) sedentary leisure occupations, such as reading, did not appear to be an important feature of the participants' lives before their first ever episode of low back pain.

Two participants, Elka and Irene, did not regard themselves as having either a disposition to physical activity or an active lifestyle before their first ever episode of low back pain, although Elka did recall having a more active lifestyle during her childhood in Poland. The reason why they differed from the other participants is not clear. The finding reveals that a perceived disposition to physical activity and / or an active lifestyle before the first ever episode of low back pain is not a universal phenomenon and it may be a matter of perception that differs between people. Another possible explanation is that the two women may have had, an as yet unidentified non-specific low back pain, that differed from the other participants or an unidentified specific low back pain. While both women experienced low back pain without either radiation to the leg or neurological signs on examination – Table 5.3- (Spitzer 1987), Elka recalled having a 'slipped disc' diagnosed using magnetic resonance imaging (MRI) in-between being recruited to the study and the study interview. The MRI scan was performed because an earlier x-ray revealed the possibility of a lytic lesion. Irene had Crohn's

disease which is associated with specific back pain through osteoporosis and osteopenia (Schoon et al 2000).

The near universal finding and emphasis within the participants' accounts of a perceived disposition to activity and the recollection of an active lifestyle prompted a search to identify whether these phenomena had been discussed previously in the literature. This search found that Blumer and Heilbronn (1981) had described 'ergomania' in patients with chronic pain. 'Ergomania' is defined as 'excessive work performance, often since childhood or early adolescence, and a history of generally relentless activity' (Blumer and Heilbronn 1981). Later, Van Houdenhove (1986, 1992) and his colleagues (1987) studied hyperactivity. Hyperactivity was operationalised as 'action-proneness': (1) the person started to work early, at home or elsewhere; (2) an inability to relax, always being busy with a tendency to perfectionism; (3) excessively engaged in heavy work or sports; and (3) combined multiple jobs or other activities (Van Houdenhove 1986). Furthermore, Van Houdenhove et al (1987) found that patients with non-specific chronic musculoskeletal pain described themselves retrospectively as more 'action-prone' compared with either patients with chronic pain of a specific nature and patients with chronic neurotic / dysthymic conditions and no pain as a primary complaint. Age, occupational status and depression level were not responsible for the observed differences (Van Houdenhove et al 1987). Van Houdenhove (1986, 1992) and his colleagues (1987) do not define chronic pain, nonetheless it appears that the concept of 'action-proneness' shows characteristics similar to the disposition to activity and active lifestyle perceived by the participants in this study.

HEALTH PROBLEMS

Research evidence suggests that people with non-specific low back pain commonly report having other non-specific symptoms of ill-health (Hestbaek et al 2003c). Nine prospective cohort studies were found during the literature

search, described in chapter four, to have questioned whether these non-specific symptoms antecede and predict the first ever episode of low back pain (Biering-Sorensen and Thomsen 1986, Symmons et al 1991, Pietri et al 1992, Von Korff et al 1993, Croft et al 1995, Masset et al 1998, Croft et al 1999, Power et al 2001, Mustard et al 2005). The findings from these prospective cohort studies provide strong evidence (≤0.05, OR≥2) that reporting:

- three or four non-specific symptoms predicted the incidence of low back pain up to three years later in commercial drivers (Pietri et al 1992);

- one or more painful conditions predicted the incidence of back pain during the following year in members of the general population registered with a Health Maintenance Organisation (Von Korff et al 1993);

and

- joint pains in different parts of the body apart from the back predicted low back pain during the following nine years in middle aged women (Symmons et al 1991).

No painful condition in any one anatomical location predicted the incidence of low back pain with the possible exception of abdominal pain (Biering-Sorensen and Thomsen 1986, Symmons et al 1991, Von Korff et al 1993, Masset et al 1998). Biering-Sorensen and Thomsen (1986) found that a history of abdominal pain predicted the incidence of low back pain whilst Von Korff et al (1993) did not.

In addition, moderate evidence (p≤0.05, OR or RR>1<2) from a single study suggests that women but not men who rated their health as ‘fair’ compared with their peers’ health were more likely to experience incident low back pain during the following year (Croft et al 1999).

The findings from this qualitative interview study resonate with the findings from these cohort studies: the participants, especially the women, commonly recalled experiencing non-specific symptoms including painful conditions in different parts of the body but not in any particular anatomical location. Moreover, the women more commonly recalled experiencing non-specific symptoms for the very first time during the year before their first ever episode of low back pain compared with any other year during the five year period before the first ever episode of low back pain. This particular finding resonates with the finding from the study by Croft et al (1999) that found women who rated their health as 'fair' compared with their peers' health were more likely to experience incident low back pain during the following year at the population level.

With regard to the study by Pietri et al (1992), suggesting that 3 or 4 non-specific symptoms predicted the incidence of low back pain, inferences cannot be drawn from the qualitative interview study regarding the prevalence of symptoms given the purposive sampling method utilised to recruit participants to the study. Nonetheless, the study's findings do advance knowledge about: (1) the nature of the non-specific symptoms perceived by the participants; (2) explanations for their occurrence and (3) patterns between the symptoms.

Firstly, in addition to perceiving non-specific musculoskeletal aches and pains in parts of the body other than the lower back; low mood states (feeling low, down and depressed); and poor general health including feeling run down were also recalled. These symptoms were the most commonly reported symptoms irrespective of whether or not they were perceived to be longstanding symptoms (>5 years); symptoms that occurred within the five years preceding the first ever episode of low back pain or symptoms that occurred immediately before the first ever episode of low back pain. Low mood, loss of vitality and non-specific symptoms have been observed to

predict the onset of recurring episodes of low back pain (Bongers et al 1993, Coggon 2005) However, they have not previously been reported before the episode of low back pain perceived to be the first ever episode.

Secondly, the first ever episode of low back pain was commonly perceived to occur in the context of non-specific symptoms universally attributed by the women to their stressful circumstances. These symptoms were irritable bowel syndrome, asthmatic attacks, panic attacks, agoraphobia, headaches and feeling run down, low and depressed. The reason why the women attributed these non-specific symptoms to stress was because they occurred in the context of and were thought to be triggered by circumstances perceived as stressful. In addition, they occurred in a part of the body thought to be affected by stress i.e. the head, neck or stomach. The lower back was not regarded by the women to be a part of the body that was affected by stress.

Thirdly, there appeared to be no pattern or link between the non-specific symptoms associated with stress and the first ever episode of low back pain. The women said that their non-specific symptoms did not appear to co-occur with the first ever episode of low back pain and that there appeared to be no pattern between the onset of the non-specific symptoms and the incidence of low back pain. This suggests that the first ever episode of low back pain may be part of a general episodic non-specific health disorder. If the non-specific symptoms share a pathophysiological mechanism it may be one associated with stressful responses. Further research into these findings may result in a greater understanding of the pathophysiology of low back pain.

In contrast to Biering-Sorensen and Thomsen's (1986) study, the participants did not recall attending hospitals either for in or out patient operations before their first ever episode of low back pain. Generally, the

participants complained of non-specific symptoms as discussed above and not specific symptoms requiring operations.

STUDY'S THIRD AIM: LAY CAUSAL ATTRIBUTIONS FOR THE FIRST EVER EPISODE OF LOW BACK PAIN

The study's third aim was to understand the participants' causal attributions for their first ever episode of low back pain. Knowledge of these beliefs is potentially important for the development and introduction of preventive strategies deemed by patients to be relevant, as well as to generate causal theories for further research. Lay causal theories have been found to advance knowledge in other specialties. The causal attributions of myocardial infarction patients rather than those of their physicians, for example, have been found to predict subjective rehabilitation (Gilutz et al 1991). Hitherto, in back pain, studies of causal attributions have focused upon the aetiology of recurrent episodes of low back pain and their impact on the course of low back pain for secondary prevention and not on causal attributions for the first incidence of low back pain.

In contrast to the perceived antecedents of low back pain that were largely embedded in the participants' accounts and had to be inferred from them (see second aim, above), the participants spoke openly about their attributions for their first ever episode of low back pain. Typically, a participant's causal attribution was prefaced by a phrase such as *'I don't know'* or *'Haven't a clue'*, revealing uncertainty about the origin of the first ever episode of low back pain. Nonetheless, the uncertainty did not prevent the participants proceeding to identify one or more factors perceived to be the cause of their low back pain. A summary of the participant's causal theories for their first ever episode of low back pain, initially presented in chapter six, are represented in Table 7.2. Commonly, these theories were related to the particular activity being performed when the low back pain was perceived for the very first time. Less commonly, where the first ever episode

of low back pain did not occur contemporaneously with an activity the back pain was attributed to an activity that 'fitted' the participant's beliefs about the cause of back pain. Where the first ever episode of low back pain occurred towards the end of the day, for example, the episode was commonly perceived to be the consequence of lifting a heavy object earlier that day.

The participants acknowledged that their causal attributions had been shaped by health professionals including doctors, physiotherapists and radiologists e.g. *my doctor said….', 'after the x-ray they said…'*; family members e.g. *'my father said…'* , folklore e.g. *'people say…'* and the media including newspaper articles. Health beliefs are thought to be strongly influenced by the media (Coggon 2005). In addition, some participants indicated that their initial attribution for their first ever episode of low back pain had been modified by their experience of subsequent episodes of low back pain. Lee, for example, initially thought that his school bed had caused his back pain but later he attributed the back pain to playing rugby against boys whom he perceived to be physically stronger than himself. A second example was provided by Hazel, who initially thought that her first ever episode of low back pain was due to stress, but later changed her mind because she did not think that stress would cause recurrent episodes of low back pain. This 'response shift' (Schwartz and Sprangers 1999) i.e. re-conceptualisation of the cause of the first ever episode of low back pain as a result of subsequent episodes of pain is a consideration for the design of future studies. Researchers may decide to 'control' for the effects of this 'response shift' by recruiting participants with a single episode of low back pain.

Generally, the participants perceived one or more factors to have triggered their first ever episode of low back pain in a linear manner, similar to the hypothesised risk factors subjected to linear regression analysis in the cohort studies reviewed in chapter four. Occasionally, the participants perceived

their first ever episode of low back pain to be due to a confluence of factors. Adil, for example, thought that his back ache was associated with his reduced physical fitness and poor lifestyle which, in turn, was linked with his family and financial situation. Moreover, he believed that he would not have back ache if his lifestyle and physical fitness improved.

None of the participants could explain why an activity carried out many times before should cause low back pain for the very first time. The only plausible reasons were thought to be internal factors that made them more vulnerable to the effects of an activity perceived to cause low back pain. In particular, a familial susceptibility to back pain, a structural weakness of the back, and ageing were thought to increase vulnerability to low back pain. The emphasis on the ageing process and the concept of accelerated ageing from the cumulative effects of activities, such as *'lugging'* boxes around for many years, implicated degenerative changes in the genesis of back pain. Degenerative changes, such as wear and tear and deterioration of the bones, were also stated explicitly. Inherent within the beliefs that familial influences, a structural weakness of the back and ageing played a role in the aetiology of low back pain was the assumption that the first ever episode of low back pain may in part be beyond a person's control and an inevitable consequence. The lay beliefs regarding ageing at the individual level however differ from those at the population level. The evidence from the prospective cohort studies reveals that age does not appear to play a role in the genesis of low back pain at the population level and may possibly confer protection in women between 60 and 70 years of age (Symmons et al 1991, Pietri et al 1992, Von Korff et al 1993, Burdorf et al 1996, van Poppel et al 1998, Croft et al 1999, Mustard et al 2005). If confirmed by further research, preventive strategies may need to address this discrepancy in perspectives. Strategies introduced at the population level are unlikely to be successful if they do not 'fit' lay beliefs.

It can be seen from Table 7.2 that some but not all causal theories were shared by the participants and the research groups who carried out the prospective cohort studies reviewed in chapter four. Many of the shared causal theories are in keeping with the traditional biomedical understanding, on which public health is based, that the cause of low back pain is biomechanical and physical in nature (Waddell 2004f). Moreover, some causal theories were shared by the two groups: ageing; standing, walking and sitting; participating in sporting activities; lifting and moving objects; and a combination of lifting, lowering and moving –pulling and pushing- objects (manual materials handling) were considered possible causes by both the participants and the research groups who had studied these possible causes in the prospective cohort studies in chapter four. The outcome of the systematic review in chapter 4 however, reveals evidence that ageing is not associated with the incidence of low back pain and that the evidence regarding the other causal theories is equivocal. Consequently, it is not possible to justify directing preventive strategies towards these causal theories at the population level.

Table 7.2 Summary of lay and health professionals causal attributions for the first ever episode of low back pain

Activity	Lay attributions	Research group's attributions (Causal hypotheses tested in prospective cohort studies)
Waking in the morning	Sleeping posture (Angela) soft mattress (Elka,Adil,Lee, Brenda) lifting wheelchair previous day (Angela)	-
Bending down	*'Bending the wrong way'* (Rushani) *'bending in a different way'* (Dinesh) *'bent stupidly'* (Denise)	-
Familial susceptibility	Brother(s) have low back pain (Dinesh,Lee) weak back (Lalit,Angela) genetic (Linford,Denise) weak muscles & bones (Hazel) the way I am made (Elka)	-
Miscellaneous	*'Just one of those things'* (Kevin) *'self-inflicted'* (Kevin) *'bad luck'* (Sirina,Hazel) abused body over time (Brenda) *'random, something silly'* (Tom) *'just waiting to happen'* (Lee) sleeping on damp mattress in air raid shelter (Irene) lack of vitamins (Lalit)	-
Age	Age-related weakness (Hazel,Joan) weak muscles (Nipa) *'wear & tear'* (Chandra,Hazel,Lalit,Gita,Rushani,Joan) *'stiffness'* (*Joan*) *'degenerative changes'* (Irene,Joan); deterioration of the bones (Joan) muscles (Joan) joints (Margaret,Joan) spaces in-between the joints (Hazel); *'calcium deposits'* (Rushani) body slow to heal following injury (Jane,Joan) general ageing (Irene,Kevin,Brenda,Hazel,Jane)	Age groups (Pietri et al 1992,Von Korff et al 1993,Burdorf et al 1996 Croft et al 1999,Mustard et al 2005)
Lifting /picking up & moving an object	Lifting: compost from car boot (Sirina) TV (Ashok) pizza pans from floor (Tariq) oil can (Nipa) car engines (Brenda) garden weed (Irene) soap from shower floor (Dinesh) patients at work (Rushani) boxes for years (Denise) something or twisted (Oditi) after inactivity (Dinesh)	Lifting (non-work) (Croft et al 1999) lifting / moving heavy weights > 11kg & number of years (Macfarlane et al 1997) carrying loads at work (Pietri et al 1992)

Activity	Lay attributions	Research group's attributions (Causal hypotheses tested in prospective cohort studies)
Psychological distress	Marital separation, worry & financial problems (Usha) lifestyle change (Brenda) stressful life (Gita,Priti)	Level of depression & anxiety (Croft et al 1995) anxiety, depression, behavioural / emotional control & psychological wellbeing (Power et al 2001) anxiety, depression & non-specific symptoms (Mustard et al 2005)
Sport	Over-exertion (Kevin) lifting in the gym incorrectly (Linford) repetitive movement playing tennis (Jane)	Participation in sport (Burdorf et al 1996) regular participation (Croft et al 1999) Golf: frequency playing; no. of lessons; handicap; warm up first (Burdorf et al 1996)
Anthropometric characteristics	Height so has to bend at work (Kevin) underweight (Oditi) overweight (Tina)	Height (Croft et al 1999) overweight (Aro & Leino 1985,Masset et al 1998,Croft et al 1999) BMI (Nissinen et al 1994,Croft et al 1999,Lake et al 2000,Power et al 2001,Mustard et al 2005) growth of BMI (Nissinen et al 1994) femur epicondylar width, leg length, hamstring length, sitting height, trunk asymmetry, kyphosis, increase in kyphosis at 12.8yrs (Nissinen et al 1994) trunk imbalance (Masset et al 1998)
Sitting	Prolonged sitting at work with back unsupported (Joan) sitting in-between sets of tennis in cold weather (Jane) sitting & stretching backwards to throw paper in bin (Vijay) slouching (Amy,Adil,Tom,Lee,Brenda)	Prolonged sitting at work (Burdorf et al 1996,Macfarlane et al 1997) time spent sitting watching TV daily (Croft et al 1999)
Standing	*'Standing doing nothing'* (Rahul)	Standing at work(Pietri et al 1992) prolonged standing at work (Burdorf et al 1996,Macfarlane et al 1997) number of years standing at work (Macfarlane et al 1997)
Walking	On concrete in thin soled shoes (Hazel)	Prolonged periods walking at work (Burdorf et al 1996, Macfarlane et al 1997) walking daily during leisure time (Croft et al 1999)

Activity	Lay attributions	Research group's attributions (Causal hypotheses tested in prospective cohort studies)
Level of activity	*'On the go all the time'* with frequent changes in posture, no back support, moving & lifting objects (Margaret,Amy) doing something after period of inactivity (Rahul)	Physical activity same / less than peers (Croft et al 1999) physical job demands (Mustard et al 2005)
Gardening	Hard work in garden (Irene)	Weekly gardening (Croft et al 1999)
Job dissatisfaction	-	Low job satisfaction (van Poppel et al 1998, Mustard et al 2005) level of strain (Mustard et al 2005)
Physical capacity of trunk	-	Trunk muscle strength (Biering-Sorensen 1984a,Troup et al 1987, van Poppel et al 1998,Masset et al 1998) trunk muscle endurance (Biering-Sorensen et al 1984a,van Poppel et al 1998) movement velocity (Masset et al 1998) lifting capacity (Troup et al 1987) spinal movement (Biering-Sorensen 1984a,Troup et al 1987,Masset et al 1998)
Ill-health	-	General health (Biering-Sorensen & Thomsen 1986,Croft et al 1999, Masset et al 1998,Mustard et al 2005) non-specific symptom(s) (Pietri et al 1992) painful condition(s) Symmons et al 1991,Von Korff et al 1993,Masset et al 1998; depression (Von Korff et al 1993)
Childhood behavioural & emotional disorders	-	Present (Mustard et al 2005)
Smoking	-	Daily (Biering-Sorensen & Thomsen 1986) current/ex smoker (Croft et al 1999,Pietri et al 1992) smoked before & since 16yrs moderately or heavily (Power et al 2001) light/heavy smoker (Mustard et al 2005)
Gender	-	Women & men (Von Korff et al 1993,Pietri et al 1992,Mustard et al 2005)

Activity	Lay attributions	Research group's attributions (Causal hypotheses tested in prospective cohort studies)
Number of children	-	≥ 3 children (Mustard et al 2005)
Social Support	-	Contact & problematic relationships with family & friends; level of support from work supervisors & co-workers (Mustard et al 2005)
Socio-economic status	-	Education (Von Korff et al 1993,Burdorf et al 1996,Mustard et al 2005) manual social class (Power et al 2001) parental education (Mustard et al 2005)
Radiological changes & abnormalities	-	Development & degeneration of disc & incident fractures (Symmons et al 1991) developmental & degenerative changes (Ogon et al 2001)
Driving	-	Longer distance home to work (Biering-Sorensen & Thomsen 1986) distance per year (Massett et al 1998) no. hours driving each week (Macfarlane et al 1997) uncomfortable car seat (Pietri et al 1992,) truck driving (Macfarlane et al 1997) less time operating forklift truck (van Poppel et al 1998)
DIY	-	Frequency (Croft et al 1999)
Digging & shovelling at work		Yes/no (Macfarlane et al 1997)

Context played an important role in the participant's causal attributions thereby providing theories about the setting in which low back pain may occur. Some of the participants, for example, attributed their first ever episode of low back pain to lifting a heavy weight, such as a bag of compost out of a car boot, but more commonly they attributed their first ever episode of low back pain to lifting a light object e.g. a bar of soap from the shower floor. The lay causal theories therefore suggest that it is not necessarily the weight that is important but the movement itself. Furthermore, there is objective evidence to support this theory: frequent heavy lifting in the work place is implicated in degenerative damage to the hip joint but not to non-specific low back pain (Coggon 2005).

In deciding what factors may have caused their first ever episode of low back pain, the lay accounts included concepts similar to Bradford Hill's (1965) causal criteria used by contemporary epidemiologists. For example, the participants appeared to consider a 'dose-response' relationship when they attributed low back pain to lifting heavy weights or to the cumulative effects of a particular activity such as the number of years spent performing an activity. A temporal sequence of exposure and effect was also an important feature of the participants' accounts and needed to be present before a factor could be considered causal. 'Biological plausibility' was also an important feature: the lower back, unlike the head, shoulders and stomach, for example, was not perceived to be a part of the body affected by stress and it was this belief together with the absence of a temporal relationship, that led the majority of the participants to conclude that back pain was not a stress-related symptom.

The finding that the participants and the research groups who carried out the prospective cohort studies shared some theories regarding the cause of the first ever episode of low back pain; and that the participants used concepts similar to Bradford Hill's (1965) causal criteria, is in keeping with the

observation that medical explanations for common physical symptoms, such as back pain, have become ingrained into contemporary western societal beliefs and everyday language (Peters et al 1998, Campbell and Muncer 2005). All the participants had consulted two or more healthcare practitioners, including a doctor and a physiotherapist, by the time they were interviewed. It is possible therefore that they chose to consult these practitioners because they believed that their problem was relevant to physical medicine i.e. that they considered the doctor and the physiotherapist the most appropriate practitioners to consult about their back pain and that they would be prepared to accept treatment and advice from them (Ogden 2003). People's beliefs about health and illness are thought to determine whether they seek medical care and the extent to which they follow the advice and intervention given to them (Open University 2009). The participants were not unquestioning about their healthcare practitioner's views about the cause of their back pain however. Frequently, during the interviews, for example, the participants said 'my doctor [or physiotherapist] said it was [caused by]…..' indicating that there was some doubt in their mind about the cause of their low back pain.

Table 7.2 also reveals some differences between the causal influences identified in previous quantitative research, and the current participants' causal beliefs. Some participants attributed their first ever episode of low back pain to aspects of sleeping e.g. a soft mattress, to bending down, and to various idiosyncratic factors (e.g. sleeping in a damp cellar and a lack of vitamins) that were not hypothesised by the research groups to play a causal role. That these factors have not been studied longitudinally may be because relatively few prospective cohort studies have been carried out and that there is insufficient evidence to warrant investigating them further.

In contrast to published quantitative evidence, the qualitative accounts did not consider driving; the size and proportions of the body (anthropometry) other than height and body weight; physical capacity of the trunk; childhood behavioural and emotional disorders; gender, number of children; social support; socio-economic status; DIY; and digging and shovelling at work to be causal. Smoking was seen by the participants as important in the cause of cardiovascular disease and unimportant in the onset of low back pain.

APPRAISING THE QUALITY OF THE STUDY

The study presented in this thesis is evaluated below using the UK Government's criteria for appraising the quality of qualitative research. These criteria were developed by the National Centre for Social Research on behalf of the Government's Chief Social Researcher's Office (Spencer et al 2003a). As discussed previously, in chapter five, these criteria were selected to guide and appraise the quality of the research presented in this thesis for two reasons. Firstly, the criteria are consistent with the subtle realist position on which the study was based. Secondly, the criteria are founded on robust and rigorous research evidence that build upon existing methods of assessing quality (Spencer et al 2003a).

The criteria take the form of eighteen open ended questions (Table 5.5). Each question is responded to, in turn, below so that the reader may appraise the quality of the study within this thesis. At the end of each question the aspect of study design or general feature (e.g. reflexivity) that the particular question relates to is placed in parentheses. The first five questions relate to the study's findings, for example, and consequently the word, 'findings' is placed at the end of each of the five questions. The sixth question relates to the study design; the seventh and eight questions to the study sample; the ninth question relates to the data collection; the tenth to thirteenth questions to the data analysis; the fourteenth and fifteenth questions to reporting the study's findings; the sixteenth question to

reflexivity & neutrality; the seventeenth question to ethics, and finally the eighteenth question to audibility. In responding to each question, the guidance on utilising the questions was followed (Appendix 14).

HOW CREDIBLE ARE THE FINDINGS? (FINDINGS)

Credibility or validity in interpretive (qualitative) research is a concept parallel to internal validity in positivist (quantitative) research that was discussed earlier in relation to the prospective cohort studies reviewed in chapter four (Guba and Lincoln 1981, 1989). The findings of this study are considered credible i.e. an accurate representation of the phenomena studied. This conclusion is based on the widely held view that an important aspect of establishing the credibility of a study's findings is the provision of a clear account of the methods involved in their production and the reasons why the particular approaches and methods were selected –Table 5.1- (Murphy et al 1998, Lewis and Ritchie 2003). This enables the reader to evaluate the quality of the data collection and its analysis. Accordingly, chapter five contains a detailed account of how the participants were recruited through NHS physiotherapy and medical outpatient clinics; the selection of in-depth interviews to collect the data; and the management and analysis of the interview data using Framework to generate the study's findings (Ritchie and Spencer 1994, Ritchie et al 2003a). Strategies to ensure the credibility / validity of the inquiry i.e. reflexivity, attention to negative cases and fair dealing are also discussed (Table 5.1). Justification for these methods and the underlying ontological belief of subtle realism and epistemological beliefs are also addressed.

The use of corroborating evidence to verify the findings was not included in this study. Triangulation, for example, seeks a single reality which is not consistent with the ontological position of subtle realism (Hammersley 1992). Subtle realism acknowledges multiple perspectives of the same phenomenon that are considered equally valid (Murphy et al 1998). Similarly,

respondent validation (member checking) was not utilised in the study because it assumes that there is a fixed truth or reality (Murphy et al 1998). Furthermore, there is no reason to assume that individual participants should be expected to recognise themselves or their experiences where phenomena have been synthesized and taken out of context. In this study, for example, while some themes were explicitly expressed by individual participants other themes were embedded in the data i.e. the themes were implicit and had to be inferred from the data by the researcher. As DeSantis and Ugarriza (2000) point out: 'iteration makes [these] themes identifiable and converts them from the emic-implicit meaning of participants to the etic-explicit meaning of the researcher'. Another reason for not utilising respondent validation was that the participants' views may have altered since their interview and consequently they may have not been able to validate the study's findings. Some participants, particularly those who ignored phenomena and pushed worries to the back of the mind, for example, may have had difficulty recalling information to answer questions put to them during the interview. The experience of the interview process may therefore have given these participants the opportunity to reflect upon their experiences and thereby recall phenomena and alter their views about the topics discussed (Cioffi 1996).

HOW HAS KNOWLEDGE / UNDERSTANDING BEEN EXTENDED BY THE RESEARCH? (FINDINGS)

The most robust evidence, from a positivist (quantitative) perspective, regarding the hypothesised causal (risk) factors in the aetiology of low back pain is presented in chapter four, in the form of a systematic review. The evidence, generated from the reviewed prospective cohort studies however is not without any limitations. The limitations include the conceptualisation of a linear relationship between exposure to a hypothesised causal (risk) factor and the first ever episode of low back pain; the removal of hypothesised causes from the natural setting in which they occur thus restricting knowledge of the effects of risk factors in different settings; and the provision

of knowledge of the effects of risk factors at the population level which may not provide information about the effects in individuals (Rockhill 2005) and individuals' causal attributions amongst other factors. These limitations are, in turn, the strength of interpretive (qualitative) inquiry. Accordingly, an interpretive (qualitative) perspective was adopted to guide the aims and design of the in-depth interview study presented in this thesis (chapter five). The aims of the study were set in the context of the existing knowledge following a preliminary review of the literature. The study's findings from the lay accounts presented in chapter six extend knowledge of the hypothesised causal (risk) factors that may play a role in the aetiology of low back pain and how people define their first ever episode of low back pain as discussed earlier in this chapter (Table 7.1). In addition, the findings offer new insights into phenomena that may possibly be associated with the first ever episode of low back pain. These findings however are considered provisional and in need of further study utilising quantitative methods to confirm any association and determine whether the nature of an association is that of a risk marker or a risk factor that plays a causal role (Seale 1999, Burton and Waddell 2004, Yarnell 2007). The suggested areas for further research are summarised below in Table 7.3. Further qualitative inquiry in different populations may also further enhance the findings.

HOW WELL DOES THE EVALUATION ADDRESS ITS ORIGINAL AIMS AND PURPOSE? (FINDINGS)

The study's objective was to advance knowledge of the cause of the first ever episode of low back pain for primary prevention. The three aims developed to meet this objective were stated clearly at the beginning of chapter five. The findings from the study were presented and discussed in relation to the study's aims in chapters six and seven respectively, and the conclusions can be seen in chapter eight. The main factors that shaped the study and that may have influenced its findings are discussed below. These factors are the effect of the researcher's background and the effect of the research process including the definition of lay participant; and specific

issues relating to the recruitment of the participants; the gendered context of the interviews; the interview locations; the development and use of the topic guide; the participants' recall of the antecedents of the first ever episode of low back pain; and the use of Framework to manage and analyse the data (Ritchie and Spencer 1994, Ritchie et al 2003a).

SCOPE FOR DRAWING WIDER INFERENCE – HOW WELL IS THIS EXPLAINED? (FINDINGS)

Drawing wider inference (generalisation) in interpretive (qualitative) research is a concept parallel to external validity in positivist (quantitative) research that was discussed in relation to the prospective cohort studies reviewed in chapter four (Guba and Lincoln 1981, 1985).

In the qualitative research study presented in this thesis, the scope for drawing wider inference was documented in chapter five and the findings were discussed in this context earlier in this chapter. Briefly, the findings from the study were considered open to three forms of generalisation. Firstly, inference may be made to the population from which the sample was drawn (Lewis and Ritchie 2003) i.e. people with acute episodes of non-specific low back pain (Table 5.3) presenting to NHS hospital outpatient clinics. Secondly, inference may be made to people in other settings in which similar conditions may exist (Lewis and Ritchie 2003) i.e. to people with acute episodes of non-specific low back pain who seek help from doctors and physiotherapists working in the community, and thirdly to generate theory (Murphy et al 1998, Morse 2001, Daymon and Holloway 2003).

HOW CLEAR IS THE BASIS OF EVALUATIVE APPRAISAL? (FINDINGS)

The rationale for selecting these criteria for appraising the quality of the study (Table 5.5) are described clearly in chapter five and briefly re-iterated above at the beginning of this section.

HOW DEFENSIBLE IS THE RESEARCH DESIGN? (DESIGN)

An essential aspect of research is that a study is designed in such a way as to ensure that it addresses its aims (Murphy et al 1998). Accordingly, a qualitative in-depth interview study was designed to meet the aims of the study presented in this thesis. This design was based on the ontological and epistemological beliefs discussed in chapter five. The ontological position of subtle realism assumes that social reality can only be accessed by talking to people about their experiences. Accordingly, people with low back pain were recruited to participate in the interviews because it was anticipated that their knowledge would enable the researcher to address the study aims i.e. to define the first ever episode of low back pain; to explore the antecedents of low back pain that may possibly play an aetiological role and to learn about the participants' causal attributions. In-depth interviews were chosen because detailed information was required to access the participant's definitions of their first ever episode, to understand the complexities of its possible causes and to reveal knowledge not considered previously.

HOW WELL DEFENDED IS THE SAMPLE DESIGN / TARGET SELECTION OF CASES / DOCUMENTS? (SAMPLE)

The purpose of the qualitative, in-depth interview study presented in this thesis was firstly, to understand how the participants defined their first ever episode of low back pain; secondly, to explore the antecedents of the first ever episode of non-specific low back pain as perceived by the participants; and thirdly, to learn about the participants' causal attributions. Therefore, a decision was made to recruit people with 'insider knowledge' related to the research objectives i.e. people with acute episodic non-specific low back pain who could recall their first ever episode of low back pain and life before it (Table 5.3). A second decision was made to purposively select a sample that was inclusive of the demographic population being studied by age, gender, socio-economic and ethnic background, in order to generate a range of experiences (Appendix 4). A third decision was made to recruit people attending NHS physiotherapy and medical outpatient clinics. The insufficient

number of participants presenting to the NHS clinics with acute episodes (< 3 months) of non-specific low back pain, however, made this sampling proposition impractical. Consequently, the inclusion criteria presented in Table 5.3 were utilised. The rationale for this sampling procedure is defended in chapter five.

It is accepted that it is difficult to identify in advance all the characteristics that need to be included in a sample, particularly in an area of research not studied before. Knowledge regarding any oversight emerges from the data collected (Ritchie et al 2003a). In this study, for example, there were insufficient data for any comparisons to be made between the first ever episode of low back pain occurring in children compared to that occurring in adults. This was because only one participant (Lee) recalled his first ever episode of low back pain occurring during childhood. In addition, there was insufficient data for any comparisons to be made between different self-defined ethnic groups other than 'Asian or Asian-British' and 'White-British' (Office for National Statistics 2001).

Given the purposive nature of recruitment to the study, it is unlikely that participants who were recruited from NHS physiotherapy and medical outpatient clinics were representative of all people with acute episodes of non-specific low back pain. The participant's motives for volunteering to participate in the study are not known but one possible reason may have been because they wanted to understand why they had low back pain.

SAMPLE COMPOSITION / CASE INCLUSION - HOW WELL IS THE EVENTUAL COVERAGE DESCRIBED? (SAMPLE)

Sample composition in terms of coverage and case inclusion is important for two reasons. Firstly, it ensures that the sample includes participants who 'symbolically represent' characteristics of relevance to the inquiry (Ritchie et

al 2003b). Secondly, it ensures that the sample is as diverse as possible within the confines of the defined population. Greater diversity optimises the chances of a full range of factors and their contributory elements being identified (Ritchie et al 2003b).

The sample composition is described in Table 5.4. Efforts were made to ensure that, where possible, the recruitment process was inclusive. The participants were given the opportunity to be interviewed either at home or in the hospital, and at a time that was convenient for them. Travel costs were reimbursed where the interviews were held in the hospital. It was not feasible however to employ translators in the many languages necessary to translate the information sheets and consent forms, and interpret the interview questions and responses. Consequently, some people may have been excluded from the study because they did not speak fluent English.

The reasons for non participation in the study are documented in chapter five. Eight people (7 men and 1 woman) volunteered and signed their consent to participate in the study. Subsequently, however they were not interviewed. Five people said they were too busy, which is consonant with the study's finding that the participants had a perceived disposition to activity; two people did not attend the interview and one person could not be contacted at the given address.

HOW WELL WAS THE DATA COLLECTION CARRIED OUT? (DATA COLLECTION)

The data collection was carried out according to the protocol approved by the Research and Development Committee, North West London Hospitals NHS Trust. Shortly after the conclusion of the data collection phase of the study, the study was randomly selected for audit under research governance procedures instigated by the Department of Health (2001, 2005). The

outcome of this audit was favourable. The audit involved checks on the procedures and documents used for collecting data, and on the origin, status and authorship of all the documents used.

Discussion of how the fieldwork methods or settings may have influenced the data collection is presented below under the heading ‘research process’. This discussion focuses upon the gendered context of the interview, the interview location, and the use of the topic guide.

All the interviews were tape recorded and transcribed verbatim to ensure the quality of the data. The quality of the data, in particular its depth, detail and complexity (i.e. richness) can be seen in the data presented in chapter six, the study’s findings.

The strategy of returning interview transcripts to participants had been intended to enhance the data collection by giving the participants the opportunity to add or amend any information if they wished to. With the benefit of hindsight, however, it was realised that this strategy did not fulfil its purpose: none of the participants volunteered additional information nor amended what they had said using the form and stamped addressed envelope provided (Appendix 8). Given the ethical implications of ensuring the confidentiality of the interview transcripts in transit and the finding that none of the participants provided additional data, it is recommended that future studies do not routinely return interview transcripts. It is acknowledged however that some participants may like to keep a copy of their interview transcript and that this should be available on request as should a synopsis of the study’s findings.

HOW WELL HAS THE APPROACH TO, AND FORMULATION OF, THE ANALYSIS BEEN CONVEYED? (ANALYSIS)

In-depth interviews were utilised in the study presented in this thesis because they are recommended for the generation of theory (Mays and Pope 2000, Morse 2001, Daymon and Holloway 2003).

The audio-taped accounts of the first ever episode of low back pain, its antecedents and causal attributions were transcribed verbatim. The transcripts were checked against the audio-tapes and revised where necessary to ensure accuracy. The data derived from these transcripts were managed and analysed using Framework's five stages (Figure 5.1). Framework was selected because it provided a rigorous and transparent means of managing and analysing the data (see below). This was consonant with the need to justify the study's methodology and findings to people working in the NHS and in public health where the dominant research paradigm is positivist.

Both descriptive and explanatory accounts relating to the aims of the study were derived from the data. The descriptive explanations sought to elucidate the range of the participants' beliefs, experiences and views within a particular theme i.e. within a particular column on a chart. Implicit explanations for the findings were inferred from the data through analytic induction and the descriptive explanations were illustrated by metaphors, quotations and tables summarising the findings. The explanatory accounts attempted to explain why patterns and links in the data occurred. For example, explanations were found in the data to explain what factors determined whether or not the participants considered low back pain a stress-related symptom.

CONTEXTS OF DATA SOURCES – HOW WELL ARE THEY RETAINED AND PORTRAYED? (ANALYSIS)

Preserving the personal, social, historical and temporal context of data sources is essential for understanding the phenomenon being studied in qualitative research -Table 5.2- (Lewis 2003). In the study presented in this thesis, for example, the multiple perspectives of the participants relating to their first ever episode of low back pain were rooted in the specific personal and social context of the their lives. Strategies were adopted to retain this contextual information. At the beginning of each interview, for example, participants were invited to talk about themselves in order to place the interview in context and provide information to place responses to subsequent interview questions in context and help guide exploratory questions. Typically, for example, the opening questions asked participants about their household, work and leisure time activities. In addition, the opening questions asked about timing of the first ever episode of low back pain to discern whether specific topics being spoken about were antecedents or followed the first ever episode of low back pain. As the in-depth interviews progressed, the sequence and phrasing of the questions were altered to permit the interviewer to be responsive to what was being said and explore the individual's particular personal and social contexts under discussion.

Framework, the method used to manage and analyse the interview data, emphasises the importance of retaining contextual information (Lewis 2003). During the charting stage of the study therefore the key points of each piece of data were summarised whilst retaining their context and the language in which they were expressed and placed in the thematic matrix. Consequently, the key points within and across participants could be seen from the charts and there was little need to return to the interview transcripts to place the information in context and thereby understand the meaning of the points being made. The context of the information is portrayed in the findings (chapter six) under the sub-heading to which it relates.

HOW WELL HAS DIVERSITY OF PERSPECTIVE AND CONTENT BEEN EMPLOYED? (ANALYSIS)

One attribute of qualitative research lies in its ability to explain the range and diversity of phenomena (White et al 2003). In the context of this study, for example, diversity was considered important to increase the chances of a full range of hypothesised causal (risk) factors being identified before the first ever episode of low back pain, and to identify any relationship between them. In this way, accurate and appropriate conclusions may be drawn from the data (Ritchie et al 2003a).

This diversity of perspective was facilitated in several ways. The sample design generated diverse perspectives by comprising men and women from different age groups, and ethnic backgrounds, who were employed in a range of sedentary and manual occupations (Table 5.4). The range and diversity of the participants' perspectives were all displayed including any alternative explanations such as the reasons why some women did not attribute their back pain to stress; and disconfirming 'cases' such as the two women, Elka and Irene, who did not describe being disposed to physical activity or having an active lifestyle before the first ever episode of low back pain. Atypical examples were also presented such as the finding that the first ever episode of low back pain occurred in people with a history of physical sensations that did not necessarily meet diagnostic criteria in medical textbooks.

Patterns of association and links in the data were also portrayed. An example of this is where the participants who attributed their first ever episode of low back pain to stress also recalled having no confidante.

HOW WELL HAS DETAIL, DEPTH AND COMPLEXITY (RICHNESS) OF THE DATA BEEN CONVEYED? (ANALYSIS)

Every effort was made to ensure that the detail, depth and complexity i.e. the richness of the data was conveyed. The purpose of this was to enable readers to evaluate whether the research findings have any relevance to their particular circumstances. In qualitative research, the onus is on the reader to judge the extent to which the findings might be transferable to their own context (Murphy et al 1998).

The data was explored in five ways so that its richness could be conveyed. Firstly, the analysis of the data included the exploration of explicit and implicit explanations that were embedded in the participants' accounts. Secondly, metaphors were sought. The women, for example, commonly used metaphors when they described their stressful circumstances: emotional distress was likened to instruments, weapons and burdens with the power to inflict physical damage. Thirdly, underlying factors were sought to understand the reasoning and detail behind some of the participant's responses. An example of this can be seen in the findings in chapter six where the women explain why they attributed their non-specific symptoms, other than their non-specific low back pain to stress. These reasons included the perception of a temporal relationship between the stressful circumstances and the symptoms, and the belief that symptoms arising from the neck, shoulder area and the stomach may be stress-related but not symptoms that affect the lower back. Fourthly, patterns of association and conceptual linkages within the data were sought and presented in the findings as previously discussed. An example of this is the attribution of the first ever episode of low back pain to stress by the participants who had nobody to confide in. As previously discussed, it was unusual for participants to attribute their low back pain to stress. Fifthly, many extracts from the participant's accounts were identified and presented in chapter six to convey the richness of the participants' accounts.

HOW CLEAR ARE THE LINKS BETWEEN DATA, INTERPRETATION AND CONCLUSIONS – HOW WELL CAN THE ROUTE TO ANY CONCLUSIONS BE SEEN? (REPORTING)

A selection of extracts from the interview transcripts are given in chapter six to illustrate the range, breadth and depth of the data, and the language the participants' used to express themselves. On the basis of this evidence the reader can see how the interpretation built on the data and how particular conclusions were reached.

From the subtle realist orientation underpinning the study it is acknowledged that any phenomena may be understood from a number of different perspectives. Consequently, the effort was made to ensure 'fair dealing' (Table 5.1) i.e. the equitable representation of each participant's perspective avoiding representing the perspective of any one participant as if it was the 'truth' about the phenomenon being discussed (Murphy et al 1998, Lewis and Ritchie 2003). For this reason, the extracts presented in chapter six were selected judiciously and pseudonyms were placed adjacent to the extracts to enable the reader to evaluate whether there was any over-reliance on any particular participant's accounts.

As discussed in chapter five, a modified form of analytic induction was used to generate theoretical propositions (Bogdan and Bliken 1992, Ratcliff 2008). This process of analytic induction started with a tentative hypothesis. Next, the data from a single participant was considered to see whether or not it 'fitted' the tentative hypothesis, or whether the hypothesis needed refining to 'fit' the emerging interpretations of the data. This process was repeated using the data from each participant, in turn, thereby giving greater credence to the evolving hypothesis. Throughout the process, the researcher actively sought evidence for the rejection of the evolving hypothesis by seeking alternative explanations and 'negative cases' –Table 5.1- as recommended by Murphy et al (1998) and Lewis and Ritchie (2003).

HOW CLEAR AND COHERENT IS THE REPORTING? (REPORTING)

As discussed above, a clear and coherent account of a study's methods contributes to the credibility of a study's findings -Table 5.1- (Murphy et al 1998, Lewis and Ritchie 2003) Therefore, a transparent explanation of the study's data collection, data management and analytic method using Framework (Ritchie and Spencer 2002, Ritchie et al 2003a), and the subtle realist assumptions underpinning the study's methods were described in chapter five. Chapter six represented the participants' recall of their first ever episode of low back pain and their life before it. Every effort was made to ensure that this representation was grounded in the participant's accounts. The discussion of the study's findings in relation to the literature is presented under headings relating to the study's aims to make the script accessible to the reader. A summary of the key findings presented from the systematic review of the literature and study's findings are presented towards the end of chapters four and six respectively.

HOW CLEAR ARE THE ASSUMPTIONS / THEORETICAL PERSPECTIVES / VALUES THAT HAVE SHAPED THE FORM AND OUTPUT OF THE EVALUATION? (REFLEXIVITY AND NEUTRALITY)

The ontological and epistemological perspectives that shaped the form (i.e. the design and methods of the study) and its output (i.e. its findings) were discussed explicitly at the beginning of chapter four.

Every effort was made to minimise bias by adopting, as far as is possible, an objective and neutral approach during the data collection. For example, the researcher did not disclose any personal views that might influence the views of the research participants either before or during their interview. During the data analysis, bias was kept to the minimum by paying close attention to 'negative cases' (i.e. disconfirming cases) and by seeking inconsistencies and alternative interpretations and explanations.

It is acknowledged however that bias may have been introduced into the study not only by the research process but by the researcher herself. The subtle realist position underpinning the study acknowledges that the researcher is part of the social world being studied and consequently that the researcher's background and beliefs may influence a study's findings inadvertently. Therefore sensitivity (reflexivity) to the ways in which the researcher and the research process may have shaped the study and its findings is important (Finlay 2002). Accordingly, it is necessary to identify and consider the ways in which prior assumptions and beliefs, and the research process itself may have affected the study's findings to enable the reader to evaluate the objectivity and neutrality of the investigation for themself.

Effect of the researcher's background

It is acknowledged that the researcher may have shaped the study's findings through factors such as her gender and her background as a health professional amongst other factors such as age and educational level (Kvigne et al 2002).

The researcher's background in positivist (quantitative) research and the need to justify the study's methods to people working in the NHS, where the dominant research paradigm is positivist, influenced the selection of Framework to guide the study's methods. Generally, regarded as a more structured approach than many interpretive (qualitative) methods and more strongly influenced by apriori reasoning, Framework is based upon aspects of the scientific method that have been modified to meet the requirements of qualitative research (Ritchie and Spencer 1994, Ritchie et al 2003a). In addition, Framework was selected because of its rigorous methods including a clear audit trail between the data and the conclusions –Table 5.1- (White et al 2003).

The researcher introduced herself to each participant as a health professional i.e. a university lecturer who taught occupational therapy and physiotherapy students whilst carrying out the study with the help of physiotherapy and medical staff at the hospital. This information was also partially evident from the information sheet handed to the participants (Appendix 6). The researcher's position as a health professional appeared to be acknowledged by the participants. Angela, for example, asked whether arrangements could be made for her son, who was considering a career in the NHS, to spend a day in the physiotherapy department where she had been recruited to the study. This request was acceded to.

Knowledge that the researcher was a health professional may have influenced the participants' responses during the interviews: it is likely that the participants adapted their responses during the interview taking into account their conceptions about the interviewer's opinions and beliefs. It is possible, for example, that some women did not express the view that their first ever episode of low back pain was due to stressful circumstances explicitly because they thought it may appear irrational and non-sensical to a health professional. The majority of the participants had consulted a health professional previously and may have been influenced by their views.

In addition to the above points, it is relevant to note that the researcher's professional background in occupational therapy education and practice, with an interest in how activity influences health and wellbeing, may have influenced the way certain themes were seen in the lay accounts. In the early interviews, for example, it was noticed that the participants described an inclination towards physical activity which was conceived by the researcher as a disposition towards activity. Consequently, this topic was added to the topic guide (Appendix 3) and explored in subsequent interviews.

Effect of the research process

Recruitment of participants

The participants were recruited to the study because they were volunteers attending NHS physiotherapy and medical outpatient clinics, and met the study's inclusion criteria (Table 5.3). In this capacity the participants were participants with specialist 'insider' knowledge relating to the first ever episode of low back pain (Arskey 1994, Entwistle et al 1998). During the interviews however it transpired that two participants were also health professionals. One participant, Gita, was a hospital technician working in a biochemistry laboratory and a second participant, Rushani, was a nurse working with older people. Gita attributed her first ever episode of low back pain to her stressful circumstances and it is thought unlikely that her employment at a laboratory bench pipetting samples shaped her beliefs about the cause of her low back pain. Rushani however attributed her first ever episode of low back pain to lifting a patient and she spoke at length about the lack of hoists and manual handling advice when she first experienced low back pain. It can be argued therefore that Rushani was not a lay participant. Her belief about the cause of her first ever episode of low back pain was consistent with the dominant belief regarding causality in the NHS that non-specific low back pain is related to mechanical and physical factors (Waddell 2004f). Nonetheless, Rushani's account did not appear to alter the study's findings: the attribution of low back pain to lifting before the first ever episode of low back pain was not unique to Rushani. It is recommended however that future studies define lay persons at the outset and that the definition acknowledges that being a patient and a health professional are not necessarily mutually exclusive.

Recruitment of participants from NHS outpatient clinics

All the participants were recruited to the study from NHS physiotherapy and medical outpatient clinics. This indicates that they found their acute episodes of pain troublesome (Unruh et al 1999). Moreover, the fact that they were utilising these NHS clinics rather than other healthcare providers e.g.

osteopaths, and complementary therapists suggests that they anticipated that their beliefs regarding low back pain might 'fit' with the doctors and physiotherapists they consulted and that they would be willing to accept treatment from them (Ogden 2003, Open University 2009). In addition, it may have served to legitimise the belief held by the majority of participants that their pain was a 'medical' problem.

Recruitment of a participant with incident low back pain in childhood

All the participants experienced their first ever episode of low back pain when they were adults, except for Lee who experienced low back pain for the very first time when he was fourteen years of age. It is possible that young people, such as Lee, with earlier onset back pain may have distinct and different risk factors from adults (Mustard et al 2005). Conversely, risk factors for the first ever episode of low back pain in adults may not apply to individuals with the most frail backs who experience low back pain for the first ever time in childhood (Power et al 2001). It is recommended therefore that this information is considered during the design stage of future studies.

Recruitment of male participants

The interview data collected from the male participants was relatively thin compared with the data collected from the female participants, and this is reflected in the findings in chapter six. There are two main reasons to explain the relative lack of data for the men. Firstly, only ten men participated in the interviews compared with twenty women. This was because compared to the women a greater number of men, who agreed to participate in the study and signed their consent, subsequently withdrew from the study because they were too busy to be interviewed. Secondly, the men appeared reticent to talk to a female interviewer about their health concerns and personal circumstances other than those relating to their employment (see below). This reticence to talk about health problems has been observed by other female qualitative researchers e.g. Nobis and Sanden (2008).

Gendered context of interviews

Every effort was made to create an atmosphere in which each participant felt at ease and able to talk freely about their past experiences and beliefs. Nonetheless, during each interview the interviewer 'set the agenda' by choosing the topics covered, asking the questions and determining the pace and length of the interview. The interview situation may therefore have been uncomfortable for the participants who were required to relinquish some autonomy and divulge aspects of the inner self behind the public persona to the interviewer whom they had met only once before on recruitment to the study. In addition, the tape recorder and lapel microphone may have been perceived as a symbol of the interviewer's authority (Schwalbe and Wolkomir 2001). The participants may therefore have felt socially uncomfortable during the interview, particularly at its outset. It may also explain why some participants appeared to 'open up' and discussed salient issues as the interviews proceeded and occasionally after the tape recorder had been switched off at the end of the interview. Furthermore, it is possible that the male participants found the interview situation more socially 'uncomfortable', than the female participants given the interviewer was female. Situations which make it difficult for men to express traits associated with masculinity such as control and autonomy may provoke anxiety. In such situations men may respond by countering the potential threat to the masculine self (Schwalbe and Walkomir 2001). Examples of this were noted to have occurred during the interviews. One example was where Dinesh told the interviewer that her line of questioning was not going to be helpful. In stating this, he was exerting his authority and thereby regaining control. In the second example, Kevin spoke about *'killing'* his back by digging in the garden. Schwalbe and Walkomir (2001) point out that where men are asked to give accounts of their lives, they are unlikely to be free from exaggeration.

Assumptions about the background experiences shared between the interviewer and the participant may also have influenced the research process and thereby shaped the study's findings. The male participants, for

example, may have framed their answers in such a way as to enhance social desirability, the tendency to respond in a manner that will be considered favourably by the interviewer. In the context of a female interviewer, Willems and Heikes (1993) suggest that men may frame their responses in such a way as to avoid opinions that appear sexist and therefore socially undesirable to female interviewers. For this reason some information relevant to the research may have been excluded from the men's accounts.

Little attention appears to have been paid towards the importance of gender differences between interviewer and interviewee in the literature (Reinharz and Case 2003). There is some evidence, however, that suggests that gender may influence men's responses to questions about pain asked during a telephone interview (Unruh et al 1999). On the basis of this limited evidence and the interview data presented in this thesis, it is recommended that gender differences are considered in the design of future studies where personal issues form part of the inquiry. Either the gender of the interviewer may be matched with that of the interviewee, or more than one interview may be arranged to increase the rapport that is necessary to gain detailed information. The disadvantage of the latter suggestion however is that it may dissuade a greater number of people from participating than would have done so had there only been one interview.

Interview locations

Participants were given the opportunity to be interviewed in the hospital, the workplace or the home and at a time that was convenient for them. Accordingly, fifteen participants chose to be interviewed at home, ten during the day and five in the evening; thirteen participants asked to be interviewed in the hospital, eleven during the day and two in the evening; and two participants chose to be interviewed at their workplace. It has been suggested that explanations are more easily elicited in the home by a researcher who is not involved in the delivery of healthcare (Kleinman 1980).

This phenomenon was not observed in this study, possibly because a genuine non-judgemental interest in the participant's perspective was expressed irrespective of the interview location. Furthermore, the interview location appeared to make no difference as to whether the participant's accounts were more 'medicalised' i.e. physically based. The women who attributed and questioned whether stressful circumstances played a role in their back pain, for example, were interviewed both in the hospital and in the home.

Development and use of topic guide

The topic guide (Appendix 3) was developed following a preliminary review of the literature. Consequently, some risk factors later identified by the systematic review presented in chapter four were not specifically noted in the topic guide. It follows therefore that the participants were not specifically asked about these topics namely, driving, physical capacity of the trunk, childhood behavioural and emotional disorders, and radiological changes and abnormalities. This did not preclude the participants volunteering information about these topics however. Amy and Tom, for example, volunteered information about their childhood emotional and behavioural disorder i.e. hyperactivity. Therefore, the omission of certain topics from the guide did not necessarily bias the study's findings. Furthermore, it can be argued that pre-specifying potential causal (risk) factors precludes exploring and discovering additional risk factors that may be important (Giacomini 2001).

Recalling the antecedents of low back pain

Generally, the participants recalled their first ever episode of low back pain and life beforehand by placing phenomena in chronological order. A potential problem with this ordering of phenomena is that it may resemble the linear assumptions of quantitative research and obscure any complex interactions between the antecedents of low back pain, and between the antecedents of

low back pain and the low back pain itself (Patton 2002). The extent to which this occurred in this study cannot be known although steps were taken to minimise its influence by encouraging the participants to go beyond sequential ordering by shaping and describing events; by placing them in context and by attaching significance, and meaning to the events (Hurwitz 2004). As Patton (2002) points out 'the challenge of qualitative inquiry is to portray a holistic picture of what has occurred' (Table 5.2). It is relevant to note, however, that where participants perceived complex interactions between phenomena in the genesis of their back pain, they had difficulty describing the relationships precisely.

Use of Framework to manage and analyse the data

The in-depth interviews were transcribed verbatim thereby generating vast amounts of raw data covering some 1118 pages of A4 paper, typed single spaced. Framework enabled the reduction of this vast amount of raw data to more manageable amounts in four stages: the identification of themes (familiarisation), the development of an index (thematic framework), and the indexing and charting of the data (Ritchie et al 2003a). The charted data was particularly helpful when it came to providing descriptive and explanatory accounts because it was possible to review data within and across participants' accounts easily. There was little need to refer back to the transcripts, but where the need arose, the inclusion of page numbers and the identification of quotations within the charted data made it possible to return to examine the data in its original context within a transcript. An example of charted data can be seen in Appendix 12 together with the index (Appendix 9) and an example of indexed data (Appendix 10). By using Framework in this way, it was possible to overcome a criticism sometimes levelled at interview data analysis, namely that the processes by which the data are reduced to manageable amounts are not necessarily clear or available for audit (Ritchie et al 2003a). The transparent and rigorous method of managing the data however does present a challenge where time deadlines need to be met as is the case with most research projects.

The fifth stage of Framework, interpretation and investigation, relied on the conceptual ability of the researcher to determine the meaning and salience of topics particularly where they were embedded in the data. This stage involved inductive and interpretive thought that is more difficult to convey as Ritchie and Spencer (2003a) acknowledge. In this study therefore it was decided to use a modified form of analytic induction to provide descriptive and explanatory accounts (Bogdan and Bliken 1992, Patton 2002, Ratcliff 2008).

A software version of Framework became available after the data management and analysis had been concluded for this study (National Centre for Social Research 2009). This software should make charting the data less laborious and free up time for interpreting the research findings.

WHAT EVIDENCE IS THERE OF ATTENTION TO ETHICAL ISSUES? (ETHICS)

Chapter five documents the ethical procedures followed in accordance with the standards that govern health and social care (Department of Health 2001, 2005). This included obtaining a positive ethical opinion from the Harrow Research Ethics Committee (reference number EC2636) and permission from the North West London Hospitals NHS Trust to carry out the research project at Northwick Park Hospital, Harrow. Brunel University sponsored the research.

Adherence to ethical standards and procedures were reviewed as part of the audit carried out under research governance procedures referred to earlier (Department of Health 2001, 2005). The ethical dimension of the audit involved a review of the documentation relating to signed consent and to the information provided to participants and their general practitioners.

The specific ethical considerations that were addressed during the design and conduct of the study were discussed at appropriate places in the text. One example of sensitivity to the participant's need for confidentiality can be found in chapter five. After the first transcript had been typed verbatim, the need to ensure the confidentiality of each participant's data in transit was realised. Accordingly, each participant was telephoned and asked where they would like their transcript to be sent and their preferred method of delivery. In this way confidentiality was assured. A second example can be seen in chapter six. During the writing of the study's findings, it was necessary to modify insignificant details about a very few of the women's circumstances e.g. details regarding family members, so as not to compromise the confidentiality promised to the participants. Confidentiality was also assured through the use of pseudonyms.

HOW ADEQUATELY HAS THE RESEARCH PROCESS BEEN DOCUMENTED? (AUDITABILITY)

A detailed account of the research process is important to place the research findings in context and permit the reader to judge the credibility of the research findings -Table 5.1- (White et al 2003). An account of the research process was therefore documented in chapter five. This included an outline of the sample design and method of sample selection, and the achieved sample composition in term of its socio-demographic characteristics (Table 5.4). The potential limitations of the sampling strategy are discussed above under the heading 'How well defended is the sample design / target selection cases / documents?'. A description of the data management and analytic method was also included and its strengths and weaknesses discussed.

Supplementary material has been placed in the appendices to enable the reader to view the detail in which they are interested. In this thesis the appendices provide detailed information about the recruitment documents (consent form -Appendix 5-, information sheet -Appendix 6-, letter to General

Practitioners -Appendix 7-); the topic guide (Appendix 3); the post interview letter and form accompanying each participant's transcript (Appendix 8); the data management and analytic documents (index -Appendix 9-, example of indexed data -Appendix 10-, extract from a time line -Appendix 11-, example of charted data -Appendix 12-); and the appraisal questions and guidelines (Appendix 14).

Other documents that are available for external audit but not included in this thesis for reason of space include indexed transcripts and sheets of A3 paper on which the dimensions of each theme were listed in blocks of a similar kind to develop the descriptive and explanatory accounts.

IMPLICATIONS FOR PRIMARY PREVENTION

Epidemiology examines patterns of disease in groups of people (populations) with the purpose of identifying strategies for prevention at the population level rather than at the individual level (Hennekens and Buring 1987, Greenberg et al 2005, Rockhill 2005).

During the past fifty years, the prevention of back pain has largely focused upon the reduction of physical demands and mechanical loading through manual handling training, for example, and ergonomic improvements in the workplace (Waddell and Burton 2000, Coggon 2005). However, there is inconsistent evidence whether and to what extent these strategies have been successful (Waddell and Burton 2000, Martimo et al 2008). It is possible that these strategies may not be found to be successful given that the prevalence of low back pain has remained stable as discussed earlier in chapter two (Manninen et al 1996, Croft 2000, Waddell 2004b). Researchers have therefore drawn attention to the need to identify aetiological factors for primary prevention (Coggon 2005, Bell and Burnett 2009).

The best available evidence, not known hitherto, about the proportion of different populations who may possibly benefit from primary preventive strategies can be seen in Tables 4.3 and 4.4. Potentially, this knowledge is important for policy development. Furthermore, these estimates suggest that primary prevention should be directed towards children and adults in the general population rather than to working populations, possibly because of the healthy worker effect. Preventive strategies may not need to be directed towards women over 60 years of age without a history of back pain, if future studies confirm the finding that older age confers protection against the first ever episode of low back pain (Croft et al 1999). This knowledge however does need to be considered cautiously given the methodological limitations and heterogeneity of the prospective cohort studies reviewed in chapter four.

In directing preventive strategies towards specific populations it is necessary to have a clear understanding of what the strategies are aiming to prevent. The participants' description of 'real' low back pain and how this differs from low back pain perceived to a 'normal' experience (Table 7.1) may be used to enhance this understanding.

The evidence emanating from the literature reporting quantitative studies suggests that there is a moderate to strong level of evidence that psychological distress associated with stressful circumstances and non-specific ill-health may play a role in the genesis of low back pain at the population level. If confirmed by further research, preventive strategies need to be based on this evidence. First, however, the lay accounts suggest that steps may need to be taken to enable people to reconcile preventive strategies with their causal beliefs or they are likely to be unsuccessful (Blaxter 1983). These steps may include the provision of education and information regarding the evidence that psychological distress associated with stressful circumstances may possibly play a role in the genesis of low back pain and be associated with non-specific symptoms. The women

universally attributed their non-specific symptoms other than low back pain to their stressful circumstances. While they questioned and used metaphors to implicate stress in the genesis of low back pain, it was uncommon for them to conclude explicitly that stress may have caused their first ever episode of low back pain. The lower back was not perceived to be a part of the body to be affected by stress unlike the head, neck and stomach.

The participants' accounts further contribute to knowledge for primary prevention by suggesting that gender should be taken into consideration in the design and development of preventive strategies. The men and women conceptualised aspects of life before the first ever episode of low back pain differently. Difficult circumstances, for example, were conceptualised as stressful by the women whereas the men associated difficult circumstances with ageing, an unhealthy lifestyle and reduced physical fitness. In addition, and in contrast to the women, sporting activities were central to the men's lives before their first ever episode of low back pain. These conceptual differences between the men and the women are consistent with the defining aspects of masculine and feminine self concepts in western culture (Eisler and Skidmore 1987, Eisler and Ragsdale 1992). Consequently, it is recommended that these conceptual differences are accommodated within preventive strategies. Men, for example, may be less likely to perform preventive healthcare behaviours than women (Blaxter 1983) and they may perceive strategies designed to address behavioural and emotional responses to stressful circumstances as emasculative. Consequently, men may respond better to strategies designed to address their perceived unhealthy lifestyle through fitness training. This training may address the loss of muscle tone and strength perceived by the men to cause low back pain. Women on the other hand may respond better to strategies designed to address their emotional and behavioural responses to their stressful circumstances. Such strategies may also address the shallow and quicker breathing, and the perceived increases in muscle tension during states of

'mild panic' when feeling *'anxious'* and *'jumpy'* to which the first ever episode of low back pain were attributed.

SUGGESTED AREAS FOR FURTHER RESEARCH

While every endeavour was made to produce findings that represented reality for the participants it is acknowledged that it is impossible to be absolutely certain that this goal was attained. As can be seen from the appraisal of the study above, certain factors in the design and conduct of the study may have shaped its findings. The study's findings therefore need to be regarded as provisional and possibly in need of further refinement as new research findings emerge (Lewis and Ritchie 2003). Suggestions for further research are listed in Table 7.3. Since asking the correct research question is fundamental to a greater understanding of the aetiology of low back pain, the onus is on the researcher to decide which questions should be given priority. In considering the evidence in the literature and the study's findings, in addition to the factors discussed earlier that may have shaped the study's findings, it is suggested that priority is given to two research areas.

The first area is psychological distress. Moderate to strong evidence was found in the literature to suggest that psychological distress associated with stressful circumstances and non-specific symptoms may play a role in the genesis of low back pain at the population level. This evidence resonated with the participants' accounts, particularly the women's beliefs, at the individual level. Feeling low, down, depressed and ill with non-specific symptoms (e.g. irritable bowel syndrome and panic attacks) were recalled by the women who universally attributed their non-specific symptoms (apart from low back pain) to stress. Furthermore, the participants' theories extend knowledge and provide novel insights into the nature of the psychological distress. This knowledge and the novel insights indicate areas for further research including the role of the following phenomena, if any, in the genesis of low back pain: loss; low mood and social withdrawal; pushing worries to

Table 7.3 Questions for further research

First ever episode of low back pain

Do physical sensations perceived to be a 'normal' experience progress to be perceived as a 'real' episode of low back pain?
What factors affect the interpretation of physical sensations in the lower back as a 'real' episode?

Perceived antecedents of first ever episode of low back pain

Psychological distress associated with stressful circumstances

Is there a predictive association between loss and the incidence of low back pain in women?
Is there a predictive association between pushing worries to the back of the mind and the incidence of low back pain?
Is there a predictive association between low mood and social withdrawal, and the incidence of low back pain in women?
Is there a predictive association between anger and the incidence of low back pain?
Does bending over to pick up a light object predict the incidence of low back pain?
Does the lack of a confidant distinguish people who attribute their first ever episode of low back pain to stress from those who do not?

Physical activity

Is there a predictive association between a preference for physical activity and the first ever episode of low back pain?
Are men who push on past their physical capacity at greater risk of 'real' back pain?
Is there a predictive association between a perceived disposition to activity and the incidence of low back pain?
Is there a predictive association between the perception of an active lifestyle and the incidence of low back pain?
Is the disposition to activity and the active lifestyle 'perceived' or 'real'?

Non-specific symptoms

Do low mood, feeling run down and musculoskeletal aches and pains predict the incidence of low back pain in women?
Do the incidence of non-specific symptoms follow as well as antecede the incidence of low back pain?

the back of the mind; and anger. In addition, the women described alterations in muscular tension and states associated with anxiety e.g. mild panic suggestive from a biomedical perspective of increased neuroendocrine activity. Further research into these phenomena is required before preventive strategies are specifically designed to address them.

The second area recommended for future research is the perceived disposition to activity and the description of an active lifestyle before the first ever episode of low back pain. In selecting these areas for future research it is acknowledged that the researcher's background may have influenced how these themes were seen in the data. However, the emphasis on these near universal phenomena in the participants' scripts was conspicuous. Furthermore, the subsequent finding of similar constructs in the literature referred to as 'ergomania' (Blumer and Heilbronn 1981) and 'action-proneness' (Van Houdenhove 1986, 1992, Van Houdenhove et al 1987) support further research into the perceived disposition to physical activity and active lifestyle in the genesis of low back pain.

The participants' theories suggest that some antecedents of low back pain may develop during childhood. In particular, pushing worries to the back of the mind; and the perceived disposition to activity and active lifestyle before the first ever episode of low back pain were believed to have developed during childhood. If further research suggests that there is a predictive association between these phenomena and the first ever episode of low back pain it is recommended that they are also investigated to see if they are a trait acquired in childhood. The current literature suggests that the incidence of low back pain in childhood is higher than previously thought (Brattberg 1994, 2004, Burton et al 1996a, Balague et al 1999, Nachemson and Vingard 2000) and that factors in childhood conditions may shape exposure to causal (risk) factors in adulthood (Mustard et al 2005).

The men and women conceptualised aspects of life before their very first episode of low back differently and this influenced their causal attributions. The women, for example, spoke about emotional responses to stress and ill-health, whilst the men spoke about an unhealthy lifestyle and loss of fitness. This finding suggests that it may be prudent to study men and women separately in future. None of the prospective cohort studies, reviewed in chapter four, considered any gender differences that may have affected the participants' responses to questions regarding hypothesised causal (risk) factors before low back pain. In turn, this may have adversely affected the internal validity of the prospective cohort studies where the cohorts comprised both men and women. It is possible, for example, that the men and women responded differently to some of the measurement and self appraisal tools used in the cohort studies. Moreover, it may partially explain why a particular risk factor was found to predict low back pain in one gender and not the other. Where differences were found for a particular risk factor between men and women, any difference in conceptualisation of the risk factor was not considered. Instead, it was inferred that the risk factor operated differently in men and women. An example of this can be found in the studies carried out by Croft et al (1999) and Lake et al (2000) where the incidence of low back pain was unrelated to weight in men but not women. It was suggested therefore that men and women may have a different susceptibility to the loading placed by weight on the spine (Leboeuf-Yde 2000a).

Another consideration for further research is the socio-economic status of participants. The findings from the prospective cohort studies reviewed in chapter four reveal that there is inconsistent evidence regarding the role of socio-economic status in the genesis of low back pain. However, while socio-economic status may not predict the first ever episode of low back pain per se there is evidence to suggest that it may contribute to hypothesised causal (risk) factors such as psychological distress which, in turn, may affect

the risk of incident low back pain (Power et al 2001, Mustard et al 2005). In addition, there is evidence to suggest that socio-economic status in early life may be a more important factor than socio-economic status in young adults between 21 and 34 years of age (Mustard et al 2005). Consequently, it is recommended that studies take socio-economic status into consideration, particularly socio-economic status in early life.

Further knowledge is also required about the cumulative incidence i.e. the proportion of different populations at risk of experiencing low back pain for the very first time during a given period of time, and who may benefit from preventive strategies. It is important that studies carried out from a positivist perspective address the heterogeneity and weakness of the published studies reviewed in chapter four that may have resulted in inaccurate risk estimates. In addition, these studies need to identify whether either men or women have a higher cumulative incidence of low back pain. The current knowledge is equivocal. It cannot be assumed that women who report a higher prevalence of low back pain concomitantly have a higher incidence of back pain. Such studies may also advance knowledge about the possible causes of low back pain. If the cumulative incidence of low back pain in a given population rises over time, for example, then the cause is likely to be environmental (Coggon 2005). Accordingly, by advancing knowledge in these ways the primary prevention of low back pain may become a practical and a realistic goal.

CHAPTER EIGHT: CONCLUSIONS

The prevention of low back pain is contingent upon a greater understanding of its cause (Leboeuf-Yde et al 1997). Until now, positivist (quantitative) research has focused upon identifying causal (risk) factors that play a role in recurring episodes of low back pain to further knowledge for secondary prevention. Little is known about the incidence of low back pain and its causative mechanisms for primary prevention because of methodological difficulties. These difficulties include defining the first ever episode of low back pain from a positivist perspective. The purpose of this thesis was to address this gap in knowledge by (1) carrying out a systematic review of the literature and (2) studying lay accounts from an interpretive (qualitative) perspective to generate lay definitions of the first ever episode of low back pain and theories about the genesis of the pain for primary prevention.

The systematic review of the literature, presented in chapter four, advances knowledge by providing estimates of the cumulative incidence of low back pain in different populations and a synthesis of the possible causes of low back pain. This knowledge was derived from the eighteen papers found to have reported the findings from studies of hypothesised causal (risk) factors in the aetiology of the first ever episode of non-specific low back pain utilising a prospective cohort design (Tables 4.1, 4.2, Appendix 2).

The estimates of the cumulative incidence of low back pain, found in the literature, advance knowledge of the proportion of people that may benefit from primary prevention in different populations (Tables 4.3, 4.4). Potentially, this knowledge is important for policy development and service provision; and for future research (see below). The difference between the estimates from similar populations and periods of follow-up may reflect the heterogeneity and methodological limitations of the reviewed studies.

Cohorts of the general population appear to have a higher annual incidence than cohorts of working populations, possibly because of the healthy worker effect (Table 4.3); and cohorts of children aged between 12.8 and 13.8 years appear to have a higher annual cumulative incidence than young adults between 21 and 34 years of age (Table 4.3). These findings, if confirmed by further studies, suggest that, initially, it may be prudent to direct preventive strategies towards these populations i.e. towards the general population and children rather than towards working populations.

From the many hypothesised causal (risk) factors studied moderate ($p \leq 0.05$, OR >1 <2) to strong ($p \leq 0.05$, OR ≥2) evidence was found in the literature to suggest that the first ever episode of low back pain may occur in the context of psychological distress associated with stressful circumstances –Tables 4.1, 4.2- (Croft et al 1995, Power et al 2001, Mustard et al 2005) and non-specific symptoms in parts of the body other than the lower back (Symmons et al 1991, Pietri et al 1992, Von Korff et al 1993, Croft et al 1999). The psychological distress was associated with anxiety and depression (Croft et al 1995, Power et al 2001, Mustard et al 2005); loss of wellbeing (Power et al 2001); loss of behavioural and emotional control (Power et al 2001); and non-specific illness (Mustard et al 2005). The non-specific symptoms of ill-health found to predict the incidence of low back pain included reporting three or four symptoms (Pietri et al 1992); one or more painful conditions (Von Korff et al 1993); and joint pains (Symmons et al 1991).

Knowledge about the possible causes of the first ever episode of low back pain, apart from psychological distress associated with stressful circumstances and non-specific ill-health, is limited. A greater number of prospective cohort studies are required. These studies need to address the heterogeneity and the methodological limitations of the reviewed studies including the need to define the first ever episode of low back pain; and to

ensure that the studies' findings are reported adequately using the standards developed by the STROBE initiative (Von Elm et al 2008).

By virtue of their design and underlying positivist philosophy, it is acknowledged that prospective cohort studies cannot answer certain research questions relating to causality. Given the subjective nature of low back pain, for example, it is argued within this thesis that the first ever episode of low back pain may be better understood by studying lay accounts from an interpretive (qualitative) perspective. Accordingly, the research study presented in chapters 5 to 7 discusses how lay accounts of life before the first ever episode of low back pain were obtained through in-depth interviews and studied from the perspective of subtle realism.

First, it was necessary to understand the participants' perceptions of their first ever episode of low back pain. A key feature of the participants' accounts was the perception of physical sensations in the lower back before the episode of low back pain considered to be the 'first ever' episode. These physical sensations were 'ignored' because they were considered a 'normal' experience and not a 'real' episode of low back pain for the reasons summarised in Table 7.1. In addition, aches and pains attributed to other health conditions (e.g. kidney stones) were thought to have concealed the first ever episode of low back pain. These lay definitions of the first ever episode of 'real' low back pain may assist future research (see below).

Higher order interpretations e.g. attributions, motivations, moods, goals, may determine whether the physical sensations are viewed benignly i.e. as a 'normal' experience, or negatively as a 'real' episode of low back pain. A greater understanding of these higher order interpretations is required (Cioffi 1996). Strategies directed towards preventing negative interpretations may possibly prevent 'real' back pain in the future.

Identifying the participant's perceptions of their first ever episode of low back pain enabled the study's second and third aims to be met. These were to explore the participants' descriptions of their lives before their first ever episode of low back pain with a view to identifying salient antecedent factors and causal attributions that may provide useful insights into the genesis of the pain to advance understanding for primary prevention.

The findings from the women's descriptions of life before low back pain resonate with the literature derived from the prospective cohort studies. Psychological distress including low mood states (feeling low, down, depressed) and poor general health (i.e. feeling run down with non-specific symptoms particularly musculoskeletal aches and pains) were recalled. These non-specific symptoms were universally attributed to stressful circumstances yet no pattern between the non-specific symptoms and the first ever episode of low back pain was recalled. This suggests that the first ever episode of low back pain may be part of a general episodic non-specific disorder related to psychological distress.

The findings from the women's accounts also advance knowledge. First, the unifying theme from the women's account of their stressful circumstances before their first ever episode of low back pain was one of loss associated with changes in lifestyle, bereavement, relationship problems and job satisfaction. Second, the women's accounts reveal alterations in breathing patterns and muscular tension associated with anxiety implicating, from a biomedical perspective, neuroendocrine activity in the genesis of back pain. Neuroendocrine activity has been implicated in the onset of low back pain previously, although the precise mechanisms remain speculative (National Institute for Occupational Safety and Health 1997, Burton and Waddell 2004)

In contrast to the women, a loss of physical fitness associated with ageing and an unhealthy lifestyle reflecting difficult circumstances were described by some men. The loss of physical fitness was characterised by reports of fatigue, lethargy, shortness of breath on effort, reduced energy and motivation to take exercise and use time efficiently. The reduced physical capacity was perceived to be associated with a loss of muscle tone and muscle weakness that increased the risk of low back pain occurring during alterations in posture and movement. In addition, a large stomach from being unfit was thought to pull on the weakened back muscles resulting in pain. Pushing on past the pain threshold was also perceived to cause low back pain.

Novel insights into the participants' responses to their stressful and difficult circumstances were: pushing worries to the back of the mind; irritation and anger; and, in women only, low mood and social withdrawal.

'Putting' or 'pushing worries to the back of the mind' was a common response to emotional upset and circumstances perceived to be difficult or stressful. It was thought to have been developed as a means of coping with adverse circumstances earlier in life. The expression suggests that repressing worries may shift the emotional tension to the back possibly with the capacity to induce pathophysiological changes as described in the literature by Kepecs (1953). This suggestion is further supported by the women's metaphorical descriptions of their emotions as weapons, instruments and burdens with the power to inflict physical damage.

Low mood and social withdrawal were also recalled by some women. Like anger, these responses have previously been regarded as a consequence of low back pain and as identifying people who may be at increased risk of chronic low back pain (Main et al 2002). The finding from this study however

reveals that these responses may occur earlier than previously thought and antecede the first ever episode of low back pain. This suggests that low mood and social withdrawal, and anger may possibly be general responses to stressors, and possibly a risk marker but not a specific cause of the first ever episode of low back pain.

It was uncommon for the participants to attribute their low back pain to stress. Several women questioned and used metaphors to implicate stress in the genesis of low back pain but it was unusual for them to conclude that stress might have caused their back pain unlike their other non-specific symptoms. This may have been because they feared that their views would appear nonsensical to the health professional interviewing them. To be perceived as stress-related non-specific symptoms had to occur in the context of and be triggered by circumstances perceived as stressful, and occur in a part of the body thought to be affected by stress e.g. the head, shoulder and stomach areas of the body. The lower back was not thought to be a part of the body affected by stress.

The very few participants who did attribute their first ever episode of low back pain to stress had no confidante to 'buffer' the effects of psychological distress (Johansson 1995, Karasek 1998).

If future studies confirm the possible role of psychological distress in the genesis of the first ever episode of low back pain, preventive strategies may first need to address causal beliefs regarding its role as a risk factor. Preventive strategies are unlikely to be successful if people do not perceive them to be relevant. In addition, preventive strategies may need to be gender specific. Men, for example, are unlikely to follow advice perceived to be emasculative and may benefit from strategies that address their

perceived loss of physical fitness to enable them to cope with difficult circumstances.

The participants' causal attributions focused upon physical and biomechanical theories similar to those studied by the research groups who carried out the prospective cohort studies. Ageing, height; overweight; level of activity; standing, walking and sitting; participating in sporting activities; gardening; lifting and moving objects (manual materials handling) were considered possible causes of the first ever episode of low back pain by individual participants. The evidence derived from the prospective cohort studies however reveals that directing preventive strategies towards these factors at the population level cannot be justified. Ageing does not appear to play a role in the incidence of low back pain and the evidence regarding the participants other causal attributions listed above is equivocal (Table 4.1, 4.2, Appendix 2).

Other similarities between features of the cohort studies and the participants' causal attributions were also evident. These similarities were the participants' perceiving one or more causal factors and their conception of a linear relationship between exposure to a given hypothesised risk (causal) factor and outcome i.e. back pain. Contextual information was central to the participants' causal descriptions thereby providing theories about the setting in which back pain may occur for future studies. Bending to pick up a light object such as a bar of soap, for example, was more commonly recalled than lifting heavier objects e.g. a television set. This is consistent with the evidence that suggests that weight may be more important in degenerative changes to the hip joint than in non-specific low back pain (Coggon 2005).

In deciding what caused their back pain, the participants used concepts resembling Bradford Hill's (1965) causal criteria that are used in

contemporary epidemiology. For example, the cumulative effects of an activity such as the number of years an activity had been carried out; the temporal sequence between cause and effect; and biological plausibility were found within the participants' causal attributions. Stress was not perceived to be a plausible cause of low back pain by most of the women (see above).

The participants' beliefs about the causes of their low back pain appeared to be shaped by the views of health professionals, family members, folklore and medical explanations in the media. These beliefs may have influenced their decision to seek healthcare from NHS doctors and physiotherapists perceived to share their beliefs. In turn, this may explain the similarities between the researchers' hypotheses studied in the prospective cohort studies and the participants' causal attributions (Table 7.2), and partially explain why low back pain was generally attributed to physical factors and not to psychological distress.

With regard to new insights, a disposition to physical activity appeared to be a salient feature of the participants' accounts that was shared by all but two of the participants. The elements of the disposition included: keeping going and overdoing it; doing things in a hurry; achieving and setting goals and an inability to be still. The perceived active lifestyle in the weeks and days before the first ever episode of low back pain shared certain characteristics with the perceived disposition to activity and may have been a manifestation of it. Furthermore, the characteristics of the disposition to physical activity resemble aspects of 'ergomania' (Blumer and Heilbronn 1981) and 'action-proneness' (Van Houdenhove 1986, 1992, Van Houdenhove et al 1987).

Finally, there is the need to consider future research. It is recommended that this research builds upon the knowledge gained from the systematic review

and the research study presented in this thesis. In particular, it is suggested that priority is given to studying the possible role of psychological distress associated with stressful circumstances (involving loss); low mood (feeling low, down and depressed); and poor general health (feeling run down with non-specific symptoms, particularly musculoskeletal aches and pains) in the genesis of the first ever episode of low back pain; and responses to the psychological distress (pushing worries to the back of the mind, irritation and anger, and low mood and social withdrawal).

One area for new research is the perceived disposition to activity and a lifestyle described as active in the weeks and days leading up to the first ever episode of low back pain.

The perceived disposition to activity and the tendency to push worries to the back of the mind were both regarded by the participants to be personality traits developed in childhood. If future research confirms that these hitherto unrecognised antecedents of the first ever episode of low back pain may possibly play a role in its genesis, it is relevant to explore the perception that they are personality traits acquired during childhood. It has been suggested that the latent effects of childhood experiences and / or childhood conditions may shape exposure to causal risk factors in adulthood (Mustard et al 2005). Socio-economic factors in early life may also play a contributory role (Mustard et al 2005).

The knowledge gained from the systematic review and the study in this thesis may be used to improve the design of future research in three ways. First, knowledge of the cumulative incidence of low back pain in different populations (Tables 4.3, 4.4) may provide researchers and statisticians with potentially useful information for sampling considerations and power calculations. Second, the lay definitions of the first ever episode of low back

pain may assist researchers define the first ever episode of ‘real’ low back pain and thereby improve the internal validity of future studies (Table 7.1). Third, gender needs to be considered in the design and conduct of future research given that men and women differ in how they perceive their circumstances and health concerns, and their inclination to report and discuss such issues.

The continuation of this research into the cause of the first ever episode of low back pain is important if the primary prevention of low back pain is to become an achievable goal. In turn, this will ameliorate the suffering and socio-economic consequences of low back pain, and contribute to the UK Government’s shift of emphasis from treating illness to promoting health and preventing ill-health (Department of Health 2004, 2006).

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APPENDICES

APPENDIX 1: CRITICAL APPRAISAL SKILLS PROGRAMME (CASP) CHECKLIST FOR APPRAISING A COHORT STUDY

(NHS Public Health Resource Unit 2007)

12 questions to help you make sense of a cohort study

General comments

Three broad issues need to be considered when appraising a cohort study

Are the results of the study valid?

What are the results?

Will the results help locally?

The 12 questions on the following pages are designed to help you think about these issues systematically.

The first two questions are screening questions and can be answered quickly. If the answer to those two is 'yes', it is worth proceeding with the remaining questions.

There is a fair degree of overlap between several of the questions.

You are asked to record a 'yes', 'no' or 'can't tell' to most of the questions

A number of italicised hints are given after each question. These are designed to remind you why the question is important.

Screening Questions

1.Did the study address a clearly focused issue? ***HINT:*** *A question can be focused in terms of:* - *the population studied* - *the risk factors studied* - *the outcomes considered* - *is it clear whether the study tried to detect a beneficial or harmful effect?*	**Yes** ☐	**Can't tell** ☐	**No** ☐
2. Did the authors use an appropriate method to answer their question? ***HINT:*** *Consider* - *Is a cohort study a good way of answering the question under the circumstances?* - *Did it address the study question?*	**Yes** ☐	**Can't tell** ☐	**No** ☐

Is it worth continuing?

Detailed questions

3. Was the cohort recruited in an acceptable way? ***Hint:*** *We are looking for selection bias which might compromise the generalisability of the findings:* - *was the cohort representative of a defined population* - *was there something special about the cohort?* - *Was everybody included who should have been included?*	**Yes** ☐	**Can't tell** ☐	**No** ☐

4. Was the exposure accurately measured to minimise bias? ***Hint:*** *We are looking for measurement or classification bias:* - *Did they use subjective or objective measurements* - *Do the measures truly reflect what you want to (have they been validated)?* - *Were all the subjects classified into exposure groups using the same procedure?*	**Yes** ☐	**Can't tell** ☐	**No** ☐
5. Was the outcome accurately measured to minimise bias? ***Hint****: We are looking for measurement or classification bias:* - *Did they use subjective or objective measurements?* - *Do the measures truly reflect what you want them to (have they been validated?)* - *Has a reliable system been established for detecting all the cases (for measuring disease occurrence)?* - *Were the measurement methods similar in the different groups?* - *Were the subjects and/or the outcome assessor blinded to exposure (does this matter)?*	**Yes** ☐	**Can't tell** ☐	**No** ☐

6. A. Have the authors identified all important confounding factors? **List the ones you think might be important that the authors missed.**	**Yes** ☐	**Can't tell** ☐	**No** ☐
B. have they taken account of the confounding factors in the design and/or analysis? ***Hint:*** *Look for restriction in design and techniques e.g. modelling, stratified, regression, or sensitivity analysis to correct, control or adjust for confounding factors*	**Yes** ☐ **List**	**Can't tell** ☐	**No** ☐
7. A. Was the follow up of subjects compete enough?	**Yes** ☐	**Can't tell** ☐	**No** ☐
B. Was the follow up of subjects long enough? ***Hint:*** - *The good or bad effects should have had long enough to reveal themselves* - *The persons that are lost to follow-up may have different outcomes than those available for assessment* - *In an open or dynamic cohort, was there anything special about the outcome of the people leaving, or the exposure of the people entering the cohort*	**Yes** ☐	**Can't tell** ☐	**No** ☐

What are the results?

8. What are the results of this study? ***Hint:*** - *What are the bottom line results?* - *Have they reported the rate or the proportion between the exposed / unexposed, the ratio / the rate difference?* - *How strong is the association between exposure and outcome (RR)?* - *What is the absolute risk reduction (ARR)?*	**9. How precise are the results?** **How precise is the estimate of the risk?** *Hint:* *- Size of the confidence intervals*
10. Do you believe the results? *Hint:* - *Big effect is hard to ignore!* - *Can it be due to bias, chance or confounding?* - *Are the design and methods of this study sufficiently flawed to make the results unreliable?* - *Consider Bradford Hill's criteria (e.g. time sequence, dose-response gradient, biological plausibility, consistency)*	**Yes** ☐ **Can't tell** ☐ **No** ☐

Will the results help me locally?

11. Can the results be applied to the local population? ***Hint:*** *Consider whether* - *the subjects covered in the study could be sufficiently different from you population to cause concern* - *Your local setting is likely differ much from that of the study* - *Can you quantify the local benefits and harms?*	**Yes** ☐	**Can't tell** ☐	**No** ☐
12. Do the results of this study fit with other available evidence?	**Yes** ☐	**Can't tell** ☐	**No** ☐

APPENDIX 2: SUMMARY OF THE ESTIMATES OF THE RISK OF EXPERIENCING LOW BACK PAIN FOR THE VERY FIRST TIME GROUPED BY HYPOTHESISED CAUSAL (RISK) FACTORS

Key: [1] confidence intervals of the risk estimates excludes the null estimate (1.0); [2] confidence intervals of the risk estimates includes the null estimate (1.0)**;** risk estimates expressed as odds ratio, or relative risk where RR is placed after the estimate; NR = data not reported in original paper; red ink statistically increased risk; blue ink statistically protective effect; black ink statistically non-significant statistic

Hypothesised causal (risk) factor	**Positive associations[1]**		**Negative associations[2]**	
	No.	**Estimate**	**No.**	**Estimate**
INDIVIDUAL RISK FACTORS				
Age				
35 -44yrs (Pietri et al 1992)	-		1	0.7
≥ 45yrs	-		1	0.6
45 – 64yrs (Von Korff et al 1993)	-		1	0.39
65 – 74yrs	-		1	0.9
♂ age (Burdorf et al 1996)			1	NR
♂ 30-44yrs (Croft et al 1999)	-		1	0.8
♀ 30-44yrs	-		1	0.9
♂ 45-59yrs	-		1	1.1
♀ 45-59yrs	-		1	1.1
♂ 60-75yrs	-		1	0.6
♀ 60-75yrs	1	0.6	-	
26 -35yrs (Mustard et al 2005)	-		1	0.69
Gender				
♀ compared to ♂ (Pietri et al 1992, Von Korff et al 1993, Mustard et al 2005)	-		3	1.5; 0.92; 1.19
♀ compared to ♂ (Power et al 2001)	1	0.72		
Socio-economic status	-			
Some college education (Von Korff et al 1993)	-		1	0.39
College graduate	-		1	0.9
♂ Educational level (Burdorf et al 1996)	-		1	NR
Manual social class at birth (Power et al 2001)	-		1	1.21
Manual social class, 23yrs	-		1	1.15

Hypothesised causal (risk) factor	Positive associations[1]		Negative associations[2]	
	No.	Estimate	No.	Estimate
Parental education at birth: high school or less (Mustard et al 2005)	**1**	**1.72**	-	
No university degree	**-**		1	1.08
Number of children				
≥3 (Mustard et al 2005)	**-**		1	1.81
Childhood emotional & behavioural disorders				
Present (Mustard et al 2005)	1	**1.87**	-	
Ill-Health				
Poor general health				
Epigastric pain history (Biering-Sorensen & Thomsen 1986)	1	NR p<0.05		
Previous hospitalisations	1	NR p<0.05		
Previous operations (in & out patient)	1	NR p<0.05		
♂ Good cf. peers (Croft et al 1999)	-		1	1.2 RR
♀ Good cf. peers	-		1	1 .0 RR
♂ Health cf. peers	-		1	1.6 RR
♀ Health fair cf. peers	1	1.8 RR	-	
♂ Health poor cf. peers	-		1	2.1 RR
♀ Health poor cf. peers	-		1	2.1 RR
Non-specific symptoms				
Non-specific symptoms, 1 or 2 (Pietri et al 1992)	-		1	1.1
Non-specific symptoms, 3 or 4	1	2.5	-	
Non-specific symptoms, 5 or more	-		1	0.8
Painful conditions				
1 or more painful conditions (Von Korff et al 1993)	1	2.09	-	
Joint pains (Symmons et al 1991)	1	2.72	-	
Depression				
Depression, moderate (Von Korff et al 1993)	-		1	0.23
Depression, severe	-		1	0.28

Hypothesised causal (risk) factor	Positive associations[1]		Negative associations[2]	
	No.	Estimate	No.	Estimate
Medical conditions in early life (Mustard et al 2005)	-		1	1.01
Functional impairment in early life	-		1	0.39
Psychological distress				
Moderate distress in persons consulting GP (Croft et al 1995)	-		1	1.04
High distress in persons consulting GP	1	2.17	-	
Moderate distress in persons not consulting GP	-		1	1.26
High distress in persons not consulting GP	1	1.95	-	
Distress at 23yrs, incidence at 32-33yrs (Power et al 2001)	1	2.52	-	
Emotional status, poor/intermediate 7 & 16yrs (Power et al 2001)	-		1	1.03
Low distress (Mustard et al 2005)	1	1.86	-	
Moderate / high distress (Mustard et al 2005)	1	1.85	-	
Personal social support				
Infrequent contact with friends and family (Mustard et al 2005)	-		1	1.04
Problematic relationships with friends and family	-		1	1.00
Smoking				
Daily smoking (Biering-Sorensen & Thomsen 1986)	1	NR p<0.05		
Smoking & ex-smokers (Pietri et al 1992)	-		1	1.3
♂ Current smoker (Croft et al 1999)	-		1	1.2 RR
♀ Current smoker	-		1	1.1 RR
♂ Ex smoker	-		1	1.2 RR
♀ Ex smoker	-		1	1.1 RR
Smoked before & since 16 years (Power et al 2001)	1	1.63		
Current light smoker i.e. 1 to 9 cigarettes daily (Mustard et al 2005)	-		1	1.63
Current heavy smoker i.e. >9 cigarettes daily (Mustard et al 2005)	1	1.85	-	
Anthropometric characteristics				
Height (metres)				
♂1.66-1.70 (Croft et al 1999)	-		1	0.8
♀1.66-1.70	-		1	1.6

Hypothesised causal (risk) factor	Positive associations[1]		Negative associations[2]	
	No.	Estimate	No.	Estimate
♂1.71-1.75	-		1	0.8
♀1.71-1.75	-		1	1.5
♂1.76-1.80	-		1	0.9
♀1.76-1.80	-		1	1.6
♂ ≥1.81	-		1	1.0
♀ ≥1.81	-		1	1.8
Sitting height				
Sitting height (skeletal size) (Nissinen et al 1994)	1	1.24	-	
Trunk asymmetry				
Trunk asymmetry (Nissinen et al 1994)	1	1.19	-	
Trunk imbalance				
Trunk imbalance (frontal plane) (Masset et al 1998)	1	1.74	-	
Kyphosis				
Kyphosis (Nissinen et al 1994)	-		1	1.04
Increase of kyphosis	-		1	1.07
Body Weight (kg)				
Overweight (Aro & Leino 1985)	-		1	0.6RR
♂ 66.3 - 71.7 (Croft et al 1999)	-		1	1.4 RR
♀ 66.3 - 71.7	-		1	0.8 RR
♂ 71.8 - 78.0	-		1	1.0 RR
♀ 71.8 - 78.0	-		1	1.4 RR
♂ 78.1 - 85.3	-		1	1.2 RR
♀ 78.1 - 85.3	-		1	1.5 RR
♂ >85.4	-		1	1.0 RR
♀ >85.4	1	1.8 RR	-	
Heavier weight (Masset et al 1998)	1	0.95	-	
Body Mass Index (BMI)				

Hypothesised causal (risk) factor	Positive associations[1]		Negative associations[2]	
	No.	Estimate	No.	Estimate
♂ 21.4 - 23.3 (Croft et al 1999)	-		1	0.9 RR
♀ 21.4 - 23.3	-		1	1.2 RR
♂ 23.4 - 25.1	-		1	1.0 RR
♀ 23.4 - 25.1	-		1	1.2 RR
♂ 25.2 - 27.7	-		1	1.0 RR
♀ 25.2 - 27.7	-		1	1.3 RR
♂ >28.8	-		1	0.7 RR
♀ >28.8	1	1.8 RR	-	
♂ Thin (<15th centile) at 7yrs incidence at 23-31yrs (Lake et al 2000)	-		1	NR
♀ Thin at 7yrs incidence 23-31yrs	-		1	NR
♂ Underweight (15th- 39th centile) 7yrs incidence at 23-31yrs	-		1	NR
♀ Underweight at 7yrs incidence at 23-31yrs	-		1	NR
♂ Overweight (61st-85th centile) at 7yrs, incidence at 23-31yrs	-		1	NR
♀ Overweight at 7yrs, incidence at 23-3lyrs	-		1	NR
♂ Obese (>85th centile) at 7yrs, incidence at 23-31yrs	-		1	NR
♀ Obese at 7yrs, incidence at 23-3lyrs	-		1	NR
♂ Thin (<15th centile) at 7yrs, incidence at 23-33yrs (Lake et al 2000)	-		1	NR
♀ Thin at 7yrs incidence at 23-33yrs	-		1	NR
♂ Underweight (15th- 39th centile) at 7yrs, incidence at 23-33yrs	-		1	NR
♀ Underweight at 7yrs incidence at 23-33yrs	-		1	NR
♂ Overweight (61st-85th centile) at 7yrs incidence at 23-33yrs	-		1	NR
♀ Overweight at 7yrs incidence at 23-33yrs	-		1	NR
♂ Obese (>85th centile) at 7yrs incidence at 23-33yrs	-		1	NR
♀ Obese at 7yrs incidence at 23-33rs	-		1	NR
♂ Thin (<15th centile) at 7yrs, incidence 32-33yrs (Lake et al 2000)	-		1	NR
♀ Thin at 7yrs incidence 32-33yrs	-		1	NR
♂ Underweight (15th- 39th centile) at 7yrs incidence 32-33yrs	-		1	NR
♀ Underweight at 7yrs incidence 32-33yrs	-		1	NR
♂ Overweight (61st-85th centile) at 7yrs incidence 32 -33yrs	-		1	NR
♀ Overweight at 7yrs incidence at 32-33yrs	-		1	NR

Hypothesised causal (risk) factor	Positive associations[1]		Negative associations[2]	
	No.	Estimate	No.	Estimate
♂ Obese (>85th centile) at 7yrs incidence 32-33yrs	-		1	NR
♀ Obese at 7yrs incidence 32-33rs	-		1	NR
♂ Thin (<15th centile) at 23yrs, incidence 23-31yrs (Lake et al 2000)	-		1	NR
♀ Thin at 23yrs incidence 23-31yrs	-		1	NR
♂ Underweight (15th- 39th centile) at 23yrs incidence 23-31yrs	-		1	NR
♀ Underweight at 23yrs incidence 23-31yrs	-		1	NR
♂ Overweight (61st-85th centile) 23yrs incidence 23-31yrs	-		1	NR
♀ Overweight at 23yrs incidence 23-31yrs	-		1	NR
♂ Obese (>85th centile) at 23yrs incidence 23-31yrs	-		1	NR
♀ Obese at 23yrs incidence 23-31yrs	-		1	NR
♂ Thin (<15th centile) at 23yrs, incidence 23-33yrs (Lake et al 2000)	-		1	NR
♀ Thin at 23yrs incidence 23-33yrs	-		1	NR
♂ Underweight (15th- 39th centile) at 23yrs incidence 23-33yrs	-		1	NR
♀ Underweight at 23yrs incidence 23-33yrs	-		1	NR
♂ Overweight (61st-85th centile) at 23yrs incidence 23-33yrs	-		1	NR
♀ Overweight at 23yrs incidence 23-33yrs	-		1	NR
♂ Obese (>85th centile) at 23yrs incidence 23-33yrs	-		1	NR
♀ Obese at 23yrs incidence 23-33yrs	1	1.47	-	
♂ Thin (<15TH centile) at 23yrs, incidence 32-33yrs (Lake et al 2000)	-		1	NR
♀ Thin at 23yrs incidence 32-33yrs	-		1	0.98
♂ Underweight (15th- 39th centile) at 23yrs, incidence 32-33yrs	-		1	NR
♀ Underweight at 23yrs incidence 32-33yrs	-		1	0.79
♂ Overweight at 23yrs (61st-85th centile) incidence 32-33yrs	-		1	NR
♀ Overweight at 23yrs) incidence 32-33yrs	-		1	1.42
♂ Obese at 23yrs (>85th centile) incidence 32-33yrs	-		1	NR
♀ Obese at 23yrs incidence 32-33yrs	1	1.78	-	
BMI <15th centile at 23yrs, incidence 32-33yrs (Power et al 2001)	-		1	1.37
BMI > 70th centile at 23 years, incidence 32-33yrs	-		1	1.22

Hypothesised causal (risk) factor	Positive associations[1]		Negative associations[2]	
	No.	Estimate	No.	Estimate
BMI 70th to 85th percentile (Mustard et al 2005)	1	0.45	-	
BMI >85th percentile	-		1	1.61
BMI (Nissinen et al 1994)	-		1	1
Growth of BMI	-		1	1.22
Physical Capacity				
Torque (Masset et al 1998)				
25% ISOM rotation	-		1	0.69
25% ISOM flexion	-		1	1.24
25% ISOM extension	-		1	1.08
25% ISOM lateral flexion	-		1	1.06
50% ISOM rotation	-		1	0.89
50% ISOM flexion	1	1.71	-	
50% ISOM extension	1	1.69	-	
50% ISOM lateral flexion	-		1	1.19
Max. ISOM rotation	-		1	0.84
Max. ISOM flexion	-		1	1.6
Max ISOM extension	-		1	1.14
Max ISOM lateral flexion	-		1	1
Movement velocity (Masset et al 1998)				
25% ISOM rotation	1	1.76	-	
25% ISOM lateral	1	1.65	-	
50% ISOM rotation	1	2.29	-	
25% ISOM flexion	-		1	1.39
25% ISOM extension	-		1	1.22
50% ISOM flexion	-		1	1.42
50% ISOM extension	-		1	1.3
50% ISOM lateral flexion	-		1	1.55
Radiological changes & abnormalities				
Severe anterior end plate lesion (Ogon et al 2001)	1	3.8	-	

Hypothesised causal (risk) factor	Positive associations[1]		Negative associations[2]	
	No.	Estimate	No.	Estimate
Moderate anterior end plate lesion	-		1	0.3
Posterior end plate lesion	-		1	1.7
Schmorl's node	-		1	1.8
ENVIRONMENTAL ACTIVITY: PHYSICAL				
Work related activity				
Level of physical activity				
Least / less demanding (Mustard et al 2005)	-		1	NR
More / most demanding	-		1	1.53
Manual material handling				
Blue vs. white collar status (Aro & Leino 1985)	1	2RR	-	
Lifting & moving objects				
♂ 18-75yrs lifting / moving weights >25lbs (11kg) (Macfarlane et al 1997)	-		1	1.5
♀18-75yrs lifting / moving weights >25lbs (11kg)	1	2	-	
♂ 45-75yrs lifting / moving weights >25lbs (11kg)	-		1	NR
♀ 45-75yrs lifting / moving weights >25lbs (11kg)	-		1	NR
♂ 18-44yrs lifting / moving weights >25lb (11kg)			1	1.6
♀18-44yrs lifting / moving weights >25lb (11kg)	1	2.8		
♂ Lifting / moving weights >25lb for 1-7yrs	1	2	-	
♀ Lifting / moving weights >25lb for 1-7yrs			1	1.5
♂ Lifting / moving weights >25lb for 8-17yrs	-		1	1.5
♀ Lifting / moving weights >25lb for 8-17yrs	1	2.7	-	
♂ Lifting / moving weights >25lb for >17yrs	-		1	1.3
♀ Lifting / moving weights >25lb for >17yrs	-		1	1
Carrying loads at work (Pietri et al '92)	-		1	0.9
Perception of heavy lifting effort at work (Masset et al 1998)	1	2.26	-	
♂ Digging or shovelling (Macfarlane et al 1997)	-		1	1.1
♀ Digging	-		1	4.8
Driving				
Longer distance driving to work (Biering-Sorensen & Thomsen 1986)	1	NR p<0.05		

Hypothesised causal (risk) factor	Positive associations[1]		Negative associations[2]	
	No.	Estimate	No.	Estimate
Driving 10 -14 hrs week (Pietri et al 1992)	1	4		
Driving 15 -19 hrs week	1	4.8	-	
Driving 20 – 24 hrs week	-		1	3.3
Driving >25hrs week	-		1	3.7
Uncomfortable car seat	1	1.9	-	
♂ Driving >4hrs (Macfarlane et al 1997)	-		1	1.1
♀ Driving >4hrs	-		1	4.8
♂ Driving a truck	-		1	0.5
Less time riding fork lift truck (van Poppel et al 1998)	-		1	**0.7**
Sitting, standing & walking				
Standing (Pietri et al 1992)	-		1	0.8
♂ 18-75yrs standing / walking >2hrs (Macfarlane et al 1997)	-		1	1.6
♀ 18-75yrs standing / walking >2hrs	1	2.9	-	
♂ 18-44yrs standing / walking >2hrs	-		1	1.8
♀ 18-44yrs standing / walking >2hrs	-		1	1.6
♂ 45-75yrs standing / walking >2hrs			1	NR
♀ 45-75yrs standing / walking >2hrs			1	NR
♂ Standing / walking >2hrs for 1-7yrs	1	2	-	
♀ Standing / walking >2hrs for 1-7yrs	-		1	1.6
♂ Standing / walking >2hrs for 8-18yrs	-		1	1.4
♀ Standing / walking >2hrs for 8-18yrs	1	2.2	-	
♂ Standing / walking >2hrs for >18yrs	-		1	1.3
♀ Standing / walking >2hrs for >18yrs	1	2	-	
♂ Sitting >2hrs	-		1	0.9
♀ Sitting >2hrs	1	0.4		
♂ prolonged sitting, standing, walking (Burdorf et al 1996)	-		1	NR
Leisure activity				
Level of activity				
♂ Same level of activity cf. peers (Croft et al 1999)	-		1	1,1 RR
♀ Same level of activity cf. peers	-		1	1.1 RR
♂ Less active cf. peers	-		1	1.1 RR

Hypothesised causal (risk) factor	Positive associations[1]		Negative associations[2]	
	No.	Estimate	No.	Estimate
♀ Less active cf. peers	-		1	1.3 RR
Walking & sitting				
♂ Walking daily >30 minutes (Croft et al 1999)	-		1	1.1 RR
♀ Walking daily >30 minutes	-		1	1.2 RR
♂ Watching TV daily >3 hours	-		1	1.1 RR
♀ Watching TV daily >3hours	-		1	1.1 RR
DIY activity & gardening				
♂ DIY occasionally (Croft et al 1999)	-		1	0.9 RR
♀ DIY occasionally	-		1	1.0 RR
♂ DIY often	-		1	1.2 RR
♀ DIY often	-		1	0.7 RR
♂ Lifting (non-work)	-		1	1.3 RR
♀ Lifting (non-work)	-		1	1.0 RR
♂ Gardening weekly	-		1	1.0 RR
♀ Gardening weekly	-		1	1.0 RR
General sport				
♂ Physical education (Burdorf et al 1996)			1	NR
♂ Sports participation	-		1	NR
♂ Regular sport (Croft et al 1999)	-		1	1.0 RR
♀ Regular sport	1	1.3 RR	-	
Golf				
♂ Frequency playing golf (Burdorf et al 1996)	-		1	NR
♂ No. golf lessons	-		1	NR
♂ Golf handicap	-		1	NR
♂ Warm up before golf	-		1	NR
ENVIRONMENTAL RISK FACTORS: PSYCHOSOCIAL				
low job satisfaction (van Poppel et al 1998)	1	1.4	-	
Job dissatisfaction (Mustard et al 2005)	-		1	1.11

Hypothesised causal (risk) factor	Positive associations[1]		Negative associations[2]	
	No.	Estimate	No.	Estimate
Job strain - high	-		1	0.83
Work social support low	-		1	1.13

APPENDIX 3: TOPIC GUIDE

Please note: the sections of the topic guide that relate to the aims of the study presented in this thesis are in black ink.

Objectives

To learn about:

- definitions of the first ever episode of low back pain
- descriptions of the antecedents of episode of low back pain
- causal attributions

Introduction

Introduce study; discuss confidentiality, audio-taping, timing

BASELINE INFORMATION (TRAIT)

- **Estimation of when last 100% before the onset of back pain**
  i.e. fit & well, able to do what they needed to do at home, work & in their spare time

- **Health (physical and emotional)**
  - Description of health when 100%
    - consideration of how health was / was not looked after
    - were they ever extremely fit

- **Performance (ability to do what they needed to do)**
  - Account of how days were filled when 100%: home / work / spare time
  - Explore coping ability: variations & reasons

- **Context**
  - What was life like when 100%: work / home / money / events / personal relationships / support

MONTHS & WEEKS BEFORE FIRST EPISODE OF BACK PAIN (key section)

- **Performance**
  Explain % scale

  - % estimation of performance
    If performance less than 100%
    - time since 100%
    - description of changes
    - impact on daily life

- **Health (physical and emotional)**
  - Description of health, including non-specific symptoms
  - Any changes of health & performance: time relationships / explanations / responses / consequences

- **Context**
  - Was life the same as when 100% or different
    - if different, how
    - what did they think / feel / do about their circumstances
    - were they aware of any symptoms / bodily sensations

- **Outcome**

FIRST EPISODE OF BACK PAIN

- **Onset**
  - Date
  - Mode e.g. gradual, sudden
  - Trigger: was one identifiable. If identifiable, was it familiar or novel activity, or a stressor
  - Were there any warning signals

- Nature of pain & other non-specific symptoms: site / duration / intensity / changes of character / any new symptoms

- Management: prescribed / self-chosen

AFTER THE FIRST EPISODE OF BACK PAIN HAD SETTLED

- **Performance**: % estimation of recovery to 100% or something lower
  - If performance settled lower
    - to what % level
    - description of the performance impairment
    - impact on daily life

- **Health (physical & emotional)**
  - Description of health: same / better / worse than period before 1st episode

- **Management**: prescribed / self-chosen

- **Context:**
  - What was life like now
    - was it affected by the back pain &, or other circumstances
    - what did they think / feel / do about their circumstances

- were they aware of any symptoms

- **Outcome**

SUBSEQUENT EPISODE(S) OF BACK PAIN

- **Onset**
  - When & how many
  - Mode e.g. gradual, sudden
  - Trigger(s): is one identifiable
    - If yes, is it the same trigger as the first episode
    - If different, what is it
  - Are there any warning signals

- **Nature of episode(s)**
  - Similar or different to 1st episode
    - if different, how
  - Description of any other symptoms

- **Management**
  - Same as first episode or different. If different how, why

- **Nature of interval(s) between episodes**
  - Are they totally or partially pain-free
  - Does the duration vary
  - Is there anything about the interval that has an effect on the next episode

OVERALL STATE BEFORE SUBSEQUENT EPISODE(S) OF BACK PAIN (key section)

- **Performance**
  - % estimation of performance related to trait
    If performance less than 100%
    - period of performance loss
    - description of changes
    - impact on daily life

- **Health (physical & emotional)**
  - Description of health including any non-specific symptoms before the episode(s)

- **Any changes of health & performance**: time relationships / explanations / responses / consequences

- **Context:**
  Have they noticed any changes in their circumstances
  - If so, what do they think / feel / do about them
  - are they aware of any symptoms

- **Outcome**

ATTRIBUTIONS & RATIONALISATIONS

- **What is the 1st episode attributed to**
  - if a familiar activity or stressor why didn't it happen before
  - **why did it happen to them when it doesn't happen to others in similar circumstances?**
- What are the subsequent episodes attributed to
  - if a familiar activity or stressor why now vulnerable
- **Why do they think they have episodes of back pain**

PRESENT STATE

- **Performance**
  - **% estimation of performance**
  - brief account of how days are filled: home / work / spare time leisure

- **Health (physical & emotional)**
  - Description of health including non-specific symptoms
  - Account of how looking / not looking after health

- **Context**
  Description of what life is like

- **Prevention & Management**
  - **Have they learnt anything about avoiding or managing back pain that might help**

END OF INTERVIEW

- Is there anything else they would like to add? Thank participant.

APPENDIX 4: SAMPLING FRAME

	MALE (15 – 20)	FEMALE (15-20)
AGE [1]		
20 TO 33 YEARS	**5 - 6**	**5 – 6**
34 TO 47 YEARS	**5 – 7**	**5 – 7**
48 TO 60 YEARS	**5 - 7**	**5 – 7**
ETHNIC GROUP [2]		
BRITISH	**10 - 13**	**10 – 13**
INDIAN	**3 - 4**	**2 – 3**
CARIBBEAN	**2 - 3**	**3 - 4**
SOCIOECONOMIC GROUP[1,3]		
HIGHER OCCUPATIONS	**5 – 6**	**5 – 6**
INTERMEDIATE OCCUPATIONS	**5 – 7**	**5 – 7**
LOWER OCCUPATIONS	**5 - 7**	**5 - 7**

[1] **AT FIRST EPISODE OF LOW BACK PAIN**

[2] **SELF-ASSIGNED USING THE OFFICE FOR NATIONAL STATISTICS (2001) CLASSIFICATION FOR ETHNIC GROUPS**

[3] **OFFICE FOR NATIONAL STATISTICS (2002) SOCIO-ECONOMIC CLASSIFICATION**

NON-EMPLOYED PERSONS WILL BE CLASSIFIED BY THEIR LAST MAIN JOB. STUDENTS AND PEOPLE WHO HAD BEEN UN-EMPLOYED FOR MORE THAN TWO YEARS OR WHO HAD NEVER WORKED WILL BE CLASSIFIED BY THE HOUSEHOLD REFERENCE PERSON –HRP-. THE HRP IS THE PERSON RESPONSIBLE FOR OWNING OR RENTING OR WHO IS OTHERWISE RESPONSIBLE FOR THE ACCOMMODATION. IN THE CASE OF JOINT HOUSEHOLDERS THE PERSON WITH THE HIGHER INCOME TAKES PRECEDENCE. WHERE INCOMES ARE EQUAL THE OLDER IS TAKEN AS THE HRP.

APPENDIX 5: RESEARCH PROJECT CONSENT FORM

The North West London Hospitals NHS
NHS Trust

RESEARCH PROJECT CONSENT FORM

Northwick Park Hospital
Watford Road
Harrow
Middlesex
HA1 3UJ

Tel: 020 8864 3232
Fax: 020 8869 2009
DDI: 020 8869

Hospital Number:

Name:

Date of Birth:

Title of Project: Investigator

Part A: TO BE COMPLETED BY THE INVESTIGATOR:

I confirm that I have explained this research project to the patient in terms which, in my judgement, are suited to the understanding of the patient and/or one of the parents or guardians of the patient.

_____	_____	_____
Name of Researcher	Signature	Date
_____	_____	_____
Name of Person taking consent (if different from researcher)	***Signature***	Date

PART B: TO BE COMPLETED BY THE PATIENT AND/OR PARENT OR GUARDIAN:

Please initial box

1. I confirm that I have read and understand the information sheet dated for The above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected ☐
3. I understand that my identity will not be disclosed in any published or written data resulting from this study. ☐
4. I understand the above information and agree to take part in the above research project ☐

_____	_____	_____
Name of Patient (and/or Parent/Guardian)	Signature	Date

On completion, one copy of this form (the original) is to be inserted into the patient's case notes. A copy must also be sent to the patient's General Practitioner and a copy handed to the patient to keep.

APPENDIX 6: INFORMATION SHEET

The North West London Hospitals NHS
NHS Trust

Northwick Park Hospital
Watford Road
Harrow
Middlesex
HA1 3UJ

Tel: 020 8864 3232
Fax: 020 8869 2009
DDI: 020 8869

Information Sheet

Research Study Title: Life Before Episodic Non-Specific Low Back Pain*

**The research study's title prior to the preparation of this thesis*

What is the purpose of the study?

Episodes of low back pain are common, but the causes are not well understood in most people. The purpose of this study is to listen to people's accounts of life before the onset of back pain in order to learn more about the possible causes. We hope this knowledge will help us to improve healthcare.

Invitation to participate

You are being invited to take part in this study because you are attending physiotherapy with the type of back pain whose cause we need to learn more about. Please read this information sheet. It tells you what the research is about and what it involves. Do not hesitate to say if any of the information is unclear or if you would like more information.

Do I have to take part?

No, it is up to you to decide whether or not to do so. Please take the time you need to make your decision and, if it helps, discuss it with another person. If you do decide to take part and later change your mind do not hesitate to let us know. You will be free to withdraw from the study without giving a reason. It will not affect the standard of care you receive.

What will happen to me if I agree to take part?

If you agree to take part, the hospital's consent form will be given to you to sign and a copy made for you to keep.

We will then ask you for an interview and arrange to talk to you in the hospital, your workplace or home whichever is most convenient for you, and at a time that suits you.

During the interview you will be asked about your general circumstances, health and performance of daily activities before the onset of your back pain, and how you dealt with any changes. You will also be asked for your views on the cause of your symptoms.

The interview will be informal and last about one and half-hours. If you wish to take a break or stop the interview for any reason you will only need to say so. Similarly, if the interviewer wants to take a break or stop she will let you know. The interview will be audio-taped to allow the interviewer to concentrate on what you are saying, and to make an accurate record.

After the interview a written copy of it will be posted to you so that you can make any alterations or additions if you wish.

We regret that, apart from any travel expenses, we are unable to pay for the interview.

What are the possible disadvantages and risks of taking part?
During the interview you may recall stressful events that upset you. If so please let the interviewer know.

What are the possible benefits of taking part?
We hope that the information we obtain from this study will help us to improve health-care. Your treatment will not be affected by your taking part. If you are interviewed and wish your GP, or any other medical practitioner treating you to know what has been said, you will only need to ask for a written copy of it to be sent to them.

What if something goes wrong?
We are required to inform you that *'if you are harmed by taking part in this research project, there are no special compensation arrangements. If you are harmed due to someone's negligence, then you may have grounds for a legal action but you may have to pay for it. Regardless of this, if you wish to complain about any aspect of the way you have been approached or treated during the course of this study, the normal National Health Service complaints mechanisms may be available to you'.*

Will my taking part in this study be kept confidential?
Any information you provide will be treated with strict confidence, and no information will be passed on to anyone else in any way that might identify you.

If you agree, we will write to your GP and any other medical practitioner who may be treating you to inform them that you are taking part in the study.

What will happen to the results of the research study?
Written and oral accounts of the study's findings will be published as soon as possible. They may include descriptions of your own particular experience of life before back pain in your own words. This information may also be used for teaching purposes. However, it will not be possible to identify you from it because steps such as the use of a pseudonym (false name) will be taken to protect your anonymity.

Who is organising and funding the research?
Researchers from Northwick Park Hospital and Brunel University are undertaking this study jointly. It is being supported by Brunel University.

Who has reviewed the study?
The study has been scrutinised by the Harrow Research Ethics Committee (Reference EC2636).

Contact for further information?
If you have any queries about the study and your involvement in it, or would like more information about it or its findings please do not hesitate to contact:

Jenny King
Department of Health & Social Care
Brunel University
Osterley Campus
Borough Road
Isleworth
Middlesex
TW7 5DU

Telephone: 020 8891 0121
email: jenny.king@brunel.ac.uk

Dr. Andrew Frank
The Arthritis Centre
Northwick Park Hospital
Watford Road
Harrow
Middlesex
HA1 3UJ

Telephone: 020 8864 3232

Thank you for reading this information sheet

April 2003

APPENDIX 7: LETTER TO GENERAL PRACTITIONERS

The North West London Hospitals NHS
NHS Trust

Northwick Park Hospital
Watford Road
Harrow
Middlesex
HA1 3UJ

Tel: 020 8864 3232
Fax: 020 8869 2009
DDI: 020 8869

GP's name and address

Date

Dear Dr *(name)*
Re. (Patient's name and address)

Your patient attended the Physiotherapy Department and agreed to participate in a study of the antecedents of episodic non-specific low back pain. We hope the knowledge we gain will help us to improve healthcare.

The study involves patients being interviewed about their life before the onset of their back pain. Specifically, patients will be asked about their general circumstances, health and performance of daily activities before the onset of their back pain, and how they dealt with any changes. They will also be asked for their views on the cause of their symptoms. Each interview will last for about one and a half-hours. It will be carried out by me in the hospital, or in the person's workplace or home, whichever is most convenient for the person and at a time that suits them.

I enclose a copy of the information sheet that has been given to your patient. If you have any queries or would like to receive information about the study's findings please do not hesitate to contact me or Dr Frank, Consultant in Rehabilitation Medicine and Rheumatology, at Northwick Park Hospital.

The study has been reviewed by the Harrow Research Ethics Committee (reference no. 2636). In accordance with the Ethics Committee's procedures I enclose a copy of the research consent form signed by your patient.

Yours sincerely

Jenny King
Lecturer, Department of Health and Social Care
Brunel University, Borough Road
Isleworth, Middlesex TW7 5DU

Tel. 020 8891 0121
email: jenny.king@brunel.ac.uk

APPENDIX 8: POST INTERVIEW LETTER AND FORM

The North West London Hospitals NHS
NHS Trust

Northwick Park Hospital
Watford Road
Harrow
Middlesex
HA1 3UJ

Tel: 020 8864 3232
Fax: 020 8869 2009
DDI: 020 8869

Participant's name & address

Date

Dear *(Name)*

Thank you very much for helping us with this research study. I enclose a copy of our conversation for you to keep.

Please will you let me know if it is an accurate account or, if not, what changes you would like to make. Also, please let me know if you remember anything that you would like to add.

I enclose a form and a stamped-addressed envelope for your reply.

With best wishes

Yours sincerely

Jenny King
School of Health Sciences and Social Care
Brunel University, Borough Road, Isleworth
Middlesex TW7 5DU

Tel. 020 8543 1276

email: jenny.king@brunel.ac.uk

Life before Episodic Non-Specific Low Back Pain*

**The research study's title prior to the preparation of this thesis*

Please complete this form by placing a tick in the appropriate box(es)

☐ I confirm the transcript is an accurate account

☐ I wish the following changes to be made

Please write the changes here. Continue on a separate sheet if necessary

☐ I would like to add the following comments

Please write the comments here. Continue on a separate sheet if necessary

Signed…….....

Please print name…….

Thank you for completing this form. Please return it in the stamped-addressed envelope to Jenny King, School of Health Sciences and Social Care, Brunel University, Isleworth, Middlesex. TW7 5DU. Tel 020 8891 0121

APPENDIX 9: INDEX (THEMATIC FRAMEWORK)

Please note, the index numbers relating to the aims of the study presented in this thesis are typed in black ink

1. Personal information

1.1 Country of birth / year (age) came to UK / ethnicity if different to country of birth
1.2 Childhood / family relationships
1.3 Education / schooling
1.4 Childhood leisure / sporting activities
1.5 Other
1.6 Notes / comments

2. Before the first ever episode of low back pain

2.1 Social circumstances and chronology of any changes / events / difficulties
2.2 Lifestyle / level of activity
2.3 Description of daily activities (typical day / week; satisfaction; home role / responsibilities; leisure hobbies / use of spare time)
2.4 Job title / role / responsibilities
2.5 Performance / (in)ability to cope with daily activities / last 100%
2.6 Description of health (emotional and physical) / wellbeing
2.7 Chronology of ill-health: diagnoses and non-specific symptoms / attribution
2.8 Consequences of any social events, changes in health and or performance
2.9 Family / social relationships / support
2.10 Other issues
2.11 Notes / comments

3. First ever episode of low back pain

3.1 Recall / definition of first episode
3.2 Year (age) occurred
3.3 Mode of onset (gradual / sudden etc.) warning signal(s) / trigger / time of day
3.4 Nature of pain (include QTF)
3.5 Performance changes
3.6 Consequences / difficulties experienced / feelings about
3.7 Self-help / management / secondary prevention-strategies and rationale
3.8 Professional advice / why sort and from whom
3.9 Treatment / therapy / concordance / outcome / feelings
3.10 Medical investigations / results / views about
3.11 Explanations / beliefs re cause

3.12 Other issues
3.13 Notes / comments

4. After first ever episode of low back pain settled

4.1 Social circumstances and chronology of any changes /events / difficulties
4.2 Performance / % / return / general approach to activity including work
4.3 Health (emotional and physical) / wellbeing
4.4 Chronology of ill-health: diagnoses and symptoms / attribution
4.5 Other issues
4.6 Notes / comments

5. Subsequent episodes of back pain

5.1 Chronology of episodes / recall
5.2 Mode of onset (gradual / sudden / warning signals / trigger / time of day)
5.3 Nature of pain (QTF / same or different from each other)
5.4 Co-morbidity
5.5 Performance changes
5.6 Consequences / difficulties experienced / feelings about
5.7 Self help / management / strategies adopted and rationale
5.8 Professional advice and management why sort / from whom
5.9 Treatment / therapy / concordance / outcome / feelings
5.10 Medical investigations / results / views
5.11 Nature of intervals between subsequent episodes
5.12 Explanations / beliefs re cause
5.13 Other issues
5.14 Notes / comments

6. Before Subsequent episodes of pain

6.1 Social circumstances / chronology of any changes / events / difficulties
6.2 Performance / ability to cope with activity / timing of any changes / %
6.3 Health – awareness & timing of any changes
6.4 Other issues
6.5 Notes / comments

7. Present

7.1 Number of months / years since first episode
7.2 Social circumstances / partnership status / children / living arrangements
7.3 Work situation
7.4 Description of performance / level of activity / ability to cope / %
7.5 Health status
7.6 Back pain / treatment status

7.7 General approach to back pain (e.g. get on with it) / knowledge of moving & handling & whether applies knowledge
7.8 General beliefs re cause of back pain
7.9 Beliefs about the future in terms of back pain
7.10 Other issues
7.11 Notes / comments

8.Issues not noted above

8.1 Disposition / approach to activity
8.2 Description of self
8.3 Physical fitness /stamina (trait) / energy levels
8.4 Health behaviour e.g. gymn / vitamin use / smoking / alcohol consumption
8.5 Sleep – quality / tiredness / rest
8.6 Knowledge of back pain gained from others
8.7 Weather
8.8 Other issues
8.9 Notes / comments.

APPENDIX 10: EXAMPLE OF INDEXED DATA

Index no: 1.2 = childhood/family relationships; 1.3 = education/schooling; 2.4 = job title/role; 3.1 = recall/definition of first ever episode; 3.3 = mode of onset; 3.4 = nature of pain; 3.5 = performance changes; 3.8=professional advice/why sort/and from whom (Appendix 9)
Please note: minor details have been altered to protect anonymity

Extracts from Transcript	**Index no.**
Interviewer: Please can you tell me about yourself?	
Margaret: I am 50 years old. I come from a fairly big family. Four children. I've got an elder sister, a younger sister, and then a brother. I went to school in, a co-ed school. I left school and went to college to train as a teacher. I got married when I left college. I was teaching at the time. Then I had two daughters who are now twenty three and twenty one. I got divorced. I can't remember the year but quite young. Then I met someone else whom I'm now still with. I gave up... I'll backtrack...I gave up, taught for five years then I had my daughters. When the youngest was two, about two and a half I went back to work part-time and then for about three years I worked part-time and I've worked ever since.	1.2 1.3 1.2/2.4
Interviewer: When did you first have back pain, your first ever episode?	
Margaret: Two years ago. That's when I started to get it [when] it was really affecting my life...there were things I couldn't do. But I do remember when I used to watch my younger daughter playing hockey. Now that would have been, at least, I would guess that must be three or four years ago. I mean she played for years but I remember towards the end when I used to watch her, if I'd been standing up watching her for like about an hour and a half I remember then my back would hurt. But it didn't last. I just remember standing there and saying 'oh my back is playing me up' but then I'd go home and sit down and it would be ok. I wouldn't even think about it the next day.....	3.1/3.5 3.3 3.4/3.5
Interviewer: You used to get it watching hockey?	
Margaret: Yes, and I remember after a while I kind of would get it every time because an hour and a half standing up I would never have normally done that. Any other time I would never stand up for an hour and a half....It wasn't like I couldn't bear it and then (daughter's name) stopped playing hockey..it didn't bother me. I just thought oh I'm standing up for a long time. That's what it is. When I got it after that. I don't remember what triggered it off but I remember being at work and it was for about five days...I remember it got bad enough to go to the doctor	3.3 3.4/3.5 3.3/3.8
Interviewer: and this would be about two years ago	
Margaret: Yes, I went to the doctor. I honestly could hardly walk but I shouldn't....I stayed at work and that was probably the worse thing.	3.5/ 3.8

APPENDIX 11: EXTRACT FROM A TIME LINE

Please note: minor details have been altered to protect anonymity

Margaret

1953	Born, Kent
1972 to 1975	Studying at teacher training college
c. 1975	Married
1975	Teaching in primary school
1980	Stopped teaching
	1st then 2nd daughter born
1983	Returned to teaching part-time Divorced. Met partner
1986	Returned to teaching full time
1997	Elder daughter left school and met boyfriend
March 1997	Experienced severe left-sided facial pain for 7-10 days Saw GP – nothing abnormal discovered
Easter 1997	Experienced severe facial pain flying home from holiday
End Easter holiday	Elder daughter pregnant
	Experienced intermittent facial pain
Beginning summer term 1997	Burst into tears when asked about facial pain. Surprised by own reaction.
	Following Tuesday felt severe facial pain watching younger daughter playing hockey. Just managed to get home. Consulted neurologist who said pain was stress-related
	Couldn't get up one morning. GP prescribed anti-depressants
July 1997	Situation with elder daughter improving Numb arm. GP said it was depression

October 1997	Stressful school inspection Annoyed, head teacher / staff thinking she cannot cope
Winter 1998/99	Back aching when standing watching hockey in cold / wet weather. Ache went on sitting down
October 1999	Elder daughter pregnant. Living at home with new boyfriend. Tension.
	Niggling facial pain. GP said stress-related
Summer 2000	Elder daughter and boyfriend moved out to a flat
Jan to June 2001	Elder daughter, two grandsons and younger daughter move to live on south coast
	Partner made redundant
	Negative feelings about teaching
June 2001	**First ever episode of low back pain**
	Pain started at work. Onset gradual. Could hardly walk. GP prescribed painkillers
2002	Moved to another teaching post

APPENDIX 12: EXAMPLE OF CHARTED DATA

Chart 2 – Before the First Ever Episode of Low Back Pain

Key: [3] = page number; <lbp = before first ever episode of low back pain; 3/12= 3 months; NAD=nothing abnormal discovered; quotations in italics; column numbers derived from index in appendix 9. *Please note: minor details have been altered to protect anonymity*.

	Col. 2.1	**Col.2.2**	**Col. 2.3**
	Social Circumstances	Lifestyle / Level of Activity	Description of Daily Activity
Usha	5yr<lbp not getting on with husband [3,4] Hoped things would work out if had baby. Didn't. Daughter born. Lots of physical stuff: hitting, fighting [3,4]. Losing hope [19]. Got court order to prevent husband taking daughter [4] Daughter scared, hiding in corners [4]. Concerned daughter thought it normal. Stressful but coped. Pushed problems to back of mind. [19] Feb/Mar (3/12<lbp) took final step, moved home to parents [4,5] Lost hope. Problems *hit me*. Gave up work to avoid husband and look after daughter [4] Financial problems [5] Worry re future. Coping with daughter on own v. difficult [19]	*Run around a lot* because of work / travelling [27] Working very long hours [8] *Just kept going* [27] (Gave up work 3/12<lbp – see col 1)	Full working day 7 am to 7pm. Home, cook, clean, TV, bed. Visited parents at weekends. Homely, not a social person. Dislike going out a lot [8]
Margaret	Married, had 2 daughters & divorced young. Met present partner [2] 1997 (c.4yrs<lbp) very upset / stressed. Elder daughter met boyfriend – *really bad news* [6] Daughter rarely at home, became pregnant [7] Also in 1997 experienced left sided facial pain-NAD [6,7,16] Stressful school inspection (12-15/12<lbp) [11] Elder daughter pregnant again & living at home whilst *new* boyfriend finished his education. Partner did not want them there. *Tension.* She felt *stuck in the middle* (5/12<lbp) [25] Elder daughter, two grandsons & younger daughter moved to live on south coast [3,38]. Partner made redundant (c.1/12<lbp) [3] Realised should not be in teaching anymore. Too many negative feelings. Heart not in it any more. Working long hours [14,32,33]	*Never really had time to sit & think. I just used to get on with things. I was busy [13] I didn't realise the stress because I was so busy [6,13] Even at weekends everything was being timed so I could slot everything in [14] No time to sit and think [13]* about / do any thing for self [6,24]	Monday to Friday at school. Evenings spent doing school work. It went on and on. Often up late to complete it. Up to 3am writing reports. Saturday morning: housework. Saturday afternoon: school work. Saturday evening: out with friends. Sunday: hockey. Everything timed to fit in. No time for self [13,14]
Elka	c.1986 met partner [9] 1986 bought house [16] Relationship with partner broke up 1996/1997 (c. 1yr<lbp) Disagreements with his mother came to a head [9,20] Reconciled after 3 or 4/12 (c. 8/12<lbp) [22]	*I wasn't that active* nor was partner. Didn't do anything strenuous [16] Time for hobbies / self. Like doing manual things e.g. glass work [17] Some days on the go at work & no time for a cup of tea [14]	Weekday: work, shopping 2/3 times each week. Home, eat, partner in at 7ish. Watch TV. Saturday: housework, shopping. Sunday: leisure activities vary e.g. cooking, visiting friends, entertaining, day out. Do less in spare time because partner is tired from more demanding job [16,17]

APPENDIX 13: REFLECTION ON HOW THE STUDY FINDINGS COMPARE WITH THE QUALITATIVE LITERATURE ON LOWER BACK PAIN

INTRODUCTION

Non-specific low back pain is an important health and social concern. As noted in chapter 1 of this thesis, the costs are high both economically and in terms of personal suffering. To advance knowledge for prevention and management therefore, researchers, from a positivist tradition, have sought to identify factors associated with the increased risk of low back pain occurring. Psychological distress, for example, has been identified by the systematic review (chapter 4) in this thesis to predict the first ever episode of low back pain. At an individual level, however, the notion of risk factors has only a limited predictive value: not everyone who is distressed will experience low back pain. To understand, therefore, how particular individuals may experience and account for ill health associated with low back pain, and its impact upon them, a wider range of factors has to be considered including physical, psychological and socio-cultural factors and the interplay between them (Helman 2007).

Little was known about the meaning of the subjective experience of low back pain before the mid-to-late 1990s (Borkan et al 1995, Walker et al 1999). Since then, important contributions to knowledge have been made by social scientists utilising qualitative research methodologies. One of the primary reasons for adopting these methodologies is the recognition that painful experiences and their meanings are actively constructed during social encounters that, in turn, are embedded in, and shaped, by social and cultural perspectives (Yardley 2000).

This paper begins by selectively reviewing the qualitative literature that contributes to knowledge about the meaning of people's experiences of low back pain and provides the context for the qualitative study presented in this thesis. This study involved listening to NHS service users' narrative accounts of their first ever episode of low back pain and what they regarded as its

antecedents, in order to better understand their experiences and thereby advance knowledge for healthcare. Through reflecting upon the literature, and further interpreting the study participants' narratives, two salient topics emerged that form the basis of the discussion in this paper. The first topic concerns the meaning of physical sensations in the lower back i.e. how 'normal' physical sensations in the lower back came to be interpreted as 'abnormal' by the study participants and therefore regarded as a symptom of ill health associated with low back pain. The second topic considers how the participants appeared to buffer the meaning of ill health associated with low back pain upon the self. Bury's (1982, 1991) distinction between meaning as significance and meaning as consequence provides a useful framework to examine the meaning of experience upon the self. Sometimes referred to as the self-concept, the sense of self or identity, the self refers to a 'dynamic set of core beliefs, constructs, affects and cognitions' by which the individual both defines and presents the self to external world (Osborn and Smith 2006 p.216). Central to the construction and expression of self are gender, ethnicity, social roles, and valued activities i.e. activities that are culturally specified, personally meaningful and / or intrinsically rewarding amongst other factors (Cantor and Sanderson 2003). The discussion of these topics, following the brief literature review–below, considers how the PhD study's findings compare with the qualitative literature that focuses upon chronic pain experiences. In this way the reader is enabled to assess the extent to which the findings from the qualitative study in this thesis build upon and contribute to the literature. The implications of these findings for healthcare conclude the paper.

LITERATURE REVIEW

This appendix offers a brief narrative review of the qualitative literature in which the study presented in chapters 5 to 8 of this thesis is situated (Greenhalgh 1997, NHS Centre for Reviews and Dissemination 2009).

Utilising the keywords 'qualitative research' and 'back pain', the literature was identified through searching six electronic databases (British Nursing

Index, CINAHL Medline, PsycArticles, PsycInfo, Scopus) from their inception to May 2011, and hand searching the references of full text papers. Forty seven papers focusing upon people's experiences of low back pain were identified. Important and recurrent issues in the identified literature were noted and grouped together, yielding a number of themes advancing knowledge of the subjective experience of low back pain and its meaning through: interpreting alterations in the internal bodily state, communicating the painful experience, interacting with health professionals (mainly doctors) to legitimise the painful experience, the influence of the painful experience on the self, and experiences and expectations of pain management. The literature relating to these themes is discussed below. Other themes, less relevant to the focus of this PhD research, are not discussed further. These themes are: physical inability to engage in everyday activities and associated emotional distress (e.g. McPhillips-Tangum et al 1998, Rhodes et al 1999, Vroman et al 2009); incapacity to work and sick listing (e.g. Hansson et al 2001, Wrapson and Mewse 2010); perceptions of recovery (e.g. Carnes and Underwood 2008, Hush et al 2009); and experiences of remaining at and returning to work (e.g. Shaw and Huang 2005, Coole et al 2010a,b).

The selected literature reflects a range of qualitative methodologies and associated epistemologies characteristic of the non-realist philosophical perspectives underpinning most qualitative research (Yardley 2000). In the main, the body of knowledge emanating from this research describes the experiences of people presenting to different healthcare settings with chronic low back pain i.e. pain that persists beyond the expected duration of healing, usually taken to be three months or more (International Association for the Study of Pain 1986). Several authors have utilised theoretical concepts drawn from the literature that have contributed to the greater understanding of chronic illness more generally to interpret their findings (Corbett et al 2007). These concepts include Bury's (1982) work on 'biographical disruption', Charmaz's (1983) study of 'loss of self', G William's (1984) account of 'narrative reconstruction'; and Zola's (1966, 1973) seminal work

on the role of socio-cultural factors in the labelling and definition of a bodily state as a symptom requiring healthcare. Very few papers report healthcare service users' experiences of recurrent (e.g. Dean et al 2005) or acute low back pain (e.g. Vroman et al 2009, Wrapson and Mewse 2010), or the experiences of non-service users (e.g. Campbell and Cramb 2008). Two studies (Borkan et al 1995, Lillrank 2003) were found that contain helpful information about people's experiences of physical sensations in the initial onset of low back pain although the topic was not the main focus of either study. No previous study was located that focused solely on experiences of the *first ever* episode of acute low back pain (duration: less than 3 months - International Association for the Study of Pain 1986-) as in the current reported study.

Given the constraints of wordage, the discussion of the literature below focuses upon the themes emerging from the qualitative literature on back pain that are most relevant to the focus of this PhD thesis, namely: people's difficulties interpreting alterations in the internal bodily state, communicating the subjective painful experience, interacting with health professionals, influence of the painful experience upon the self, and experiences and expectations of pain management. The concepts of 'biographical disruption' (Bury 1982), 'loss of self' (Charmaz 1983) and 'narrative reconstruction' (Williams 1984) are also considered.

Interpreting alterations in the internal bodily state

It is evident from the literature that uncomfortable physical sensations in the lower back appear to be a 'normal' everyday experience (Borkan et al 1995). Normalisation, the recognition that these physical sensations are part of the normal human experience and do not necessarily represent illness or the need to seek healthcare until they are sufficiently severe to interrupt social functioning in everyday life, is commensurate with western cultural beliefs (Zola 1973, Kessler and Hamilton 2004). Usually, the 'normal' discomforting physical sensations go unrecognised by healthcare professionals and do not

appear in the literature because people rarely seek care for them (Borkan et al 1995). The literature search for this paper, however, found two examples of 'normalisation' in published accounts of back pain. In the first account, people described a heightened awareness of back 'tension' and 'tiredness' during daily activity for which no particular treatment was sought (Borkan et al 1995). In the second account, women's written narratives documented the integration of 'pain' into daily life until a turning point was reached. Thereafter, the 'pain' restricted physical activities such as walking, sitting, sleeping and other everyday functions. Consequently, the women could not continue to ignore the discomfort and were forced to acknowledge the bodily reality of their painful experience as something 'abnormal' (Lillrank 2003). The turning point for interpreting the internal bodily state as 'abnormal' appears to vary between people and depends upon several factors including past experience, personality, familial and cultural mores, the context of the individual's situation and current interpersonal interactions such as with family members who might sanction the need to take a day off work, or insist upon a visit to the GP (Borkan et al 1995, Nettleton 2006a).

Communicating the painful experience

The deciphering of the internal bodily state as 'abnormal' is further complicated by the fact that many internal sensations, including low back pain, do not possess a lexicon (Scarry 1985). What is said about pain may be learnt in childhood and differ according to local cultural practices (Sim and Smith 2004). Given this difficulty sharing the private inner experience and the impact that this may have upon pain assessment and treatment, a number of researchers have sought to advance knowledge about the use of language in the communication of the painful experience. De Souza and Frank (2000) and Barker et al (2009), for example, explored verbal descriptions of the painful experience given by lay people and health professionals, revealing differences that may lead to misunderstandings if not addressed in the healthcare setting. In the latter study, for example, the medical constructs of 'acute' and 'non-specific back pain' were understood

by lay focus group participants to mean ‘severe, in a specific spot or sharp’ and ‘pain felt all over’ respectively (Barker et al 2009). The words used to elicit information about back pain in research settings may also be open to individual interpretation by study participants and influence the outcome of research questions, and hence the validity and reliability of quantitative pain rating scales. Consequently, researchers have focused upon the use of language to develop more meaningful assessment tools (e.g. Hush et al 2009), research questions (e.g. Dunn et al 2006) and outcomes (e.g. Casarett et al 2001). Qualitative research does not appear to have addressed non-verbal communication of back pain, such as bodily gestures and silent pauses, despite Hyden and Peolsson (2002) and Charmaz (2002) noting its importance in the communication of inner experiences.

Interacting with health professionals to legitimise the painful experience

Given its ‘invisibility’, non-specific low back pain challenges biomedical epistemology (Eccleston et al 1997). In the absence of any imaging techniques to make visible any underlying tissue damage (Rhodes et al 1999), doctors appear uncertain as how best to diagnose (i.e. explain the nature of the pain) and provide evidence-based back pain care (Skelton et al 1995a, Schers et al 2000, McIntosh and Shaw 2003, Breen et al 2004, 2007). Consequently, this is an important area for continuing professional education (Skelton et al 1995b, Breen et al 2007). Typically, people reporting back pain consider it important to receive an accurate diagnosis so that they can provide a credible explanation to others that their pain is ‘real’ (Twisselman 2004, Verbeek et al 2004, Dean et al 2005, Liddle et al 2007). Tensions in the doctor – patient relationship may ensue when this is not forthcoming (Glenton 2003, Lillrank 2003, McIntosh and Shaw 2003). Dismissive and moralising attitudes about the subjective painful experience including unhelpful medical explanations that the pain is a ‘normal’ experience, ‘unreal’ (Lillrank 2003) or ‘psychological’ (i.e. a problem of the mind rather than mechanical dysfunction) have been reported (Eccleston et al 1997, May et al 2000, Lillrank 2003). In addition, treatment perceived to be

inappropriate (e.g. referral to a psychologist, and the provision of insufficient information and advice) have been recalled by patients (Glenton 2003, Lillrank 2003, McIntosh and Shaw 2003). Thus individual patients may feel let down and perceive that their pain is not considered legitimate (May et al 2000, Glenton 2003, McIntosh and Shaw 2003). Feelings of delegitimisation, that may be interpreted by the person as a threat to their moral character (Sim and Smith 2004), have been described in a number of accounts of back pain sufferers' experiences (e.g. Borkan et al 1995, Rhodes et al 1999, Walker et al 1999, Glenton 2003, Lillrank 2003).

Inescapably, therefore, pain has a social dimension and convincing other people of the reality of back pain appears to be a necessary part of legitimising the painful experience. Accordingly, individual patients appear to stress the authenticity of their accounts including the physical reality of their pain and blame the failure of health professionals to find a cure (May et al 2000, Vroman et al 2009). Physical signs, such as mechanical dysfunction (e.g. difficulty walking or bending down) may be emphasised, and stressful circumstances and mental health problems may be 'hidden' from the healthcare professional due to the fear that talking about them may confirm the professional's belief that the pain is 'psychological' and not 'real', leading further to its delegitimisation (May et al 2000, Glenton 2003). Glenton (2003) and Lillrank (2003) describe how experiences of delegitimisation can be understood as a result of the back pain sufferer's inability to resolve the diagnostic uncertainty associated with ill health and achieve the 'sick role', thereby accessing social benefits and sick leave.

Influence of the painful experience upon the self

One of the effects of not having the painful experience believed is to experience stigma (Newton et al 2010). Holloway et al (2007) and Slade et al (2009) provide detailed accounts of the stigma experienced by people with chronic back pain: subtle and overt stigmatisation may be perpetrated not only by healthcare professionals but also by family, friends, the general

public, work colleagues, employers and other back pain sufferers (Slade et al 2009). In turn, this may have a profound effect upon the person's self-concept and influence their attitude and behaviour towards others including those offering professional help (Holloway et al 2007).

Multiple stigmatising encounters, in addition to the experience of pain per se may have an effect on a person's identity (Holloway et al 2007, Vroman et al 2009, Crowe et al 2010a, Newton et al 2010). An emerging theme from a number of qualitative studies has been the impact of the experience of acute and chronic pain on the self (e.g. Osborn and Smith 1998, Gustafsson et al 2004, Corbett et al 2007, Smith and Osborn 2007, Vroman et al 2009). Stigma and oppression, for example, may not only lead to feelings of low self-esteem (Snelgrove and Liossi 2009) but also to withdrawal from valued activities and social roles perpetuating feelings of distress, and a fear of being a burden to others (Lawton 2003). In turn, living a more restricted life may exacerbate perceptions of diminished social and moral worth because of the absence of opportunities for constructing a valued self through meaningful social interactions (Lawton 2003). Emergent themes from several studies illustrate the multi-faceted experience of loss across all areas of the sufferer's life and disruption to personal relationships and the self (Charmaz 1983, Walker et al 2006, Crowe et al 2010a, De Souza and Frank 2011).

With regard to the experience of low back pain per se, awareness of the body is basic to consciousness of the self (Cameron 2001). Low back pain may therefore impinge upon the self by bringing about a new consciousness of the body and alter the way in which a person perceives the self in relation to their body (Osborn and Smith 2006, Snelgrove and Liossi 2009, Crowe et al 2010a). Parts of the body, previously taken for granted, may become associated with feelings of exclusion, alienation, rejection and powerlessness (Osborn and Smith 2006). A dualism of self (i.e. a separation of the mind and body) may also be experienced in which any dysfunctional or painful part of the body is placed outside the body and felt to be 'not me'

(Osborn and Smith 2006 p.219, Crowe et al 2010a p.590). For some people the impaired functioning of the body may be perceived to be 'letting them down' (Snelgrove and Liossi 2009 p.745) and the accompanying negative self-appraisal may adversely impact upon self-identity (Eccleston et al 1997, Smith and Osborn 2007) and self-esteem (Snelgrove and Liossi 2009). Consequently, these qualitative studies highlight the importance of addressing issues relating to the concept of the self in healthcare, as discussed further below (Osborn and Smith 2006, Holloway et al 2007).

Experiences and expectations of pain management

Given the diagnostic uncertainty and the typical lack of an effective long-term treatment, people with low back pain are often dissatisfied with the healthcare that they receive (Walker et al 1999, Verbeek et al 2004). Consequently, there appears to have been an increasing emphasis on self-management in recent years (Holloway et al 2007, Crowe et al 2010b). The qualitative literature reveals that a wide range of self-management techniques may be utilised for pain relief and to prevent exacerbations of the pain. Mainly physically-oriented, these self-management techniques include light exercise; back and stomach strengthening exercises; postural and ergonomic awareness; rest with a gradual return to activity; activity modification; application of heat; massage; analgesia; family assistance; wearing a corset; pacing activities and use of information from self-help books (Skelton et al 1996, Liddle et al 2007, May 2007, Crowe et al 2010b). Knowledge of these techniques appears to have been learned both from health professionals and from personal experience (May 2007, Crowe et al 2010b).

Suggestions for improving healthcare based upon people's previous experiences are also documented in the literature. Irrespective of the nature of the pain i.e. whether it is acute or chronic, people with back pain expect healthcare professionals: to have a better understanding of the physical and emotional impact of low back pain (Liddle et al 2007, Oien et al 2009); to

improve their communication skills (McIntosh and Shaw 2003) i.e. to understand, listen, respect and include patients and their views in decision making, and to ensure appropriate standards of care e.g. timely appointments (Skelton et al 1996, McIntosh and Shaw 2003, Verbeek et al 2004, Liddle et al 2007), to offer a detailed physical examination and diagnostic tests (Verbeek et al 2004), and to provide discussion about diagnostic and treatment uncertainties (McIntosh and Shaw 2003, Verbeek et al 2004). Also, people with back pain would like exercise programmes with individually tailored advice and follow-up support (May et al 2000, Liddle et al 2007), advice about activity modification (Liddle et al 2007), pain relief to decrease difficulties performing daily activities (Verbeek et al 2004, Liddle et al 2007), better information and advice (Verbeek et al 2004), and to be included in the development of information material that meets their needs (McIntosh and Shaw 2003) amongst other factors.

Healthcare appears to have paid little attention to addressing the self explicitly (Smith and Osborn 2007, Snelgrove and Liossi 2009) despite a number of authors asserting that the self experiencing the pain as well as the pain itself should be addressed in healthcare (e.g. Holloway et al 2007, Osborn and Smith 2007). Given this situation, relatively little evidence appears in the back pain literature as to how best to address the self experiencing back pain. Consequently, this appears to be an important area for the continuing professional development that is needed (Skelton et al 1995b, Breen et al 2007).

Utilising illness narratives in pain management to explicitly address the self has been recommended by some authors (e.g. Eccleston et al 1997, Holloway et al 2007, Osborn and Smith 2007). This is because they contribute to an understanding of how people experience, make sense of, and redefine the self in the face of illness (Hyden 1997). Laerum et al (2006) suggest that a fundamental element of this approach is the general attitude

of the healthcare professional characterised by showing respect for the patient's values and autonomy.

Enabling an individual patient to maintain their identity as someone with 'real' pain requires constructive interactions with healthcare professionals (May et al 2000, Vroman et al 2009). By listening carefully to the low back pain sufferer's narrative, the health professional may be better able to understand and reason about each person's perceptions and interpretations, not only from the way that the narrative is constructed but also from the content of the narrative (Hamilton 2008). Understanding what each person considers legitimate and defamatory, for example, may help the healthcare professional avoid explanations and suggestions that may be perceived by the person to delegitimize their pain and be stigmatising (Laerum et al 2006). The perception that the healthcare professional believes that the pain is 'real' may minimise feelings associated with delegitimisation such as stigma and oppression that may have previously led to withdrawal from social activities (Laerum et al 2006). To further alleviate stigma, exercise programme participants recommend the inclusion of health professional and public education, and low back pain specific support groups (Slade et al 2009). Support groups provide back pain sufferers with the opportunity to share information with each other which may, in turn, contribute to normalisation of internal bodily changes and pain, enhance the reconstruction of identity and promote a collective sense of self (Borkan et al 1995, Haugli et al 2011). Also, it may be advantageous for service users to listen and learn from non-service users who manage their own back pain (Campell and Cramb 2008). The dissemination of success stories may also be helpful (Slade et al 2009).

In addition to enhancing social interactions in healthcare, by telling their story, for example, individual patients may fulfil the need to make sense of their pain and re-contextualise their experiences in ways that are more accepting of the lived experience (Eccleston et al 1997, Smith and Osborn 2007, Vroman et al 2009). May et al (2000) and Vroman et al (2009), for

example, recommend that patients are enabled to view low back pain as a recurring disorder that can be managed with self-help strategies rather than as a medical condition that can be cured. Similarly, Smith and Osborn (2007) suggest that the person may be helped to see that their experience is not a character flaw or a weakness but integral to the painful experience that cannot be cured but can be accepted and managed. Smith and Osborn (2007) also suggest that enabling patients to recognise their own experience and expertise may, in turn, promote engagement and rapport with healthcare professionals.

Biographical disruption, loss of self and narrative reconstruction

The literature discussed hitherto reveals the disruptive nature of experiencing back pain. It is relevant therefore to consider Bury's (1982, 1991) theory of 'biographical disruption' and two other concepts Charmaz's (1983) 'loss of self' and G Williams (1984) 'narrative reconstruction'. These papers have contributed to an understanding of the (chronic) illness experience more generally. Consequently, many authors, including the author of this paper, utilised these concepts to interpret their study's findings.

Bury's (1982, 1991) theory of biographical disruption suggests that an inability to perform valued everyday activities because of ill health may impact upon aspects of the self e.g. perceptions of self-worth. Given this disruption, re-appraisal of the self, after the onset of the illness commonly occurs as the person tries to make sense of the experience in the wider context of their life. Bury (1988) distinguishes 'meaning as consequence' (i.e. the practical problems that illness creates for the individual such as disruption to work, domestic routines and social relationships), from 'meaning as significance' (i.e. the socio-cultural representation of different conditions including imputed stigma, social worth and other perceptions) that may impact upon the individual's sense of self. The meaning of illness therefore is not 'fixed' but may be revised during everyday social interactions.

In reviewing Bury's (1982, 1991) theory, SJ Williams (2000) emphasised that the meaning of the biographical disruption may be influenced by contextual factors. For some individuals, by virtue of experiencing a hard life and advanced age, for example, SJ Williams (2000) argued that the onset of (chronic) illness may not necessarily be extra-ordinary (i.e. biographically disruptive) but rather a continuation of a person's biography through which they continue to experience many other difficult events and situations. SJ Williams' (2000) argument is supported by empirical research carried out by Pound et al (1998) and Sanders et al (2002). These studies of chronic illnesses commonly associated with ageing (osteoarthritis and stroke) suggest that the impact of prior illness and lifestyle upheavals may militate against the onset of illness being perceived as particularly disruptive. Sanders et al (2002) study of people experiencing osteoarthritis, for example, found that older people portrayed their symptoms as integral to the ageing process (i.e. minimised the 'meaning of significance'). However, the disruption to their day to day lives (i.e. 'meaning as consequence') was evident. Advanced age and the events that accumulate with age may therefore mediate the illness experience.

Charmaz (1983) examined the social impact of chronic illness on the self. From her study it is apparent that as individuals try to make sense of their illness, they may speak of their concerns about the person they see themselves becoming and about valued self-images from the past which they feel they have lost. Also, her study reveals how loss of self in one sphere of life (e.g. through stigma) may result in loss in another area (e.g. withdrawal from social activities). Charmaz (1983) refers to this process as a 'loss of self'. This 'loss of self', however, is not necessarily a permanent feature, as some people are able to create 'reconstituted identities'.

G Williams' (1984) notion of 'narrative reconstruction' focuses upon the reappraisal of the onset of illness in the context of the person's life which may serve as a turning point involving a changed identity or 'reconstruction

of the self' (Williams 1984). In seeking to explain their current illness, G Williams (1984) found that participants often referred to significant past events (e.g. death within the family). In doing so, G Williams suggests that they are adding a moral component to their accounts and seeking to find a legitimate and meaningful place for chronic ill health in their lives.

In summary, this brief narrative review of selected topics reveals the disruptive nature of low back pain and the profound difficulties people may experience not only in deciphering and communicating their painful experience but also in interacting with healthcare professionals to legitimise their experience and to receive healthcare that explicitly addresses the meaning of the experience upon the self. The meaning of the disruption is determined by its consequences and significance (Bury 1982, 1988, 1991).

FURTHER INTERPRETATION OF THE STUDY'S FINDINGS

Preamble

The discussion that follows reflects upon two topics that appeared salient in the context of the literature review presented above: firstly, the subjective experience of physical sensations in the lower back and their meaning i.e. whether they were interpreted by the participants as 'normal' or 'abnormal' and associated with a first ever episode of low back pain and secondly, the actions that appeared to be taken by the participants to buffer the meaning of ill health upon the self when recalling their first ever episode of low back pain.

The discussion of these topics is predicated upon the social construction of the self (Nettleton 2006b, Crotty 2007). It is taken as axiomatic that narratives i.e. individuals' accounts of themselves and the events within their lives are important in the social construction of the self (Garro and Mattingly 2000). The meanings of experiences are communicated through narration or storytelling (Kleinman 1988, Garro and Mattingly 2000, Hamilton 2008). Since the meaning of experiences cannot be accessed directly, salient

experiences are first interpreted by the narrator and presented to the listener who, in turn, interprets what they understand the narrator to be presenting (Osborn and Smith 2006). Thus the self is communicated in language and established in narrative (Ong et al 2004). Each person has the privilege to present a preferred self from the available multiplicity of selves reflecting age, gender, ethnicity and specific social roles amongst other factors as they go about their daily lives (Deaux et al 1995, Karlsen and Nazroo 2002). Thus, by telling their story, each participant reflects their experiences as they see them and as they wish to have others see them at that point in time (Johansson et al 1999). Since people's accounts are a form of self-presentation, situational factors may play a role in the narrative construction (Hyden 1997). The person who is listening to the narrative, for example, may play a role in its construction (co-construction). Consequently, people may produce new narratives in new contexts as well as in the light of other changes in the illness experience (Hyden 1997). This is not to indicate that narratives are not authentic but rather that they are socially contingent i.e. they are framed in a certain social interaction with another individual (Lillrank 2003). In the context of the study presented in this thesis the participants were recruited and interviewed by a white British female healthcare professional. One implication of this is that the participants' narratives may have been shaped by the tacit conventions of the clinical encounter which, in turn, may be influenced by the historical and socio-cultural context (Clark and Mishler 1992).

Throughout the discussion that follows it is apparent that the participants' conceptualised their health and illness associated with low back pain in relation to their ability to carry out their daily activities that were central to their social roles. Also, daily activity appeared to be a means through which the participants could express their individuality i.e. who they were to themselves and to others, and impute meaning to their experiences of their first ever episode of low back pain and life before it (Laliberte-Rudman

2002). These experiences were discussed in the wider context of each participant's life.

As described in chapter 5, the study participants comprised thirty people (20 women and 10 men) between 16 and 66 years of age (mean 36yrs) who could recall their first ever episode of low back pain. All the participants were referred to an NHS hospital by their GP and recruited to the study whilst receiving (out-patient) physiotherapy for low back pain. This indicates firstly, shared beliefs, values and customs about the causes of low back pain and its treatment, and secondly, that the participants had, in part, achieved the sick role and acceptance of the biomedical nature of their suffering. In contrast to the literature, which focuses on people's experiences of chronic back pain, the participants reported recurring (two or more) episodes of acute low back pain (duration less than three months -International Association for the Study of Pain 1986-). The term 'acute' is a construct utilised by healthcare professionals to indicate that the pain and disability are usually in proportion to the physical findings and self-limiting, and to distinguish it from 'chronic' i.e. persistent low back pain where the pain appears to become dissociated from the original physical problem (Waddell 2004). It is generally assumed by healthcare professionals that the meaning of the painful experience is likely to be shaped by its acute or chronic nature (Waddell 2004).

The meaning of physical sensations in the lower back

There appears to be a paucity of knowledge in the literature regarding people's experiences of 'normal' discomforting physical sensations in their lower back (Borkan et al 1995). The findings from this study, therefore, contribute knowledge about the nature of these physical sensations experienced by some of the study participants before the episode of low back pain perceived to be the 'first ever', and the reasons why they considered them to be a 'normal' experience at that time. In keeping with the reviewed qualitative literature (Bury 1982, 1991), the study's participants

who experienced these sensations tried to make sense of them by discussing them in the wider context of their everyday lives. These physical sensations in the lower back were initially considered 'normal' in the context of regular bodily functions e.g. monthly periods and childbirth, other painful conditions, fatigue, viral infection and fever. Moreover, physical sensations that were considered short-lived and considered straightforward outcomes of certain physical activities (e.g. gardening) and excessive physical effort, and that disappeared with rest and / or a warm bath were also portrayed as a 'normal' experience (Table 7.1). These 'normal' physical sensations in the lower back associated with excessive physical effort were considered 'good' when they were self-inflicted either from pushing on through pain or working too hard. Kevin, for example, recalled 'killing' his back by digging the garden and carrying on from 10am until it got dark despite his back hurting him. Consequently, he felt that the aches and pains in his arms, legs and back were 'good' and that he had a right to feel them. This concept of 'good' albeit uncomfortable, physical sensations has previously been described in the qualitative literature. The contemporary dancers studied by Thomas and Tarr (2009), for example, perceived 'good' sensations sometimes referred to as training or stretching pains, to be 'normal' i.e. perceiving them as the consequence of overuse during training or a work out. It can be surmised, therefore, that physical sensations that do not appear to be biographically disruptive i.e. that have no untoward practical or social consequences (Bury 1982, 1991), may considered 'normal'. Furthermore, 'normal' physical sensations in the lower back (and other parts of the body) that are self-inflicted from excessive physical effort or overuse may be perceived to be 'good' when they affirm the self as virtuous or hardworking as in Kevin's description of digging the garden.

The study's findings also contribute to knowledge by providing detailed descriptions of people's experiences of the turning point that is reached when the physical sensations in the lower back come to be interpreted as 'abnormal' i.e. as a symptom of ill health associated with the first ever

episode of low back pain. This turning point has previously been described in women's narratives studied by Lillrank (2003). In this study, it was not until the physical sensations started 'getting worse' i.e. becoming biographically disruptive (Bury 1982, 1991), that the participants recalled taking notice of them. Now the sensations were no longer considered self-limiting: they did not necessarily come with activity and go away with rest as they had once done. Moreover, the qualities of the experience once described as 'tingling', 'niggling', 'tiredness' were now described using stronger adjectives e.g. 'throbbing', 'sharp', 'stabbing' sensations and 'real' pain. The perceived intensity of the painful experience and its interpretation as interfering with valued activities through difficulties standing and sitting, for example, and the loss of roles that conferred social status (e.g. paid employment), distinguished the participants in the study who considered their first ever episode of low back pain to be a problem requiring healthcare from sensations which did not. The disruption to their daily lives (both in terms of meaning as consequence and significance, -Bury 1982, 1988, 1991-) was therefore evident.

As discussed above, the qualitative literature suggests that the occurrence and timing of the turning point, when physical sensations are considered 'abnormal', varies between people depending upon past experience, personality, familiar and cultural mores, the context of the individual's situation and current interpersonal interactions (Borkan et al 1995). Thus the historical and socio-cultural context may influence different responses to essentially the same experience (Zola 1966). The perceived incidence of low back pain in a particular community and whether it is recorded in morbidity statistics not only appears to depend upon its perception therefore but also on its interpretation as it being something 'abnormal'. In the latter case this depends on the socio-cultural context in which the back pain occurs and whether there is a 'fit' between the physical sensations, and the individual's subjective interpretation and responses to them. The interpretation of the physical sensations in the lower back as 'abnormal' and therefore a

symptom of ill health possibly requiring healthcare may therefore be seen as a social process that undermines the self and not an aetiological one (Zola 1966, Helman 2007).

The realisation, that social processes underlie a person's definition of their first ever episode of low back pain challenges the ontological assumptions held by positivist researchers and, in turn the validity and reliability of the prospective cohort studies reviewed in chapter 4. In particular, it may partially explain the variations in the estimates of the cumulative incidence of low back pain in different populations presented in the body of the thesis (Tables 4.3 and 4.4). Focusing on the role of risk factors in the aetiology of low back pain and ignoring socio-cultural factors underlying people's perceptions of 'abnormality' may therefore obscure knowledge that is important for epidemiological study design.

The study's findings also contribute knowledge about the setting in which back pain may occur: the first ever episode of low back pain was perceived to occur in the historical context of other non-specific symptoms including musculoskeletal aches and pains in parts of the body apart from the back, low mood and poor general health including feeling 'run down' (Tables 6.6 and 6.8). This finding resonates with the results from three of the prospective cohort studies reviewed in chapter 4 which found that non-specific symptoms in parts of the body other than the lower back predicted the onset of the first ever episode of low back pain (Symmons et al 1991, Pietri et al 1992, Von Korff et al 1993). It may be that these non-specific symptoms reflect insufficient normalising explanations or a 'breakdown' in the 'normalisation' process and explain the increased symptom reporting across a broad range of non-specific complaints (Hamilton et al 2001, Kessler and Hamilton 2004). Statistically, the lack of normalising attributions is associated with frequent GP visits (Sensky et al 1996).

Buffering the meaning of ill health upon the self

An important body of knowledge emerging from the literature review is the profound impact that back pain and associated social interactions (e.g. with healthcare professionals) may have on the self. Reflecting upon the participants' narratives from this perspective, it became apparent that some participants appeared to buffer the meaning of ill health upon the self. The rhetorical means by which the participants appeared to do this were by reconstructing the self and thereby maintaining self-regard, downplaying the meaning of discomforting physical sensations before the first ever episode of low back pain, portraying a physically active self and emphasising the physical reality of the painful experience. Each is considered, in turn below.

Reconstructing the self and maintaining self-regard

In keeping with the literature that has contributed to a greater understanding of the challenges facing people with chronic ill health, the participants located the onset of the episode of low back pain, perceived to be the first ever, in the wider context of their past lives by recalling their age or the year, and the time of day when it first occurred and what they were doing at the time (Bury 1982, 1991, Lillrank 2003). Thereafter, the participants constructed accounts of their lives before low back pain by selecting, ordering and discussing past events and actions that were of particular significance to them.

Many participants appeared to portray the onset of their back pain to be a continuous rather than a singularly disruptive aspect of their biographies (Bury 1982, 1988, 1991, Williams 2000). They communicated this through emphasising the loss of a way of life and the self embedded within it (Charmaz 1983), before experiencing low back pain for the very first time, and by describing the reconstruction of the self (Williams 1984). Many women, for example, spoke about the loss of a carefree, healthy childhood growing up in 'sunny' surroundings in East Africa. This location of the self in past idealised surroundings appears to serve as a bittersweet reminder of

the past and accentuated the loss of the previous self experienced daily thereafter. Alternatively, it may be that the nostalgic recall of an idealised self-image enabled the women to maintain some self-regard in the face of the difficult circumstances and ill health they experienced subsequently (Osborn and Smith 1998). These difficult circumstances included travelling to Britain, frequently at short notice, to live in a 'cold' climate, and to marry and take on roles intimately connected with their new identities as wives, daughter-in-laws, mothers, carers, volunteers and employees. Fulfilling these new roles involved learning domestic activities, not performed hitherto, such as budgeting, handling money, shopping, cleaning, cooking, and caring for sick relatives. Frequently, unresolved tensions within extended families and difficulties fulfilling social obligations such as combining housekeeping and care giving with paid employment were contained within their accounts.

The loss of the former self and the need to construct new identities were not unique to the women who grew up in East Africa. Migration to the UK from other countries; bereavement; job dissatisfaction; bankruptcy, non-specific ill health in parts of the body apart from the back; 'rejection' and the breakdown of relationships, amongst other problems had all challenged the women's identities and altered their social roles. The younger participants, who did not describe loss identified instead with new roles such as leaving home to study, marry and find paid employment for the first time. By locating low back pain within the context of their lives, these participants linked their past life before low back pain to the present and gave a personal interpretation of experiences in ways that appeared to affirm their identity other than that of being a 'back pain patient' (Mattingly 1994).

Generally, the women spoke at greater length than the men. It was unusual for the men to discuss personal issues such as past ill health, experiences of migrating to the UK and issues within the home. Their accounts mainly focused on topics related to their working lives and to leisure pursuits especially sport. Gender differences in the experience of illness associated

with low back pain may therefore occur because of the different roles that men and women adopt within their socio-cultural environment (Courtenay 2001). Moreover, the men's reticence to discuss personal concerns may, amongst other factors, have been associated with the need to protect the masculine self especially when being interviewed by a woman (Schwalbe and Wolkomir 2001).

Downplaying the meaning of physical sensations

Both the published qualitative literature (Borkan 1995, Lillrank 2003) and the present study participants' narratives reveal that discomforting physical sensations in the lower back may be interpreted as 'normal' before the episode of low back pain perceived to be the 'first ever'. Understanding the reasons why people 'explain away' or 'downplay' the meaning of these physical sensations may, therefore, advance knowledge about the social processes that determine whether or not people consider themselves as ill and seek healthcare (Campbell and Cramb 2008).

One possible explanation, arising from the participants' accounts, is that by 'ignoring' and 'pushing' physical sensations 'to the back of the mind', they minimised any disruption to their social relationships and activities. Lee, for example, said that he ignored his sore back and that he didn't see it as a 'real' problem because he could do all he wanted to do including going to the gym. Bury (1991) identified 'minimising' or 'normalisation' in this way as a coping mechanism employed to buffer the effects of illness on the person's identity. Other researchers have also found that some people with chronic illness 'normalise' their condition in order to cope and avoid being defined as a malingerer or complainer (e.g. Radley and Billig 1996). Similarly, the non-service users, a previously unheard group, interviewed by Campbell and Cramb (2008), actively masked their pain to appear as the person that they were before they experienced pain. Engaging in activity despite discomfort enabled them to feel in control of their pain and 'normal' in comparison to

other people deemed to be in more pain or in worse situations than themselves thereby maintaining their sense of self.

A second reason given by some participants to explain why they downplayed the meaning of the physical sensations in the lower back is that given the social context in which the physical sensations occurred, individual participants felt comfortable with their causal explanations for these sensations. Consequently they waited for them to subside without needing to seek healthcare. Margaret, for example, recalled that initially she had come to realise that her back would ‘play up’ and ‘hurt’ when she stood for an hour and a half to watch her daughter play hockey in cold weather. Following going home and sitting down, however, her back would be ‘ok’ and she wouldn’t even think about it the next day.

A third reason given to explain why some participants had initially downplayed the significance of their physical sensations was the participants’ assumption that everyone experienced similar sensations. Tariq, for example, recounted how all his friends who played cricket also experienced physical sensations in their back. Consequently, the physical sensations that he experienced when bending over at the cricket crease for prolonged periods of time were initially considered a ‘normal’ everyday experience that did not represent illness. Borkan et al (1995) concur that physical sensations in the lower back are a common experience. These observations are consistent with Zola’s (1966) cross cultural studies of morbidity: when an aberration, such as low back ache, is widespread, the condition may be perceived as a natural, expected part of everyday life, and thus not symptomatic of back pain. This perception reinforces the view that it is not necessarily the physical sensations in the lower back or their frequency that are significant but the social context in which they occur, and are perceived and understood, that is important. The social context portrayed by many participants before the onset of low back pain contained accounts of hardship and multi-morbidities. Many of the women, for

example, recalled experiencing internal changes in parts of the body other than the lower back associated with panic attacks and an irritable bowel, for example, resulting in the need to re-organise daily activities and meetings around these intermittent changes. They associated these changes in their body with stressful circumstances. Consequently, the perception of physical sensations before the episode of low back pain defined as the 'first ever' may not have been considered excessively disruptive by them. These findings are consistent with studies that suggest that the impact of prior illness may militate against the onset of illness being perceived as particularly disruptive (Pound et al 1998, Sanders et al 2002).

A fourth reason given by some participants to explain why they had initially downplayed the meaning of their physical sensations was that their aches and pains were perceived to be the consequence of 'wear and tear' to the lower back and a 'normal' part of the ageing process. The concept of ageing invoked by these participants, however, did not necessarily relate to their chronological age. Jane, for example, who recalled experiencing her first ever episode of low back pain when she was 31 years of age, initially reasoned that the stiffness and soreness she felt in her lower back after sitting out between games of tennis in cold weather was a 'normal' experience associated with ageing. This finding, that people may portray internal sensations as an integral part of the normal ageing process and therefore downplay their significance has previously been reported by people interviewed by Miles et al (2005) and Sanders et al (2002, 2004). The participants interviewed by Sanders et al (2002, 2004), however, were largely retired compared with the participants in this study who were largely of working age. A growing body of evidence suggests that older people may be more reluctant to seek healthcare for these 'normal' sensations because they are perceived to be a continuous part of their biography in relation to age (Walters et al 2001, Adamson 2010).

In addition to downplaying the significance of physical sensations in the lower back, it is relevant to note that some participants thought that they may have been less perceptive of alterations in their internal bodily state compared to other people. -Hazel, for example, said that she did not listen to her body. Her husband had noticed that her headaches occurred when she was stressed. Also, some participants said that they had an awareness of physical sensations in their lower back but that they had not paid close attention to them because they were 'masked' by other aches and pains that they were more concerned about. Adil, for example, initially thought his pain was a kidney problem for which he was having medical investigations.

Portraying a physically active self

A near-universal finding among this sample was the perception of a previous disposition to physical activity. The disposition to physical activity was portrayed by individuals as involving one or more of the following approaches to activity: keeping going and overdoing it, doing things in hurry, goal setting and an inability to be still. The participants portrayed this disposition by describing their participation in activities perceived by them to be socially valued (i.e. that enabled them to fulfil their roles within the context of their ethnic / cultural identity). In particular, the women described enacting role- defining household tasks such as cooking, cleaning and shopping; care-giving tasks out-with and within extended families; and voluntary work e.g. cooking at the temple and taking children with disabilities to a holiday camp, in addition to paid work. This description of tasks, traditionally associated with female roles, may reflect the gendered and ethnic assumptions about shared understandings and background experiences with the female interviewer (Oakley 1981, De Vault 1990, Ong et al 2004, Williams and Heikes 1993). Also, it may reflect the desire not be perceived by the interviewer as a malingerer.

The men eschewed 'feminine activities' and displayed their masculinity through their stated involvement in DIY activities, gardening and sport.

Those men who had cut down or given up sport before experiencing back pain implied that they had done so to devote more time to paid work and family responsibilities, again emphasising their ability to perform socially valued masculine roles.

Values of self-reliance, a strong work ethic and physical activity that had shaped individual identities since childhood pervaded the participants' narratives. By referring to a previously valued active self, and by implication to a present lesser impaired self, the participants rhetorically positioned themselves in a favourable light and added a moral component to their accounts i.e. by fulfilling all their social roles and obligations they identified themselves as having high moral standards (Snelgrove and Liossi 2009, Ong et al 2004). Given that western culture privileges 'doing' over 'being' (Charmaz 1983, Nettleton 2006a) and that low back pain may restrict 'doing' (i.e. participating in daily activities) the participants' emphasis on a previous disposition to physical activity in the context of a hectic lifestyle may have been an endeavour to preserve their integrity by positioning themselves as currently physically ill thereby averting potentially stigmatising explanations and accusations of malingering (Snelgrove and Liossi 2009) rather than being a 'causal' factor in the genesis of their physical discomfort.

Snelgrove and Liossi (2009) further suggest that the discrepancy between the previous valued active self with a present lesser valued impaired self may be associated with depression. Whilst a depression scale was not utilised in the current study it is thought that this is unlikely to fully explain the near universal reporting of the perceived disposition to physical activity before the onset of back pain. It is relevant to note that a very few women did recall that their GP had suggested that they were depressed which they refuted strongly. On reflection, it is now considered that this may also have been a rhetorical means of legitimising their back pain (see next section).

Emphasising the physical reality of the painful experience

The qualitative literature reveals that people seek to legitimise their experiences by stressing the physical reality of their pain (e.g. Glenton 2003, Lillrank 2003, McIntosh and Shaw 2003, Verbeek et al 2004). Consonant with this literature are the findings from the study presented in this thesis. The participants sought to understand and explain why their first ever episode of low back pain had occurred. Commonly, the participants constructed their experiences within a biomedical framework emphasising the physical and mechanical nature of their pain. Lifting and moving objects, alterations in posture and prolonged walking and sitting, for example, were considered responsible for the onset of back pain. By emphasising the biomechanical / physical nature of their pain these participants appeared resistant to their back pain being causally associated with psychological factors such as low mood states (feeling low, down and, or depressed), stress and emotional distress (Snelgrove and Liossi 2009).

In contrast to the literature (Holloway et al 2007, Slade et al 2007, Newton et al 2010), the participants did not discuss experiencing negative attitudes (stigma), or difficulties achieving the sick role, nor did they blame their doctor or any other health professional for an inability to diagnose and provide care directly. Three possible reasons may help to explain this. Firstly, the study focused upon the first ever episode of low back pain and its antecedents, and not upon the sequelae of experiencing low back pain such as experiences of healthcare. Secondly, the participants were NHS service users and therefore had, in part at least, achieved the sick role and accepted a biomedical perspective of their problems. Thirdly, the participants were interviewed by a healthcare professional which may have shaped the construction of the participants' narratives. For example, they may not have wanted to appear antagonistic by locating culpability for any inadequacy of treatment amongst her colleagues.

Psychological factors were, however, perceived to be causally related to one or more of their other non-specific conditions e.g. irritable bowel syndrome, headaches and panic attacks by the women who suffered from them. Gita, who experienced irritable bowel syndrome when stressed, for example, spoke about how she had bottled up her emotions since she was a child because she had no right to speak out. The rebuttal of psychological causal attributions for back pain may have been the rhetorical means by which the women could emphasise the perceived physical and mechanical nature of their low back pain. In addition, privileging a physical cause for low back pain may have been a means firstly, of seeking to legitimise the painful experience as a physical disorder and thereby gain entry to the 'sick role' and secondly, of counteracting potentially stigmatising explanations (Snelgrove and Liossi 2009). This rhetorical positioning may reflect previous experiences of not being believed, sensitivity to charges about moral worth and / or part of the legitimacy of seeking medical help (Kugelmann 1999, Snelgrove and Liossi 2009). Thus it may be a rational response and serve to protect the self as a moral individual with a valid right to the sick role (Eccleston et al 1997, May et al 2000). Alternatively, as May et al (1999) suggest, constructing accounts of low back pain as biomechanical in origin is commensurate with how the pain is experienced during daily activity and understood, and 'fits' with the ontological status of back pain as a physical disorder in western culture.

Generally, the participants acknowledged that their interpretations of their altered internal bodily state may, amongst other factors, have been shaped by health professionals including doctors and physiotherapists. The treatments and causal explanations given by their physiotherapists were likely to be predominantly physical in orientation and consistent with the profession's understanding of low back pain (Snelgrove and Liossi 2009). Providing patients with a hypothetical explanation for their painful experience may, in turn, enable them to give a credible explanation to others that their pain is 'real' (Laerum et al 2006). In searching for meaning, therefore,

patients may have adopted their healthcare professional's explanations and interpretations about their ill health and thereby gained the legitimacy afforded by taking on medical reasoning (Shaw 2002). This overlap between professional and lay explanations is not uncommon, and prompts the question 'how lay are lay beliefs?' (Shaw 2002 p.287).

Causal explanations that did not accord with biomedical explanations for back pain were uncommon: they included sleeping in damp air raid shelters, taking insufficient vitamins and stressful circumstances such as marital separation. The participants who thought that their back pain might be linked with stress recalled not having another person to confide in. Since people are dependent upon social interactions for the creation and maintenance of their sense of self (Goffman 1959) it may be that the loss of a previous self had not been accompanied by the development of an equally valued new self. Moreover, the lack of a confidante to buffer the effects of stressful circumstances and mobilise social and material resources may be an important influence in the ways in which physical sensations in lower back are perceived and interpreted.

SUMMARY AND IMPLICATIONS FOR SERVICE PROVISION

In light of the qualitative literature review and the further interpretation of the narratives of the participants (who were all NHS service users), valuable insights have been gained into how discomforting physical sensations in the lower back may be experienced as a threat to the self as well as the physical body, and the actions that people may take to buffer the meaning of low back pain upon the self. The threat to the self appeared to be conceptualised by the participants in terms of whether or not valued activities, through which they expressed their sense of self, were disrupted by low back pain.

Some participants recalled downplaying the meaning of the discomforting sensations in their lower back before their first ever episode of low back

pain. This endeavour appeared to protect the self from any disruption to social relationships and daily activities. There came a point, however, whereby the discomforting sensations were acknowledged to be disrupting everyday activities and came to be regarded as 'abnormal' and a symptom of ill-health associated with the first ever episode of low back pain. Thereafter, legitimising the experience of low back pain appeared central to the participants' accounts. By emphasising the physical reality of their back pain, the participants appeared to offset potentially stigmatising explanations and sought to establish a legitimate reason for their back pain. Portraying a disposition to physical activity and a strong work ethic added a moral component to nearly all of the participants' accounts, thereby further averting stigmatising explanations and possible accusations of malingering. Moreover, locating the first ever episode of low back pain in the wider context of a difficult life and ill health appeared to be a means of maintaining self-regard.

Other participants, albeit uncommonly, emphasised the role of stressful circumstances in their back pain. These participants recalled having no one to confide in to buffer the effect of their stressful circumstances. Thus, the meaning of their experiences appeared to differ from those people who were able to mobilise social support.

These findings support the call in the literature for healthcare professionals to address the self explicitly in pain management by listening carefully to each patient's narrative (Eccleston et al 1997, Holloway et al 2007, Osborn and Smith 2007). Moreover, the findings suggest that this approach should not only be offered to people with chronic low back pain but also to people with acute episodes of low back pain. The general principles of this approach, which is predicated upon a patient-centred approach to healthcare (McIntosh and Shaw 2003), have been outlined in the literature review above. The perception that the healthcare professional believes that the pain is 'real' may minimise feelings associated with delegitimisation such as

stigma, for example. In addition, the findings from this study suggest that the healthcare professional should listen closely to each person's account of their valued activities through which they express their individuality and how any disruption to daily activity associated with back pain came about. An effective partnership may then be established with each back pain sufferer that not only addresses the practical consequences of the painful experience but also its personal significance (Bury 1982, 1988, 1991). As Hammell (2004) points out, engaging with each person to modify the unique consequences and significance of impairment will, in turn, change its meaning. During the re-appraisal of self that commonly occurs as the individual tries to make sense of illness (Bury 1982, 1991), it may be possible to facilitate a re-prioritisation of goals and thereby maintain a positive self-image by focussing upon activities that are both valued and achievable (as suggested by Reynolds and Prior 2003 albeit in a different health context). Also, it may be possible to facilitate the modification or pacing of activities that enable an individual to engage in activities that reconstruct or maintain previous important aspects of the self such as a perceived disposition to physical activity and a strong work ethic (Reynolds and Prior 2006). With regard to a person who has no one to confide in, it may be possible to create the opportunity for the social interactions (e.g. through participating in a back pain support group) that are necessary for the reconstruction and maintenance of self. In turn, this creates the opportunity for social support to be mobilised if needed in the future.

It is acknowledged that the participants' accounts in this in-depth interview study were socially constructed. It cannot be known, therefore, whether individual participants would have constructed and expressed their accounts differently in different contexts and circumstances (for example, with a male interviewer, or one who shared their ethnic background). Therefore, research needs to continue in different health and community settings in order to ensure that a full range of perspectives are examined in terms of what physical sensations someone might expect to experience in their lower back

before defining it as back pain that needs professional treatment and how back pain may impact on the self. Also, these perspectives may be usefully utilised in the continuing professional education of both medical and other therapy staff that is clearly required.

CONCLUSION

By relating the study's findings to the qualitative research literature, it is inferred that discomforting physical sensations in the lower back may be experienced as a threat to the self, as well as the physical body. The threat to the self appeared to be perceived by the participants in terms of whether or not valued activities, through which the participants expressed their sense of self, were disrupted by low back pain. The participants appeared to buffer the effects of the threat upon the self by reconstructing the self to maintain self-regard, downplaying the meaning of the physical sensations, portraying a physically active self and emphasising the physical reality of the painful experience. It is recommended that healthcare professionals address the selfhood of the patient explicitly in pain management, even in the earliest phases of the pain trajectory: firstly, by listening carefully to people's illness narratives to identify the nature of any disruption to valued everyday activities and secondly, by facilitating engagement in activities that promote a more positive sense of self, even in the continuing presence of pain. These perspectives may be incorporated into the continuing professional education of medical and other therapy staff that is clearly required, according to the concerns of back pain patients voiced in the literature.

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APPENDIX 14: APPRAISAL QUESTIONS (Spencer et al 2003a)

Appraisal questions	**Quality indicators** (possible features for consideration)
1. How credible are the findings? (findings)	Findings/conclusions are supported by data/study evidence (i.e. the reader can see how the researcher arrived at his/her conclusions; the 'building blocks' of analysis and interpretation are evident) Findings/conclusions 'make sense'/have a coherent logic Findings/conclusions are resonant with other knowledge and experience (this might include peer or member review) Use of corroborating evidence to support or refine findings (i.e. other data sources have been used to examine phenomena; other research evidence has been evaluated; see also Q14)
2. How has knowledge / understanding been extended by the research? (findings)	Literature review (where appropriate) summarising knowledge to date/key issues raised by previous research Aims and design of study set in the context of existing knowledge/understanding; identifies new areas for investigation (for example, in relation to policy/practice/substantive theory) Credible/clear discussion of how findings have contributed to knowledge and understanding (e.g. of the policy, programme or theory being reviewed); might be applied to new policy developments, practice or theory Findings presented or conceptualised in way that offers new insights/alternative ways of thinking Discussion of limitations of evidence and what remains unknown/unclear or what further information/research is needed
3. How well does the evaluation address its original aims and purpose? (findings)	Clear statement of study aims and objectives; reasons for any changes in objectives Findings clearly linked to the purposes of the study and to the initiative or policy being studied Summary or conclusions directed towards aims of study Discussions of limitations of study in meeting aims (e.g. are there limitations because of restricted access to study settings or participants, gaps in the sample coverage, missed or unresolved areas of questioning; incomplete analysis; time constraints?)

4. Scope for drawing wider inference – how well is this explained? (findings)	Discussion of what can be generalised to wider population from which sample is drawn/case selection has been made Detailed description of the contexts in which the study was conducted to allow applicability to other settings/ contextual generalities to be assessed Discussion of how hypotheses/propositions/findings may relate to wider theory; consideration of rival explanations Evidence supplied to support claims for wider inference (either from study or from corroborating sources) Discussion of limitations on drawing wider inference (e.g. re-examination of sample and any missing constituencies: analysis of restrictions of study settings for drawing wider inference)
5. How clear is the basis of evaluative appraisal? (findings)	Discussion of how assessments of effectiveness/ evaluative judgements have been reached (i.e. whose judgements are they and on what basis have they been reached?) Description of any formalised appraisal criteria used, when generated and how and by whom they have been applied Discussion of the nature and source of any divergence in evaluative appraisals Discussion of any unintended consequences of intervention, their impact and why they arose
6. How defensible is the research design? (design)	Discussion of how overall research strategy was designed to meet aims of study Discussion of rationale for study design Convincing argument for different features of research design (e.g. reasons given for different components or stages of research; purpose of particular methods or data sources; multiple methods, time frames etc.) Use of different features of design/data sources evident in findings presented Discussion of limitations of research design and their implications for the study evidence
7. How well defended is the sample design / target selection of cases / documents? (sample)	Description of study locations/areas and how and why chosen Description of population of interest and how sample selection relates to it (e.g. typical extreme case, diverse constituencies etc.) Rationale for basis of selection of target sample/settings/

	documents (e.g. characteristics/features of target samples/settings/documents, basis for inclusions and exclusions, discussion of sample size/number of cases/ setting selected etc.) Discussion of how sample/selections allowed required comparisons to be made
8. Sample composition / case inclusion – how well is the eventual coverage described? (sample)	Detailed profile of achieved sample/case coverage Maximising inclusion (e.g. language matching or translation; specialised recruitment; organised transport for group attendance Discussion of any missing coverage in achieved samples/cases and implications for study evidence (e.g. through comparison of target and achieved samples, comparison with population etc.) Documentation of reasons for non-participation among sample approached/non-inclusion of selected cases/ documents Discussion of access and methods of approach and how these might have affected participation/coverage
9. How well was the data collection carried out? (data collection)	Discussion of who conducted data collection; procedures/documents used for collection/recording; checks on origin/status/authorship of documents Audio or video recording of interviews/discussions/ conversations (if not recorded, were justifiable reasons given?) Description of conventions for taking field notes (e.g. to identify what form of observations were required to distinguish description from research commentary/ analysis) Discussion of how fieldwork methods or settings may have influenced data collected Demonstration, through portrayal and use of data, that depth, detail and richness were achieved in collection
10. How well has the approach to and formulation of the analysis been conveyed? (analysis)	Description of form of original data (e.g. use of verbatim transcripts, observation or interview notes, documents etc.) Clear rationale for choice of data management method/ tool/package Evidence of how descriptive analytic categories, classes, labels etc. have been generated and used (i.e. either through explicit discussion or portrayal in the commentary) Discussion, with examples, of how any constructed

	analytic concepts/typologies etc. have been devised and applied
11. Contexts of data sources – how well are they retained and portrayed? (analysis)	Description of background or historical developments and social/organisational characteristics of study sites or settings Participants' perspectives/observations placed in personal context (e.g. use of case studies/vignettes/ individual profiles, textual extracts annotated with details of contributors) Explanation of origins/history of written documents Use of data management methods that preserve context (i.e. facilitate within case description and analysis)
12. How well has diversity of perspective and content been explored? (analysis)	Discussion of contribution of sample design/case selection in generating diversity Description and illumination of diversity/multiple perspectives/alternative positions in the evidence displayed Evidence of attention to negative cases, outliers or exceptions Typologies/models of variation derived and discussed Examinations of origins/influences on opposing differing positions Identification of patterns of association/linkages with divergent positions/groups
13. How well has detail, depth and complexity (i.e. richness) of the data been conveyed? (analysis)	Use and exploration of contributor's terms, concepts and meanings Unpacking and portrayal of nuance/subtlety/intricacy within data Discussion of explicit and implicit explanations Detection of underlying factors/influences Identification and discussion of patterns of association/ conceptual linkages within data Presentation of illuminating textual extracts/observations
14. How clear are the links between data, interpretation and conclusions - i.e. how well can the route to any conclusions be seen? (reporting)	Clear conceptual links between analytic commentary and presentations of original data (i.e. commentary and cited data relate; there is an analytic context to cited data, not simply repeated description)

	Discussion of how/why particular interpretation/ significance is assigned to specific aspects of data – with illustrative extracts of original data Discussion of how explanations/theories/conclusions were derived – and how they relate to interpretations and content of original data (i.e. how warranted); whether alternative explanations explored Display of negative cases and how they lie outside main proposition/theory/hypothesis etc. or how proposition etc. revised to include them
15. How clear and coherent is the reporting? (reporting)	Demonstrates link to aims of study/research questions Provides a narrative/story or clearly constructed thematic account Had structure and signposting that usefully guide reader through the commentary Provides accessible information for intended target audience(s) Key messages highlighted or summarised
16. How clear are the assumptions/ theoretical perspectives/ values that have shaped the form and output of the evaluation? (reflexivity and neutrality)	Discussion/evidence of the main assumptions/ hypotheses/theoretical ideas on which the evaluation was based and how these affected the form, coverage or output of the evaluation (the assumption here is that no research is undertaken without some underlying assumptions or theoretical ideas) Discussion/evidence of the ideological perspectives/ values/philosophies of research team and their impact on the methodological or substantive content of the evaluation (again may not be explicitly stated) Evidence of openness to new/alternative ways of viewing subject/theories/assumptions (e.g. discussion of learning /concepts/constructions that have emerged from the data; refinement restatement of hypotheses/theories in light of emergent findings; evidence that alternative claims have been examined) Discussion of how error or bias may have arisen in design/data collection/analysis and how addressed, if at all Reflections on the impact of the researcher on the research process
17. What evidence is there of attention to ethical issues? (ethics)	Evidence of thoughtfulness/sensitivity about research contexts and participants Documents of how research was presented in study settings/to participants (including, where relevant, any

	possible consequences of taking part) Documentation of consent procedures and information provided to participants Discussion of confidentiality of data and procedures for protecting Discussion of how anonymity of participants/sources were protected Discussion of any measures to offer information/advice/ services etc. at end of study (i.e. where participation exposed the need for these) Discussion of potential harm or difficulty through participation, and how avoided
18. How adequately has the research process been documented? (audibility)	Discussion of strengths and weaknesses of data sources and methods Documentation of changes made to design and reasons; implications for study coverage Documentation and reasons for changes in sample coverage/data collection/analytic approach; implications Reproduction of main study documents (e.g. letters of approach, topic guides, observation templates, data management frameworks etc.)