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FACTORS AFFECTING WORK STATUS OF EMPLOYEES WITH CHRONIC BACK PAIN IN SOUTH AFRICA

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9400948R

A dissertation submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Science in Occupational Therapy

Ethical Clearance Number

M080524

Johannesburg, October 2011

DECLARATION

I, Megan Spavins declare that this research report is my own work. It is being submitted for the degree of Master of Science in Occupation Therapy in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University

Signed _____

_____day of _____ 2011

For Chris, Cathy, Nicole and Matthew

ORAL PRESENTATIONS ARISING FROM THIS STUDY

1. Spavins, M.H. The Art and Science of Functional Capacity Evaluations: A review of the literature over the past 5 years. OTLA Meeting. Johannesburg: Verbal presentation, September 2009.

2. Spavins, M.H. Factors Affecting Ability to Work in People with Chronic Back Pain. University of the Witwatersrand School of Therapeutic Sciences Research Day. Johannesburg: Verbal presentation, August 2009.

3. Spavins, M.H. Assessment Tools and Techniques. OTASA Medico-legal Workshop. Limpopo: Verbal presentation, April 2010.

ABSTRACT

Background: Numerous factors influence work status in employees with chronic back pain. The objective of this study was to identify those factors which were most significantly associated with long term absence from work.

Methods: The design entailed a sample of employees diagnosed with chronic back pain referred for functional capacity evaluation. Quantitative, descriptive, cross sectional and multivariate correlation study design was used. Fifty-seven Clients participated. Outcomes were defined using self-report questionnaires, two lifting tasks and a dynamic and static posturing assessment. This study was performed within an occupational therapy private practice setting in South Africa.

Results: Multivariate logistic regression analysis indicated significant adjusted odds ratios (OR) for kneeling (OR 7.6; CI 1.27-45.29), waist to floor lift (OR 3.8 CI 0.99-14.9) and depression (OR 2.7; CI 0.71-10.4).

Conclusion: This study supported current views that work status in employees with chronic back pain was affected by both physical and psychological factors. Kneeling, lifting from floor to waist and depression were factors most significantly associated with employees with chronic back pain not being at work. Occupational therapists taking referrals for FCEs need to integrate these factors into their assessment in order to make informed recommendations regarding capacity for work in clients with chronic back pain.

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NOMENCLATURE

FCE - Functional capacity evaluation

DOT - Dictionary of Occupational Titles

Definitions:

Catastrophizing – an exaggerated negative appraisal of pain and its meaning [1].

Chronic back pain – continuous, long-term pain of more than 12 weeks or after the time that healing would have been thought to have occurred in pain after trauma or surgery [2,3].

Functional capacity evaluation- An evaluation of capacity of activities that is used to make recommendations for participation in work while considering the person's body functions and structures, environmental factors, personal factors and health status [4].

Anxiety – distress or uneasiness of mind caused by fear of danger [5].

Kinesiophobia – An irrational and excessive fear of movement, physical activity, or re-injury exhibited by many chronic pain patients [6].

Physical – of or pertaining to the body [5].

Biomechanical - the study of the action of external and internal forces on the living body, especially on the skeletal system [5].

Disability - An alteration of an individual's capacity to meet personal, social, or occupational demands because of an impairment [7,8].

Work status – The employee's workforce participation defined as full-time, part-time or not working as reported by the employee [9].

Full Time Work – A position of at least 35 hours per week [9].

Part Time Work – A position of less than 35 and more than 20 hours per week [9].

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CHAPTER 1: INTRODUCTION

1.1 Background to the problem

Chronic back pain is the most widely occurring musculoskeletal condition and the most common cause of disability in developed nations [10]. The lifetime incidence of chronic back pain (at least one episode of chronic back pain in a lifetime) in developed countries is reported to be as high as to 85% [11].

Within the 45 to 65 year age group, chronic back pain is one of the most frequently reported medical reasons for work loss [12]. Although chronic back pain is a significant public health problem affecting many aspects of society [13], this current study is concerned with the aspects of back pain which impact on work.

Failure to return to work due to chronic back pain is of considerable concern to long term health insurance providers, the Road Accident Fund and employers, as the long term financial implications of a permanent disability claim are high. In addition to the sick leave certificates and the medical information provided by the treating specialists, health care funders frequently require further independent, often costly, medical and functional information to determine liability for a disability claim. Independent reports are used to determine the effect of the employee's disability on their ability to function at work. The independent and objective medical and functional information enables heath care funders and employers to manage each case appropriately, with optimal allocation of rehabilitation and financial resources. Cost effective management of each case of chronic back pain is of primary concern. Thus the focus is on managed return to work, with the aim of reducing the incidence of a long term disability claim and thus saving on costs. This highlights the importance of accurately ascertaining the functional capacity of each disability claimant presenting with chronic back pain.

1.2 Occupational therapy in chronic back pain

South Africa's first democratic constitution was accepted in 1996. This legislation entrenched the rights of people with disabilities to live and work in a society freed legally from discrimination. Through the codes of good practice, The Labour Relations Act of 1995 and the Employment Equity Act of 1998, gives guidelines to employers regarding recruiting, selection, training, retention and placement of potential or current employees who were or become ill or disabled[14]. OTs in South Africa are regarded as indispensable and crucial in implementing this legislation. OTs deliver work practice services under the structure of this labour legislation. FCEs are considered essential in guiding the process of managing an employee with a disability or medical condition which impacts on their capacity for work. FCEs are usually conducted by OTs working in the field of work delivery services, usually in the context of private practice. Employees with chronic back pain or "failed back syndrome" are frequently referred for an independent occupational therapy evaluation. The occupational therapist will perform a functional capacity evaluation (FCE) to determine whether the employee:

1. could return to, or continue with their own occupation without adaptations,
2. could return to work in their own occupation if adaptations or reasonable accommodations are implemented,
3. needs to be accommodated in a suitable alternative occupation with their own or an alternative employer,
4. is unable to work at all in any suitable alternative occupation.

Occupational Therapists use FCEs to evaluate the employee to determine the extent to which the injury or illness impacts on the client's functional capacity to perform work duties. The objective findings of the FCE assist the employer with recommendations for appropriate return to work. Where the employee is unable to return to work, the outcome of the FCE will contribute to the decision making process of the health care funder as to whether the

employee qualifies for disability benefits or not. A decision regarding an employee's eligibility for benefits is a legal one and is based on medical evidence, objective functional findings and the definitions of disability as indicated in the respective insurance policy.

Obtaining an objective and holistic view is important when considering the functional capacity of the employee for determining disability benefits. Studies have shown that physical, psychosocial and functional deficits are common but highly variable among employees with chronic back pain [15]. It is this complex interrelationship of these factors which is of interest to occupational therapists who provide services in determining capacity for work of employees with chronic back pain.

1.3 Procedure of FCE

There are a number of factors which the occupational therapist takes into consideration when addressing the holistic recommendations for optimal management of the employee with chronic back pain in the FCE report. The occupational therapist will consider the employee's physical, psychological and socio-emotional state and evaluate these factors in the context of the physical and psychosocial and psycho-emotional demands of their specific job.

If, on the basis of the FCE together with other legal and medical information, it is determined that the employee is able to return to work with or without accommodations, the insurer may request that the occupational therapist become involved in facilitating the process. The occupational therapist will then act as a case manager, performing the function as a driver of the return to work process. The recommendations made by the occupational therapist in the FCE report are also valuable to the employer in determining how best to manage the employee and their disability in the workplace.

When conducting an FCE, the occupational therapist carries out an extensive interview. The referred employee's medical, educational, vocational and social history is obtained. The employee also reports on his ability to perform activities of daily living as well as their perception of their ability to perform their work tasks. Following the interview, standardised and non-standardised testing is conducted to evaluate the extent of disability and to determine their capacity for work. Based on the outcome of the evaluation, the occupational therapist will make relevant recommendations as to whether the referred employee has the capacity for participation in sedentary, light, medium, heavy or very heavy physical work. This classification of work is extensively used in FCE protocols[16]. The referred employee's own job will also be evaluated according to this classification so as to determine whether there is a match between the demands of the job and the employee's functional abilities.

Conclusions and recommendations are made to the health funder/employer regarding the extent to which the referred employee has retained the capacity to perform their own job with or without accommodation, or whether a suitable alternative occupation is required. Proposals regarding rehabilitation and further management of the return to work process conclude the report.

The process of a safe and timely return to work can be a challenging brief for an occupational therapist when the employee has been diagnosed with chronic back pain as there are numerous, multifaceted factors which affect the successful outcome of return to work.

Factors including co-morbid psychological conditions such as anxiety or depression [17-19], lack of belief in their own ability to work [20-22] together with limited physical abilities as they relate to the demands of the job [23,24] will have an impact on the outcome of return to work.

1.4 Statement of the problem

From clinical experience, the researcher noted there were often a number of factors, not necessarily directly related to organic spinal pathology, which impacted on the employee with chronic back pain's work status. Whether the employee was at work or not (work status) appeared to be determined by a complex interplay between various psychological, physical and environmental factors. For example, employees who had sustained similar injuries or who had undergone similar surgical procedures often presented with very different functional abilities/deficits. One employee, with seemingly mild spinal pathology, may have presented with medically unexplained, severe pain, resulting in this employee being unable to participate in any work tasks or able to perform only limited activities of daily living. Another employee may however have presented with more severe organic back related pathology but managed to continue working for extended periods of time in spite of the on-going, chronic back pain.

Work participation has been found to improve quality of life and well-being. Evidence strongly indicates that work is good for physical as well as mental functioning. Being employed is the most generally accepted manner of earning an income to support oneself and one's family. In addition to provision of basic daily physical needs, work meets important psychosocial needs and is central to individual identity, social roles and social status. It is generally accepted that people with disabilities should be encouraged and supported to remain in or to re-enter the workplace as soon as possible because work helps to promote recovery and rehabilitation [25,26].

Whilst there have been numerous international studies examining variables affecting the return to work outcome of employees suffering from chronic back pain, these studies generally examined either the psychological or physical factors associated with functional outcome of chronic back pain but few examined the two factors in combination. In addition,

South African studies on the topic of work and chronic back pain are limited and, to the researcher's knowledge, no South African studies in the field of occupational therapy have been published on this topic.

1.5 Purpose of the study

This study investigated the effect of both physical and psychological factors relating to chronic back pain which influenced an employee's work status from an occupational therapy perspective in the context of private referrals for FCE.

1.6 Research question

The question explored in this dissertation was:

> *"Which are the most significant factors associated with chronic back pain that impact on an employee's work status?"*

This study centred on the work status of employees suffering from chronic back pain and the associated factors which were most predictive of employees not being at work (i.e. not returning to work after a diagnosis of chronic back pain is made).

1.7 Aim of the study

The aim of this study was:

- For occupational therapists to have a better understanding of the most predictive psychological and/or physical factors which affect work status in employees with chronic back pain, who are referred for FCE.

1.8 Objectives of the study

1) To identify the extent to which the following factors were evident in the study sample of employees with chronic back pain:

- psychological factors;
- physical capacity (biomechanical) factors;

2) To identify which of the above factors may be predictive of work status in employees with chronic back pain.

1.9 Justification for research

The causal mechanisms behind chronic back pain are thought to be multidimensional, complex, and most likely interactive, with contributing factors associated with physical work requirement [23,27], psychological factors [18,28-31] and biomechanical, or physical capacity factors [32,33]. It has always been challenging to assess predictors of return to work because of the complexity and interactions between many potential sources or initiators of back pain. Given the spectrum of factors that might potentially influence chronic back pain, there is a lack of understanding of how the mix of factors influences the risk of failure to return to work of employees with chronic back pain.

The outcome of this research will be of benefit in identifying factors which are most closely associated with employees with chronic back pain not being at work. Occupational therapists conducting FCEs who take cognisance of the predictive factors, which may become apparent from the research, will be better informed as to the possible effect certain factors may have on the outcome of their return to work recommendations. This research will be useful to the occupational therapist in identifying areas in the referred employee's profile which may present as challenges to successful return to work. These areas may be

further addressed in a back pain treatment program prior to or in conjunction with a return to work program.

This chapter had outlined the statement of the problem and the purpose, research question, aims, objectives and justification for the research. The following chapters will examine the literature relating to the topic of FCE and chronic back pain, the research methodology used and analysis of the data. The results from the study are stated and the findings are discussed. In the final chapter the conclusions of the study are drawn together and recommendations are made.

CHAPTER 2: REVIEW OF THE LITERATURE

2.1 Introduction

This review defines and describes the key concepts discussed in the literature that underpin this study. The chapter is organised so that it initially reports on research concerned with the prevalence and financial impact of chronic back pain. Next, the review examines literature relating to the prognostic indicators associated with return to work in clients with chronic back pain, including socio-demographic factors, psychological and physical factors. Finally the review explores the measurement techniques and self-report questionnaires that have been used in this research to evaluate each of the three factors listed above.

The literature presented in this review was sourced from the following databases: Science Direct, Medline, EBSCO and Springer Link. The key words and phrases searched included chronic back pain, employment, return to work, psychological factors, depression, anxiety, fear of movement, kinesiophobia, lifting and functional capacity evaluation. Limited South African literature pertaining to lower back pain and work was found, however, international studies on chronic back pain as it relates to work are numerous. While unpublished data from insurance companies were commented on, most of the research reviewed consisted of systematic reviews and descriptive studies carried out internationally.

2.2 Prevalence and financial impact of chronic back pain

Back pain is common among people in the industrialised western countries [34]. The consequences of back pain are often far reaching with sufferers experiencing varying degrees of disability and reduced quality of life as well as physical and psychological distress [35]. These often lead to increased absence from work, lost productivity and work related injuries, which in turn are associated with increased direct and indirect economic costs [36,37].

In most cases, acute pain resolves quickly with employees returning to work within a few days. Unfortunately, an estimated 3% - 10% of these acute cases develop into long term disability [38]. Although relatively few individuals with acute low back pain develop chronic low back pain, approximately 80% of all expenses arising from low back pain disability are accounted for by these individuals [39]. Wynne-Jones has suggested that this may even be an understatement of the costs of back pain as those reporting reduced duties and non-employment are often excluded from studies [40].

In Japan cases of occupational lower back pain accounted for approximately 60% of all occupational diseases from 1990 to 2000 [41]. In the United States of America (USA) individuals with work-related cases of back pain lost 101.8 million work days over a year owing to this pain[41]. In the early 1990's, the cost of back pain in the Netherlands was found to be 1.7% of the Gross National Product [13]. The majority of these costs are caused by the indirect consequences of back pain which include loss of productivity, work absenteeism and permanent disability [13]. It has been estimated that the indirect cost of lower back pain, due to loss of productivity, is about 6.5 times the direct medical costs [37].

There is a scarcity of literature on the prevalence and incidence of back pain in Africa and South Africa in particular but that which is available, suggests that chronic back pain is evident and possibly more prevalent than the figures mentioned above[42]. An international study which included South Africa, published in 2007, found that 26.3% of the South African respondents reported experiencing chronic neck or back pain in the preceding 12 months [42]. This prevalence of 26.3% for South Africa was found to be amongst the highest in the world with only the Ukraine (42.2%) and Beijing (29.2%) having higher prevalence rates [42]. One of the limitations of this study is that although the researchers were able to access a very large sample size (N = 4315 for South Africa; N= 85,088 total population of study), chronic back or neck pain was determined by study participant *self-report*, rather than objective, clinical evaluation. Reneman, Jorritsma, Schellenkens and Goeken have suggested that

instruments based on self-report or those based on performance appear to measure separate components of disability. Reneman et al. suggested that both a performance measure and a questionnaire need to be used to obtain a more comprehensive picture of the disability of people with chronic back pain [43]. This recommendation was later supported by Baldwin, Butler, Johnson and Cote [44].

Van Vuuren, Zinzen, van Heerden, Becker and Meeusen found a lifetime prevalence of back pain to be 63.9% among steel workers in South Africa [45]. This finding is lower than the often quoted life time prevalence of 80% [45]. At the time of the study 15.3% of the workers had more serious lower back pain which limited their daily activities [45]. These findings are in accordance with prevalence rates between 12% and 35% reported in the international literature [46,47].

Unpublished statistics from *Momentum Benefits At Work*, an insurer managing approximately 15% of all South Africa's disability claimants, showed that disability claims for back pain comprise a significant portion of the monthly disability claims paid. On 31 August 2010, *Momentum Benefits at Work*, managed a total of 3064 active disability cases of which 403 were categorized as "spinal disability". Spinal disability includes, but is not limited to, chronic back pain cases. These statistics suggest that 13% of the employees claiming disability benefits from this insurer suffer from a spinal disability. Spinal disability cases received a total of R2 943 374 in monthly disability benefits. Momentum holds a total of R183 679 200 in reserve for "spinal disability" cases, an average of R455 000 per case. If one considers that Momentum holds only 15% of the disability market, the total amount committed by insurance companies for spinal disability would be in the region of R1.2 billion (This information was obtained from personal communication between the researcher and the rehabilitation case manager at *Momentum Benefits at Work*. The data were unpublished but permission was obtained to use the information for the purpose of this study. Statistics from insurance companies and health providers is not published for competitive reasons.)

The Road Accident Fund shows that compensation costs for people involved in motor vehicle accidents who have claimed for lower back pain in South Africa resulted in R153 million pay outs in 2000 [48]. More recent data have not been made available by the Fund.

Prevalence rates in South Africa for psychological factors as they relate to chronic back pain are variable. Major depression prevalence estimates vary among persons with chronic back or neck pain across countries, but most prevalence studies estimates are in the 4 – 11% range [42]. In South Africa the prevalence of a major depressive episode among persons with chronic neck or back pain was found to be 8.4% within one year after the onset of chronic pain[42]. The prevalence of major depressive episode in the general population in a South African study found a 9.7% prevalence for lifetime [42]. The prevalence of specific anxiety disorders is generally lower than the prevalence rates of major depression. In South Africa, generalized anxiety was found to have a prevalence of 3.9% in persons with chronic neck or back pain [42].

The above literature confirms that the prevalence of chronic back pain is high. The direct and indirect costs associated with the condition are significant and there are usually psychological factors acting as compounding elements to the primary physical/musculoskeletal factors which add to the complexity of the problem. In order to reduce the burden of chronic back pain, it is important to examine the prognostic indicators for return to work. Early return to work and maintaining people with disabilities within the workplace is firmly entrenched within the South African Labour Legislation. South Africa's first democratic constitution was accepted in 1996, two years after the first democratic elections took place. This legislation deliberately and specifically recognises the rights of people with disabilities to live and work in a society freed legally from discrimination. The codes of good practice associated with The Labour Relations Act of 1995 and the Employment Equity Act of 1998, guide South African employers in the recruitment, selection,

training, retention and placement of potential or current employees who were or become ill or disabled[14]. The Labour Relations Act and Employment Equity act with their respective codes on managing disability in the workplace are considered to be among the most progressive in the world.

2.3 Prognostic indicators for return to work

Return to work has been considered a key outcome for judging resolution of work-related chronic back disability [49]. There is strong evidence that work is good for physical and mental functioning and well-being. Employment is generally the most important means of obtaining adequate economic resources, which are essential for material well-being and full participation in today's society. Work meets important psychosocial needs and is central to individual identity, social roles and social status. When their health condition permits, sick and disabled people should be encouraged and supported to remain in or to re-enter the workplace as soon as possible because work helps to promote recovery and rehabilitation. Formal participation in employment also minimizes the harmful physical, mental and social effects of long-term sickness absence. Work participation has also been found to improve quality of life and well-being [25].

Predicting a return to work outcome has proven especially complex and multifaceted because in chronic back pain, the pain involves factors which are not always directly related to physical ones [50]. Traditionally, chronic back pain is defined as back pain with no known etiology which has lasted for 12 weeks or more [3]. This definition suggests a non-medical cause for the perpetuation of the back pain. An association between biomedical, psychological and social factors was first suggested in 1980 in the bio-psychosocial model of chronic pain [51]. This model provides a framework to explain why employee's behaviours and clinical presentations may relate strongly to non-medical factors. The literature reports

numerous studies on the topic and there is now greater acceptance of a multifaceted model for the perpetuation of chronic back pain.

Despite extensive literature, the etiology and risk factors of chronic back pain as they relate prognostically to an employee's capacity for work are however, not yet fully understood [52].

In order to clarify work capacity in employees with chronic back pain, a number of factors affecting return to work with back pain have been investigated in various studies. The quality of these studies is variable and it is difficult to compare results as they each examine different factors and use different measurement techniques to determine prognostic factors for return to work. For instance, Lotters and Burdorf examined workplace factors and found that workers with a high perceived physical work load returned to work increasingly slower over time than expected [53]. Lotters also suggests that the perceived physical workload hampers return to work and, hence, supports the need for workplace interventions among workers with chronic back pain off work for prolonged periods [53]. Similarly, van Vuuren, Becker, van Heerden, Zinzen and Meeusen also examined work place factors [36] and lower back problems in a South African steel industry [45]. However, their findings on workplace factors in this study were insignificant on data processing when compared with the influence of family support [45]. It is thus evident that both these studies examine workplace factors but take a different slant and the results are entirely contradictory. It is thus difficult to compare the findings to determine the most critical factor influencing return to work.

It has only been in recent years that physical demands and psychosocial work characteristics were investigated as risk factors for back pain within the same study. To study both factors in the same study was recommended by Hoogendoorn and his co-workers[54] in their review on psychosocial risk factors for back pain in 2000. At around this time, van der Giezen showed that psycho-social aspects of health and work in combination with economic aspects have a significantly larger impact on return to work when compared

to relatively more physical aspects of disability and physical requirements of the job [55]. On the back of these studies, Volinn, Spratt, Magnusson and Pope challenged the research community in 2001 to include both occupational exposures and psychosocial factors into their analyses as these variables may co-vary, raising the possibility of confounding problems if both types of risk factors are not accounted for in risk models [56]. Despite the fierce debate among clinicians and the divergent opinions of researchers on the subject, it is commonly accepted today that chronic back pain disorders are multidimensional in origin and may be associated with occupational, psychosocial and non-work-related factors which all influence the final prognosis [22,26,56].

Since Volinn's challenge to researchers in 2001 to include occupational and psychosocial factors in research design, the number of studies examining the relationship between chronic back pain and comorbid factors has increased considerably [29,57-59]. An important study by Von Korff, Crane, Lane, Miglioretti, Simon, Saunders, Bradenburg and Kessler found that the majority of persons with chronic back pain have at least one other chronic condition and suggested that 55.3% of chronic back pain sufferers have at least one comorbid chronic physical disorder, 35.0% have a co-morbid mental disorder [57].

As Volinn suspected, more recent research findings have confirmed that over a third of the disability burden may be linked to environmental and psychosocial factors rather than just purely the organic mechanical fallout of the spine [29].

Since it has been appreciated that chronic back pain which results in disability is not only based in neurophysiology, studies have explored which of these non-medical factors influence an employee's work capacity. Baldwin, Butler, Johnson and Cote suggested that what appears to matter most in determining patterns of return to work is not the initial severity of pain but how well an injured worker is able to function. Functional performance is determined by how well he or she is able to adapt to the pain [44]. This finding was later

supported by Du Bois, Szpalski and Donceel when they conducted a population-based study in which a large set of biopsychosocial prognostic indicators for return to work in employees with back pain were examined. It was found that in the first weeks off work due to back pain, return to work could be adequately predicted by a set of questions which provide information regarding the patient's own prediction of whether they would return to work, pain interference, fear of movement and affect[60]. The psychological factors are included in the model described by Vlaeyen, Kole-Snijders, Boeren, Rotteveel, Resnik and Heuts in 1995 [21], which hypothesizes that chronic back pain leads to catastrophizing, fear of movement (kinesiophobia) and avoidance behaviour – all of which lead to deconditioning and the perpetuation of pain, and are poor prognostic indicators for return to work. This model is supported in a number of more recent studies which examine psychological predictors of return to work in employees with chronic back pain [60,61,62].

Building on this model, Baldwin suggests that employment outcomes for workers with occupational back pain could be improved by identifying and treating workers with poor mental health status at the time of onset of back pain [44]. Mental health status, particularly relating to self-efficacy and perceived prognosis has consistently been found to be a strong predictor for return to work [53,55,60,62]. This perception of prognosis appears to be contributed to by the employee's beliefs, values, fitness level, accommodation possibilities at work and physical and organizational demands of their work [49].

A recent study to determine the importance of psychosocial factors in the outcome of function in all spheres of life, including work [63] found that a small number of factors to be predictive of outcome in chronic low back pain patients. The four factors which were found to be most predictive of outcome at 6 months were the patients' perceptions that the problem will last well into the future, the belief that many other symptoms were related to their back problem, weak beliefs about personal controllability and finally low confidence in their own ability to perform normal activities despite the pain.

These findings are consistent with the main body of literature which suggest that the employee's understanding of the medical aspects of the back pain together with how he or she subjectively interprets this information within their own belief and attitudinal system, will determine the ultimate outcome of a return to work program [64]. If a clinician is concerned about rehabilitation for return to work, the findings of the above studies would suggest that it is important for the treating therapist to identify psychological conditions, particularly those affecting self-efficacy in employees with chronic back pain because if untreated, these conditions will interfere with successful outcome of return to work [39,63,64].

The literature surveyed strongly suggests that progression from acute back pain to chronic back pain is influenced by a number of co-existing non-medical factors which have some significance for ultimate prognosis for return to work. Any combination of these factors, (i.e. socio-demographic, psychological, work place related, and/or physical) may contribute to the perpetuation of the chronic pain cycle and will influence return to work. Each factor affecting work status of employees will be examined in further detail in the following sections.

2.4 Demographic factors and chronic back pain

The Demographic factors affecting return to work in chronic back pain are very similar to other general medical conditions and generally accepted actuarial principles for determining probability of disability appear to apply. Older female employees, workers with low education and low occupational class are at the highest risk for chronic and disabling chronic pain and are negative factors for return to work [65,66]. Among young men, occupational status and pain duration seem to be important predictors of return to work [65].

Employees with a bigger financial need, return to work more often, irrespective of their health[55]. An economic variable (i.e. the breadwinner) has also been found to be significantly

predictive for return-to-work [55]. This shows the importance of an economic incentive to return to work.

Although socio-demographic factors appear to play a role in work status, the body of the literature surveyed places greater significance on the role of psychological factors which influence work status.

2.5 Psychological factors associated with chronic back pain

The International Labour Organization (2008) recently emphasised the intrinsic importance and meaning of work in the lives of people, irrespective of whether they have a medical condition or not: "work is not just an economic issue, it provides a means to prove one's worth and ability, gain self-confidence and self-esteem, and participate in the life of the community" [67]. It is thus important for occupational therapists to understand the meaning and importance of work in our client's lives. Employees in whom chronic back pain develops have often been found to have a number of psychological difficulties (e.g. depression and/or anxiety) as well as social losses (e.g. inability to work, family role changes, and financial stressors) [68].

It has been suggested that chronic pain is more likely to result when the diagnosis and mechanism of injury are more subjective and vague [69]. More specifically, where there has been no specific spinal trauma, event, or pathology, failed efforts to identify the source of the pain often results in the identification of "psychogenic" or "functional pain". These terms are attributed to pain for which no physical source can be found and, therefore, for which psychological or "non-organic" causes are suspected [69].

Psychological difficulties and social losses are factors which are now thought to be modulators of the pain experience. Turk and Rudy were amongst the pioneers in this field

and helped popularize the biopsychosocial model of pain. They emphasized that pain is engendered not only by the physical insult but also by cognitive, affective, psychosocial and behavioural influences [68].

In a similar study of affective and psychosocial factors, Foster, Thomas, Bishop, Dunn and Main corroborated these findings. Foster found that perceived outcome and low confidence in one's own ability to perform activities despite pain to be better predictors of functional disability than fear avoidance, catastrophizing or depression [63]. This popular view of belief in self as being an important predictor of functional disability stands in stark contrast to the findings of Schiphorst-Preuper, Reneman, Boonstra, Dijkstra, Versteegen and Geertzen who found the fear of movement or re-injury (kinesiophobia) to be the only one psychological variable that contributed significantly in determining return to work. Schiphorst-Preuper et al. do not consider self-belief to be of significance [18]. The fear of movement or "kinesiophobia", refers to a condition in which the pain sufferer has an excessive irrational and debilitating fear of physical movement and activity, resulting in feelings of vulnerability to painful injury or re-injury [70]. People who are kinesiophobic will avoid activities that they associate with re-injury. As such, kinesiophobia may have a negative effect on the results of performance testing [70]. The concept of kinesiophobia is an important one and will be examined in greater detail later in this review.

Most studies examining the relationship between chronic back pain and psychological factors conclude that depression, anxiety, distress and related emotions are related to pain and disability [19,50,71]. Nonetheless, there have been two studies which have questioned this finding. Schiphorst Preuper, in contrast to the main body of literature, concluded that relationships between some psychological variables (i.e. depression and anxiety) and disability in chronic back pain are non-existent or weak [18] but that psychological variables relating to fear of movement are very important [18]. Reneman agreed with this assumption and concluded his study with similar results [72]. The finding that psychological variables such

as depression and anxiety are not important factors in the management of chronic back pain appears however to be an uncommon result in the literature surveyed. The psychological factors which have been explored for the purpose of this study include depression, anxiety and kinesiophobia. Each of these variables will be discussed in the following sections of this review.

2.5.1 Depression and Chronic Back Pain

Correlations between depression in employees with chronic back pain have been identified[42]. The research shows that people with chronic back pain are more likely to experience a major depressive episode within 1 year of onset when compared to the general population [73].

It has been found that in people suffering from chronic back pain, the first episode of major depression follows shortly after pain onset but the initial major depressive episode may only become evident several years later [74].

The onset of major depression following onset of chronic back pain carries significant implications for employees. Although the onset of depression may vary, it is generally accepted that depression considerably influences loss of function associated with all types of chronic pain, but particularly chronic back pain [17,50,75]. Six depressive symptoms have been noted in individuals with chronic back pain [76]. These six symptoms, which would clearly affect daily function, included severe insomnia, psychomotor retardation, feelings of worthlessness, feelings of guilt, fatigue and difficulty concentrating [76]. Individuals suffering from chronic back pain often experience loss of vitality, persistent discomfort which result in sleeping difficulties and the sedative side effects of pain medication are of importance, particularly to those who are making an effort to be productive with the workplace [77].

The cumulative impact of the symptoms of depression and the restrictive effects of pain on the employee will have an effect on productivity within the workplace. When an employee presents with symptoms associated with depression and pain such as fatigue, discomfort and poor concentration, it is likely to cause both the employee and employer to question the employee's ability to perform adequately within the work environment [49]. But what about objective evidence? Is general *perception* of reduced work productivity enough to say with certainty that an employee is unable to perform their duties?

Alschuler, Theisen-Goodvich, Haig and Geisser took this notion further and explored the association between self-report of depressive symptoms, self-report of disability and objectively measured physical performance. Alschuler and his co-workers found that self-report of depression did significantly contribute to poor physical performance on tasks [50]. This finding supports the notion that there is a genuine relationship between depression and functional incapacity in persons with chronic back pain [50]. This is an important study for occupational therapists as it showed that the depression-disability relationship extends beyond self-report measures and is maintained when objective measures of functional capacity are evaluated [50].

Reneman, Geertzen, Groothoff and Brouwer queried this finding and asserted that instruments for self-report and those based on performance, appear to measure separable dimensions of the disability construct. A performance measure should be used to measure 'a person's ability to perform an activity', whereas a questionnaire should be used to measure 'a person's self-reported ability to perform an activity' [78]. Reneman et al. concluded with the recommendation that both a performance measure and a questionnaire be used in an FCE to obtain a more comprehensive picture of the functional disability of patients with chronic back pain [78].

While considering the important recommendation of Reneman to include both functional, performance based evaluation and self-report questionnaires in assessment of work capacity to evaluate the separate constructs of disability, one must not overlook the findings of Alschuler et al. (2008). Alschuler supports the notion that depression and function are affected by each other at least in part through reduced effort during activity [50]. Most importantly, neurovegetative symptoms associated with depression such as low levels of energy, lack of interest and anhedonia limit a person's capacity to apply effort on various tasks and decreases their motivation in engaging in effortful activity. Negative cognitions are also thought to reduce effort during activity, as persons with depression may have more negative views about the outcome of their efforts, or are more fearful that activity may cause more pain and discomfort [50]. Alschuler thus establishes a link between mood symptoms associated with depression and functional ability.

Despite evidence confirming the association between chronic back pain, depression and the resultant loss of physical function, the clinical significance of the effects of treating depression in people with chronic pain, and the effect this may have on function has been questioned [79]. If one analytically examines these studies, it is apparent that many factors have been proposed to be related to disability associated with chronic pain and managing the depression, or any other factor, *in isolation* may not be sufficient to significantly improve function[50]. Whilst depression is an important contributor to loss of work function which should be addressed in a rehabilitation program, one must not overlook the importance of other psychological difficulties which are often associated with chronic pain, for instance anxiety.

2.5.2 Anxiety and chronic back pain

In South Africa, it is thought that anxiety has a lower prevalence in relation to chronic back pain than does major depression [42]. In comparison to the numerous studies examining the relationship between depression and chronic back pain, there is relatively little research examining anxiety as a specific diagnosis in relation to chronic back pain. In the few studies which do examine the topic, findings between anxiety and chronic back pain are inconsistent. This conflicting evidence is highlighted in the studies of von Korff (2005), Breslau (1993) and McWilliams (2003).

Von Korff, Crane, Lane, Miglioretti, Simon and Saunders asserted that anxiety disorders are as commonly found in people with chronic back pain as depression [57]. McWilliams, Cox and Enns [69] and the study conducted by Breslau and Davis found similar trends but concluded that pain conditions were in fact *more* strongly associated with several anxiety disorders than with depression [71,80]. If anxiety is equally or more strongly associated with chronic back pain than depression, then the question that needs to be asked is why are there comparatively so few studies on the topic? A possible answer is suggested by the findings of a study conducted by Thomas and co-workers.

Thomas, Pers, Mercier, Ambiere, Frasson, Ster, Herrisson and Blotman found that the correlation between the overall Hospital Anxiety and Depression Scale (HADS) score and catastrophizing/kinesiophobia was due to the HADS anxiety items and was not found when considering the depression component alone. Hence anxiety seems to be required for the generation of catastrophizing in the chronic back pain sufferer and reduces his/her control over the situation [29].

The findings as noted above suggest that research on comorbidity of chronic back pain and mental disorders may benefit from increased attention as to the specific role of anxiety. This

is particularly so in the light of the evidence that suggests that anxiety may be a more significant factor than depression in determining work function of employees with chronic back pain. It could however be postulated that the apparent paucity of anxiety specific research may be a matter of terminology. Anxiety can be used as a general term to describe a sense of unease and a fear of possible danger. Kinesiophobia on the other hand is a more specific form or anxiety. If one considers the definition of anxiety - distress or uneasiness of mind caused by fear of danger [5], kinesiophobia, which is pain related fear of movement [6], can be considered to more accurately describe a specific form of anxious state. Kinesiophobia may thus be a form of anxiety in the specific context of chronic back pain. In the past 10 years, pain related fear of movement (or kinesiophobia) has received much attention in the literature [81-88]. If viewed in the context of kinesiophobia, then the subject of anxiety has been extensively studied. The review will now examine kinesiophobia and how it relates to chronic back pain in the context of work.

2.5.3 Pain related fear or "kinesiophobia"

It is generally agreed that back pain is not only a physical problem but may also depend on the person's attitudes and beliefs, psychological distress and illness behaviour [89]. A person's fear of pain and the degree to which he or she will seek to avoid painful experiences or behaviours is conditioned by the psychological context within which the painful event occurs [86]. Previous stressful life events, maladaptive personal pain coping strategies, prior pain experiences and personality characteristics, have all been identified as factors which influence the psychological context within which the person will function [90,91].

The term fear-avoidance was first introduced by Lethem, Slade, Troup and Bentley (1983) who described the fear-avoidance model of exaggerated pain perception [91]. According to this model there are two divergent responses to pain: firstly the adaptive response or confrontation and secondly, the non-adaptive response or avoidance. The confronter is likely to view pain as something temporary and is therefore prepared to confront the pain.

Furthermore he or she is probably motivated to return to work and normal activities. The importance of psychological mechanisms and consequences will in this case be minor. Avoidance, on the other hand, might create physical as well as psychological consequences that increase not only the individual's beliefs of fear but also the actual disability [91]. This model provides a rather simplistic view of a complex problem.

Literature suggests that fear avoidance beliefs centre on the person's belief that participation in work or physical activity is likely to worsen or prolong the disability [84]. Fear-avoidance beliefs are thus a specific psychosocial variable involved in the development of chronic disability from low back pain. Fear of pain and activity seemingly lead to avoidance behaviours that contribute to onset of a chronic condition and work loss. In further support of this theory, van Vuuren et al. found a highly significant association between chronic back pain and fear-avoidance beliefs about work in a South African study within the steel industry[58]. This finding adds to the already well-established body of work supporting the hypothesis that fears specific to work-related activities have an effect on perceived incapacity for work. As previously indicated, a person's perceived capacity for work is a critical factor in determining return to work.

The relationship between Kinesiophobia and avoidance have been examined in both a controlled research environment[20,21,84] as well as in a clinical setting[92]. Statistically significant correlations of low to moderate strength were found between kinesiophobia and avoidance behaviour determined as a factor of prolonged holding of a 4.5kg suitcase [20], peak torque in trunk flexion-extension test [84] and prolonged holding of a 5.5kg bag [84].

In contrast, weak correlation was found between kinesiophobia and a progressive lifting task. Reneman et al. could not confirm the relationship between kinesiophobia and avoidance, evaluated with lifting in the context of an FCE [70].

The findings of the above studies reveal a source of controversy in the literature. A definitive conclusion regarding the relationship between kinesiophobia and function has not been reached.

Having explored the relationship between fear of movement and how this relates to function, the next logical step is to consider the impact of physical or biomechanical impairment on functional outcome.

2.6 Physical factors associated with chronic back pain

The physical factors assessed in this current study relate to the biomechanical abilities of the employee. It is however important to consider the human physical factors in the context of the inherent physical demands of the employee's job. In order for an employee suffering from chronic back pain (or any employee for that matter) to be able to work safely and productively, there must be a match between their physical abilities and the inherent physical demands of the job [93]. The physical factors, as they relate to the loss of biomechanical ability due to chronic back pain, in the context of the physical demands of the job, will be explored further in this section of the literature review.

2.6.1 Pain intensity

Studies have suggested that back pain intensity is a weak predictor of post-injury employment[44]. When all severity measures are included in a single model, the pain intensity variables become insignificant [44]. Although it is suggested that pain intensity in the acute stage of back pain may be one of the factors associated with progression to chronic back pain [94], it's significance in relation to an employee's capacity for work is of less importance[84].

2.6.2 Time since last at work

It is well documented that the longer an employee stays off work following an injury, the less likely they are to return to work[49]. Valat, goupille, Rozenburg, Urbinelli and Allaert showed that employees who had been off work for a long time were more likely to evolve towards chronic back pain [95]. Furthermore, evidence strongly suggests that disability prevention opportunities are substantially less likely to help the worker if implemented 3 months after the work injury and resultant cessation of work [60].

2.6.3 Physical ability of the employee in relation to physical demands of the job

For the purpose of this study, it was important to look at various biomechanical components of human movement which are commonly used in the workplace. The most frequently reported occupational risk factors for chronic back pain from international studies are frequent bending, twisting, lifting, pulling and pushing, repetitive work, forceful movements, static postures like prolonged sitting, awkward postures and whole-body vibrations [54,96,97]. Repetitively engaging in these activities is thought to trigger or aggravate a pre-existing back disorder [49].

The human physical components of movement examined for the purpose of this study were lifting, kneeling, squatting, bending forward, reaching above head height and twisting. These movements and positions were selected as they were considered to be important functional components required in a number of occupations as described in the literature. The literature surveyed revealed interesting findings relating to these postures as they relate to work.

The most studied risk factor for back pain is manual lifting of loads [23]. The one risk factor highly associated with back pain was load carriage, with a high odd ratio of 7.2 [36]. Size of

the objects, weight of the object and lifting frequency were all significant factors in the outcome of severity of back injury [98].

In a South African study dealing with musculoskeletal pain and workplace stressors, the weight employees were expected to lift during their work day was found to be significantly associated with back pain [23]. Lifting 25kg or more was found to be a significant risk factor for low back pain when this occurred more than 15 times per working day [54]. Similar findings were reported by Lin, Chen, Chen and Cheng who found that employees who were lifting 30kg or more with an accumulated frequency of 30 times per day experienced increased risk of back pain [98].

Whilst lifting and carrying are important risk factors for lower back pain, it is also important to consider other positions commonly used during execution of general work tasks. In a South African study, Van Vuuren et al. found significant associations with back pain for sitting, kneeling and squatting[36]. Literature findings on these variables are inconsistent with some researchers demonstrating associations between these postures and back pain [97,99] while others do not [100]. A study by Harkness, Macfarlane, Nahit, Siman and McBeth found no association between sitting and lower back pain (OR 0.9) but they did find kneeling (OR 2.1), standing for more than 2 hours (OR 1.8) or squatting (OR 1.8) for 15 minutes or longer to be predictive factors for new-onset back pain [101].

Kneeling is an uncommon work posture but it may be important to examine why this position is strongly associated with lower back pain. When an employee is positioned in a kneeling position, there are changing biomechanical relationships such as decreases in muscle leverage and changes in muscle length. In addition, the movement degrees of freedom and stability of the spine are limited when individuals are kneeling [102]. How these factors impact spinal loads when working in a kneeling posture is however not well understood. Studies

have shown significant increases in lateral and anterior posterior shear forces of the spine when kneeling [103]. Kneeling is an inherently more limited posture than standing. Employees are not able to move with the same dexterity as when standing and may not be able to use their trunk dynamics in the same way [102].

Van Vuuren et al. found that the combination of twisting and bending was the only trunk posture variable which was significantly associated with back pain [36]. Axial twisting and flexion of the torso has been found to be a significant risk factor for occupational related low back pain [54,54,99]. Hoogendoorn, Koes, Bongers, de Vet, Douwes and Miedema elaborated with the clarification that extreme trunk flexion led to an increased risk of low back pain when the trunk was in a minimum of 60 degrees of flexion for more than 5% of the working time [54]. In a group of employees who used their trunk in rotation in their work for more than 10% of the working time, an increase in the risk of lower back pain was found [54].

Working in the positions discussed above are inherent in many jobs, but more so in manual labour intensive occupations. The impact of occupation on chronic back pain exists but it is generally agreed that the effect is modest except for extreme working conditions [104]. The causal relationship between workload factors and chronic back pain is however not fully understood. It is assumed that the worker's individual workload should not exceed their capacities [105]. Reneman, Dijstra, Jorritsma, Muskee, Schiphorst Preuper and Goeken have developed the concept of load and capacity into the 'model of functional capacity and functional demands' [106]. According to this model, it is assumed that chronic back pain is caused by an on-going imbalance between a person's functional capacity and functional demands. In the event of an imbalance, back pain will start, develop into chronic back pain and continue to exist until the balance is re-established. Functional load and functional demands are in turn constantly influenced by physical, mental, and environmental factors. Work ability is related to both functional capacity and functional load [106].

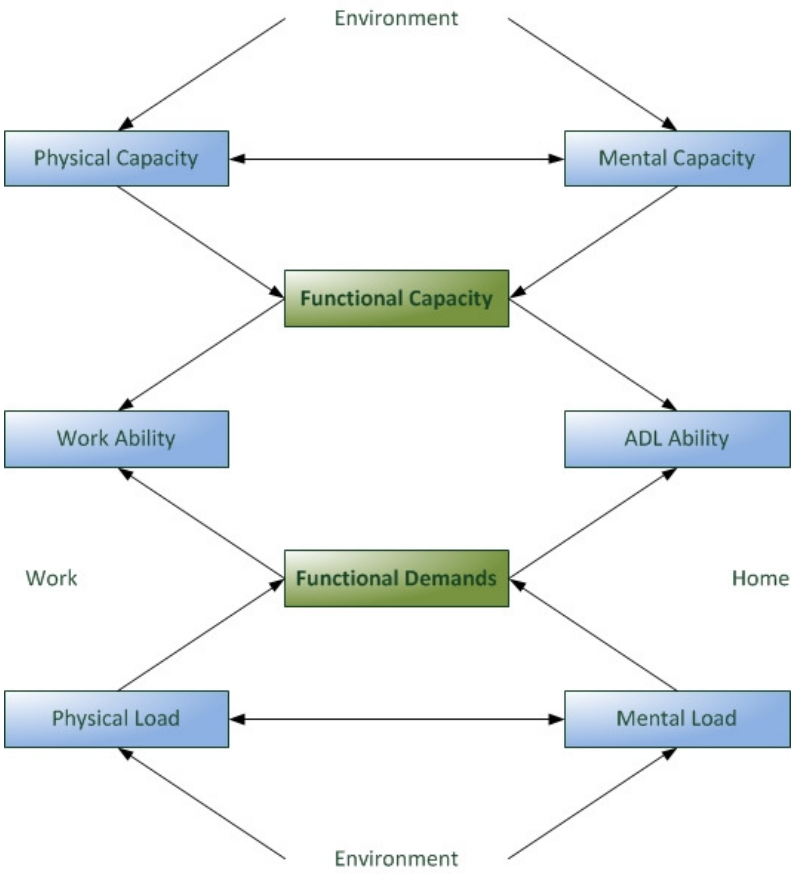

Figure 2-1 Model of functional capacity and functional demands for assessment and treatment of work related disorders [105]. Permission from Mr Reneman has been obtained to reproduce this model.

As demonstrated in the above load/capacity model, every person, with his or her individual physical and mental capacity, fulfils tasks in a certain environment. A task leads to both a physical and mental load for the worker. Physical and mental demands and capacity influence each other, but are in turn influenced by the environment. In an optimal situation the total capacities (functional capacity) is in balance with the total demands (functional demands). In the case of an imbalance, complaints such as non-specific low back pain will eventually start and probably continue until the balance has been re-established. From this point of view, a comprehensive evaluation of a person's disability has to incorporate functional load and functional capacity, as well as physical, mental and environmental factors [106].

Reneman has highlighted the need to evaluate a number of critical aspects of function when assessing capacity for work. He stresses the need to evaluate both physical and mental capacity of the employee in relation to the physical and mental load of the work within the context of the employee's specific environment [106]. Occupational therapists typically make use of a functional capacity evaluation (FCE) to objectively determine fitness and safety for work in employees with chronic back pain [14,107,108]. As the review of the literature has shown in this section, consideration for non-medical factors such as employee's self-belief in ability to work, symptoms of depression and/or anxiety as well as fear of movement are as important as the evaluation of the employee's physical abilities with respect to the relevant job demands, when compiling a comprehensive FCE. In the next section the importance of the FCE in determining functional capacity for work will be looked at.

2.7 Using the FCE as a tool in determining capacity for work

Functional Capacity Evaluations are standardized batteries of tests which form an evaluation of capacity of activities [4]. The objective of FCE in occupational therapy is to evaluate an individual's capacity in a work context[14]. Over the past 5 years, there has been considerable research and investigation into the use of FCE in the field of insurance medicine [109], rehabilitation medicine and occupational medicine [110].

In the United States, FCE frequently occurs within the multidisciplinary team at outpatient clinics [15]. The patient is assessed by a physiotherapist, occupational therapist, psychologist and rehabilitation counsellor [15]. The testing by the physiotherapist and by the occupational therapist considers the physical aspects of evaluation, with the occupational therapist assessing whole body function and the physiotherapist assessing isolated performance measures [15]. The psychologist evaluates the affective and emotive components of the individual's disability and the rehabilitation counsellor takes the rehabilitation and return to work process further and case manages the process [15].

In South Africa, the requirement for an FCE are referred to occupational therapists working in private practice, generally without multidisciplinary support. The referral for an FCE can come from a number of sources but is usually sent from an insurance company, a pension fund, disability managers or employers themselves [14]. Occupational therapists in South Africa conduct not only physical evaluations but also perform in-depth assessment of cognitive and psychological status with a focus on the effect these components have on function in the workplace [14]. This holistic approach to assessment procedure is in line with the recommendation of the literature as discussed in the preceding topics of this review.

The FCE is used to establish if an application for a disability benefit meets the criteria of the insurance policy. The occupational therapist assists the insurer and the employer in making every effort to re-integrate a disabled worker into the workplace in terms of the relevant labour legislation [14].

The question to be answered by the occupational therapist with such a referral is: Now that this worker has an injury/illness/disability, will he or she be able to continue with their previous work or is it possible for him or her to perform any alternative work [14]? The occupational therapist assimilates all information obtained during the assessment to answer this question and to make relevant recommendations for return to work [14]. In addition, the occupational therapist may be asked to comment on whether further rehabilitation, accommodations, assistive devices, adaptions or training will assist the worker to improve their work capacity and productivity [14].

In order to make informed judgments and recommendations, the occupational therapist will make use of both standardized and non-standardized measures [14]. Standardized FCE protocols typically include tasks requiring dynamic lifting, postural tolerance and mobility [110].

These physical components of the FCEs are used to determine an employee's ability to perform the physical demands of their work safely [110].

Assessment of manual handling capacity in FCEs, especially lifting and carrying, provides clinicians with a more realistic way of determining an employee's ability when the actual workplace and job tasks are not available. Studies have shown that the amount of weight lifted from floor to waist is the most predictive element of an FCE protocol in relation to return to work [111,112].

Return to work is often considered the ultimate level of functional status as well as the end of economic loss for all stakeholders involved. It is also commonly equated with recovery [49].

This literature review will now look at the validity and reliability of the various assessment tools and techniques used in this study. First, the self-report questionnaires used will be examined and then the literature relating to the physical FCE assessment protocols used in this study will be examined.

These self-report questionnaires and performance measures have not been standardised for the South African population. No South African standardised self-report questionnaires or performance measures which evaluate the specific measures required for this research are known to the evaluator. This will be considered further under limitations of the study. The use of the MPQ, TSK and the HADS have been used in studies involving chronic back pain. The use of the PILE and the FAST have been established in assessment of people with chronic back pain [20,84,85,113-116.]

2.8 Self-report Questionnaires

Four well recognised self-report questionnaires were used in this study. The findings of the literature relating to each of these questionnaires are detailed below.

2.8.1 World Health Organization Quality of Life assessment instrument (WHOQOL-BREF)

The World Health Organization Quality of Life assessment (WHOQOL-100) was developed by the WHOQOL Group with fifteen international field centres simultaneously in an effort to develop a quality of life assessment which would have cross-cultural relevance. The WHOQOL-BREF is an abbreviated version of the WHOQOL-100. The questionnaire comprises of 25 questions relating to quality of life which are grouped into 4 larger domains: physical, psychological, social relationships and environment [117]. The 26th question relates examining overall quality of life and general health perceptions. The participants are asked to rate their responses to the 26 questions on a scale of 1 – 5. Skevington, Lofty and O'Çonnel found the WHOQOL - BREF to have internal consistency, item-total correlations, discriminate validity and construct validity through confirmatory factor analysis [117]. This self-report measure was found to have good to excellent psychometric properties of reliability and validity [117]. It was concluded that this assessment tool is a sound, cross-culturally valid assessment of quality of life, as reflected by its four domains: physical, psychological, social and environment[117].

In the original document introducing the WHOQOL-BREF, the author notes that Cronbach's α was calculated for all of the items in the instrument and for the total sample. The results showed that the UK WHOQOL-100 has excellent internal consistency reliability (α = 0.967). Cronbach's α for in-patients was 0.97 and excellent results for out-patients, primary care and well samples were also found (0.96) [118]. These results show that the scores in each domain can be reliably used in all groups of both patients and well people.

Skevington's study showed that positive feelings as indicated on the WHOQOL are the best national (British) predictor of overall quality of life, with mobility and energy and fatigue making minor contributions [118].

Skevington published a study in which the relationship between pain and discomfort and quality of life using the WHOQOL was examined [119]. It was found that pain and discomfort do make a substantial impact on people's overall perceptions of their health and quality of life. It was further noted that when multiple regression was carried out to examine the separate effects of the three classes of McGill pain questionnaire on total quality of life, only affective pain was found to be significant, and only a modest 12% of the variance was explained. This demonstrates that it is the emotional component of pain that most affects quality of life (or vice versa) when pain is present. Pain and discomfort was significantly associated with general quality of life (t= 2.45). When comparing the quality of life of chronic, acute and pain-free subgroups, quality of life is best for the pain-free group, poorer for the acute group and poorest for those in chronic pain [119].

This quality of life (QOL) assessment was used to establish participant's perceptions of their quality of life, health and other areas of their life in relation to their pain.

2.8.2 Hospital Anxiety and Depression Scale

The Hospital Anxiety and Depression Scale (HADS) is a 14-item scale developed by Zigmond and Snaith (1983) to provide a brief measure of both anxiety (seven items) and depression (seven items) [120]. It was designed for use in medical out-patient clinics to detect clinical cases and severity of anxiety and depression. The HADS is used to identify probable occurrence of anxiety disorders and depression among patients with physical impairment [120]. The HADS is designed for use in the context of a physical impairment as being the primary diagnosis [115].

The scale is self-administered with instruction on the printed form and takes about 10 minutes to complete. The HADS consists of 14 items which are divided into two sub-scales, one for anxiety and one for depression. The participant rates each item on a four-point scale. Each items is scored from 0 to 3 and the total scores range from 0 to 21 for the anxiety subscale and also for the depression subscale. Higher scores indicate greater anxiety or depression. Based on Zigmond and Snaith's study scores from 8 to 10 on each scale have been taken to indicate possible clinical disorder and from 11 to 21 to indicate probable clinical disorder [115]. To prevent "noise" from somatic disorders on the scores, all symptoms of anxiety or depression relate to physical disorder, such as dizziness, headaches, insomnia, anergia and fatigue were excluded. Symptoms relating to severe psychiatric disorders were also excluded from this questionnaire [115].

Tests for inter-rater and test-retest reliability have been satisfactory (r=0.67 – 0.77) [121]. In a literature review conducted by Bjelland, Dahl, Haug and Neckelmann, a concurrent validity between the Beck Depression Inventory and the HADS (depression scale) was found to be 0.62 and 0.73 [115]. When compared to other questionnaires such as the BDI, STAI, CAS and SCL-90 Anxiety and Depression subscales, the correlation to HADS–D and HADS-A respectively were between 0.60 and 0.80, which should be characterised as medium to strong correlations [115]. Bjelland et al. concluded that the concurrent validity of the HADS is good to very good.

Despite its brevity, the HADS showed similar sensitivity and specificity similar to the longer versions of the General Health Questionnaire (GHQ) [115]. The demand for a Cronbach's coefficient to be at least 0.80 for a self-report instrument to be reliable [122] has been met in all studies using the HADS that report data on internal consistency. Internal consistency of the HADS is thus considered robust [115].

Burns and Eidelson [123] argue that the correlation between any valid and reliable measure of depression and anxiety should be at the 0.70 level, not because of shared symptoms between anxiety and depression, but because of a common causal factor. However other authors have claimed that a low correlation between the two measures of anxiety and depression is a hallmark of good discriminant validity of a bi-dimensional test [124]. Watson, Weber, Assenheimer, Strauss and McCormick attempted to clarify the distinction between anxiety and depression. In this study the supposition was made that phenomenologically anxiety and depression are unmistakeably separate from each other. Anxiety is centred on the emotion of fear and involves feelings of worry, apprehension, and dread. In contrast, depression is dominated by the feelings of sorrow, hopelessness and gloom and is associated with a general emotion of sadness. Nevertheless, despite their seeming distinctiveness, it is challenging to differentiate these constructs empirically [125]. Watson et al. pointed to studies which have shown that self-report measures of anxiety and depression using the HADS are highly correlated, with coefficients typically in the 0.45 to 0.75 range [125].

The HADS questionnaire was used in the current study as a measure of the psychological components for depression and anxiety in employees suffering from chronic back pain.

2.8.3 Tampa Scale of Kinesiophobia

The Tampa Scale for Kinesiophobia (TSK) [6] has become one of the most frequently employed measures for assessing pain-related fear in back pain sufferers.

The TSK was developed to measure fear of movement or (re)injury in chronic pain patients[85]. The questionnaire consists of 17 items scored on a 4-point scale assessing the subjective rating of kinesiophobia ranging from “strongly disagree” to “strongly agree”. Participants are asked to make ratings of their degree of agreement with each of the 17 statements. A total sum is calculated after inversion of the individual scores of items 4, 8, 12

and 16. Scores range from 17 (low fear) to 68 (high fear). A high TSK value indicates a high degree of kinesiophobia, i.e. greater fear of movement / (re)injury.

Two factors can be identified, the first is activity avoidance which reflects the belief that activity may result in (re)injury or increased pain (items 1, 2, 9, 10, 13, 14, 15 and 17). The second factor has a somatic focus which reflects a belief in underlying and serious medical problems (items 3, 5, 6, 7, and 11). In this two factor model the four inversely phrased items showed weak associations with the TSK total score and were omitted, thus leaving a total number of 13 items [21,126].

The Dutch version of the TSK has been shown to demonstrate good internal consistency and test-retest reliability [114]. Woby, Roach, Urniston and Watson have found that the English version of the TSK is also valid and reliable [114]. Woby et al. further demonstrated that the English version of the TSK demonstrates excellent test-retest reliability in a sample of chronic lower back pain patients [114]. Measures of internal consistency for the complete 17 item version of the TSK revealed a high level of reliability across items. The range of obtained item-total correlations for all 17 items was from r=0.29 to r=0.69 (average r=0.44) and from r=0.29 to r=0.34 for the four negatively phrased items. A Cronbach's $\alpha = 0.84$ was obtained using all 17 TSK items indicating a high level of internal consistency [85]. Several studies have found support for the construct and predictive validity and reliability (i.e. internal consistency and test-retest) reliability of the TSK [20,21,126]. In particular, a study by French, France, Vigneur, French and Evans have confirmed the results of the Woby et al. study, indicating that the original version of the TSK has good psychometric properties in English-speaking chronic back and neck pain patients [85]. TSK scores were found to be positively related to self-report of clinical pain, disability and negative affect. Regression analyses indicated that TSK scores were predictive of disability levels even after controlling for clinical pain [85]. The TSK (together with the Fear Avoidance Beliefs Questionnaire(FABQ) have been found to be superior in predicting self-reported disability and poor behavioural

performance[84]. Interestingly, Cook, Bruwer and Vowels found that older participants had a lower score on the TSK than middle aged participants [83], thus older participants were not as fearful of movement being a cause of pain.

Construct validity has been found to be strongly related to changes in pain intensity (r=0.22, P<0.01) [20,21,81,82,125]. Face validity has been claimed to be high [22]. Criterion validity is derived from correlations with other self-reported measures of fear (of bodily injury), anxiety depression and catastrophizing [20,21]. Construct validity of the TSK was found to be significantly correlated with the FABQ which is another measure of fear-avoidance beliefs [85].

The TSK was thus used in this study to measure the effect of pain related fear on work status. For the purpose of this study, kinesiophobia falls within the psychological category of factors studied.

2.8.4 McGill Pain Questionnaire

The MPQ is designed to assess three dimensions of pain experience as hypothesized by the gate control theory of pain (Melzack and Wall 1965) [113]. Specifically, the Pain Rating Index (PRI) of the MPQ includes 20 groups or subclasses of pain descriptions. (The initial scale developed by Melzack [127] comprised 16 subclasses but after further investigation 4 additional subclasses were subsequently added.) Each section is designed to assess a different quality of pain experience [113]. These subclasses of pain descriptors are further grouped into 4 subscales designed to assess the sensory, affective, cognitive and behavioural dimensions of pain [113]. Within each subclass, descriptors are ranked in order of intensity. Subclass scores are summed to form 4 subscale scores, describing the quality of pain in each category with a higher score indicating a higher pain experience in that pain experience [113]. A Present Pain Intensity (PPI) scale is the final section in which the client chooses a word which best describes the intensity of the pain. Each word is given a numerical rating from 0 (no pain) to 5 (excruciating).

Reliability – Retest over 3 – 7 days showed that respondents tended to choose the same words in the Pain Rating Index (PRI) and report the same Present Pain Intensity (PPI) level. A recent systematic search of three databases concluded that investigators of five studies reported the test-retest reliability (0.70 – 0.90), inter-rater agreement (85% - 86%), concurrent (0.31 – 0.46), and predictive validity (67% - 77%). Findings of four studies supported the MPQ as a reliable, multidimensional measure [128].

2.9 Performance based assessment tools

The available standardised FCE tools which assess performance measures include both lifting tasks as well as static and dynamic positioning tasks [129-131]. Various FCE protocols are available to clinicians including WorkWell [129], Epic Lift [132] and Progressive Isoinertional Lifting Evaluation (PILE) [133]. The PILE was used for the purpose of this study. This protocol was chosen because it is relatively inexpensive to obtain and administer and is easily accessible to the South African occupational therapist.

2.9.1 Progressive Isoinertional Lifting Evaluation (PILE)

There are two main approaches to lifting protocols in an FCE, these being the psychophysical and kinesiophysical approaches. ***Psychophysical*** FCEs place the worker in control, and performance is stopped when the worker believes maximal function has been reached[134]. In psychophysical testing, the worker's opinion determines the test end point. Research studies of workers use psychophysical criteria to determine a worker's perception of his or her ability. This format has been used for lifting and grip strength research to obtain normative data [69]. This approach has less application for workers who may not have a clear perception of their own ability and have psychosocial factors which may impact on performance, or are suspected of not accurately reporting or demonstrating ability [69]. Determination of psychophysical end point relates to the worker's capacity to perform the physical demands with regard to the person's cognitive-perceptual systems and draws on their inherent self-perception, beliefs, and expectations of their ability. Perceptions of

exertion and load, pain location and intensity, pain behaviours and the worker's fear of pain and movement are indicators to the evaluator as to whether the worker has exerted maximum acceptable effort [69].

In ***Kinesiophysical*** testing, the end point is determined by the evaluator using functional movement criteria [69]. The kinesiophysical approach places the administering therapist in control. Tasks are stopped by the therapist when biomechanical signs of maximal effort are observed such as accessory muscle recruitment, physiological indications such as heart rate and difficulty counterbalancing (altered biomechanics judged as being unsafe) [134]. Objective criteria for test performance that are used to determine scores and end points but the evaluator maintains communication with the evaluee during testing. These measures are put in place to ensure the safety of the worker and the assessment is stopped prior to overexertion [134]. If an evaluee refuses to perform or to continue and a functional end point has not been reached, this situation will be scored as a self-limited end point, not one determined by objective criteria [69].

The PILE is an example of a psychophysical lifting protocol as the worker determines the end point of lifting [133]. No studies were located that specifically examined the validity of the PILE; however there were a number of studies that used the PILE as an outcome measure or compared PILE results with other measures. These studies are considered to contribute to various aspects of validity of the PILE [116]. Test-retest reliability of the PILE is 0.91 in chronic lower back pain patients [135]. Lygren, Dragesund, Joensen and Ask found no significant difference in the test-retest reliability among women or men [135]. The error of measurement indicates that the true result in 95% of cases will be within 4.5kg from the measured value, while the difference between 2 measurements in 95% of the cases will be less than 6.4kg [135]. No harm to participants has been reported in the many studies in which the PILE has been used [135].

The PILE's inter-rater reliability is excellent for the lumbar (floor to waist) and cervical lift (waist to shoulder) lifts [136]. The test-retest reliability of the lumbar PILE lift varied from moderate for female nursing aides [136] to excellent in subjects with chronic low back pain [135]. The lifting test chosen for the current study was the PILE as it met the criteria for the purpose of this study.

All commercially available FCEs have a component of dynamic material handling (i.e. lifting, lowering, carrying, pushing or pulling). Although all FCEs incorporate manual handling components, it is not possible to use the results from varying protocols interchangeably [116]. Soer, Poels, Geertzen and Reneman found that the floor to waist lifting tasks of the PILE and WorkWell system (WWS) are strongly related to each other but that a significant difference of 6kg in mean lifting performance exists [116]. The average employee with chronic lower back pain was able to lift 22kg using the PILE protocol which would classify them as suitable for medium work. On the WWS the same average patient was able to lift 28kg which would classify him as suitable for performing medium / heavy work [116]. Soer et al. concluded that psychological differences could not explain the differences between the PILE and WWS [116]. Soer indicated that none of the psychological variables correlated significantly with the difference between the Pile and the WWS [116].

Differences between evaluators may also contribute to the differences between the test results[116]. Interaction variability such as the physical distance between the evaluator and the patient, the way of communication and fear-avoidance level of the evaluator (i.e. any insecurities the evaluator may have relating to asking the worker to participate in the lifting task) may influence the behaviour of patients with chronic lower back pain [116]. Soer et al. concludes that further research is recommended to isolate possible influences that may account for differences in test procedures, test approaches and test leader characteristics[116].

In contrast to the above study, Schenk, Klipstein, Spillmann, Stroyer and Laubli found that the weights lifted using the PILE were significantly higher than the WWS FCE [24]. Given the conflicting results from these studies, all that can be said is that the results of these lifting tests are not interchangeable.

Studies have shown that it is not unusual for people to experience an increase in symptoms following testing, this increase was usually mild to moderate discomfort and returned to pretesting levels within several days [137].

There is some controversy in the literature regarding the instruction of safe manual handling methods during the FCE and providing correction throughout the lifting task if techniques become unsafe [138]. Some approaches recommend that workers being evaluated should be allowed to use their usual lifting technique and not be corrected during evaluation because this would indicate how the person would perform when in an unsupervised situation at work[138]. There is however agreement on some aspects of what can be recommended with regard to correct lifting of low lying objects.

The aspects of safe lifting body mechanics which have strong support from the literature [139] are keeping the load close, using a secure grip and a stable base and using a smooth movement or moderate pace [139].

In addition to a lifting protocol, a static and dynamic positioning test was required to evaluate participant's tolerance for assuming and maintaining various postures which are frequently required during work tasks. For this purpose, the Functional Activities Screening Test (FAST) [140] was used.

2.9.2 Functional Activities Screening Test (FAST)

The Functional Assessment Screening Test (FAST) is a simple, inexpensive, and easy to administer test that measures activity tolerance in common tasks such as kneeling, stooping, reaching and squatting. The FAST forms part of the Spine Team Assessment for chronic pain disability and is administered by occupational therapists to evaluate patient performance in functional tasks designed to approximate work or home conditions. The test was designed by Ruan, Haig, Geisser, Yamakawa and Bucholz after a number of clinical observations in which they observed that, based on their patients' behaviour upon entering the clinic, an experienced therapist would be able to predict performance on functional testing that required subjective reports of tolerance, but was less able to predict the level of performance which the patient would be able to achieve on more objective measures such as cardiovascular fitness [140].

In the clinic setting, Ruan et al. observed that a number of the patients with chronic low-back pain seemed to give up just before they had finished the task. Most interestingly, when the length of the test was changed, this relationship remained true. Based on these observations, the therapists concluded that these supposed physical assessment tasks were in fact measuring psychosocial responses in many (but not all) of the patients presenting for evaluation. Ruan et al. designed the FAST to comprise of tests which had face validity as measures of spinal performance, and that were of sufficient duration to allow the subject to make choices about continuation or non-completion of the task, but were, in fact, of minimal biomechanical stress when compared to the physical demands required for participation in their usual activities of daily living [140]. For example, all able bodied persons were able to complete all aspects of the FAST during the preliminary study [140].

The FAST is a group of five time-limited self-paced tests including 2 minutes of static kneeling, stooping and squatting, a 5 minute test of repeated stooping and overhead

reaching and 5 minutes of repeated reaching and twisting while standing. The test is scored primarily in terms of completion or non-completion but the occupational therapist also records patient performance in seconds. This physical performance measure is not physically demanding and in the initial study of the FAST [140] failure to complete the test related to depression, a tendency to avoid pain and compensation status. Among a large population of chronic back pain patients, only 19.7% completed all five tests [140]. Poor performance on the FAST was associated with poorer outcome on the Sorenson Test and the PILE (140). Performance on the FAST helps the occupational therapist understand the employee's limitations, motivation, and pain behavior [141]. The FAST is a relatively safe test. It does not over exert the cardiovascular system of most people, and does not create forces across the spine which are significantly different from typical daily activities [140].

2.10 Summary

The literature indicates that chronic back pain is a leading cause of work disability and constitutes a significant socioeconomic burden worldwide. Based on the studies available (although these have been limited), South Africa has one of the highest prevalence rates for back pain in the world.

Based on these literature findings, it is evident that chronic lower back pain is a multi-dimensional pathology. For instance, back pain in South Africa is strongly correlated to comorbid depression which compounds the disability. In many instances the diagnosis of back pain, particularly in combination with a comorbid depression, results in prolonged absence from work. The longer an employee is off work, the more deconditioned and less "work-hardened" they become. The success of return to work becomes exponentially smaller the longer the employee is off work. Long term unnecessary absence from work can be detrimental in many ways, resulting in financial, physical, psychological and social losses not only within the individual's immediate context but also within the larger community.

Prolonged sickness absence can result in permanent disability, even without serious illness, as previously employed people become depressed, inactive, develop catastrophic beliefs and become fixated on their disability when timeous return to work is not actively pursued. The intrinsic importance of work in terms of providing meaning in people's lives should not be underestimated. Work is not only a means of providing an income for one's family but it also promotes status, self-worth and self-esteem in the employee.

There is good evidence showing that both the course and prognosis of chronic back pain and disability are highly influenced by many factors which are not related to clinical findings. Patients with psychological difficulties such as depression, anxiety, fear avoidance, catastrophizing, financial stressors and changes in social status are more likely to develop a chronic pain condition. Psychological factors need to be clinically managed in order to minimize the role these factors play in acting as barriers to return to work.

Whilst there is general consensus that psychological factors do play a role in progression of acute to chronic back pain, physical factors relating the specific demands of the employee's job cannot be ignored. Factors such as repetitive heavy lifting and working in awkward postures, particularly prolonged stooping and twisting are recognised risk factors for onset of lower back pain. During the FCE, the occupational therapist will evaluate the employee's dynamic material handling capacity, postural tolerance and mobility.

In good ergonomic work practice, the employee's workload should not exceed their capacities and it is the occupational therapist's duty to determine the worker's safe maximum capacity for work. Interestingly, the weight lifted from floor to waist has been found to be one of the most predictive elements of the FCE protocol in relation to return to work. Manual handling of materials is therefore clearly a crucial element of the FCE, even where the employee is performing sedentary work only. In addition to manual handling and positional tolerances, the occupational therapist will obtain an overview of the employee's level of

psychosocial functioning and the compounding effect of any comorbid psycho-emotional conditions may affect successful return to work. Examining the physical demands of the work in relation to the client's abilities are important in determining capacity for work but the literature has consistently reported that an employee's own expectations of return to work constitutes one of the most important predictors of work-disability outcomes and should be considered in the functional capacity process together with assessment of psychological and physical status. Based on the outcome of the FCE, The occupational therapist will make recommendations to manage, rehabilitate and accommodate the client, in the most effective way, as they are re-integrated back into the work place.

The literature presented in this section highlights the need for occupational therapists conducting FCEs to better understand the complex interplay between physical and psychological factors which may affect the successful outcome of return to work. This study seeks to identify the most significant psychological and physical factors which impact on work status in employees with chronic back pain.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research design and procedures used to assimilate the data used to meet the two objectives of this study:

1. To identify the extent to which the following factors were evident in the study sample of employees with chronic back pain:
    - psychological factors;
    - physical capacity (biomechanical) factors.
2. To identify which of the above factors may be predictive of work status in employees with chronic back pain.

Table 3-1 Summary of research methodology

Research Design	Quantitative, descriptive, cross sectional and multivariate correlation study.
Study Population & Sampling	Convenience sample of adults with chronic back pain who are employed or had previously been employed. The study population included all clients referred for FCEs to OTs in similar private practice settings of the researcher.
Subject Selection	Adults referred for FCE for evaluation of their chronic back pain were selected, and informed consent was obtained.

Data Gathering Instruments & Techniques	1) *Biographical information form* (completed by researcher based on information provided by participant during a structured interview). 2) *Patterns of employment* (completed by researcher based on the participant's response to structured questions). *3) Self-report questionnaires* (completed by participant)*:* • McGill Pain Questionnaire, • Tampa Scale of Kinesiophobia, • Hospital Anxiety and Depression Scale, • WHOQOL Questionnaire, • Job Demands Questionnaire. 4) *Functional Assessment Techniques* (administered by researcher): • Progressive Isoinertional Lifting Evaluation (PILE), • Functional Assessment Screening Test (FAST).
Data Analysis	Data was analysed using: STATA Statistical Software, Version 10 by the statistician of the MRC in Pretoria and the researcher using Microsoft Excel 2000. Odds ratios (OR) were derived from 2x2 tabulations. Adjusted ORs were derived from logistic regression analyses. Crude ORs were determined to run a multivariate analysis.

3.2 Study design

This study used a quantitative, descriptive, cross sectional and correlational design. The quantitative design was used as this was the best design to collect the data as the variables of interest could be assigned a numeric value that reflected the amount of that variable that could be described in the sample. Numeric quantities of one variable could then be examined in isolation or compared to those of other variables [142]. This research method was selected as it was useful in identifying whether specified variables are related in this multivariate study.

Descriptive methodology in this study explored the extent to which the psychological and physical factors were relevant to work status and which were evident within the specific sample of individuals with chronic back pain.

A correlational research method was used to examine the relationships between the various factors (or variables) in this study to determine the predictive value, if any, of the variables that were studied.

3.3 Sample

This research studied a sample of males and females between 20 and 65 years of age who suffer from chronic back pain. The sample live predominantly in the greater Johannesburg area but some also came from other regions of South Africa. The participants were referred for an FCE at the researcher's private occupational therapy practice. The sample was selected from the study population using a convenience sampling procedure. Chronic back pain sufferers referred for FCE at the researchers private practice between November 2008 and December 2009 were invited to participate in the study, if they met the inclusion criteria listed below.

The sample size was calculated by the statistician based on a power estimate. A sample of 57 adult subjects of between 20 and 60 years was required to ensure a 95% confidence interval with and accuracy of 10%.

Subjects were selected based on the following inclusion and exclusion criteria:

Inclusion criteria

- The client must have suffered from chronic back pain lasting 3 months or more.
- Clients were included only if consent had been obtained from the referral source to use the client's data for research purposes.
- Clients who were currently at work, as well as those who were no longer at work, but who had been previously employed for at least 4 hours per day were included. There was no time lapse attached to this.
- Only clients who had been evaluated by a medical specialist who had diagnosed a medical condition resulting in chronic back pain were included in the study. These participants were required to provide a medical report in support of their condition.

Exclusion Criteria

- Cognitively impaired clients were excluded as these clients would have had difficulty completing the self-report questionnaires independently.
- Clients with comorbid physical disability were excluded. For instance, if they suffered comorbid pathology affecting other areas of their body such as arthritis, amputation or uncontrolled hypertension.
- Clients with a clinically diagnosed psychiatric condition other than depression or anxiety were excluded. For instance clients diagnosed with bipolar mood disorder or schizophrenia were excluded. Symptoms of depression and/or anxiety associated

with these conditions would have been evident due to a primary mood disorder and any association with chronic back pain would have been compromised.

All chronic back pain sufferers who participated in this study had some form of compensation claim. The referrals came from a variety of sources including private companies, insurance companies as well as plaintiff and defendant attorneys acting in matters relating to the Road Accident Fund. The reasons for referral included evaluation for disability benefits, re-evaluation of chronic back pain sufferers who were in receipt of disability benefits or to assist in determining quantum in Road Accident Fund matters. Some referrals came from insurers who wanted to assist employers in making appropriate accommodations for employees who suffered chronic back pain. Thus the chronic back pain sufferers included in the study were either at work and had some level of difficulty in performing the duties of their occupation or were not at work due to limitations resulting from their chronic back pain.

3.4 Study population

The study population included all clients referred for FCEs to OTs in similar private practice stings of the researcher.

3.5 Ethical considerations

3.5.1 Ethical Clearance

The research protocol was approved by the Postgraduate Assessor Committee of the Faculty of Health Science of the University of the Witwatersrand. Ethical clearance to carry out this study was granted by the University of the Witwatersrand Ethics Committee for Research on Human Subjects (Medical) (Ethical Clearance Number: M080524/R14/49). A copy of the Ethical clearance certificate is included in Appendix A.

3.5.2 Informed consent

- **Information Sheet and Informed Consent Form**

The researcher introduced herself and the purpose of the study to each chronic back pain sufferer who met the inclusion criteria when they presented for their FCE and gave them the information sheet to read (see Appendix B). The chronic back pain sufferer was invited to participate (the principle of autonomy was thus applied). The researcher explained to the participant that the researcher did not make the final decision regarding the outcome of the validation of a disability claim or the quantum granted in the matter of a Road Accident Fund claim. It was explained to the participants that the questionnaires they were to complete were for research purposes only and the results would not be included in the FCE report. However the results of the performance based tasks (i.e. PILE and FAST) would be included in the FCE report for which they had been referred as these components reflected an inherent requirement of the FCE which needed to be fulfilled for the purpose of the referral source. Any questions the chronic back pain sufferer had were answered in full by the researcher.

Chronic back pain sufferers were informed that they could withdraw from the study at any time without consequence to themselves and that this would not affect their application for compensation in any way.

By attending an FCE performed by a qualified and experienced OT as required by insurer to determine capacity for return to work, all parties are acting in the best interest of the employee (principle of beneficence).

The safety protocol of each of the physical performance measures was strictly adhered to. The client was told that they were permitted to stop any part of the test they felt uncomfortable with at any stage. The OT is trained in the observation of non-verbal

indicators of discomfort and pain and would stop the assessment process prior to the client sustaining any injury. The principle of non-maleficence was thus applied.

If it became evident that the participant could identify severe symptoms of anxiety or depression whilst completing the questionnaires, appropriate referral to resources within their community would be made. Relevant emergency care contacts were available as well as a comprehensive first aid kit was available in the unlikely event that the client experience severe pain during the PILE or FAST testing.

If the client agreed to participate in the study, they were asked to sign the informed consent form (see Appendix C).

- **Letter of consent from referring party**

A letter was sent to each of the referring parties in order to obtain consent to use the data collected from the chronic back pain sufferers they referred for FCE in this research. Copy of the letter can be found in Appendix D.

3.5.3 Confidentiality

All aspects of data collection took place in a private assessment room. All participants had privacy while performing the FCE tasks and whilst completing questionnaires. Each assessment was performed individually and there was only one assessment being performed by the researcher at any given time.

Anonymity was assured by excluding the participant's names and contact details from all record forms and questionnaires. Participants were assigned reference numbers for use by the researcher only.

3.6 Data Collection

3.6.1 Demographic information recorded by researcher

Once the participant had agreed to participate in the study and signed consent, the researcher completed two data collection forms based on the responses to the participant's responses to structured interview questions. The demographic form used to capture the information was specifically designed for the purpose of the research.

- **Demographic form**

The demographic form was used to record demographic information, medical history, employment history and course of illness. Names of participants were omitted to ensure confidentiality. This questionnaire was developed by the researcher based on clinical experience in gathering the relevant background information required for the purpose of this study. The relevant data form can be found in Appendix E.

- **Patterns of Employment Form**

The researcher then completed the Patterns of Employment Form (See Appendix F). This questionnaire was a tool used by Baldwin, Butler, Johnson and Cote, who identified that the questions and patterns of employment were an effective means of measuring return to work outcomes of employment patterns[44]. Permission was obtained from Prof. Baldwin to use this form for the purpose of this study (See Appendix G).

Classification of patterns of employment was based on the five standard questions answered by the participant. When recording the employment classification on the Excel spread sheet, the number of each category was recorded. However when it came to the statistical analysis the patterns were grouped with a response falling in pattern 1 – 4 as "at work" and pattern 5

as “not at work.” Thus the pattern of employment recorded was thus converted into ordinal data for statistical purposes.

3.6.2 Measurement Instruments

The reasons for inclusion of each of the self-report questionnaires and performance measures are described below. Pilot study was not deemed necessary for the purpose of this study as the researcher was very familiar with each of the measurement instruments as they formed part of her daily practice in performing FCEs. The total time taken to complete a full FCE, including the full interview and testing took between 2 ½ to 3 ½ hours, depending on the complexity of the case.

3.6.2.1 Self-report questionnaires (subjective measures):

A set of five self-report questionnaires were selected to best describe the participant’s experience of the factors being researched. The self-report questionnaires were primarily used as a tool to measure psychological well-being of the participants. The questionnaires were only available in English. A decision was taken not to translate the questionnaires as this may have compromised the reliability and validity of the questionnaires. The population to be study was limited and were generally able to read and write in English. Translation of the questionnaires into all 11 languages was not warranted. If the tests were to be used cross-culturally, translation of the questionnaires would be indicated.

1. ***The McGill Pain Questionnaire (MPQ)*** was used to determine the pain rating index and gave a score for pain intensity. An affective score was also obtained from this questionnaire which contributed to the psychological component of the comparison.

2. ***The Tampa Scale of Kinesiophobia (TSK)*** was selected to obtain a score of the clients rating of fear of movement. This again forms an important component of the psychological factors considered.
3. ***The Hospital Anxiety and Depression Scale (HADS)*** was used to determine a separable measure for anxiety and depression independently which again contributed to the psychological factors considered.
4. ***The World Health Organization Quality of Life Questionnaire (WHOQOL-BREF)*** was selected as a score to determine the participant's perceived psychological health as well as their perceived physical health.
5. ***The Job Demands Questionnaire*** was completed in order to determine the classification of work into sedentary, light, medium or heavy work.

The participant was seated in a private assessment room where they were asked to complete the various questionnaires. The participant was verbally instructed on how to complete each questionnaire by the researcher. The participants were left alone to complete the questionnaires once they had confirmed that they had understood what was required of them in completing the forms. One participant was unable to grasp the meaning of the TSK, WHOQOL or McGill Pain Questionnaires and thus these tests were not completed with this participant. One further participant omitted to complete the WHOQOL and McGill Pain Questionnaire and thus the responses from these two participants could not be included in the results. All other participants were able to read and interpret the questionnaires independently without facilitation from the researcher. The battery of self-report questionnaires took in the region of 30 minutes to complete. Participants did not require a break during the completion of the questionnaires.

The psychometric properties of each of these questionnaires have been discussed in the literature review. The questionnaires were administered and were scored by the researcher according to the prescribed procedure defined by the author(s).

- **McGill Pain Questionnaire (MPQ), Appendix H**

Research has shown that individual 0 – 10 pain intensity ratings (such as the visual analogue scale) have sufficient psychometric strengths to be used in chronic pain research, especially research that involves group comparison designs with relatively large sample sizes. However, composites ratings (such as the MPQ) may be more useful when maximal reliability is necessary for instance in studies with relatively small sample sizes [143]. Considering the relatively small sample size accessible to the researcher as well as the extent of each data set per participant, the MPQ was determined to be a suitable tool for the purpose of this study.

The McGill Pain Questionnaire (MPQ) was determined to be suitable for use in this study for a number of reasons. The MPQ (Melzak 1975) [127] has been used widely in both clinical work as well as research into chronic pain because it intends to assess pain intensity as well the multidimensional aspect of pain [113]. Considering the multi-factorial nature of this study, the MPQ was thus considered well suited to the purposes of this study. In order to determine whether pain intensity was a physical factor to be considered, use was made of the McGill Pain Questionnaire.

The MPQ was used to assess pain intensity as perceived by the participant as well as the multidimensional aspect of pain. The Pain Rating Index (PRI) included 20 groups or subclasses of pain descriptions. Each section was designed to asses a different quality of pain experience. The participant was asked to place a cross next to the word which best describes their pain. If none of the words in that section describes their pain, they were required to leave that section out. These subclasses of pain descriptors were further grouped into 4 subscales designed to assess the sensory, affective, cognitive and behavioural dimensions of pain, describing the quality of pain in each category with a higher score indicating a higher pain experience in that category. The final question required the participant to rate their pain on a scale of 0 – 5 with each number corresponding to a word

describing pain intensity. This scale was used to describe Present Pain Intensity (PPI). The MPQ also provides the outline of a body in which the participant is able to visually depict their areas of pain. This component of the questionnaire was not used for the purpose of this research. The questionnaire took approximately 5 minutes to complete.

- **Tampa Scale of Kinesiophobia (TSK), Appendix I.**

The TSK was used to measure fear of movement or (re)injury in chronic pain patients. The questionnaire consisted of 17 items scored on a 4-point scale assessed the subjective rating of kinesiophobia. Each item had a 4-point likert scale with scoring alternatives ranging from "strongly disagree" to "strongly agree". A lower score indicated less fear of movement and a high score suggested an increased fear of movement. The questionnaire took approximately 5 minutes to complete.

- **Hospital Anxiety and Depression Scale (HADS), Appendix J.**

The HADS was used to identify possible occurrence of anxiety disorders and depression among participants who had a diagnosis of a medical condition, which was of a physical nature. It was a brief assessment of anxiety and depression, consisting of 14 items divided into two sub-scales, one for anxiety and one for depression. The participant rated each item on a 4-point scale. A score of higher than 8, on either the anxiety or depression subscales, indicated the possibility of a positive diagnosis for one or both of these psychological problems. The questionnaire took approximately 5 minutes to complete.

- **World Health Organization Quality of Life assessment instrument (WHOQOL-BREF), Appendix K.**

This quality of Life assessment was used to establish the participant's perceptions of four domains of life. The questionnaire had 26 questions. Each question was rated on a 5-point scale. The four domains were physical health, psychological health, social relationships and

the physical environment in which they lived. A raw score was calculated for each domain. The raw score was then converted into a transformed score out of 100. This questionnaire took approximately 10 minutes to complete. A score for each domain was determined. The facets incorporated within each of these domains can be found in Appendix L.

- **Job Demands Questionnaire, Appendix M.**

The Job Demands Questionnaire comprised 12 questions relating to the physical nature of the employee's work. The participant was asked to identify how often they performed the action in question (e.g. kneeling, squatting, lifting etc.) A rating of "not at all", "rarely", "occasionally", "frequently" or "constantly" was determined by the participant for each physical aspect. The participant was also asked to rate their job as sedentary, light, medium, heavy or very heavy. The questionnaire took approximately 2 – 3 minutes to complete. The completion of the Job Demands Questionnaire enabled the researcher to classify the physical demands of the participant's job into categories of sedentary, light, medium, heavy and very heavy work. The physical demands (sedentary, light, medium, heavy or very heavy) of the work were classified as per the classification criteria in the Dictionary of Occupational Titles (DOT).

The classification of occupational class was also determined from the Job Demands Questionnaire completed by the participant. Jobs were classified into one of the following categories; professional, semi-professional, manager, routine non-manual worker, manual worker.

The self-report questionnaires are an important aspect of this study as they determined the employee's perception of the effect their back pain has on their daily functioning. It is however important, as recommended by Reneman[43], that both a performance measure and self-report questionnaire(s) be used to obtain a more comprehensive picture of the employee with chronic back pain.

3.6.2.2 Performance based assessment tasks (objective measures)

Once the questionnaires had been completed, participants completed two physical performance based assessment protocols.

The Progressive Isoinertional Lifting Task (PILE) was conducted first, followed by the Functional Activities Screening Test (FAST). The lifting tasks (PILE protocol) as well as the dynamic and static positioning tasks (FAST protocol) were conducted and scored by the researcher as part of the FCE for which the participant had been referred.

The protocols were administered by the researcher as per the prescribed requirements of the respective evaluations:

- **Progressive Isoinertional Lifting Task (PILE) Appendix N**

Isoinertional lifting tests consisted of progressive dynamic lifting at a steady speed. The test closely imitated lifting movements used in daily home life and in work situations [133].

This test comprised of two types of lifting. The first was lifting a weight in a crate from floor to waist height. The second was lifting from waist to crown height. See appendix N for the full protocol for this evaluation.

Prior to commencement of the lifting tasks, the participant's blood pressure was taken and they were fitted with a heart rate monitor. These procedures formed part of the safety protocol. No participants were excluded due to high blood pressure and all testing was conducted within the recommended safe heart rate.

The participant was provided with demonstration of the requirements of the task, with emphasis on the correct body mechanics for appropriate lifting. The participant's safety was

of primary concern during the performance of these lifting tasks. As the PILE was a phsychophysical evaluation, the participant indicated when they had reached their maximum performance. If it was determined that the participant was no longer safe to continue with the task, the exercise was terminated by the occupational therapist.

Floor to waist lift - a weight was placed in a plastic milk type crate on the floor. A 4kg weight was placed in the crate for men and 2.25kg was placed in the crate for women for the first set of 4 lifts. The participant was required to lift the crate from the floor and place it on a shelf 75cm high from the floor. Placing the crate on a shelf at this height approximately brought the hands (which were placed on the handles of the crate) to waist height. The participant then lifted the weighted crate from the shelf and placed it back on the floor. Participants performed 4 lifts of the same weight from floor to waist within 20 seconds [135]. If the participant met the safety requirements and agreed to continue with further testing, an additional 4.5kg (for men) or 2.25kg (for women) was then added to the crate. The floor to waist lift was again repeated four times with the increased weight. Additional weights were added to the crate in increments of 4.5kg or 2.25kg respectively for men and women until the participant determined maximum capacity or the occupational therapists observations of criterion for safe maximum performance were reached.

The measured outcome was the weight (in kilograms) the participant successfully and safely lifted for four repeats during the final lift. After each set of lifts, observations related to body mechanics and heart rate was recorded. A new series of lifting, with the relevant increase in weight began once the heart rate had recovered to an acceptable level.

Once maximum safe lifting had been reached on the floor to waist lift the task was terminated and the crate emptied of weights. Demonstration was then provided for the second type of lift.

Waist to crown lift - the weighted crate was lifted from waist to crown height (0.75m – 1.37m). Using the PILE protocol criteria, this height of the shelves was not adjusted according to the height of the individual. The participant was required to lift the weighted crate from a shelf fastened to the wall at a height of 0.75m from the floor, to a shelf at a height of 1.37m from the floor. The shelves were positioned one above the other, securely fastened to the wall. Lifting the crate and placing it on a shelf at a height of 1.37m brought the hands on the handles to approximately crown height (i.e. the base of the crate was not lifted to crown height but the hands on the handles were at approximately crown height when the crate is placed on the shelf). The first set of lifts was started with the crate loaded with a 4.5kg weight for men and 2.25kg for women. Four lifts were conducted within 20 seconds. The same criteria for safe maximum performance were determined as per above.

Many participants with back pain are afraid of lifting because they have experienced worsening of symptoms during similar lifting situations. Participants were able to self-select their maximal effort and discontinue the PILE test at any time. As a standard instruction, the participants were told to discontinue the test if they had an increase in pain. By doing this, the participant's safety was allowed for. Participants were advised they may experience some muscular discomfort in the day or two following the evaluation as a result of the unfamiliar exercise.

The specific weight lifted in both the waist to floor and waist to crown lifts was recorded on the record form (see Appendix O). For analysis purposes the weight lifted were categorised. The male and female pparticipants were separated and each were scored according to three categories; those who were able to lift between 0 and 9kg (light), those who were able to lift between 9 and 22kg (medium) and those who managed more than 22kg (heavy).

Table 3-2 Definition of categories of weight lifted.

Category	Weight lifted
Light	0 – 9kg
Medium	9 – 22kg
Heavy	>22kg

These categories were determined based on the definitions of physical demands strength rating as indicated by the DOT[144]**.** The definitions of physical demand of work were adapted slightly for the purposes of this study in that the sedentary and light physical categories were grouped together for scoring purposes.

- **Functional Activities Screening Test (FAST), Appendix P**

Once the PILE had been completed, the FAST was administered. The Functional Activities Screening Test (FAST) was a simple, brief test of functional performance. The FAST was a group of 5 time-limited, self-paced tests. The tasks included 5 minutes of repeated stooping and 5 minutes of repetitive twisting. These dynamic standing activities were followed by 2 minutes each of static kneeling, squatting and stooping [140]. The FAST was designed to reflect performance on low effort tasks typical of most work and daily activity [140,142,143].

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For each test, a stopwatch recorded the time from the moment the participant correctly assumed the position and the test was considered complete when the participant requested to stop or after the full 5 minutes or 2 minutes had passed, depending on the test. A test score of 0 was recorded if the participant attempted but was unable to perform the test position. If the participant was able to perform the test position the test score comprised the time in minutes and seconds and was recorded as such. The time was recorded on the record sheet (see Appendix Q). The measurement on the FAST was recorded in time only. For analysis purposes the scores of the static positioning tasks of sustained stoop, kneel and

squat were translated from an actual time to falling into one of four categories. These categories being unable to assume the position, able to hold the position for less than 20 seconds and able to hold the position for 20 seconds but less than 2 minutes and finally being able to hold the position for the full 2 minutes. For the alternating stoop and twist task the same categories were used except the maximum time to hold the position was 5 minutes.

This study was conducted as part of the researchers daily work practice and thus information in addition to that described above was required for the compilation of the FCE report. The duration of the full assessment varied depending on the complexity of the participant's personal, vocational and medical history. On average a full assessment was completed within 2 ½ to 3 hours. The completion of the various self-report questionnaires extended the evaluation time by approximately 20 – 30 minutes.

3.7 DATA ANALYSIS

All data were captured onto an Excel spread sheet, descriptive statistics were use to describe the sample. Means and percentages were calculated for all the participant variables of age, gender, level of education, occupational class, physical demand of work and work status.

Prof. PJ Becker from the Medical Research Council (MRC) of South Africa in the Pretoria Office assisted in the analysis of the independent and dependant variables using STATA Statistical Software, version 10. All statistical analyses and testing were done at the 0.05 level of significance. The results of the subjective and objective tests were analysed using odds ratios (ORs) and confidence intervals (CI). The ORs were calculated for the FAST, PILE and HADS to describe the magnitude of the influence on each of the factors which were considered in the participant's work status. The crude odds ratios were derived from 2

X 2 tabulations. The risk factors were then identified and assessed for the significance of each factor risk as a result of the adjusted odds ratios (OR) which were derived from logistic regression analyses. The CI described the precision of the estimated risk each variable has on work status. To control for confounding factors initially, all the observed risk factors for FAST, PILE and HADS were included in the logistic regression analysis.

To determine the statistical significance of the scales of the pain rating index of the McGill Pain Questionnaire, TSK and the WHOQOL BREF, Welch's test was preferred as the output deals with unequal variances as was the case with these three self-report questionnaires. Significant differences between sets of ratio data were thus evaluated using Welch's t-test. The 2x2 tables to determine odd ratios could not be used in the instance of these questionnaires due to the nature of the raw data obtained from these questionnaires. A p-value was obtained for each questionnaire which could be used to compare the data on an equivocal basis.

Again the 95% level of confidence ($p<0.05$) was applied to the Welch's t-test results as the minimum to interpret significant differences among the sets of data. In the statistical analyses, testing was done at the 0.05 level of significance. Where appropriate and where the data were of an ordinal nature, standard descriptive statistics (means and standard deviations) were employed.

Once the logistic regression on all independent variables, both subjective (client self-report questionnaires) and objective (results of PILE and FAST) had been determined, categories were condensed and a multivariate model was built. Those variables with the most significant p-values were used to build the multivariate model. The multivariate approach was used to build a model to identify risk factors which were significant in those participants who were not at work. Multivariate analysis was used to adjust for possible confounders because, by using a multivariate approach, it was possible to ensure that the data analysis

was not adversely affected by any extraneous variable which may have correlated (positively or negatively) with both the dependent and the independent variables. This methodology was used to control for confounding factors to avoid a false positive (Type I) error which may have led to an incorrect conclusion that the dependent variables were in a causal relationship with the independent variable. Every effort was taken to limit confounding and thus avoid threat to the validity of inferences made about cause and effect. The internal validity of the study was thus ensured with the use of multivariate analysis and the observed effects can thus be attributed to the independent variable rather than the confounder. Building a multivariate model was preferable to using a univariate model on it's own (i.e. logistic regression) as it examined the significance of each factor in the company of the other factors.

In order to compare certain variables with the similar findings in the literature, analysis of the certain of the variables was conducted as secondary outcome findings. Pearsons Correlation coefficient was used to examine the correlation between the HADS and the TSK. Weight lifted from floor to waist was correlated to the depression scale of the HADS as well as to the TSK. Pearsons correlation coefficient was again used for this purpose.

3.8 Conclusion

This chapter has outlined the design and methods used to gather and analyse the data. The results will be described following chapter.

CHAPTER 4: RESULTS

4.1 Introduction

This chapter records the results of the study which aimed to identify the factors which may be predictive of the work status in persons with chronic back pain who are referred to occupational therapists for FCE associated with compensation.

The results have been reported in three sections. Firstly the demographics of the sample that participated in the study have been described. Secondly the chapter reports on the socio-demographic, psychological and physical factors identified within the sample. Finally the factors which are predictive of work status in the sample have been described.

4.1.1 Demographic information of sample

The study sample size consisted of 57 participants which was the exact number calculated by the statistician to ensure a 95% confidence interval with an accuracy of 10% when calculating the odds ratios. The sample included 32 (56%) males and 25 (44 %) females and the mean age of the subjects was $\bar{x}$ = 42.1 years in the age range 22 – 64 years. The medical information, employment and income data pertinent to this sample is presented in the two tables below:

Table 4-1 Medical information of the sample

	N	Percentage of sample
Region of back pain		
Whole spine	18	32%
Low back pain	27	47%
Neck	10	18%
Thoracic	2	4%
Surgery		
Yes	23	40%
No	34	60%
Rehabilitation		
Yes	37	65%
No	20	35%

Table 4-2 Employment and remuneration

Work status		
Total participants at work	34	58%
Total participants not at work	23	42%
Females at work	15	60%
Females not at work	10	40%
Males at work	19	59%
Males not at work	13	41%
Income		
Yes	53	93%
No	4	7%

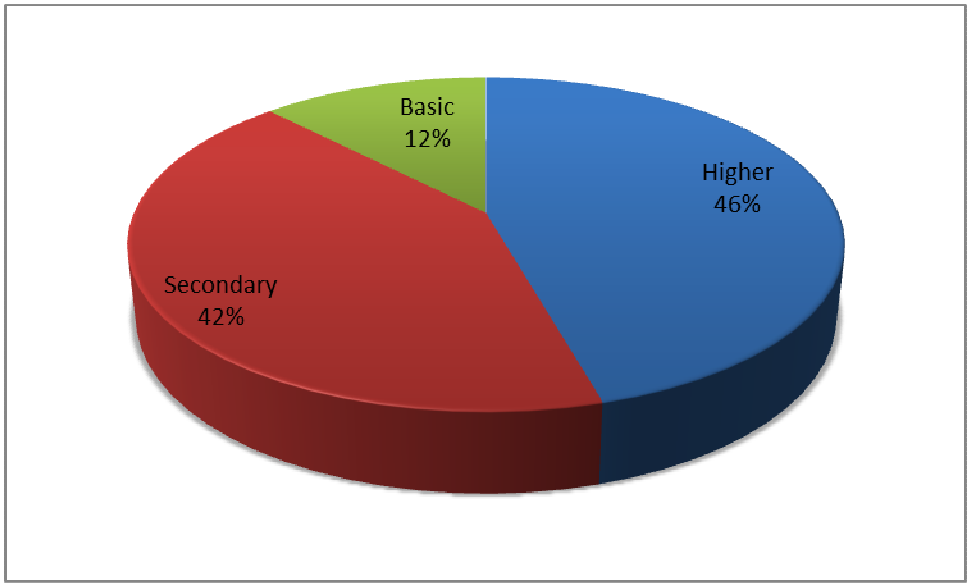


Figure 4-1 Level of education of participants.

Figure 4.1 indicates that at the time of the study 46% of the sample had completed some level of post school studies and 12 % had only primary school education.

(Basic = primary school unfinished and finished; Secondary = high school finished; Higher = post school qualification, diploma or bachelor's degree from university).

4.1.2 Patterns of employment and characteristics of work

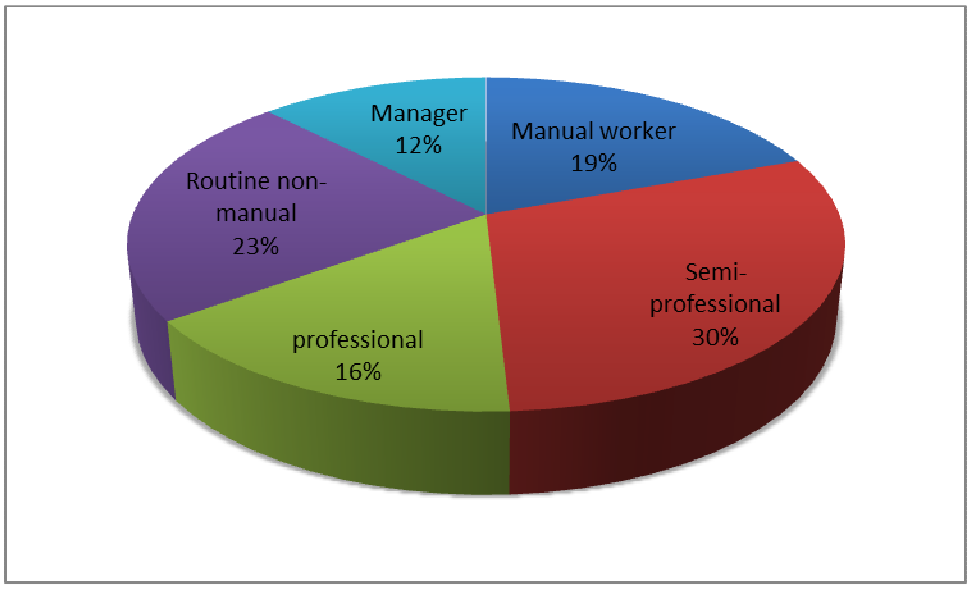


Figure 4-2 Classification of occupations of the participants

Figure 4.2 shows that 30% of the sample had jobs that were classified as semi-professional, 23% were routine non-manual, 16% were professional and 12% performed a managerial role. Of the sample 19% were manual workers.

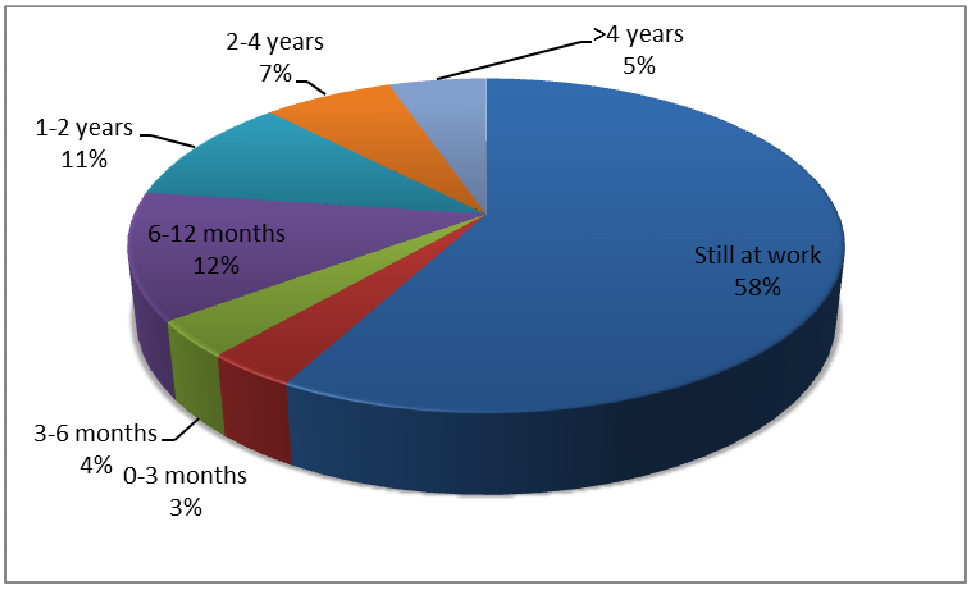


Figure 4-3 Time since last at work

Figure 4.3 indicates that at the time of the data collection most of the sample was still at work (58%) whilst the remaining sample had not been at work for anything between 3 months and 4 years due to chronic back pain. The mean time off work was 6-12 months.

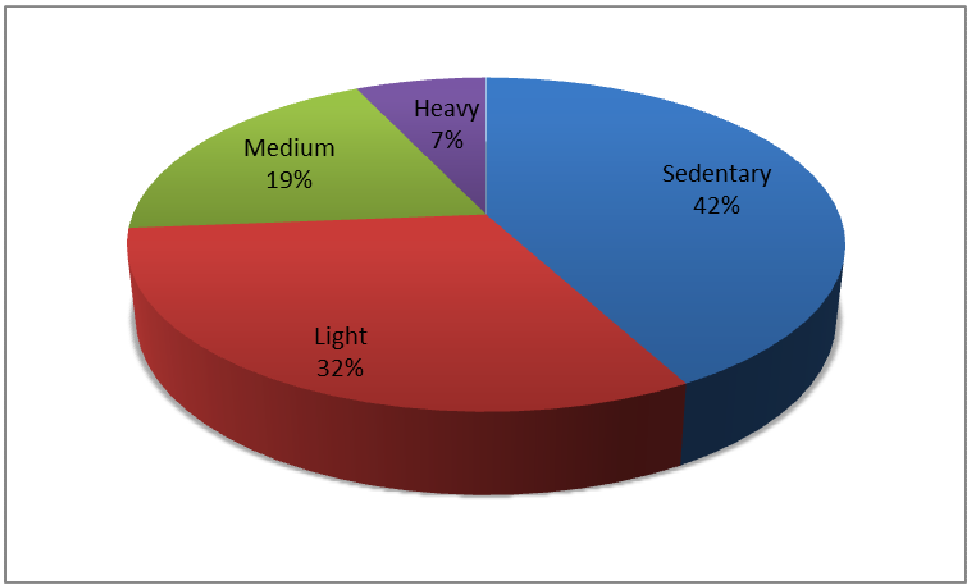


Figure 4-4 Physical demands of premorbid work of the participants

Of the total sample, 42% of the participants reported that whilst employed, the work they participated in was of a sedentary nature, while 32% reported light physical work. A total of 19% reported doing medium work as per the U.S. classification of physical work demands. The smallest percentages of participants were involved in heavy work (7%).

4.2 Description of the factors based on the self-report questionnaires

These factors were identified in the sample by each participant completing a self-report questionnaire.

Table 4-3 Results of McGill Pain questionnaire

Questionnaire	Index	Scale	Mean for this sample	Sd.	CI
McGill Pain Questionnaire	Sensory	0 – 42	21.05	8.31	18.9 - 23.3
	Affective	0 – 14	5.03	3.98	3.9 – 6.0
	Evaluative	0 – 5	3.52	1.65	3.1 - 4.0
	Miscellaneous	0 – 17	6.52	4.25	5.4 - 7.6
	PRI	0 – 78	36.12	14.97	32.2 - 40.1
	PPI	0 – 5	3.30	1.01	3.04 - 3.6

When compared to the mean scores for people with chronic back pain provided by Melzack(126), this sample presented with higher scores in sensory and affective self-evaluation of pain but evaluative and miscellaneous scores were very similar to the mean. Melzack suggests a mean Pain Rating Index (PRI) score of 31.6 and this sample presented with a PRI of 36.1. Overall, this sample rated their pain as slightly higher than the mean. Melzack reported a mean Present Pain Intensity (PPI) score of 2.6 in a sample of back pain sufferers. The PPI score in this sample was higher at 3.30.

Table 4-4 Results of TSK

Questionnaire	Scale	Mean	Sd.	CI
TSK	17-68	48.59	8.26	46.4 - 50.8

This sample presented with a high mean TSK score of 48.59 which suggested a high level of pain related fear of movement.

Table 4-5 Results of HADS

Questionnaire	Index	Scale	Mean	Sd.	CI
HADS	Anxiety	0-16	11.80	4.45	10.7 - 13.0
	Depression	0-16	8.69	4.28	7.5 - 9.8

On the HADS, the sample presented with a mean anxiety index score which was higher than the depression index score. The cut off for clinical indication of possible anxiety or depression is 8. Both the anxiety and depression mean scores indicate that the mean respondent in this study had clinical symptoms of anxiety and/or depression.

Table 4-6 Results of WHOQOL-BREF

Questionnaire	Index	Scale	Mean	Sd.	CI
WHOQOL -BREF	Domain 1 Physical	0 – 100	36.70	17.73	32.0 - 41.3
	Domain 2 Psychological	0 – 100	46.45	20.11	41.1 - 51.8
	Domain 3 Social	0 – 100	49.58	24.38	43.1 - 56.0
	Domain 4 Environmental	0 – 100	51.27	21.06	45.7 - 56.8

Domain scores were scaled in a positive direction (i.e. higher scores denoted higher quality of life). The mean scores on this questionnaire suggest that participant's perception of quality of life in the physical domain was least satisfactory. Perceived quality of life as noted in the psychological domain was the second least satisfactory area. Participants perceived their social and environmental domains respectively to be the most satisfactory.

4.3 Results of performance based assessment techniques

Blood pressure and heart rate measurements were taken as per the protocol of the PILE. These procedures formed part of the safety protocol. No participants were excluded due to elevated blood pressure. No participants exceeded safe maximum heart rate during participation of the lifting tasks.

4.3.1 Results of floor to waist lift (PILE)

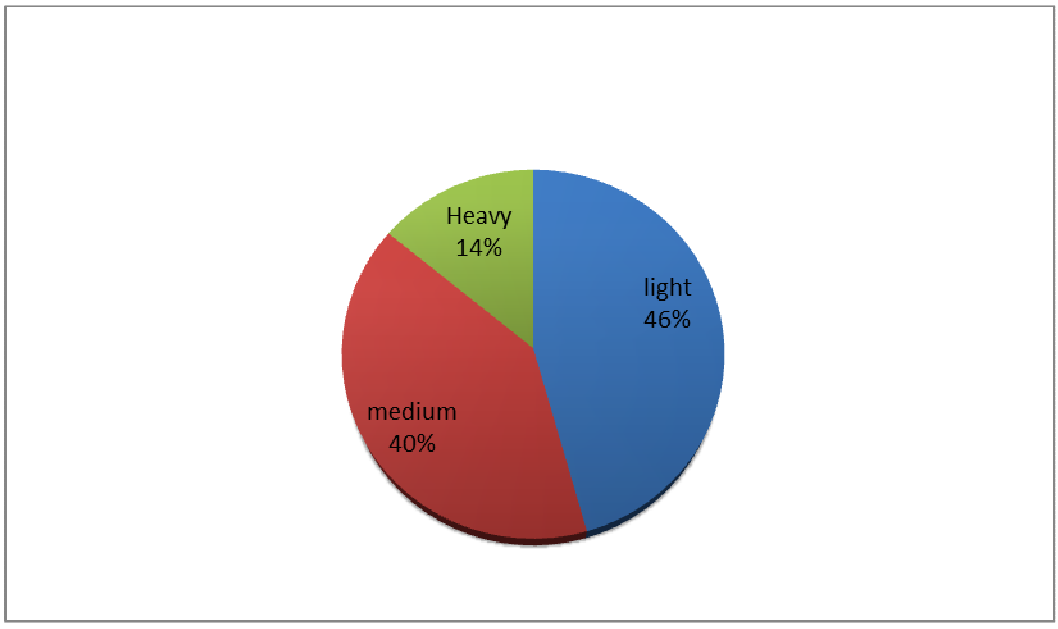


Figure 4-5 Percentage of categories of weight lifted from floor to waist for all participants

Figure 4.5 describes that 46% of participants were able to lift a light weight (0 – 9kg) from the floor to the shelf placed at waist height, 40% were able to lift a medium weight (9kg – 22kg) and only 14% were able to lift a heavy weight (>22kg) from floor to waist.

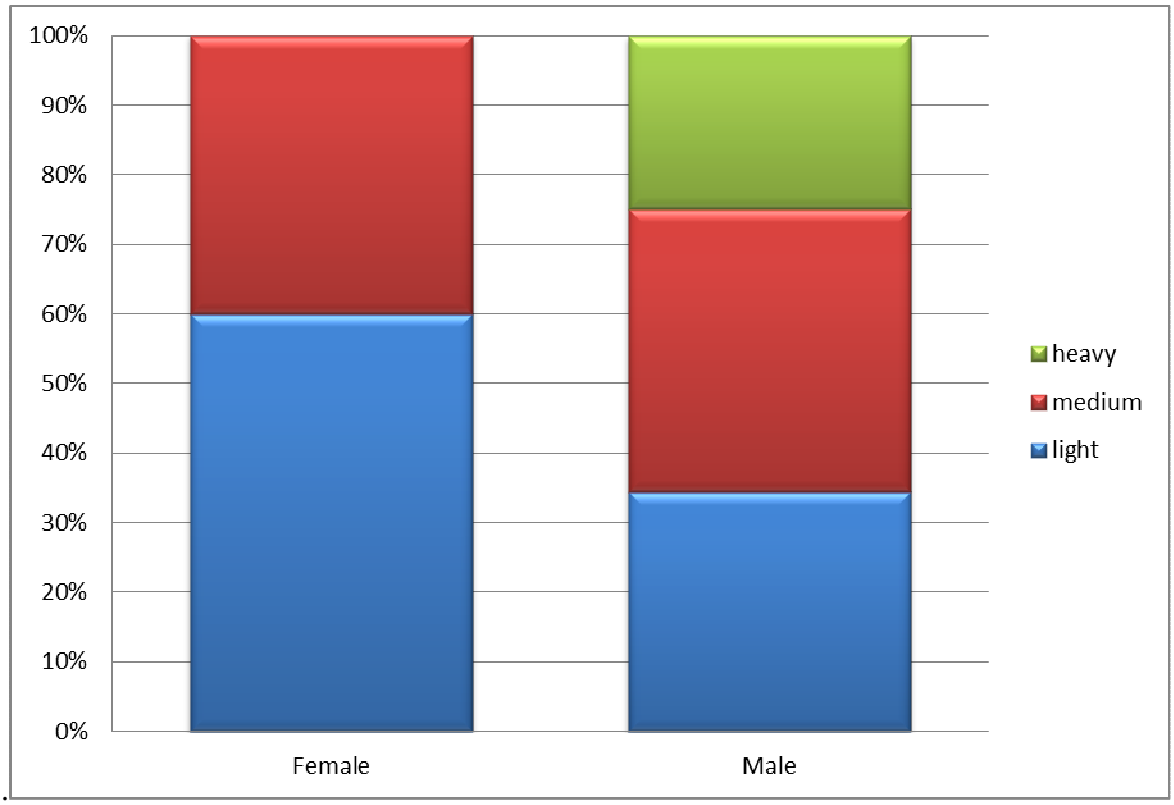


Figure 4-6 Comparison between weight lifted from floor to waist between males and females

Of females, 60% were able to lift no more than a light weight (0 – 9kg) compared to 34% of males. Lifting a medium weight (9 – 22kg) was very similar between males and females with 41% of males and 40% of females being able to lift a medium weight. It should be noted that participants who were able to lift a medium weight were, by definition, also be able to lift a light weight. Of the males, 25% were able to lift a heavy weight (> 22kg) but no females were able to lift weight in this category. Soer et al. found that the normative value for material handling of low lifting in the sedentary DOT classification for a normal population (Dutch) was 36kg[146]. Reneman et al. found a mean lifting capacity of 29.5kg from floor to waist in a sample with chronic lower back pain[43]. This sample was thus able to lift less weight from floor to waist than the expected norm for the general population but was also able to lift less than that which was found in a sample with chronic back pain.

4.3.2 Analysis of waist to crown lift (PILE)

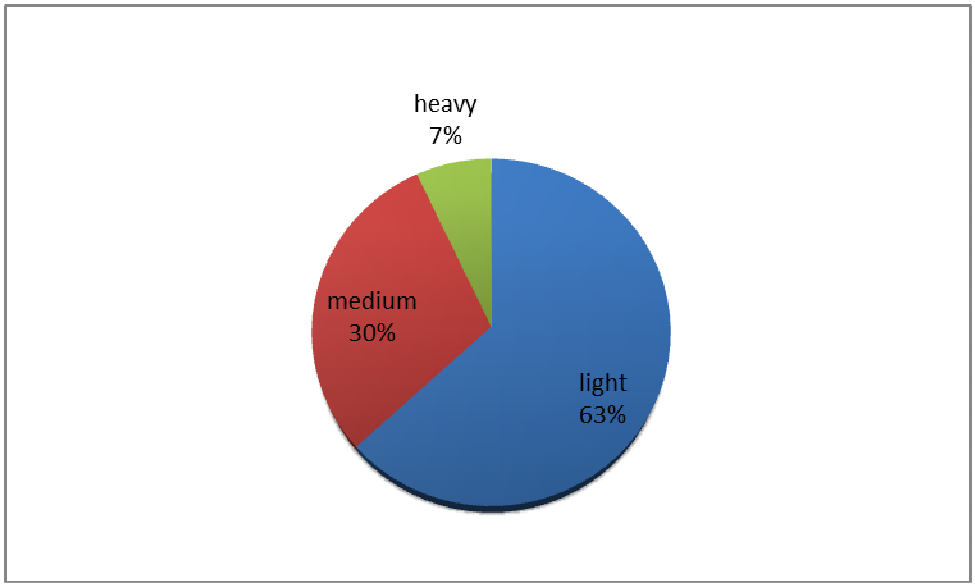


Figure 4-7 Percentage of categories of weight lifted from waist to crown all participants

Figure 4.7 shows that only 7% of the participants were able to lift a heavy weight (>22kg) from waist to crown. Most were able to lift a light weight (0 – 9kg) from waist to crown (63%) and 30% were able to lift a medium weight (9 – 22kg). Soer et al. found that the mean weight lifted in a high lift in a sample of sedentary workers was 16kg[146]. In a sample of chronic low back pain sufferers, Reneman et al. found a mean weight lifted of 16.1 kg in an overhead lift[41]. The results of this current study show that 63% of the sample were not able to lift more than 9kg from waist to crown and thus their lifting capacity falls below the norm suggested by Soer et al. and Reneman et al.[41,146]

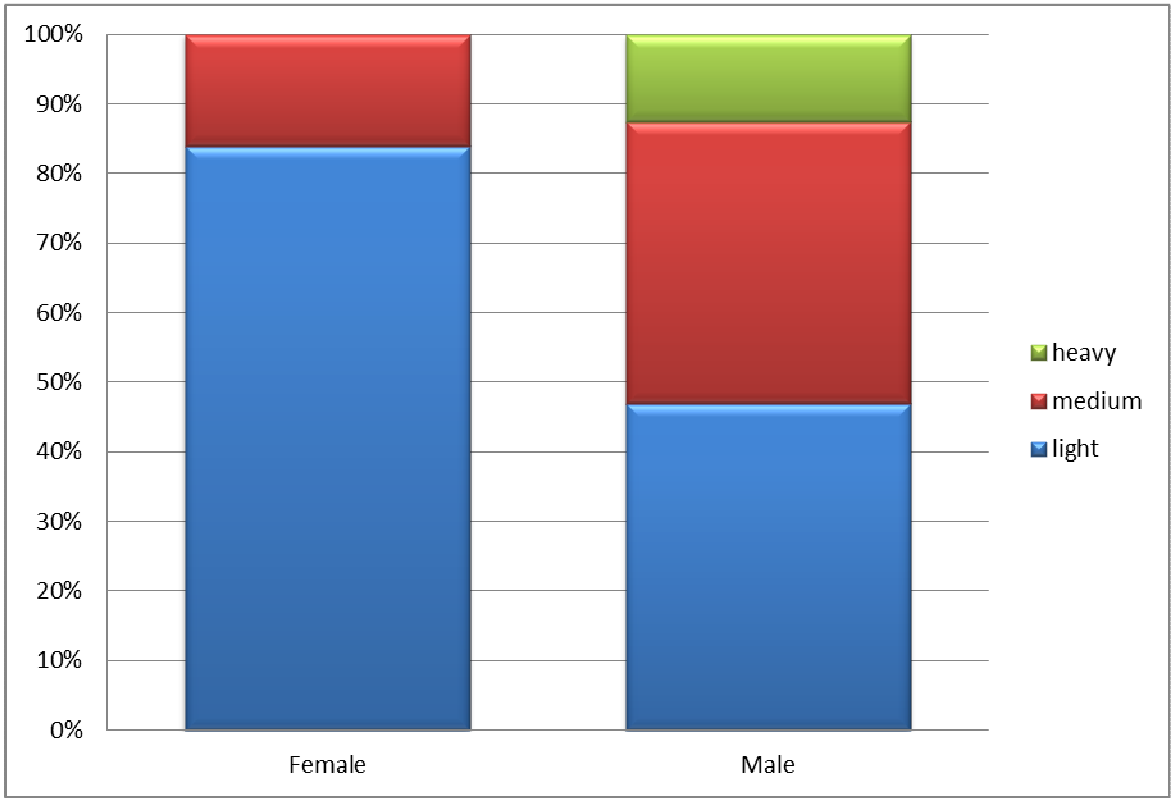


Figure 4-8 Comparison between weight lifted from waist to crown between males and females

No females were able to lift weight falling within the heavy classification while 12% of males were able to lift a heavy weight from waist to crown. More males were able to lift a medium weight (41%) than females (16%). Of the female participants, 84% demonstrated lifting capacity for light weight from waist to crown while 47% of males demonstrated light lift capacity.

4.3.3 Results of static and dynamic posturing (FAST)

Table 4-7 Summary of results of FAST for all participants in the sample

Completion status of 5 FAST components					
Test	**Alternating Stoop**	**Twist**	**Kneel**	**Static Stoop**	**Squat**
Normal range	*5 min*	*5 min*	*2 min*	*2 min*	*2 min*
Completed test	15 (26.3%)	23 (40.3%)	35 (61.4%)	26 (45.6%)	21 (36.8%)
Mean performance	05:00	05:00	02:00	02:00	02:00
Attempted	34 (59.6%)	28 (49.1%)	16 (28.0%)	21 (36.8%)	22 (38.6%)
Mean performance	1:46	01:49	01:04	00:57	01:04
Did not start	8 (14%)	6 (10.5%)	6 (10.5%)	10 (17.5%)	14 (24.5%)
Mean performance	00:00	00:00	00:00	00:00	00:00

Table 4-3 shows that 61.4% of participants completed the kneeling test but only 26.3% were able to complete the alternating stoop test. The squat test presented as a significant difficulty for participants with 63.2% being unable to complete this test (i.e. participants did not start the test or attempted the test but did not complete the full 2 minutes). Although the participants coped slightly better on the twist and static stoop test, only 40.3% and 45.6% completed these two tasks respectively.

4.4 Correlations between self-report questionnaires work status

Table 4-8 Pain Rating Index (McGill Pain Questionnaire) vs. work status using Welch t-test

Group	Participants	Mean	Std. err	Std. Dev.	95% Confidence Interval
At work	34	33.2	2.7	16.0	27.6 – 38.8
Not at work	21	40.9	2.6	11.9	35.5 – 46.3
Combined	55	36.1	2.0	15.0	32.1 – 40.2
Difference		-7.7	3.7		-15.3 - -0.13

P-value: 0.046

Analysis showed a moderate positive correlation between work status and Pain Rating Index of the McGill Pain Questionnaire as reflected by the p-value of 0.046. This suggested that participants in this study who rated their present pain index (PPI) higher were less likely to be at work.

Table 4-9 TSK vs. work status using Welch t-test

Group	Participants	Mean	Std. err	Std. Dev.	95% Confidence Interval
At work	34	47.9	1.4	8.2	45.0 - 50.7
Not at work	22	49.7	1.8	8.4	45.6 - 53.4
Combined	56	48.6	1.1	8.3	46.37 – 50.8
Difference		-1.8	2.28		-6.3 – 2.8

P-value: 0.43

There was no significant correlation between the TSK and work status using the Welch t-test. Although this sample had a high mean TSK score which indicates a high level of kinesiophobia, this fear of movement was not a significant determinant of work status.

Table 4-10 HADS vs. work status

	At work	Not at work	Total
Depression Scale (HADS)			
No risk of depression (score 0-8)	26 76.47%	11 47.83%	37 64.91%
Risk of depression (score 9-16)	8 23.53%	12 52.17%	20 35.09%
Total	34	23	57
Fisher's exact (P value)	0.046		
1-sided Fisher's exact	0.026		
Anxiety Scale (HADS)			
No risk of anxiety (score 0-8)	16 47.06	10 43.48%	26 45.16%
Risk of anxiety (score 9-16)	18 52.94%	13 56.52%	31 54.39%
Total	34	23	57
Fisher's exact (P value)	1.000		
1-sided Fisher's exact	0.503		

A significant correlation (with a significant p-value being 0.05 or less) between the risk of depression and work status was shown. This was demonstrated in the above table with the p-value of 0.046 in the correlation between depression and work status. Participants with a higher depression score were less likely to be at work. Conversely, there was no significant correlation between a risk of anxiety and work status. A p-value of 1 was found on the correlation between anxiety and work status in this sample which indicated anxiety was not a significant indicator for determining work status.

Table 4-11 WHOQOL-BREF Domain 1 (physical) vs. work status using Welch t-test

Group	Participants	Mean	Std. err	Std. Dev.	95% Confidence Interval
WHOQOL-BREF Domain 1 (physical)					
At work	33	42.7	3.0	17.4	36.6 – 48.9
Not at work	22	27.7	3.0	14.4	21.3 – 34.0
Combined	55	36.7	2.3	17.7	31.9 – 41.6
Difference		15.0	4.3		6.4 – 23.7

P-value: 0.001

Table 4-12 WHOQOL-BREF Domain 2 (psychological) vs. work status using Welch t-test

Group	Participants	Mean	Std. err	Std. Dev.	95% Confidence Interval
WHOQOL-BREF Domain 2 (psychological)					
At work	33	51.6	3.4	19.3	44.7 – 58.4
Not at work	22	36.6	4.2	19.9	27.8 – 45.4
Combined	55	45.6	2.7	20.7	40.0 – 51.2
Difference		14.9	5.4		4.1 – 25.8

P-value: 0.0081

Table 4-13 WHOQOL-BREF Domain 3 (social) vs. work status using Welch t-test

Group	Participants	Mean	Std. err	Std. Dev.	95% Confidence Interval
WHOQOL-BREF Domain 3 (social)					
At work	33	53.0	4.3	24.7	44.2 – 61.8
Not at work	22	44.4	5.0	23.3	34.1 – 54.8
Combined	55	49.6	3.3	24.4	43.0 – 56.2
Difference		8.6	6.6		-4.6 – 21.7

P-value: 0.1969

Table 4-14 WHOQOL-BREF Domain 4 (environmental) vs. work status using Welch t-test

Group	Participants	Mean	Std. err	Std. Dev.	95% Confidence Interval
WHOQOL-BREF Domain 4 (environmental)					
At work	33	54.8	3.0	17.1	48.8 – 60.9
Not at work	22	45.9	5.4	25.4	34.7 – 57.2
Combined	55	51.2	2.8	21.1	45.6 – 57.0
Difference		8.7	6.2		-3.7 – 21.4

P-value: 0.1608

A significant correlation between the participants' perception of their quality of life relative to their physical status and their work status was found ($p = 0.001$). Similarly, perceived quality of life with respect to psychological status was correlated to work status. Participants in this sample who perceived themselves to have poor quality of life due to their physical and / or psychological status were less likely to be at work. Conversely there was weak correlation between social and environmental domains and work status as measured by the WHOQOL-BREF.

4.5 Correlations between functional assessments and work status

4.5.1 Work status in relation to floor to waist lifting capacity

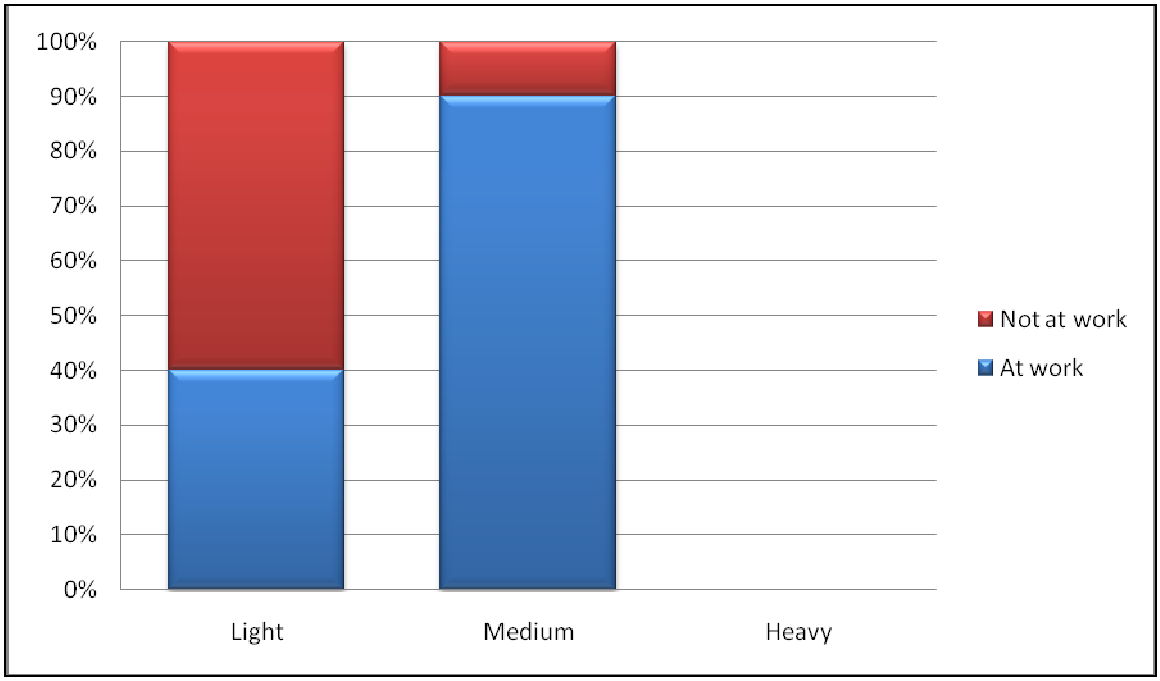


Figure 4-9 Female floor to waist lifting capacity in relation to work status

Females who were able to lift a medium weight from floor to waist were more likely to be at work than those who were able to lift a light weight only.

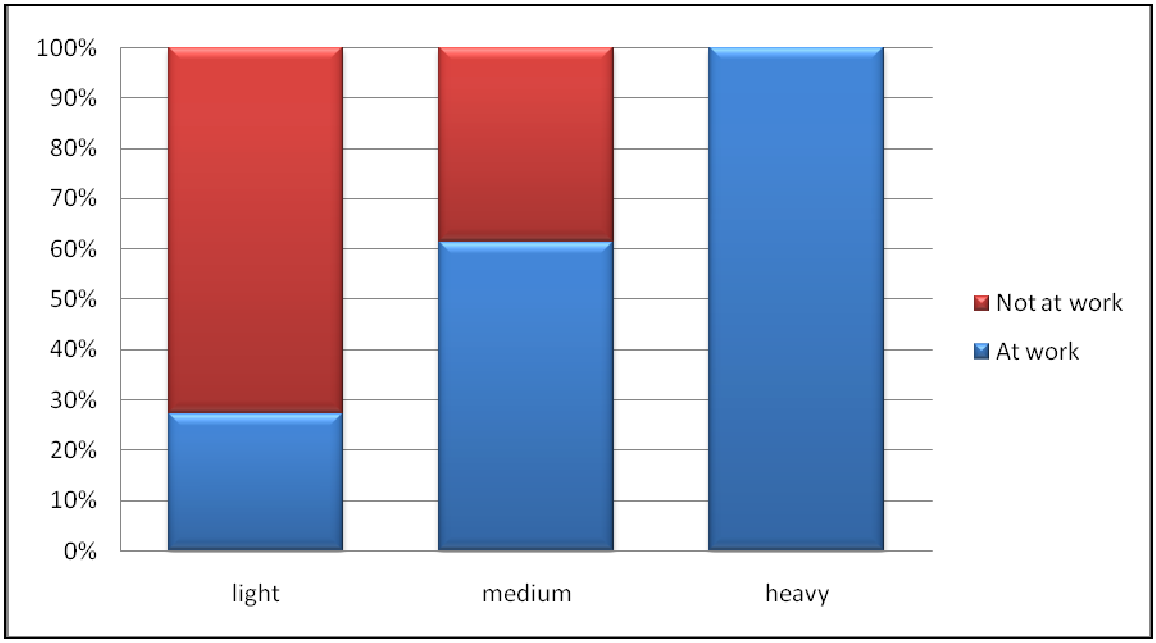


Figure 4-10 Male lifting floor to waist capacity in relation to work status

This graph illustrates the relationship between progressively increasing ability to lift weight from floor to waist corresponds with increasing likelihood of 'at work' status. All of the males who were able to lift a heavy weight were at work. Of those who were able to lift a medium weight, 62% were at work. Of the males who were able to lift a light weight only, 27% were at work.

Table 4-15 PILE vs. work status OR table (male and female)

	At work	Not at work	Total
Floor to waist lift (PILE)			
>22kg	23 67.65%	5 21.74%	28 49.12%
9-22kg	7 20.59%	8 34.78%	15 26.32%
<=9kg	4 11.76%	10 43.48%	14 24.56%
Total	34 100%	23 100%	57 100%
Fisher's exact (P value)	0.002		
Waist to Crown lift (PILE)			
>22kg	8 23.53%	1 4.35%	9 15.79%
9-22kg	16 47.06%	10 43.38%	26 45.61%
<=9kg	10 29.41%	12 52.17%	22 38.60%
Total	34 100%	23 100%	57 100%
Fisher's exact (P value)	0.083		

With the combined male and female data, it was evident that lifting from floor to waist had a significant correlation to work status (p=0.002) whilst waist to crown lifting had a weak correlation to work status (p=0.083).

4.5.2 Physical demands of work versus lifting capacity

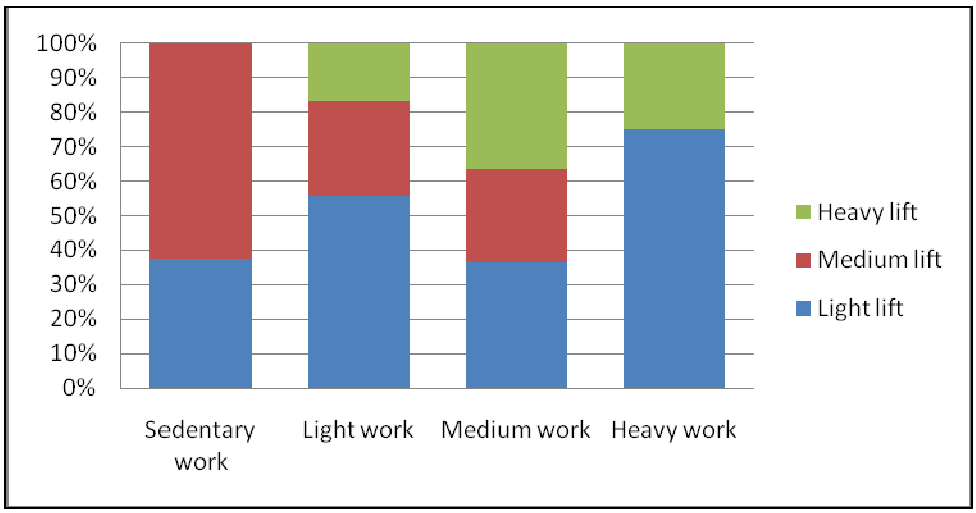


Figure 4-11 Comparison between floor to waist lifting capacities of participants classified by physical demands of work

The majority of participants who were employed in sedentary work were able to lift weight from floor to waist consistent with the physical demands of medium work. Therefore these participant's physical capacity for manual handling tasks exceeded the demands of their job. Conversely, the significant majority (73%) of those participants who were employed in heavy work were only able to lift a light weight which was consistent with the demands of sedentary or light work only. This highlighted a mismatch between the job demands and the physical handling capacity of these participants.

Table 4-16 FAST vs. work status in OR tables

	At work	Not at work	Total
Alternating stoop task (FAST)			
No/Mild difficulty	19 55.88%	7 30.43%	26 45.10%
Moderate difficulty	10 29.41%	5 21.74%	15 26.32%
Severe difficulty	3 8.82%	2 8.70%	5 8.77%
Unable	2 5.88%	9 39.19%	11 19.30%
Total	34 100%	23 100%	57 100%
Fisher's exact (P value)	0.016		
Twisting task (FAST)			
No/Mild difficulty	21 67.76%	9 39.13%	30 52.63%
Moderate difficulty	7 20.59%	6 26.09%	13 22.18%
Severe difficulty	4 11.76%	1 4.35%	5 8.77%
Unable	2 5.88%	7 30.43%	9 15.79%
Total	34 100%	23 100%	57 100%
Fisher's exact (P value)	0.059		

	At work	Not at work	Total
Kneeling (FAST)			
No/Mild difficulty	32 94.12%	12 52.17%	44 77.19%
Moderate difficulty	2 5.88%	11 47.83%	13 22.81%
Total	34 100%	23 100%	57 100%
Fisher's exact (P value)	0.000		
Static stoop (FAST)			
No/Mild difficulty	27 79.41%	9 39.13%	36 63.16%
Moderate difficulty	4 11.76%	4 17.39%	8 14.04%
Severe difficulty	3 8.82%	10 43.48%	13 22.81%
Total	34 100%	23 100%	57 100%
Fisher's exact (P value)	0.002		
Squat (FAST)			
No/Mild difficulty	24 70.59%	7 30.43%	31 54.39%
Moderate difficulty	7 20.59%	3 13.04%	10 17.54%
Severe difficulty	3 8.82%	13 56.52%	16 28.07%
Total	34 100%	23 100%	57 100%
Fisher's exact (P value)	0.000		

On the FAST, four subtests (i.e. alternating stoop, kneeling, static stooping and squatting) were found to have a significant correlation with work status. Weak significance was found for the twisting subtest. Of particular interest, the P-value of the kneeling and squatting tasks was 0.000.

4.6 Predictive value of all variables in relation to work status

Table 4-17 Multivariate Analysis represented by Odds Ratios, SD, and 95% confidence intervals

Variable	Odds Ratio	Std. Error	Z	p>/z/	95% Confidence Interval
Kneeling	5.11	5.92	1.41	0.15	0.52 - 49.55
Floor to waist lift	4.47	3.86	1.74	0.08	0.83 - 24.21
Depression	2.70	1.99	1.38	0.17	0.65 - 11.38
Static stooping	2.20	2.46	0.70	0.48	0.24 - 19.74
Twist	1.03	0.96	0.03	0.97	0.16 – 6.45
Squat	1.89	1.44	0.84	0.40	0.43 - 8.44
Waist to crown lift	1.21	1.55	0.15	0.88	0.10 - 14.96
Alternating stoop and reach	0.34	0.33	-1.09	0.28	0.05 - 2.34

The multivariate analysis table 4.17 reveals the 7 variables which are found to be most predictive with respect to work status in order of risk. Kneeling was found to be most predictive of work status. In this sample, if a participant was unable to kneel for 20 seconds, there was a 5.11 fold increased risk that the participant would not be at work.

Table 4-18 Step wise logistic regression returned the following results from the multivariate model

Variable	Odds Ratio	Std. Error	Z	P>7	95% Confidence Interval
Kneeling	7.60	6.92	2.23	0.02	1.277 - 45.29
Waist to floor lift	3.85	2.65	1.95	0.051	0.99 - 14.90
Depression	2.70	1.85	1.45	0.147	0.71 - 10.40

Step wise regression modelling returned the three variables of kneeling, floor to waist lifting capacity and depression to be the most significant predictors of work status. Negative findings in these three factors were found to be the most significant prognostic indicators of "not at work" status. In the absence of the other factors mentioned in the multivariate analysis results in the table above, the variable of kneeling becomes even more significant. An odds ratio of 7.6 for kneeling and work status is evident. The odds ratio for waist to floor lift was slightly less, and for depression, the odds ratio remained the same.

4.7 Secondary outcome findings

There was some debate in the literature as to the correlation between kinesiophobia and depression. There was also controversy regarding weight lifted in relation to depression and/or kinesiophobia. The relationships between these variables, as collected for the purpose of the primary study, are demonstrated below as secondary outcomes.

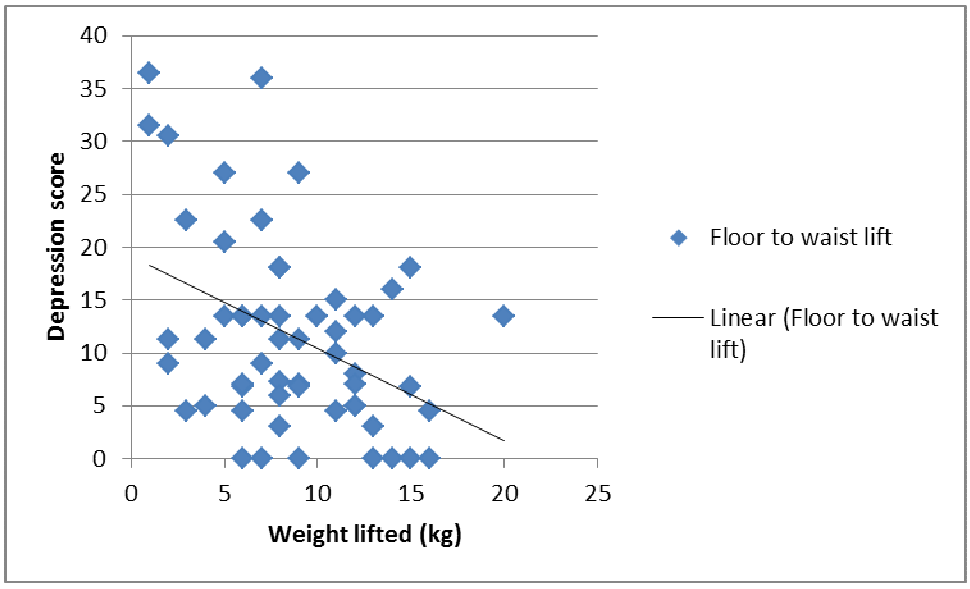
4.7.1 Relationship between kinesiophobia and depression

Table 4-19 Correlation between HADS and TSK scores

Pearsons correlation coefficients			
	HAD overall	**HAD anxiety**	**HAD depression**
TSK	0.38	0.27	0.38

The Pearson's correlation coefficient demonstrated a weak correlation (r=0.38) between TSK and overall HAD score. This suggested a weak relationship between fear of movement and anxiety/depression. There was however a slightly stronger relationship between TSK score and the depression subscale of the HADS than when compared to the anxiety subscale. There was however very little linear relationship between kinesiophobia when compared to anxiety or depression.

4.7.2 Relationship between weight lifted and depression



r=0.4

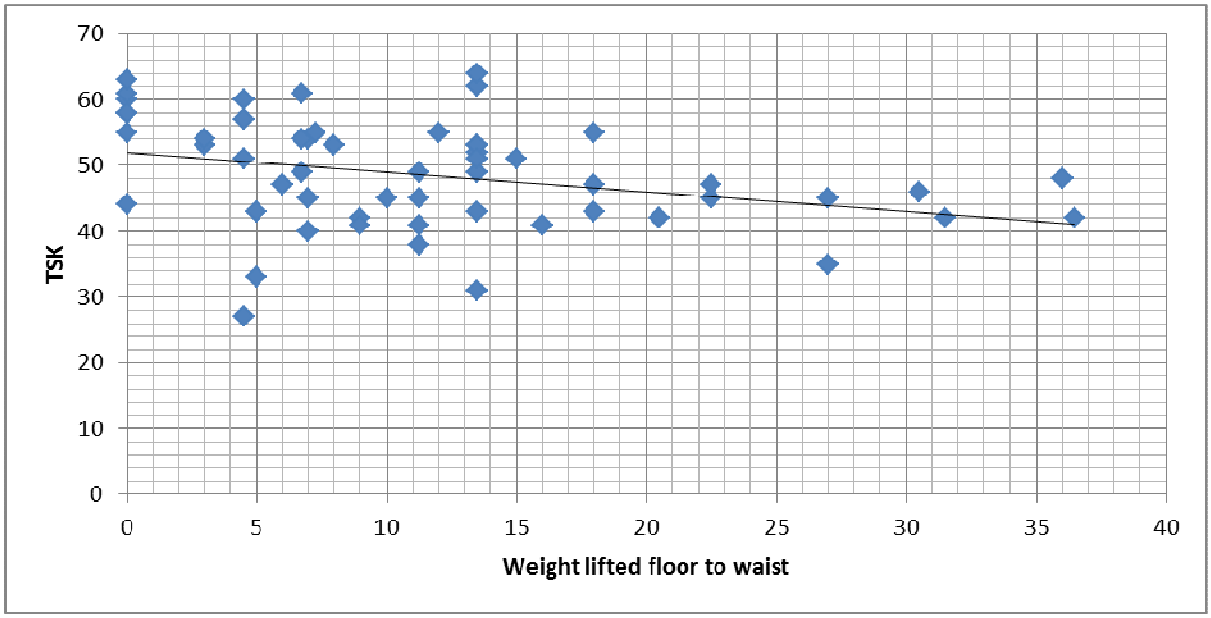
Figure 4-12 Relationship between weight lifted and depression

A Pearson's correlation coefficient of 0.4 was derived for the correlation between lifting from floor to waist. The relationship between floor to waist lift and depression was thus statistically weak.

4.7.3 Relationship between kinesiophobia and weight lifted

Table 4-20 Comparison between kinesiophobia (TSK score) and category of weight lifted

	Light	Medium	Heavy
Ave TSK Score	51.12	47.52	43.75
Std. dev.	8.84	7.54	3.86
95% CI	33.79 – 68.44	32.74 – 62.30	36.18 – 51.32



r=0.33

Figure 4-13 Relationship between kinesiophobia and floor to waist lift

No linear correlation between kinesiophobia (as measured using TSK score) and weight lifted from floor to waist was found. A Pearson's correlation coefficient of 0.33 was determined. Despite a difference in TSK score between light weight lifted and heavy weight

as indicated in table 4.20, no statistical relationship between kinesiophobia and floor to waist lift was found.

4.8 Summary

This study sought to determine the psychological and physical (biomechanical) capacity factors which were evident in a sample of employees with chronic back pain. The predictive value of these factors in determining work status was then determined.

4.8.1 Psychological and physical variables evident in this sample

The results of the results of the subjective *self-report questionnaires* revealed interesting outcomes. On the McGill Pain Questionnaire, the mean Pain Rating Index (PRI) was 36 (scale 0 – 78). The mean score on the Present Pain Intensity (PPI) scale was 3.3 (scale 0-5). These scores are both considered to be slightly higher than the average norms. On the HADS, using a scale of 0-16, the mean for anxiety was 11.8 and for depression the mean was 8.69. Thus this sample demonstrated a higher level of anxiety than depression in participants.

Using the WHOQOL-BREF, the environmental domain was found to be the highest with a mean score of 51.27 on a score of 0-100. This score demonstrated that this sample was most satisfied with their living environment. Similarly they demonstrated satisfaction in their social domain with a score of 49.58. A mean score of 36.70 was obtained for the physical domain which demonstrated that of the four domains, this sample was least satisfied with their physical health. A mean score of 46.5 was obtained on the psychological domain representing some dissatisfaction in this area.

The results of the TSK indicate that this sample was highly kinesiophobic with a very high mean score of 48.59 on a scale of 17 – 68.

The objective *performance based evaluations* reflected the participants' strength and mobility. The results of the PILE demonstrated that the participants were mainly able to perform light lifting from floor to waist (46%) but a few were able to lift heavy weight (14%). The waist to crown lift proved more challenging with only 7% of participants able to lift a heavy weight and 63% restricted to light lifting. No females were able to lift a heavy weight in either lifting tasks. Twenty-five% of the males were able to lift a heavy weight from floor to waist but only 7% of males were able to lift the heavy weight from waist to crown.

Using the FAST as an assessment for static and dynamic posturing, the results showed that the alternating stoop test proved most challenging for participants, with only 26.3% of the sample being able to complete the required 5 minutes. Most participants were able to complete the sustained kneeling task (61.4%). On the twisting task, 40.3% of the sample completed, on the static stoop 45.6% completed and finally on the sustained squat, 36.8% of the sample completed the activity. Interestingly, of the components of the test which participants did not attempt, the sustained squat was the task that most did not start or declined to attempt. 24% of the participants did not start the squat task.

4.8.2 Predictive value of the variables

Analysis of the self-report questionnaires in relation to work status using a Welch t-test showed that the PRI ($p=0.046$) of the McGill Questionnaire, the physical health domain ($p= 0.0014$) and the psychological health domain ($p=0.008$) of the WHOQOL-BREF were statistically significant. The results of the TSK ($p=0.43$), social relationships (0.19) and environmental (0.16) domains of the WHOQOL were not statistically significant in this analysis.

The multivariate analyses identified that ability to sustain a kneeling position, higher scores on weight lifted from floor to waist and a higher score on the depression scale were the variables that were able to predict work status. Kinesiophobia, anxiety, lift from waist to

crown, stooping, crouching, twisting and alternating stoop/reach variables were not strongly predictive of work status.

4.9 Summary of the key findings

This study had identified three key factors which are associated with people with chronic back pain who are not at work. The factors derived from multivariate analysis in order of significance are:

- Inability to assume or sustain a kneeling position for 20 seconds or less (OR 7.6 ; CI 1.28 – 45.29),
- Lifting a weight of 0 – 9kg from waist to floor level (OR 3.85 ; 0.99 – 14.9),
- A positive finding of self-reported depression (OR 2.7; CI 0.71 – 10.4).

CHAPTER 5: DISCUSSION

5.1 Introduction

This study was designed to explore the factors which affect work status in people with chronic back pain. The aim of the study was to investigate the psychological and physical factors which may present in a sample of individuals with chronic back pain referred for FCE for purposes of compensation and to determine if any of these factors were predictive of work status. The population studied reflected the insured, employed or previously employed population referred to OTs for FCE and was not reflective of the general South African population.

It was critically important that the correct decision is ultimately made by the insurer or funder regarding return to work after disability or illness. The decision to continue with disability benefits and thus preventing a person from returning to work can have disastrous effects, financially, emotionally and physically if that person is in fact ready to return to work. Getting back into the routine and structure of work is part of the therapeutic process and will, in many instances, aid in speeding up the recovery process. Recovery is facilitated by the social, cognitive and physical stimulation obtained at work. The employee will be rewarded not only with financial gains, but also with improved self-esteem and social status. As long as return to work is indicated and is safe, work is an imperative component of a person's general well-being. OTs play a very important role in determining timeous and safe return to work through the use of appropriate FCE.

A convenience sample of 57 participants was obtained from the researcher's private practice. The relatively small sample size used in this study will be a limitation to this study. The sample size is however considered statistically significant. These clients had been referred for FCE to determine capacity for work and had been diagnosed with chronic back pain by an orthopaedic surgeon. The sample reflects a very specific and select group of

people within the larger context of chronic back pain sufferers. The results therefore cannot be interpreted in the context of the larger population. The results can only be interpreted within the parameters of clients with chronic back pain being referred to private occupational therapists for FCE for work purposes. The characteristics of this sample will differ from the general chronic back pain population. All participants had an interest in financial compensation for their back pain as this was the underlying reason they had been referred for evaluation. Financial compensation may have had a negative impact on the results determined by this study.

Participants were invited to participate in the research and if they agreed they were asked to provide background information used to complete a background information form and to determine their current work status. All those participating in the study were then asked to complete 5 self-report questionnaires as well as participate in 2 performance based assessment tasks.

The administration of questionnaires during the evaluation was beneficial as it ensured a high response rate. This was advantageous as there was no waiting for participants to return completed questionnaires. The administration of the 5 questionnaires was however time consuming and made the already lengthy FCE even longer.

The TSK was found to be a particularly difficult questionnaire to understand and interpret, even for first language English speakers in some instances. A number of clients, including first language English speakers, found the terminology used in the McGill questionnaire confusing. This finding may have compromised the quality of the data collected. One participant was unable to complete the TSK and two did not complete the WHOQOL BREF and MPQ. This may have had an impact on results as not all the questionnaires were completed. A decision to include these two participants in the data in an effort not to discriminate against those based on poor grasp of the English language.

The explanation of terminology and questions, although necessary in completing the relevant questionnaires in some instances, may have introduced a source of interviewer bias as the participants may have answered questions based on how they thought the researcher wanted them to answer.

The data were analyzed by the MRC's biostatics department and the researcher used Microsoft Excel 2007 to analyze aspects of the data. The following chapter discusses the findings of this research, relates the findings to the existing body of knowledge and suggests how these findings contribute to FCEs as they relate to clients with chronic back pain.

5.2 Low back pain and demographic factors

The sample comprised of participants who were specifically referred for a FCE to determine their capacity for work. Inherently, these clients had an invested interest in the outcome of the evaluation as their financial compensation would, in part, be determined by the outcome of the findings. It should be noted that the results of this study should only be interpreted within the context of clients being referred for an occupational therapy FCE with the aim of determining capacity for work. The fact that the sample was purposively rather than randomly selected had some implication for generalization to the broader chronic back pain suffering population. The fact that subjects were sourced from a single practice may also have implications for generalizability.

The sample comprised 57 participants, which is the number that had been estimated, would give a 95% confidence level. The sample comprised 56% men and 44% women of which 58% of the participants were at work and 42% of the participants were not at work. This sample size was larger than many of the similar studies conducted by Soer et al, Brouwer et al. and Reneman et al. who have studied functional capacity with chronic back pain in some

depth. The sample sizes used by Reneman et al., Brouwer et al. and Soer et al. range from 24 participants [145] and 30 participants [129] to the largest study comprising 64 participants [43]. The number of male and female participants in these studies differed between studies. Some studies had an equal split of 50% male and 50% female whilst the study by Brouwer et al. made use of a convenience sample and invited the first consecutive patients with chronic back pain to participate in the study. In this instance, of the 30 participants, 24 were male and 6 were female[129]. In a large study which aimed at developing normative values for FCE, Soer, van der Schans, Geertzen, Brouwer, Dijkstra, Groothoff and Reneman noted that the reason researchers chose not to specify gender (or age) when presenting the normative values is that capacity should be adequate to overcome the required workload of the job regardless of age or gender [146].

When further examining the work status in this sample, a similar distribution of at work and not at work is found between men and women. Forty percent of women were not at work and 41% of men were not at work. This was dissimilar to the literature which suggests that female sex is a negative factor in RTW [66].

Various back pain sites were identified in the sample of this study but the most common area was low back pain (47%) which is consistent with the findings in the literature. Studies have found a higher prevalence of chronic low back pain when compared to other areas of the spine [15,41,112,147,148]. Haig et al. noted a 74% prevalence of chronic low back pain their back pain sample[15]. This study did not relate site of pain to any of the variables.

This sample was relatively well educated with 46% of participants having achieved higher education and post-matric qualification. Secondary schooling (i.e. grade 8 – grade 12) had been achieved by 42% of the sample and only a small percentage of 12% had a primary school level of education. This sample was consistent with what is routinely seen in this practice. Occupational therapists in private practice who are performing FCEs are primarily

evaluating a population who are employed and who's employers pay a premium for disability benefits to an insurer. Many of the referred clients are therefore "white collar" employees.

Consistent with the generally high level of education was the occupational class of the sample. A combined total of 81% of the sample had achieved an occupational status falling within the professional/semi-professional, managerial fields and routine non-manual workers. The small number of the remaining participants were employed as manual workers. The nature of work was not statistically significant in determining work status ($p=0.32$). This finding implies that the physical nature of premorbid employment did not significantly impact on whether the person was at work or not. This finding should however be viewed in the context of the physical demands of the participant's work. The majority of participants were involved in either sedentary or light work, comprising 74% of the sample. Work of a medium nature was performed by 19% of participants and only 7% of the sample was employed in work of a heavy physical nature. A more significant relationship between the physical demands of the work and the occurrence of chronic back pain may have been more apparent if the sample was employed in more physically demanding work. A study by van Vuuren et al. examined the prevalence and association between lower back pain and occupational risk factors. The findings of the van Vuuren et al. study illustrated that certain work related tasks such as prolonged trunk flexion, manual handling and load carriage as well as lifting were risk factors for onset of lower back pain [36]. It is important that the occupational therapist objectively quantify the client's capacity for performing these and other physical abilities. During an FCE the occupational therapist will assess the physical demands of the job and classify the work as sedentary, light, medium or heavy work. The physical abilities of the client are evaluated and these abilities (and limitations) are matched against the demands of the job to determine whether the client has retained the capacity for continued safe participation in their own job, considering the physical demands thereof.

The majority of the sample was in receipt of an income, either they were in receipt of their full salary as they were still at work, or they were in receipt of a disability benefit and were receiving a percentage of their salary. Only 7% of the sample were not in receipt of any income, they included participant's whose insurance policies had been suspended due to non-fulfillment of the requirements of the insurer (i.e. completing an FCE), or a decision on their disability benefit had not yet been reached by the insurer and the employer has stopped paying their salary. Alternatively these participants fell under the Road Accident Fund category of clients and had selected to stop working after their motor vehicle accident.

As indicated in this research, chronic back pain as it related to capacity for work involved a complex interplay of a number of factors. There were numerous other factors which may have had an impact on work status which were not considered in this study. Consideration of factors relating to the socio-demographics, family support and other psychosocial factors were beyond the scope of this study.

The above demographic representation is consistent with the insured and employed or previously employed population of South Africa and represented a higher socio-demographic class than the general population. The results of this study need to be interpreted within the context of the study sample used.

Not all people who suffer from chronic back pain are able to access the services offered by an occupational therapist performing FCEs as this is an expensive service which is funded by the insurer or Road Accident Fund for purposes of determining compensation. The clients are not expected to fund these evaluations themselves if they or their employer have disability insurance through individual or group scheme benefits. Thus the general population would generally not be able to afford an FCE if they were required to pay for this themselves. Attempts by some government hospitals have not demonstrated long term success in establishing and maintaining assessment units, although there are exciting

developments in vocational rehabilitation which are taking place at Chris Hani Baragwanath Academic Hospital, through the occupational therapy department there. Development through increasing of resources including trained and skilled occupational therapists is an area for government to consider and develop further, in conjunction with the occupational therapists managing work focused outpatient occupational therapy services in government hospitals.

5.3 The assessment procedure

The participants completed a two-part assessment process. During the first part of the assessment, the participants were asked to complete 5 self-report questionnaires. In the second part of the assessment they were asked to participate in 2 physical assessment tasks, the first being the PILE and the second being the FAST. Both self-report questionnaires as well as performance based measures were used in this study as recommended by Reneman et al.[43]. When examining the concurrent validity of several self-report questionnaires (i.e. Roland Disability Questionnaire, Oswestry Disability Questionnaire and the Quebec Back Pain Disability Questionnaire) and performance based disability measurements (i.e. Isernhagen work Systems Functional Capacity Evaluation) in patients with chronic low back pain, Reneman et al. found that correlations between the results of a questionnaire and performance based disability measurements differ substantially[43], suggesting that instruments based on self-report or performance appear to measure different aspects of disability. A performance measure should be used to measure a person's ability to perform an activity, whereas a questionnaire should be used to measure a person's self-reported ability to perform an activity [43]. Reneman et al. concluded that a self-report questionnaire together with a performance measure should be used to determine an inclusive perspective of the disability construct of chronic lower back pain patients [43].

The overall assessment in the research took longer than average because the FCE would not usually include the completion of all the self-report questionnaires used in this study. This increased duration of the FCE is unlikely to have influenced the final outcome as the self-report questionnaires were completed whilst seated and did not physically exert the participant. The participants completed the self-report questionnaires and performed the physical assessment in a private setting on their own. They were thus not influenced by other participants or anyone else in the test environment and there was no element of competition or pressure to complete the tasks within a specific time frame and similarly, the possibility of a negative attitude of one participant could not have influenced any other participant.

This study was conducted in a clinical setting with regular clinical procedures. The evaluator was, therefore not blinded to the results of the testing. Theoretically this could have affected the researcher's judgments and in turn have affected the participant's test results. The researcher was however the only one to conduct the tests and therefore evaluator differences would not have accounted for significant variations in test procedure.

5.4 Psychological factors associated with work status

The psychological variables considered in this study were depression, anxiety and kinesiophobia. Depression and kinesiophobia [85-88,91] in relation to chronic back pain are described in some depth in the literature [17,42,50]. Anxiety is commented on less frequently and there is some debate as to the relationship between anxiety and chronic back pain[57,71,149]. It was thus decided to use these three psychological factors for the purpose of this study. Further psychological factors which were not considered included coping strategies, self-belief and catastrophizing. These are factors which have also been explored in the literature and have been found to be important variables to consider. The inclusion of these variables in future studies would be indicated.

The data used to explore the factors of depression; anxiety and kinesiophobia were obtained with the use of various questionnaires. This section will discuss the results obtained from each of the self-report questionnaires and the implication of the results to FCE. The McGill Pain Questionnaire (MPQ), Tampa Scale of Kinesiophobia (TSK), Hospital Anxiety and Depression Scale (HADS) and finally the World Health Organization Quality of Life Brief (WHOQOL-BREF) were used to obtain the relevant data.

5.4.1 Pain intensity

When compared to the mean scores for people with chronic back pain provided by Melzack[127], this sample presented with higher scores in sensory and affective self-evaluation but evaluative and miscellaneous scores were very similar to the mean. When compared to the expected norm, this sample presented with a higher overall pain rating score, indicating that this sample described their pain in more severe terms than the norm. Similarly, this sample rated their pain intensity as being more severe than the norm. Melzack reported a mean Present Pain Intensity (PPI) score of 2.6 in a sample of back pain sufferers [127] and the mean score for Present Pain Intensity on this sample was rated at 3.3 on this analogue scale. The Pain Rating Index on the MPQ was found to be a significant indicator of work status when examined in isolation ($p=0.046$). However the effect of this significance diminished in the multivariate analysis and was found to have low predictive value in the presence of other variables. This finding was consistent with the findings of Baldwin et al. who found that when severity measures were included in a single model, the pain intensity variable became insignificant [44].

As will be seen later in this discussion, participants generally rated their perception of disability as higher than the expected norm. Greater than average mean scores were obtained for pain intensity, anxiety and kinesiophobia. The fact that this was an evaluation to be submitted to the referral source for consideration in the decision making process of

whether the participant would qualify for financial compensation was likely to have influenced their self-report responses on these questionnaires. It is important for therapists conducting FCEs to take note of the finding of elevated scores on self-report questionnaires in comparison to the norm as indicated in the literature. When using self-report questionnaires as part of a battery of tests it is important to consider that there is likely to be a tendency, at least in some clients, to over-state their impairment on these questionnaires. In some cases this may be an intentional effort to mislead the therapist but in many instances there may be a subconscious or unintentional over-estimation of the facts. Interestingly, although participant self-rated high levels of pain intensity and fear of movement, participants did not self-evaluate themselves as having a particularly high level of depression in comparison to the norm. Depression was, however found to have been a significant factor in relation to work status on the multivariate analysis of the data.

5.4.2 Depression

This study explored the association between the implications of a self-report of depressive symptoms and an objective physical performance measure. One of the aims was to ascertain whether a significant relationship existed between depression associated with chronic back pain and work status. The results of the data analysis indicate that depression was a significant factor in work status in people with chronic back pain. An odds ratio of 2.7 fold increased risk of depression was evident in participants who were not at work. This finding was consistent with findings in the literature where it was been suggested that the level of depression is one of the most significant factors when predicting return to work for employees with chronic pain [44,50]. These findings support the notion that depression influences function, at least in part, through reduced physical effort during activity [141].

The fact that higher scores for depression were noted in those who were not at work may also signify a protective effect that work offers in preventing depression. Without the purpose, goals, structure, affirmation and social interaction that the workplace offers, a

depressive state which may never have become apparent if the participant had stayed at work, now developed into a mood state of depression at a level which is considered to be an indicator for clinical management. This study does not consider whether the pain related depression was apparent prior to cessation of work or only became apparent after stopping work. This suggestion of the protective effects of the workplace against depression is merely speculative.

Both depression and floor to waist lift were independently found to be statistically significant in the multivariate analysis. However, when comparing these two factors to one another on a linear scale, there is no correlation between the two (p=0.4). Although both are significant, depression and lifting capacity are not directly correlated to one another and are considered to be independent variables in this sample. This was a somewhat surprising finding as was expected that neurovegetative symptoms associated with depression, such as anergia and anhedonia, would limit a person's capacity to apply effort on physical tasks. Symptoms of depression were assumed to also result in reduced interest or motivation in engaging in effortful activity. It was also plausible that negative cognitions may reduce effort during activity, as persons with depression may have more negative views about the outcome of their efforts, or be more fearful that activity may cause more pain and discomfort. This hypothesis was however not supported by the results of this study which found no correlation between depression and lifting capacity.

A strong association has been found between depression and cognitive impairment in patients suffering from chronic pain [150]. Although assessment of cognitive ability was beyond the scope of this research, it is postulated that reduced cognitive function may have been associated with the chronic pain and comorbid depression noted on in this study. In this sample, where 42% of the participants had completed high school and a further 46% completed post-school studies, and therefore represented an educated sample. They were likely to have taken advantage of cognitive skills in their employment setting, rather than

relying on their physical strength to generate income. Thus a reduced capacity for cognitive functions such as memory, concentration and decision making may have had a negative impact on work productivity and may have contributed to cessation of work. This is an important concept to consider in this particular sample as the majority of participants were involved in professional, semi-professional, managerial or administrative type jobs where executive cognitive skills are critical to work performance. This avenue of study could be investigated in future studies.

Consistent with the positive correlation between work status and depression is the significant correlation between the psychological domain of the WHOQOL questionnaire and work status. This domain of the questionnaire examines dimensions such as body image and appearance, negative and positive feelings, self-esteem, personal beliefs, thinking, memory, learning and concentration. Deficits in these perceptions of self are typically associated with a diagnosis of depression. Again, positive self-esteem, body image and belief in one's personal capacity to contribute in a meaningful manner within the workplace are vitally important in a person's productive participation within any work sector but particularly within the generally "white collar workers" participating in this study.

5.4.3 Anxiety

The statistical significance of anxiety in relation to work status was found to be weak (p=0.5). There was very little difference in the level of reported anxiety when comparing employees at work and those who were not at work. Studies have generally found the prevalence of anxiety to be lower than the prevalence of major depression [42] but some studies have found anxiety disorders to be as frequently observed as depression [57]. The fact that some studies have illustrated a greater prevalence of several anxiety disorder to be associated with pain conditions than with depression [80] illustrated the fact that there is little agreement on the significance of anxiety in relation to chronic back pain and particularly in relation to work status. Interestingly, the mean score on the HADS in this study was higher for anxiety

subscale (mean = 11.8; SD 4.5) than the mean score for the depression subscale (mean 8.69; SD 4.28). Although the prevalence of pain related anxiety was higher than the prevalence of depression in this sample, anxiety was not significantly correlated with work status. Despite the depression score being found to be lower in this sample, self-reported depression was found to be a strongly significant indicator of work status whereas anxiety was not. The elevated anxiety score may be reflective of a generally raised level of anxiety within the white collar working population which may be related to factors unrelated to chronic back pain. Increased anxiety may be secondary to factors including but not limited to financial stressors, high demand for productivity and tight deadlines which are factors inherent in many work environments. The results of this study however suggested that anxiety in isolation was not significant to consider as a risk factor for "not at work" status when considering clients with chronic back pain.

A weak correlation between the overall HAD score (i.e. combined anxiety and depression score) and kinesiophobia as measured by the TSK was found. The correlation between kinesiophobia and depression was slightly stronger on the HAD scale's depression item but was not found when considering the anxiety component alone. Although overall anxiety and kinesiophobia raw scores were very high in this population, these variables showed a weak correlation whereas there was a significant relationship between work status and self-reported depression.

5.4.4 Kinesiophobia

The correlations between kinesiophobia and work status in this sample were low and non-significant. This finding implied that fear of movement, measured with the TSK, and was not related to whether a person is at work or not. Based on these results, it cannot be confirmed that there was a relationship between kinesiophobia and work status in this sample.

The mean result of the TSK was surprisingly high when compared to similar studies. A mean TSK score of 48.6 (sd = 8.2) was found. The mean TSK score on other studies has varied between 33.8 and 46 (sd between 9.5 and 6.4)[20,70,84,92,126]. The mean TSK result of 48.6 indicated that this sample was substantially kinesiophobic when compared to other similar studies. Although a high mean score was achieved, the result could not be used to significantly predict those participants who are at work as opposed to those who are not at work. The reason postulated to explain this finding was that the majority of the sample are/were engaged in sedentary or light physical work at the time of onset of back pain, jobs which were not intensely physically demanding. Although participants feared movement, they may not have perceived the inherent physical demands of their jobs as posing a physical threat which may cause further disability or injury. It was also unlikely that back pain in this population was as a direct result of work related injury as this sample did not include participant's claiming from workman's compensation. Another reason participants may have been fearful of movement is that although many participants (65%) had attended some form of rehabilitation (e.g. physiotherapy), a comprehensive back program, including education regarding safe activities may not have been part of the rehabilitation process. Participants may therefore have self-reported perceived participation in certain activities as being dangerous to their backs and leading to further back injury.

When TSK score was compared to weight lifted, there was a difference between the average weight lifted and the TSK score. Those who lifted a light weight demonstrated a higher score, demonstrating greater fear of movement (mean 51.12; CI 33.79 – 68.44). Those who lifted a heavy weight demonstrated a lower TSK score suggestive of lower level of fear of movement (mean 43.75; CI36.18 – 51.32). Despite the difference noted on direct comparison, the effect of kinesiophobia was lost when processing the data in a multivariate regression. A weak correlation of 0.33 were similar to the findings of Reneman et al.[70,72]. Reneman et al.'s results were determined using a similar progressive lifting protocol to this study and concluded that the results indicate that although participants were substantially kinesiophobic, they were able to lift a mean of 29.5kg and were physically able to perform moderate to heavy work. Reneman et al. determined the strength of the correlations was very low.

The findings of this study were consistent with Reneman et al.'s studies which found the relationship between kinesiophobia and avoidance, operationalized as lifting, could not be confirmed. Whilst this finding may be true in a clinical setting where the participant is being observed and monitored by a trained health professional, it may not be transferrable to the reality of the workplace. Whilst under the study environment, the participant may have felt more confident to attempt maximum lift as they were instructed on appropriate body mechanics, they felt their safety was increased with the use of the heart rate monitor and the therapist had advised they would be observing the participant for objective signs of maximum effort. Although participants feared movement, participants may have been more willing to attempt greater weight in the lifting tasks than they would have in the workplace due to the clinical setting of the evaluation. With the unsupervised, fast paced and relatively unsympathetic conditions in the work place, participants may be more reluctant to exert themselves physically due to fear of re-injury.

5.5 Physical factors associated with work status

The physical factors evaluated included two progressive lifting tasks and a series of tasks evaluating static and dynamic positioning. The results of these evaluations were compared to the work status of the employees. In addition to the above objective measures, the use of the Physical Health Domain of the WHOQOL-BREF provided further subjective information regarding the participant's views of their physical wellbeing.

Statistical analysis of the WHOQOL-BREF highlighted a significant association between work status and the physical domain of the questionnaire ($p = 0.001$). Individuals with higher scores (i.e. perceiving themselves to have higher quality of life in the physical domain) were more likely to be at work. This finding was consistent with the nature of the questionnaire which examined issues such as participation in activities of daily living, energy and fatigue, mobility, pain and discomfort, sleep and rest as well as work capacity. A significant correlation between perception of physical wellbeing and work status was consistent with literature suggesting that self-reported measures of physical functioning and health related quality of life were highly significant and clinically important predictors of employment patterns[19]. The high statistical significance of the outcome on the physical capacity aspect of the WHOQOL-BREF questionnaire was consistent with other studies which have shown a patient's own beliefs about their work return are very important in the outcome [62]. It has been suggested that workers perceptions of their capacity to work was the most prominent predictive factor for return to work [49]. In clinical practice this was also evident from informal observation of the successful return to work cases. It would appear that clients who believe they are capable of working and who are motivated to work are more easily able to overcome barriers to work. Other clients, who do not believe they can work, may interpret similar barriers as being insurmountable obstructions to work. Motivated clients appear more able to problem solve as well as draw on internal and external resources and together

with the employer and the occupational therapist/case manager to come to a mutually acceptable arrangement to allow successful return to work.

5.5.1 Static and dynamic posturing

Of the various posturing tasks evaluated, the ability to assume and sustain a kneeling position was found to be highly correlated to work status (i.e. whether the participant is at work or not at work). Participants who were unable to kneel or sustain a kneeling position were unlikely to be at work (OR 7.6; CI 1.2 , 45.3). Those who were not able to assume or sustain kneeling for longer than 20 seconds were found to have a statistically significant increased risk of not being at work. This finding was similar to two previous studies where a significant association was found in people with chronic back pain and difficulty kneeling [97,99]. However, some research also found no association between chronic back pain and kneeling[97,99,100]. It should be noted that the aforementioned studies used an element of lifting in combination with kneeling to establish a correlation between positional tolerance and onset of lower back pain. While in this current study, only the ability to assume and sustain a kneeling position for less than or more than 20 seconds without any manual handling requirement was examined. Working in a kneeling position is more physically demanding than working in a standing position. A person working in kneeling must work at a greater percentage of their maximal capacity, exerting greater energy and requiring greater physical stamina [102]. Working for prolonged periods in kneeling could result in ligamentous creep and spinal instability which could aggravate any subclinical back pain [36].

Clinically, the inability to kneel/sustain kneeling was strongly associated with a “not at work” status is an interesting finding, as kneeling is generally not an inherent requirement of the jobs performed by this sample. Very few people are required to work in a kneeling posture, or even assume this position at any time during their work day. The actual inability to kneel in itself should not be preventing these participants from working. When one considers the data obtained from the FAST, it was evident that most (61.4%) of the participants were able to complete the kneeling test. In fact, more participants were able to complete the kneeling test than any of the other functional assessment tasks presented on the FAST. This seemed

to suggest that kneeling was the least physically demanding performance task of the FAST, yet inability to kneel or sustain a kneeling position was however significantly associated with a "not at work" status (O.R. 7.6). Inability to kneel for longer than 20 seconds thus appeared to be indicative of more severe functional deficit when compared to any of the other functional performance or self-report factors measured. Persons with severe chronic lower back pain presenting with ligamentous creep and spinal instability may make it difficult for them to assume or sustain a kneeling position and this may be the critical underlying factor which impacts on ability to perform a number of functional daily tasks in varying degrees, including kneeling. It is therefore suggested that inability to kneel or sustain kneeling is reflective of marked biomechanical changes, such as shortening of the soft tissue and musculature of the back and hips and spinal instability which is secondary to the chronic back pain. Difficulty in kneeling tends to reflect a generally more severe level of disability, having a globally negative impact on mobility and agility required for participation in daily activity and may not be job or work specific.

Alternating between stoop and reach was initially found to be marginally significant ($p = 0.01$) when establishing the crude odds ratio but was found to be statistically insignificant in the presence of other factors after building the multivariate model (OR 0.34; CI 0.05 - 2.3). None of the literature considered for this literature review commented on reach and stoop and therefore comparisons cannot be drawn.

The spinal twist does not have a significant effect on the outcome of work status (OR 1.0; CI 0.16 - 6.4). A study by Marras, Davis and Granata suggested that axial twisting of the torso was a significant risk factor for occupationally-related low back disorders [96]. The finding that axial twisting was not significant to work status in this study was thus inconsistent with the findings of other studies which have examined this factor. The difference in findings could be explained by the position adopted in the two different studies. The study by Marras et al. positioned the participants in forward flexion and then required participants to twist clockwise

and anti-clockwise[95]. Most occupationally related twisting is performed with the trunk in a flexed or extended posture[95]. It may therefore have been inappropriate to generalize the results of studies where participants were in an upright posture to occupational twisting situations.

5.5.2 Lifting

A significant correlation was found between work status and lifting from floor to waist. Participants were divided into three categories; those who were able to lift between 0 and 9kg, those who were able to lift between 9 and 22kg and those who managed more than 22kg. Using step wise multivariate logistic regression, lifting from waist to floor was found to be statistically significant when compared with work status (OR 3.8 ; CI 0.99 – 14.9).

When deriving the crude odds ratio, it was found that the risk of "not at work status" of participants who were able to lift between 9 – 22kg was 5.26 times greater that of participants who were able to lift 22kg or more. Taking it further, participants who were able to lift between 0 and 9kg demonstrated an 11.5 fold risk of being not at work when compared to those able to lift 22kg or more. This finding was particularly interesting in view of the physical demands of work of the study sample. According to the DOT [151] classification of work, employees performing sedentary work would occasionally be required to handle weights of up to 4.5kg occasionally and people performing light work would occasionally be required to manually handle weight of up to 9kg. It was therefore interesting that although the sample used in this study was predominantly representative of the sedentary or light physical workforce, those who were not at work had a significantly increased risk of not being able to manually handle weight between 0 and 9kg when compared to those who are at work (both categories suffer chronic back pain).

Gender differences in lifting capacity were evident with analysis of the data. None of the women in the sample were able to lift a weight of 22kg from floor to waist or from waist to

crown. Sixty percent of the females in the sample managed to lift a light load from floor to waist and 40% managed to lift a medium load of between 9 and 22kg from floor to waist. Females who were able to lift a medium weight from floor to waist were more likely to be at work than those who were able to lift a light weight only. This statistical interpretation of the data further supports the multivariate regression which indicated that the weight of the load lifted from floor to waist is a significant indicator of work status.

Other studies have suggested that lifting from floor to waist was as predictive of an entire FCE protocol in determining return to work [131]. Gross even went as far as to suggest that if costs prohibit testing with an entire FCE protocol, a reasonable alternative for the purpose of making predictions of future recovery may be testing only performance on the floor-to-waist lift[112].

In contrast to the female participants, 25% of males were able to lift a heavy weight from floor to waist. The majority of males who were able to lift a light weight only were not at work. All of the males who were able to lift a heavy weight were at work. A total of 84% of the men who were at work were also able to lift a medium or heavy weight.

Lifting from waist to crown of 9 – 22kg (medium load) was found to have a crude odds ratio of 5 fold increased risk of 'not at work' status when compared to participants who were able to lift more than 22kg. Of those participants able to lift between 0 – 9kg (light load), the crude odds ratio was 9.6 fold ($p = 0.083$). This significance was no longer as apparent in multivariate logistic regression analysis where, in the company of other factors, the odds ratio of waist to crown lift was reduced to 1.21 (CI 0.98 ; 14.96). Ability to lift from waist to crown was therefore not a reliable indicator of work status.

When comparing the category of weight lifted by the participant to the physical demands of their work an interesting phenomenon arose. In each category of work there were participants who were able to lift weight exceeding the physical demands of their own job by one, and in the instance of light work, by two levels. Some participants performing work in the DOT light physical demand classification were able to lift a medium or heavy weight. However, none of the participants who performed sedentary work were able to lift a heavy weight. There were also a number of participants whose lifting capacity fell below that of the physical demands of their job. For instance, in the heavy physical demand category, a significant proportion of the sample were only able to lift a light weight and would therefore, according to the FCE protocol criteria, not meet the demands of the manual handling requirements for their own occupation.

A possible limitation to this study was the use of a psychophysical approach to the lifting task rather than a kinesiophysical approach. The PILE made use of a psychophysical approach. Although the PILE was found to have excellent inter-rater and test-retest reliability in subjects with chronic low back pain, a psychosocial approach had been reported to have less application for participants who may not have a clear perception of the own ability or have psychosocial factors (e.g. fear-avoidant behaviour) which impact on performance. A kinesiophysical approach may have been a more objective tool to use for the purpose of this study but such an FCE protocol was not available in South Africa at the time of conducting this research. It should however be taken into account that Soer et al. suggested that the differences between a psychophysical and a kinesiophysical approach, described in the literature as each other's opposites, may in practice, be non-existent with regards to endpoint determinations[116].

This chapter has drawn conclusions from the results determined from the study. Chronic low back pain in employees has been considered in relation to demographic factors, psychological factors and physical factors and has been correlated to "work status". Those

factors found to have been most predictive of “work status” have been highlighted and discussed relative to the literature findings.

5.6 Implications for Clinical practice

The FCE focused not only on assessing overall work ability and limitation but also on evaluating the employee’s effort level and job-specific functional capacity. Owing to its roots in work tasks and medical evaluation the FCE bridges the gap between the medical and employment realms. This research has highlighted the fact that OTs need to consider the psycho-emotional components of the employee’s functioning in addition to their physical abilities. A wide range of performance measures need to be included in the FCE but the OT needs to take specific cognizance of the employees’ ability to kneel and their ability to lift weight from floor to waist height as these factors were found to be most limited in employees who were not at work at the time of the study. Appropriate referral to physiotherapy or biokineticist for mechanical strengthening of the trunk may be indicated in some cases. In some instances, the recommendation of suitable reasonable accommodations or realignment may be indicated.

OTs need to incorporate measures of depression in particular as this was found to be of significance in those who were not at work. Being depressed does not imply that the person is not able to work per se but that the outcome of return to work may not be successful due to socio-emotional difficulties relating to depression rather than the physical ability to perform their work tasks. In this instance, a strong recommendation should be made for referral to appropriate treatment resources where depression can be appropriately managed and the effects of symptoms reduced (if not eliminated).

CHAPTER 6: CONCLUSION

6.1 Summary of the research

Occupational therapists working within the field of vocational rehabilitation are frequently asked to perform FCEs for clients with chronic back pain. The purpose of these evaluations is to determine the level of output performance which the client is capable of, using standardized and non-standardized measures. The occupational therapist will then couple the results of the evaluation according to the analysis of job demands of the client, interpret the data and make a recommendation as to whether there is a job match or not. If a job match does not exist a suitable alternative employment option may be investigated. In some instances, the recommendation may be that the client is no longer suited to open labour market employment and then the insurer may consider paying a disability benefit if all the contractual obligations of the policy are met.

The FCE of the client with chronic back pain is complex and complicated by the multiple factors which impact on performance. Thus the outcome of the evaluation is likely to be influenced by a variety of factors and not just the objective mechanical nature of the back pathology. Psychological, social, environmental and physical demands of the work have all been found to impact on the performance of clients with chronic back pain.

This study has attempted to identify the psychological and physical factors which can be most significantly associated with clients with a 'not at work' status. The significance of these factors is noted in relation to participants with chronic back pain who have returned to work in their own or an accommodated position, or who have not stopped working since the onset of their back pain or who have stopped working due to chronic back pain.

Multivariate analysis highlighted three areas which are statistically significant in those participants who are not at work.

- Inability to assume or sustain a kneeling position for longer than 20 seconds is found to be the most significant factor.
- Inability to lift a weight of between 0 – 9 kg from floor to waist height is noted to be statistically significant in participants who are not at work.
- A positive finding of depression on the HADS is significantly correlated with a "not at work" status.

The finding that floor to waist lift is strongly associated with ability to perform work duties is consistent with international studies. The statistical significance of kneeling has received little attention in the literature and is not a performance measure which has been investigated in depth. It is suggested that lifting and carrying are more commonly encountered functional tasks in the work place than low work such as crouching and kneeling and therefore investigation of lifting capacity justifies a greater intensity of research. The significant relationship between kneeling and work status found in this study, despite the largely sedentary nature of work of the majority of participants, suggests that this performance measure also warrants further investigation.

The physical findings found on objective assessment were re-enforced with significance in the results of the quality of life self-report questionnaire, in which participants who indicated a low perception of quality of life with regard to physical abilities were less likely to be at work. Similarly, the scores obtained from the HADS depression scale correlated well with perceived quality of life relating to symptoms consistent with a diagnosis of depression on the WHOQOL-BREF. It is interesting to note that the mean depression score is lower than the mean anxiety score, which suggests that this sample presents with higher levels of anxiety related to their physical condition. Despite a high baseline finding for the anxiety score on the HADS, anxiety is however not a significant factor affecting work status in this study.

When considering fear of movement, no significant correlation found between kinesiophobia and work status. It is however noted that the results of this questionnaire reflect a highly fear avoidant or kinesiophobic sample when compared to mean scores in the international literature. Closer examination of the fear of movement aspect of the analysis indicates that participants who lifted a lighter weight scored higher on kinesiophobia scale. On the surface this finding suggests that fear of movement had an impact on weight lifted because clients who were able to lift a heavier weight, had lower kinesiophobia scores. On multivariate analysis a statistical relationship was however not found to be significant. Although weight lifted from floor to waist is significantly correlated with work status, the implication is not implicit that fear of movement increases risk of “not at work status”.

This study has shown that impairment in certain components of both the physical and psychological domains are relevant in relation to work status. Findings thus confirm the already well-established notion that the management of chronic back pain is a complex and multifactorial condition, particularly when considering integration into the workplace.

The results of this study are important for occupational therapists to consider. It is vital that occupational therapists taking referrals for FCEs to integrate these factors into their assessment in an effort to make informed recommendations regarding capacity for work in clients with chronic back pain. Whilst certain physical components of the performance based evaluation have proven to be significant, it is important to pay specific attention to psychosocial factors, depression in particular, as this particular factor may account for a significant portion of the functional impairment in chronic back pain. It is important for therapists to recognize the multidimensional nature of back pain, taking into account objective research results, but at the same time it is equally important to recognize the individual characteristics and potential of each client and integrate this with clinical experience when formulating an informed decision on ability to work.

6.2 Areas for further research

From this body of work, several areas can be identified in which further occupational therapy research would be beneficial. Further investigation in the following areas is recommended:

- There is little consensus among experts concerning FCE terminology and in particular there is no consensus on the definition of Functional Capacity Evaluation. Further research should focus on defining the term and defining the requirements of an FCE as it pertains to the South African context. For validity purposes, the ultimate goal would be to develop a gold standard for functional capacity evaluation with the development of normative data for a South African population.
- Normative data for the South African population for the various components of functional capacity are required. For instance, normative values for material handling, postural work, repetitive and coordination tests are required.
- Fear of movement was investigated in relation to work status in this study and was found to have little significant value. Of interest however, is that this sample represented a highly fear avoidant population when compared to similar international studies. Future research into the underlying reasons for fear avoidance in South Africa and the likely impact this may have on participation in work activities is warranted.
- Further research into the use of a psychophysical approach to lifting task vs. a kinesiophysical approach is warranted. There is some debate in the literature as to whether the difference is theoretical only or whether the evaluator approach to end point determination is significant in determining outcomes. This is important in the context of South Africa because use of the PILE (which makes use of a psychophysical approach) is freely available. The use of the well-researched WorkWell System, which is a kinesiophysical approach to FCE, is costly and can only be performed under license once training with a faculty provider from the United States has been undertaken. Research to determine differences in end point outcomes in the two approaches would

assist therapists in determining which protocol is going to prove most beneficial in their practice, taking into account cost considerations.

- The majority of research is performed on patients with chronic lower back pain. Generalization of the results to other diagnoses is unknown. Research is needed to study measurement properties of FCE on patients with other diagnoses.

FCE is a relatively new field of practice in South Africa. It is an exciting area of practice and research for occupational therapists. This study has highlighted psychological and physical factors which occupational therapists need to consider when conducting FCEs and when considering return to work. There are numerous opportunities for further study. There is considerable need for further investigation in this field of practice in order to firmly entrench the value of the occupational therapist's input in the management of employees with disabilities in the workplace.

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APPENDIX A: Ethical Clearance Certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Spavins

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER M080524**
PROJECT	Factors affecting ability to work in people with chronic pain
INVESTIGATORS	Ms MH Spavins
DEPARTMENT	Occupational Therapy
DATE CONSIDERED	08.05.30
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 08.07.03 **CHAIRPERSON** .....
(Professor P E Cleaton Jones)

*Guidelines for written 'informed consent' attached where applicable

cc: Supervisor : Prof P de Witt

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

APPENDIX B: Information Sheet

Title of Research: Factors affecting work status of employees with chronic back pain

This research is being conducted by Megan Spavins, a student registered for a higher degree with the University of the Witwatersrand

Hi there,

My name is Megan; I am an Occupational Therapist who is working in the field of vocational rehabilitation. I am conducting research to understand those factors which make it easier and those that make it more difficult for people with chronic pain to go back to work.

You are invited to participate in this research if you have suffered from pain for the past 3 months or more. If you agree to volunteer, I will ask you for information about your background, medical history, work history and about whether you are currently working or not.

You will be asked to fill in 4 questionnaires relating to pain which will take you approximately 20 minutes in total. These questionnaires cover topics including job satisfaction, depression and anxiety, quality of life, how you perceive your pain.

I will ask you to perform a lifting task to see what weight you will safely be able to lift. You may experience some discomfort performing this task but it should not elicit pain.

Participation in this study is voluntary and you are free to refuse to participate or to withdraw your consent and to discontinue participation at any time. If you refuse to participate or discontinue your participation, it will not affect the functional capacity evaluation for which you have been referred in any way. Please remain assured that your responses to these questionnaires will remain anonymous.

Feedback on the results of the study may be obtained on request

If you have any questions please contact me
Megan Spavins
Occupational Therapist
084 556 3983
(011) 440-0325
Email: megan@therapyteam.co.za

APPENDIX C: Informed Consent to Participate in Study

SUBJECT NUMBER: _____

Title of Research:

Factors affecting work status of employees with chronic back pain

I have been fully informed of the procedures to be followed. In signing this consent form, I agree to participate in this study and understand that I am free to refuse to participate or withdraw my consent and discontinue my participation in this study at any time. I understand also that if I have any questions at any time, they will be answered by the researcher.

Signed _____

Date: _____

I have fully explained the purpose of the study and what will be researched in this study. I have asked if there are any questions and answered these questions to my best ability.

Date _____

Researcher _____

APPENDIX D: Letter of consent from referring party

MEGAN SPAVINS
OCCUPATIONAL THERAPIST
BSc O.T. (Wits), Dip Voc Rehab (UP),
Adv Dip O.T. (Wits), ICBS (IISA)
40 Garden Road, Bordeaux,2194
Tel: (011) 886-3900
Fax: 086 530 0275 or (011) 326-2968
Cell: 084 556 3983
Email: megan@workcapacity.co.za

Date:

To:

Fax:

Dear Sir/Madam

PERMISSION TO ALLOW CLIENTS TO PARTICIPATE IN RESEARCH

I am currently registered for my Masters degree in occupational therapy at the University of Witwatersrand. My topic of study is "Factors affecting work status of employees with chronic back pain".

Clients suffering from chronic back pain you have referred for Functional Capacity Evaluation may be asked if they would consent to participate in the study. If they do give consent, they will be asked to complete 4 questionnaires and perform a lifting task. Participation in these tasks will form part of the comprehensive evaluation for which they have been referred. Should any additional time be required for the client to complete the necessary documentation or testing, you will not be charged any additional fee. Should the client refuse to participate in the study, they will not be prejudiced in any way.

If you agree to allow clients referred from your company to participate in this study, please could you sign the consent below. If you have any further questions, I would be delighted to discuss this further with you.

Yours sincerely,

Megan Spavins
Occupational Therapist

I hereby give consent for clients referred by my company to participate in the research described above should they consent to do so

_____	_____	_____
Signature	Company	Date

APPENDIX E: Demographic Form

Date:		Gender	Male	Female		
Referral source:		Level of education	Higher (>12 years)			
			Secondary (10 – 12 yrs.)			
			Basic (>10 years)			
Subject Number:		Dependants				
Age		Receipt of income	Yes	No		
Residential area						
Marital Status	Married/cohabiting,	Never Married	separated/divorced			
	Widowed					
Date of injury/onset of pain	3- 6 months	6-12 months	1 yr. – 2 yrs.)	<2yrs		
Cause of pain/diagnosis						
Surgical intervention	Yes /No					
Current medication	Name Dosage Frequency					
Consultation with medical practitioners						
Multidisciplinary intervention	Physiotherapy	>1month	1-6mnths	6mnth – 1 yr.		
	Psychology	>1month	1-6mnths	6mnth – 1 yr.		
	Other (state)	>1month	1-6mnths	6mnth – 1 yr.		
Occupational class	Manager	Professional	semi-professional			
	Routine non-manual employee		manual worker			
Time since last at work	Still at work	0-3 months	3 – 6 months	6 – 12mnths		
	1 – 2yrs	2 – 4 yrs.)	<4years			
Physical nature of work	sedentary	Light	Medium	Heavy		
Work history – number of previous jobs	1	2-4	5-8	9-12	13 or more	
Average duration of employment at each job	>1 year	1-2 years	2-4 years	4-6 years	6 years and more	

APPENDIX F: Patterns of Employment

SUBJECT NUMBER: _____

To be completed by therapist

Please tick the appropriate response. Comment if necessary.

Question	Pattern
1. Have you taken time off work due to on-going pain?	***Pattern 1***: (no absence): The worker takes no time off work following onset of pain ***Pattern 2***: (Return and Stay): The worker returns to work after an initial absence and reports no subsequent spells of absence associated with back pain.
2. Between the time you returned to work and now (date of interview) did you have to take any additional time off work because of pain?	***Pattern 3***: (Multiple Spells): The worker experiences one or more spells of work absence associated with back pain after the initial absence and return to work (i.e. the employee takes additional sick leave once they have returned to work).
3. If you have returned to work are you doing the same job as before the onset of your pain? 4. If you have returned, are you working a reduced number of hours than previously?	***Pattern 4***: (Return in accommodated work): The worker has returned to work which is different to that (number of hours worked/ nature of duties performed) which he/she was performing prior to the onset of pain.
5. If you have not yet returned, do you plan to return in future?	***Pattern 5***: (Not yet returned): The worker has been absent from work since onset.

APPENDIX G: Consent to use patterns of employment form

Megan Spavins

From: Marjorie Baldwin [Marjorie.Baldwin@asu.edu]
Sent: 01 February 2011 02:16 AM
To: 'Megan Spavins'
Subject: RE: Return to work outcomes

Megan - There should be no problem with you using our employment patterns so long as you give appropriate credit to the source. I'm glad you find our research helpful.

Marjorie Baldwin
Professor
Department of Economics

From: Megan Spavins [mailto:megan@workcapacity.co.za]
Sent: Sunday, January 30, 2011 12:47 PM
To: Marjorie Baldwin
Subject: Return to work outcomes

Dear Mrs Baldwin,

I have read your journal article "Self-reported Severity Measures as Predictors of Return-to-work Outcomes in Occupational Back Pain" published in J. Occup Rehabil (2007). I am currently doing my master's thesis at the University of Witwatersrand in Johannesburg, South Africa. I am researching the topic of "factors affecting return to work in employees with chronic back pain". I would very much like to use the Patterns of employment as you describe in your article. Would you please give me permission to use the Patterns you describe as defined in your article? This will be of great assistance to me.

Many thanks,

Regards,
Megan

MEGAN SPAVINS
OCCUPATIONAL THERAPIST

TEL: 011 886 3900
FAX (1): 086 530 0275
FAX (2): (011) 326-2968
CELL: 084 556 3983
EMAIL: megan@workcapacity.co.za

WorkWell
WorkWell Certified Practitioner

No virus found in this incoming message.
Checked by AVG - www.avg.com
Version: 8.5.449 / Virus Database: 271.1.1/3413 - Release Date: 01/30/11 19:34:00

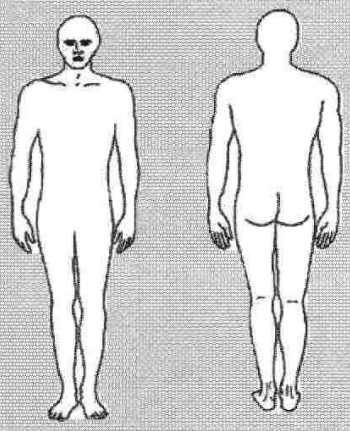
1

APPENDIX H: McGill Pain Questionnaire

(1-10) (11-15) (16) (17-20) (1-20)

1 FLICKERING	11 TIRING	BRIEF
QUIVERING	EXHAUSTING	MOMENTARY
PULSING		TRANSIENT
THROBBING	12 SICKENING	
BEATING	SUFFOCATING	
POUNDING		
2 JUMPING	13 FEARFUL	
FLASHING	FRIGHTFUL	
SHOOTING	TERRIFYING	
3 PRICKING	14 PUNISHING	
BORING	GRUELLING	
DRILLING	CRUEL	
STABBING	VICIOUS	
LANCINATING	KILLING	
4 SHARP	15 WRETCHED	
CUTTING	BLINDING	
LACERATING		
5 PINCHING	16 ANNOYING	
PRESSING	TROUBLESOME	
GNAWING	MISERABLE	
CRAMPING	INTENSE	
CRUSHING	UNBEARABLE	
6 TUGGING	17 SPREADING	
PULLING	RADIATING	
WRENCHING	PENETRATING	
	PIERCING	
7 HOT	18 TIGHT	
BURNING	NUMB	
SCALDING	DRAWING	
SEARING	SQUEEZING	
	TEARING	
8 TINGLING	19 COOL	
ITCHY	COLD	
SMARTING	FREEZING	
STINGING		
9 DULL	20 NAGGING	
SORE	NAUSEATING	
HURTING	AGONIZING	
ACHING	DREADFUL	
HEAVY	TORTURING	
10 TENDER	PPI	
TAUT	0 NO PAIN	
RASPING	1 MILD	
SPLITTING	2 DISCOMFORTING	
	3 DISTRESSING	
	4 HORRIBLE	
	5 EXCRUCIATING	

BRIEF	RHYTHMIC	CONTINUOUS
MOMENTARY	PERIODIC	STEADY
TRANSIENT	INTERMITTENT	CONSTANT



E = EXTERNAL
I = INTERNAL

COMMENTS:

The descriptors fall into four major groups: sensory, 1 to 10; affective, 11 to 15; evaluative, 16; and miscellaneous, 17 to 20. The rank value for each descriptor is based on its position in the word set. The sum of the rank values is the pain rating index (PRI). The present pain intensity (PPI) is based on a scale of 0 to 5. Copyright © 1970 Ronald Melzack.

APPENDIX I: Tampa Scale for Kinesiophobia

SUBJECT NUMBER: _____
(Original version Miller RP, Kori SH, Todd DP, 1991)
Strongly disagree = 1 Disagree = 2 Agree = 3 Strongly agree = 4

1. I am afraid that I might injure myself if I exercise	1	2	3	4
2. If I were to try to overcome it, my pain would increase	1	2	3	4
3. My body is telling me I have something dangerously wrong.	1	2	3	4
4. My pain would probably be relieved if I were to exercise	1	2	3	4
5. People are not taking my medical condition seriously enough	1	2	3	4
6. My accident has put my body at risk for the rest of my life	1	2	3	4
7. Pain always means I have injured my body	1	2	3	4
8. Just because something aggravates my pain does not mean it is dangerous	1	2	3	4
9. I am afraid that I might injure myself accidentally	1	2	3	4
10. Simply being careful that I do not make any unnecessary movements is the safest thing I can do to prevent my pain from worsening	1	2	3	4
11. I would not have this much pain if there were not something potentially dangerous going on in my body	1	2	3	4
12. Although my condition is painful, I would be better off if I were physically active	1	2	3	4
13. Pain lets me know when to stop exercising so that I do not injure myself	1	2	3	4
14. It is really not safe for a person in my condition to be physically active	1	2	3	4
15. I cannot do all the things normal people do because it is too easy for me to get injured.	1	2	3	4
16. Even though something is causing me a lot of pain, I don't think it is actually dangerous	1	2	3	4
17. No one should have to exercise when she /he is in pain	1	2	3	4

APPENDIX J: Hospital Anxiety and Depression Scale (HADS)

SUBJECT NUMBER: _____

This questionnaire is designed to help the evaluator to know how you feel. Read each item below and underline the reply which come closes to how you have been feeling in the past week. Ignore the numbers printed at the edge of the questionnaire. Don't take too long over your replies; your immediate reaction to each item will probably be more accurate than a long, thought-out response.

A	D			A	D
		I feel tense or "wound up"	**I feel as if I am slowed down**		
3		Most of the time	Nearly all the time		3
2		A lot of the time	Very often		2
1		From time to time, occasionally	Sometimes		1
0		Not at all	Not at all		0
		I still enjoy the things I used to enjoy	**I get a sort of frightened feeling like "butterflies" in the stomach**		
	0	Definitely as much			
	1	Not quite so much	Not at all	0	
	2	Only a little	Occasionally	1	
	3	Hardly at all	Quite often	2	
			Very often	3	
		I get a sort of frightened feeling as if something awful is about to happen	**I have lost interest in my appearance**		
			Definitely		3
3		Very definitely and quite badly	I don't take as much care as I should		2
2		Yes, but not too badly	I may not take quite as much care		1
1		A little, but it doesn't worry me	I take just as much care as ever		0
0		Not at all			
		I can laugh and see the funny side of things	**I feel restless as if I have to be on the move**		
	0	As much as I always could	Very much indeed	3	
	1	Not quite as much now	Quite a lot	2	
	2	Definitely not so much now	Not very much	1	
	3	Not at all	Not at all	0	
		Worrying thoughts go through my mind	**I look forward with enjoyment to things**		
3		A great deal of the time	As much as I ever did		0
2		A lot of the time	Rather less than I used to		1
1		Not too often	Definitely less than I used to		2
0		Very little	Hardly at all		3
		I feel cheerful	**I get sudden feelings of panic**		
	3	Never	Very often indeed	3	
	2	Not often	Quite often	2	
	1	Sometimes	Not very often	1	
	0	Most of the time	Not at all	0	
		I can sit at ease and feel relaxed	**I can enjoy a good book or radio or television program**		
0		Definitely			
1		Usually	Often		0
2		Not often	Sometimes		1
3		Not at all	Not often		2
			Very seldom		3

APPENDIX K: World Health Organization Quality of Life Assessment Instrument (WHOQO –BREF)

WHOQOL–BREF

UK VERSION



Department of Mental Health

World Health Organisation

Geneva

For Office Use Only

	Equations for computing domain scores	Raw score	Transformed score	
			4-20	0-100
Domain 1	(6-Q3) + (6-Q4) + Q10 + Q15 + Q16 + Q17+ Q18 □ + □ + □ + □ + □ + □ + □	=		
Domain 2	Q5 + Q6 + Q7 + Q11 + Q19 + (6-Q26) □ + □ + □ + □ + □ + □	=		
Domain 3	Q20 + Q21 + Q22 □ + □ + □	=		
Domain 4	Q8 + Q9 + Q12 + Q13 + Q14 + Q23 + Q24 + Q25 □ + □ + □ + □ + □ + □ + □ + □	=		

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ABOUT YOU

Before you begin we would like you to answer a few general questions about yourself: by **circling** the correct answer or by **filling in the space provided**.

What is your gender? **MALE / FEMALE**

What is your date of birth? ____/___/_____. (day/month/year.)

What is the highest education you've received?
None at all
Primary school
Secondary school
Tertiary

What is your marital status?
Single **Separated**
Married **Divorced**
Living as married **Widowed**

Are you currently ill? **YES / NO**

If something is wrong with your health what do you think it is?
Please write your illness(s) or problem here:_____
_____

Instructions

This questionnaire asks how you feel about your quality of life, health and other areas of your life. **Please answer all the questions**. If you are unsure about which response to give to a question, **please choose the ONE** that appears most appropriate. This can often be your first response.

Please keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life **in the last two weeks**. For example, thinking about the last two weeks, a question might ask:

		Not at all	Not much	Moderately	A great deal	Completely
	Do you get the kind of support from others that you need?	1	2	3	4	5

You should **circle** the number that best fits how much support you got from others **over the last two weeks**. So you would circle the number 4 if you got a great deal of support from others as follows:

		Not at all	Not much	Moderately	A great deal	Completely
	Do you get the kind of support from others that you need?	1	2	3	4	5

You would circle the number 1 if you did not get any of the support that you needed from others in the last two weeks. Please read each question, assess you feelings, and **circle** the number on the scale for each question that gives the best answer for you.

		Very poor	Poor	Neither poor nor good	Good	Very good
1	How would you rate your quality of life?	1	2	3	4	5

		Very Dissatisfied	Dissatisfied	Neither Satisfied nor Dissatisfied	Satisfied	Very Satisfied
2	How satisfied are you with your health?	1	2	3	4	5

The following questions ask about **how much** you have experienced certain things **in the last two weeks.**

		Not at all	A little	A moderate amount	Very much	An extreme amount
3	How much do you feel that pain prevents you from doing what you need to do?	1	2	3	4	5
4	How much do you need medical treatment to function in your daily life?	1	2	3	4	5
5	How much do you enjoy life?	1	2	3	4	5

		Not at all	A little	A moderate amount	Very much	Extremely
6	To what extent do you feel life to be meaningful?	1	2	3	4	5
7	How well are you able to concentrate?	1	2	3	4	5
8	How safe do you feel in your daily life?	1	2	3	4	5
9	How healthy is your physical environment?	1	2	3	4	5

The following questions ask about **how completely** you experience or were able to do certain things **in the last two weeks**.

		Not at all	A little	Moderately	Mostly	Completely
10	Do you have enough energy for everyday life?	1	2	3	4	5
11	Are you able to accept your bodily appearance?	1	2	3	4	5
12	To what extent do you have enough money to meet your needs?	1	2	3	4	5
13	How available to you is the information that you need in your day-to-day life?	1	2	3	4	5
14	To what extent do you have the opportunity for leisure activities?	1	2	3	4	5

The following questions ask you to say **how good or satisfied** you have felt about various aspects of your life **over the last two weeks**.

		Very poor	Poor	Neither poor nor good	Good	Very good
15	How well are you able to get around?	1	2	3	4	5

		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
16	How satisfied are you with your sleep?	1	2	3	4	5
17	How satisfied are you with your ability to perform daily living activities?	1	2	3	4	5
18	How satisfied are you with your capacity for work?	1	2	3	4	5
19	How satisfied are you with yourself?	1	2	3	4	5
20	How satisfied are you with your personal relationships?	1	2	3	4	5
21	How satisfied are you with your sex life?	1	2	3	4	5
22	How satisfied are you with the support you get from your friends?	1	2	3	4	5
23	How satisfied are you with the conditions of your living place?	1	2	3	4	5
24	How satisfied are you with your access to health services?	1	2	3	4	5
25	How satisfied are you with your transport?	1	2	3	4	5

The following question refers to **how often** you have felt or experienced certain things **in the last two weeks**.

		Never	Seldom	Quite often	Very often	Always
26	How often do you have negative feelings, such as blue mood, despair, anxiety, depression?	1	2	3	4	5

Did someone help you to fill out this form? **YES** / **NO**

THANK-YOU FOR YOUR HELP

APPENDIX L: WHOQOL-BREF Domains

SUBJECT NUMBER: _____

Domain	Facets incorporated within domains
1. Physical health	Activities of daily living Dependence on medicinal substances and medical aids Energy and fatigue Mobility Pain and discomfort Sleep and rest Work capacity
2. Psychological	Bodily image and appearance Negative feelings Positive feelings Self-esteem Spirituality/Religion/personal beliefs Thinking, learning, memory and concentration
3. Social relationships	Personal relationships Social support Sexual activity
4. Environment	Financial resources Freedom, physical safety and security Health and social care: accessibility and quality Home environment Opportunities for acquiring new information and skills Participation in and opportunities for recreation/leisure activities Physical environment (pollution/noise/traffic/climate) Transport

APPENDIX M: Job Demands Questionnaire

Job Title_____

1) How many hours per week do you usually work on this job? _____

2) Work postures: For this job, fill in the hours per day that you usually work in the following postures:

	Max at 1 time	Total hours
- sitting down (office, car, truck, etc.)	_____	_____
- standing (at a counter, at a machine, etc.)	_____	_____
- walking while carrying less than 10kg	_____	_____
- walking while carrying more than 10kg	_____	_____

3) How often do you have to kneel or crawl in your work?

( )	( )	( )	( )	( )
Not at all (never)	**rarely (less than 1/10 of the time)**	**occasionally (less than 1/3 the time)**	**frequently (1/3 to 2/3 of the time)**	**constantly (more than 2/3 of the time)**

4) How often do you have to lie down (e.g., as an auto mechanic) in your work?

( )	( )	( )	( )	( )
Not at all (never)	**rarely (less than 1/10 of the time)**	**occasionally (less than 1/3 the time)**	**frequently (1/3 to 2/3 of the time)**	**constantly (more than 2/3 of the time)**

5) How often do you have to squat or remain bent or twisted at the hips in your work?

( )	( )	( )	( )	( )
Not at all (never)	**rarely (less than 1/10 of the time)**	**occasionally (less than 1/3 the time)**	**frequently (1/3 to 2/3 of the time)**	**constantly (more than 2/3 of the time)**

6) How often do you do work which caused vibrations to your whole body?

( )	( )	( )	( )	( )
Not at all (never)	**rarely (less than 1/10 of the time)**	**occasionally (less than 1/3 the time)**	**frequently (1/3 to 2/3 of the time)**	**constantly (more than 2/3 of the time)**

7) Do you have to operate a foot pedal

( )	( )	( )	( )	( )
Not at all (never)	**rarely (less than 1/10 of the time)**	**occasionally (less than 1/3 the time)**	**frequently (1/3 to 2/3 of the time)**	**constantly (more than 2/3 of the time)**

8) On this job, how often do you lift:

	Not at all	Rarely	Occasionally	Frequently	Constantly
4.5 – 10kg					
10kg – 23kg					
23kg – 45kg					
More than 45kg					

9) On this job, how often do you carry:

	Not at all	Rarely	Occasionally	Frequently	Constantly
4.5 – 10kg					
10kg – 23kg					
23kg – 45kg					
More than 45kg					

10) How often do you jump from one level to another (e.g. jumping down from a truck cab or from a loading dock?

( )	( )	( )	( )	( )
Not at all (never)	**rarely (less than 1/10 of the time)**	**occasionally (less than 1/3 the time)**	**frequently (1/3 to 2/3 of the time)**	**constantly (more than 2/3 of the time)**

11) About how often per day do you climb a flight of steps on this job?

( )	( )	( )	( )	( )
Not at all (never)	**rarely (less than 1/10 of the time)**	**occasionally (less than 1/3 the time)**	**frequently (1/3 to 2/3 of the time)**	**constantly (more than 2/3 of the time)**

12) Five ratings of physical demands are described below. Please mare the one which best describes your job.

☐ Sedentary **Sometimes I stand or walk, but I sit down most of the time. Occasionally I lift up to a 4.5kg load.**

☐ Light **Any of the following**

- **I walk or stand more than one third of the time**
- **I often lift up to 4.5kg**
- **I sit down, but often work a foot pedal**

☐ Medium **I often lift up to 9kg, or sometimes up to 23kg**

☐ Heavy **I often lift up to 23kg, or sometimes up to 45kg**

☐ Very Heavy **I often lift over 23kg, or sometimes over 45kg**

APPENDIX N: PILE Assessment Protocol

Materials needed for the test include the following:

- A plastic crate measuring 42cm x 24cm x 30cm and of negligible weight.
- Sturdy shelving measuring 46cm x 92cm. Shelves are placed one above the other at heights of 0.75m and 1.37m above the floor. The shelves need to be very securely fastened to the wall.
- Polar heart rate monitor.
- 20 unmarked weights of 2.25kg
- 10 unmarked weights of 4.5kg

Fit the heart rate monitor:

The Polar heart rate monitor is placed on the participant's chest and the watch on their wrist, according to the manufacturer's specifications. The use of the heart rate monitor was explained to the participant and any reassurance was provided. A resting heart rate is taken. The maximum safe heart rate was established using the formula 220 – age x 85%.

Lifting

This test comprises of two types of lifting. The first is lifting a weight from floor to waist height and the second is lifting from waist to crown height.

The participant is provided with demonstration of the requirements of the task, with emphasis on the correct body mechanics for appropriate lifting.

Floor to waist lift

For the first type of lift, a weight is placed in a plastic milk type crate on the floor. The participant is required to lift the crate from the floor and place it on a shelf at waist height. The participant then lifts the weighted crate from the shelf and places it back on the floor. A 4kg weight is place in the crate for men and 2.25kg is placed in the crate for women for the first set of 4 lifts. The participant lifts the crate using their hands to grip the handles. The participant is provided with demonstration of the requirements of the task, with emphasis on the correct body mechanics for appropriate lifting. The participant lifts a weighted crate from the floor to a shelf 0.75m above the floor level and then places the crate back on the floor (i.e. floor to approximately waist height). Participants perform 4 lifts of the same weight from floor to waist within 20 seconds. If the participant meets the safety requirements and agrees to continue with further testing, an additional 4.5kg (for men) or 2.25kg (for women) is then added to the crate. A new series of lifting, with the relevant increase in weight begins after 20 seconds of rest. The floor to waist lift is then again repeated four times with the increased weight. Additional weights are added to the crate in increments of 4.5kg or 2.25kg until the criterion for safe maximum performance is reached.

The weights are unmarked. The participant is not told what the weight in the crate amounts to. Weight increments of 4.5kg for men and 2.25kg for women are used until a criterion for maximum performance was reached.



Figure 6-1 Floor to waist lift

The model depicted in these photographs was not a study participant. Consent was obtained to use these photographs for the purpose of demonstration in this study.

Safe Maximum Performance:

Safe maximum performance was determined using the following criteria:

- Participant wishes to terminate test (psychophysical end point)
- 85% of maximum age related heart rate is reached (i.e. 85% x (220 – age) (aerobic end point)
- Weight ceiling is reached (participant should not lift more than 40kg)
- Speed of lifting is not maintained (i.e. cannot lift the weight 4x in 20 seconds)
- Acceptable maximum effort
- Lifting becomes unsafe (safety end point) (133)

The participant's safety is of primary concern during the performance of these lifting tasks. If it is determined that the participant is no longer safe to continue with the task, the exercise is terminated. The following signs of increased effort are used in judging when participants have reached safe maximal levels:

- Muscle bulging of prime movers
- Involuntary use of accessory muscles
- Altered body mechanics including counterbalancing or use of momentum
- Loss of equilibrium
- Increased base of support
- Decreased efficiency and smoothness of movement
- Cardiovascular signs, including hear rate and breathing patterns
- Peripheralization of radicular or referred symptoms(152).

Measured outcome

The measured outcome is the number of kilograms lifted in the final set of lifts. After each set of lifts, observations related to body mechanics and heart rate is recorded.

Waist to crown lift

For the second type of lift, the test is repeated but this time the weighted crate is lifted from waist to crown height (0.75m – 1.37m). The lifts are started with the crate loaded with a 4.5kg weight for men and 2.25kg for women. The participant is required to lift the weighted crate from a shelf placed at a height of 0.75m from the floor, to a higher shelf at a height of 1.37m from the floor. The shelves are positioned one above the other, securely fastened to the wall. The lifts are performed with the hands placed on the handles of the crate. Lifting the crate and placing it on a shelf at a height of 1.37m takes the hands on the handles to approximately crown height. The same criteria for safe maximum performance are determined as per above.



Figure 6-2 Waist to crown lift

The model depicted in these photographs was not a study participant. Consent was obtained to use these photographs for the purpose of demonstration in this study.

As a standard instruction, the participants were told to discontinue the test if they had a significant increase in pain or other discomfort. By doing this, together with the objective signs observed by the therapist as noted above, the participant's safety was allowed for. Participants should be advised they may experience some muscular discomfort in the day or two following the evaluation as a result of the unfamiliar exercise.

APPENDIX O: Pile Assessment Score Sheet

SUBJECT NUMBER: _____
Age: _____ Weight: _____

Height: _____

Target heart rate: _____ Heart rate achieved: _____

Test	**Total time (20 sec x no. of repetitions)**	**Total weight lifted**
Lumbar (0 – 76cm)		
Cervical (76cm – 137cm)		

End Point

Psychophysical	Aerobic end point	Safety end point (55% of body weight)

APPENDIX P: Functional Activities Screening Test (FAST)

Materials needed for this test include the following:

- A number of nuts and bolts,
- 3 small plastic containers,
- A shelf adjustable to participant's waist height as well as to the participant's maximum reach.

The five tests are as follows:

1. ***The 5-min test of repetitive stooping (stoop5)***. The participant performs this task in a standing position. It is essentially a task requiring the participant to repeatedly bend over forward, retrieve an item from the floor and reach up and place it in a container overhead.

   The participant is required to pick up small bolts from a plastic container on the floor and place them into another container placed at maximum reach. The height of the shelf is adjusted to the participant's maximum reach without requiring the participant to stand on his or her toes. A stopwatch is used to record the time and the participant is not notified of the time until the 5-min completion time is met. The participant stooped repeatedly at his or her own speed but once he or she stopped, the test ended.

   The instructions to the participant are as follows:

   "For this 5 minute test, stand in front of this overhead shelf. When I say "start", bend forward at the waist and hips, with very little knee bending, pick up a bolt from the container, then straighten up and reach overhead to put it in the empty container on

the overhead shelf. It is best if you can alternate hands, first one hand, then the other. Are there any questions? Start."

If the participant asked to stop or spontaneously stops before five minutes are up, the time is noted and the participant is told "Thank you", or "Yes you may stop", or some such statement of agreement. Otherwise, at the end of 5 minutes, they are told to stop.



Figure 6-3 Alternating stoop test of the FAST

2. ***The 5-min repetitive twisting test (twist5)***. The shelf is lowered to the participant's waist level. An empty bolt container is placed on the centre of the shelf. Two small tables are placed at each side of the participant, adjusted so they are the same height as the shelf in front of them (should be as close to the participant's waist height as possible). A full bolt container is placed on each of the side tables. The participant is positioned in standing, facing the front shelf. The participant is then instructed:

“For this 5 minute test, please stand facing the shelf. The bolt containers on the side tables should be right beside you, not slightly in front or behind.

When I say “Start”, turn to the left, using your right hand to pick up a nut/bolt combination, turn to the front again and place it in one of the containers on the shelf in front of you. Then turn to the right, and use your left hand to pick up a bolt and place it in a tray. Are there any questions? Start.”

If the participant is asked to stop before five minutes were up, the time is noted and the participant is told “Thank you”, or “Yes you may stop”, or some such statement of agreement. Otherwise, at the end of 5 minutes, tell the participant to stop.



Figure 6-4 Twisting test of the FAST

3. ***The 2-min test of kneeling (kneel2)***. A container of bolts is placed on the floor. The participant is positioned kneeling directly in front of the container.

   The following instructions are given:

   "When I say start, please kneel on one or both knees, and fasten the nuts and bolts while I time you. Ready? Start".

   If the participant asks to stop before two minutes are up, the time is told "Thank you", or "Yes you may stop", or some such statement of agreement. Otherwise, at the end of 2 minutes, the participant is told "You may stop. Please stand."

   The nuts and bolts assembly is simply a diversionary task whilst the participant holds the kneeling position. The test is terminated at the first of the participant no longer being able to maintain the kneeling position or the completion of the 2 minutes.



Figure 6-5 Kneeling test of the FAST

4. ***The 2-min squatting test (squat 2)***. The participant squatted down (attained a comfortable position that was not kneeling, in which the buttocks was lower than the shoulders) and fastens nuts and bolts for up to 2 minutes. The examiner says:

   "When I say start, please squat, and fasten the nuts and bolts while I time you. Ready? Start". If the participant asks to stop before two minutes are up, the time is noted and the examiner said "Thank you", or "Yes you may stop", or some such statement of agreement. Otherwise, at the end of 2 minutes, the examiner says: "You may stop. Please stand."



Figure 6-6 Squat test of the FAST

5. ***The 2-min stooping test (stoop2)***. The container of nuts and bolts is placed on the floor. The participant bends forward, standing in front of the container of nuts and bolts. The participant bends at the waist with the spine flexed forward (knees could be slightly bent) and fastens nuts and bolts for up to 2 minutes. The examiner states:

"When I say start, bend over at the waist, with very little knee bending, and fasten the nuts and bolts while I time you. Ready? Start."

If the participant asks to stop before two minutes were up, the time is noted and the participant is told "Thank you", or "Yes you may stop", or some such statement of agreement. Otherwise, at the end of 2 minutes the participant is told "You may stop. Please stand."

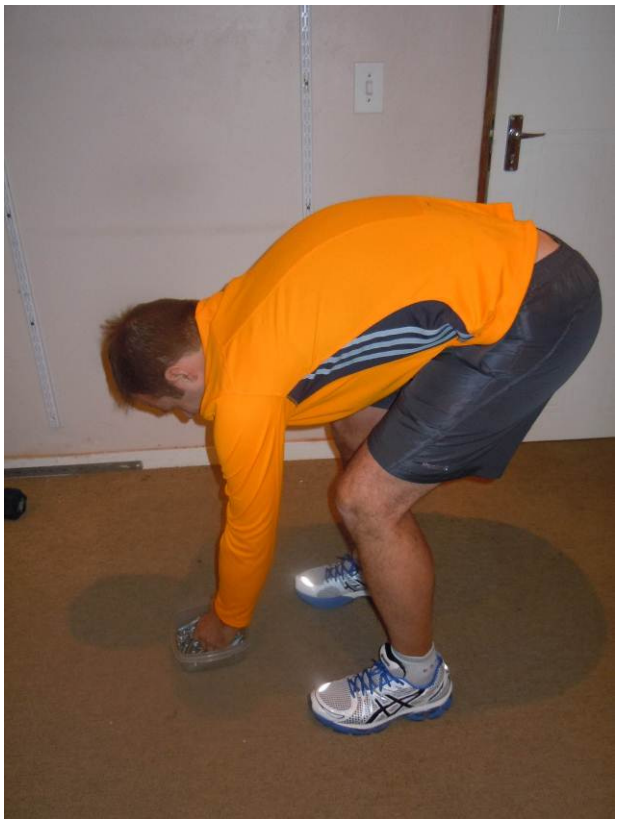

Figure 6-7 Static stoop test of the FAST

For each test, a stopwatch records the time from the moment the participant correctly assumed the position. The test was considered complete when the participant requested to stop or after the full 2 or 5 minutes, depending on the test, had passed. A test score of 0 is recorded if the participant attempted but was unable to perform the test position in each case. If the participant is able to perform the test position the test score comprises the time in minutes and seconds and should be recorded as such.

APPENDIX Q: FAST assessment score sheet

SUBJECT NUMBER: _____

	Stoop (5 min)	**Twist (5 min)**	**Kneel (2 min)**	**Stoop (2 min)**	**Squat (2 min)**
Completed test (Time in mins & secs)					
Attempted but did not complete (time)					
Attempted but did not take test					