

Humberto Manuel Oraison

(1516187)

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Department of Psychology, College of Arts

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### **Abstract**

- I. Back pain is a major health problem in the Western World impacting on individuals, their families and the whole society. Back pain causes significant economic costs due to health expenses and absenteeism from work. Most cases of back pain respond well to treatments and are resolved within weeks. However, some individuals do not respond well to medical treatments and experience persistent back pain that becomes chronic in nature. Chronic back pain is characterised by its duration and its poor response to medical interventions. The literature researched indicated that in most cases the experience of chronic back pain is heavily influenced by psychosocial factors, which impact on individuals more than the original injury or disease. There is limited literature in relation to biopsychosocial factors and treatment up-take. The aim of this study was to explore the impact of biopsychosocial factors in the experience of chronic back pain. It was hypothesised that biopsychosocial factors would have an impact on the number of treatments received and the level of disability reported. A total of 201 adult participants (men and women) completed a battery of questionnaires that collected demographic information, psychological distress, social support, pain levels and disability scores. The findings indicated that psychosocial factors had a greater impact on the number of treatment sessions and reported disability than level and/or duration of pain. Education level was the strongest marker for both hypotheses with tertiary educated participants reporting significantly higher numbers of treatment sessions and lower disability scores. The findings of this study supported the Biopsychosocial Model of Health and the Theory of Social

Causation. In addition, the findings supported previous research that advocated that a diagnosis of chronic back pain is a unique condition different from acute or temporary pain. Furthermore, the findings supported the creation of new diagnostic and measurement tools for chronic back that include psychological and social measures in addition to biological indicators. Finally, the findings offered renewed backing for interdisciplinary approaches to the treatment of chronic back pain in light to its multifaceted nature.

## Living with Back Pain; a Biopsychosocial Analysis of Contributing Factors

### Doctor of Philosophy Declaration

“I, Humberto Manuel Oraison, declare that the Ph.D. thesis titled ‘Living with Back Pain: A Biopsychosocial Analysis of Contributing Factors’ is no more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references, and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.”

Signature:

Date:

## **Preface**

Pain is a personal and private sensation of hurt, a harmful stimulus or a series of responses that protect the body from harm (Sternbach, 1968). The complexity of this pain definition indicates the multifactorial nature of pain. Although two individuals may suffer a very similar injury resulting in practically identical anatomical damage, their experience of pain and resultant incapacity can be vastly different (Simon, Elrich & Sawin, 2002). There are many classifications of pain types. In terms of duration, the most accepted categories include acute pain (present for a period of fewer than six months) and chronic pain (present beyond the six mark period) (Melzack & Wall, 1965, Sternbach and Waddell, 2004).

One of the most commonly reported sources of pain arises from the back. Fortunately, most cases of acute back pain improve within one month of onset (Pengel et al., 2003). In a European study lifetime prevalence was estimated at anything from 59% to 90% and the incidence of lower back pain (LBP) in any one year at 5% (Hermans, 2000). However, a third of sufferers reported persistent back pain one year after an acute episode, and 20% of these report a substantial limitation in activity. Back pain is a major health concern in Western Countries with a lifetime prevalence of 70-95% according to different studies (Deyo, 2006; Cassidy et al, 1998; Walker, 2000). Waddell (1987) and Pengel (2003) concluded that most people will experience back pain sometime in their lives, with 6 to 10% suffering disabling persistent pain.

While most diagnostic procedures and treatments appear to address issues of acute back pain there has been limited success in dealing with persistent back pain. Chronic pain is now also considered a condition and not just a symptom. It is characterized by the failure to respond to traditional therapies such as surgery, medication, rest, physiotherapy or other treatments (Bakal, 1996).

Since back pain represents such a common problem in modern society, it is important to consider any relationship between chronicity and intensity of pain. Intensity of pain has not been found to be a marker of duration or chronicity. In fact people suffering from chronic back pain may be experiencing debilitating levels of discomfort on a daily basis. Similarly, high levels of acute pain do not predict depression or disability. Interestingly, however, socio-cultural factors have been found to contribute to the transition from acute to chronic back pain. Furthermore, it has also been found that disability is predictive of subsequent depressive symptoms, and in chronic sufferers high disability predicts persisting pain intensity, while high depressive symptoms predict continued disability (Epping-Jordan, et al., 1998; Deyo, 2006). Thus, the interplay between chronic back pain and factors such as socio-cultural circumstance, disability and mood is complex.

A number of studies have found that lower socio-economic status (SES) is associated with chronic back pain (De Moraes-Vieira et al., 2014; Hagen et al, 2005; Keeley et al., 2008; Kuijer et al 2006; Yilmaz and Dedeli, 2012). The concept of socio-economic status includes a series of indicators such income, level of education, type of employment and employment status. Many researchers have utilised these factors independently and found that education appeared to be the most stable and reliable indicator. However, they also identified problems with multicollinearity as variables such as income, educational level; employment and status clearly have a high degree of association. This association is demonstrated by the fact that participants with less than 12 years of education are more likely to be unemployed and to be of lower socio-economic status (Keeley et al., 2008). These methodological difficulties may alter or bias research outcomes and these implications must be taken into account when studies use such variables. Nevertheless, there appears to be a general agreement in the

literature about the association between low socio-economic status (SES) and poor health, including chronic back pain

Although SES clearly contributes to the experience of pain, social support is one of the most important factors predicting physical health and wellbeing. Many authors describe social support as a “buffer” for pain and disability (Clark, 2005; Kawi, 2014; Kerns, Rosemberg and Otis, 2002; Oliveira et al., 2015 and Thomten, Soares and Sundin, 2011). Higher levels of psychological distress together with lower levels of social support have been found not only to predict poorer physical health, but more precisely to be associated with intensity and chronicity of back pain. There is a wide agreement in the literature about the relationship between psychological distress, social support and chronic back pain. Most studies, however, cannot specify the causal direction between these factors (Ackerman & Stevens, 1989; Brox et al., 2005; Dickens, Jayson, Sutton & Creed, 2000; Grotle et al., 2006; Kinky, Gatchel, Polatin et al., 1993; Main, Wood, Hollis, et al., 1992; Romano & Turner, 1985).

Culture significantly affects the assessment and management of pain as well as the individual’s treatment seeking behaviour (Davidhizar, et al. 2004). Many studies have found that migrants and non-native speakers face higher levels of health challenges and have poorer health outcomes in comparison with local populations (Bui, Doescher, Takeuchi & Taylor, 2011; Gray, 2006; and Walker, 1995)

The existing literature has established a relationship between biopsychosocial (BPS) factors and chronic back pain. In fact, many studies have focussed on determining markers of chronicity and disability for a range of factors with limited success. The aims of this study were; first; to confirm the relationship between psychosocial factors and chronic back pain in an Australian based sample, gain a better understanding of the interactions of these BPS factors in the experience of the chronic back pain sufferer, and finally investigate the

influence that these factors have in the recovery and/or the perpetuation of the pain. In relation to the latter there was a focus on the treatments received by participants and how the access to and number of treatments was influenced by BPS factors. Gaining a further understanding of the relationship between these factors and treatments may assist in explaining the nature of the relationship between these factors and chronic back pain and subsequent disability. Previous attempts to establish a causal association between these factors with disability have been unsuccessful. The influence of BPS factors on an individual's participation in treatments may hold the key to determine the final outcome in terms of chronicity and disability. The emphasis of this study lay in explaining the mechanisms of the chronic back pain rather than focussing on finding a causal relationship between BPS factors and chronic back pain.

This study was conducted within the theoretical framework of the BPS Model of Health and its multifaceted approach to chronic back pain. Previous research has demonstrated the relevance of this model for chronic conditions and the shortcomings of the Medical Model of Health in this area (Engel, 1977; Gatchel, 2004 and Gatchel, 2007). The emphasis of this analysis will be located within in a deeper understanding of how treatments or lack thereof may lead to disability.



Table of Contents

<b>Abstract.....</b>	<b>ii</b>
<b>Preface.....</b>	<b>v</b>
<b>Table of Figures.....</b>	<b>xiv</b>
<b>1. Literature Review.....</b>	<b>1</b>
<b>1. 1 Health and Health Models .....</b>	<b>1</b>
1.1.1 The Medical Model.....	1
1.1.2 The Biopsychosocial Model.....	2
1.1.3 Social Causation Theory. ....	5
<b>1.2 Pain.....</b>	<b>10</b>
1.2.1 Definition of Pain.....	10
1.2.2 Aspects of Pain. ....	13
1.2.3 Chronic Pain Considerations.....	17
1.2.4 Lower Back Pain.....	20
1.2.5 Prevalence of Back Pain. ....	21
1.2.6 Cost of Back Pain.....	29
1.2.7 Assessing Back Pain. ....	30
<b>1.3 The Human Back.....</b>	<b>31</b>
1.3.1 Anatomy.....	31
1.3.2 Physiology.....	32
1.3.3 Pathology. ....	33
1.3.4 Diagnosis of back pain and back conditions. ....	37
1.3.5 Treatment of back pain. ....	41
1.3.6 Access to treatments.....	50
<b>1.4 Socio-demographic contributors to Chronic Back Pain .....</b>	<b>53</b>

Living with Back Pain; a Biopsychosocial Analysis of Contributing Factors	
1.4.1 Age.....	55
1.4.2 Sex. ....	57
1.4.3 Socio-economic Status.....	65
1.4.4 Social Support.....	74
1.4.5 Living arrangements. ....	81
1.4.6 Culture and ethnicity.....	82
<b>1.5 Psychological Contributors of Chronic Back Pain .....</b>	<b>83</b>
1.5.1 Mental Health and Chronic Low Back Pain.....	83
1.5.2 Depression.....	84
1.5.3 Depression and Chronic Back Pain.....	91
<b>1.6 Functionality .....</b>	<b>94</b>
1.6.1 Assessing Functionality .....	95
1.6.2 Pain and Functionality .....	95
1.6.3 Psychosocial Factors, Pain and Functionality .....	96
1.6.4 Pain and Disability. ....	97
<b>1.7 Overview of the variables and Aims .....</b>	<b>98</b>
<b>1.8 The Current Study .....</b>	<b>102</b>
2. Method.....	103
<b>2.1 Participants.....</b>	<b>103</b>
<b>2.2 Materials .....</b>	<b>105</b>
2.2.1 Depression Anxiety Stress Scales. (DASS) .....	105
2.2.2 McGill Pain Questionnaire. (SF-MPQ).....	107
2.2.3 West Haven-Yale Multidimensional Pain Inventory (WHYMPI). ....	109
2.2.4 Oswestry Low Back Pain Questionnaire. (ODQ) .....	110
2.2.5 Demographic Data Collection Questionnaire. ....	110
<b>2.3 Procedure .....</b>	<b>111</b>

2.4 Identification of variables .....	112
3. Results .....	115
3.1 Data Screening.....	115
3.2 Outliers.....	115
3.3 Normality .....	116
3.4 Variable transformations.....	116
3.5 Reliability Analysis.....	117
3.6 Descriptive Statistics .....	118
3.7 Analysis of means ( <i>t</i> -tests and Analyses of Variance, ANOVAs).....	121
3.8 Correlation Analyses .....	141
3.9 Linear Regressions .....	143
3.10 Path Analysis .....	148
3.10.1 Data Screening .....	150
3.10.2 Model fit indices for Initial Model. ....	152
3.10.3 Model fit indices for the Second Model.....	156
4. Discussion .....	159
4.1 Overview of the hypotheses .....	159
4.2 First hypothesis Number of Treatments.....	159
4.2.1 Age.....	160
4.2.2 Sex. ....	163
4.2.3 Income. ....	164
4.2.4 Occupational Status.....	166
4.2.5 Employment Type.....	169
4.2.6 Level of Education. ....	170

## Living with Back Pain; a Biopsychosocial Analysis of Contributing Factors

4.2.7 Social Support.....	172
4.2.8 Living Arrangements. ....	174
4.2.9 First Language Spoken.....	175
4.2.10 Percentage of Life in Australia. ....	176
4.2.11 Depression.....	177
4.2.12 Anxiety.....	179
4.2.13 Life Control.....	180
4.2.14 Affective Distress.....	180
4.2.15 Level of Pain. ....	181
4.2.16 Duration of Pain. ....	181
<b>4.3 Second Hypothesis Level of Disability .....</b>	<b>184</b>
4.3.1 Age.....	184
4.3.2 Sex. ....	186
4.3.3 Income. ....	187
4.3.4 Occupational Status.....	188
4.3.5 Employment Type.....	189
4.3.6 Level of Education. ....	191
4.3.7 Social Support.....	192
4.3.8 Living Arrangements. ....	194
4.3.9 First Language Spoken.....	196
4.3.10 Percentage of Life in Australia. ....	196
4.3.11 Depression.....	198
4.3.12 Anxiety.....	200
4.3.13 Life Control.....	201
4.3.14 Affective Distress.....	204
4.3.15 Level of Pain. ....	204
4.3.16 Duration of Pain. ....	206
4.3.17 Overall number of Treatment Sessions. ....	207
4.3.18 Number of sessions for physical therapies. ....	209

<b>4.4 Strengths and Limitations .....</b>	<b>211</b>
<b>4.5 Applications .....</b>	<b>213</b>
<b>4.6 Recommendations for future research .....</b>	<b>215</b>
<b>4.7 Conclusion.....</b>	<b>215</b>
<b>References .....</b>	<b>221</b>
<b>Appendices .....</b>	<b>244</b>

**Table of Figures**

Table 1.1 Recipients with musculoskeletal and connective tissue primary medical condition by age range and sex at June 2013 (adapted from Department of Human Services Report, 2013). .....	28
Table 2.1 DSP recipients by relationship status and sex at June 2013. (Adapted from Department of Human Services Report, 2013).....	28
Table 3.3 Reliability coefficients of the WHYMPI summary scales, DASS subscales, McGill Pain Questionnaire and the Oswestry Disability Questionnaire. ....	118
Table 4.3 Demographic variables frequencies and percentages. ....	119
Table 5. 3 Number of treatments received by number of participants and percentages of total participants. ....	119
Table 6.3 Means and standard deviations for measures of psychological distress, pain, social support and disability.....	120
Table 7.3 Number of overall sessions for treatments received by sex, level of income, level of education, occupational status, employment type, living arrangements and first language spoken. ....	123
Table 8.3 Level of disability by sex, income, education, occupational status, living arrangements and first language spoken. ....	124
Table 9.3 Number of physical therapy sessions received by sex, level of income, level of education, occupational status, living arrangements and first language spoken.....	124
Table 10.3 Depression scores by sex, level of income, level of education, occupational status, living arrangements and first language spoken.....	127
Table 11.3 Anxiety scores by sex, level of income, level of education, occupational status, living arrangements and first language spoken.....	129

Table 12.3 Life control scores by sex, level of income, level of education, occupational status, living arrangements and first language spoken.....	130
Table 13.3. Affective distress scores by sex, level of income, level of education, occupational status, living arrangements and first language spoken.....	131
Table 14.3. Level social support reported by sex, level of income, level of education, occupational status, living arrangements and first language spoken. ....	132
Table 15.3 ANOVA comparison for three groups of disability levels by, a range of psychosocial factors and treatment participation. ....	134
Table 16.3 ANOVA comparison for three groups of education levels by, age, social support, percentage of life in Australia, depression, anxiety, life control, affective distress, pain, overall number of treatments and number of physical therapies. ....	136
Table 17.3 ANOVA comparison for three groups of depression levels by a range of psychosocial factors, treatment participation and disability. ....	137
Table 18.3 ANOVA comparison for three groups of disability levels by a range of psychosocial factors and treatment participation. ....	141
Table 19.3 Correlation matrix for all markers and dependent variables for multiple regression. ....	142
Table 20.3 Unstandardized Coefficients ( <i>B</i> ), Standardized Coefficient ( $\beta$ ), <i>t</i> Coefficient and <i>p</i> values for significance for a multivariable linear regression for biopsychosocial factors to predict overall number of treatments. ....	145
Table 21.3 Results of regression for markers of disability scores. ....	147
Table 22.3 Minimum and maximum values, skewness with critical ratios (c.r.) and kurtosis with critical ratios (c.r.) for all variables.....	151
Table 23.3 Estimates ( <i>B</i> ), standard errors (SE), estimated coefficients ( $\beta$ ) and critical ratios. ....	154

Table 24.3 Estimates ( $B$ ), standard errors ( $SE$ ), estimated coefficients ( $\beta$ ) and critical ratios ( $C.R.$ ) .....	156
Table 25.3 Direct and indirect effects of markers on disability.....	158



## **1. Literature Review**

### **1. 1 Health and Health Models**

#### **1.1.1 The Medical Model.**

‘Medical Model’ is an imprecise and widely used term. The characteristics of the medical model are rarely specified. The term sometimes refers to the framework of assumptions underpinning the relationship between doctor and patient. However, the term is used mainly in a derogatory manner and often to criticise aspects of modern medical practice and patient care. One problem with this term is that it suggests a uniformity of medical ideas about causation and treatment that do not fit the empirical diversity very well, since most doctors do not focus exclusively on physical factors, even in relation to physical illness. While the biomedical model is considered the epitome of scientific, objective, reproducible medicine, the actual delivery of health care may be somewhat different in practice. The following statements about biomedicine thus represent an idealised, necessarily artificial version of this model (Turk & Gatchel, 1999). Turk and Gatchel (1999) described the medical model with a series of statements. They defined the medical model as a system focussing on the ‘absence of disease’ and functional fitness with services designed to treat ailments and conditions (professionals within institutions to heal the sick). According to these authors, the medical model is “biologically reductionist” as it views health from a narrow physical point of view that diagnoses pathologies and devises treatments to deal with them.

Critics of the biomedical model usually cite the cold and physical nature of biomedical practice, such as focusing on the pathology rather than the patient. Helman (1985) stated that with advancing technology, biomedicine focusses more and more on the body in which the disease is, and causes “Specialists (to) learn more and more about less and less” (Helman, 1985, p. 923). The medical model, which is based on the process of diagnosis, treatment and recovery, has been very effective in the treatment of acute transient pain. In contrast, this

success has been less than optimal in the treatment of chronic pain. The experience of chronic pain is highly influenced by the presence of psychological and social factors. It is only logical that these factors are considered at the time of implementation of treatments to improve patient outcomes. Given that psychological and social factors mediate biological factors in chronic pain, it is essential that multimodal treatments are devised in which all aspects of the experience of pain are considered (Turk & Gatchel, 1999). If the biomedical model characterises the theoretical underpinnings of scientific medicine, the BPS model has replaced it as the model that best characterises contemporary Western health care delivery (Gatchel et al, 2007).

### **1.1.2 The Biopsychosocial Model.**

The biopsychosocial (BPS) model was developed by the late Dr George Engel. The way medical professionals approach sufferers and the symptoms they present with is very much influenced by the conceptual models of which they are often unaware. Until recently, Western medicine has dichotomized scientific facts and subjective experiences as biology versus psychology. George Engel, an internist and practising physician, published a revolutionary and original paper in the journal *Science* in 1977 entitled ‘The Need for a New Medical Model: A Challenge for Biomedicine.’ In the context of clinical medicine, Engel made the deceptively simple observation that actions at the biological, psychological and social level are dynamically interrelated and that these interrelationships affect both the process and outcomes of care. Engel stated: “To provide a basis for understanding the determinants of disease and arriving at rational treatments and patterns of health care, a medical model must also take into account the patient, the social context in which he lives and the complementary system devised by society to deal with the disruptive effects of illness, that is, the physician role and the health care system. This requires a BPS model” (Engel, 1977, p. 133).

The BPS perspective involves an appreciation that disease and illness do not manifest themselves only in terms of pathophysiology, but also may impact upon multiple levels of functioning. These levels of functioning may include the physiological and psychological functioning of the patient, but also extend out to influence the family and even society at large. This model provides a broader understanding of disease processes as encompassing multiple levels of functioning including the effect of the physician-patient relationship (Engel, 1977). Medicine practised within a BPS framework acknowledges the links between socio-economic deprivation and adverse health. It also considers issues such as improving access to health services and reducing health inequalities as a legitimate and appropriate function of health service provision (Engel, 1980). Gatchel (2004) and Gatchel et al. (2007) have continued the study of the BPS model and consider it to be the best theoretical framework to understand health related issues. These authors also criticised the ‘biomedical reductionism and dualism’ of the medical model which considered that mind and body function separately and independently.

In the second half of the 20<sup>th</sup> century, new approaches such as Melzack’s gate control theory of pain contributed to highlighting the role of psychological and social influences in the experience of pain (Waddell, 1987). Earlier views that followed the medical model considered organic pain to be different from psychogenic pain, indicating that the latter was due to psychological origins. Psychogenic pain was considered not real as no specific and diagnosable cause could be found.

Today the BPS has been widely embraced, and its tenet that considers physical disorders to be the result of the interaction of physical, psychological and social factors is recognised in all areas of health sciences. As Sternbach (1968) pointed out, the experience of pain is subjective and personal and therefore influenced by an array of personal and social factors surrounding the individual. While every experience of pain is personal and will vary between

individuals, it is in the study of chronic pain that subjective factors (psychological and social) will play a bigger role in relation to the severity, duration and recovery from any physical injury.

The BPS allows a differentiation to be made between disease and illness. Turk and Monarch (2002) defined disease in physical terms that are closer to the traditional medical model. According to these authors, disease is “An objective biological event that causes damage or disruption in anatomical and physiological terms” (p. 239). Waddell stated that pain, being a subjective experience, should be studied as a separate phenomenon to the neurological concept of nociception. While it is important to understand the physical side of the pain experience through neurological and other means of medical diagnostics, they only represent one aspect of the wider experience of pain. Elements of the duality between pain and nociception can be extrapolated to the duality of disease and illness. In the same manner that the concept of pain includes the individual experience, mediated by personal and social circumstances, illness is seen as a ‘subjective experience of self-attribution’ for individuals experiencing disease.

McLaren (1998) criticised the BPS model, arguing that it is not based on a well-formulated theory. He argued that predictions about an individual psychological state cannot be made from biological data or vice versa. Furthermore, McLaren stated that, due to a lack of an integrating theory, gathering biological, psychological and sociological data would only yield lumps of unrelated data without meaningful association. However, in considering the BPS and the gathering of personal information in relation to treatment and functionality, it is obvious that the relationships between the different categories of data have utility (Gatchel et al., 2007).

The implications of the BPS model for users and therapeutic relationships include the accommodation of emotional and spiritual aspects of health (Gatchel et al, 2007).

Consultations with health professionals who work under this model should acknowledge the wider environment, users' social support networks, family support and levels of patient stress. In theory, the BPS model can generate hypotheses about an individual's illness that tally with patient's broader understandings about why they are ill, in the context of their whole life story. This moves away from professionals deciding what is wrong to a more balanced therapeutic relationship in which users are encouraged to be active partners in health decisions. There may also be scope for more 'caring' therapeutic relationships as patients will value the opportunity to talk about their emotions and broader concerns and may find this therapeutic in itself.

Within the theoretical framework of the BPS model, there is a discipline called, 'medical sociology'. This discipline has a wide array of interests that include institutions, medical systems and political decision-making in the area of health. Medical sociology is also interested in how social factors may impact on individuals' health status (Gabe, Bury and Elston, 2004). Social epidemiology shows that the distribution of disease is related to the structure of social inequalities (i.e., to occupational class, socio-economic status, sex, marital status, age, ethnicity, area of residence, housing, family structure, and employment status). These social inequalities may account for health disparities. Social relations (such as social support for individuals and social cohesion for communities) have been investigated as determinants of the health of individuals and communities. There is also strong empirical support for the importance of lifestyle practices and behaviours embedded in social environments and cultural contexts (Gabe, Bury & Elston).

### **1.1.3 Social Causation Theory.**

The relationship between lower socio-economic status (SES) and health status has been the subject of studies and investigation since the 19<sup>th</sup> Century. There is agreement that lower SES is strongly associated with poorer health. Despite agreement about the relationship

between low SES and poor health outcomes, there are opposing theories about the causality of poor health in people with lower SES. This debate focuses on the direction of the association, that is, do SES factors affect health or does health affect SES? The first option is generally known as the social causation theory and the second as social selection theory. However, it is evident that the causality may operate in both directions. Thus, there is growing support for the idea that these factors may affect one another reciprocally across the life span. Inequalities in health due to socio-economic factors are present at all ages.

The social causation theory suggests that variations in environments cause socio-economic health inequalities (Mulatu and Schooler, 2002; Warren, 2009). Several European studies have reached similar conclusions as worsening socio-economic conditions cause a parallel worsening in perceived health in most longitudinal studies. However, the relationship between lower SES and poorer perceived health is more evident within lower socio-economic strata.

Elstad and Krokstad (2003) studied a cohort of adult men in Norway (base age 25-49, 10 years later age 35-59) and found in longitudinal studies that their perceptions are maintained over time, forming a pattern. Utilising social causation as their theoretical framework, these authors found that in the lower SES groups of the populations, perceptions of health actually decreased with age. Elstad and Krokstad investigated a range of possible sources of social causation (SES factors) while working with men over 25. One fifth of the sample had negative changes due to ageing and accumulation of health burdens. In an attempt to investigate what the authors called 'wider inequalities', they focussed on employment and occupation type. A comparison of findings from 1985 and 1995, showed that differences in perceived health widened between white collar and manual workers as well as between those who were employed or unemployed, with manual workers and unemployed people having lower perceptions of their health. In 1985, 8.1% (95% CI, 7.0-9.2,) of white collar workers

reported a 'below good' perceived health compared with a 12.9% (95% CI, 11.9-13.9) reported by manual workers. In the follow up study (1995) 11.4 % (95% CI, 10.1-12.7) white collar workers reported "perceived below health" compared with 20.4% (95% CI, 19.1-21.7,) reported by manual workers. After accounting for age and other factors they concluded that the differences both at baseline and follow up study were socially patterned. These differences were believed to be in line with the social causation theory. In considering the possibility that participants suffer poorer health after becoming unemployed, they found that the idea that declining health caused participants to become unemployed (or forced to reduce their working hours) was more plausible. This premise falls within the social selection theory which supports the idea that people with less 'good health' will go downwards in the social hierarchy. These authors concluded that the differences in perceived health were due to social causation but recognised that differences in perceived health between employed and non-employed was a primary result of health-selective mobility (in and out of the non-employed category).

A longitudinal study in New Zealand found clear evidence that increasing exposure to unemployment by children was associated with increasing risk of social problems (substance abuse and crime) and psychological disorders (depression, anxiety and suicidal ideation) (1265 children were studied from birth to age 21). The authors reached this finding having considered the impact of reverse causality and confounding factors (Ferguson, Horwood & Woodward, 2001).

The statistical association between poverty and ill health is well known and widely accepted in all disciplines (Charlton, 1996). Charlton stated that this association could be viewed as 'positive, progressive and fine grained' with no threshold or plateau, and be relevant across all socio-economic strata. Many authors view and support the idea of an association between lower socio-economic status (SES) and lower indicators of health (Elstad

and Krokstad, 2003; Ferguson, Horwood and Woodward, 2001; Gabe, Bury and Elston, 2004; Mulatu and Schooler, 2002; Warren, 2009). Charlton proposed that increments in SES were correlated with increments of health indicators. In what he called a “salutogenic explanation” of the causes of health, Charlton stated that human psychological processes are the common cause of economic stratification and the correlation between resources and health. These concepts appeared in the theoretical framework of ‘Darwinian’ or ‘evolutionary’ medicine which studies both biological and social evolution and their implication on health. Charlton explained how societies became stratified and how healthier and richer individuals’ bloodlines were more likely to be continued. In addition, these theories would also explain the differences in life expectancy, both between richer and poorer countries and within different areas in the same countries. In short, richer individuals have more access to resources and become healthier, live longer and are more likely to reproduce. This process is somehow cyclic in that it allows healthier individuals to keep getting richer.

The idea that incremental steps in SES are connected with improvements in health status was also shared by Mulato and Schooler (2002). These authors, like others before them, faced the dilemma of explaining the correlation between SES and health via social causation or health selection reasons. They introduced the concept of ‘proximal mediating mechanisms’ which appear in the relation between the two indicators. The main premise is that SES influences health through its effects on shaping individuals’ day to day lifestyle and health-affecting behaviours. They identified several ‘mediators’ such as diet, sleep, exercise, smoking, drug use, access to better health care, etc. Furthermore, they proposed that SES differences increased psychological distress, leading to, in turn, higher levels of anxiety, depression, and feelings of hopelessness. On the reverse side, they also found that the same lifestyle mediators may impact on job performance and health and cause a decline in SES. Psychological distress may also be responsible for a decline in SES, particularly in the case of



psychotic disorders and serious psychiatric conditions that occur early in life. In the first study of this kind, Mulatu and Schooler found a reciprocal causal connection between SES and health. However, they found stronger evidence for social causation in agreement with Matthews and Manor (1998) than for health selection. This was evidenced by the fact that even when stress levels were controlled for, individuals with lower SES were more vulnerable to psychological distress. In addition, they found significant evidence that SES affects health through factors such as work conditions and demands; high work strain; poor work support; low control of workplace; job insecurity; repetitive work and exposure to uncomfortable working conditions.. A further methodological advance reported in their study was the analysis of the three-way interaction between SES, health indicators and psychological distress, taking into consideration the presence of several mediators between these factors.

Social causation appeared then to be more relevant, with the findings indicating that lifestyle factors accounting for an 8% reduction in path size, psychological distress accounting for a 33% reduction and the two combined accounting for a 46% reduction in health status. However, income or educational level did not account for any differences in health when considered independently. In relation to psychological distress, there were a series of findings that shed some light on the interactions. Although there was a greater influence of ill health on psychological distress (health selection), psychological distress acts as a mediator between SES and health in two ways. Firstly, SES influences health through psychological distress and secondly, differences in SES lead to differences in psychological distress.

A Western Australian study by Johnson, Dally, Mullon and Phillips (2009) found a strong association between socio-economic, behavioural and psychosocial factors with physical and mental functioning. It found that there was a clear negative association between behavioural

factors (smoking, exercise, alcohol, weight, fruit consumption, etc.) and physical health. Psychosocial factors negatively impacted more clearly on mental health. Again in this study the concept of 'mediating' behavioural and psychosocial factors substantially reduced/increased the effects of SES on health. Thus, they found a strong influence of SES in both behavioural and psychosocial factors. This influence was much more evident in individuals of lower SES, with a strong association between income and physical functioning with a gradient up to AUD\$40,000 and then minimal effect above that threshold. While these authors did not deny the impact of health selection, they found more evidence to support social causation theory in line with the findings of Power, Matthews and Manor (1999).

## **1.2 Pain**

### **1.2.1 Definition of Pain.**

Pain is a subjective sensation, 'a hurt we feel' (Sternbach, 1968). The sensation of pain is personal and difficult to communicate to others or measure by objective or mechanical means. The personal and subjective characteristics of pain mean that it can be described to others who, in turn, may understand and even sympathise with the individual, but are not able to feel the other's pain. A possible reason for the difficulties people have in communicating pain may reside in the fact that different people may feel and react differently to similar pain stimuli. Similarly people may feel and report different sensations and emotions that vary according to time. In order to define pain as an abstract concept, all the aforementioned aspects have to be considered.

Pain is a personal and private sensation of hurt, a harmful stimulus or a series of responses that protect the body from harm (Sternbach). The complexity of this pain definition indicates the multifactorial nature of pain. Determining the cause or the origin of pain is often a relatively easy exercise, given that most injuries (contusions, sprains, fractures, dislocations, disc herniations or nerve injuries) that cause pain can be discovered using various scanning

methods (e.g., computed axial tomography, magnetic resonance imaging etc.). However, in reality although two individuals may suffer a very similar injury resulting in practically identical anatomical damage, their experience of pain and resultant incapacity may be vastly different (Simon, Elrich & Sawin, 2002). The World Health Organisation (WHO) has defined pain as “an unpleasant sensory and/or emotional experience associated with actual or potential tissue damage or described in terms of such damage” (p. 20). Similarly, pain has also been defined by the International Association for the Study of Pain (IASP) as ‘an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage’ (Merskey, 1994, p. 12). IASP has recognised the importance of pain as a major component of the somatosensory system. Chapman and Stillman (1996) proposed a multidimensional explanation to pain that includes neurological and emotional aspects. While recognising the importance of the sensory features of pain, they defined pain as a powerful and demanding feeling state. The measurement of sensory pain is primitive and subjective and has produced limited relief in terms of medication and treatments within the medical model. The usual therapeutic solution to an aversive sensation is to turn it off in one of the following ways; remove the origin of the noxious signaling, control signal transmissions from the peripheral tissues with opioid or other drugs, prevent such transmission with temporary nerve blocks, or introduce destructive lesions within the nervous system that prevent such transmission. Chapman and Stillman described this level of understanding pain as a sensorial phenomenon and as incomplete, given the inability of this method to effectively deal with pain and, in particular, chronic and persistent pain (Chapman and Stillman). Furthermore, pain in its pathological form (chronic) is defined as disruptive to normal living and degrading of functional capacity. Therefore, as the pain affects the functioning of the whole body, Chapman recommended a treatment of the whole person, including functional capability, psychological well-being and overall health.

Gatchel (2004b) stated that a person with a stressful and hated job might use pain from a back injury as a way to escape it. In addition, if they see pain as a way out, they may not do everything they can for a successful recovery. Identifying and treating social influences such as these, and their hidden psychological consequences, can speed a patient's recovery. Even after the original injury has healed, patients may still be in pain or very susceptible because their muscles have atrophied and there is nothing protecting them from sprains and strains. With that low activity level, they are likely to lose muscle tone throughout their body increasing the possibility of pain which is difficult to treat and therefore increasing the risk of it becoming chronic in nature.

Lumley et al. (2011) described the processes involved in the actual feeling of pain. The processes involve the tissues at the site of the initial injury, the nerves that transmit the pain messages and various parts of the brain responsible for receiving and conceptualising the messages. The processes are directed and controlled by electro-chemical signals which dictate the extent to which the messages are transmitted and these processes are influenced by both physical and emotional factors. The way a person behaves and feels in response to an injury are important factors in controlling pain and promoting tissue healing. These factors of course can be influenced heavily by many other aspects of their lives.

Pincus and Morley (2001) defined pain as a multidimensional phenomenon that includes sensory (the actual feeling of pain, its nature and locality), cognitive (what the individual thinks about the pain and how the individual interprets its meaning and context) and affective (how the individual behaves in reaction to it) elements. People's thoughts and emotions (cognitions) can directly affect the healing rate of an injured tissue. This can be due to people's behavioural changes or even just due to the way they view their problem (Lumley et al.). In the same manner, Calvino and Grillo (2006) described the four dimensions of pain as sensory-discriminatory; affective and emotional, cognitive, and behavioural. A peripheral

nociceptive stimulus triggers a cascade of physiological events that leads to the integration of the information, encoding the various facets of pain. Ward Edwards in 1950 recognised that pain was epistemologically dualistic and stated that affective aspects had a major role in what he described as the “psychophysics of pain”. Furthermore, he highlighted the distinction between pain as perceived and pain behaviour which may or may not result from that perception. Edwards identified the difficulties in pain research because the stimulus for pain is so much less clearly understood than is the stimuli for other kinds of sensory experience. Edwards stated: “In pain, no such simple dependence on an easily identifiable stimulus exists” (p. 451). This paradigm is, in fact, essential to understanding later theories that consider pain beyond its neurological nature.

Even within the medical model there are indications of a connection between neural and affective aspects of pain. The amygdala plays an important role in affective states and disorders such as anxiety and depression as well as emerging as a neural substrate of pain affect. A study of rats showed for the first time that CRF1 (corticotropin-releasing factor receptor 1) receptors in the amygdala contribute critically to pain-related anxiety-like behavioural and nocifensive responses in a model of arthritic pain. These findings are a direct demonstration that the clinically well-documented relationship between pain and anxiety involves the amygdala (Ji et al, 2007).

### **1.2.2 Aspects of Pain.**

Sternbach (1968) suggested a division between brief or acute and long-term or chronic pain utilising affective terms. Previous definitions of pain were based on physical terms (e.g., neurological, physiological and behavioural). In cases of brief pain (a pinch or a burn), the stimulus may be identified as an external element and the bodily responses are usually visible. In such cases, the psychological or affective impact is minimal. The duration and strength of the stimulus turn this into a more mechanical experience where affective or

subjective influences play a minor role. The medical perspective supports this view of pain as spatially located in body regions, or more generally, as particular conditions of body parts. In contrast, when pain is experienced for longer periods the stimuli are perceived as internal and the affective impact is much greater, as thoughts and feelings have more time to play a role. Pinel (1997) noted that the experience of pain can be totally suppressed by cognitive and emotional factors setting it apart from other sensory experiences (Waddell, 2004).

Transient pain caused by a noxious stimulus is called nociceptive (activating a high threshold of afferent fibres in a normal transmission of information from perceived stimuli). Pain is considered a normal consequence to damage of tissues and organs; examples include sprains, bone fractures, burns, bumps, bruises, inflammation (from an infection or arthritic disorder), obstructions, and myofascial pain (which may indicate abnormal muscle stresses) (Pinel, 1997).

There is no localised area in the brain for the processing of pain information. Although positron emission tomography detects pain-related activation in the anterior cingulate cortex, it is unclear whether this is due to the perception of pain or the emotional response to it (Pinel, 1997; Melzack, 1999; Beltrutti et al., 2004; Calvino and Grillo, 2006).

The appraisal of pain is most likely closely linked to one's pain tolerance - the point at which one cannot take more pain than is presently experienced. If a disassociation between nociception and pain appraisal occurs, the experience of pain would not bear on behaviour, as the affect is missing. This affect really makes pain what it is for every individual. It can account for the variability of pain tolerance among individuals (Pinel, 1997; Beltrutti et al., 2004).

The most common type of pain mostly caused by an injury or disease is acute or transient pain and is typically well localized, constant, and often with an aching or throbbing quality. Visceral pain involves the internal organs. It tends to be episodic and poorly localized. Pain

is usually time-limited, meaning that when the tissue damage heals, the pain usually resolves. Arthritic pain is a notable exception in that it is not time limited.

Another characteristic of nociceptive pain is that it tends to respond well to treatment with opioids. In contrast, neuropathic pain is the result of injury or malfunction in the peripheral or central nervous system. The pain is often triggered by an injury, but this injury may or may not involve actual damage to the nervous system. Nerves can be infiltrated or compressed by tumours, strangulated by scar tissue, or inflamed by infection. This type of pain frequently has burning, lancinating, or electric shock qualities. This pain may persist for months or years beyond the apparent healing period of any damaged tissues. In this case, pain signals no longer represent an alarm about the ongoing or impending injury, but instead indicate that the alarm system itself is malfunctioning (Calvino & Grillo, 2006).

Neuropathic pain is frequently chronic and tends to have a less robust response to treatment with opioids, but may respond well to other drugs such as anti-seizure and antidepressant medications. Examples include post herpetic (or post-shingles) neuralgia, reflex sympathetic dystrophy/causalgia (nerve trauma), components of cancer pain, phantom limb pain, entrapment neuropathy (e.g., carpal tunnel syndrome), and peripheral neuropathy (widespread nerve damage). Among the many causes of peripheral neuropathy, diabetes is the most common. Other conditions can be caused by chronic alcohol use, exposure to other toxins (including chemotherapy), vitamin deficiencies, and a large variety of other medical conditions. It is not unusual for the cause of this type of pain condition to go undiagnosed or even be undiagnosable. Wand and O'Connell (2008) found strong evidence that structural changes within the spine have little meaning in the context of chronic non-specific lower back pain (CNSLBP). Evidence suggested that structural abnormalities have little impact on the outcome of conservative treatment and invasive interventions. These treatments, specifically designed to address putative peripheral pathology, appear to offer little benefit to

patients (Wand and O'Connell). Pain beyond the normal healing time or in the absence of any meaningful peripheral pathology has long been a challenge in the understanding of non-specific chronic low back pain. Wand and O'Connell suggested that one explanation for this phenomenon is the presence of some degree of sensitisation of the nociceptive system in patients suffering from CNSLBP. Theoretically, this may be the result of changes in the periphery, the spinal cord, the brain or in a combination of these areas.

Acute pain serves as a warning system to protect the body and has been termed 'eudynia' in contrast with 'maldynia,' a longer lasting pain that is processed and transmitted by different mechanisms (Giordano, Schatman and Höver, 2008). Pinel (1997) describes the perception of pain as a paradox because it is a useful negative experience. Pain is useful as a warning system to avoid further injury. Maldynic pain may be initiated by a disease process that may be caused by chemical changes in the body. This phenomenological division again shows the marked differences between acute and chronic pain, with the latter identified as a more unique and subjective process. Chronic pain may also be defined by the extent to which it may affect the life of the individual in terms of functionality. Maldynic pain represents a challenge to the traditional views of medicine and health, as the techno-centric medical model is built around evidence-based practice. In this type of pain, there is a greater reliance on the patient's sense and feeling, and a lack of communication between patient and doctor arises as one of the main barriers to effective diagnosis and treatment. As previously stated, despite technological advances there is no scientific method to measure a person's pain. Evaluating maldynic pain can be considered as challenging at best since individuals may overrate the pain on the basis of other factors. These factors may include a sense of despair due to the loss of functionality which may imply a reduction of pleasurable activity as well as a loss of purpose caused by disabling pain interfering with work activities. Health professionals have to rely on the patient's self-reports of pain, which may vary not only



amongst individuals, but also within the same individual depending on times and situations. The affective state at the time of reporting pain would play a significant role in evaluating levels of pain. The relationship between affective state and the experience of pain remains a key that escapes the traditional methods of the medical model. Thus, evaluating, assessing and treating chronic pain is a difficult and inexact exercise for traditional medicine that follows a general pattern of diagnosis, treatment and recovery (Edwards, 2006; Giordano, Schatman and Höver, 2008; Maricich and Giordano, 2007). Philosophical, phenomenological and even medical considerations of pain coincide in rough terms in identifying two markedly different types of pain. The main differential characteristic of chronic pain is its duration. The International Association of the Study of Pain (1986) defined acute pain as pain persisting for less than 6 months, whereas chronic pain is defined as pain for 6 months or longer, with a few considering three months as an appropriate period (Blyth et al., 2001; Waddell, 2004; Wand and O'Connell, 2008). This pain may present with a wide variety of sensations and different intensities ranging from discomfort and tingling to severe and debilitating pain. The pain may be constant or intermittent (as long as it is recurrent) as in cases of migraines (Penzo, 1989).

### **1.2.3 Chronic Pain Considerations.**

Bury (1982) defined chronic illness as a biological disruption with three dimensions. The first dimension involves “coping” with cognitive processes employed by the sufferer to sustain a sense of self-worth and to come to terms with his/her altered body. A second dimension involves “strategy” with actions and processes employed in the management of the conditions and their impact on interactions and life changes (juggling resources and demands). And finally, “style” of adjustment to new reality, how much should be disclosed or disguised and assuming a new identity that integrates the disorder and the symptoms.

Chronic pain may be caused by chronic illness such as rheumatoid arthritis, osteoarthritis, fibromyalgia or an unknown source. In the past physicians were not able to understand the reality of the pain (thought to be imaginary) for the sufferer, particularly in conditions such as fibromyalgia. The failure to establish a cause for chronic pain can lower self-esteem and depress the sufferer, interfering with daily activities and diminishing quality of life. Patients may feel misunderstood because doctors are unable to find evidence of illness or injury as the cause of the pain. In other cases, the severity of pain and duration of pain is not consistent with the injuries and the known course of recovery (Melzack, 1990). Chronicity has been found to be more influential than the source of pain when rating the intensity and impact of pain (Anderson & Rehm, 1984).

Chronic pain is now also considered a condition and not just a symptom. It is characterised by the failure to respond to traditional therapies such as surgery, medication, rest, physiotherapy or other treatments (Waddell, 2004). This condition may appear as a result of stimuli perceived by peripheral nerve receptors (nociceptors) caused by burns, physical impact, infections and/or surgical interventions. This pain is known as neuropathic as its origin is damaged nerves and not the original tissue lesion. Neuropathic pain can be caused by illnesses, such as diabetes, cancer, alcoholism and immunological conditions amongst others. Once damaged, nerves may transmit false messages of pain. There is little knowledge about the cause of this malfunction, but research points towards the theory that when nervous tissue is injured the end cells of this tissue may form a tangled and disorganized cluster called a neuroma (Bakal, 1996).

Chronic pain is considered to be the costliest health problem in the United States of America. Annual expenses, including direct medical costs, loss of income, loss of productivity, compensation payments and legal costs reach \$90, 000 million USD annually. Studies have found that close to 50% of Americans may suffer chronic pain in some part of

their bodies (Bonica, 1990; Lackner and Carosella, 1996; Hoffman et al., 2007).

LBP is a major health problem in Western countries and a major drain on medical resources. It is estimated that 70 to 85% of the population will experience low back pain at some time in their lives. Over 70% of patients with acute lower back pain recover quite rapidly simply by following management guidelines, which include explanation and reassurance from health professionals. The remaining 30% are at risk of having pain persisting for longer than three months and developing chronic lower back pain (CLBP) and disability. Levels of incidence and prevalence of low back pain are fairly similar in Australia and other developed countries (Gevirtz et al. 1996).

Although there is an affective and emotional side to every pain experience, in the case of chronic pain there is a more influential presence of a psychological impact in comparison with acute pain. From a psychological perspective, chronic pain sufferers may present a complex situation with several specific issues. These may include a perception of failure of therapeutic resources, either professional or patient controlled, as well as diminished confidence in finding efficient relief. Furthermore, the patients may find it particularly difficult to describe and recognise symptoms, providing ambiguous information to health professionals. An excess of rest and a reduction in the level of physical activity, aggravated sometimes by age and retirement, abuse and possible dependence on narcotics or other medications as well as alteration to sleeping patterns (quantity and/or quality of sleeping) may complicate even further the nature of the presentation of this condition (Gatchel, 2004b; Waddell, 2004). The collective influence of physical, psychological and environmental issues may lead to a reduction in the level of functionality, social contact and communication problems (including with medical professionals). There may also be professional and financial consequences not consistent with the injuries in medical terms, such as estimated healing time due to loss of income and cost of treatments. On a micro level, the patient may

have a loss of autonomy, requiring assistance from family members, which in turn, may increase their overall stress (Penzo, 1989). Individuals have a natural (some would argue a learnt response) fear and avoidance response to pain as a protective warning mechanism to elude further damage. While this mechanism is useful in the case of acute and transient pain it may become a barrier in the case of chronic pain and its treatments. The intensity of pain has not been found to be a marker of the duration or chronicity. High levels of acute pain do not predict depression or disability. However, socio-cultural factors (e.g., ethnicity) were found to contribute to the transition from acute to chronic pain. Furthermore, it has also been found that disability is predictive of subsequent depressive symptoms, and in chronic sufferers high disability predicts persistent pain intensity while high levels of depressive symptoms predict continued disability (Epping-Jordan, et al., 1998).

Fordyce (1986) emphasised the importance of differentiating between acute and chronic pain, as they present different problems and require diverse treatments. In an experimental environment, measuring induced pain may be considered in terms of different parameters: threshold of pain; the amount of nociceptive stimulation (which varies along a dimension of intensity) required for a perception of pain by the individual; the level of pain tolerance: time required between the nociceptive stimulus and the verbal or motor response. With age, there is an increased intolerance to cutaneous pain and a reduction in deep or internal pain. In addition, Fordyce identified two extra parameters; point of analgesia; a moment in which an individual may decide to take an analgesic in an everyday situation, and rank of sensitivity to pain being the arithmetic difference between pain tolerance and pain threshold.

#### **1.2.4 Lower Back Pain.**

LBP is a broadly defined term, which in all likelihood represents a variety of conditions that may present as slight discomfort with no consequences for the individual to far more

painful and severely disabling conditions. In the majority of patients with LBP, it is not possible to reach an exact diagnosis that can match specific clinical, biological, laboratory, or imaging findings with the presence of LBP.

Waddell (2004) defined LBP as being between the lowest ribs and the inferior gluteal folds. Spitzer et al (1987) proposed a simple, but reliable classification of LBP in relation to the clinical presentation that consists of three categories. First, the presence of low back pain alone; second, LBP with radiating pain into the thigh (either or both), but not below the knee; and third, nerve root pain, with or without neurological deficit. Selim et al (1998) provided a similar classification with a clear gradient in the intensity of pain, level of disability and analgesic consumption. They divided the presentation into four groups; group one with back pain alone; group two with back pain and radiating leg pain above the knee; group three with back pain and leg pain below the knee; and group 4 with back pain and leg pain below the knee and a positive straight leg raising test (Selim et al.).

### **1.2.5 Prevalence of Back Pain.**

LBP affects sufferers, their families, workplaces and the whole of society. In 2001 results of the National Health Survey indicated a prevalence of 21% in Australia. LBP is the fifth most common reason for all physician visits in the USA (Chou, 2007). Approximately one-quarter of American adults reported having LBP for a whole day in the previous three months, and 7.6% reported at least one episode of severe acute LBP within a one-year period (Deyo, et al., 2006). According to the American National Health Survey of 2002, 17% of the population reported experiencing back pain which, weighted statistically, would translate to 34 million US residents.

Deyo et al. cited an annual prevalence between 15 and 45 % with point prevalences of 30%. Furthermore, he reported that 22% of the patients were incapacitated by pain to perform work duties and 2% were receiving compensation due to this condition. Conversely,

Anderson (1999) reported similar findings as well as indicating that in the USA back pain is the most common cause of activity limitation for people 45 years old and under. Furthermore, back pain was the second most frequent reason for visits to the physician, the fifth ranking most common cause of hospital admission and the third most common cause of surgical procedures.

Across the Western World, it is believed that most people would experience back pain during their lives, with a prevalence of 70-95% according to different studies (Deyo, 2006; Cassidy et al, 1998; Walker, 2000). Fortunately, most cases of acute pain improve within one month of onset (Pengel et al., 2003). In a European study lifetime prevalence was estimated at anything from 59% to 90% and the incidence of low back pain in any one year at 5% (Hermans, 2000). However, a third of sufferers reported persistent back pain one year after an acute episode, and 20% of those participants reported a substantial limitation in activity. Waddell (1987) and Pengel (2003) concluded that most people will experience back pain sometime in their lives, with 6 to 10% suffering disabling persistent pain. The Bone and Joint Decade Report (2005) found that most episodes of back pain settle after a couple of weeks, but many sufferers may have a recurrent course, with further acute episodes affecting 20-44 % of patients in the working population within one year, and life time recurrences of up to 85%.

In Finland, Saastamoinen (2005) found that 35% of the population reported some form of chronic pain, and 40% of visits to primary care provider were pain related. In Spain, there were more than two million visits to primary care in relation to pain and it was estimated that 80% of the population would experience back pain at some stage. Furthermore, back pain was the first cause of morbidity for adults under the age of 50 and one of the three most common causes of work incapacity. A 2007 EU Commission study estimated that 67 million people suffered pain in their lower or upper back in the previous week. Typically around

50% of the population reported musculoskeletal pain at one or more sites for at least one week in the preceding month. Population surveys show that back pain is the most common of regional pain in younger and middle-aged adults.

A Canadian study by Cassidy et al, (1998) indicated that the wide variations in prevalence rates are probably due to methodological differences between studies, including case definition. Most prevalence studies had not differentiated between trivial and severe or disabling pain. While the responses to questions such as “are you experiencing back pain today?” or “have you ever experienced back pain?” may elicit a high number of positive responses it was essential that a true indication of the severity of pain is reported. A cross-sectional analysis was conducted on adults in the province of Saskatchewan. The findings showed that 28.4% (95% CI, 25.6-31.1) of adults experienced low back pain at any given time and that 84.1% (95% CI, 81.9-86.3) had experienced back pain in their lives. In addition, the findings also offered a breakdown according to severity that indicated that low-intensity/low-disability low back pain was present in 48.9% (95% CI, 45.9-52.0) of the adult population in the six months before the survey. High-intensity/low-disability low back pain was present in 12.3% (95% CI, 10.3-14.4), and high disability low back pain was present in 10.7% (95% CI, 8.8-12.5) (Cassidy et al.).

An African review was conducted to systematically appraise the published prevalence studies conducted on the African continent to establish the prevalence of LBP. This was the first known systematic review to report on the findings of LBP prevalence and LBP risk factors among African populations. This review indicated that there is little difference in the prevalence of LBP among Africans compared with the prevalence of LBP in developed countries. The mean LBP point prevalence among the adults was 32%. The average one-year prevalence of LBP among adults was 50%. The average lifetime prevalence of LBP among adults was 62% (Louw-Morris and Grimmer-Somers, 2007).

In Australia, there has been limited research, both in quantity and quality, in relation to the prevalence of LBP. Walker et al. (2004) emphasised the importance of the adherence to accurate methodological criteria and guidelines in order to obtain reliable and valid data. Before this study, the only entire population studies that met these requirements were the National Health Surveys conducted in 1983, 1989 and 1995. However, these were general health surveys that did not provide a definition of LBP. Walker et al. conducted a population-based study and found that the prevalence of Australian adults who had LBP for more than six months, 'or thought it was likely to last more than six months', was 13.4% (95% CI, 12.0-15.0). This study graded the severity and impact of the pain from 0 (pain-free, disability-free) to IV (high disability, severely limiting). The prevalence of LBP in the previous six months was 64%, of which two-thirds reported low-intensity low-disability pain, with 4.6% (95% CI, 3.0- 7.1) of the respondent being chronically disabled for the entire six months period.

The Australian National Health Survey (NHS) of 2004-2005 together with the 2003 Australian Bureau of Statistics Survey of Disability, Ageing and Carers, the 2004-2005 National Aboriginal and Torres Strait Islander Health Survey and other ABS sources offered an overview of the prevalence of chronic back pain in Australia. These sources indicated that in 2004-2005, 31% (6 million) of the population (33% of women and 29% of men) reported having a long-term disease of the musculoskeletal system and connective tissue. Of the total Australian population in 2004-2005, 15% reported having arthritis, 15% reported having back problems, and 3% reported having osteoporosis. The prevalence for back problems was slightly higher for men (16%) than for women (15%). In an Australian review about the epidemiological features of chronic pain, it was found that the mean prevalence data indicated that back and spine impairments were more common in women (70.3 per 1000 population) than men (57.3 per 1000 population) (Walker et al., 2004).



The Canadian National Population Health Survey in 1994-1995 (Tunks et al, 2008) estimated a level of prevalence of chronic pain of 20% for women and 15% for men. Overall, this prevalence increased in age; 10% for those between 15-24 years old and 35% for those aged 75 years and older. Furthermore, 20% of those aged between 45-64 years reported severe pain. LBP had an overall prevalence of 15% and together with arthritis/rheumatism were the leading painful diagnoses. The findings from 2004-2005 Australian NHS indicated that 24% of people between aged 65-75 years reported pain. Prevalence of back problems then declined with age to 18% amongst those aged 75 years and over.

Deyo et al (2006) found that the prevalence of back pain was highest amongst patients with low levels of education and income. However, these findings could not be linked to types of employment or other factors. Bergman (2005) found the patients with Chronic Widespread Pain (CWP) and Fibromyalgia were highly affected by psychosocial factors. These factors included being a migrant, residing in a lower socio-economic area, having a lower level of education and having a family history of chronic low back pain (CLBP). However, these factors did not have an impact when considering more strict parameters defining CWP or in patients with no chronic pain. Keeley et al. (2008) found that socio-economic factors had a strong influence on chronic low back pain. However, they also identified problems with multicollinearity as variables such as income, educational level and employment and status had a high degree of association. This association was demonstrated by the fact that subjects with less than 12 years of education were more likely to be unemployed and to be of lower SES. These methodological difficulties may alter or bias research outcomes and the use of such variables must be considered when examining outcomes. However, there appeared to be a general agreement in the literature about the association of low socio-economic status (SES) and poor health including chronic pain

(Hagen et al, 2005). Hagen et al found that low SES was associated with higher prevalence of chronic musculoskeletal complaints at nine anatomical sites (including lower and upper back) in men and women.

While many studies have found a strong association between low SES and chronic pain they have failed to clarify causality and direction. It could be that those with low SES may have fewer resources to access services and, therefore, prolong and aggravate their experiences of back pain. However, it could also be hypothesised that those suffering from chronic pain are less likely to access better employment and pay and, therefore, be relegated to lower incomes and generally to a lower SES. Keeley et al. (2008) utilised education level alone in order to consider SES association with chronic pain. Considering that the mean age of the first back pain attack is approximately 28 years (Tunks et al, 2008) and most individuals have completed the majority of their education by that age, educational level may be the most useful parameter when considering relationship between SES and back pain.

The Australian NHS (2004-2005) indicated that people aged 15 years and over living in the most disadvantaged areas were more likely to report suffering back problems (21%) than those living in the least disadvantaged areas (17%).

A report from the Australian Federal Government Human Services Department (DHS, 2013) revealed the characteristics of disability support pension (DSP) recipients in Australia. This benefit is paid to individuals of working age who are unable to work due to the impact of their medical condition (aged 16-65 years). There were a total of 214,745 people receiving DSP due to musculoskeletal and connective tissues related conditions (110,976 men and 103,769 women) as well as a total 13,786 people receiving DSP due to chronic pain (6,403 men and 7,473 women). While these numbers may not specifically relate to chronic back pain, the previously discussed data from the Australian Bureau of Statistics (2005) indicated that chronic back pain is the leading cause of disability amongst musculoskeletal conditions.

Table 1.1 details the number and percentage of DSP recipients with Musculoskeletal and connective tissue as their primary medical condition by age range and sex.

Table 1.1

*Recipients with musculoskeletal and connective tissue primary medical condition by age range and sex at June 2013 (adapted from Department of Human Services Report, 2013)*

Age range (years)	Women		Men		Total	
	n	(%)	n	(%)	N	(%)
16-24	670	(0.6)	598	(0.5)	1,268	(0.6)
25-34	2,254	(2.2)	2,679	(2.4)	4,933	(2.3)
35-44	8,062	(7.8)	10,898	(9.8)	18,960	(8.8)
45-54	25,412	(24.5)	29,554	(26.6)	54,966	(25.6)
55-64	61,953	(59.7)	60,462	(54.5)	12,241	(57.0)
65 +	5,418	(5.2)	6,785	(6.1)	12,203	(5.7)
Total	103,769	(100.0)	110,976	(100.0)	214,745	(100.0)

Table 1.1 shows a breakdown of small sex differences for DSP recipients with a high proportion of recipients in the 55-64 age group. Data for recipients over the age of 65 may not be an accurate depiction of prevalence as those in that age category may receive age pension rather than disability pension and therefore may be not categorized by their medical condition. Other data indicated that the proportion of Australian-born DSP recipients in 2011 was 75.2% compared with overseas-born 24.8%. This data is in line with the results of the Australian census of 2011 (Australian Bureau of Statistics, 2012) which indicated that 24.6% of the Australian population were born overseas.

Table 2.1 details the DSP recipient population as at June 2013 by relationship status and sex.

*DSP Recipients by relationship status and sex at June 2013. (Adapted from Department of Human Services Report, 2013)*

Relationship status	Women		Men		Total	
	n	%	N	%	N	%

Married	87,685	(23.0)	98,456	(22.3)	186,141	(22.7)
Defacto	20,394	(5.4)	23,200	(5.3)	43,594	(5.3)
Single	125,190	(32.9)	200,051	(45.4)	325,241	(39.6)
Separated	96,035	(25.2)	94,442	(21.4)	190,477	(23.2)
Divorced	33,463	(8.8)	19,213	(4.4)	52,676	(6.4)
Widowed	18,168	(4.8)	5,344	(1.2)	23,512	(2.9)
Total	380,995	(100.0)	440,743	(100.0)	821,738	(100.0)

### 1.2.6 Cost of Back Pain.

Musculoskeletal conditions (including arthritis) accounted for 3.5% of all hospital separations (discharges) in public hospitals, and 8.3% of all hospital separations in private hospitals. In 2000-01, 9.2% of total allocated health expenditure (\$4.6 billion) was spent on musculoskeletal conditions, which was third after cardiovascular diseases and diseases of the nervous system. This amount comprised: \$1.2 billion (25%) for osteoarthritis; \$567 million (12%) for chronic back pain, while slipped disc accounted for \$299 million (6%) (AIHW, 2005). Walker, Muller and Grant (2004) estimated the direct cost of low back pain in 2001 to be AUD \$1.02 Billion. Approximately 71% of this amount was for treatment by chiropractors, general practitioners, massage therapists, physiotherapists and acupuncturists. The cost of imaging, prescription and over the counter medication and rehabilitation contributed to the total costs. Furthermore, they estimated that the indirect costs were an additional AUD \$8.15 Billion.

In one of the largest analyses of its kind, a team of Duke University Medical Center (1998) researchers found that patients suffering from back pain consumed more than \$90 billion annually in health-care expenses, with approximately \$26 billion of that amount directly attributable to treating the back pain. The Duke team mined data from the Medical Expenditure Panel Survey (MEPS) in 1998. The MEPS is a national survey conducted by the Agency of Healthcare Research and Quality (AHRQ) and the National Center for Health Statistics. The team found that 25.9 million adults reported back pain in 1998, with 172.7

million reporting no back pain. To put these expenses in perspective, the total \$90 billion spent in 1998 represented 1% of the U.S. Gross Domestic Product (GDP), and the \$26 billion in direct back pain costs accounted for 2.5% of all health care expenditures for that year” (Economic Impact of Back Pain Substantial. Ascribe Newswire: Medicine, 1/2/2004). In their analysis, the researchers examined such cost categories as in-hospital costs, office-based visits, hospital outpatient visits, emergency room visits, prescription medications and home health services. For office-based and outpatient services, in addition to physician visits, the survey also measured visits to such health-care providers as chiropractors, physical therapists, psychologists and nurses. The annual per capita expenditures for patients with back pain were 1.6 times higher than for those without back pain.

They also found that health-care expenditures were not equally distributed among patients with different levels of expenditures. For example, in each of the health services, the top 10% most expensive patients accounted for more than half of the total expenditure. Furthermore, the 25% most expensive patients accounted for more than 75% of the total expenditures. As expected, the researchers found that elderly patients with back pain incurred higher expenditures compared to younger patients. They also found that women incurred higher average expenditures than men. In addition, they found that white patients, as well as patients who had medical insurance, had higher per capita expenses. This suggests that there may be some barriers to caring for those who are African-American or uninsured. However, when compared to those with private insurance, patients who had government-supported insurance had higher expenditures, especially in the areas of inpatient care, home health services and prescription drugs.

### **1.2.7 Assessing Back Pain.**

While assessing back pain is a basic part of the clinical practice, it is often a difficult and complex process that relies on the report of the sufferer. This reporting may be influenced by

a plethora of factors that must be considered by health professionals at the time of assessment and diagnosis (Turk & Melzack, 2001). In addition to detecting serious conditions and categorizing back symptoms, the medical history establishes rapport between the clinician and patient. The patient's description of present symptoms and limitations, duration of symptoms, and history of previous episodes defines the problem. It also provides insight into concerns, expectations, and nonphysical (psychological and socio-economic) issues that may alter the patient's response to treatment. Assessment tools such as pain drawings and visual analogue pain-rating scales may help further document the patient's perceptions and progress.

A patient's estimate of personal activity intolerance due to low back symptoms contributes to the clinical assessment of the severity of the back problem, guides treatment, and establishes a baseline for recommending daily activities and evaluating progress.

### **1.3 The Human Back**

#### **1.3.1 Anatomy.**

The first step to understanding the various causes of low back pain is learning about the normal design (anatomy) of the tissues of this area. Important structures of the low back that can be related to symptoms there include the bony lumbar spine (vertebrae), discs between the vertebrae, ligaments around the spine and discs, spinal cord and nerves, muscles of the low back, internal organs of the pelvis and abdomen, and the skin covering the lumbar area.

The spine is a flexible column extending from neck to tail, made from a series of bones. The spine combines strong bones, unique joints, flexible ligaments and tendons, large muscles and highly sensitive nerves. The spine, also known as the backbone or vertebral column, is made up of 33 individual bones termed vertebrae. The vertebrae are stacked on top of each other, grouped into four regions: Cervical, Thoracic, Lumbar and Sacral. Each vertebra consists of a ventral body or centrum surmounted by a Y-shaped neural arch. The natural curves in the spine, kyphotic and lordotic, provide resistance and elasticity in

distributing body weight and axial loads sustained during movement. The vertebrae are composed of many elements that are critical to the overall function of the spine, which include the intervertebral discs and facet joints. The joints in the spine are commonly called Facet Joints because the faces of the vertebral process come together formed from the articular processes, one of which descend from the superior vertebra and the other ascends from the inferior vertebra (Corrigan & Maitland, 1998). Between each vertebra is a disc that serves to cushion the vertebrae and connect them together in a flexible way (Maitland & Corrigan, 1998).

### **1.3.2 Physiology.**

The main functions of the back are to provide support, protection and movement. To achieve this combination, different parts of the back interact, providing a balance between functions. The low back, or lumbar area, serves a number of important functions for the human body. These functions include structural support, movement, and protection of certain body tissues (Marieb, 2001). When humans stand, the lower back is functioning to hold most of the weight of the body. Injury to the structures important for weight bearing, such as the bony spine, muscles, tendons, and ligaments, often can be detected when the body is standing erect or used in various movements.

The role of support is mainly played by the bony structures which have flexibility thanks to cartilaginous bodies between them that allow them to glide. The rigid support necessary to support body weight and transmit compressive force is achieved through the vertebral bodies, which have a thick outer rim that contains thin inner body trabecular struts for added support. Spinal movements comprise a summation of synchronized movements that take place at each intervertebral level. Bony projection, the transverse process and the spinal processes allow muscle and ligament attachments to help control movement (Corrigan & Maitland, 1998).



Normal spinal function requires that spinal movements can take place without encroaching upon the vertebral canal or the numerous nerve fibres that pass with their blood supply through the intervertebral foramen. In turn, the muscles control the movement of the back and can be categorised according to the type of movement they generate. Soft tissues around the spine also play a key role in the health of the back. A large and complex group of muscles work together to support the spine and hold the body upright and allow the trunk of the body to move, twist and bend in many directions (Corrigan & Maitland, 1998). The spine is also designed to protect the spinal cord. The spinal cord is a column of nerves that connects the brain to the rest of the body, allowing controlling movements. Without a spinal cord there could not be any movement in any part of the body, and the organs could not function (Corrigan & Maitland, 1998; Marieb, 2001).

### **1.3.3 Pathology.**

Common causes of low back pain include lumbar strain, nerve irritation, lumbar radiculopathy, bony encroachment, and conditions of the bone and joints. Each of these is reviewed below.

There are many conditions that may cause back pain, and physicians normally eliminate these before proceeding into further diagnoses. Refshauge and Maher (2006) listed spinal fractures (sometimes linked to osteoporosis), cancer, infections (spinal osteomyelitis), inflammation (inflammatory arthritis) and cauda equina as responsible for back pain and restrictions to movements. However, less than 1% of the cases are due to serious spinal diseases such as cancer or infection and less than 1% is due to an inflammatory disease that needs rheumatologic investigation. In addition, less than 5% of cases involve true nerve root pain, and only a small proportion of that ever needs surgery (Waddell, 2004; Bono & Garfin, 2004; Corrigan & Maitland, 1998). The so-called ‘sinister causes’ of back pain are: primary or secondary malignancy. Secondary cancers are a more common cause of back pain than

primary cancers which usually originate from bronchus, breast, prostate, thyroid, kidney or pancreas). Other red flags are metabolic disease of bone; inflammatory disease (ankylosing spondylitis, psoriatic arthritis, Reiter's syndrome, and finally infections. 'Red flags' are risk factors detected in low back pain patients' past medical history and symptomatology and are associated with a higher risk of serious disorders causing low back pain compared to patients without these characteristics. If any of these are present, further investigation (according to the suspected underlying pathology) may be required to exclude a serious underlying condition, for example, infection, inflammatory rheumatic disease or cancer.

Concerning symptoms of red flags may include; age of onset less than 20 years or more than 55 years, recent history of violent trauma, constant progressive, non-mechanical pain (no relief with bed rest), thoracic pain, past medical history of malignant tumour, prolonged use of corticosteroids; drug abuse, immunosuppression, HIV, systemically unwell, unexplained weight loss, widespread neurological symptoms (including cauda equina syndrome), structural deformity and fever (Corrigan & Maitland, 1998).

One of the most common causes of back pain is muscular strains. This occurs when an unexpected force, twist or pull is applied to one or several of the muscles in the back. A lumbar strain is a stretching injury to the ligaments, tendons and/or muscles of the low back. The stretching incident results in microscopic tears of varying degrees in these tissues. Lumbar strain is considered one of the most common causes of low back pain. The injury can occur because of overuse, improper use, or trauma. Soft-tissue injury is commonly classified as 'acute' if it has been present for days to weeks. If the strain lasts longer than three months, it is referred to as 'chronic'. Lumbar strain most often occurs in people in their forties, but it can happen at any age. The condition is characterized by localized discomfort in the low back area with onset after an event that mechanically stressed the lumbar tissues. The severity of the injury ranges from mild to severe, depending on the degree of strain and

resulting spasm of the muscles of the low back. As a result, several tears may occur in the muscle. These muscular tears cause pain felt in the back. Ligamentous sprains are another common cause of back pain. This occurs when the ligaments of the back are stretched beyond their means. Sprains often occur along with muscular strains. These strains cause mainly acute episodes of pain responding well to treatments and lasting generally less than six months. Repeat actions using improper body mechanics can damage an entire side of the body, stretching the ligaments beyond their normal level of flexibility and support (Marieb, 2001, Saladin 2004). Over time, this condition will result in chronic poor posture, and eventually pain. Not only can poor posture cause the ligaments to ache, it can cause chronic back pain which cannot be traced to a specific incident of injury. Often, many forms of non-specific back pain are related to ligament injuries which have occurred over weeks, months or even years of practising poor postural habits such as bending and lifting, which can take a toll on the ligaments. Once ligaments are sprained or overstretched (and in some cases they can even tear) the healing process is slow, painful and can be debilitating, resulting in poor blood supply along the ligament and the spine as well as a loss of employment, mobility, or movement without pain. However, several causes are responsible for physiological (age-related) and pathological bony and articular degeneration. The main mechanism implicated is trauma, in the forms of sequels of acute traumatism, chronic multitraumatism and chronic overload. When the trauma or strain affects parts other than the muscles there is an increased chance of this pain becoming long-lasting or chronic (Galluci et al., 2005). Stresses not able to cause fractures when acutely applied can be responsible for bony (and disc) damage when applied for longer periods.

In what Waddell called the “ordinary backache” the usual presentation involved individuals aged between 20 and 55 years with pain that is mechanical in nature affecting mainly the lumbosacral region, buttock and thighs, varying over time and with physical

activity (sufferers are generally well). Furthermore, Waddell emphasises that the severity of the pain does not assist in the process of diagnosis. Given the ratios cited before it is unlikely for this pain to be linked to any major disease and even any sort of nerve root compression.

Herniated discs result in back pain by compressing the spinal nerves where they exit the spinal column. They are often the result of repetitive vibratory motion (as experienced by truck drivers/machine users) or due to a sudden heavy loading of the back (as occurs with improper lifting). This movement exerts pressure on the spinal nerves, causing local weakness and acute pain. Sciatica is an extremely painful condition that often accompanies low back pain and can affect either one or both lower extremities. Waddell (2004) stated that nerve root pain may arise from a disc prolapse but also from canal stenosis or even surgical scarring and in fact in most cases the pain stems from a single nerve root.

The lumbar region bears much of the weight of the body and performs most of the bending and flexing, causing most cases of herniated discs to be within this area. The incidence of sciatica can increase with age and at age 60 can be as high as 50% for those with low back problems. Cases of disc prolapse may cause LBP with a severe and sudden onset in most cases (although it can also develop gradually) (Corrigan & Maitland 1998; Saladin, 2004). Lumbar radiculopathy is nerve irritation that is caused by damage to the discs between the vertebrae. The pain commonly increases with movements at the waist and can increase with coughing or sneezing. In more severe instances, sciatica can be accompanied by incontinence of the bladder and/or bowels.

The nerves of the lumbar spine can be irritated by mechanical impingement or disease anywhere along their paths from their roots at the spinal cord to the skin surface. Any condition that results in movement or growth of the vertebrae of the lumbar spine can limit the space (encroachment) for the adjacent spinal cord and nerves. An impingement of a nerve root may result from a narrowing of the intervertebral foramen caused by stenosis,

facet joint degeneration, herniated discs, or other space-occupying lesions. In older individuals, degeneration of the intervertebral discs and facet joints may combine to result in narrowing of the spinal canal (spinal canal stenosis). Spinal canal stenosis results from the compression of nerve roots in the spinal canal and develops as a result of a combination of narrowing of the disc space, bulging of the disc into the spinal canal and degeneration of the facet joints. This occurs due to wear and tear. Pain is worsened by maintaining a posture for prolonged periods and aggravated by forced or unguarded movements. Severe disc-space narrowing is an obvious sign of degeneration in the disc, and single-level severe narrowing is more likely to reflect a traumatic or biomechanical origin than a systemic origin. However, recent studies have challenged the traditional view that most disc pathology has a physical (trauma) origin and have pointed to genetic factors to explain its aetiology (Battie & Videman, 2006).

Other common back complaints are caused by alterations to the normal curvature of the spine such as kyphosis, lordosis and scoliosis (Marieb, 2001; Saladin, 2004; Tortora & Dickerson, 2009). Major spinal pathology accounts for less than 1% of all back pain (Waddell, 2004; Corrigan & Maitland, 1998; Bono & Garfin, 2004). Spondylosis deformans concerns most of the age-related vertebral alterations. Many authors believe that spondylosis is gradual disc degeneration (Corrigan & Maitland, 1998). Spondylolysis is caused by degeneration of a vertebral structure secondary to repetitive stress (Marieb, 2001b, Corrigan and Maitland, 1998).

#### **1.3.4 Diagnosis of back pain and back conditions.**

The diagnosis and treatment of back pain around the world have been focused in the management of back pain rather than on effective treatments. Having eliminated potentially serious conditions (major trauma, cancer, infections, cauda equina, etc.) the health professional can perform a physical examination. Guided by the medical history, the

physical examination includes a general observation of the patient followed by a regional back exam, a neurological screening and, if required, testing for sciatic nerve root tension. Limping or coordination problems indicate the need for specific neurological testing. Severe guarding of lumbar motion in all planes may support a suspected diagnosis of spinal infection, tumour, or fracture. However, given marked variations among persons with and without symptoms, range-of-motion measurements of the back are of limited value. Vertebral point tenderness to palpation, when associated with other signs or symptoms, may be suggestive of but not specific for spinal fracture or infection. Palpable soft-tissue tenderness is, by itself, an even less specific or reliable finding (U.S. Agency for Health Care Policy and Research, 1994).

If the diagnosis would appear to be of simple back pain, then no investigation is required. If other diagnoses are entertained, appropriate investigations are in order, depending upon the suspicion. In general, there seems to be a general agreement in procedures in countries such as Canada, New Zealand, Netherlands, UK, USA and Australia. Firstly, the recommendations follow the stages after the initial triage in primary care into possible vocational and return to work interventions. Adams et al, (2006) summarise these stages as follows:

- Diagnostic triage (exploring type of back pain)
- Exclusion of red flags (sinister and neurological aetiologies)
- Identify potential psychosocial barriers for recovery (including vocational factors)
- X-ray in suspected cases of a specific pathology.

Chou et al (2007) proposed similar recommendations for the diagnosis and treatment of low back pain, combining a joint practice guideline from the American College of Physicians and the American Pain Society. These recommendations were that clinicians should conduct

a focused history and physical examination to help place patients with low back pain into one of three broad categories: nonspecific low back pain, back pain potentially associated with radiculopathy or spinal stenosis or back pain potentially associated with another specific spinal cause. The history should include assessment of psychosocial risk factors, which predict risk for chronic disabling back pain (strong recommendation, moderate-quality evidence). Other recommendations included the avoidance of routine imaging unless there are neurological deficits and provide patients with evidence-based information on low back pain with regard to their expected course, advise patients to remain active, and provide information about effective self-care options (strong recommendation, moderate-quality evidence). For most patients, first-line medication options are acetaminophen or non-steroidal anti-inflammatory drugs (NSAIDs). For patients who do not improve with self-care options, clinicians should consider the addition of non-pharmacologic therapy with proven benefits for acute low back pain, spinal manipulation; for chronic or subacute low back pain, intensive interdisciplinary rehabilitation, exercise therapy, acupuncture, massage therapy, spinal manipulation, yoga, cognitive behavioural therapy, or progressive relaxation (weak recommendation, moderate-quality evidence).

A group of twelve European countries under the guidance of the European Commission, formulated a similar set of guidelines focusing on management and recovery, maintaining physical activity and a course that may include medication, manipulation and, for those suffering for longer, a multidisciplinary approach. Airaksinen, Brox and Cedraschi (2004) proposed guidelines specifically designed to diagnose, evaluate and treat CLBP. A summary of the concepts of diagnosis in CLBP was described in different stages in a similar manner as the general guidelines for back pain

The initial patient assessment would normally include a physical examination and case history in which the use of diagnostic triage, to exclude specific spinal pathology and nerve

root pain, and the assessment of prognostic factors (yellow flags) are recommended. Waddell (2004) found that about 85% of people who sought any health care for back pain in the United Kingdom saw their General Practitioner (GP). The fact that GPs are the first point of contact is consistent with the medical model utilised in Western Societies. Different British studies have identified approximately 9% of visits to GPs being related to back pain (a staggering number of 6.5 million GP consultations in the UK alone) (McCormick Fleming and Charlton, 1995).

The role of GPs as gatekeepers and first point of contact for back pain sufferers is extremely valuable. A simple physical examination, together with reported symptomatology and patient's history (sometimes aided with the results of X-rays) assists the GP in eliminating the so-called sinister causes of back pain and in, prescribing the appropriate treatments and making relevant referrals to other health professionals. The first examination is nevertheless an event of primal importance not only for its usefulness in relation to diagnoses and treatments, but also as the first step in a long line of intervention that sufferers may have to undertake due to their back pain. Despite the enormous advances in imaging techniques, it is the combination of these results and physical examination and consultation that offers a more accurate understanding of the individual's pathology and its effects on functionality (Bono and Garfin, 2004; Corrigan and Maitland, 1998).

The role of imaging is vital in diagnosing and understanding spinal pathologies. X-Rays still remain the initial form of imaging, CT (computed tomography) offers a better contrast resolution for soft tissues with slice-like images and MRI (magnetic resonance imaging) has advantages over other techniques in detecting disc hydration and disc degeneration. Most patients will have X-rays, CT scan and MRI in search of pathologies that may explain the origin of their pain and physical restrictions. This process and the psychosocial stresses involved are a significant journey in the life of chronic back pain sufferers and their families,



often involving money and time that may become obstacles in regaining normality. There is a series of prognostic factors considered key in relation to back pain diagnoses. These are the assessment of work-related factors, psychosocial distress, depressive mood, severity of pain and functional impact, prior episodes of LBP, extreme symptom reporting and patient expectations in the assessment of patients with non-specific CLBP (Waddell, 2004).

### **1.3.5 Treatment of back pain.**

Back pain and back pathologies are treated with a plethora of methods which in a broad categorisation may include surgical, pharmacological and manipulative therapies. In most cases, sufferers may receive a combination of treatments which in the case of chronic patients may also extend to psychotherapy, counselling and social support interventions. The use of these therapies and, in particular, the type and quantity of therapy will be influenced by a variety of reasons including medical and psychosocial factors. Given the cost of treatments, economic considerations have to be examined as well as the access in different countries with different health systems. Furthermore, the cost of treatment will determine the access according to the individual's income. On the other hand, social considerations are equally important as age, sex, ethnicity and language, and the level of knowledge about treatments available will have a marked influence on the level of access for sufferers (Marieb, 1999).

The nature of treatments and recommendations has changed significantly since the 90s. Waddell (2004) reported a marked reduction in the GP advice to restrict activities or observe bed-rest with the reverse increase in recommending exercise and maintaining physical activities (Waddell). Data from a study called Working Back Scotland (2004) reported no change in the GPs prescription of analgesics and referrals to X-ray between 1990 and 2002 (approximately 64% of the visits) with an increase in referrals to physiotherapy.

There are many treatments for low back pain, and their use will depend on a variety of reasons that may include personal and social factors (i.e., cost and availability). Conservative

treatments such as cognitive behavioural therapy, supervised exercise therapy, brief educational interventions, and multidisciplinary (bio-psycho-social) treatments can each be recommended for non-specific CLBP. Back schools (for short-term improvement), and short courses of manipulation/mobilisation can also be considered. The use of physical therapies (heat/cold, traction, laser, ultrasound, short wave, interferential, massage, corsets) cannot be recommended.

In relation to pharmacological treatments, the short-term use of NSAIDs and weak opioids can be recommended for pain relief. Noradrenergic or noradrenergic serotonergic antidepressants, muscle relaxants and capsicum plasters can be considered for pain relief.

Finally, there is a group of treatments considered invasive that may include: acupuncture, epidural corticosteroids, intra-articular (facet) steroid injections, local facet nerve blocks, trigger point injections, botulinum toxin, radiofrequency facet denervation, intradiscal radiofrequency lesioning, intradiscal electrothermal therapy, radiofrequency lesioning of the dorsal root ganglion, and spinal cord stimulation . These treatments cannot be recommended for non-specific CLBP (Marieb, 2001).

Surgery for non-specific CLBP cannot be recommended unless two years of all other recommended conservative, including multidisciplinary approaches with combined programs of cognitive intervention and exercises, have failed, or such combined programs are not available, and only then in carefully selected patients with maximum two-level degenerative disc disease (Jiwa et al, 2008).

In Australia, referrals to specialists are defined by the structure of the existing health system, which has two streams, being public or private in nature (Walker et al., 2004). These are, firstly, a clearly defined public hospital system manages the health care needs of the entire population. Access to hospital specialists follows a referral from GPs. Secondly, a private hospital system manages patients with private health insurance, currently estimated to

cover 44% of the population. Access is also via referral by GPs. However, appointments in most cases are usually offered much more speedily than in the publicly funded hospital sector (Jiwa et al, 2008). Therefore, in Australia sufferers that have private health insurance are not only assured quicker access to a specialist but also the possibility of choosing a professional of their preference. Most Australians do not have private health insurance cover and face long delays before accessing specialists under the public health scheme. Therefore, public patients may endure pain and discomfort for several months (depending on waiting lists) before they can even have a proper diagnosis about the causes of their pain (Walker et al., 2004).

There are several specialisations amongst the professionals that treat back pathologies. Spine surgeons, orthopaedists and neurosurgeons perform the overwhelming majority of spine surgeries and procedures (Jiwa et al, 2008). In recent years, spine surgery has become increasingly specialised contributing to enhancements in surgical technique, which in turn has led to overall improved success rates and reduced morbidity (e.g., reduced post-operative discomfort, faster healing time) (Marieb, 2001). Rheumatologists sometimes act as consultants to advise other physicians about a specific diagnosis and treatment plan, and sometimes lead the patient's treatment and may include a team approach to treatment involving physical therapists, psychologists, or other specialists (Marieb, 2001; Saladin, 2004; Tortora and Derrickson, 2009; Waddell, 2004 ).

The primary purpose of back surgery or neck surgery is to correct an anatomical lesion in individuals who fail to show improvement with conservative treatment. Spine surgery can basically accomplish three tasks: it can decompress a nerve root or the spinal cord; it can stabilize an unstable or painful segment with fusion surgery and it can reduce a deformity (e.g., scoliosis surgery in the thoracic spine). Lumbar discectomy is the most common surgical procedure performed in the US for patients with back pain and leg symptoms

because of intervertebral disc herniation (Tosteson et al, 2008). An American study that carried out a comprehensive analysis (considering direct and indirect costs) suggested that surgical treatment of herniated discs represents a reasonably cost-effective health care intervention when compared with other common health care interventions (Tosteson et al.).

Although there is no absolute contraindication specifically related to the spine, there are certainly factors that have been shown to predict a poor outcome for surgical intervention for CLBP. Patients with high fear-avoidance of pain, psychological distress, compensation claims, personal injury litigation, and job dissatisfaction generally have poorer outcomes than those without these risk factors. Such risk factors are much more common in patients without definite pathology or destructive processes (Don and Carragee, 2008).

The use of heat energy to treat chronic low back pain (CLBP) is an alternative to standard surgical procedures in certain patients. Reviews on the efficacy of this technique found that it provides only modest improvement, but is likely to be a less destructive, cheaper and safer method than other invasive therapies (Derby et al, 2008) with better prospects for pain relief than improved functionality.

Physiotherapy is the most utilised method of manipulative treatment for back pain and back pathology sufferers (Marieb, 2001). Core skills used by chartered physiotherapists include manual therapy, therapeutic exercise and the application of electro physical modalities. Physiotherapists believe it is of vital importance to take note of psychological, cultural and social factors which influence their clients. They try to bring the patients into an active role to help make the best of independence and function (The Chartered Society of Physiotherapists UK, 2002). Physiotherapists apply manipulative techniques but also prescribe exercise regimes so clients can continue to gain mobility once the intervention has ended.

The practice of chiropractic therapy focuses on the relationship between structure (primarily the spine, and pelvis) and function (as coordinated by the nervous system) and how that relationship affects the preservation and restoration of health. Chiropractors apply manipulative techniques as well as providing advice on lifestyle issues such as exercise and maintaining a healthy body. The goal of the chiropractic adjustment is to correct the spinal subluxations detected during the examination. The bone will then be free to align itself correctly. Over 215,000 Australians visit chiropractors each week (Australian Bureau of Statistics, 2004-2005, 2006). Meade et al. (1995) found the patients reported chiropractic as being more helpful than hospital treatment after three years of treatment (utilised Oswestry Disability Questionnaire, Fairbank and Pynsent, 2000).

Acupuncture is an ancient Chinese practice that involves the use of specialized needles to stimulate parts of the body. The number of Americans who use acupuncture services continues to grow each year. Two elements required to deliver high-quality acupuncture treatment are the identification of the appropriate acupuncture points and proper manipulation of the acupuncture needle. Despite a growing awareness of the importance of proper needle techniques, no tool capable of objectively measuring needle manipulation in a clinical setting has ever been developed. Chou and Hoyt-Hoffman (2007) studied several systematic reviews which found sparse and inconclusive evidence of the efficacy of acupuncture for acute low back pain. In the same manner, they found that the evidence of long-term benefits from acupuncture is mixed. However, for chronic back pain two high-quality systematic reviews found acupuncture moderately more effective than no treatment or sham treatment for short-term pain relief.

Chou and Hoyt-Hoffman (2007) included 79 unique trials of exercise therapy in six systematic reviews. They found evidence of exercise therapy being superior to usual care and no treatment for acute low back pain. In addition, the reviews found exercise slightly to

moderately superior to no treatment for pain relief at earlier and later follow-ups. When compared with other non-invasive interventions exercise was statistically significant for function but had small effects on pain. In further reviews, these authors found limited evidence of the effectiveness of Yoga with the significant exception of six weeks Viniyoga (therapeutically oriented style) to be slightly better than conventional exercise and moderately superior to a self-care education book.

The role of adjunctive analgesics in the relief of chronic back pain has grown in recent years as the traditional analgesics have not always managed to bring relief to chronic sufferers. These medications include tricyclic antidepressants, selective serotonin-norepinephrine reuptake inhibitors and antiepileptic drugs and can be prescribed by general practitioners (Chang et al, 2008).

Functional restoration is a comprehensive intervention based on a BPS approach to CLBP which considered a range of issues faced by professionals and sufferers. In this multidisciplinary approach, the combined effect of each intervention administered is greater than the sum of its parts (Gatchel & Mayer, 2008). Functional restoration requires a multidisciplinary team of clinicians. Given the number of health providers involved, effective communication among functional restoration team members is crucial so that patients' fear of physical activity will not interfere with their physical reconditioning. Gatchel and Mayer, however, emphasize the importance of the suitability of the participants for this intervention. The ideal CLBP patient for functional restoration is one who is motivated to learn to manage his pain more effectively, is compliant with the prescribed rehabilitation regimen, and wishes to return to work and full activities of daily living.

Multidisciplinary treatment for chronic back pain is a BPS therapy strategy based on biological, social and psychological aspects. Therefore, it encompasses a physical component (physical exercises and ergonomic training) as well as psychotherapy (education

and cognitive-behavioural therapy) and workplace-based interventions (Buchner et al, 2006). This approach has gained support in recent years, as a multifaceted approach seems the appropriate way to deal with a multifaceted problem such as chronic back pain. Buchner et al found that in a study of 365 individuals (134 with chronic neck pain and 231 with chronic low back pain) 67.4% of participants returned to work after six months of therapy. In addition, these results show higher rates of success with purely biomedical treatment. Across a series of categories which included: return to the original occupation that they had before the pain; reduction of pain intensity; the level of satisfaction with therapy; health-related quality of life and functional back capacity, the multidisciplinary treatments' results were significantly better for chronic neck and low back pain sufferers. Other studies have found consistently similar results, and the literature concurs in the benefits of multidisciplinary treatments. In a review of the existing literature Guzman et al. (2001) conducted 12 trials that included 1964 adult participants with back pain for more than three months. They found evidence that intensive BPS rehabilitation with a functional restoration improves pain and function when compared with non-multidisciplinary treatments. Results have been positive in different workers' compensation and socio-economic systems, which speaks highly for the generalisability and robustness of this approach in carefully selected patients. An important advantage of functional restoration relative to traditional unimodal medical intervention methods is that it simultaneously addresses multiple outcome measures, including self-reported measures of pain and disability, objective physical functional measures, and socio-economic outcomes such as return to work (Gatchel & Mayer, 2008). However, less intensive outpatient psycho-physical treatments did not improve pain compared with non-multidisciplinary outpatient therapy. Despite the level of support and evidence in favour of the implementation of multidisciplinary treatments, there are also a growing number of studies and reviews that don't support these views. Wand and O'Connell (2008) found that

while some papers show small differences with the addition of treatments, the majority of studies report no difference when unimodal and multimodal approaches are compared. Similarly, Hayden et al. (2005) provided systematic and methodologically rigorous information on this perspective. They compared exercise-only groups with groups that received exercise and additional therapy. The addition of other conservative care to exercise therapy for CLBP patients produced only small and clinically insignificant changes in pain and function.

In Australia, the Multidisciplinary Spinal Pain Unit is a service that involves acupuncturists, chiropractors and medical practitioners within the Australian public health system. These services provide specialised diagnostic and management for patients with acute, subacute and chronic spinal pain syndromes. Giles, Muller and Winter (2003) carried out a study based at the Multidisciplinary Spinal Pain Unit in Townsville between 1995 and 2001. They found evidence that publicly funded hospital or community health centre based specialised multidisciplinary spinal pain units would provide a useful referral option for medical practitioners as referral centres for socio-economically disadvantaged patients who cannot afford specialised spinal care. Studies reviewed concluded that active exercises (physiotherapy exercises were effective in reducing pain in people with CLBP) were a valuable therapeutic approach, despite the lack of consensus on the optimal techniques, intensity or active intervention (Hayden et al, 2005; Lewis, Morris & Walsh, 2008).

Functional restoration programmes focused strongly on self-responsibility, activity and a multidisciplinary approach. A more structured back rehabilitation class appeared to generate additional benefits to a general fitness or aerobics class and might provide a more realistic replication of a typical work day situation as well as enabling people to regain confidence to return to pre-injury activities. A cognitive behavioural approach was used in most of the back care or functional restoration programmes and the rationale is to normalise behaviour



patterns and give people the confidence to overcome the fear of movement. Lewis et al (2008) found strong evidence to support the idea that multidisciplinary interventions appear to have the greatest efficacy in treating chronic pain as they address the multifactorial components of CLBP.

Patients with chronic pain exemplify all BPS complexities, and the best hope of helping these patients within rehabilitation is a methodical, steady, compassionate and, above all, multidisciplinary approach (Geertzen et al, 2006).

In a study that presented before–after comparison, the findings suggested that a Back Rehabilitation Program (BRP) was effective in improving back-specific and general measures of physical functioning, as well as measures of psychological well-being in people with CLBP, and the degree of improvement was commensurate with other studies of the effects of similar BRP (Gaskell et al., 2007). The BRP consisted of nine two-hour group sessions run over five weeks. It included education and advice on spinal anatomy and disease, pain, exercise, posture, lifting and handling, self-help strategies and relaxation techniques. The focus was active and patient-centred and aimed to challenge unhelpful beliefs by using cognitive behavioural principles, that is, that pain does not always equate to harm and that the avoidance of physical activities is likely to result in worsening disability. It included setting individual specific, measurable, achievable, realistic and timed (SMART) goals and pacing relevant to, and agreed by, each participant (Gaskell et al.).

Authors of several studies speculated that increased levels of exercise and activity may have had an antidepressant effect in itself. Alternatively, the physical activity and/or education, cognitive behavioural principles and SMART goals could have led to increased feelings of control and confidence to manage their condition; better understanding of it, and/or more realistic expectations of their abilities. This may have led the participants to adjust their perception of their pain and disability, which is known to be as important in

determining an individual's level of activity as physical impairment (Gaskell et al., 2007; Asghari & Nicholas, 2001). Gaskell concluded that a back rehabilitation program combining education, cognitive behaviour principles, goal setting, exercises and fitness training led to significant improvements in pain, disability, anxiety and depression, fitness and perceived control in people with CLBP. This concurs with the general literature in relation to multidisciplinary treatments approaches and their superior results when compared with unidisciplinary strategies. A combination of exercise, education and cognitive behavioural principles included within a BRP is thought to empower the patient by reducing fear-avoidance behaviour and encouraging normal physical functioning (Asghari & Nicholas).

### **1.3.6 Access to treatments.**

The level of functionality and quality of life of the back pain sufferer will vary immensely between individuals. A range of BPS factors undoubtedly will contribute to the final outcome. These factors may also impact on the individual's belief, attitudes and motivation to access treatments and enhance their functionality and wellbeing. It is imperative to understand the underlying mechanisms and influences that drive individuals to obtain and participate in treatments.

In the United Kingdom, Keeley et al., (2008) conducted a research with patients attending a hospital orthopaedic clinic to investigate health care utilization ( $n = 108$ , suffering back pain for at least six months). Eighty-six patients answered questionnaires six months after the initial recruitment (80%) with a median of four health service contacts (range 1-29) with 20% of patients having more than ten contacts. Baseline markers were: the cause of back pain (traumatic), more fearful cognitions relating to work and back related stresses. In contrast, scores for the Hospital Anxiety and Depression Scale (HADS) and the Fear-Avoidance Belief Questionnaire were not independent markers for health care utilisation. Social stresses were found to be important markers of health care utilisation and health-related

quality of life with influences from anxiety and depression. A high degree of association was found between socio-economic, employment and education data and only education was utilized for further analysis (education was not an independent marker). The authors stated, “That the contribution of HADS scores and back pain related stresses continue to contribute significantly to the model if employment status or socio-economic status were instead of educational status” (Keeley et al. p.144). There are some considerations in regards to these findings. Socio-economic status was determined by the participants’ report of manual labour which is somehow unusual but described as appropriate for this study by the authors. Furthermore, results for health care utilization may be difficult to generalize to other countries with different health systems, costing and availability of services.

Walker et al., (2004) investigated health provider utilization and care seeking by Australia adults. Data from 1913 participants (69.10 % respond rate) was demographically consistent with the Australian population and with the non-respondent group. The findings indicated that 64.60% reported at least one episode of low back pain within the previous 6 months of which 44.50% (28% of the entire sample) reported seeking care within the same period ( $n = 547$ ; 95CI, 41.80 to 47.30). Further analyses indicated that 59% visited more than one type of practitioner compared with 41% who only visit one type (GP, chiropractor, massage therapist and physiotherapist). Older participants were found to be more likely to visit their GP exclusively with no other socio-economic or demographic factors having statistically predictive significance for health seeking (women were more likely to seek medical help). Chiropractors were more commonly visited than physiotherapists, despite the latter being the referral of choice of GPs in Australia and the fact of that chiropractic treatment is not covered by Medicare rebates (at least were not covered at the time of the publication of this article in 2004). The limited findings in relation to socio-demographic factors may be attributed to methodological and design issues of this study. Age groups were

unevenly distributed (18 to 19 years of age, 20 to 80 years of age and more than 80 years of age), but the authors justified this distribution by comparison to a previous study on low back pain prevalence (by the same authors). Psychological influences were measured by reporting lifetime emotional distress (0- 10 Likert scale) which may not be relevant to the experience of back pain and fear of back pain and may not indicate a propensity to seek medical help. There were also questions about the marital status distribution as “never married” does not reflect the level of support that the individual may have. Finally, in relation to education groups which were divided into four: “education leading to a basic job or vocation”, “education leading to skilled job or vocation”, “undergraduate diploma or degree” and “postgraduate diploma or higher degree” which is at odds with traditional divisions of education of primary, secondary and tertiary level.

Ferreira et al., (2010) conducted a review of studies from 1996 to 2008 in relation to care-seeking in low back pain focussing on comparing people with non-specific back pain who sought treatment with those who did not (specific spinal pathologies and pregnant women were excluded). Eleven studies of a possible 3721 were selected as meeting the main criteria (from seven different Western countries). The findings from the seven studies indicated a prevalence of .58 (95% CI, .32 to .83) with a range from .20 to .92 which questions the validity of this measure as well as the definition of care seeking which may account for such a wide range. The authors attribute these differences to the inclusion of medication as a treatment and the periods utilized for different studies to receive treatments. Women and those with higher levels of pain were slightly more likely to seek care, while those with higher levels of disability were highly likely to seek care. Unfortunately, many different factors were analysed by individual studies and could not be pooled into this review. Therefore, there is very limited data in relation to psychosocial factors and their influence in

care seeking (authors indicated that there was a small number of studies and they were too heterogeneous to be pooled).

Another Australian study by Miller and Hafner (1990) provided some indication of markers of care seeking in people with low back pain. Sex and age were the only demographic variables investigated with mood data obtained from subscales of the Illness Behaviour Questionnaire. Men were found to consult more specialists and visit them more often than women (no sex differences in psychological disturbances). The authors attributed this difference to the possibility that men more actively pursue specialist treatment or are involved in legal/compensation cases that require a great deal of reviews and examinations by specialists. Pain duration was the strongest marker of GP visits and an even stronger marker of specialist visits. The authors question some of the stress related responses as they may reflect a high level of somatization.

#### **1.4 Socio-demographic contributors to Chronic Back Pain**

Pain is a universal experience that affects individuals of all ages, socio-economic status and cultures. As a subjective experience, it varies between individuals and as a psychological experience it acquires a social and cultural significance that cannot be ignored. Some cultures may encourage avoidance of pain or its acceptance as part of the life experience. Therefore, culture becomes a conditioning influence in the formation of the individual's reaction to and reporting of pain. Furthermore, culture significantly affects the assessment and management of pain as well as the individual's treatment-seeking behaviour (Davidhizar, et al., 2004).

In a Melbourne-based study, Holmes et al. (2010) investigated which independent factors predicted pain severity three months after a serious injury. A total of 290 participants were recruited from trauma centres in Melbourne and 242 were followed up at three months. After an extensive literature search, the authors identified a series of factors or markers that

included demographic measures (age, sex, marital status, living status, dependents, income, employment and schooling), health-related function measures, social support measures and mental health measures. The only demographic factor that was statistically significant as a marker was living status with higher levels of pain for those living alone (bivariate association: alone = 3.17, not alone = 2.31,  $p = .014$ , Odd Ratios). Alcohol dependency was also significant as a pain severity marker (bivariate association: alcohol dependent 3.50, not alcohol dependent = 2.42,  $p = .001$ , with only 6 participants being alcohol dependent). There were modest significant correlations for several health indicators. Results from a multiple regression indicated older age as a significant marker of pain ( $\beta = .18$ ,  $p = .006$ , CI 95%, .92 to 5.35). One the limitation of this study is that it did not record the nature of the injuries. In addition, three months is a relatively short time to ascertain the impact of demographic factors on the experience of pain. The same authors conducted a follow up a study (Holmes, et al., 2013) to investigate the determinants of chronic pain three years after a moderate or serious injury. Two hundred and twenty participants (75.9% of the original cohort) were assessed three years after the original study. Fifty-two participants (23.60%) fulfilled the criteria for chronic pain and 146 (66.40%) reported some pain. Lower income, family history of depression, past alcohol dependence, injury severity, lower limb injury severity, initial pain severity, pain beliefs regarding the need for medication, emotional impact and low expectations, duration of hospitalization and compensable injury were significant markers of pain in a bivariate analysis with modest correlations. Psychological measures did not predict pain-related disability and the only demographic variable that was significant marker was income (AUD\$90,000). The authors indicated that this lack of association could have been due to the presence of multiple prospective psychological measures which were partially collinear. The authors discussed the association between lower income and chronic pain

identifying the “relatively greater benefits of illness in those with limited resources” (Holmes et al., 2013, p.342).

#### **1.4.1 Age.**

While back pain affects men and women of all ages, it is believed that adults of working age are the most vulnerable, and hence that the prevalence of back pain decreases around the middle of the sixth decade, although there is no consensus on the actual prevalence rates of back pain (Dionne et al, 2001, Waddell, 2004, Walker et al, 2000).

The findings of a Swedish study indicated that there was an inverse relationship between age and the chances for individuals with chronic pain to return to work. While considering the fact that younger individuals probably enjoy better general health, the authors elaborated on the possible effects of motivational issues (higher motivation in younger people) as a significant influence in the results (Selander et al, 2007). This study also found that for people over 60 a disability pension or welfare may be an “established and common way” to leave the workforce. Although these results were based on a Swedish sample, there are similar social security regulations and benefits in Australia, Canada and Europe and this may also influence disability levels in these countries.

Ageing tends to decrease physical health in patients with CLBP. Bentsen et al (2007), found that when all variables were controlled for, as expected, increasing age and not working was negatively related to physical functioning and physical role limitations in patients that received spinal fusions. Correlational analyses (Pearson's  $r$ ) indicated significant associations between socio-economic status, working status and affective pain. Not working and being economically worse off after surgery were positively correlated with affective pain (measures of social functioning and mental health). This was followed up by a linear regression that showed that age, work status and number of years after surgery

predicted physical role limitations. These findings were similar to those of Ren et al. (1999), cited in Bentsen, 2007 who found a decreasing level of physical activity with age.

Generally, in young adults (less than 60 years old), common conditions include sciatica, degenerative disc disease, and isthmic spondylolisthesis. In older patients (more than 60 years old), common conditions include osteoarthritis, spinal stenosis, and degenerative spondylolisthesis. With age, the spinal discs break down or degenerate; this may result in degenerative disc disease in some people. These age-related changes include the loss of fluid in the discs. As the space between the vertebrae gets smaller, there is less padding between them, and the spine becomes less stable. The body reacts to this by constructing bony growths called bone spurs (osteophytes). Bone spurs can put pressure on the spinal nerve roots or spinal cord, resulting in pain and affecting nerve function. While a physical deterioration may not always result in the experience of higher levels of pain and disability it is obvious that an accumulation of degenerative changes, as well as a gradual decline in physical fitness, may lead to higher levels of pain (Marieb, 2001).

Grzywacz et al (2007) found that individuals suffering from chronic conditions, in presence of pain and functional impairment show a higher level of complementary medicine use. Complementary medicine comprises a variety of interventions from acupuncture to mind-body therapies, herbal medicines, yoga and exercise and energy therapies. The use of these interventions as part of a self-management strategy involves several cognitive activities that are shaped by social and cultural factors. These include beliefs about health and health models. Grzywacz et al. found that despite having a higher need of for complementary medicine older adults were less likely to use these treatments when compared with younger adults. One possible reason is that older adults believe strongly in the benefit of conventional medicine and have less experience with complementary approaches. Furthermore, these authors elaborated on the age differences in beliefs about the causes of poor health. While



older adults may interpret ailments as inevitable signs of aging, younger adults may attribute them to illness or disease. Therefore, older adults may have a tendency to “wait out” minor ailments and only seek help when severity or length intensifies.

The ability to cope with pain and the use of coping strategies to deal with pain has been regarded as important characteristics in explaining variation in individuals’ pain experiences (Lachapelle & Hadjistavropoulos, 2005). Several studies in this area have reported varied findings in relation to age and use of coping strategies in dealing with pain. Lachapelle and Hadjistavropoulos found that older adults reported lower levels of pain severity and pain interference than their younger counterparts. Furthermore, they found significant differences in one particular area of life-context variables; “daily hassles” where younger adults had better coping skills than older adults. They cited similar findings from Watkins, Shifren, Park and Morrell (1999) who found age-related differences. In this study, it was found that age interacted with pain severity to influence coping strategy use; when the pain was mild, middle-aged and older adults reported catastrophizing, more praying/hoping and less coping self-statements than younger adults (no differences with severe pain). Similarly other studies have found that when dealing with painful conditions, younger adults (under 35) reported using twice as many cognitive coping strategies such as progressive muscle relaxation and distraction (Sorkin, Rudy, Hanlon, Turk and Stieg, 1990, cited in Lachapelle and Hadjistavropoulos, 2005).

#### **1.4.2 Sex.**

The existing literature supports the existence of sex differences in pain. However, there is not agreement in the source of these differences as some may be attributed to biological mechanisms and others may refer to sex-differentiated learning history, behaviour, socialisation and risk factors. The possibility of a combination of factors is considered by most (Robinson et al., 2001; Robinson et al., 1998 & Berkley, 1997).

Women are more likely to report back pain than men (Deyo, et al, 2006; Strine & Hootman, 2007). Men are less willing to report pain and are expected by both sexes to have higher pain endurance and have lower pain sensitivity than women (Robinson et al, 2001; Waddell, 2004 & Keeley et al. 2008). Meana (1998) found that the chronic pain sufferers in Canada are more likely to be a woman than a man. However, women also have lower incomes, less formal education and twice the prevalence of depression, all of which were strongly associated with the report of chronic pain in this study. Thus, it seems reasonable to speculate that the differences in chronic pain evidenced in this study were attributable to a combination of biological and psychosocial conditions specific to each sex.

In an Australian study Walker et al. (2004) found while there were no sex differences in prevalence rates for lifetime point and 24 hours, here were some sex differences for the periods of two weeks, one month, six months, and one year, all demonstrating statistically higher rates for women. A total of 1913 (53% women, 47% men) respondents out of 2768 eligible respondents provided data through questionnaires (69.1%). The Chronic Pain Grade Questionnaire was utilized. This questionnaire has a mannequin drawn and a scale to rate pain and disability (similar to the McGill Pain Questionnaire). Although women reported higher levels of pain in relation to lower gradings of pain no significant differences were found between sexes. There were no differences by sex in relation to high grades of chronic pain and disability. However, Walker et al. highlighted the marked difference between their results and those of the National Health Survey (NHS) of 1995. In particular, the prevalence of low back pain at six months for the NHS was 5.10% compared with this study at 13.40% (CI 95%, 12.00-15.00). Walker et al. questioned the accuracy of the NHS in collecting data for low back pain prevalence due to the inclusion of certain conditions. The finding of that study reported higher prevalence in comparison with similar studies from the United States and Europe.

In a Dutch study, Peul et al. (2008) investigated sex differences for sciatica sufferers who were treated either by surgery (discectomy) or conservative treatments. There was no age or other demographic differences at baseline by sex (186 men and 97 women). In a regression analysis sex was a significant marker with a Univariate Odds Ratio of 3.29 (95 CI 1.72-6.28) with women having poorer outcomes. In addition, a Cox Proportional Hazard Analysis showed a slower rate of recovery after surgery for women (HR 0.76; 95% CI: 0.59 -0.99). These findings were consistent with findings from the Roland Disability Questionnaire and the Visual Analog Scale with high significant differences between groups ( $p = 0.001$ ). Peul et al. (2008) found that being a woman was a predictive determinant for an unsatisfactory outcome at one year after 6–12 weeks of severe sciatica. In addition, women showed a slower perceived recovery from sciatica. Men presented more pronounced early treatment effects that were significantly different to those of women. Women reported a worse initial value on all pain and disability scales and also presented with higher pain and disability scores when they recorded unsatisfactory perceived recovery in contrast to men with unsatisfactory recovery. This was a randomized trial and thus the investigators were not able to perform an elaborate observational prognosis. In addition, sex differences in relation to catastrophizing were not established which could have shed light on differences in attitudes towards surgery (women were believed to be more reluctant which impacted negatively on recovery). In this above study it is not that clear if only men and women were being compared or types of treatment were also compared.

In several studies, however, being a woman appeared to be a risk factor for chronic pain and disability caused by other musculoskeletal pain disorders. In addition, recent basic and clinical research has shown that biological, social and behavioural factors contribute to the risk of pain-induced chronic disability in women (Wijnhoven, et al., 2007). Explanations for

sex differences have included differences between men and women's emotional and coping responses to pain (Wijnhoven, et al.).

Women not only report greater emotional distress, but may also use more emotion-focused problem solving which may be less beneficial in the long-term (Robinson et al., 2001). Robinson et al. researched on the stereotypes of sex and pain issues finding that women more often report multiple pain sites, intense pain and frequent pain, and concluded that women exhibit lower pain thresholds and tolerance than men. There appears to be a general agreement on the fact that women report higher levels of pain than men. The sex effect for willingness to report pain is quite large, accounting for 46% of the variance in rated willingness to report pain. Robinson et al. found that both men and women reported that men are expected to report lower levels of pain than women. Furthermore, this study reported greater sex differences in the willingness to report pain and to a lesser degree in endurance and sensitivity of pain. These results may indicate that traditional societal and cultural views make it less acceptable for men to report pain even if the endurance and sensitivity level is similar. Women rated men as having greater endurance, less willingness to report pain, and slightly less sensitivity to pain. Men rated women as having less endurance and more willingness to report pain. Given that pain levels reported are subjective expressions it may be difficult to distinguish sex stereotypes and obtain objective results in relation to intensity and pain thresholds. These results offer a unique and interesting perspective into this issue. However, the main limitation is that participants did not report on actual pain stimuli. In addition, the sample of undergraduate students offers a limited level of generalisability. Finally, sex stereotypes are subject to cultural, social and chronological changes and further research in this area is necessary to confirm the original results and their validity in terms of extrapolation to their populations.

There has been limited research to objectively measure sex differences in relation to pain. For instance, studies that utilised physical stimulus have not focused on sex differences. Unruh (1996) conducted a critical summary of research examining sex variations in clinical pain experience. Sex-comparative pain research was identified through Medline and Psychlit searches and references obtained from bibliographies of pertinent papers and books. Review of this research demonstrates that women are more likely than men to experience a variety of recurrent pains. In addition, Unruh found that many women had moderate or severe pains from menstruation, pregnancy and childbirth. In most studies, women reported more severe levels of pain, more frequent pain and pain of longer duration than do men. Women were at greater risk for pain-related disability than men, but women also responded more aggressively to pain through health-related activities. Women were more vulnerable than men to unwarranted psychogenic attributions by health care providers for pain in relation to sex stereotypes mentioned earlier (Unruh, 1996).

Selander et al. (2007) found conflicting evidence in relation to sex differences in returning to work. While recognizing that previous studies had found significant differences giving men a better chance of successfully returning to work, in their study these differences were not replicated.

Sex differences have also been found in responses to pharmacological and non-pharmacological treatments. Keogh et al. (2005) explored sex effects in predicting outcome following multidisciplinary pain management. They found that for LBP, men benefited the most from physiotherapy, whereas women benefited from back exercises. They concluded that men reported lower levels of pain at three months follow-up. Further analyses were conducted to investigate the role of distress and catastrophizing as mediators between sex (independent variable) and level of pain at follow-up. It was found that both distress and catastrophising “Mediate the effect that sex differences have on increases in current pain

reports following treatment” (Keogh et al., p.43). Some reservations remain about these findings. Sex differences were evident with single items, but this was not the case for validated measures such as Beck Depression Inventory and the Pain Anxiety Symptom Scale. In addition, further research is warranted in relation to biological sex differences that may explain differences in pain levels. Lastly, the men and women may respond differentially to elements of multidisciplinary treatment and thus there should be sex-tailored changes in the planning of treatments to maximise outcomes.

Many authors have elaborated that sex differences in the perception and above all in the reporting of pain may lie in differences in coping mechanisms, catastrophising, and stress management (Leino & Magni, 1993; Lopez Martinez et al.; Sa et al., 2008). Weisse, Foster and Fisher (2005) conducted a study where a standard cold pressor task (placing the non-dominant arm in ice water) was used to observe differences in reactions to pain mediated by sex and race. They found that women reported greater pain sensibility and exhibited lower pain tolerance compared with men. In addition, the study indicated that total immersion time was shorter for women, and they reported higher pain intensity and unpleasantness scores.

Utilising a similar procedure, Jones and Zachariae (2004) investigated the interactive effects of sex and psychological factors on pain response. Although they found no effect of sex on any pain measures, they found an interactive effect of anxiety in relation to pain tolerance. Men with low anxiety displayed significantly higher pain tolerance than both low and high anxiety women. Other studies cited by these authors have found consistent differences in pain responses for men with and higher levels of anxiety and in particular for chronic pain (Riley, Robinson, Wade, Myers and Price, 2001, cited in Jones and Zachariae, 2004). Keogh and Kirby (1999) also found sex differences in responses to pain as women had high anxiety sensitivity, reporting higher levels of pain using the McGill Pain Questionnaire-Short Form. Jones and Zachariae (2004) indicated that an explanation for sex

differences could be found in the fact that negative expectancy was shown to be significantly related to pain unpleasantness and marginally related to pain intensity in women (only). In addition, they considered that women may have a lower level of stoicism, enabling them to better evaluate the pain experience with less stereotypical expectations than men.

Many authors agree that there are significant sex differences in the experience of chronic low back pain. Sheffer, Cassisi, Ferraresi, Lofland and McCracken (2002) defined this variable as ‘fuzzy’ and cited anatomic, physiologic and hormonal differences. These are obvious and undisputed. However, they proposed that in order to understand sex effects better it was necessary to consider the nature and quality of sex differences. There was a myriad of psychosocial factors that acted as covariates with sex. For instance, employment and marriage have significant psychosocial influence and men and women experience work and marriage differently. In the U.S., large sex differences continue to exist in employment. The majority of employed women are still clustered in low-paying, female dominated positions (Women Employed Institute, 2000). Women earn less than men despite equivalent education. Moreover, as the level of education for men and women increases, the gap in wages between the sexes increases as well (Women Employed Institute, 2000). Although there has been some improvement in the past 30 years, women still earn less than 73% of every dollar earned by men (National Council of Women’s Organizations, 2001; U.S. Bureau of the Census, 2000; Women’s Bureau, 2001; Women Employed Online, 2001).

Even though women earn less than men, women continue to shoulder a large proportion of the financial responsibility for their families. Nearly two-thirds of employed women report that they provide at least half of their family’s income, and nearly one in five U.S. families is headed by a single woman (Women Employed Institute, 2000).

Incongruities in the pay scale translate to increased financial stress throughout the lifespan into old age as lower lifetime earnings reduce Social Security benefits and access to pension

plans (Women Employed Institute, 2000). Older women today are less prepared for retirement because they were paid less than 73% of every dollar earned by men. Only 32% of women retirees receive a pension, compared with 55% of men retirees. The median pension benefit paid to women is also less than half that paid to men (Women Employed Institute, 2000). Significantly more retired women than men are economically dependent on Social Security benefits (Barusch, 1994; National Council of Women's Organizations, 2001; The Office of Policy, 2001a; The Office of Policy, 2001b).

Employment status, including retirement, is associated with different income levels for women and men. A significant number of women live in poverty or financial stress despite employment or retirement benefits (Women Employed Institute, 2000). Many studies spanning numerous specialties and disciplines indicates that poverty and financial stress are consistently associated with increased stress and depressive symptoms, increased pain, and other health and mental health related problems (Elstad and Krokstad, 2013; Ferguson, Horwood and Woodward, 2001; McGrath, Keita, Strickland, & Russo, 1991; Meana, 1998).

Married persons generally have higher household incomes than unmarried persons. The economic benefits of marriage are greater for women than for men. Marriage appears to predict health-related resilience for both married men and women (Basic Behavioural Science Task Force of the National Advisory Mental Health Council, 1996). Married persons generally report greater overall well-being and less psychological distress than unmarried persons; however, these relationships are stronger and more consistent for men than for women (Basic Behavioural Science Task Force of the National Advisory Mental Health Council, 1996; McRae & Brody, 1989).

Although women have a higher life expectancy in every country in the world (outlive men by five to nine years in most developed countries (82 years cf.. 76.6 in Australia) overseas data on morbidity indicate that women tend to be less healthy than men (Gray, 2006).



Women might suffer more long-term conditions such as neoplasms, endocrine disorders, metabolic diseases and psychological disorders. However, men have a higher incidence of back problems. An explanation for this is the occupation type, as men are more involved in industries such as construction, heavy manufacturing and transport. In addition, men are more likely to engage in recreational sport activities that may involve physical risks, more likely to smoke, be overweight, and consume more alcohol and less fruit than women (Gray, 2006). In contrast women are more likely to have lower SES, lower paid jobs and more social isolation as well as having the role of primary house carer in addition to paid employment. Men are less likely to define themselves as ill and seek treatment, less likely to engage in health preventive activities and are less familiar with the health system. Women are more likely to be sedentary, have less environmental risks, but a higher incidence of mood disorders. There are many theories about the differences in reporting between the sexes, but there is no objective data that may identify big differences in health (other than for blood diseases).

#### **1.4.3 Socio-economic Status.**

SES is the measurement of the level of social and economic standing each person has in society. It includes several indicators such as income, education, occupation, place of residence, etc. For example, if the specified person's income is rather low, compared to a national average, that person would be considered as a part of the low socio-economic status group. Individuals with low socio-economic status also tend to have less control over their lives. Consequently, they become more sensitive to stressors in their environment and less able to control their reactions.

Differences in life expectancy and health status are found according to social class, sex, ethnicity and migrant status in Australia (Gray, 2006). Despite the fact that Australia has universal public health care (Medicare) individuals with lower SES have poorer health

outcomes and higher levels of mortality. In addition, people from the 'working class', also identified as blue collar workers, are more likely to suffer more serious chronic illness and disability. In data from several Australian health surveys (1982, 2001 & 2006) individuals with lower SES had a higher incidence of chronic illness. In 2001, findings indicated that Australians in the highest income quartile had a 10.8% of chronic illness incidence while their counterparts in the lowest income quartile had a 25.4%.

Low SES is associated with increased mortality, lower levels of health and higher morbidity from musculoskeletal conditions (Dionne et al., 2001). Education is considered one of the best sub-indicators of socio-economic status because it is less likely to be impacted by chronic illness in adult life like other sub-indicators. In addition, Dione et al. also stated that education may also be a marker for traits such as intelligence, adaptive skills and awareness of risky health behaviours, which in turn, may have a great influence in treatment seeking and chronicity of conditions.

Schollgen et al. (2011) studied the impact of social support and psychological strengths according to different SES. They found education level to be a more consistent indicator having a greater influence than income when isolated in data analyses. They concluded that individuals with a lower SES were impacted more significantly by social support and psychological resources when compared with higher SES. In particular, they found, that income did not have a significant impact, that psychological resources (optimistic self-beliefs) were a strong influence in individuals with lower education.

In relation to back pain, Dionne et al., (2001) found that education played three different roles; first, as a marker of the frequency of back pain; second, as a marker of outcomes of back pain episodes, and finally as a marker of outcomes of surgical or rehabilitation interventions. Therefore, it could be assumed that people with higher levels of education are more likely to have better outcomes in relation to treatments and recovery.

Bergman (2005) found that patients with Chronic Widespread Pain (CWP) and fibromyalgia were highly affected by psychosocial factors. These factors included being a migrant, residing in a lower socio-economic area, lower level of education and having a family history of chronic low back pain (CLBP). However, these factors did not have an impact when considering more strict parameters defining CWP or in patients with no chronic pain.

#### ***1.4.3.1 Income.***

Income is a common and significant indicator of an individual's social status. Lower income usually equates to lower SES (at least on a long term basis) and may influence health status. In the same manner, an individual may have his/her income seriously affected due to poor health. The relationship between low income and poor health is in any case well documented (Gray, 2006). In Australia, individuals with lower income tend to use the services of general practitioners and hospital outpatient clinics more, but are less likely to use dentists and other health care professionals including allied health professionals. In addition, those with lower incomes are less likely to have private health insurance, which represents longer waiting periods and no access to benefits in relation to allied health professionals.

Gray (2006) proposes a material deprivation explanation which states that “there are certain economic hardships working class people encounter that produce more health problems than those found among people from more advantaged backgrounds” (p. 264). Individuals in the lowest income quartile had a 29.5% of private insurance membership compared with 82.3% for those in the highest quartile. In addition, those on lower incomes in Australia are more likely to have lower exercise levels, to be a smoker, to be overweight and have a lower daily intake of fruit.

A Brazilian-based study found a strong association between high self-efficacy and low fear avoidance beliefs and higher income (De Moraes-Vieira et al., 2014). Data from 235 participants mainly recruited from health services (82.30%) was analysed to investigate the relationship between BPS factors and self-efficacy and fear avoidance beliefs. The findings showed that income, sex, depression, disability and fatigue were significant positively associated to at least one of the two beliefs. Income was divided into three groups (below US\$450, between US\$450 and US\$1,350 and above US\$ 1,350 per month) and a follow up analysis showed that those with higher incomes had a higher level of self-efficacy ( $\beta = 19.20, p = .02$ ) and lower fear avoidance ( $\beta = 6.7, p = <.001$ ). These associations, however, have no relevance in relation to causality due to the cross-sectional nature of this study. In addition, there is no exploration of the duration of pain or duration of absence from work for each participant, which in turn, questions the usefulness of this data as these factors may have a direct influence in relation to both beliefs.

#### ***1.4.3.2 Occupational Status.***

Lipscomb et al. (2006) found that occupation and work type were important contributors for differences in income but also accounted for significant disparities in health status. Manual workers were at higher risk and exposure to injury, non-whites were more likely to have jobs with lower conditions, pay and safety standards. SES (and, in particular, race) were a clear indicators with Black, Indians and Hispanic migrants more likely to perform in lower paid more risky positions. Fatal injuries at work of Hispanic men in the USA were higher than any other ethnic group (double the average within the construction industry). These differences also have implication with lower access to return to work programs (light duties), access to health care and legal protection for workers.

Having a job provides individuals, and their families, with basic needs of modern times such as money, status, and a sense of accomplishment. When people are fired or laid off

from their job, it can be devastating, but having social support can make the transition from job to job much smoother. Social support can help in three major categories: (1) dealing with the financial loss of a job; (2) dealing with the symptoms that come with losing one's job, such as poor physical health brought on by low self-esteem or depression; and (3) how motivated the person is to seek a new job. These three conditions can shorten the time of unemployment and improve the person's overall positive outlook on life (Fretz, & Mallinckrodt, 1988).

There is limited research in relation to work status and reported levels of disability. However, Kuijer et al (2006) found that non-working participants reported higher levels of disability. Suter (2002) found that work status (working vs. non-working) had a significant effect in recovery from injury and pain chronicity. In the same manner, Romano and Turner (2000) found that unemployment was a significant marker for depression.

#### ***1.4.3.3 Type of Employment.***

Schneider et al (2006) found that poor physiological posture and repetitive carrying; lifting and holding heavy loads were the most conclusively documented work-related risk factors for back pain. Furthermore, they reported that workers traditionally described as 'blue collar' were at higher risk of developing chronic back pain. Working class (blue collar) people are also likely to have a weaker network of social support and lower level of participation in recreational activities (Stansfeld, 1999).

Australian data reflects that those working in the manufacturing or primary industries are at higher risk of work-related accidents (Gray and Mendeloff, 2002).

Yilmaz and Dedeli (2012) investigated the link between occupational risk factors for LBP and biomedical demands of the job as well as the possible influence of psychosocial factors. These authors cited three main focuses of influence on LBP: psychological distress, work satisfaction and biomechanical issues (excessive and/or repetitive loading, awkward postures,

etc.). Several Turkish studies were reviewed with a higher prevalence of LBP in physically demanding jobs with 20 kg load lifting, load-pulling and load carrying being the major contributors for LBP. The prevalence at 12 months was 64.80% for metal workers, 34.30% for care workers at the university hospitals and 39.90% for nurses. These authors emphasized the influence of personal factors (psychological distress, social support, coping styles) on the prevalence of back pain amongst manual workers.

A German-based study focused on bricklayers and investigated risk factors for musculoskeletal injuries. Employees were interviewed at intake and at three years follow-up (follow-up subjects were older and new recruits were added to keep the sample consistent with population distribution). At baseline, participants responded to questions about the nature of their job, physical demands, age and smoking status. Age and low job satisfaction were markers for a higher prevalence of back pain both at 12 and 36 months. The use of heavier bricks was associated with CLBP. This study had some problems with sampling and recruitment as it was not randomized (not consistent with age distribution for bricklayers in Germany). The prevalence at 3 years (15.40%) was lower than at baseline (17.70%) which is odd given that age was identified as a strong marker of LBP (possible selection bias). Another problem is the limited inclusion of psychosocial variables as marker/confounders of CLBP despite the authors recognising them as a probable influence. Despite these limitations, involvement in heavy manual labor (sandstones weighing about 7-10 kg) was a marker of chronic lower back independently of any psychosocial influences (Latza et al., 2002).

Oliveira et al., (2015) conducted a study of risk factors for low back pain in twins that were “Generally and broadly discordant” for LBP history. Participants were asked: “Why do you think you have/have not had more lower back pain than your twin?” (p.52). The most frequent reported factor was engagement in different types of work ( $n = 21/24$  pairs, 88%).

In particular, 71% reported as possible causes; carrying heavy loads, lifting manual tasks, awkward postures and gardening, while 51% reported a single trauma or injury. There were no significant differences between reports by pairs of monozygotic or dizygotic twins. This study offers a unique perspective in relation of the role of genetic influences in the experience of chronic back pain. There are, however, a series of limitations, commencing with the small sample and that there was no cross-examination between psychosocial factors and levels of pain reported (only general data for the whole sample). Furthermore, the data was self-reported and at risk (minimized by case-control matching) of bias of one twin reporting on the other.

#### ***1.4.3.4 Level of Education.***

Education is often considered to be the best indicator of socio-economic status because it is easy to observe and unlikely to be affected by diseases that begin in adult life (Hagen et al. 2006). Education may also be a marker for specific traits like intelligence, acquisition of adaptive skills, or awareness of risky health behaviours (Dionne et al. 2001). Dionne et al conducted a review of 64 articles to investigate the relation between the level of formal education and back pain. They found that the relationship had three distinctive aspects. First education was identified as a marker of the frequency of back pain, second as a marker of the outcomes of back pain episodes (duration and functionality impact), and third as a marker of the outcomes of medical interventions. They found a robust association between low education and high frequency and longer duration, and less favorable outcomes of back pain (general association of lower education and poorer health outcomes). In addition, these authors recommended that any further research should include the level of education as a socio-economic measure. The evidence found was stronger for an effect of education on the duration and/or recurrence of back pain episodes than for an effect of education on the

incidence of back pain. This indicates a link with chronicity which can be attributed to a number of reasons including biological reasons and adaptability to stress.

A Taiwanese study by Huan et al., (2013) of 969 participants of who 353 had experienced LBP in the last three months found that having elementary or below elementary education was a significant marker of LBP. Levels of education were divided into; low (elementary and below), medium (junior and senior high school) and high (college and above). Statistical tests indicated that those with lower education  $X^2 = 17.14$ ,  $p = <.001$  in comparison with higher levels. Logistic regressions indicated that medium and higher levels of education predicted a lower risk of LBP compared with lower levels of education (medium/low = .56 [95% CI, .41, .76] and high/low = .58 [95% CI, .41, .81] Odd ratios). This study included a large number of participants and investigated a combination of factors including medical measures (osteoporosis, osteopenia, etc.), lifestyle issues (coffee consumption, exercises) as well as general demographic measures. The study provided a tree model which did not provide a measure for accuracy (confidence interval for each division of the tree).

Level of education has been largely identified as a marker of chronic pain and disability (Costa et al., 2009). In fact, level of education has been recognized as the most stable and reliable indicator of an individual's socio-economic status. Other indicators such income can change rapidly and sometimes are linked to the fact that the individual had to cease working or reduce his/her workload due to a back condition. In the same manner, while a place of residence has been used to identify health vulnerability (i.e., chronic pain) this socio-economic indicator may also be prone to sudden changes in income linked to the condition and, therefore, have a lower level of reliability.

Costa et al. (2009) found that having lower levels of education had a less favorable prognosis in relation to back pain (moderate effect). This study examined 973 patients that presented to a primary care clinic in the Sydney area with a recent onset of chronic non-



specific back pain with 406 reporting pain lasting more than three months. Education level was measured by creating two groups, no education beyond secondary school (n=239, 59%) and further education (n= 167, 41%). The findings showed that low level of education was associated with delayed recovery ( $X^2_1=3.8, p=.05$ ). The adjusted ratio hazard for lower level of education was .74 (CI .54 to 1.00). While the authors found that most participants recover from an incident of acute back pain within 12 months they indicated that those with previous sick leave due to low back pain, lower level of education, and higher perceived risk of persistent pain were more likely to have a delayed recovery from back injury leading to disability. This study had a high rate of success in conducting a 12 months follow-up (99% at 3 months and 97% at 12 months) and utilized prognostic markers at the initial acute episode and follow up rather than relying on the participants' recollection, however, these were self-reports.

Cornelius et al. (2010) reviewed 796 studies from January 1990 to March 2009 describing longitudinal studies with a follow-up of at least one year. They selected seven articles of high methodological quality describing a range of prognostic factors (medical, personal and external factors). While they found older age to be a strong marker for long-term disability, other factors such as level of information with modest relationships between lower level of education and a higher risk of disability in three studies and the opposite in one. In particular, they cited a study that reported that a lower education increased the risk of depressive complaints leading to a longer time to return to work.

#### ***1.4.3.5 Place of Residence.***

SES, a measure of deprivation, is typically classified by examination of factors such as home ownership, levels of unemployment, and education. There is an inverse relationship between SES and the prevalence of both acute and chronic pain. Data suggests that lower levels of education, lower income and being unemployed (Davies et al., 2009) are all

associated with an increased likelihood of reporting pain. Living in a less affluent area is also associated with muscular pain/stiffness (Brekke et al., 2002) and widespread pain (Brekke and Hjortdahl, 2004). Davies et al found that subjects living in an area of lower socio-economic status were more likely to have new onset CWP than subjects living in an area of higher socio-economic status. However, this relationship was modest and was explained by co-morbid psychological factors. After controlling for individual psychological factors, the relationship between CWP and the socio-economic area of residence was no longer evident. These authors found significant methodological challenges while utilising concepts such as socio-economic factors (income, employment status or place of residence). However, it was evident that the differences in the prevalence of chronic back pain in different neighbourhoods were mediated by psychological factors.

In Australia, individuals living in less advantaged suburbs or areas are more likely to have poorer health outcomes due to a range of issues. This may include living near factories or industrial estates, more likely to live in older housing, have to endure higher crime rates and fewer services (Gray and Mendeloff, 2002).

#### **1.4.4 Social Support.**

Social support is a concept that has been in use for nearly two centuries, although the definitions and literal name have been widely used since the 1950's (Williams, Barclay & Schmied, 2004). Social support is a multifaceted construct that assumes multiple forms and varied range of relationships. The literature provides a wide range of definitions, but most appear to focus in the nature and the origin of the support as well as the perceptions of the person receiving this support. In addition, many authors have studied the different levels of support circle being intimate (family/friends), from interest or support groups or society in general. These authors conducted a qualitative analysis and critically appraised 30 definitions of social support and concluded that only two could be used with confidence.

These were formulated by Gottlieb in 1978 and Coffman and Ray in 1999. Most definitions, however, include emotional and practical components and most authors note the importance of the perceptions from those receiving help.

Benjamin Gottlieb (1978) made significant contributions to defining social support as it is known today. In an analysis of 26 helping behaviours (grouped into three categories: emotionally sustaining behaviours, problem-solving behaviours and indirect personal influence), he studied the impact of the support provided by significant others. Gottlieb also stated that “The significant others help the individual mobilize his psychological resources, and master his emotional burdens...” (p. 17). This sentence is perhaps paramount in order to understand how social support and to some degree professional support will actually have a measurable impact on the well-being, functionality and quality of life of those receiving help. Furthermore, Gottlieb advocated that social support has an important role to play within medical interventions in instances such as compliance with treatment and medication as well as attendance and aftercare procedures. The classification and impact of helping behaviour was an extremely useful step to measure and evaluate the effectiveness of the help provided. Gottlieb in 1985 had embraced the term ‘social support’ and studying the relation between social support and personal relationships stating that a better understanding of social processes around the helping behaviour would contribute to evaluating its impact and importance. Gottlieb noted the lack of attention paid to social processes previously and suggested more research in this area to gain insight and plan effective interventions.

Pearson (1986) concluded that counsellors and other professionals had to take into consideration the fact that their clients were part of families, groups and communities and they should teach them to identify and use social supports and establish networks of helpful relationship that may provide the necessary support and facilitate coping in times of need. In addition, Pearson saw social support as an extension of community health bringing the care

closer to the person's reality. Therefore, professionals should utilise these resources when implementing their treatments to achieve greater and longer lasting results.

Streeter and Franklin (1992) pointed out that not all social links between individuals result in social support and emphasised on the importance of the perception of the person receiving that support (many expressions of support could be ill-timed, insufficient or simply not wanted). These authors identified two types of support; instrumental and affective. The first is tangible and practical such as assistance with services or financial. The second is purely emotional providing reinforcement and comfort. These authors, not only found the measuring of social support important to ascertain the client's skills, but also to identify useful tools that may be used in the implementations of the interventions of social workers and other professionals.

Social support is defined as the resources perceived as being available from others in social networks. The literature describes positive and negative effects of social support on chronic pain patients. Chronic pain sufferers who report high levels of social support experience less distress and less severe pain (Lopez-Martinez et al., 2008 and Waltz et al., 1998). Alternatively, support in the form of attention from partners and solicitude regarding patient pain behaviour is associated with heightened pain severity and overt pain behaviour (Boothby et al., 2004; Romano et al., 2000 and Stroud et al., 2006). The reason for this contradiction may lie in the definition of support and its different aspects.

The BPS model of health argues that several psychological factors play an important role in the origin, exacerbation and maintenance of recurrent pain conditions. Three psychological variables are viewed as important in predicting pain; cognitions, coping responses and social environment (Lopez-Martinez et al., 2008). Social support promotes certain adaptive coping responses which in turn improves adjustment of chronic pain. Furthermore, social support may also contribute to reducing pain severity and disability by

encouraging specific coping strategies. Many studies indicated that social support can be associated with adaptation and a buffering role of the effects of stress. Furthermore, there is widespread evidence that sufferers receiving higher levels of social support showed decreases in depression, severity of pain and an increase in functional status (Kerns et al., 2002; Lopez-Martinez et al., 2008; Sarason, et al, 1983 and Stroud, et al., 2006).

Social support is one the most important factors predicting physical health and wellbeing. The physical health of an individual can be greatly affected by his or her social support system and level of social support (Clark, 2005). On the other hand, the absence of social support may predict some disadvantage for individuals facing health challenges. Social support may affect psychological well-being and levels of stress, which in turn, may affect physical health and the ability to face symptoms and treatments. Studies have found that individuals with high social support have a lower chance to of experiencing depression or anxiety as well as a lower rate of disease and early death (Clark, 2005). Individuals who come from a lower socio-economic class would be more likely to receive less social support. They basically do not have enough resources in their environment available to assist with social support. Social strain, which is common in their daily lives, increases the risk for of lower social class individuals to developing some kind of physical and mental illness or a lower sense of well-being. This should not come to surprise that adults who have higher SES tend to receive more social support (Gallo, Bogart, Vranceanu, & Matthews, 2005). The resources of social support also tend to decrease somewhat for older adults. Volunteering is a big factor relating to social support for older adults. This element will help build companionship and interact with more people in the community. This step may become necessary as older adults lose some social support from their family members. This group of people needs to keep themselves busy by connecting with other people as often as needed. This method leads to better overall mental and physical health and better well-being. The

amount of social support is the key to determine life satisfaction among the older adults. As expected, older adults who elect not to do any work or volunteering during their retirement experience a lower level of life satisfaction. Their bodily functions may deteriorate more quickly compared to other older adults who keep themselves busy (Aquino, Russell, Cutrona, & Altmaier, 1996). The initial level of social support essentially predicts the outcome of older adults' general health in the following years. Inadequate initial social support at the beginning of retirement would predict that older adults will develop depressive symptoms over time. Older adults would be able to ignore the negative effects in their lives with help and positive reinforcement from others. This is considered a psychological effect. Not enough social support would likely make the individuals notice their daily hassles and life stressors much more clearly. This step could accelerate the deterioration of their physical and mental health (Clark, 2005). Strong social systems can give sufferers a more positive state of mind when it comes to their affliction. With support, a patient is more able to accept and can come to terms with the illness. This, in turn, allows a patient to make positive strides in treatment (Gore-Felton et al., 2002). However, it is important to note that some attempts of support are not always viewed positively. Family members and friends who, for instance, offer advice may cause more harm than good for an individual. Some individuals may perceive attempted support as degrading or humiliating; moreover, forced support through the social network may also induce feelings of helplessness. There are studies (Butcher et al., 2004, Fordyce 1976) that proposed that social support is not always beneficial to a person's physical and mental health. Negative, unhealthy social support can be destructive to a person's overall well-being (Butcher et al.). In the same manner, Fordyce stated that sometimes social support causes a reinforcement of pain behaviour and, therefore, has a counterproductive impact on quality of life and functionality.

Kerns, Rosemberg and Otis (2002) conducted a study to examine the contributions of self-appraised problem-solving competence and pain-relevant social support to the prediction of pain, depression and disability. They found that pain-relevant support was significantly related to pain and disability. In addition, the results indicated that the presence of pain-relevant social support buffered the relationship between problem-solving skills and depressive symptoms. These findings highlighted the ambivalence of the relationship between pain and social support. While in one hand participants with high levels of social support felt less depressed, on the other they may have been receiving high levels of reinforcement of pain behaviours contributing to the chronicity of their pain. The term buffering was introduced by Cohen and Wills (1985) when they studied the processes in which social support may benefit well-being. They considered two models in their hypotheses. The first assumed that social support may only benefit those under stress (buffering model) while the second model had a wider scope and had a general beneficial impact regardless of the person's situation (no stress, main effect model). The findings of this review revealed evidence consistent with both models in the literature.

Thomten, Soares and Sundin (2011) conducted a study among Swedish women with pain and investigated the influence of psychosocial factors on quality of life. They described social support as a buffer for pain and disability and found that it was associated with greater activity levels among individuals with pain. Social support at work was found to be a marker of a better quality of life and the lack of support was identified with a higher risk for CLBP. They also found that social support may act as coping assistance and result in activity levels, reduce catastrophizing and avoidance. These factors may have an impact on seeking and complying with treatments. In addition, they found that social support may have a limited impact on the initial period of pain, but its effects increase over time. As part of this buffering effect, they found that social support may diminish the negative emotional reaction

to pain such as stress and depression. However, they found that access to emotional relationships was not central for perceptions of psychological quality of life.

In contrast, perceived social isolation has been found to be a marker of disability (Oliveira et al, 2015). Findings from a regression analysis revealed significance ( $p = .006$ ) for social isolation at a 6-month follow-up ( $-.91$ , CI 95%,  $-1.56$  to  $-.26$ ). Utilising the “Friendship Scale (Hawthorne et al., 2013, cited in Oliveira et al., 2015) to measure social isolation (0-24 points) and the Roland Morris Disability Questionnaire (Albert, et al., 2003, cited in Oliveira et al., 2015) to measure disability (0-100). The authors reported that one point increase in the level of isolation results in one point increase in disability. Social isolation was also found to predict anxiety, but to a lesser extent (1 point in social isolation scale predicted a .08 increase in the anxiety scale). Social isolation did not predict depression and catastrophizing (Oliveira et al., 2015).

Kawi (2014) found that support received (other than from health professionals) was significant in predicting success in relation to self-management (SM) for chronic low back pain (CLBP). SM support was positively associated with engagement in SM ( $\beta = 4.081$ ,  $SE = 1.311$ ). For support received from other than their healthcare provider, those reporting “not much” support ( $M = 50.477$ ,  $SE = 2.658$ ) differed significantly from those reporting: ‘a little’ ( $M = 60.523$ ,  $SE = 2.349$ ,  $p = .004$ ), ‘a good amount’ ( $M = 60.160$ ,  $SE = 2.753$ ,  $p = .011$ ), and ‘a great deal’ ( $M = 64.385$ ,  $SE = 3.205$ ,  $p = .001$ ). This study utilized 230 participants recruited by convenient samples that experience at least 3 months of non-malignant LBP diagnosed by a doctor. Data from a demographic survey and four additional questionnaires were analysed utilised a linear regression and further analysis of the significant markers. While this American-based study is limited by its use of self-report data analysed from convenience samples from primary care (results cannot be generalised to other settings) it provided useful information in relation to the role of support in SM for CLBP.



A Canadian study found that women living with a partner and/or children were associated with an increased likelihood of being not currently employed. The reverse was observed for men, more likely to be currently employed if living with a partner and/or children (Churcher, Chan and Badley, 2013). This study with 79,719 participants responding to questionnaires distributed through community health services had a number of limitations despite its large sample. The data were self-reported, there were issues with the concept of “not currently employed” as per the timeframe of inactivity (short-time absence vs. long term absence). In addition, the questionnaires failed to report back and arthritis presentations that were acute or recurrent (only reported presentations lasting for six months or more). And finally, the authors highlighted that comorbidity between back pain and arthritis revealed different results (not altering significance) (Churcher, Chan and Badley, 2013).

### **1.4.5 Living arrangements.**

While the concept of social isolation includes the requisite of living without companionship it also includes a level of social disconnection and lower levels of social engagements (Oliveira et al, 2015). In fact, a person who lives alone may not be considered to be socially isolated and *vice versa*, a person who lives with another may be perceived to have very low levels of social support. Smith, Hannaford and Chambers (2004) explored the differences between “new” chronic back pain and “persistent” back pain. Amongst other demographic variables, they utilized marital status and living arrangements. While multiple regression models did not identify either as a significant marker there were very sizeable differences between those living alone and living with another adult as well as those who were living as married and never married. Living alone increased the chances to have persistent chronic back pain.

In a Melbourne-based study Holmes et al. (2010) found that living alone was a statically significant marker for chronic back pain. There were also significant differences in pain

severity at 12 months. Subjects (  $n = 290$ ) recruited from trauma centres in Melbourne, Australia between December 2006 and May 2008 were more likely to have pain at 12 months (follow up  $n = 238$ , 82%) from the initial injury and the pain was higher at 12 months for those living alone compared with those living in company.

#### **1.4.6 Culture and ethnicity.**

Pain is a universal experience that affects individuals of all ages, socio-economic status and cultures. As a subjective experience, it varies between individuals and as a psychological experience it acquires a social and cultural significance that cannot be ignored. Some cultures may encourage avoidance of pain or its acceptance as part of the life experience. Therefore, culture becomes a conditioning influence in the formation of the individual's reaction to and reporting of pain. Furthermore, culture affects significantly the assessment and management of pain as well as the individual's treatment- seeking behaviour (Davidhizar & Giger 2004). Cultural differences are broader than race and biological differences and include values, beliefs and interpretations of phenomena and verbal expression of pain. Giger and Davidhizar (1999) found that despite being an individual experience there were similar pain responses between individuals from the same cultural or ethnic group.

In countries like the United States or Australia with a culturally and ethnically diverse population, cultural influences must be considered to develop effective responses to pain (Walker, 1995). Ethnicity alone may not determine responses of pain, and other factors may interfere with the report of pain. For instance, there could be a greater level of difference in reporting between men and women of a particular culture as well as a different level of stoicism in the aged compared with younger individuals. In the same manner, many cultural groups may have a lower SES such as the Aborigines and newly arrived refugees in Australia and African-Americans and Latinos in the United States. It is important to consider cultural influences in the utilisation of assessment tools, appreciation of variations in affective

response to pain across cultures, being sensitive to communication styles across cultures and the meaning of pain among different cultural groups (Davidhizar & Giger, 2004).

Australian data indicates that Australian-born residents live longer than overseas-born residents (ABS 2001a). Those for whom English is a second language are less likely to visit health care professionals other than GPs (ABS 2002b). In addition, those born overseas are more likely to be amongst the lower SES, be more socially fragmented, and have less social support and higher societal anxiety (Gray and Mendeloff, 2002). However, people who do not speak English at home are more likely to have lower rates of chronic and recent illness than the rest of the population. They are also less likely to assess themselves as disabled and generally report lower health risks factors such as smoking, alcohol consumption and being overweight (ABS 2002b). Gray and Mendeloff (2002) attributed this later data to the 'healthy migrant phenomenon' and the fact that age may have a confounding factor as migrants are more likely to be younger in comparison with the rest of the population.

English proficiency, nativity and higher generational status were found to be positively associated with back pain in an American study (Bui, Doescher, Takeuchi and Taylor, 2011). These authors found that a higher level of acculturation was negatively associated with the reports of back pain. However, when the model was adjusted for socio-demographic indicators no significant association was found between the proportion of lifetime in the US and reports of chronic back pain. English proficiency was associated with a 61% increased risk of chronic back or neck problems (1.61, 95% CI: 1.18, 2.14).

## **1.5 Psychological Contributors of Chronic Back Pain**

### **1.5.1 Mental Health and Chronic Low Back Pain.**

A review of the literature since 1985 showed that there are some studies on back pain and mood disorders that consider limited psychosocial factors. These studies examine functionality in relation to conditions, perceived symptoms and usefulness of treatments. The

depressive disorders are grouped under a category in the DSM-5 called Mood Disorders. Included in this category are major depressive disorder, dysthymic disorder, bipolar disorder, cyclothymic disorder, mood disorder due to a general medical condition, and substance-induced mood disorder. Two subtypes of mood disorders include seasonal affective disorder and postpartum depression while premenstrual dysphoric disorder has been proposed as a diagnosis for further study. For each of these mood disorders, there are specific criteria that a person's symptoms must meet in order to receive a diagnosis. However, there are no studies that have considered both psychological and social factors in relation to chronic disability with the exception of Keeley et al. (2008). In this Manchester based study social stresses and psychological factors were examined as markers of health-related quality of life and health service utilisation.

Tunks, Crooks and Weir (2008), studied the comorbidity between chronic pain and psychological conditions. After reviewing several studies, they found an increased association between chronic pain disorders and psychological conditions as the stress of pain contributes to increased emotional distress. Chronic pain prevalence increased with the number of depressive symptoms and, in particular, fourfold for those suffering major depression. In addition, the prevalence of major depression increased with greater pain severity. Findings from a Danish multidisciplinary pain clinic also indicated that more than half of the patients suffered from depression or anxiety associated with disability.

### **1.5.2 Depression.**

#### ***1.5.2.1 Definition of Depression.***

According to the DSM 5 (American Psychiatric Association, 2013) criteria for diagnosing a major depressive disorder one or both of the following two required elements need to be present:

## Living with Back Pain; a Biopsychosocial Analysis of Contributing Factors

- A. Depressed mood, or loss of interest or pleasure It is sufficient to have either of these symptoms in conjunction with five of a list of other symptoms; these include (same 2-week period):
1. Depressed mood most of the day, nearly as indicated by subjective reported or observed by others.
  2. Marked decrease of interest in pleasurable activities.
  3. Significant weight loss when not dieting or weight gain, or decrease or increase in appetite nearly every day.
  4. Insomnia or hypersomnia nearly every day
  5. Psychomotor agitation or retardation nearly every day (observable by others).
  6. Fatigue or loss of energy nearly every day.
  7. Feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day.
  8. Diminished ability to think and concentrate, or indecisiveness, nearly every day (either subjective account or observed by others).
  9. Recurrent thoughts of deaths (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide.
- B. The symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.
- C. The episode is not attributable to the physiological effects of a substance or to another medical condition.

No specific cause for depression has been identified, but there are a number of factors believed to be involved. The tendency to develop depression may be inherited; there is some evidence that this disorder may run in families.

Brain chemicals called neurotransmitters allow electrical signals to move from the axon of one nerve cell to the neuron of another. A shortage of neurotransmitters impairs brain communication. There may be changes or imbalances in chemicals which transmit information in the brain, called neurotransmitters. Many modern antidepressant drugs attempt to increase levels of certain neurotransmitters, like serotonin. While the causal relationship is unclear, it is known that antidepressant medications do relieve certain symptoms of depression. Low self-esteem and self-defeating or distorted thinking are connected with depression. While it is not clear which is the cause and which is the effect, it is known that sufferers who are able to make corrections to their thinking patterns can show improved mood and self-esteem. Psychological factors include the complex development of one's personality and how one has learned to cope with external environmental factors, such as stress.

Events such as the death of a parent, abandonment or rejection, neglect, chronic illness, and severe physical, psychological, or sexual abuse can also increase the likelihood of depression later in life. Post-traumatic stress disorder (PTSD) includes depression as one of its major symptoms. Job loss, financial difficulties, long periods of unemployment, the loss of a spouse or other family member, or other traumatic events may trigger depression. Long-term stress, at home, work or school, can also be involved.

Those living with someone suffering from depression experience increased anxiety and life disruption, which increases the possibility of their also becoming depressed (Tunks, Crooks and Weir, 2008).

#### ***1.5.2.2 Diagnosis of depression.***

The Diagnostic and Statistical Manual of Mental Disorders- Fifth Edition (American Psychiatric Association, 2013) is the current reference used by mental health professionals and physicians to diagnose mental disorders. This publication is often referred to as the DSM

or DSM-5, the fifth edition, was published in 2013. The current DSM-5 lists over 200 mental health conditions and the criteria required for each one in making an appropriate diagnosis.

Diagnostic criteria for mental disorders are essentially descriptions of symptoms that fall into one of four categories. In major depressive disorder, for example, affective or mood symptoms include depressed mood and feelings of worthlessness or guilt. Behavioural symptoms include social withdrawal and agitation. Cognitive symptoms or problems in thinking include difficulty with concentration or making decisions. Finally, somatic or physical symptoms include insomnia or hypersomnia (American Psychiatric Association, 2013).

#### ***1.5.2.3 Treatments for Depression.***

Depression is a widespread condition that affects individuals of all ages, sex, social status, culture and birthplace. There are many approaches in the treatment of depression, but they can be separated into two broad categories: pharmacological and psychological approaches. Solid evidence indicates that these approaches complement each other and work better when administered in coordinated manner (Pampallona, Bollini, Tibaldi, Kupelnick, & Munizza, 2004).

Antidepressants are drugs designed to treat depression (although some doctors prescribe them in the presence of chronic pain in addition to analgesia). They are prescribed by medical professionals (doctors, psychiatrists and other specialists). Antidepressants work by changing the level of neurotransmitters (chemical messengers) in the brain. Several neurotransmitters are thought to be in low supply in depression, including noradrenaline (sometimes called norepinephrine) and serotonin. Tricyclics mainly increase the level of noradrenaline in the brain. People who are depressed often experience anxiety as well. Tranquillizers are drugs which provide short-term relief of anxiety. Most tranquillisers belong to a class of drugs called the 'benzodiazepines'. Benzodiazepine tranquillisers can

relieve this anxiety. People who are depressed have distorted thinking patterns. They see themselves and their situation more negatively than others see it. These thinking patterns can make their depressed mood worse. In cognitive behaviour therapy, distorted thinking is challenged by the therapist who teaches the person how to overcome their negative thinking patterns in everyday life. Cognitive behaviour therapy is sometimes called just 'cognitive therapy'. It involves learning from a therapist to overcome the distorted, negative thinking patterns that can lead to depression. Cognitive behaviour therapists may also use other techniques, like getting the depressed person to do more things that give them pleasure, helping them to solve problems in their life, and learning better social skills. Cognitive behaviour therapy is one of the best treatments available for mild or moderate depression as it provides individuals with the tools to prevent further episodes of depression. Cognitive behaviour therapy may not be suitable for severely depressed people because they may be too depressed to learn the new thinking skills (Oltmanns and Emery, 2003).

Women are two or three times more vulnerable to depression than men (Oltmanns and Emery, 2003). Lifetime prevalence rates for major depression are 7% for men but only 2.6% for women (no significant differences are found for bipolar disorder). There are many theories to explain these differences. Women are more likely to seek treatment and men may be socially conditioned to avoid display or reporting feelings of despair or hopelessness. However, the differences are well accepted by the current literature. Contrary to popular belief, mood disorders are more frequent among young and middle-aged adult than with the elderly. Rates for major depressive episodes and dysthymia are significantly lower for people over the age of 65. Cross-cultural research overwhelming suggests that clinical depression is a universal phenomenon that has similar prevalence across cultures and continents (Oltmans and Emery, 2003).



#### ***1.5.2.4 Measuring Depression.***

The presence and severity of depression and other mood disorders is diagnosed in accordance to the criteria of the DSM 5. The symptomatology and level functionality is compared with a series of parameters or requisites in order to arrive at a diagnosis. In most cases, this is achieved through a clinical interview where the sufferer describes his/her symptoms which are collated by the health professional in order to formulate a diagnosis. There are a number of instruments widely used to assist in the diagnosis of depression. These instruments have been constructed around the diagnostic criteria of the DSM 5 and are generally utilized in conjunction with a clinical interview. The tests differ according to the target populations that they were designed for with an emphasis on age and cultural differences (Oltmanns and Emery, 2003).

The Hamilton Depression Scale is a widely used questionnaire for children and adults, mainly targeting a clinical population used in research and for the evaluation of the effectiveness of depression therapies and treatments (Hamilton, 1980). The Beck Depression Inventory was first published in 1966 and is currently in its third version (Beck, Steer & Brown, 1996). This questionnaire has two components, one affective and one somatic, which are represented by different questions ranging from rating feelings of guilt to reporting physical symptomatology. This test is utilised in general populations for patients 13 years and older and has been translated into several languages. It is essential to emphasise that questionnaire results are by no means a diagnostic tool but rather a contributing tool in the process of diagnosis (Beck, Steer & Brown, 1996).

The Depression, Anxiety and Stress Scale (DASS) (Lovibond & Lovibond, 1995) was utilised in this study due to its usefulness and relatively straightforward questions that cover depressive symptoms and also include elements of anxiety and stress which according to previous research may be present in conjunction with depression in chronic pain sufferers.

***1.5.2.5 Depression and other mental health conditions.***

Depression and back pain appeared to be associated according to the majority of studies researched. There is also a strong association between depression and anxiety. However, associations between chronic back pain and anxiety have not been so intensely investigated. Many studies found a strong association between anxiety disorders and chronic pain conditions (McWilliams et al., 2004 and Sareen et al., 2005). In some cases, the studies found that many sufferers had a combined impact of different anxiety disorders and effects of depression. Sareen et al. investigated each anxiety disorder separately controlling the effects of comorbidity and found that every anxiety disorder had a strong association with chronic back pain. Post-traumatic stress disorder was strongly associated with physical conditions, and, in particular, agoraphobia was associated with bone conditions and back pain. As mentioned in relation to depression most studies do not attempt to establish causality between anxiety and chronic pain but merely investigate the association between these two variables.

In the same manner, the comorbidity between depression and anxiety in all sufferers has been established over time and also presents difficulties with causality. It appears to be extremely difficult to prove whether anxiety causes depression or vice versa, but it is clear that these two conditions are strongly associated. The combinations of anxiety and depression presentation are many and will depend on whether the client has a depressive or anxiety disorder with anxious and depressive symptoms and the impact of which they impact on the sufferer (Sareen, 2005).

Depression symptoms are present in the diagnosis of many psychological disorders and may be a contributing cause or a consequence of those disorders. Chronically ill patients that suffer from depression and anxiety report a higher number of medical symptoms (Katon et al., 2007). Anxiety and depression whether together or on their own have a range of somatic symptoms on their own without the presence of any physical condition. Katon et al. found

that anxiety and depression were associated with poorer adherence to self-care regimes (diet, exercise, medication compliance, etc.) and complications with chronic medical illness and an increased number of symptoms. Furthermore, these authors found that anxiety and depression led to a heightened awareness of psychical symptoms. In addition, anxiety and depression can cause physiological symptoms such as: muscle tension, autonomic nervous system and hypothalamic-pituitary axis deregulations. At the same time, worsening in symptoms may cause more anxiety, more testing and more medical costs (up to double), more medication and more frequent medication changes (Katon et al.).

Anxiety was found to be associated with fear avoidance and higher levels of musculoskeletal pain (Cimmino, Ferrone and Cutolo, 2011; Luchetti et al., 2012). However, the previous research linked pain to anxiety but no disability. In fact, most studies favoured depression over anxiety and some of them used concepts such as psychological distress (Luchetti et al.).

### **1.5.3 Depression and Chronic Back Pain.**

There is widespread agreement in the comorbidity of depression and chronic pain (Ackerman & Stevens, 1989; Brox et al., 2005; Dickens, Jayson, Sutton & Creed, 2000; Grotle et al., 2006; Kinky, Gatchel, Polatin et al., 1993; Main, Wood, Hollis, et al., 1992; Romano and Turner, 1985) although no study has confirmed causality in any direction.

Pincus and Morley (2001) propose a new model to describe the relation and interaction between depression and pain. There is a critique to pre-existing models based on a flawed depression measurement tool, particularly when used with pain sufferers. They also argue that the main barrier of these models is the assumption of the duality of depression and pain instead of being considered as two perceptions of the same problem, one physical and the other affective. The traditional Medical Model was refuted on the basis that

neurophysiological models of pain and analyses of pain descriptors all include affective and mood components as intrinsic parts of the pain experience.

Ullrich et al. (2007) found that a combination of high psychological distress and pain was associated with catastrophic thinking that impacts negatively on function. Catastrophising was defined as a cognitive process with exaggerated negative expectations or interpretations of an experience such as pain. These authors emphasised the importance of catastrophising as a mediator between severity of pain and depressive symptoms in one end and disability in the other. They also referred to the concept of 'pain schemas' as defined by Pincus and Morley (2001) who defined these schemas as 'Memory stores of knowledge related to pain that are activated in response to environmental stimuli'(p. 604). Furthermore, Pincus and Morley stated that chronic back pain sufferers had biased schemas compared with non-sufferers, and described differences between pain sufferers with and without depression. Finally, this study concluded that psychological distress, pain severity and catastrophising have interactive effects on pain-related functional disability

Depression is associated with poor pain-related outcomes, elevated pain intensity, functional limitations and non-recovery (McWilliams, Goodwin and Cox, 2004). These authors found a significant positive association between three pain conditions (arthritis, migraine and back pain) and common mood disorders. Utilising multivariate logistic regression analyses they found strong associations after adjusting for confounding variables such as age, sex, education level, race and other pain conditions. In the same manner, Aschuler, Goodwich et al. (2008) found that self-reported depression significantly contributed to higher levels of self-report of disability after controlling for age, sex, site of pain and pain intensity utilising regression analyses. Furthermore, the findings of this study suggested that the relationship between depression and disability is not only confirmed with self-reported measures but also extends to objective measures. Although no relationship

between pain intensity and disability was established, a clear association was found in relation to negative cognitions reducing effort levels during physical activity and an increase in avoidance by feelings of fear. In contrast, other studies found pain intensity to be the most influential factor contributing to the variance of disability and depression. Therefore, the more intensive the pain is the greater interference with home and family responsibilities, self-care and life-support activities (Arnstein, 1999). Pain intensity influenced and negatively impacted both in cognitive (lower self-efficacy) and affective (more depressive) states. Lower self-efficacy causes higher disability even with low or moderate levels of pain. Thus, beliefs of low self-efficacy also lowered performance. The role of mediators allows the explanation of the relationship between two variables and, in this case, may even explain the differences in results between studies, as one of them may not have considered the influence and role of the mediating factors in the correlation. Arnstein explained his findings stating that self-efficacy contributes more to depression than disability.

Beesdok et al. (2009) found a strong positive association between Generalised Anxiety Disorder (GAD) and unexplained pain (more than any other anxiety disorder). This association was not attributed to demographic factors and applied to subthreshold levels of GAD. Finally, this study also found that a co-occurrence of both GAD and the unexplained pain was associated with poorer quality of life outcomes, higher levels of disability and higher health care utilisation. These authors also reported a bidirectional causality relationship due to the perpetuating effects of pain, perpetuating anxiety and anxiety exaggerating awareness and attention to pain leading to chronicity.

Depression was found to be twice as likely for those reporting multiple pain sites (Taloyan and Lofvander, 2013). Women had a higher prevalence of multiple pain sites (68.30%) compared to men (44.70%). In addition, women had higher levels of depression than men (50.00% compared with 33.30). This Swedish study that focussed in migrants found that

Christian women reported higher levels of depression than Christian men, but there were no sex differences in the Muslim participants.

The influence of depression on patients suffering from an acute episode or recurrent back pain in the recovery process was investigated in Western Australia based study (Melloh, et al., 2013). Depression was measured utilizing the modified self-rating Zung Self-Report Depression Scale (0-69 point range with a cutoff mark of 33 for depression, Cronbach's alpha at baseline = .74) and level of disability was measured with the Oswestry Disability Index (0-100 range, Cronbach's alpha baseline = .84). Two hundred and eighty-six participants responses were analysed and 51 (18%) were classified as depressed. Markers for depression were; high functional limitation,  $F(1,261) = 15.79$ ;  $p < .001$ ; partial  $\eta^2 = .057$ ; (2) high pain intensity,  $F(1,260) = 6.84$ ;  $p < .01$ ; partial  $\eta^2 = 0.026$ ; and a high job-stressor index,  $F(1,252) = 8.95$ ;  $p < .01$ ; partial  $\eta^2 = 0.034$ .



### **1.6 Functionality**

The concepts of functionality (or ability) and disability are intrinsically linked, and in many occasions definitions of one are presented in relation to the other. In relation to physical functionality, it refers to the physical ability and fitness to perform certain functions or tasks successfully. The ability of individuals to perform tasks and physical activity will always be mediated by age, sex, level of physical fitness and lifestyle issues. Many physical functions are easily measured, such as the ability to walk distances, speed of running, the angle of bending, stretching or rotating, ability to lift and carry, etc. Measures of functionality are artificially created as some individuals are able to run at high speeds, lift heavy weights and bend their bodies in amazing ways while others would perform at a much lower level. Furthermore, measures of physical ability may be compared within the same individual following an injury or an onset of an illness to ascertain any significant changes (Gatchel and Kishino, 2011).

### **1.6.1 Assessing Functionality**

Functionality is assessed by measuring physical ability within parameters set by current laws and regulations. In Australia organisations such as Work Cover, the Transit Accident Commission or Centrelink (Social Security) have set a range of measurements in relation to the functionality of different body parts such as upper and lower limbs, vision, hearing, and range of body movements. The ranges of measurements were set by medical experts in each field and reflect what levels are considered normal for any individual to be considered to have an acceptable level of functionality. It is important to remember that these ranges are artificially set and can change over time and place according to legislation (Mitchel, 2008).

A Functional Capacity Evaluation (FCE) is a physical assessment conducted by Occupational Therapists, Physiotherapists or other allied health professional who utilise a variety of tools to objectively determine an individual's physical abilities and limitations. The FCE is a valuable tool widely recognised in the area of vocational rehabilitation (Mitchell, 2008).

The professionals explore the individual's history (including injuries), his/her perception in relation to pain and other variables and measure a range of tasks that may include a range of movements, ability to lift and carry, use of stairs and endurance capacity. In most cases, these assessments will include a pain questionnaire and a disability-related questionnaire. The results and interpretation of the FCE contribute to the determination of the individual's work capacity, employability, rehabilitation needs and possible compensation entitlements.

### **1.6.2 Pain and Functionality**

Pain and, in particular, chronic pain has a significant impact on functional ability. Depending on severity, duration and frequency, pain may interfere in different degrees, affecting activities of daily living, ability to work and even self-care. One of pain roles' studied early was a warning function to avoid bodily harm. This role interferes with the

ability to perform physical tasks as individuals may be reluctant to bend or stretch due to previous painful experiences (Gatchel and Kishino, 2011).

### **1.6.3 Psychosocial Factors, Pain and Functionality**

The presence of pain has a direct impact on the individual's level of functionality and level of physical activity. The person suffering pain (particularly chronic pain) will, in most cases, decrease his/her level of physical activity and exercise, which in turn may cause a reduction on their ability to perform these activities in the future. This may be due to a combination of factors such as an element of fear and avoidance as the physical activity may cause additional pain, or simply the interruption of activity due to severe pain. Given that pain is indeed a subjective experience it is extremely difficult to ascertain the level of pain of each individual in relation to physical activity. However, there are individuals that will engage and continue to perform activities while others with similar levels of pain will not. In many cases, exercise and physical activity is part of the prescribed and recommended treatment for sufferers of musculoskeletal conditions, and the avoidance of these activities is therefore extremely detrimental to the recovery process. Psychosocial factors will influence the individual's cognitions and behaviours and will have a significant role in the relationship between pain and functionality in each individual. Many would argue that the cause of disability of all the pathologies previously listed is not the injuries or disease but the actual pain they produce (Waddell, 2004).

Psychosocial factors have an influence on the experience of pain by themselves, but they can also have an influence on the individual mental state. In turn, the mental state will have a direct influence not only on the experience of pain but also on the way each person views treatments and recovery options and finally on the way that each individual maintains functionality levels. Briggs et al. (2010) defined health literacy as an individual's capacity to seek, understand, and utilise health information. Quantitative data confirmed that LBP



related beliefs and behaviours, rather than pain intensity and functional health literacy skills measured from a standard questionnaire, are important correlates of LBP disability. Less positive beliefs and pain attitudes are associated with persistence of pain and high levels of LBP-related disability. It is obvious that social factors such as level of education will have an impact on the sufferer's beliefs and on their health literacy levels. As Briggs et al. stated, the psychosocial model emphasizes the importance of self-care in the management of LBP and, therefore, their level of health literacy is pivotal to this management. The lack of health literacy skills has a doubly detrimental influence as it will not only limit the level and quantity of treatments that the sufferer will seek but also affect his/her level of motivation and confidence and general psychological responses to the pain experience. Therefore, it can be assumed that individuals with lower levels of health literacy may have their physical impairment causing a higher level of disability (lower functionality) than their counterparts with higher levels of health literacy.

#### **1.6.4 Pain and Disability.**

Disability was defined as 'An alteration of an individual's capacity to meet personal, social or occupational demands because of impairment' (AMA Guides to the Evaluation of Permanent Impairment, 5<sup>th</sup> Edition). Mitchell (2008) focused on clarifying the difference between disability and impairment. Citing also the AMA Guides which defined impairment as: 'a loss, loss of use, or derangement of any body part, organ system or organ function'. The difference between these two concepts means that a person may have an impairment, but not necessarily have a disability.

The effects of pain and, in particular, those of chronic pain due to loss of function and productivity are enormous, as seen in previous chapters. Tunks, Crook and Weir (2008) discovered that sufferers of chronic pain more often than not report inability to manage some or most activities. Furthermore, they also found that those reporting the highest pain intensity

also had poor health, greater medication and health care use, depression and more pain sites. Other studies have found that those with severe pain have greater chances of interference with their employment and approximately one-fifth of chronic pain sufferers had lost their jobs (Boulanger et al., 2007). In addition, Von Korff et al. (2005) found that 87.1% of chronic spinal pain sufferers had other condition (35% of mental health disorders). Furthermore, the same study found that the comorbidity between chronic spinal pain and mental health conditions accounted for a third of disability cases.

In another Canadian study (Kopec & Sayre, 2004, cited in Tunks et al., 2008), it was found that increased psychological stress predicted an increase of pain onset and those who reported moderate and severe pain had some restrictions in activities.

In an Australian study, Blyth et al. (2001) found that chronic pain sufferers with extreme functional interference used health services more significantly (hospital admission and emergency and GP visits). In the same manner, the comorbidity of chronic pain and psychological distress accounted for a higher level of health services utilization.

### **1.7 Overview of the variables and Aims**

The literature researched appear to consistently demonstrate an association between depression and higher levels of reported back pain (Ackerman & Stevens, 1989; Brox et al., 2005; Dickens, Jayson, Sutton & Creed, 2000; Grotle et al., 2006; Kinky, Gatchel, Polatin et al., 1993; Main, Wood, Hollis, et al., 1992; Romano and Turner, 1985). In addition, there is solid evidence of the association between depression and other mental disorder and, in particular, anxiety (Mc. Williams et al., 2004). As mentioned previously, there is limited research regarding possible relationships between chronic back and anxiety (Mc Williams et al., 2004). There is a need for further research of the role of anxiety and how its interaction with demographic and social factors may contribute to the chronicity of back pain.

Age, and, in particular, older age has been identified as a marker of chronic back pain (Cornelius et al., 2010; Dionne et al, 2001; Waddell, 2004; Walker et al, 2000). This is, in fact, a given assumption due to the gradual deterioration of the body, the accumulation of injuries and chronic disease and the reduction of all activities with older age. However, there is a gap in the current literature regarding the interaction of age with other BPS markers. In fact, no literature exists in relation to age and attitudes towards treatments. Furthermore, there are indications that the elderly from minority and non-mainstream cultures and language appeared to have lower levels of social engagement and a higher propensity for mood disorder and lower socio-economic status (Walker, 1995). There is a need for further research in the area of age and its interaction with other factors in relation to chronic back pain.

While there seems to be a universal agreement in sex differences regarding pain and chronic pain, there is a myriad of conflicting reports that differ in the way that men and women experience and above all report levels of pain (Sheffer, Cassisi, Ferraresi, Lofland and McCracken, 2002). Women were found to have higher levels of psychological distress in relation to their back experience. However, it is unclear if these differences in reported levels of pain are affected by other indicators such as socio-economic issues, social support and engagement or even physical/biological issues (Unruh, 1996). Further research in this area is warranted to ascertain the aetiology of these differences.

Differences in SES have been found to impact on individuals' health according to most studies to date (Bergman, 2005; Dionne et al., 2001; Gray, 2006). However, socio-economic status is proven to be a difficult construct to measure and may include indicators such as income (Gray and Mendeloff, 2005), level of education (Costa et al., 2009; Hagen et al., 2006), place of residence (Brekke et al., 2002; Brekke and Hjortdahl, 2004,) and type and tenure of employment (Lipscomb et al., 2006; Davies et al., 2009). While there appears to be

agreement of the association of heavy manual labour and LBP (Gray and Mendeloff, 2005; Latza et al., 2002; Oliveira et al., 2015; Yilmaz and Dedeli, 2012;) there is limited research to date on the role that other BPS factors may play in this association, particularly in relation to the Australian population. Many studies have focussed in this area investigating the association and predictive values of these indicators. However, it is important to consider each individual factor separately and the way this factor interacts with other BPS indicators in order to obtain an accurate measure of its influence. Many studies have utilised some of these factors as markers of chronic pain, nevertheless, it appear to be limited literature that consider all of the factors above mentioned together in order to obtain a more accurate reflection of the impact of SES in the experience of chronic back pain.

Higher levels of perceived social support are considered to be a “buffer” for chronic pain and disability (Cohen and Wills, 1985; Kerns et al., 2002; Kerns, Rosemberg and Otis, 2002; Lopez-Martinez et al., 2008; Sarason et al, 1983; Stroud, et al., 2006; Thomten, Soares and Sundin, 2011). This consideration as a “buffer” reflects, at least in part, the role of this support within the intricacies and interactions between mood, motivation, fear avoidance and willingness to participate in treatments which combined with other demographic factors may determine differences in the experience of the chronic back pain sufferer. There is also a significant level of agreement on the association between higher levels of perceived social support and better psychological outcomes (Kerns et al., 2002; Lopez-Martinez et al., 2008; Sarason et al., 1983; Stroud, et al., 2006). However, there is no available literature in the possible personal differences in the relationship between social support and psychological indicators such depression or anxiety levels. Personal differences may be influenced by demographic factors and given the limited research in this field it appears to be a significant need to investigate the associations, relationships and possible predictive nature of the

interactions between demographic factors, psychological issues and perceived social support in relation to chronic back pain and related disability.

Cultural and ethnic differences have been broadly investigated in relation to health outcomes. People from minorities and lower levels of acculturation to the host country have been found to have worse health outcomes (both physical and psychological) as well as a lower socio-economic status (on most indicators mentioned earlier) (Davidhizar et. al, 2004; Gray, 2006; Walker, 1995). Migrants are believed to be in a lower socio-economic stratum when compared with the local population as they most probably would have a lower income, lower paying employment that may involve manual labour, live in poorer areas and have language barriers that may further interfere with their employability and salary. In fact, migrants in the United States reported higher levels of pain but a lower level of disability. This was attributed to the healthy migrant's phenomenon (Gray, 2006). There is limited literature in relation to how other BPS factors interact with culture and ethnicity. In particular, there is no Australian-based study that includes a wide exploration of cultural differences in relation to chronic back pain.

There is ample evidence of a strong relationship between an injury (and disease) and acute levels of back pain, however, this initial source of pain appears to play a minor role in relation to chronic pain and disability. The first purpose of this study was to investigate which factors may predict chronic pain. The literature cites a range of demographic factors, emotional distress, perceived social support and the length and severity as the main contributors to the chronicity of back pain. Why individuals with a very similar type of injury or disease have vastly different outcomes and reports markedly different levels of functionality and disability?

While there is a strong correlation between psychological distress and chronic back (well established in the literature) there is limited evidence of factors influencing how and how

much sufferers access treatments and obtain positive outcomes. What factors contribute to sufferers receiving the quality, variety and extent of treatment required?

### **1.8 The Current Study**

The aims of this study were to examine a range of biopsychological variables (demographic, pain related, social support and psychological distress variables) that may impact on the experience of chronic back pain sufferers (disability). The identification of markers and possible interaction between markers may lead to a better understanding of the complexities around this very common and costly problem. Furthermore, the ultimate goal and benefit of gaining a better understanding of the chronic pain experience is to formulate recommendations for improved and better-tailored treatments and interventions to enhance the quality of life and functionality of back pain sufferers. Two research questions present which warrant examination as a consequence of what has been revealed in a review of the literature. These questions and the broad hypotheses which address them are shown below.

- (a) *Which of the following factors contribute to the number of treatments sessions received by chronic back pain sufferers: demographic factors, social support, pain or psychological distress?*

The literature suggests that women, older people, those suffering from depression or anxiety, and those with a lower level of education are more likely to report higher levels of pain. There is very limited research in relation to factors contributing to higher levels of engagement in treatments; the prediction includes the assumption of a possible relationship of higher indicators of contributing factors and lower levels of engagement in treatments. On this basis the first broad hypothesis is as follows:

H1: It was hypothesized that women, older participants, participants reporting a higher level of psychological distress, higher levels of pain and those with a lower level of education would have received fewer treatments in relation to chronic pain.

(b) *Which of the following factors contributes to the reported level of disability more: demographic factors, psychological distress, and level of pain or social support?*

The literature suggests a strong relationship between socio-economic factors, psychological distress and levels of disability reported. In addition, the literature researched also indicated a relationship between the level of pain and social support and reported levels of disability. On this basis the second broad hypothesis is as follows:

H2: It is hypothesized, that those with a lower socio-economic status, higher level of depression, anxiety or stress, higher levels of reported pain and lower levels of social support would report high levels of disability.

## **2. Method**

### **2.1 Participants**

A total of 201 participants were recruited with the assistance of health professionals (chiropractors, physiotherapists, osteopaths and acupuncturists) who distributed the questionnaires amongst their patients. The only inclusion criterion was that participants had experienced chronic or recurrent back pain for a period longer than six months. The only exclusion criterion was that the participants were 18 years old and older. The participants lived mainly in the Western and Northern suburbs of Melbourne. Participants were born in Australia or overseas and some reported receiving language assistance in order to complete the battery of questionnaires due to language barriers.

The participants were 89 men and 112 women residing in metropolitan Melbourne, Australia. The participants were aged between 19 to 88 years and the mean age was 47.18 years ( $SD = 13.44$ ). The mean ages were 46.14 for women ( $SD = 14.00$ ) and 48.48 for men ( $SD = 12.64$ ).

The most common living arrangement was with a spouse (61.2%), followed by living with a parent/child/relative (23.9%), and partner/companion (16.8%). Only a small proportion of participants lived with a housemate/roommate (3.5%), or friend or neighbour (3.5%). Just over half of the sample was born in Australia (52.7%). Twenty-four participants reported having been born in an Asian country (11.9%), 31.8 per cent were born in a European country and 3.5 percent of the sample was born in a Middle Eastern country. A slight majority of participants reported having lived all of their lives in Australia (52.7%), with 59.7 percent of participants having reported English as their first language.

In relation to socio-economic status, 40.3 percent of the sample was employed full-time and 22.4 percent employed part-time. Twenty-five participants were unemployed (12.4%), 29 reported being Government benefits recipients (14.4%) and 21 participants were retired (10.4%). There was an imbalance between participants earning below \$60,000 per annum (71.1%) compared to 28.9 percent earning above \$60,000 per annum.

The most common serious diagnosis was sciatica (27.9%), followed by bulging disc (22.4%), prolapsed disc (16.4%) and degenerative disease (11.9%). Less common diagnoses included arthritis (7.5%), herniated disc (5.5%), spondylosis (5.0%), osteoporosis (2.0%) and lordosis (0.5%). Two participants (1.0%) reported nil serious diagnoses.

The majority of the sample reported having experienced pain for longer than 24 months in duration (72.6%). One-fifth, (20.9%) of participants reported experiencing pain for between 6-24 months. Ten participants (5.0%) reported experiencing pain for between 3-6 months, and only three participants reported experiencing pain for three months or less.



## 2.2 Materials

A letter of invitation was provided to Health Professionals included information about the study as well as the requirements involved for their participation in the recruitment process and how to deliver the questionnaires to their patients.

The participants were presented with a reply- paid, a self-addressed envelope which contained a letter of invitation, a consent form and a battery of questionnaires. The letter of invitation explained the purpose of the study and the requirements that needed to be fulfilled in relation to this study. This study received approval from the Victoria University Human Research Ethics Committee.

### 2.2.1 Depression Anxiety Stress Scales. (DASS)

The DASS consists of three self-report scales that have been designed to measure the negative emotional states of depression, anxiety and stress. Each of the three DASS-21 (brief version of DASS 42) scales contains seven items representing the dimensions of depression, anxiety and stress (Lovibond & Lovibond, 1995). The principal value of the DASS in a clinical setting is to clarify the locus of emotional disturbance, as part of the broader task of clinical assessment. The essential function of the DASS is to assess the severity of the *core* symptoms of depression, anxiety and stress. It must be recognised that clinically depressed, anxious or stressed persons may well manifest additional symptoms that tend to be common to two or all three of the conditions, such as sleep, appetite, and sexual disturbances. As the essential development of the DASS was carried out with non-clinical samples, it is suitable for screening normal adolescents and adults. The results of a Dutch study revealed that internal consistency of the DASS subscales was high, with Cronbach's alphas of 0.94, 0.88, and 0.93 for depression, anxiety, and stress respectively. The internal consistency for the DASS 21 was also high, with Cronbach's alphas at 0.94 for depression, 0.87 for anxiety and 0.91 for stress (Anthony et. al, 1998). Factor analysis revealed a three-factor solution, which

corresponded well with the three subscales of the DASS. Construct validity was further supported by moderately high correlations of the DASS with indices of convergent validity (0.65 and 0.75), and lower correlations of the DASS with indices of divergent validity (range -0.22 to 0.07). Support for criterion validity was provided by a statistically significant difference in DASS scores between two diagnostic groups. A cutoff score of 5 for anxiety and 12 for depression is recommended. The DASS showed probabilities of anxiety and depression after a negative test result of 0.05 and 0.06 respectively. Probabilities of 0.29 for anxiety disorder and 0.33 for depression after a positive test result reflect a relatively low specificity of the DASS (Nieuwenhuijsen, et al., 2003).

In terms of traditional diagnostic classifications such as DSM-5, the DASS Anxiety scale corresponds most closely to the symptom criteria for the various Anxiety Disorders, with the exception of Generalized Anxiety Disorder (GAD). The DASS Depression scale corresponds fairly closely to the Mood Disorders, although the diagnostic criteria for those disorders include many symptoms that were rejected during DASS development as not specific to depression (e.g., guilt, appetite change). Finally, the DASS Stress scale corresponds quite closely to the DSM-5 symptom criteria for GAD. The Stress scale originally labelled 'tension/stress', measures a syndrome that is factorially distinct from depression and anxiety, characterised by nervous tension, difficulty relaxing and irritability. It is quite similar to the DSM-IV diagnosis of Generalized Anxiety Disorder (GAD).

Although the stress scale can be distinguished from depression and anxiety in factor analysis, it is important to note that all three syndromes are moderately intercorrelated.

Psychometrically, the DASS is quite different from diagnostic instruments in that it reflects the underlying continuity of severity of symptoms in the population. DASS scale scores are dimensional rather than categorical. However, the DASS 21 is highly correlated

with other measures such as the Beck Depression Inventory (0.62), the Beck Anxiety Inventory (.059) and the State Trait Anxiety Inventory (STAI, 0.59).

Although the full version of the DASS with 42 items offers additional information, Anthony et al. (1998) have clearly endorsed the use of the shorter version (DASS 21) stating that it had fewer items (quicker completion and scoring), cleaner factor structures and smaller inter-factor correlation.

### **2.2.2 McGill Pain Questionnaire. (SF-MPQ)**

The McGill Pain Questionnaire (MPQ) consists primarily of three major classes of word descriptors: sensory, affective and evaluative, as used by patients to specify subjective pain experience (Melzack, 1975). The MPQ includes a list of 78 descriptors that can be used both for quantitative and qualitative purposes. The questionnaire allows the participants to rate the intensity of their pain as well as describing the nature of that pain. A pain rating index (PRI) is calculated by adding the total of the scale rank values for all descriptors. Although this instrument was designed to report pain at the time of its completion (Melzack, 1975) some authors have questioned the accuracy of the reporting as this may be influenced by previous experiences of pain (Scrimshaw & Maher, 2001). While in most studies the participants were required to report their pain at the time of filling the questionnaire, others have requested them to report on the experiences of pain over the previous two weeks.

A Canadian study found that the internal consistency estimates for the sensory and affective dimensions based on the Melzack (1987) factor structure were 0.78 and 0.76, respectively. The internal consistency estimates for the sensory and affective dimensions (two factorial correlations) based on the final model were both 0.77 (Wright, Asmundson & McCreary, 2001).

An Australian study with patients that had undergone surgery (discectomy, fusion or laminectomy) found that the VAS was more responsive to clinical change than the MPQ

(Scrimshaw & Maher). However, Langley and Sheppeard (1985) found the MPQ a better measurement tool than the VAS because it included descriptors as well as intensity measures.

Melzack developed a shorter version of the MPQ in 1987 called the short-form McGill Pain Questionnaire (SF-MPQ) as the full version required approximately 20 minutes to complete and was considered too long in some settings. The SF-MPQ comprises 15 adjectives that describe the sensory and affective dimensions of pain as well as a visual analogue scale (VAS) and present pain index (PPI). A Visual Analogue Scale (VAS) is a measurement instrument that tries to measure a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured. Operationally a VAS is usually a horizontal line, 100 mm in length, anchored by word descriptors at each end. The patient marks on the line the point that they feel represents their perception of their current state. The VAS score is determined by measuring in millimetres from the left-hand end of the line to the point that the patient marks (Wewers & Lowe, 1990). Although some population groups (elderly, illiterate or particular cultural groups) may not conceptualise their pain in order to be able to mark their pain along a line, the VAS appear to be a simple and straightforward resource to report pain for the vast majority of the population (Burckhardt & Jones, 2003).

The SF-MPQ has been widely used in a variety of health and allied health settings across the world and has been translated to a large number of languages. Significant pain studies have utilised the SF-MPQ given its high validity and reliability (Dudgen, Raubertas and Rosenthal, 1993; Grombald et al., 1990). Correlations between the short and long forms ranged between 0.67 and 0.87 in two groups of patients with either post-surgical or dental pain. Internal consistency reliability was 0.73 to 0.89 in repeated testing of rheumatoid arthritis and fibromyalgia patients (Burckhardt & Jones, 2003).

### **2.2.3 West Haven-Yale Multidimensional Pain Inventory (WHYMPI).**

The West Haven-Yale Multidimensional Pain Inventory (WHYMPI/MPI) was designed to provide a brief, psychometrically sound, and comprehensive assessment of the important components of the chronic pain experience including social support. This questionnaire is a 52-item, 12-scale inventory that is divided into three parts. Part I includes five scales designed to measure important dimensions of the chronic pain experience including 1) perceived interference of pain in vocational, social/recreational, and family/marital functioning; 2) support or concern from spouse or significant other; 3) pain severity; 4) perceived life control; and 5) affective distress. Part II assesses patients' perceptions of the degree to which spouses or significant others display Solicitous, Distracting or Negative responses to their pain behaviours and complaints. Part III assesses patients' report of the frequency with which they engage in four categories of common everyday activities: Household Chores, Outdoor Work, Activities Away from Home, and Social Activities. In addition to the individual scale scores, a General Activity scale score, obtained from the combination of all four activity scale scores, has been recommended for some purposes (Turk & Rudy, 1990). Responses to WHYMPI items are made on a 7-point scale.

Kerns, Turk and Rudy (1985) demonstrated that the internal reliability coefficients of all WHYMPI scales range from 0.70 to 0.90; the test-retest reliabilities of these scales over a two-week interval range from 0.62 to 0.91. The original research indicated that the WHYMPI had a 4-factor structure. Construct validity was estimated from correlations between the four factors and nine well-known and established scales. The affective distress dimension correlated highly with measures such as the Beck Depression Inventory. The support from significant others dimension correlated with marital satisfaction. The pain severity and interference dimension correlated with the McGill Pain Questionnaire (Burckhardt & Jones, 2003). The WHYMPI can be used to classify individuals into

dysfunctional, interpersonally distressed, or adaptive coping categories. Burckhardt & Jones found the WHYMPI a 'useful instrument for capturing the multidimensionality of the chronic pain experience' (p. 104S).

#### **2.2.4 Oswestry Low Back Pain Questionnaire. (ODQ)**

The Oswestry Low Back Pain Disability Questionnaire (ODQ) is used to assess patients with low back pain by determining its impact on the activities of daily living (Fairbank & Davies, 1980). The Oswestry Disability Index (aka Oswestry Low Back Pain Disability Questionnaire) is an extremely important tool that researchers and disability evaluators use to measure a patient's permanent functional disability. The questionnaire has six items graded on an ordinal scale within each of 10 factors representing different aspects of disability with increasing value/ intensity from a to f (Matheson et. al., 2008). The test has been utilised for 25 years and is considered the 'gold standard' of low back functional outcome tools. The ODQ is a widely used instrument which has a strong internal consistency ( $\alpha = 0.85$ ) and is strongly correlated with the Roland Morris Disability Questionnaire (RM) ( $r = 0.70, p = .0005$ ) another widely used instrument (Tibbles, Waalen and Hains, 1998). In addition, the ODQ was found to be a strong marker of the RM scores ( $T = 9.45, p = .0005$ ) and duration symptoms ( $T = -2.17, p = 0.325$ ). The ODI shows moderate correlation with pain measures such as a visual analogue scale ( $n = 94, r = 0.62$ ) 51 and the McGill Pain Questionnaire. The data gathered in the ODI is in a categorical format, but each category is ordinal. This is converted to discrete quantitative data by summing (a dimensional scale). This assumes that disability can be viewed as a continuum from 'not disabled' to 'severely disabled' (Fairbank & Pynsent, 2000).

#### **2.2.5 Demographic Data Collection Questionnaire.**

This 12- item questionnaire was designed for the collection of demographic data and includes variables considered to have an impact in the experience of chronic low back pain.

Furthermore, this tool includes questions about access to treatment that relate to the number of sessions, and the type of providers utilised.

### **2.3 Procedure**

A total of 450 self-addressed reply paid envelopes containing the participant's consent form and the battery of questionnaires were distributed through doctors and allied health professionals (consented by signing the specially designed form).

The information collected in the questionnaire was analysed utilizing the Statistical Program for Social Sciences Version 20 (SPSS). The data collected from the questionnaires was input reflecting the participants' answers. All questionnaires were scored and computed according to the guidelines recommended by the questionnaires authors.

Anxiety, Depression and Stress scores were obtained for the DASS 21 and this data was then categorised in nominal groups according to the severity of symptoms from mild to severe.

Prior to analysis, the raw data was examined for missing cases and unusual values. Through this process, several missing and unusual scores were identified and were attributed to mistakes made in data entry. All these values were corrected before undertaking further analysis. Reliability analysis was conducted on the DASS-21 sub-scales. Overall, reliability was very good and comparable to those reported for the respective scales, depression (Cronbach's  $\alpha = .90$ ), stress (Cronbach's  $\alpha = .90$ ) and anxiety (Cronbach's  $\alpha = .75$ ). Following reliability analysis, depression, anxiety and stress scores were calculated for each participant.

The McGill pain questionnaire offered scores in pain intensity and pain type with a series of descriptors for pain. These descriptors included categories such as "quivering, "pounding" and throbbing which were not relevant for this study and were not analysed. In addition, the Mc Gill pain questionnaire offered a further measure for intensity of pain with the Visual

Analog Scale which contributes to the overall score for intensity of pain. Reliability for this questionnaire was good with a Cronbach's alpha score of .76 and a score of pain intensity was calculated for each participants.

The WHYMPI offered scores in social support, impairment and activity scales. The latter was found to have low reliability (Cronbach's alpha = .37) and was not utilised for the analysis. The impairment scale was not utilised as a measure of disability as the Oswestry Disability Index was found to be more reliable and more widely used in previous studies. The social support scale was found to be reliable (Cronbach's alpha = .72) and scores for this measure were calculated for each participant.

The Oswestry Disability Questionnaire offered scores of perceived level of disability with an overall measure (no subscales) that was found to be highly reliable (Cronbach's alpha = .83) and a score for disability for each participant was calculated.

Finally, results from the specially designed demographic questionnaires were collated and entered into SPSS for analysis. A description of the analysis's stage was included in the results' section.

## **2.4 Identification of variables**

The following variables were identified as possible markers of chronic pain and were utilised in the analyses as independent variables. Demographic measures, medical measures, measures of psychological distress, measures of pain and measures of social support. The level of disability reported was identified as a dependent variable as it reflects the overall functionality of participants.

Demographic Variables were collected from the purposely devised Demographic Questionnaire. The variables selected for investigation included:

- Gender (male and female)
- Age (in years)



## Living with Back Pain; a Biopsychosocial Analysis of Contributing Factors

- Country of Birth (Australia or Other)
- Length of Residence in Australia
- Language (First and Second Language Spoken)
- Occupational Status (Fulltime; Part-time; Unemployed; Retired; Welfare and Other)
- Employment Experience (Services; Manufacturing; Construction and Government)
- Socio-economic status (income in dollars per year; 0-19,999; 20,000 to -39,999; 40-60,000 and over 60,001)
- Level of Education (Primary; Secondary; Tertiary and Other)

Medical Variables were also collected from the purposely devised Demographic Questionnaire. Medical variables included:

- Diagnosis (Sciatica; Herniated Disc; Prolapsed Disc; Bulging Disc; Spondylosis; Lordosis; Osteoporosis; Arthritis; Degenerative Disease and Other)
- Treatment Type (Surgery; Medication, Physiotherapy, Chiropractic, Acupuncture, Hydrotherapy, Massage, Exercise, Naturopath, Psychologist, Psychiatrist, Counsellor, Hypnotherapist and Other)
- Duration of Treatments (date of commencement and date of cessation)
- Number of sessions for every treatment listed.

Psychological variables were extracted from the DASS 21. The variables selected for investigation included:

- Depression (Mild, Moderate and Severe)
- Anxiety (Mild, Moderate and Severe)
- Stress (Mild, Moderate and Severe)

Pain Variables were collected from the McGill Pain questionnaire, the Visual Analog Scale and Demographic Questionnaire. The variables selected for investigation included:

- Duration of pain (0-3 months; 3-6 months; 6-24 months and over 24 months)

## Living with Back Pain; a Biopsychosocial Analysis of Contributing Factors

- Pain Rating Index (PRI) (severity: none, mild, moderate and severe)
- Present Pain Intensity (from no pain to worse possible pain rated in a ten centimetres

line and scored between 0 and 10.

- Evaluative overall intensity of total pain experience (values: 0 = no pain; 1=mild; 2=discomforting; 3=distressing, 4=horrible and 5=excruciating).

Social Support variables were collated from the WHYMPI. Social support variables included:

- Evaluation of perceived pain and the impact of pain on aspect of daily life
- Evaluation of participant's perception to their significant other's response to the communication of pain
- Frequency of a participants' performance of common activity.

Disability variable was collated from the ODI:

- Included a self-reported level of disability (ten sections: Pain Intensity; Personal Care; Lifting; Walking; Sitting; Standing; Sleeping; Sex Life, Social Life and Travelling; with scores from 0 to 5 ).

### **3. Results**

The data were collated and analysed using the Statistical Package for the Social Sciences for Windows Version 22.0.

450 surveys were distributed and a total of 201 completed surveys were received. This represented a response rate of 45%.

#### **3.1 Data Screening**

Prior to the analyses, the raw data were examined for missing values. Some missing data were identified including the following; four missing values for the Oswestry Pain Questionnaire, four missing values for total pain score, and one missing value for the West Haven-Yale Multidimensional Pain Inventory. Each missing value was replaced with the series mean for that particular variable.

#### **3.2 Outliers**

Outliers in the present data set were checked using boxplots. In addition, inspection of the descriptives' tables provided an indication of the extent of the problem associated with the identified outlier. This was done by comparing the original mean and the new trimmed mean values to determine whether extreme scores were likely to create a bias in the results.

To minimize the exclusion of cases as a result of outliers, a Winsorising procedure, as opposed to a trimming procedure was deemed an appropriate method for treating outliers. Winsorisation required the identification of all outliers and recoding these to their nearest acceptable value (upper or lower bound values). The procedure was only applied where outliers contributed to less than 20% of the variance (Lewis, 2007). Univariate and multivariate outliers were assessed using the SPSS REGRESSION procedure (Tabachnick & Fidell, 2013). Univariate outliers with an extreme standardised score (Z score  $\pm 3.29$ ,  $p < .001$ ) on one or more variables were deleted. For multivariate outliers, the Mahalanobis

distance statistic was computed. Any outliers that exceeded the critical  $\chi^2$  value, with degrees of freedom equal to the number of independent variables at  $p < .001$  were deleted (Tabachnick & Fidell, 2013). A total of 15 outlying cases were deleted from the analysis. Thus, the final number of cases used in the analysis was 180.

Multicollinearity was assessed through the examination of the computer tolerances, the condition indices, the variance proportions associated with each variable, and the Pearson's correlation coefficients between the independent variables, all produced by SPSS (Tabachnick & Fidell, 2013). None of the tolerances were less than .20 and no condition indices of  $>.30$  were found. There were two variables (DASS Stress and DASS Depression) that had a correlation higher than .8. DASS stress was deleted from the analyses (Tabachnick & Fidell, 2013).

### **3.3 Normality**

The distribution of scores on all of the continuous variables was found to within parameters of normality (scores were not above  $z = 3.29$  or below  $z = -3.29$ ) (Tabachnick & Fidell, 2013). No departures from normality were detected, and an examination of the residuals scatterplots showed no major violations to the assumptions of linearity and homoscedasticity.

### **3.4 Variable transformations**

Categorical demographic variables were “dummy” coded so that they could be utilised in the multiple regression. These included: sex (0 = male, 1 = female); marital status (0 = spouse, partner/companion; 1 = housemate/roommate, friend, neighbour, parent/child/other relative, other); occupation group (0 = full-time employed, part-time employed; 1 = unemployed, welfare, retired, other, housewife); language spoken at home (0 = English; 1 = other); socioeconomic status (0 = below \$40,000; 1 = above \$40,000); and education (0 = primary and secondary; 1 = other). A new variable was created:

percentage of life in Australia was calculated from the 'age' and 'length of residence in Australia' variables (from the result of divided age from the length of residence in Australia for those born elsewhere). This new variable reflected more accurately the level of cultural immersion of the participants. Employment Type groups were reduced from four to two with the new groups being (0=light to moderate and 1=heavy employment type).

### **3.5 Reliability Analysis**

The internal consistency of the measures was assessed by the computation of reliability coefficients using Cronbach's Alpha for each of the scales. The results of the reliability analyses are shown in Table 3.3.

The reliability coefficients (Cronbach's Alpha) indicated high internal consistency for all measures, except for the Impairment and the Activity Summary Scales of the West Haven-Yale Multidimensional Profile Analysis Scale. Given the low reliability of the Impairment and Activity Summary Scales, they were excluded from any multiple regression analyses. The results for, Social Support Summary Scales (WHYMPI, all DASS scales, McGill Pain Questionnaire and Oswestry Disability Questionnaire) were consistent with the original reliability analyses conducted by the authors (refer to Materials section in the Method Chapter2).

Table 3.3

*Reliability Coefficients of the WHYMPI Summary Scales, DASS Subscales, McGill Pain Questionnaire and the Oswestry Disability Questionnaire.*

Measure	Cronbach Alpha
West Haven-Yale Multidimensional Profile	
Impairment Summary Scale	.67
Social Support Summary Scale	.72
Activity Summary Scale	.37
DASS	
Depression Subscale	.90
Anxiety Subscale	.76
Stress Subscale	.90
McGill Pain Questionnaire	.76
Oswestry Disability Questionnaire	.83

### 3.6 Descriptive Statistics

Table 4.3 shows a breakdown of demographic variables by frequency and percentages.

Table 4.3  
*Demographic Variables Frequencies and Percentages.*

Variable	Category	<i>n</i>	(%)
Sex	Male	84	(46.3)
	Female	94	(53.7)
Place of Birth	Australia	96	(53.30)
	Other	84	(47.70)
First Language	English	108	(60.00)
	Other	72	(40.00)
Occupational Status	Working	113	(62.80)
	Not working	67	(37.20)
Employment Type	Heavy work	54	(30.00)
	Light work	126	(70.00)
Income	Below 40 K	91	(51.60)
	Above 40K	89	(49.40)
Education	Below Tertiary	110	(61.15)
	Tertiary	70	(38.85)
Living arrangements	In company	109	(60.10)
	Alone	71	(39.90)

Table 4.3 shows the demographic variables were distributed fairly evenly, with proportions ranging between about 40% to 60%. The most notable exception to this was for Type of Employment, with a greater proportion being engaged in light work (70%) compared to heavy work (30%).

Table 5. 3  
*Number of treatments received by number of participants and percentages of total participants*

Treatment	N	%
Surgery	24	(13.30)
Medication	94	(52.2)

Physiotherapist	109	(56.10)
Chiropractor	46	(25.60)
Acupuncture	21	(11.70)
Hydrotherapy	27	(15.00)
Massage	47	(26.10)
Exercise	43	(23.90)
Naturopath	4	(2.20)
Psychologist	26	(14.40)
Psychiatrist	10	(5.60)
Counsellor	4	(2.30)
Hypnotherapist	1	(0.60)

Table 5.3 shows the number of participants who engaged in each treatment and the percentage in relation to total number of participants ( $n = 180$ ). Participants may have received a number of different treatments (not mutually exclusive). More than half of participants received medication and physiotherapy treatment. The total number of participants who engaged in psychological treatment (psychologist, psychiatrist, counsellor and hypnotherapist) was 37 (4 participants had seen a psychiatrist and a psychologist). Of the 26 participants who had been treated by a psychologist 50% ( $n = 13$ ) had received 6 sessions or less. Of 10 participants who had been treated by a psychiatrist more than half indicated that had received 2 sessions or less. Descriptive statistics for measures of psychological distress, pain, social support and disability are shown in Table 6.3.

Table 6.3  
*Means and standard deviations for measures of psychological distress, pain, social support and disability*

Measure	Range	<i>M</i>	<i>SD</i>
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DASS Anxiety	0 – 16.00	4.11	3.75
DASS Depression	0 – 40.00	13.94	11.14
DASS Stress	0 – 21.00	8.94	5.55
McGill Pain Q	0 – 38.00	12.25	9.42
WHYMPI Soc Supp	1.00 – 5.77	3.36	1.08
Oswestry Disability	0 – 78.00	18.35	11.19

Mean scores for DASS anxiety fell within the mild range (4-5), mean scores for DASS depression fell within the extremely severe range, DASS Stress mean results fell within the mild range. The DASS Stress scale was excluded from further analyses as the results violated normality recommendations. Mean scores for McGill Pain questionnaires fell within the mild to moderate range. In relation to the measures from the WHYMPI higher scores on the subscales of interference and pain severity indicate more pain and pain interference with life. No cutoff points or critical score points have been established. The Oswestry Disability Questionnaire means results fell within the mild range (0-20).

### **3.7 Analysis of means (*t*-tests and Analyses of Variance, ANOVAs).**

Differences between means for key variables were assessed using *t*-tests for independent groups, and as required one way ANOVA with post-hoc comparisons. Correlation and regression was used to estimate the predictive utility of demographic and other variables in relation to number of sessions and perceptions of disability. Mediation testing was conducted using path analysis in SPSS AMOS. This also permitted the simultaneous estimation of equations for more than one dependent variable.

Independent samples *t*-tests were used to explore sex, income, level of education, occupational status, employment type, social support, living arrangements and first language spoken. The effect size was calculated for results that were found to be statistically significant with alpha set at .05. Cohen's *d* was used to assess effect size. *d* values between 0 to 0.3 are considered a small effect size, 0.3 to 0.6 are considered a moderate effect size, and

greater than 0.6 are considered a large effect size (Pallant, 2013). For each *t*-test conducted the dependent variable was overall number of sessions for treatments received and the independent (grouping variable) variables were the dichotomous biopsychosocial variables. Table 7.3 shows the means, standard deviations, and *t*-tests results for the number of sessions for treatments received by biopsychosocial factors.

Table 7.3

*Number of overall sessions for treatments received by sex, level of income, level of education, occupational status, employment type, living arrangements and first language spoken*

Variable	Category	<i>M (SD)</i>	<i>t</i>	<i>p</i>	<i>d</i>
Sex	Men	118.77 (193.57)			
	Women	191.36 (284.54)	-2.02	.05	.30
Income	Below 40K	121.11 (224.13)			
	Above 40K	195.49 (267.80)	-2.02	.05	.30
Education	Prim/Secondary	123.97 (211.15)			
	Tertiary	211.19 (292.31)	-2.16	.03	.34
Occ Stat	Not Working	148.49 (261.95)			
	Working	163.46 (241.69)	.39	.70	
Emp Type	Heavy Employment	138.15 (215.38)			
	Light Employment	164.66 (259.69)	-.62	.53	
Liv Arrang	Not Alone	187.81 (267.99)			
	Alone	88.07 (180.52)	2.91	.005	.44
Language	English	185.69 (270.21)			
	Other	116.19 (207.59)	1.95	.05	.29

Independent-samples *t*-tests were conducted to explore differences in relation to the number of treatments received by categorical variables (dichotomous). Men received fewer treatments than women; participants with lower incomes received fewer treatments compared with those with higher incomes; participants with primary/secondary education received fewer treatments than those with tertiary education; participants living in company received more treatments than those living alone and participants with English as their first spoken language received more treatments than those who spoke another language as their first language. There were no significant differences between those working and not working and those who had involvement in heavy or light employment.

Table 8.3 shows the means, standard deviations, and *t*-tests results for level of disability reported by biopsychosocial factors.

Table 8.3

*Level of disability by sex, income, education, occupational status, living arrangements and first language spoken*

Variable	Category	<i>M(SD</i>	<i>t</i>	<i>p</i>	<i>d</i>
Sex	Men	18.34 (8.80)			
	Women	16.02 (10.57)	1.59	.11	
Income	Below 40K	18.65 (10.55)			
	Above 40K	15.49 (8.82)	2.18	.03	.32
Education	Prim/Secondary	19.35 (9.83)			
	Tertiary	13.54 (8.79)	4.03	.005	.62
Occ Stat	Not Working	18.91 (10.14)			
	Working	16.01 (9.53)	-1.93	.065#.	.29
Emp Type	Heavy	20.78 (11.96)			
	Light	15.82 (8.68)	3.02	.01	.48
Liv Arrang	Not Alone	15.88 (9.20)			
	Alone	19.91 (10.73)	-2.56	.02	.40
Language	English	16.26 (9.56)			
	Other	18.37 (10.16)	-1.43	.16	

# indicates a p value above .05, but considered a trend approaching significance

Table 8.3 shows participants with lower incomes reported higher levels of disability in comparison to those with higher incomes. Participants with primary/secondary education also reported higher levels of disability than those with tertiary education. Participants who were not working reported higher levels of disability ( $t = -1.93$ ,  $p = .06$ , nearing significance); participants who were involved in heavy employment reported higher levels of disability; participants living in company reported lower levels of disability than those living alone. There were no significant differences in the mean levels of disability between men and women or in relation to the first language spoken.

Table 9.3 shows the means, standard deviations, and  $t$ -tests results for number of physical therapy sessions received by biopsychosocial factors.

Table 9.3

*Number of physical therapy sessions received by sex, level of income, level of education, occupational status, living arrangements and first language spoken.*

Variable	Category	<i>M (SD)</i>	<i>t</i>	<i>p</i>	<i>d</i>
Sex	Men	122.65 (209.57)			
	Women	317.02 (547.92)	-3.23	.01	.47
Income	Below 40K	124.94 (272.60)			
	Above 40K	317.04 (526.07)	-3.13	.05	.46
Education	Prim/Secondary	126.71 (263.79)			
	Tertiary	385.61 (585.57)	-3.48	.01	.46
Occ Stat	Not Working	157.39 (314.96)			
	Working	268.90 (491.36)	1.85	.07#	.57
Emp Type	Heavy	184.89 (337.81)			
	Light	241.96 (465.87)	-.89	.38	
Liv Arrang	Not Alone	304.80 (524.52)			
	Alone	111.29 (207.50)	3.45	.05	.27
Language	English	266.59 (514.13)			
	Other	168.60 (276.13)	1.66	.10	

# indicates a p value above .05, but considered a trend approaching significance

Additional independent-samples *t*-tests were conducted to explore differences in relation to the number of physical therapy sessions received by categorical variables (dichotomous). These therapies included physiotherapy, chiropractic treatment, osteopathy, acupuncture, massage and other allied health treatments. Women received more sessions than men; participants with lower incomes received more sessions than those with higher incomes. Participants with primary/secondary education received fewer sessions than those with tertiary education. Participants who were working reported higher levels of disability ( $t = -1.85$ ,  $p = .07$ , nearing significance) and participants currently working received participants living in company reported lower levels of disability than those living alone. There were no significant differences between those involved in heavy or light employment or in relation to the first language spoken. However, there were differences in the means for these variables with those involved in lighter employment and those with English as their first language

receiving a higher number of sessions compared with those involved in heavy employment and those with “other” as their first language respectively.

Table 10.3 shows the means, standard deviations, and *t*-tests results for depression scores by biopsychosocial factors.

Table 10.3

*Depression scores by sex, level of income, level of education, occupational status, living arrangements and first language spoken*

Variable	Category	<i>M (SD)</i>	<i>t</i>	<i>p</i>	<i>d</i>
Sex	Men	16.00 (9.88)	1.02	.31	
	Women	14.34 (11.72)			
Income	Below 40K	21.04 (8.52)	7.91	.0005	.46
	Above 40K	9.92 (10.13)			
Education	Prim/Sec	20.14 (9.38)	9.49	.005	.47
	Tertiary	7.20 (8.14)			
Occ Status	Not working	18.54 (10.71)	-3.33	.005	.47
	Working	13.08 (10.56)			
Emp Type	Heavy	18.30 (10.54)	2.33	.02	.51
	Light	14.01 (10.86)			
Liv Arrang	Not alone	10.41 (9.78)	-3.13	.005	.40
	Alone	22.15 (8.50)			
Language	English	14.36 (11.07)	-1.12	.26	
	Other	16.22 (10.64)			

In relation to levels of depression reported significant differences were found between all groups with the exception of sex and language, where no group differences were found.

Notably, there were very large differences in mean depression scores according to income and education level, with those on lower incomes and with lower levels of education scoring higher than their respective counterparts. This contrasted with results for Occupational

Status, with people who were working (and therefore should be earning more money) displaying higher mean depression scores than those who did not work outside of the home. There was a significant difference between people who described their work as heavy showing higher mean depression scores compared to people who described their work as light. The effect size as indicated by Cohen's  $d$  was moderate. Living arrangements also seemed to be important, with people who were living alone scoring much higher than people who lived with others. Table 11.3 shows the means, standard deviations, and  $t$ -tests results for anxiety scores by biopsychosocial factors.

A similar pattern of results were found for mean anxiety scores as was found for depression. Although the size of differences between group mean scores appears smaller and in this case the effect sizes were only marginally reduced, indicating a similar magnitude of difference.



Table 11.3

*Anxiety scores by sex, level of income, level of education, occupational status, living arrangements and first language spoken.*

Variable	Category	<i>M (SD)</i>	<i>t</i>	<i>p</i>	<i>d</i>
Sex	Men	4.58 (4.29)			
	Women	4.74 (4.40)	-.25	.80	
Income	Below 40K	5.71 (4.50)			
	Above 40K	3.75 (3.99)	3.10	.0005	.46
Education	Prim/Sec	5.11 (4.30)			
	Tertiary	3.97 (4.34)	1.73	.09	
Occ Status	Not working	5.58 (4.41)			
	Working	4.12 (4.22)	-2.20	.03	.34
Emp Type	Heavy	4.65 (3.43)			
	Light	4.67 (4.62)	-.03	.98	
Liv Arrang	Not alone	3.86 (3.88)			
	Alone	5.88 (4.72)	-3.16	.0005	.34
Language	English	4.31 (4.12)			
	Other	5.19 (4.62)	-1.34	.18	

Table 12.3 shows the means, standard deviations, and *t*-tests results for life control scores by biopsychosocial factors.

Table 12.3

*Life control scores by sex, level of income, level of education, occupational status, living arrangements and first language spoken*

Variable	Category	<i>M(SD)</i>	<i>t</i>	<i>p</i>	<i>D</i>
Sex	Men	4.58 (4.29)			
	Women	4.74 (4.40)	-2.71	.01	.47
Income	Below 40K	2.99 (1.28)			
	Above 40K	3.91 (1.52)	4.39	.0005	.50
Education	Prim/Sec	3.07 (1.37)			
	Tertiary	4.12 (1.42)	-4.93	.0005	.75
Occ Status	Not working	3.19 (1.48)			
	Working	3.65 (1.45)	2.07	.04	.31
Emp Type	Heavy	3.01 (1.33)			
	Light	3.64 (1.50)	-2.53	.01	.44
Liv Arrang	Not alone	3.75 (1.56)			
	Alone	3.08 (1.25)	3.01	.005	.47
Language	English	3.72 (1.41)			
	Other	3.12 (1.51)	2.73	.01	.41

Independent-samples *t*-tests showed significant differences in the mean scores on life control for each categorical variable examined. For women, those with lower income and education, living alone, working, involved in heavy employment and those whose first language was other than English had less reported life control.

Table 13.3 shows the means, standard deviations, and *t*-tests results affective distress scores by biopsychosocial factors.

Table 13.3

*Affective distress scores by sex, level of income, level of education, occupational status, living arrangements and first language spoken.*

Variable	Category	Affective Distress	<i>t</i>	<i>p</i>	<i>D</i>
Sex	Men	3.35 (1.57)			
	Women	2.87 (1.31)	2.21	.03	.33
Income	Below 40K	3.68 (1.25)			
	Above 40K	2.58 (1.42)	5.49	.0005	.82
Education	Prim/Sec	3.45 (1.39)			
	Tertiary	2.53 (1.37)	4.36	.0005	.67
Occ Status	Not working	3.50 (1.49)			
	Working	2.85 (1.37)	-3.00	.005	.45
Emp Type	Heavy	3.57 (1.28)			
	Light	2.93 (1.47)	2.66	.01	.46
Liv Arrang	Not alone	2.75 (1.46)			
	Alone	3.60 (1.28)	-3.98	.0005	.62
First Lang	English	2.80 (1.42)			
	Other	3.53 (1.38)	-3.44	.005	.52

Results from independent-samples *t*-tests revealed significant differences between means for affective distress. Women, those with lower income and education, living alone, working, involved in heavy employment and those whose first language was other than English reported more affective distress.

Table 14.3 shows the means, standard deviations, and *t*-tests results for level social support reported by biopsychosocial factors.

Table 14.3

*Level social support reported by sex, level of income, level of education, occupational status, living arrangements and first language spoken.*

Variable	Category	<i>M(SD)</i>	<i>t</i>	<i>p</i>	<i>d</i>
Sex	Men	3.28 (1.12)			
	Women	3.43 (1.09)	-.92	.36	
Income	Below 40K	2.96 (1.12)			
	Above 40K	3.73 (0.97)	-4.94	.0005	.73
Education	Prim/Secondary	3.11 (1.14)			
	Tertiary	3.78 (0.93)	-4.32	.0005	.64
Occ Stat	Not Working	3.53 (1.06)			
	Working	3.09 (1.14)	2.67	.01	.40
Emp Type	Heavy	3.11 (1.20)			
	Light	3.46 (1.06)	-1.74	.065#	.31
Liv Arrang	Not Alone	3.77 (0.87)			
	Alone	2.77 (1.15)	6.28	.0005	.98
First Lang	English	3.51 (1.05)			
	Other	3.15 (1.17)	2.12	.04	.32

# indicates a *p* value above .05, but considered to be approaching significance

Results from independent-samples *t*-tests showed differences in relation to perceived social received by categorical variables (dichotomous). Participants with lower incomes reported lower levels of social support than those with higher incomes; participants with primary/secondary education reported lower levels of social support than those with tertiary education participants who were working reported lower levels of social support; participants living with company reported higher levels of social support than those living alone and those which English as their first spoken language reported higher levels of social support (all differences were statistically significant). Although women reported higher mean levels of social support than men, the difference was not statistically significant. In addition, to *t*-tests

three one-way analyses of variance (ANOVA) were conducted to explore mean differences by disability, level of education and depression scores (with three groups). Tables presented below include means (*M*) and standard deviations (*SD*), distribution effect between groups (*F*) and significance value (*p*).

Table 15.3 shows results of ANOVA comparisons for three groups according to level of disability by a range of biopsychosocial factors. Data were first recoded into three groups according to the spread (range) of disability scores for this sample. These categories do not completely reflect the categories of the Oswestry Disability Index. This questionnaire is utilised for clinical populations and in its higher categories has scored for “crippled” and “bed bound” and none of the participants in this sample reported those levels.

Table 15.3

*ANOVA comparison for three groups of disability levels by, a range of psychosocial factors and treatment participation*

Variable	<i>Low</i>		<i>Moderate</i>		<i>Severe</i>		<i>F</i>	<i>P</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Age	46.63	15.09	46.13	12.36	48.64	9.82	.41	.66
SocSupport	3.57	1.00	3.21	1.16	2.93	.99	16.22	.0005
Life Aust	85.71	22.45	75.90	30.55	66.76	37.49	5.72	.00
Depression	9.82	10.02	15.81	10.53	24.67	8.88	14.94	.0005
Anxiety	3.95	3.90	3.72	3.64	6.10	2.93	1.83	.16
Life Cont	3.70	1.37	3.32	1.57	2.76	1.34	4.68	.01
Affec Dist	2.64	1.37	3.37	1.44	4.00	1.16	8.47	.0005
Pain	10.35	9.15	13.44	9.50	16.17	7.62	3.46	.03
Sessions	222.04	243.06	102.23	149.51	70.03	179.73	9.64	.0005
Phys Thera	433.57	594.47	104.44	161.41	17.12	25.34	17.99	.0005

Note: Modified ODI scoring.

Post hoc tests (LSD) conducted at the  $p < .05$  level showed, those with mild disability reported a higher level of social support with differences between low and moderate ( $p = .005$ ) and low and severe ( $p = .005$ ), those living for in Australia for a shorter percentage of their life were more likely to be in the moderate ( $p = .03$ ) or the severe groups ( $p = .01$ ). Those reported higher depression were more likely to in severe group rather than the mild ( $p = .005$ ) or the moderate group ( $p = .005$ ), depression levels increased with severity with differences between mild and moderate ( $p = .005$ ), low and severe ( $p = .0005$ ) as well as

between moderate and severe ( $p = .005$ ), life control decreased with severity with differences between low and moderate ( $p = .04$ ) and mild and severe ( $p = .005$ ), affective distress increased with severity with differences between low and moderate ( $p = .005$ ) and low and severe ( $p = .005$ ), there were differences between low and moderate ( $p = .04$ ) and low and severe ( $p = .01$ ) in regards to intensity of pain and similar trend with duration of pain between mild and moderate ( $p = .005$ ) and low and severe ( $p = .01$ ). There were significant differences between the mild and severe groups for life control ( $p = .01$ ) and moderate and severe ( $p = .04$ ) and the same for affective distress between low and severe ( $p = .0005$ ) and moderate and severe ( $p = .005$ ). Significant differences were also found between the low and severe group in relation to pain score ( $p = .01$ ). There were significant differences between the low and the moderate group ( $p = .005$ ) and low and severe group ( $p = .005$ ) for the number of sessions of physical therapies. Finally, there were significant differences in the mean number of overall sessions for treatments between the low and moderate group ( $p = .005$ ), and between low and severe group ( $p = .005$ ).

Table 16.3 shows the results of a one way ANOVA on key variables by level of education.

Table 16.3

*ANOVA comparison for three groups of education levels by psychosocial factors, overall number of treatment sessions and number of physical therapies.*

	Primary		Secondary		Tertiary			
Variable	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>p</i>
Age	56.62	8.73	48.75	12.24	41.39	13.13	14.69	.0005
SocSupport	2.76	1.25	3.20	1.07	3.76	.99	9.40	.0005
LifeAust	73.44	32.17	74.93	31.87	87.32	20.35	4.41	.01
Depression	20.95	9.77	20.15	11.24	6.94	9.87	10.99	.0005
Anxiety	7.09	5.39	4.70	3.93	3.90	4.28	4.51	.01
LifeCont	2.74	1.34	3.13	1.37	4.14	1.40	13.83	.0005
AffectDist	3.95	1.01	3.31	1.47	2.54	1.35	10.74	.0005
Pain	12.19	7.54	13.43	9.07	10.97	9.88	1.73	.18
OverTreat	36.71	47.62	48.26	10.32	305.40	253.37	51.82	.0005
PhysThera	67.54	108.08	160.27	348.89	360.69	551.49	6.05	.005
Disability	20.67	12.33	18.95	9.23	13.65	8.82	7.82	.005

Participants were classified into three groups: primary ( $n = 21$ ), secondary ( $n = 89$ ) and tertiary ( $n = 70$ ) (between groups  $df = 2$ ). *Post hoc* tests (LSD) conducted at the  $p < .05$  level revealed significant differences for all variables except pain scores. Younger participants were more likely to have a higher level of education with age differences being significant between primary and secondary education ( $p = .02$ ), primary and tertiary education ( $p = .0005$ ), and between secondary and tertiary education ( $p = .0005$ ). There were significant differences between primary and tertiary educated participants ( $p = .0005$ ) as well as differences between secondary and tertiary educated ( $p = .0005$ ). Participants with a higher percentage of their life lived in Australia were more likely to be in tertiary education group compared with the primary education group ( $p = .05$ ) and with the secondary education group ( $p = .005$ ). Participants with higher mean levels of depression were more likely to be in the



primary education group when compared with the tertiary group ( $p = .0005$ ) as well as those with secondary education being more likely to have higher levels of depression when compared with the tertiary group ( $p = .0005$ ). In the same manner, those with tertiary education reported higher levels of life control compared with primary educated participants ( $p = <.001$ ) and those with secondary education ( $p = .0005$ ). Tertiary educated participants were more likely to report affective distress compared with primary educated ( $p = .0005$ ) and secondary educated participants ( $p = .005$ ). Tertiary educated participants recorded a higher mean number of sessions for treatments for back pain than those with primary education ( $p = .0005$ ) and those with secondary education ( $p = .0005$ ). In the same manner, tertiary educated participants received more sessions of physical therapies than those with primary education ( $p = .01$ ) and those with secondary education. Finally, tertiary educated participants recorded lower mean scores of level of disability than those with primary education ( $p = .005$ ) and those with secondary education ( $p = .005$ ). Although DASS scores can be classified into five categories in terms of severity for the current study only three were constructed, being Normal (DASS score range), Mild-Moderate (DASS score range) and Severe to Extremely Severe (DASS score range). One way ANOVAS were subsequently conducted on key variables. The results of these are shown in Table 17.3 below. Table 17.3 shows differences by three severity levels of depression (DASS 21, scoring modified, Lovibond and Lovibond, 1985) in a one-way ANOVA. Depression results in  $t$ -tests revealed significant interactions with most variables. Further investigation according to severity was necessary in order to further understand the nature of these interactions. While the DASS had five degrees of severity for depression this was modified creating three groups in order to gain stronger results and to maintain consistency of the three groups' analysis in ANOVAS.

Table 17.3

*ANOVA comparison for three groups of depression levels by a range of psychosocial factors, treatment participation and disability.*

# Living with Back Pain; a Biopsychosocial Analysis of Contributing Factors

	Normal		Mild-Moderate		Sev-Ext Severe		<i>F</i>	<i>P</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>P</i>
Age	44.40	13.37	50.50	13.30	17.07	12.87	2.04	.13
SocSupport	3.75	.95	3.68	1.10	3.03	1.10	8.84	.0005
LifeAust	86.70	21.50	77.20	24.82	76.33	32.16	2.46	.09
Anxiety	1.98	2.99	3.39	3.96	6.51	4.20	26.14	.0005
LifeCont	4.60	1.24	3.96	1.07	2.72	1.24	44.20	.0005
AffecDist	1.92	1.13	2.50	1.15	3.90	1.13	57.94	.0005
Pain	7.36	7.98	10.91	7.88	15.73	8.97	17.32	.0005
Sessions	241.83	280.90	146.86	208.20	94.62	131.97	9.49	.0005
PhysThera	273.54	479.13	301.32	574.86	180.85	359.59	1.26	.29
Disability	14.01	8.10	14.84	9.12	21.95	9.07	17.10	.0005

As may be seen in Table 17.3 there were significance differences by social support between the normal and the severe-extremely severe ( $p = .0005$ ) and between the mild-moderate group and the severe-extremely severe group ( $p = .01$ ). There were differences in mean levels of depression by percentage of Life in Australia with higher percentages for the normal ( $p = .03$ ) compared with severe-extremely severe. There were significant differences for all groups for life control and affective distress. Participants with depression scores within severe-extremely severe had significantly higher scores of pain compared with those within the normal group ( $p = .0005$ ) and mild-moderate group ( $p = .01$ ). Participants with normal levels of depression had more overall treatments than those with mild-moderate levels ( $p = .04$ ) and severe-extremely severe levels ( $p = .0005$ ). Finally, participants within the severe-extremely severe groups had more disability than those within the normal group ( $p$

=.0005) and the mild-moderate group ( $p = .0005$ ). There were no significant differences between groups for the mean number of physical therapies.

Table 18.3 shows results of ANOVA comparisons for three groups according to level of disability by a range of biopsychosocial factors. Three groups were created according to the spread (range) of disability scores for this sample which does not reflect the categories of the Oswestry Disability Index (Fairbank and Pynsent, 2000). This questionnaire is utilised for clinical populations and in its higher categories has scored for “crippled” and “bed bound” and none of the participants in this sample reported those levels.

Participants were classified into three groups (Modified ODI scoring): mild ( $n = 76$ ), moderate ( $n = 71$ ) and severe ( $n = 33$ ) (between groups  $df = 2$ ). *Post hoc* tests (LSD) conducted at the  $p < .05$  level showed, those with mild disability recorded a higher mean level of social support with differences between mild and moderate ( $p = .0005$ ) and mild and severe ( $p = .0005$ ), those living for in Australia for a shorter percentage of their life were more likely to be in the moderate ( $p = .03$ ) or the severe groups ( $p = .01$ ). Depression levels increased with severity with differences between mild and moderate ( $p = .0005$ ), mild and severe ( $p = .0005$ ) as well as between moderate and severe ( $p = .0005$ ), life control decreased with severity with significant differences between mild and moderate ( $p = .04$ ) and mild and severe ( $p = .005$ ), affective distress increased with severity with significant differences between mild and moderate ( $p = .00$ ) and mild and severe ( $p = .0005$ ), there were differences between mild and moderate ( $p = .04$ ) and mild and severe ( $p = .01$ ) in regards to intensity of pain and a similar trend with duration of pain between mild and moderate ( $p = .0005$ ) and mild and severe ( $p = .01$ ). There were significant differences between the mild and severe groups for life control ( $p = .01$ ) and moderate and severe ( $p = .04$ ) and the same for affective distress between mild and severe ( $p = .0005$ ) and moderate and severe ( $p = .005$ ). Significant differences were also found between the mild and severe group in relation to the mean pain

score ( $p = .01$ ). There significant differences in mean scores between the mild and the moderate group ( $p = .0005$ ) and mild and severe group ( $p = .0005$ ) for the mean number of sessions of physical therapies. Finally, there were differences in the mean overall number of treatments between the mild and moderate group ( $p = .005$ ), and between mild and severe group ( $p = .005$ ).

Table 18.3

*ANOVA comparison for three groups of disability levels by a range of psychosocial factors and treatment participation.*

<i>Variable</i>	<i>Mild</i>		<i>Moderate</i>		<i>Severe</i>		<i>F</i>	<i>P</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Age	46.63	15.09	46.13	12.36	48.64	9.82	.41	.66
Soc Support	3.57	1.00	3.21	1.16	2.93	.99	16.22	.0005
Life Aust	85.71	22.45	75.90	30.55	66.76	37.49	5.72	.00
Depression	9.82	10.02	15.81	10.53	24.67	8.88	14.94	.0005
Anxiety	3.95	3.90	3.72	3.64	6.10	2.93	1.83	.16
Life Cont	3.70	1.37	3.32	1.57	2.76	1.34	4.68	.01
Affec Dist	2.64	1.37	3.37	1.44	4.00	1.16	8.47	.0005
Pain	10.35	9.15	13.44	9.50	16.17	7.62	3.46	.03
Sessions	222.04	243.06	102.23	149.51	70.03	179.73	9.64	.0005
Phys Thera	433.57	594.47	104.44	161.41	17.12	25.34	17.99	.0005

### 3.8 Correlation Analyses

Table 19.3 below shows a correlation matrix for all biopsychosocial markers and both dependent variables (Numbers of Sessions and Level of Disability).

## Living with Back Pain; a Biopsychosocial Analysis of Contributing Factors

Table 19.3

*Correlation Matrix for all Markers and Dependent Variables for Multiple Regression.*

	Age	Sex	Income	Education	SocSupp	LivArran	Depress	Anxiety	LifeCont	AffDist	PainScore	PainDura	OccStatus
Age	X												
Sex	-0.07	X											
Income	-0.1	.03	X										
Education	0.28**	.26**	.52**	X									
SocSupp	-0.18*	.07	.35**	.30**	X								
LivArran	0.09	.01	-.56**	-.49**	-.45**	X							
Depress	0.18*	-.08	-.51**	-.58**	-.35**	.53**	X						
Anxiety	0.13	.20	-.23**	-.13	-.22**	.23**	.37**	X					
LifeCont	-0.08	.20**	.31**	.35**	.32**	-.22**	-.52**	-.29**	X				
AffDist	0.02	-.17	-.38**	-.31**	-.25**	.29**	.58**	.36**	-.70**	X			
PainScore	0.03	.03	-.21**	-.14	-.18*	.35**	.36**	.33**	-.28**	.38**	X		
PainDura	0.1	-.15	-.08	-.16*	-.12	.08	.08	-.02	-.12	.06	.07	X	
OccStatus	0.25**	-.10	-.46**	-.21**	-.20**	.26**	.24**	.16*	-.15*	.22**	.13	-.14	X
EmpType	-0.09	-.09	.07	.18*	.14	-.07	-.17*	.00	.19*	-.20**	-.12	-.13	-.13
Language	0.26**	-.13	-.17	-.12	-.16*	.10	.08	.10	-.20**	.25**	.01	.04	.29**
LifeAust	-0.04	.17*	.10	.25**	.10	-.13	-.08	.74	.16*	-.12	-.11	-.14	-.17*
OverSess	-0.22**	.16*	.47**	.63**	.36**	-.45**	-.53**	-.18*	.14	-.22**	-.16*	.01	-.14
PhysSess	-0.1	.22**	.22**	.29**	.09	-.22**	-.21**	-.07	.10	-.19**	-.08	-.02	-.12
Disability	0.12	-.10	-.46**	-.50**	-.42**	.44**	.55**	.17*	-.28**	.34**	.32**	.27**	.28**

(\*) indicates significance at .05

(\*\*) indicates significance at .01

The overall number of treatments (sessions) was strongly positively correlated with income, education level, moderately positively correlated with social support and weakly correlated with sex. There were also strong negative correlations between number of overall treatments and living arrangements and depression and weak negative correlations between number of overall treatments and age, anxiety, affective distress, pain score, and English as first spoken language.

There were a number of significant positive correlations with the number of sessions for physical therapies. There were to moderate positive correlations with sex, income, education, percentage of life in Australia and overall number of treatments. There were to moderate negative correlations between number of physical therapies with living arrangements, depression and affective distress.

Disability scores and income and education were negatively correlated. Similarly, disability is positively correlated with depression and living arrangements and only negatively correlated with social support.

### **3.9 Linear Regressions**

Multiple regressions were used to test the hypotheses.

For hypothesis 1, the dependent variable was the overall number of treatment sessions. The analysis was conducted only on cases where the number of visits was greater than zero. For hypothesis 2, the dependent variable was level of disability. For both analyses, the independent variables were age, sex, marital status, language spoken at home, occupation status, and socioeconomic group, and education level, duration of pain, total pain, anxiety, depression and social support.

Tests of hypotheses

HI: It was hypothesized that women, older participants, participants reporting a higher level of psychological distress, higher levels of pain and those with a lower level of education would have received fewer treatments in relation to chronic pain.

Multicollinearity was not a concern since tolerance coefficients were all greater than .10 and all VIF coefficients were smaller than 10. The data met the assumption of independent errors (Durbin-Watson value = 1.13). The histogram of standardized residuals indicated that the data contained approximately normally distributed errors, as did the normal P-P plot of standardized residuals, which showed points that were not completely on the line, but close. Thus, the assumptions for random normal distribution of errors, homoscedasticity and linearity of data were met. The data also met the assumption of non-zero variances for all variables (Tabachnick & Fidell, 2013). All variables were tested for all regressions.

Table 20.3. Standard Multiple Regression of Demographic Variables, Pain, Psychological Distress and Social Support on Number of Sessions with Health Professionals for Treatment.



Table 20.3

*Multiple linear regression for biopsychosocial factors to predict overall number of treatments.*

Model	Unstandardized		Standardized		<i>T</i>	<i>p</i>
	<i>B</i>	Std. Error	<i>B</i>			
Age	-.49	.96	-.03		-.51	.61
Sex	37.33	24.33	.09		1.54	.13
Income	73.63	32.09	.18		2.30	.02
Education Groups	173.08	33.67	.40		5.14	.01
Occupational Status	56.60	27.65	.13		2.05	.04
Employment Type	-4.25	27.93	-.01		-.15	.88
Language	-44.83	25.27	-.11		-1.77	.08
Life in Australia	.22	.44	.03		.50	.62
Social Support	32.15	11.86	.17		2.71	.01
Living Arrangements	2.49	31.85	.01		.08	.94
Depression	-5.75	1.64	-.30		-3.52	.0005
Anxiety	-.75	2.96	-.02		-.252	.80
Life Control	-36.83	11.23	-.26		-3.28	.0005
Affective Distress	3.98	12.52	.03		.32	.75
Pain Score	-.85	1.38	-.04		-.62	.54
Duration of Pain	34.66	18.53	.10		1.87	.06

The results of the standard regression are summarised in Table 20.3. Overall the results showed that the 16 variables significantly predicted the number of treatment visits as ( $R^2 = 0.55$ ,  $F(16,161) = 12.19$ ,  $p = .0005$ ). Altogether, 55 per cent (50% adjusted) of the variability in number of sessions with health professionals was predicted by these 16 variables. The major contributors to the prediction of number of treatment visits were education ( $t(16,161) = 5.14$ ,  $p = .0005$ ); depression ( $t(16,161) = -3.52$ ,  $p = .0005$ ); life control ( $t(16,161) = -3.28$ ,  $p = .0005$ ); social support ( $t(16,161) = 2.71$ ,  $p = .01$ ); income ( $t(16,161) = 2.30$ ,  $p =$

.02) occupational status ( $t(16,161) = 2.05, p = .04$ ). Duration of pain ( $t(16,161) = 1.88, p = .06$ ) and first language spoken ( $t(16,161) = -1.77, p = .08$ ) results neared significance.

Treatment unique contribution

Education = .228

Depression = 0.094

Life control = 0.073

Social Support = 0.059

Total unique variance = 0.454

Common variance = 0.049

Hypothesis 2: Disability.

Table 21.3 Standard Multiple Regression of Demographic Variables, Pain, Psychological Distress and Social Support on Level of Disability.

Table 21.3  
*Results of regression for markers of disability scores*

	Unstandardized		Standardized			
	Coefficients		Coefficients			
Model	<i>B</i>	Std. Error	<i>β</i>	<i>T</i>	<i>p</i>	
Age	-.06	.05	-.08	-1.35	.18	
Sex	.18	1.15	.01	.160	.87	
Income	-1.88	1.51	-.10	-1.24	.22	
Education Groups	-3.74	1.59	-.19	-2.36	.02	
Occupational Status	1.08	1.30	.05	.83	.41	
Employment Type	.55	1.32	.03	.42	.67	
Language	1.83	1.19	.09	1.54	.13	
Life in Australia	-.05	.02	-.14	-2.23	.03	
Social Support	-1.82	.56	-.21	-3.26	.005	
Living Arrangements	-.17	1.50	-.01	-.11	.91	
Depression	.29	.08	.33	3.80	.0005	
Anxiety	-.15	.14	-.07	-1.08	.28	
Life Control	.83	.53	.13	1.57	.12	
Affective Distress	.02	.59	.00	.03	.97	
Pain Score	.15	.07	.15	2.36	.02	
Duration of Pain	2.83	.87	.18	3.24	.01	

The results of the standard regression predicting level of disability are shown in Table 21.3. The results show that the 16 independent variables in the regression equation significantly predicted the level of disability ( $R^2 = .47$ ,  $F(16,161) = 10.91$ ,  $p = .0005$ ). Altogether, over half (52%; 47% adjusted) of the variability in the level of disability was predicted by these 16 variables. The major contributors to the prediction of level of disability were: depression scores ( $t(16,161) = 3.80$ ,  $p = .0005$ ); social support ( $t(16,161) = -3.26$ ,  $p =$

0005); duration of pain ( $t(16,161) = 3.24, p = .005$ ); education ( $t(16,161) = -2.36, p = .02$ ); total pain score ( $t(16,161) = 2.34, p = .02$ ) and percentage of life in Australia ( $t(16,161) = -2.23, p = .03$ ).

For disability

Depression = 0.084

Social Support = 0.066

Duration of Pain = 0.181

Education = 0.046

Living in Australia = 0.031

Pain Score = 0.026

Total unique variance = 0.434

Common variance = 0.047

### **3.10 Path Analysis**

In light of the results of the regression analysis a path model was estimated using the AMOS module available in SPSS. In addition to the benefit of exploring more than one dependent variable simultaneously, this method of analysis also permits mediation effects to be assessed. Following the recommendation of Tabachnick and Fidell (2013) only the variables with a moderate or strong correlation ( $> .3$ ) were utilised to construct the model. The model comprises five independent variables (income, education, social support and living arrangements and pain score) and three dependent variables: number of sessions, depression and disability scores. The model is shown in Figure 1 below.

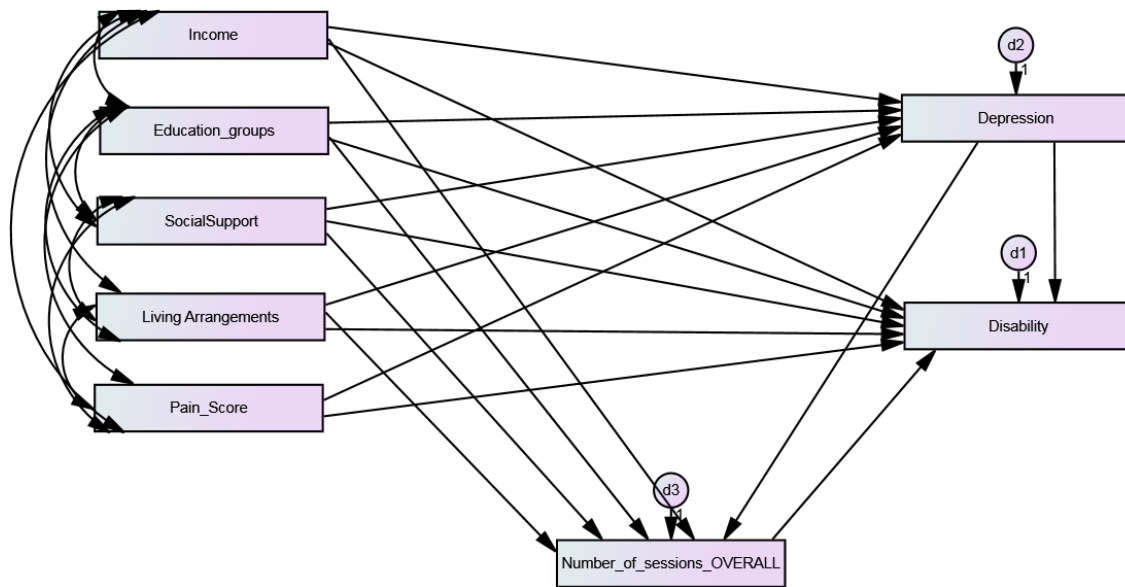


Figure 1. Path analysis for income, education, social support, living arrangements, pain score and depression predicting number of sessions for treatments and disability.

The model shown above consists of four exogenous variables (income, education, social support and living arrangements) as markers of the number of sessions. The number of sessions is shown as a marker of disability. Depression an endogenous variable is shown as a mediator of the relationship between the four exogenous variables and number of sessions. All five exogenous variables are also shown as a marker of disability. Depression is shown as a mediator between the five exogenous variables disability and also number of sessions overall. The number of sessions overall is shown as a mediator of the relationship between the four exogenous variables(income, education, social support and living arrangements) and disability and the five exogenous variables (income, education, social support, living

arrangements and pain score) and disability by way of a path through depression (a double mediation).

### **3.10.1 Data Screening.**

Univariate outliers were checked via box plots and histograms, which indicated that the data were normal in this regard. Multivariate outliers were checked using the Mahalanobis distance statistic. The largest Mahalanobis d-squared value, or the observation the furthest distance from the centroid, was 15.28 with a probability value  $>.05$  or a non-small probability of an unusual observation (i.e., outlier). Further, data were screened for instances of multicollinearity via analysis of tolerance (TOL) and variance inflation factor (VIF). Multicollinearity was not present as all TOL indices were  $>.10$  and all VIF measures were  $<3$ , which met noted cut-off points for these measures of  $>.10$  and  $<10$ , respectively (Belsley, Kuh & Welsch, 1980; Hair, Anderson, Tatham & Black, 1995). These are shown in table 18.3 below.

Table 22.3

*Minimum and Maximum values, Skewness with Critical Ratios (c.r.) and Kurtosis with Critical Ratios (c.r.) for all variables.*

Variable	min	max	Skew	c.r.	kurtosis	c.r.
Living Arr.	.00	1.00	1.59	4.73	.53	.79
Pain Score	.00	28.00	.92	2.73	-.33	-.49
Education	.00	1.00	-.59	-1.75	-1.65	-2.46
Income	.00	1.00	-1.31	-3.89	-.29	-.43
Social Support	1.50	5.60	-.115	-.340	-.58	-.86
Sessions	.00	1044.0	1.38	4.10	1.20	1.79
Disability	.00	32.00	.35	1.04	-.70	-1.04
Multivariate					3.62	1.17

Table 22.3 shows that in relation to skewness not all of the variables were univariate normal. The critical ratios (t-scores) for living arrangements, income and number of sessions were in excess of 3.29 which is the cut-off for significance at a p value of .01 (Tabachnick & Fidell, 2013). Mardia's kurtosis value was used to check for multivariate normality. Mardia values as small as not >3 and as large as not >30 have been noted as signs of multivariate kurtosis (Bentler & Wu, 1993; Newsom, 2005). The current study's Mardia value was 3.69, which was an indication that there was no multivariate kurtosis affiliated with the data. In view of the skewness observed in the variables named above a Bollen-Stine (1992) bootstrap technique of 200 iterations (cf. Nevitt & Hancock, 2001) was conducted in AMOS (Analysis of Moment Structures) (Arbuckle, 2006). The bootstrap method yields a *p*-value that can be compared to the *p*-value for the Chi-square statistic when the data are non-normal. Thus, if the *p*-value from the Bollen-Stine bootstrap was >.05, we would fail to reject the model and determine that it indeed fit the data. The initially fitted model is shown in Figure 2 below.

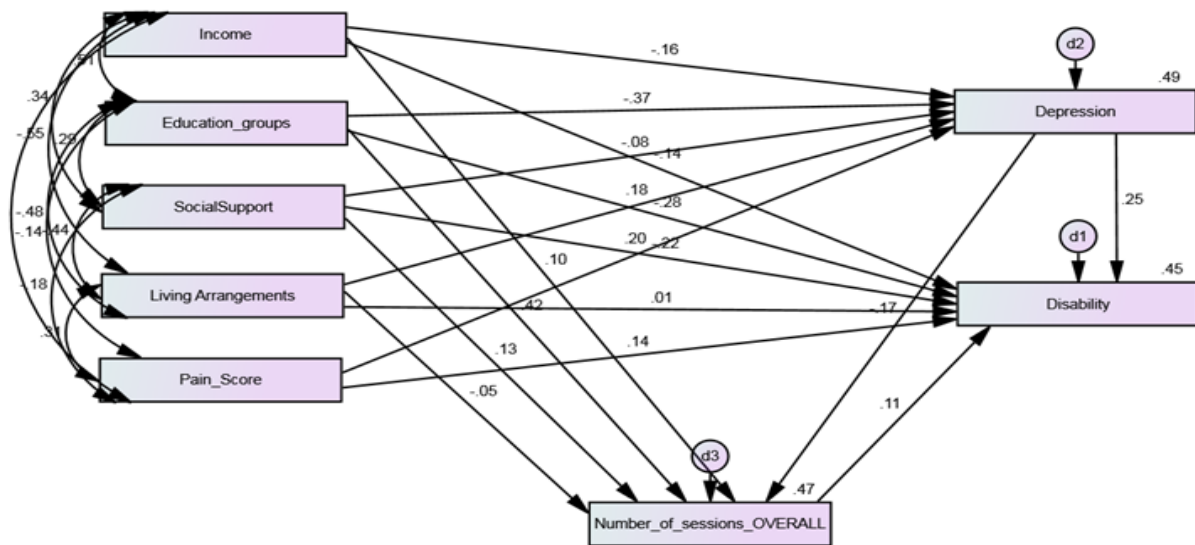


Figure 2. Initial Fitted Model

### 3.10.2 Model fit indices for Initial Model.

The initial model was estimated using the Maximum Likelihood Estimation (MLE) method. Five indicators of fit were utilised to determine how closely the model represented the data (c.f.. Hu & Bentler, 1999). As with guidelines provided for effect size measures (c.f. Cohen, 1988), benchmarks were used to evaluate model fit indices in terms of the goodness- or the badness-of-fit for the model.

In terms of model fit, Chi square ( $\chi^2$ ) statistics whose  $p$  values are  $<.05$  signify that a model may be a bad fit for the data, whereas  $\chi^2$  statistics whose  $p$  values are  $>.05$  may render the model a good fit due to the two covariance structures (theoretical and observed) not being statistically significantly different from each other. However, the  $\chi^2$  statistic as a measure of fit is known to be sensitive to multivariate non-normality (e.g., skewness and kurtosis) and sample size (e.g., small samples  $< 200$  may have  $\chi^2$  values that are not statistically significant, which can lead to Type II errors. This causes uncertainty concerning the overall appropriateness of a study's model based on this particular measure (Bentler,



1990; Browne & Mels, 1992; Cheung & Rensvold, 2002; Hu & Bentler, 1995). Because of these caveats,  $\chi^2$  values were reported, but not given profound weight in terms of model selection and interpretation. Instead an alternative  $\chi^2$ -based test noted in the literature was more relied upon. The ratio of  $\chi^2$  to degrees of freedom ( $\chi^2/\text{df}$ ) was used as an indicator of model fit. It has been suggested that a  $\chi^2/\text{df} = 2$  signifies a good fit (Hair et al., 1995; Kline, 1998). For the estimated model  $\chi^2$  was .05,  $p = .83$  and  $\chi^2/\text{df}$  was .05. Both of these indices were indicative of very good fit since the Chi-square  $p$  value exceeded .05 and the  $\chi^2/\text{df}$  was less than 2.

As fit measures, the comparative fit index (CFI) and the Tucker-Lewis index (TLI) were also employed. For both indices, the proposed model needed to compare very well to, or exceed, the cut-off point  $\geq .90$  (Kline, 1998; Schumacker & Lomax, 1996). For the estimated model the CFI = 1.0 and the TLI = 1.0. As mentioned the Bollen Stine  $p$  value needs to exceed .05 as an indicator of good model fit. The Bollen Stine  $p$  value was .83. These indicators also suggest that the model was a very good fit. The Root Mean Square Error of Approximation (RMSEA) and the Standardised Root Mean Square Residual (SRMR) were used as measures of fit. The RMSEA value was .005, where values  $< .05$  indicate close model fit (Browne & Cudeck, 1993; Hu & Bentler, 1998). For the SRMR the value was .005. Typically, SRMR values  $\leq .08$  are preferred for model fit (Hu & Bentler, 1998). Parameter estimates for the model are shown in Table 23.3 below.

Table 23.3

*Estimates (B), Standard Errors (SE), Estimated Coefficients ( $\beta$ ) and Critical Ratios.*

Variables		<i>B</i>	<i>S.E.</i>	<i>p</i>	<i>C.R.</i>	$\beta$
Depression	← Income	-3.56	1.50	.02	-2.38*	-.16
Depression	← Education	-8.19	1.46	.005	-5.62*	-.37
Depression	← Soc Supp	-.75	.60	.21	-.26	-.08
Depression	← Liv Arrang	3.90	1.60	.02	2.44	.18
Depression	← Pain score	.24	.07	.005	3.54	.20
Sessions	← Soc Supp	24.06	11.67	.04	2.06	.13
Sessions	← Income	40.86	29.74	.17	1.37	.10
Sessions	← Education	181.70	30.60	.005	5.94	.42
Sessions	← Liv Arrang	-20.14	31.27	.52	-.64	-.05
Sessions	← Depression	-3.23	1.42	.02	-2.28	-.17
Disability	← Income	-2.64	1.40	.06	-1.88	-.14
Disability	← Education	-5.51	1.58	.005	-3.48	-.28
Disability	← Soc Supp	-1.89	.55	.005	-3.41	-.22
Disability	← Liv Arrang	.23	1.49	.88	.16	.01
Disability	← Pain	.15	.06	.02	2.36	.14
Disability	← Treatments	.01	.00	.14	1.47	.11
Disability	← Depression	.22	.07	.005	3.11	.25

The results in Table 23.3 show that two exogenous variables (education and social support) and one endogenous variable (depression) significantly predicted number of treatments. In addition, four exogenous variables (education, social support, income [nearing significance] and pain score) and one endogenous variable (depression) predicted disability. The number of sessions and disability showed a positive relationship meaning that more sessions would result in higher disability scores (not statistically significant). These results reflect an anomaly, as it was assumed that more treatments would reflect lower disability.

The relationship between number of treatments and disability was removed from the analysis and requires further investigation and discussion. Further exploration was conducted by splitting the sample between two education groups. In the sample for tertiary educated participants, the results revealed a negative relationship between number of treatments and disability in line with our initial expectations. However, in the sample for primary/secondary participants the relationship was positive. There was no significance in either relationship. An interaction between education and social support as positive markers of number of treatments and depression as a negative marker may be the reason for this anomaly that will be discussed further in the next chapter. In terms of the markers of number of sessions, depression and disability the multiple r-square coefficients were .47, .49 and .45 respectively. Thus, percentage of variance explained by the markers was quite good at almost 50%. Following an assessment of the path coefficients, only significant paths were retained and a second model was estimated. The second model fitted is shown in Figure 3 below.

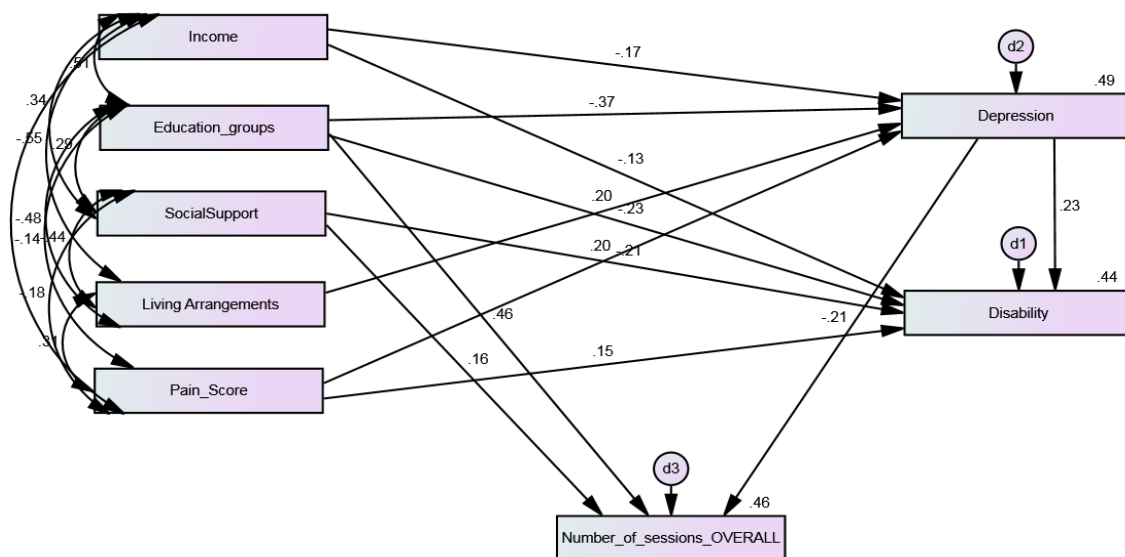


Figure 3. Model Indices for Final Model

### 3.10.3 Model fit indices for the Second Model.

All fit indices for the second model and were found to be within the recommended parameters as outlined earlier (CFI = 1.00; TLI = 1.05; RMSEA = 0.03; SRMR = 0.02). Path coefficients for the second model are shown in Table 22.3.

Table 24.3. Path coefficients for final disability model.

Table 24.3

*Estimates (B), Standard Errors (SE), Estimated Coefficients ( $\beta$ ) and Critical Ratios (C.R.).*

Variables		<i>B</i>	<i>S.E.</i>	<i>p</i>	<i>C.R.</i>	<i>B</i>	
Depression	← Income	-3.77	1.50	.01	-2.51	-.17	
Depression	← Education	-8.30	1.46	.0005	-5.68	-.37	
Depression	← Liv Arrang	4.47	1.54	.005	2.91	.20	
Depression	← Pain score	.24	.07	.0005	3.58	.20	
Sessions	← . Soc Support	29.33	10.99	.01	2.67	.16	
Sessions	← Education	198.72	29.44	.0005	6.75	.47	
Sessions	← Depression	-4.05	1.32	.005	-3.07	-.21	
Disability	← Income	-2.46	1.35	.07	-1.82	-.13	
Disability	← Education	-4.59	1.44	.005	-3.18	-.23	
Disability	← Soc Support	-1.78	.53	.0005	-3.37	-.21	Not
Disability	← Pain	.15	.06	.02	2.4	.15	e. All
Disability	← Depression	.20	.07	.005	2.97	.23	critical

ratios

had significant results/paths.

The results showed that four variables (income, education, living arrangements and pain score) predict depression, multiple  $r$ -square = .49. These variables work in different ways; higher pain score and living arrangements (living alone) predicted higher depression (positive relationship). In contrast, higher education and income predicted lower depression (negative relationship).

In the aggregate 46% of the variation in the number of sessions overall was predicted. Two variables, education and social support directly predicted the number of treatment sessions for back pain. Education and social support have a positive relationship. Thus, with increased education and social support there is a higher number of sessions for treatment. Depression, on the contrary, has a negative relationship meaning that increased level of depression will determine a lower number of sessions for treatment. Depression acts as a mediator only between education, and number of sessions overall since only this variable was predictive of both the number of session and depression (Barron and Kenny, 1986). The mediation effect is weak. The total standardised effect of education (.54), when partitioned into direct and indirect effects on number of sessions overall, is .46 (direct effect of education on number of sessions overall) plus .08 ( $-.37 \times -.21 = .08$ ) the indirect effect of education on number of sessions overall through depression. Thus, the standardised indirect effect is  $.08/.54 = 15\%$ . Four exogenous variables (income, education, social support and pain score) and one endogenous (mediating) variable depression explained 44% of the variation in disability scores. Income, education and social support have a negative relationship with disability; pain score has a positive relationship with disability. The standardised direct and indirect effects of these variables on disability are shown in Table 25.3.

Table 25.3  
*Direct and indirect effects of markers on disability.*

Variable	Direct Effect	Indirect Effect	Total Effect	Indirect Percentage of Total by Path
Income	-.17	-.04	-.21	19
Education	-.37	-.09	-.46	20
Social Support	-.21	.00	-.21	00
Pain Score	.15	.03	.18	17
Totals	-.60	-.10	-.70	

Table 25.3 shows the direct and indirect effects of biopsychosocial factors on disability. Education appears to be the strongest marker with a total effect of -.46.

## **4. Discussion**

### **4.1 Overview of the hypotheses**

The findings of this research have shown a number of important associations between variables predicting disability, pain and depression that will be discussed in this chapter and compared with previous findings and theories from the existing literature.

### **4.2 First hypothesis Number of Treatments**

It was hypothesized that women, older participants, participants reporting higher level of psychological distress, higher levels of pain, those with lower level of SES and those who had spent a smaller percentage of their life in Australia and had lower level of social support would have received fewer treatments in relation to chronic pain. This hypothesis was supported as the 16 variables analysed predicted 50% of participation in overall treatments in linear regression analyses. Seven markers (income, education, occupational status, social support, depression, life control and duration of pain) reached statistical significance with first language spoken nearing significance. The strongest markers were in order; education, life control, depression, social support, income, duration of pain and occupational status. Age, sex, employment type, percentage of life in Australia, living arrangements, anxiety, affective distress and pain score were not significant. However, there were significant differences for these variables in results from *t*-tests and ANOVAs as well as significant correlational relationships that warrant discussion. Following the path analysis technique, education and social support together with depression predicted nearly half of the score for number of sessions of treatment for back pain. Depression mediated between number of treatments and income, education and living arrangements. In fact, the indirect impact of education was higher than the direct impact on number of treatments.

The findings confirmed the importance of socio-economic, psychological and social factors in relation to the number of treatments received. Level of education, depression and social support appear to have a prominent role which falls in line with the hypotheses for this study. Pain scores had a minimal contribution to the overall predictive value and duration of pain was only the second last marker with a much smaller coefficient than the other indicators.

The progression from acute to chronic pain is characterized by the failure to respond to traditional therapies such as surgery, medication, rest, physiotherapy or other treatments. It is, therefore, essential to investigate the existence of any contributors to this failure. An analysis of BPS marker (as indicated in the existent literature) has shed light on the interactions of these markers and the level of engagements in treatments for the sample.

#### **4.2.1 Age.**

No significant differences, association or predictive value were found for age in all results. While there were significant differences by age groups in relation to other variables and some associations with other variables there were no indications that age has an impact in either the overall number of treatments received or the number of physical therapies received. These results are consistent with Walker et al (2004) as age was found not be a significant marker in this health provider utilisation and care seeking for LBP Australian study. These results are also consistent with Grzywacz et al (2007) who found that despite having a higher need for complementary medicine older adults were less likely to use these treatments when compared with younger adults. These authors had two explanations for this phenomenon; firstly, older adults may have a tendency to “wait out” minor ailments and only seek help when severity or length intensifies and secondly, older adults may opt for a traditional approach to treatments and a tendency to seek through their doctor rather than engage in alternative or



complementary therapies. There is no doubt that older age impact in the overall health of each individual and, in particular, the presence of injury and degenerative disease (Marieb, 2001; Bentsen et al, 2007; Grzywacz et al, 2007; Selander et al, 2007). Given the overwhelming evidence that points to a gradual deterioration of the spine's health what is the reason for this deterioration not translating into a higher level of provider utilization and a higher level of treatments for older adults? Waddell (2004) and Walker et al, (2000) found that adults of working age are the most vulnerable, and hence that the prevalence of back pain decreases around the middle of the sixth decade. Selander et al. (2007) entertained the possibility that younger people had higher levels of motivation and, therefore, were more likely to seek treatment than older people. Grzywacz et al. elaborated on the age differences in beliefs about the causes of poor health. While older adults may interpret ailments as inevitable signs of aging, younger adults may attribute them to illness or disease. Therefore, older adults may have a tendency to accept moderate levels of pain and only seek help when severity or length intensifies. The ability to cope with pain and the use of coping strategies to deal with pain have been regarded as important characteristics to explain variation in individuals' pain experiences (Lachapelle & Hadjistavropoulos, 2005). Several studies in this area have obtained different results in relation to age differences in the ability to use coping strategies to deal with pain. Lachapelle and Hadjistavropoulos found that older adults report lower levels of pain severity and pain interference. Furthermore, they found significant differences in one particular area of life-context variables: "daily hassles" where younger adults had better coping skills than older adults. They cited similar findings from Watkins, Shifren, Park and Morrell in 1999 who found age-related differences. In this study, it was found that age interacted with pain severity to influence coping strategy use; when pain was mild, middle-aged and older adults reported catastrophising, more praying/hoping and less coping self-statements than younger adults (no differences with severe pain). In the

same manner, other studies have found that when dealing with painful conditions, younger adults (under 35) reported using twice as many cognitive coping strategies such as progressive muscle relaxation and distraction (Sorkin, Rudy, Hanlon, Turk and Stieg, 1990, cited in Lachapelle and Hadjistavropoulos, 2005).

It is necessary to examine methodological questions in regards to the present study's treatments' questionnaire and evaluate whether visits to GP for back pain were adequately recorded. In addition, recording visits to GP (especially for older patients) may entail a consultation for additional health complaints as well as back pain making more difficult to quantify.

There were significant differences in relation to level of education with younger participants reporting higher levels of education. This difference is probably best explained by greater access to higher education in recent decades in Australia. In addition, older participants had a higher chance to have another language (compared to English) as their first spoken language. This difference is explained by a high percentage of the migrant population in the city of Melbourne and in particular in the Western Suburbs of Melbourne which experienced a high migratory influx in the 60's and 70's. Furthermore, there were significant differences in relation to occupational status as older participants (over 60 years old) were less likely to be working than their younger counterparts. Finally, older participants reported higher levels of disability with significant differences for each age group and a significant association of age and disability. These results are consistent with all previous literature that clearly identifies ageing tending to decrease physical health in patients with CLBP. While a physical deterioration may not always result in the experience of higher levels of pain and disability it is obvious that an accumulation of degenerative changes, as well as a gradual decline in physical fitness, may lead to higher levels of pain (Marieb, 2001). Again, the association between age and disability also concurs with the results of Cornelius et al. (2011)

who found that being over 50 years old was the strongest marker of continuous disability and delayed return to work in a review of 796 studies from 1990 to 2009. This study investigated a range of medical, psychological and demographic that had a lesser level of association with disability. Age was considered a strong marker (Consistent findings ( $\geq 80\%$ ) in at least two high-quality studies.

#### **4.2.2 Sex.**

Women received a large number of treatments according to the results of *t*-tests. Women also received a higher number of sessions for physical therapies. The mean number of physical therapies for women was nearly 3 times as high when compared with men. There were weak correlations (significant) between sex and both overall number of sessions and number of physical sessions. However, sex was not a significant marker of the overall number of sessions received. Previous research has consistently found sex differences in relation to pain and disability (Keeley et al. 2008; Meana, 1998; Robinson et al, 2001; Waddell, 2004). As there is limited literature on number of treatments it is difficult to compare these results with previous research but an exploration of associated factors may assist in explaining the lack of significant strength for sex differences. Keogh et al. (2005) found that men had better outcomes in a three months follow-up after a multidisciplinary intervention. They also found that men responded better to physiotherapy while women responded better to back exercises. Given the fact that women report higher levels of pain and disability (Walker, 2004) it is important to establish if the treatments available are suited for women. Selander (2007) found no significant sex differences in returning to work after back pain. Further explanation of sex differences will be explored in relation to psychological indicators as the literature reflects a number of issues that may contribute to higher reporting of pain by women.

Peul et al. (2008) found limited sex differences in relation to outcomes for sciatic pain with women reporting longer recovery and lower levels of recovery compared to men at 6-12 months from initial pain. While most of the literature agrees that women reported higher levels of pain and results indicate a significant difference in the number of treatments received compared to women the results revealed that contrary to the formulated hypothesis sex was not a marker (regression) for service utilization for back pain. Further investigation into the relationship between sex and other variables may contribute to an explanation for these results. Significant differences were observed in relation to psychological distress, occupational status, and level of education and percentage of life in Australia. Women reported higher levels of depression and affective distress and lower levels of life control than men. In addition, there were significant associations between these three indicators and sex. Furthermore, sex differences were found in relation to occupational status and level of education (both in comparison of means and significant associations) with women less likely to be working and having lower levels of education than men. Can these differences account for an explanation to how despite the clear evidence in support of women reporting higher levels of pain there is no such a clear indication in terms of treatments received? Are higher levels of psychological distress as consistently found in these results impacting on female's levels of service utilization? Can higher psychological distress together with lower levels of employment and education account for the lack of predicting value by sex despite higher and longer incidence of back pain?

#### **4.2.3 Income.**

Income levels significantly predicted a level of participation in treatments (Linear Regression). There were significant differences in relation to income and number of treatments received as well as a significant relationship between income and treatments.

Given the strength of the relationship between income and overall treatments in correlational analysis this variable was included in the model for the path analysis. However, this relationship did not have statistical significance in the initial model and was removed from the final model. A possible explanation for this phenomenon was the high level of correlation between income and education which may have impacted on the role of income in the model. The findings indicated that those with higher income had a higher number of overall treatments compared with lower income earners. Furthermore, lower income participants had a lower number of sessions of physical therapies.

These results coincided with those of Gray and Mendeloff (2002) and De Moraes-Vieira et al.(2014) that concluded that lower income was related to lower level of health care utilisation. In the same manner, Holmes et al. (2010) identified income as a significant risk factor for pain presence 12 months after an initial injury, which may explain the relationship between low income and low number of treatments. These findings supported the hypothesis as income will influence the number of treatments received. The overall numbers of treatments included medication and exercise as well as a number of physical therapies (chiropractic treatment, physiotherapy, massage, acupuncture) and psychological interventions (psychiatrists, psychologists, counsellors). Medication (which may include analgesia or anti-inflammatories) may be a relatively inexpensive long-term treatment particular for low-income earners who may possess a concession card and obtain medications a very low cost. In the same manner “exercise” are cost-free unless there an instructor involved or gymnasium attendance. On the other hand, access to physical therapies incurs significant out of pocket expense. Patients can be referred to allied health therapists (chiropractor, physiotherapist, occupational therapist, exercise physiologist and osteopath) for a maximum of five visits per calendar year under the Medicare Better Health Plan currently utilised in Australia. CBP sufferers would have to pay out of pocket for any additional

sessions in a calendar year at a cost ranging from AUD\$ 50 to AUD\$100. Considering the significant association between income and other variables (occupational status, level of education, social support, living arrangements, depression, life control, affective distress and level of disability) and the differences revealed by the results there are number of plausible explanations for the differences between income in relation to overall number of treatments and with physical therapies. The first and more obvious explanation was the higher income people are more able to afford the cost of allied health therapies while lower earner may limit themselves to access to the bulk-billing and low-cost treatment provided by public health. As previously stated more research is necessary in order to further identified potential barriers to health care utilisation.

#### **4.2.4 Occupational Status.**

Occupational status was a significant marker of overall number of treatments. The hypothesis was supported as those working had a higher number of overall treatment sessions compared with not those working as well as a higher number of physical therapy sessions (nearing significance). Working participants were more likely to be younger, male, higher educated, with a higher income and percentage of life in Australia. In fact, there were differences for every variable in terms of working status with those not working reporting higher levels of distress (all four indicators), lower social support and a higher level of pain, for longer duration and off course higher levels of disability. *T-tests* and correlational analyses showed a consistent trend for occupational status. In relation to the overall number of treatments, these were positively correlated with being working (both for overall treatments and physical therapies); however, these differences did not attain statistical significance. In the same manner, those working received more overall treatment sessions and a higher number of sessions for physical therapies.

These findings were in agreement with Suter (2002) who found that not working had a significantly effect on recovery and pain chronicity. Moreover, Romano et al. (2000) found that not working was associated with higher levels of depression. Other previous research assisted with the interpretation of these results. Lipscomb et al. (2006) found that ethnic minorities were much more likely to be unemployed in the United States, while Fretz and Mallinckrodt (1998) found that social support was instrumental for those not working in reducing recovery time and attaining better psychological outcomes. Finally, Kuijer et al. (2006) found that those not work working had higher levels of disability.

While there was no previous research comparing occupational status and number of treatments it was possible to formulate an explanation in light of the consistent concurrence of the results with previous research in relation to other variables and working status. Nguyen and Randolph (2007) found that unemployment was a marker for chronic pain and being “jobless” was an indicator for delayed recovery. Some methodological doubts remained about the marker role of unemployment in relation to chronic pain as causality in this relationship may be interpreted as bidirectional with plausible explanations for both arguments. However, the association itself can be utilised as a reliable data providing the basis for a wider interpretation and explanation of the relationship between unemployment and use of treatments for the back pain sufferer. The results lead to the creation of a profile of the non-working person with chronic pain with a variety of BPS indicators. This profile includes: being a female, older, with lower SES, lower social support, higher psychological distress, higher and longer pain and higher levels of disability. All these indicators in the results and previous research gave indeed a clear picture of their association with disability, but two questions remained unanswered. Firstly, does this association transfers to the association between BPS factors and treatments received? Secondly, if so is the second association an explanation or pathway to explain the road to chronicity of pain and disability?

Income can account for differences in accessing treatments given that these differences were much higher for physical therapies (compared with overall treatments) and the evidence provided earlier that these interventions are much more costly in Australia. In addition, lower social support (including findings for living alone) together with the findings of Fretz and Mallinckrodt (1998) may explain why those who were not working have less number of treatments. Lower education levels and lower levels of acculturation may also account for lower levels of “health literacy” and be significant contributing factors to a lesser health care utilisation. Finally, last but definitely not least the role of psychological distress in the experience of the back pain sufferer may play a paramount influence in delaying recovery and return to the workforce. Again, questions of causality between psychological distress and unemployment need to be considered. However, given the difficulties reported by previous research (Romano and Turner, 2000) a shift of the focus from causality may be warranted. Instead, an exploration of this solid relationship rather than seek causality for academic purposes may be more useful. Breaking the circular nature of this relationship may offer a better solution. There are two options at hand; one is finding employment for the depressed back pain sufferer, the other treating the depression of the unemployed back pain sufferer. The latter appears to be a much realistic approach as reducing symptoms of depression, providing the individual with better coping strategies while increasing confidence would increase his or her chances to return to the workforce. This postulate was also supported by Nguyen and Randolph (2007) who identified Cognitive Behaviour Therapy as a very useful intervention for CBP patients. In addition, given that CBP presents itself as a different experience to acute back pain it is imperative that its diagnosis and treatment plans are revised. Current criteria for the diagnosis of CBP only include two criteria; duration of pain and inefficacy of conventional treatment. If CBP is to be considered as an independent condition where the original injury or anatomical problem only plays a part (a lesser part than



depressive symptoms) in the overall experience of the condition then new diagnostic criteria are required. These criteria would have to include employment status and a range of BPS indicators.

#### **4.2.5 Employment Type.**

There were no differences, associations or predictive roles for employment type in relation to treatments. On the other hand, the findings revealed a number of significant differences between participants who were performing or had performed light (administration, government) and heavy employment (manufacturing, construction). Participants involved with heavy work were less likely to be working. These findings are consistent with Schneider et al (2006), Gray (2006) and Yilmaz and Dedeli (2012) who found the workers described as “blue collar” were more likely to suffer from CBP and as a consequence be out of work for longer periods. Gray found that workers in manufacturing or primary industries were more likely to have workplace accidents. Yilmaz and Dedeli investigated the association between psychological factors and biomechanical issues. Workers involved in more physically demanding jobs were more likely to suffer psychological distress and have lower coping mechanisms. The findings indicated a significant negative association between heavy employment and life control and a significant positive association between heavy work and affective distress. This was consistent with Yilmaz and Dedeli and opens a new perspective in the relationship between heavy work and CBP which have been traditionally associated as heavy and repetitive work involves a higher chance of injury. Taking into account the presence of psychological distress may shed light in the higher level of chronicity for this cohort. In addition, there were significant differences and significant association between heavy employment and disability. These findings were consistent with most existing literature (Gray 2006; Wadell, 2004; Walker, 2000 and 2004). While the risk of

injury for heavy work is well established and to a point fairly self-explanatory it was essential to investigate if these workers are at a higher risk to transition from acute to chronic pain due to psychological distress.

Workers undertaking heavy employment were less likely to have a tertiary education which was also self-explanatory. Other findings of note were the fact that the heavy employment workers were more likely to live in company and had spent a shorter period of time in Australia. Given the previously discussed association of lower income and likelihood to be not working a possible explanation for living in company for this group was simply “cost” as living independently may be unaffordable for this group. Furthermore, these results are consistent with Davidhizar and Giger, (2004) as migrants are more likely to be involved in more physically demanding jobs such as manufacturing and construction. Another explanation may lay in the association between heavy work and higher levels of disability reported as this group may need to live in company due to higher levels of disability (greater need for support).

#### **4.2.6 Level of Education.**

Level of education has been identified in the literature as one of the most reliable indicator of SES. Level of income, occupational status and type of employment were found to be more vulnerable to change with conditions occurring later in life (Hagen et al, 2006).

An initial comparative analysis (independent sample *t*-tests) revealed a significant difference between participants with primary/secondary education and those with tertiary education with the latter being more likely to have received a higher number of treatments overall and more likely to have received a higher number of physical therapies. Further exploration through an analysis of variance (primary, secondary and tertiary education groups) confirmed the differences between groups and provided evidence of differences

between primary and secondary education participants. Statistically significant differences between groups were found for 13 out of 18 variables with very large mean differences in relation to the other 5 variables. This was further confirmed by a correlational relationship between level of education and overall number of treatments received. The results of a linear regression indicated that level of education was a significant marker of the overall number of treatments received. Finally, education was the strongest marker of number of treatments in the path analysis (PA) impacting directly in the number of treatments and indirectly with depression as a mediator. These findings supported the hypothesis as outlined. Dionne et al. (2001) found level of education as a marker of the outcomes of back pain episodes (duration and functionality impact), and third as a marker of the outcomes of medical interventions. They found a robust association between low education and high frequency and longer duration, and less favorable outcomes of back pain (general association of lower education and poorer health outcomes). In addition, these authors recommended that any further research should include level of education as a socio-economic measure. The review found a stronger effect of education on the duration and/or recurrence of back pain than to an association with onset. This indicates a link with chronicity which can be attributed to a number of reasons including biological reasons and adaptability to stress. The findings were consistent with Dionne et al. and offer further explanation for the mechanism in how an individual's level of education may impact on the experience of chronic pain given the strong variations and relationship of all variables when educational level was considered. These findings were also consistent with Walker et al (2004). While there were methodological differences as Walker et al. had a classification of educational level that included four groups: education leading to basic job or vocation, education leading to a skilled job or vocation, undergraduate diploma or degree and postgraduate diploma or degree. Those with tertiary/skilled education were more likely to have received more treatments than those

without tertiary and also more likely to have received physical therapies such chiropractic treatment, massage therapy and physiotherapy.

Level of education has been widely regarded as a marker of disability (Dionne et al, 2001), however, there was no previous literature relating to its possible influence in treatments for back pain. These findings were in line with those of Costa et al. (2009) who found that lower level of education predicted a delayed recovery. Costa et al. divided their Sydney based sample in the same manner (non-tertiary and tertiary) as this study. These findings not only confirmed the first hypothesis but also introduce a new angle in relation to the chronicity of back pain. A possible explanation for these findings was that people with higher education have a better understanding of the treatments available and their nature. In addition, there were a number of significant differences in relation to education that were that may influence the level of participation in treatments. Participants with higher education had lower levels of depression and affective distress, higher levels of perceived life control, higher incomes, living in company and with higher levels of social support, reported less pain intensity and duration, were more likely to be performing or had performed lighter employment type and more likely to live in company as well as being born in Australia or had a higher percentage of their life in Australia (both confirmed by comparison and correlational tests).

#### **4.2.7 Social Support.**

As hypothesised social support was a significant marker higher number of treatments for CBP. The findings were consistent with Gottlieb (1978) and Coffman and Ray in (1999) theories that describe social support as a very important factor in recovery and treatment adherence and participation. In addition, these findings coincided with previous research and contribute to confirming the buffering role of social support in relation to psychological distress, pain and functionality (Kerns et al., 2002; Lopez-Martinez et al., 2008; Sarason, et

al, 1983; Stroud, et al., 2006 ). The relationship between social support and psychological indicators may shed light in explaining the role of social support as a marker of participation in treatments. There were significant correlations between depression, anxiety, perceived life control and affective distress and social support. Furthermore, there were significant differences between participants with normal and extremely severe level of depression in relation to the overall number of sessions received. This gave further credibility to the concept of “buffering” as the presence of social support may lower depression levels.

Anxiety, perceived life control and affective distress were consistently related to depression at all levels of analyses in this study. These four indicators formed a solid group that in turn relates to social support and living arrangements. As stated earlier there was very limited research to date in terms of number of treatments received and social support. However, in order to understand the relationship between social support and disability it was vital to explore the relationship between social support (and other indicators) and treatments leading to avoid or minimise the disabling effects of CBP.

The first step was to examine the positive association between social support and income. As mentioned earlier, there were a number of treatments that are costly and having that additional income would facilitate access for the sufferers. Higher educated participants reported higher levels of social support, were more likely to be working and had involvement in light type of employment. As expected those living in company reported higher levels of social support. Participants with higher levels of perceived social support reported higher levels of life control, lower affective distress and lower level of depression. Furthermore, participants with scores of normal level of depression scored higher social support which declined gradually for those in the mild, moderate and severe ranges of depression. Lastly, the association between higher social support and lower duration of pain may be the clearest indication of the importance of this marker. The relationship between social support and

psychological indicators can be attributed to confounding factors which may prove difficult to establish causality. On the other hand, there was little confusion at the time to judge the role of social support in reducing the length of pain.

#### **4.2.8 Living Arrangements.**

A new measure was introduced separating participants who lived alone and those who lived in company. While there was a great deal of literature exploring marital status, no evidence was found in relation to living arrangements other than Holmes (2010). The findings for this variable have provided unique and useful data as there were significant differences for living arrangements in relation to depression, anxiety, social support, level of education and income, intensity and duration of pain, percentage of life in Australia and employment type as well as the number of treatments received. This was also confirmed by correlational analyses leading to regression analyses.

Participants living alone received fewer than half the overall number of treatments and fewer than half of the number of physical therapies compared with those living in company. The size of this difference was indeed remarkable for a measure that has been largely ignored to date. There was also a significant negative correlation between living alone and the overall number of treatments received which further reinforces the importance of the interaction of these two factors. How can these phenomena be explained? Perhaps a first port of call was noting the differences and associating between psychological factors and living alone. Higher levels of depression (close to double), higher levels of anxiety, higher levels of affective distress and lower levels of life control may explain the existence of motivational factors influence health care utilisation for back pain. In addition, those living alone had much lower levels of education and income which may also explain (given costs involved discussed earlier) the lesser levels of utilisation. Despite undertaking only half of the

treatments, those living alone reported much higher levels of pain and disability. Given the limited research in this topic, it was difficult to compare these results. Smith, Hannaford and Chambers (2004) found (not significant) that living alone increased the chances of suffering persistent and chronic pain.

#### **4.2.9 First Language Spoken.**

Participants with English as their first spoken language had much higher numbers of overall treatments (significant). In addition, this group also reported a much higher number of sessions for physical therapies. These findings were consistent with previous Australian data that indicated that those for whom English was a second language were less likely to visit health care professionals other than GPs (ABS 2002b). People with English as a second language were significantly older, with less income, lower levels of education, more likely to live alone and higher levels of psychological distress. This group reported higher intensity and duration of pain and higher levels of disability (marginal differences). The findings identified another demographic group with higher levels of physical and psychological distress who has received significantly fewer treatments. These findings were consistent with Davidhizar and Giger, 2004, who found that culture affected treatment-seeking behaviour.

Correlational analyses revealed that those with English as a second language reported lower levels of life control, more affective distress, less social support and were more likely to be not working. These findings confirmed previous outcomes for *t*-tests. English as a second language was weakly associated with lower income and education. These findings were in line with Gray and Mendeloff (2002) who found the people born overseas were more likely to be within lower socio-economic parameters with lower social support and higher anxiety.

First language spoken was chosen as a marker as part of a myriad of BPS indicators. While these findings have indicated several differences and associations worth of discussion, there are methodological considerations in relation to the reliability of this measure. It was unclear whether participants having been born abroad had migrated at a young age. This posed a problem in regards to the relevance of this measure as a marker of the level of participants' acculturation and its impact on the experience of CBP. Duration Length of residence in Australia was introduced as an item in the demographic questionnaire. Nevertheless, this measure also had some limitations to measuring acculturation its strength would vary depending on the age of the individual. Therefore, a new variable was created dividing the number of years of residence in Australia (for those born overseas) by the age of the participants. This "percentage of life in Australia" was believed to reflect more accurately the level of acculturation of the participants and a more reliable indicator of its impact on the experience of chronic pain. Cultural considerations and influences in relation to the chronic pain experience will be discussed utilizing the percentage of Life in Australia and English as a second language and observing other interactions with BPS variables.

#### **4.2.10 Percentage of Life in Australia.**

While this measure was created to obtain a closer representation of the level of acculturation to the Australia this measure and its results are to be examined with care. Migrants came to Australia from all corners of the world, with different level of education and in different circumstances. In addition, many born overseas participants may have migrated from English-speaking countries like the United Kingdom or New Zealand or may have had fluency in English before their arrival. Notwithstanding these factors this measure has yielded very interesting finding that were in line with studies of migrant populations conducted previously. These studies concluded that migrants have a lower rate of access to



treatments for back pain (Keeley, 2008; Walker, 2004) which was also confirmed by Australian statistics that found that those born overseas had shorter lives and were less likely to visit health care professionals (ABS 2002b). The findings confirmed these statistics as percentage of life in Australia was negatively correlated with the number of sessions for physical therapies received, but there was no significance difference in relation to the overall number of treatment sessions which included visits to GPs. Gabe, Bury and Elston (2004) found that ethnicity was an indicator of social inequality that leads to poorer health outcomes. This study did not focus on treatment seeking, however it could be assumed that there is an association between treatment-seeking and health outcomes. A higher percentage of life in Australia was also positively correlated with higher levels of education and lighter employment. Given the salient role of education in relation not only to the two main hypotheses, but also to most factors investigated, the association between education and life in Australia may prove to be more influential than it initially appeared to be.

#### **4.2.11 Depression.**

Depression was a significant marker of the number of treatment received. Higher levels of depression were associated with lower numbers of sessions for treatments. These findings were consistent at all levels of analyses. Depression was strongly correlated (negatively) with number of sessions for treatments. Depression was cast as a mediator between exogenous psychosocial values and number of treatments. Depression was associated with sex, living arrangements, occupational status, income, level of education, social support, anxiety and pain intensity and duration. Depression, indeed, appeared to be a key factor in the experience of chronic pain like the mortar that holds the bricks of all other BPS indicators. There were differences in the number of overall treatment sessions in relation to severity of depression. Those with normal levels of depression and those with severe depression had the

larger number of treatment sessions. There was a significant difference between the normal scale of depression and extremely severe (mean number of treatment sessions was nearly double). Those with extremely severe depression had a lower number of treatments compared with all others. This confirmed the first hypothesis in relation to the role of depression in treatment engagement. The findings were in agreement with Tunks, Crooks and Weir (2008), who studied depression and chronic pain and attributed depression as important in influencing motivation and participation. Furthermore, Keeley et al., (2008) found that more fearful cognitions relating to work and back related stresses were baseline markers. However, scores for the Hospital Anxiety and Depression Scale (HADS) and the Fear-Avoidance Belief Questionnaire were not independent markers for health care utilisation. Social stresses were found to be important markers of health care utilisation and health-related quality of life with influences from anxiety and depression. These authors stated that depression influenced socio-economic factors (other than education) and their interaction with levels of health seeking. Walker et al., (2004) measured psychological influences by examining reporting lifetime emotional distress (0- 10 Likert scale) which may not be relevant to the experience of back pain and fear of back pain and may not indicate a propensity to seek medical help. In another Australian study, Blyth et al. (2004) found that chronic pain sufferers with extreme functional interference used health services more significantly (hospital admission and emergency and GP visits only). In the same manner, the comorbidity of chronic pain and psychological distress accounted for a higher level of health services utilisation (emergency departments and GPs but no other services). The findings of Walker et al. and Blyth et al. were consistent with the findings of the present study. McWilliams, Goodwin and Cox, (2004) found that higher levels of depression were associated with reduced physical activity and increased fear avoidance by feelings of fear. These feelings may contribute to lower levels of motivation to engage in treatment-seeking.

Pincus and Morley (2001) theory of biased schemas for back pain sufferers may contribute to explain the relationship between depression and treatment-seeking. Ullrich et al. (2007) also proposed that the presence of depression will increase the level of catastrophising and therefore further negatively impact on treatment seeking.

As outlined, previous research also indicated a complicated relationship between depression and health seeking. While there appeared to be overwhelming agreement to a relationship between depression and disability as well as depression and pain this has not translated in establishing a relationship between depression and either health care seeking or service utilisation. One of the reasons for this may be that methodological issues such as measures may differ from study to study (difference in concepts health care seeking versus service utilisation) and the questionnaires may have differences levels of validity. One purpose was to establish a relationship between psychological distress and treatment participation.

In light of these findings of this study and the overwhelming evidence in the existing literature, depression plays a major role as a deterrent in treatment-seeking for LBP. Depression causes cognitive distortions, creates avoidance and fear or simply reduces motivation levels as well as causing psychosomatic symptoms that further aggravate the experience of chronic pain.

#### **4.2.12 Anxiety.**

Anxiety was negatively associated with the overall number of treatment sessions. Anxiety was higher in those with lower income (inverse direction), lower education (inverse direction), higher disability, women and over 61 years old participants. In contrast, anxiety was higher for those working compared with no working and English as first language participants, the only psychological indicator behaving in this way, anxiety was significantly

correlated with living alone and reported pain levels. While anxiety was highly correlated with depression its interactions with other variables differ greatly from the latter. Findings for anxiety were both weaker (statistically speaking) and appear to lead in a different direction than those for depression.

#### **4.2.13 Life Control.**

Life control was negatively associated with the number of physical therapies received, but results did not reveal any significant relationship between life control and overall treatment sessions for back pain. Life control was highly correlated (negatively) with depression and life control results are consistent with those obtained for depression. In addition, while this measure has offered useful findings in relation to disability and other variables the lack of significance in relation to treatments may have a methodological explanation. This measure was constructed out of two items included in the WHYMPI and while there are no doubts about its validity, there are some concerns in relation to the strength given the limited amount of items (questions) that it was based on. Therefore, this measure as well as affective distress has been utilised to give support and broaden the picture of psychological distress together with the results for depression and anxiety from the DASS.

#### **4.2.14 Affective Distress.**

Affective distress was negatively correlated with the overall number of treatments and the number of physical therapies. Affective distress was negatively correlated with life control and positively correlated with depression and anxiety. These relationships have remained constant and consistent in relation to the overall number of treatment sessions. Notwithstanding these results, the relationship between affective distress and treatments and treatment sessions appears to be weak and fuzzy. In addition, affective distress was measured through three items in the WHYMPI and it has a limited strength (similar to life control).

There was no previous literature in regards to either life control and affective distress and care seeking or service utilisation.

#### **4.2.15 Level of Pain.**

Intensity of pain was not a significant marker of the number of the overall number of treatment sessions. Given the correlations between pain intensity and psychological indicators which were also not related to treatments, these results appear to give consistency to the overall results. Pain intensity was found to be a marker of disability. The lack of relationship between pain and treatments opens the door to question motivational issues in relation to health service utilisation. Logically, those affected by higher levels of pain should have a higher rate of service utilisation. However, this relationship may be explored from a different angle and it could be argued that the reason why the back pain sufferers still have higher levels of pain was explained by low service utilisation.

Previous research with a Biopsychosocial Model perspective has emphasized that the outcomes in chronic pain have little to do with the original injury or disease and more to do with psychosocial influences (Gatchel, et al., 2007). In the same manner, it could be argued that the rate of service utilization has a limited relationship with the level of pain and more to do with other indicators such as level of education and social support. In fact, there were three significant markers for the overall number of treatments: income, level of education and social support.

#### **4.2.16 Duration of Pain.**

Duration of pain was found to be a significant marker of a higher number of treatments for back pain. Pain duration was one of the inclusion criteria for this sample in line with the definitions of chronic pain in most of the literature researched (Penzo, 1989, Wadell, 2004). This measure was indeed an important indicator of the chronicity of pain and the results are

in line with the hypothesis. However, while there was no doubt in relation to the validity and reliability of the findings additional care must be taken for their interpretation and discussion. Having back pain for longer periods may result in having a larger number of treatment sessions, but this may escape the purpose of this research. In fact, the aim of investigating the treatment participation was to investigate if this engagement would reflect in disability levels reported. Furthermore, one of the main focus of this study was to explore socio-demographic variable that may impact on the number of treatments received. Nevertheless, in addition of the significance obtained in a linear regression there are other significant results worth of discussion in relation to pain duration.

Duration of pain was negatively correlated with level of education and social support. Considering the negative association between level of education and age indicating that younger participants have higher education, this means that younger participants may have reported higher levels of pain. While there was no intention in establishing a causal relationship between level of education and duration of pain, an explanation for the relationship of these variables appear to lay in the former causing the latter. To be specific, it was most unlikely to explain the fact that those that longer duration of back pain cause to have a lower levels of education. A more plausible explanation would be that those with a higher level of education have shorter periods of pain. Higher educated individuals may possess higher levels of health literacy, have a higher level of awareness of their conditions and the treatments available (Briggs et al., 2010). Furthermore, most individuals complete their education in young adulthood well before the development of back pain (Marieb, 2001). Therefore, it can be safely assumed that education level was established earlier and may be a causal marker of the duration of pain.

In addition to supporting for the Biopsychosocial Model of Health, the present findings gave additional support to the Theory of Social Causation. The theory that

increments of SES are connected with improvements in health status was also shared by Mulatu and Schooler (2006). These authors, like others before them, faced the dilemma of explaining the correlation between SES and health with social causation or health selection reasons. They introduced the concept of 'proximal mediating mechanisms' which appeared in the relation between the two indicators. The main premise is that SES influences health through its effects on shaping individuals' day to day lifestyle and health-affecting behaviours. They identified several 'mediators' such as diet, sleep, exercise, smoking, drug use, access to better health care, etc.. Furthermore, they proposed that SES differences increased psychological distress, presenting higher levels of depression, anxiety and hopelessness. On the reverse side, they also found that the same lifestyle mediators may impact on job performance and health and cause deterioration in SES. Psychological distress may also be responsible for a decline in SES, particularly with psychotic disorders and psychological conditions that occur earlier in life. In the first study of this kind, Mulatu and Schooler found a reciprocal causal connection between SES and health. However, they found stronger evidence for social causation (agreeing with Matthews and Manor, 1998) than for health selection. This was evidenced by the fact that even when stress levels were controlled, individuals with lower SES were more vulnerable to psychological distress. In addition, they found significant evidence that SES affects health through occupation with factors such as job conditions and demands; high work strain; poor work support; low control of workplace; job insecurity; repetitive work and exposure to uncomfortable working conditions. Another innovation from this study is the concept of three-way interaction between SES, health indicators and psychological distress, with the presence of several mediators between them.

### **4.3 Second Hypothesis Level of Disability**

It was also hypothesised, that those with a lower SES, higher level of depression, anxiety or stress, higher levels of reported pain and lower levels of social support will report high levels of disability. This hypothesis was also supported as the 16 variables analysed predicted 52% of the disability scores. Six markers (education, social support, depression, life control, pain scores and duration of pain) reached statistical significance at with percentage of life in Australia nearing significance. The strongest markers were in order: duration of pain, depression, life control, social support, pain score, education, age, sex, income, employment type, first language spoken, anxiety and affective distress were not significant. However, a series of significant relationships both in analyses of means and correlations analyses between these variables and disability that may assist in explaining their contribution to the overall predictive coefficient.

#### **4.3.1 Age.**

Significant differences were found in relation to disability by age groups. Participants aged between 31 and 60 years reported higher levels of disability compared with younger and older participants. These findings were consistent with the existing literature as it was found that adults of working age are the most vulnerable, and hence that the prevalence of back pain decreases around the middle of the sixth decade, although there was no consensus on the actual prevalence rates of back pain (Dionne et al, 2001, Waddell, 2004, Walker et al, 2000). In order to explain the decrease in reported disability between the 31 to 60 years and 61 and older groups, it is important to investigate biological and psychological issues. Firstly, according to all medical evidence presented functional ability decrease with age. In addition, older individuals were more likely to experience degenerative and chronic conditions such as arthritis, osteoarthritis and simply the accumulation of residual pain from injuries (Marieb,



2001, Saladin, 2004). The findings also indicated that the 31 to 60 years old groups reported higher intensity and duration of pain compared to their younger and older counterparts. On biological or medical considerations, this would represent a strong contradiction. Therefore, to seek an explanation it was necessary to explore psychosocial contributors and in particular in relation to the concepts of functionality and disability. Mitchell et al. (2008) explored the differences between impairment and disability. Perhaps older participants perceive their physical impairment as a result of the normal process of ageing and not as a sign of disability. In addition, older individuals may have fewer demands in terms of work or general physical activities and, therefore were less likely to feel disable or unable to fulfil those demands. Finally, older individuals having fewer demands from work or other activities may be less likely to strain their back and cause pain. Lumbar strain has been recognized as one of the most common causes of low back pain. The injury can occur because of overuse, improper use, or trauma. Soft-tissue injury was commonly classified as 'acute' if it has been present for days to weeks. If the strain lasts longer than three months, it was referred to as 'chronic'. Lumbar strain most often occurs in people in their forties, but it can happen at any age (Saladin, 2004). Finally, the 31 to 60 years old group reported higher levels of depression which has been correlated to pain and disability in these results and in previous research (Ackerman & Stevens, 1989; Brox et al., 2005; Dickens, Jayson, Sutton & Creed, 2000; Grotle et al., 2006; Kinney, Gatchel, Polatin et al., 1993; Main, Wood, Hollis, et al., 1992; Romano and Turner, 1985). The comorbidity between depression and back pain and in turn disability appears to be a more plausible explanation in light of these age differences. The intensity of pain has not been found to be the main marker of the duration or chronicity of back pain. High levels of acute pain do not predict depression or disability. However, socio-cultural factors (e.g., ethnicity) were found to contribute to the transition from acute to chronic pain. Furthermore, it has also been found that disability is predictive of subsequent

depressive symptoms, and in chronic sufferers high disability predicts persisting pain intensity while high depressive symptoms predict continued disability (Epping-Jordan, et al., 1998). To explain the nature and idiosyncrasies of CBP, it was necessary to focus in the role of depression as the medical model cannot account for the fact that a younger group experiences higher levels of pain than an older group. While the medical model has been accurate in understanding the experience and processes of acute pain a more comprehensive approach is necessary in light of the findings. Following Pincus and Morley (2001) in their construct stating that depression was an intrinsic part of chronic pain and Anderson and Rehm (1984) who found chronicity to be more influential than the source of pain when rating the intensity and impact of pain may lead to a better understanding of this phenomenon. This may give additional support to the idea of chronic pain as a condition is not just a symptom (Bakal, 1996). Social Causation Theory postulates the idea that psychological distress acts as a mediator between SES and health in two ways: firstly, SES influences health through psychological distress and secondly differences in SES lead to differences in psychological distress.

#### **4.3.2 Sex.**

Contrary to the hypothesis, men reported higher levels of disability. Women reported higher education, a longer percentage of life in Australia, higher levels of pain (marginally) but shorter duration (marginally). Women also reported higher numbers of overall treatments and physical therapies with lower levels of life control and a higher level of affective distress.

Women reported higher levels of depression and other psychological distress indicators. These differences may be attributed to the way men and women report physical and psychological disability. Women tend to report higher levels of psychological distress while men tend to report more somatic symptoms (Robinson et al., 2001). These findings confirm,

previous findings in relation to the complexities of sex differences in the experience of chronic pain (Berkley, 1997; Robinson et al., 2001; Robinson et al., 1998 ). Women reported higher levels of pain and psychological distress but lower levels of disability than men. There were two phenomena worth of noting. Firstly, women and men experience chronic pain in different ways. Women reported suffering higher levels psychological distress and were also able to report it more freely. Secondly, it was imperative to revisit the previous discussion in relation to the duality of CBP in terms of physical and psychological impact. Supporting the idea that psychological distress and physical impairment are part of one reality that causes overall disability will assist in understanding the sex differences found in previous literature and in these results. In order to identify sex differences in regards to disability a new measure that includes a psychological component is required. Only with such a measuring tool it be possible to obtain a true reflection of the overall impairment caused by chronic pain. The measuring tool for this research (Oswestry Disability Questionnaire also know as The Oswestry Low Back Pain Disability Questionnaire [ODQ], Fairbank & Davies, 1980) focus on pain and physical disability and has no mention of psychological distress. While it can be argued that the report between pain and disability is subjective and personal and influenced by the individual's cognitions and emotions there is no doubt that measures of psychological distress need to be included in line with the concept of overall disability.

#### **4.3.3 Income.**

Income was negatively associated with disability and those with lower income reported higher levels of disability. These findings coincided with the overwhelming view of the literature that reflect a link between lower income and poorer health (Gray 7 Mendeloff, 2002). In contrast, a strong association between high self-efficacy and low fear avoidance beliefs and higher income (de Moraes-Vieira et al., 2014).In the same manner, Holmes et al.

(2010) identified income as a significant risk factor for pain presence 12 months after an initial injury. Income was strongly associated with other socio-economic variables with those with higher incomes reporting a higher rate of tertiary education, more likely to be working and were involved in a lighter type of employment. These associations were in most part logical and easy to understand as an individual with higher education would normally attracted higher salaries. Income was also associated with psychological measures with big differences in depression scores between those earning above and below AUD\$40,000 per year. There were significant differences by depression scores in relation to level of income with a gradual decline in income reported with each increase in depression severity. Higher income was associated level of social support and more likely to live in company. Lower income earner reported higher levels of pain and longer periods which correspond with the fact that this group has engaged in a much lower number and a variety of treatments.

While differences in income assisted to understand the importance and the size of the impact that socio-economic factors have on health and in particular on disability. Unfortunately, given its vulnerability for variations income has been identified as a less reliable indicator in terms of socio-economic measures. It could be argued that disability and inability to work cause a reduction in income and, therefore, income could be a consequence of disability rather than a cause or a marker. The literature researched indicated a tendency to cite level of education as a more stable and long lasting indicator of SES.

#### **4.3.4 Occupational Status.**

Occupational status was not a significant marker of disability. *T*-tests reveled difference between participants that were working and not working (neared significance) with those not working reporting higher levels of disability. In the same manner those not working reported higher psychological distress in all the indicators (higher depression, anxiety, affective distress

and lower life control) as well as lower levels of social support. Not working was also positively correlated with disability. This correlation was significant but of weak strength (below .30) and was this variable was not included in the path analysis.

These findings are in line with the hypotheses and answer the research question in relation of SES and level of disability. In addition, these findings coincided with previous findings that clearly highlighted an association between non-working and higher levels of disability (Fretz, & Mallinckrodt, 1988; Kuijer et al, 2006; Suter, 2002). Furthermore, the findings for occupational status were line with other socio-economic indicators such as education and income providing additional strength to the overall validity of this study. Not surprisingly, occupational status was strongly correlated with income, but it was also correlated with language with those with English as a second language less likely to be working. These relationships agreed with previous research that cited unemployment and lower quality employment were more prevalent within migrants and minorities (Lipscomb et al., 2006). The consistency of socio-economic indicators as well as psychological and social support indicators also reinforced the theoretical approach within the Biopsychosocial Model. Occupational status alone cannot be used as a reliable marker given the volatility of this status and the bidirectional nature of the relationship between this indicator and disability. Individuals with CBP may have to cease work due to ongoing pain and the unemployment status may contribute to the chronicity of the pain and disability. However, occupational or employment status in conjunction with other socio-economic indicator has been proven extremely important within this research.

#### **4.3.5 Employment Type.**

Employment type was also a significant marker for disability. Participants who were working or were involved in the past in more physically demanding employment were at

higher risk of disability. Participants with involvement in heavy employment had significantly higher scores for disability, depression, affective distress and lower scores for life control. The findings also revealed significant differences for sex, percentage of life in Australia and neared significance for social support. Those involved in heavy employment were more likely to be men, have a lower percentage of life in Australia and higher levels of disability. In addition, employment type was correlated with disability and there were significant differences with a higher presence of blue collar worker within the higher disability group (compared to the mild and moderate disability group). These findings were line with previous findings that identified “blue collar” worker at a higher risk of injury and disability (Gray & Mendeloff 2002; Latza et al.; Stansfeld, 1999; Yilmaz and Dedeli, 2012). The relationship between heavy employment and back pain, therefore, has been well established. There was a myriad of other associations and relationships relating to this variable that required exploring and discussion in order to gain a better understanding of the chronic pain experience. Some associations were easily explained. For instance sex differences could be attributed to the fact that men have more likely to involved in heavy employment. In the same manner, lower educated individuals are also traditionally associated with heavy employment or blue collar type of employment. Migrants have also been associated with blue collar employment. These findings were no groundbreaking but they indoubtly contributed to establish the internal consistency of the data and agreement with previous research. The association between employment type and other socio-economic indicators further confirmed the hypothesis.

Another interesting finding was the consitency in the association of employment type and psychological indicators. It could be argued that those involved in heavier employment may be in a more vulnerable possition for pain and physical restrictions. This, in turn, may render the return to work more honerous and thefore cause more depression and distress and having

less life control. There were marked and significant differences in the number of treatments (both overall number of sessions and number of sessions for physical therapies) with those involved in heavy employment receiving fewer treatments. In summary, despite having both higher levels of physical and psychological distress participants involved in heavy employment received much fewer treatments than those involved in light employment.

#### **4.3.6 Level of Education.**

Level of education was the strongest marker for disability at all levels of analyses. The path analysis (final model) clearly identified education as the main influencer not only on disability, but also in the overall number of sessions for treatments and depression. Education was a significant marker of disability in a linear regression and was strongly correlated with disability. Given the initial strength of the differences in disability by level of education in initial *t*-tests a subsequent analysis of variance was conducted to allow the exploration of level of education at three levels of education (primary, secondary and tertiary) as *t*-tests only allowed the analysis with two groups. Participants with tertiary education reported much lower levels of disability when compared with those with secondary and primary education alone. Analyses of variance revealed significance for all continuous variables but level of pain. These results highlighted the pivotal role of education in relation to all other variables. An extensive research of the existing literature revealed that education level was the most reliable and stable indicator of SES (Costa et al, 2009; Dionne et al, 2001 and Hagen et al, 2006). Education was positively correlated with other socio-economic indicators (income, occupational status and type of employment), social indicators (social support and living arrangements), and cultural indicators (first language spoken and percentage of life in Australia) and negatively correlated with psychological indicators (depression, anxiety, affective distress and lower life control). These findings demonstrated

both the internal consistency of the data and the importance of the role of education in this research. Indeed, these findings were also consistent with previous literature (Cornelius et al, 2010; Costa et al, 2009; Davies et al, 2009, Dionne et al, 2001; Huan et al, 2013). All studies examined agreed that there was a clear association between level of education and health outcomes. They also concurred that lower education levels lead to poor health outcomes. One of the reasons for this this association may lay in the fact that individuals with higher levels of education may possess higher levels of cognitive function which, in turn, may give them higher coping and adaptability skills (Dionne et al). Another explanation was that higher educated individuals may also possess higher levels of health literacy which allowed them to make better lifestyle choices and access a better range of treatments and interventions (Costa et al, 2009). While there was little doubt in regards to the association between levels of education and the incidence of lower back pain and disability, it was imperative to investigate the relationship between education level and other variables in order to understand the mechanisms that may assist to explain this relationship. Education level was also associated with pain, with those with lower levels of education reporting higher levels of pain. Lower educated participants also reported involvement in heavy employment and those involved in heavy employment also reported higher pain and disability. These findings showed evidence of a triangle where lower educated people work in heavy employment and this makes them more vulnerable to pain and eventual disability. This explanation was not only plausible but it also logical and easy to understand.

#### **4.3.7 Social Support.**

Social support was a significant marker of disability. In addition, social support was negatively correlated with disability and there were significant differences according to the level of disability. Participants with low disability had higher social support than the



moderate disability group and in turn the high disability group has the lowest level of social support. In addition, social support was associated with psychological measures. The findings indicated that those with higher social support had higher incomes, were working and were more likely to live in company. As previously mentioned earlier social support was also associated with a higher number of treatment sessions. These findings were concurrent with most of the existing literature indicating that sufferers receiving higher levels of social support showed decreases in depression, severity of pain and an increase in functional status (Kerns et al., 2002; Lopez-Martinez et al., 2008; Sarason, et al., 1983; Stroud, et al., 2006). In addition, these findings also confirmed theoretical definitions of social support given its interactions with psychological measures (Coffman and Ray, 1999; Gottlieb, 1978).

Further analysis shed additional light into the nature of the relationship between depression and social support. Participants with normal levels of depression reported the highest level of social support but those with mild, moderate, severe and extremely severe (extremely severe was marginally higher than severe) had gradually less social support. These findings supported theories that explain the role of social support as identified by Thomten, Soares and Sundin (2011). They described social support as a buffer for pain and disability and found that was associated with greater activity levels among individuals with pain. Social support was found to be a marker of a better quality of life and the lack of support was identified with a higher risk of CLBP. They also found that social support may act as coping assistance and result in activity levels, reduce catastrophizing and avoidance. This was also supported by findings by Lopez-Martinez et. al., (2008) who found higher social support as instrumental for enhanced coping mechanisms and minimising catastrophising.

Having established the importance of social support and its relationship with psychological indicators, it was important to explore what other factors may influence this

relationship. Social support and depression were associated with socio-economic indicators such as education, income and employment status. There was no evidence of a causal relationship between all variables mentioned but there a definite trend between higher SES, better psychological functioning, higher social support and lower pain duration and lower disability. Curiously, social support was not associated with intensity of pain further contributing to theories that postulate that injury and pain have a lesser influence in chronic pain and disability than psychosocial indicators. Therefore, these findings not only supported the BPS Model of Health above the Medical Model of Health, but also give further credibility to the Social Causation Theory.

Higher levels of social support were associated with having English as a first spoken language and a higher percentage of life in Australia.

#### **4.3.8 Living Arrangements.**

Living arrangements was chosen as a social measure to compliment social support. This measure has been rarely used as most research has focussed on marital status. The present analyses have yielded very interesting findings that indicate the fact the living alone was associated with significant differences, association with most variables including disability. Living alone was a marker of higher levels of disability (results of linear regression indicated a trend toward significance). In addition, living alone was positively associated with disability and there were differences between groups by disability severity. Severity of disability was divided in 3 groups and those with a low-minimal disability were highly likely to live with company, this rate reduced for those with moderate severity. Furthermore, there was a very large difference for those with the higher level of disability as they were most likely to live alone. Living arrangements was moderately positively associated with social support, and was strongly associated with affective distress

(significantly correlated with all psychological indicators). Living arrangements may have played a very important and relevant role in the experience of chronic pain given that psychological indicators were found to be associated with disability. The relevance of this role increased even more when exploring a positive association with pain levels and a negative association with overall number of treatment sessions received. The findings of this study were consistent with those of Holmes et al (2010) who found that those living alone had significantly higher levels of pain 12 months after an injury when compared with those living with company. Furthermore, these findings confirmed the findings of Smith, Hannaford and Chambers (2004) in relation to the role of living alone being associated with a higher likelihood of having “persistent” chronic back pain compared with “recovered” chronic back pain. Both studies (Smith et al., 2004 and Holmes et al., 2010) reflected on the different nature of acute back pain and CBP and stated that chronic back was not only a different condition but also requires a different treatment approach. In particular Smith et al. suggested that: “while management or tertiary prevention of *persistent* chronic back pain should consider psychological health, primary prevention of *new* chronic back pain should focus on physical health and management of other pain” (p. 1038). These findings would also support these premises as the psychological (influenced by socio-demographic factors) incidence in the severity of disability has been well established. Another social indicator was found to be strongly linked with disability and perhaps the best way to explain this link is by identifying psychological distress as a mediating path. Many would argue that higher levels of depression would indicate a psychological disability. However, the evidence suggested that as a result of the interaction between psychosocial factors and SES there are higher levels of physical disability and loss of functionality in the experience of CBP.

#### **4.3.9 First Language Spoken.**

While having not having English as their first language spoken was not found to be a significant marker of disability there were several associations and significant differences in relation to all variables. Those within the low or minimal level of disability were more likely to have English as their first spoken language. However, there were significant differences when this group was compared with the moderate severity group. These differences decreased in relation with the high severity group. As mentioned earlier, those with English as a first spoken language had also a higher level of education, more likely to be working, living in company, have more life control and less affective. All these measures have been associated with lower levels of disability. These findings were consistent with Davidhizar and Giger, 2004; Giger and Davidhizar, 1999 and Walker, 1995 who found that migrants and members of ethnic minorities were more likely to report poorer health outcomes and have a lower socio-economic status.

There were some questions about the validity of this measure given that participants may have migrated to Australia at a younger age and while they acquired English as a second language their level of fluency may be high. Therefore, while these findings had a trend that confirms a higher likelihood of disability for those from a non-dominant culture or ethnicity a new variable was created in order to obtain more accurate data in relation to cultural issues.

#### **4.3.10 Percentage of Life in Australia.**

Percentage of life in Australia was found to be a significant marker of disability. These findings supported the hypothesis and confirmed previous literature in terms of levels of acculturation and health outcomes. In addition, there was a negative association between percentage of life in Australia and pain and disability. Furthermore, there were significant differences by level of disability severity with increased severity with reducing percentage of

life in Australia. One of the explanations for this differences was the positive association between “heavy” employment involvement and a lower percentage of life in Australia as migrant are normally involved in manufacturing, construction and similar industries.

Another, explanation, perhaps more in line with the other findings of this study, is the higher levels of psychological distress for those with a lower percentage of life in Australia.

These findings differed from those of Gray and Mendeloff (2002) who found that non-English speakers were less likely to report CBP and other illnesses due to the “healthy migrant” phenomenon. This discrepancy was of particular interest as Gray and Mendeloff used an Australian sample. Findings indicated very little differences in percentages of life in Australia for this sample when divided by age groups with a slight increase in percentage in the 61 years and older. These differences could be due to the diverse demographic composition of the sample or to the fact that Gray and Mendeloff sample could have been focussed in language fluency. In theory, a higher percentage of life Australia would equate with a higher level of English fluency but this was not ascertained by this study Given the varied composition of the sample and the continuous immigration flow, it is essential that these are investigated further.

Bui, Doescher, Takeuchi and Taylor (2011) found that English proficiency was positively associated with back and neck problems. However, they also found that higher levels of acculturation were negatively associated with the report of widespread pain. They focussed in the differences between Latin-American migrants and the general US population. The present findings did not coincide with the findings of this study. One of the reasons for this discrepancy is the existence of contextual differences between the realities of the samples. Bui et al. investigated one particular ethnic group while the present study dealt with people born in Australia or abroad. While the literature appears in agreement in relation to ethnic and cultural differences in the reporting of pain (Davidhizar and Giger, 2004; Giger and

Davidhizar, 1999; Walker, 1995 ) there was no agreement in the direction of these differences.

#### **4.3.11 Depression.**

Depression was found to be a significant marker of disability confirming the hypothesis. These findings were in agreement with the majority of the existing literature (Ackerman and Stevens, 1989; Brox et al., 2005; Dickens, Jayson, Sutton and Creed, 2000; Grotle et al., 2006; Kinney, Gatchel, Polatin et al., 1993; Main, Wood, Hollis, et al., 1992; Romano and Turner, 1985). Some authors, attributed this relationship to the interaction between pain and depression (Arnstein, 1999) while others advocated for a new schema that considers pain and depression as “two perceptions of the same problem” (Pincus and Morley, 2001). Despite a great deal of agreement in regards to the relationship between depression and chronic pain, there was little agreement and even literature in relation to causality. Surely, one may lead, cause, or fuel the other. However, if we were to follow Pincus and Morley, there would be no need to investigate causality but rather a more detailed exploration of how these two variables are influenced by other indicators. If depression and physical disability are indeed two sides one physical and one emotional considerate may be adequate them as one variable of a new concept of global disability. Most literature and most existing questionnaires and tools utilised to measure disability focus in the physical impacts mainly as well as impairment and loss of functionality. Given this consideration, it was essential to explore the associations, variances and other significant relationships revealed by these findings to further understand the dual nature of disability.

The correlation between depression and disability was stronger than the correlation between pain and disability. This finding gave further strength to the theories that see chronic pain as different phenomenon to acute pain and even consider it as a condition on its

own. Again, there was a strong correlation between depression and pain. Depression rose significantly with the severity of disability doubling the mean for depression scores with each increase in disability score (low, moderate and high disability scores groups). In the same manner, disability level rose with increased values of depression severity (normal, mild, moderate, severe and extremely severe depression scores). Gatchel et al (2006) found that 50% of individuals with chronic pain had depression. Interestingly, the data revealed a correlation of .55. Others have found similar levels of comorbidity and explored other emotions comorbid with chronic pain such as anger. Melzack and Wall (1965) and Melzack and Casey (1968) argued that chronic pain sufferers develop frustration due to the length of their symptoms and feel misunderstood by the medical profession given where pain is continuous in the absence of significant physical injury. Others go further seeing much more than a common comorbidity and see a mutually enforcing relationship between depression and chronic pain-disability (Banks and Kerns, 1996; Romano and Turner, 1985 and Ruby, Kerns and Turk, 1998).

These findings and previous research led to support the idiosyncrasy of CBP as a medical condition, with its own range of symptoms and requiring a tailored approach in relation to treatment. They also led to consider depression as an integral part of disability interweaving into a physical and emotional system leading to loss of functionality and impairment in both areas. The presence of depression in the experience of CBP acted both as a barrier in motivational terms that impacts on recovery and as fuel for catastrophising towards a pessimistic outcome. Ullrich et al. (2007) focussed on the role of depression within the experience of CBP and in conjunction with disability. They identified the role of catastrophising in the context of CBP as a mediator in the relationship between depression and physical disability. Further investigation and exploration and how catastrophising may

contribute to the chronicity and entrenchment of back pain beyond the reasonably expected period of recovery of an initial physical injury.

Whether depression was considered to be a marker (and independent variable for the purpose of this research) or indeed was to be considered as part of a wider expression of impairment and disability it was important to examine the role socio-demographic indicators in relation to depression and disability. Level of education has been identified as more reliable and stable indicator of SES in the past and this has been confirmed by these findings. In particular, there are significant and sizable differences in reports of pain, depression and disability between participants with and without tertiary education. What were the reasons for such differences? Given that higher education has been associated with better incomes, higher access to treatments and lighter type of employment it was fairly clear to understand the connection between all outcomes. Given the positive association between outcomes and treatments and the negative association between numbers of treatment sessions (and number of physical therapies) and disability perhaps an explanation for the role of education (linked to income) could be found in the fact that participants with tertiary education have more treatments for back and, therefore, suffer less disability and depression. While this study has not collected data in relation to catastrophising it was not hard to hypothesise a link within lower income barriers to access treatments due to cost leading to higher levels of disability.

#### **4.3.12 Anxiety.**

Anxiety was found to be a significant marker of disability confirming the hypothesis that higher psychological distress would predict higher levels of disability. Anxiety was positively associated with disability, but this relationship did not demonstrate a statistical significance. Anxiety was moderate to highly correlated with other psychological measures as well as moderately correlated with pain and with living alone. The findings confirmed



those of McWilliams et al., (2004) and Sareen et al., (2005) who found that anxiety was strongly associated with chronic pain. In addition, these findings also coincided with Sareen et al. confirming a strong association of between anxiety and depression. However, anxiety appeared to have a lesser impact when compared with depression. Anxiety was also correlated with pain which contributed to confirm the interaction between psychological distress, pain and disability. In addition, these findings were in line with other studies that linked anxiety to musculoskeletal pain (Cimmino, Ferrone and Cutolo, 2011 and Luchetti et al., 2012).

There were significant differences within participants with a moderate level and those with a high level of disability (anxiety mean scores doubled). There was limited research in relation to anxiety and CBP and the findings of this study offer a limited contribution in this area. However, anxiety findings can be utilised in conjunction with depression, life control and affective distress given the high correlations with these variables. The model designed for the path analysis included depression only but given the high level of correlation with the other psychological indicators it can be assumed that anxiety was an important component of the experience of chronic pain and disability.

#### **4.3.13 Life Control.**

Life control and affective distress are two psychological measures within the West Haven-Yale Multidimensional Pain Inventory (WHYMPI, Kerns, Turk and Rudy, 1985). Although the main source of psychological information was the Depression, Anxiety and Stress Scale (DASS, Lovibond and Lovibond, 1985) these two indicators were utilised as additional independent variables in the analyses of variance and correlational analysis. There were several reasons for this. Firstly, given the focus of this study in examining the relationship between sociodemographic, psychological and disability they offered a very valuable

additional information. Secondly, Kerns, Turk and Rudy identified the measure of life control as an indicator for adaptive coping categories. This information has contributed to reinforcing the role of psychological distress within the experience chronic pain. Measures of affective distress in the WHYMPI were found to be highly correlated with the Beck Depression Inventory a well known and widely used depression measuring tool.

Both measures were highly correlated with depression and each other and moderately correlated with anxiety. In addition, the findings of these two measures appeared to be similar to those of the depression scores which reinforces the strength of these findings (both were significantly correlated with pain and disability). Given that life control measures coping strategies it has proven to be an invaluable source of information considering that coping has been identified as an essential element of psychological resilience for chronic pain sufferers. There were significant differences in life control levels by levels of disability severity (mild, moderate and severe) with those reporting higher levels of disability as having much lower levels of perceived life control. Having established a solid link between life control and disability, it was essential to examine the relationships between life control and socio-economic variable to determine the role of this indicators. Was the level of perceived life control a pivotal link between psychological and physical disability? If so, what was the role of life control in relation to chronicity of back pain? Finally, how socio-economic indicators influence the individual's perceived life control leading to different outcomes in the experience of CBP? Tertiary educated participants had much higher levels of life control compared with those with primary and secondary education alone. Furthermore, there were also significant differences between secondary (higher) and primary educated participants. The differences between education groups for life control much were higher than the differences for depression and affective distress. These findings may hold the key to explaining the role of higher education in relation to the experience of CBP. This would lead

to the conclusion that higher educated people have higher adaptive coping strategies and skills and, therefore, experience lower levels of depression and affective distress causing lower levels of disability when compared with those with lower levels of education.

Gender differences for life control and affective distress were found to be statistically significant which coincided with some of the literature in indicating the women suffer higher levels of psychological distress (Keeley et al., 2008; Robinson et al., 2001; Waddell, 2004). These were of particular interest from a methodological point of view given that neither Depression or Anxiety scores reflected statistically significant differences between the sexes.

Differences for having English or other as first language yielded significant findings for both life control and affective distress. These differences were stronger than those found for depression (anxiety differences had no statistical significance). Furthermore, the association between higher percentage of life in Australia and life control was statistically significant but this was not replicated for depression, anxiety or affective distress. Therefore, life control appeared to play a role in relation to acculturation level and this role was indeed more prominent than those of other psychological indicators. This statement gained further importance given that percentage of life in Australia was found to be a significant marker for disability. Finally, these findings also coincide with those of Bui, Doescher, Takeuchi & Taylor (2011) and confirm the theoretical propositions of Davidhizar and Giger (2004) in relation to ethnicity and culture in relation to health and chronic pain in particular.

The association between life control and social support was found to be stronger than between depression and social support (both significant) and similar findings were obtained for income, employment status and living arrangements.

#### **4.3.14 Affective Distress.**

As previously stated affective distress was strongly negatively correlated with life control and their findings were consistently diametrically opposed to this measure at all levels of analyses. Affective distress had a higher correlation coefficient with pain and disability than life control. While affective distress was not a significant marker of disability in a linear regression it was significantly correlated with this measure. In addition, the strong correlation of affective distress with depression and anxiety further validates its use in this analysis as it provides evidence of robustness and internal consistent of the data as an additional psychological indicator. Findings for a independent *t*-test showed significant differences for all variables in relation to affective distress. Women, participants with lower income, lower education, living alone, not working, with involvement in heavy employment and those with English as a second language reported higher levels of affective distress. In addition, findings from an analysis of variance showed significant differences with those reporting higher disability also reporting higher levels of affective distress.

#### **4.3.15 Level of Pain.**

Level of pain was found a significant marker of disability. This findings confirmed those of Walker (1985); Epping-Jordan et al.1998; Grotle et al.2007; Gatchel and Mayer, 2008 and Holmes et al., 2010) as level of pain was found to be a marker of disability at different stages of an initial injury. Despite the logical and understandable relationship between pain and physical disability due to reduced functionality, these findings indicated that depression has more than double the statical strength compared with pain. These differences are even more significant when considering the strong association between pain and psychological distress. Pain was associated with lower income (significant) and to a lesser extent with lower levels of education (not significant). Higher levels of pain were also associated with lower

percentage of life in Australia and with involvement in heavy work. These two variables have been discussed and their association has been explained by the assumption of migrants engaging in more physically demanding employment. Finally, living alone was also associated with higher levels of pain.

There were differences in the relationship of pain and disability with other indicators. The fact that depression (a psychological indicator) has a stronger predicting power and relationship with disability (a measure of functional ability) than pain may shed light into the nature and reality of CBP. A more detailed examination of these findings is necessary in order to discuss the interaction between pain and disability and the role of depression in this relationship. Level of pain increased with every increase of level of depression reported. The mean level of pain was doubled for those with severe depression compared with those with no depression and even higher for those with extremely severe depression. This gradual increase was also observed when level of pain was measured by severity of disability, but the increases (although statistically significant) appeared to be of smaller percentages. Higher levels of pain have been associated with all markers with different degrees of significance. While women reported higher levels of pain this difference was modest. These findings coincided with some of the existing literature (Walker, 2004; Jones and Zachariae, 2004) but there were not as strong as differences found by others (Unruh, 1996; Weisse, Foster and Fisher, 2005 and Winjhoven et al, 2007). Perhaps the best way to explain the differences for pain by sex is following the definition of “fuzzy” by Sheffer, Cassisi, Ferraresi, Lofland and McCracken (2002).

Differences by age were also inconclusive in relation to pain in a similar manner as age differences by disability. The present findings are at odds with theories based on the Medical Model that would suggest higher levels of pain and disability with increasing age. On the contrary, there were no significant pain differences by age groups. In fact, the 31 to 60-year-

old group reported the higher level of pain followed by the under 30 years of age and with the under 30 reported marginally higher pain than those over 61 years of age. Again, it was important to reflect on these findings given the overwhelming evidence pointing to a gradual deterioration and degeneration leading to higher levels of pain with ageing (Marieb, 2001, Saladin 2004). Finally, these findings appear to follow in line with Wadell (2004) who found that middle-aged people were more likely to suffer “ordinary back pain” due to strains and disc injuries. Other explanations may be attributed to methodological issues given the exclusion criteria for this study which may have favoured a mechanical/strain type of injury as sufferers from so-called “red flags” were excluded.

It was important to reflect on the fact that experience of pain and the reporting of pain is subjective and influenced by emotional or psychological factors. Having discussed the role of depression in the experience of chronic pain there cannot be an absolute certainty about a directional causality between these two variables. Katon, Kleinman and Rosen (1982) and later Ruby, Kerns and Turk (1998) theorised that depression follows back pain but obtained inconclusive findings. Gatchel et al (2007) also indicated that depression may contribute to the progression from acute to CBP. Gatchel et al also stated that pre-existing psychological distress may be a marker of the severity and duration of pain. In addition, these authors advocated for a multifactorial relationship between depression and pain in which emotional distress may be a modulating factor (reducing or amplifying pain) be a consequence of pain or a perpetuating factor. This complicated relationship may be the key to explaining the true nature of chronic pain irrespective of the causal direction.

#### **4.3.16 Duration of Pain.**

Duration of pain was found to be a significant marker of disability. Pain duration was also significantly correlated with disability. More precisely, there were significant differences

between those with mild levels of disability and those having moderate or severe disability with those with higher disability reporting a longer duration of pain. In addition to the significant findings in relation to duration of pain and disability there were also relationships noted by this analysis that offered a more novel insight into the relationship of duration of pain and other BPS factors. This novel insight explored the association between duration of pain and psychosocial indicators. Duration of pain significantly correlated with level of education and social support. These associations not only highlighted the complexity of CBP but may assist to a more comprehensive understanding of the role of underlying factors that may prolong the duration of this condition. As stated previously level of education has been identified as one of the more reliable and solid indicators of SES. The literature research has widely identified a link between lower levels of education and higher levels of disability. Findings in regards to the relationship between level of education and overall number of sessions for treatments may assist in providing an explanation to the interaction between level of education and disability. Given that this sample excluded any “red flags” or congenital conditions participants it can be safely assumed that attaining a higher level of education was not influenced or hindered by CBP and this most likely would have presented after the individual had completed their formative years.

#### **4.3.17 Overall number of Treatment Sessions.**

Overall number of treatment sessions was negatively correlated (moderate) with disability. There were also strong correlations with depression (negative) and education (positive). An analysis of variance by three groups according to disability showed significant and very marked differences in relation to number of sessions. Participants within the mild disability group had double the number of sessions (mean) than those in the moderate disability group and triple the number of sessions than those in the severe disability group. There was an

anomaly in relation to the path analysis (initial) as it showed a positive relationship between number of sessions and disability. This was inconsistent with previous analyses within this study and was it was eliminated in the final model. Further analysis was conducted splitting the data in two groups: primary/secondary educated and tertiary educated. This analysis showed that that there was a positive relationship for the primary/secondary group and negative relationship for the tertiary educated group (both not statistically significant). The explanation for this anomaly lies within the two main influencers of number of treatment sessions education and depression. One positive and one negative they collide statistically rendering the analysis with a very limited value. However, the strong findings from analysis of variance indicates that those in higher need of treatment are actually receiving less of it. In fact, the interaction between education and depression may be the key to explain the relationship between number of treatments sessions and disability. Another analysis of variance by three levels of education showed that those with lower levels of education received fewer treatments.

Participants with tertiary education reported receiving six times more than those with secondary education and ten times compared with those with primary education. On the other hand, another analysis of variance by three levels of depression showed that those with a normal level of depression had a much higher number than those in the mild-moderate range and nearly three times the number compared with those in the severe-extremely severe range. The evidence was therefore overwhelming. Depression levels interfere and hindrance the number of treatment sessions received this was not only ascertained by the findings but also widely accepted in the current literature. Previous research attributed this interference to different cognitive influences. Arneisten (1999) stated that depression causes lower self-efficacy, Pincus and Morley (2001) theorised on the fact that individuals suffering from depression have “biased schemas” that impact on adequate cognitive function. Ulrich et al.



(2007) explored the role of catastrophising for depressive individuals and Keely et al. (2008) investigated the presence of fear-avoidance and social stressors affecting them. It was unclear which underlying mechanism explain the influence of depression in accessing treatments or health care. The very diagnostic criteria for depression (DSM 5) include most of the symptoms previously mentioned and includes an implicit lack of motivation and ongoing doom that may deter the sufferer from engaging in treatments or taking the necessary lifestyle measures to gain functionality and richer lives. In contrast, higher education has been widely identified as increasing levels of health literacy and better functionality overall.

#### **4.3.18 Number of sessions for physical therapies.**

In order to obtain a wider and deeper understanding of the access to treatments a new variable was created to focus in treatments that may require a more active approach and a higher level of motivation. Findings for this variable were in line with the expectations and hypothesis in relation to the overall number of treatment sessions. Independent *t*-tests showed that women, higher income earners, tertiary educated, working participants and those living in company had significantly higher number of sessions for physical therapies. Those with English as their first language and those involved in lighter employment had also a large number of physical therapies (not statistically significant). The number of physical therapies was moderately negatively correlated with disability. However, this measure was not significantly correlated to the overall number of treatment sessions. Findings for an analysis of variances showed major differences in relation to physical therapies by level of disability. Those with low level of disability reported four times more sessions than those with moderate level and more than 20 times than those with severe disability. In the same manner, findings by level of education showed that tertiary educated participants received more than double than those with secondary education and 6 times more than those primary educated.

Another ANOVA by level of depression showed differences that did not attain statistical significance, but were however present, in particular those with normal levels of depression had a higher number of physical therapies than those within the severe-extremely severe depression group. These findings offer an alternative view and provide a richer understanding in relation to treatment seeking for those experiencing CBP. In addition, the large differences observed in relation to levels of disability indicated that those reporting higher level of disability and higher levels of depression may also be giving up in these interventions. This could confirm the pervasive and circular nature of CBP and identify this group as particular vulnerable one. Sufferers report higher physical and psychological distress but also because they appear to be in a dead end with little possibility of improvement. Participation in physical therapies may not only be advantageous in terms of gaining physical functionality but also contact with health professionals may assist with obtaining advice about lifestyle changes and implementing other interventions such as prescribed home exercises as well as back education to avoid further aggravation of pain. One of the explanations for low participation in physical therapies may lay in the fact that the health professionals involved may have limited resources to treat CBP patients. Synott et al (2015) called for physiotherapists to receive additional training and more precisely to receive “live” training with CLBP. They found that physiotherapists felt unprepared to identify and treat psychosocial barriers that were a clear obstacle for participation and efficiency of their treatments. These findings support the concept of the inability of the Medical Model in relation to CBP. While training physiotherapists was a worthwhile and logical suggestion it appears to be a complicated path. Since most of the barriers identified by these studies are psychological and social it would more efficacious to use professionally trained therapists in this field to work in conjunction and coordination with physiotherapists. Gatchell et al. (2011) advocated for interdisciplinary treatments for CBP. These treatments are provided by

a range of physical and psychological professionals operating under the principles of the BPS Model of health. Gatchell et al. emphasised that this approach has proven more efficacious in terms of recovery and functionality gains. Without psychological and social interventions there is little chance of success for CBP sufferers.

In addition, these findings are in line with findings by Valencia, Robinson and George (2011). These authors found that fear avoidance measures were associated with disability for participants with lower SES. While this study did not explore fear avoidance there is a clear indication that individuals with lower SES status have higher levels of fear avoidance and pain catastrophising which may become deterrants in relation to treatment seeking and participation.

#### **4.4 Strengths and Limitations**

This study has several strengths which had contributed greatly to the robustness of its findings and its overall internal consistency. Given the variety of data collect this study presents a moderately large sample. The internal consistency is widely demonstrated by the highly concurrent findings with multilevel statistical analyses that show unswerving findings at all levels. In addition, the multilevel analyses yield interesting findings far beyond the initial research questions and hypotheses.

Another strength of this research was the use of multiple socio-economic indicators that have a dual purpose. Firstly, all findings for these indicators were consistent adding robustness to the current findings. Secondly, these findings were also consistent with previous findings and in agreement with the theoretical propositions of the BPS Model and the Theory of Social Causation. In the same manner, the internal consistency of these findings was reinforced by the fact that all findings relating to psychological markers systematically moved in the same direction. This strong internal consistency vindicates the

use of multiple sources of data which has also allowed a deeper and more multifaceted analysis of the experience of CBP.

A new variable was created: “percentage of life in Australia” in order to obtain more accurate information and how this factor contributed to the chronicity of back pain. Previous studies focussed in “country of birth” or preferred language. The data from this variable and that from first language spoken offer a wider view of cultural issues. Percentage of life in Australia alone does not consider the migrants from English speaking countries.

Living arrangements proved to yield very interesting findings. Previous studies tended to focus on marital status rather than living arrangements. However, single, divorced or widow participants may live in company and received meaningful social support. Living arrangements measures has contributed to present a richer view of social support.

This study also provided new findings in relation to treatments and the influence of BPS factors in relation to treatments. These finding shed new light in explaining the mediating effects of treatments between psychosocial factors and disability. Furthermore, findings for relationship between psychosocial factors and disability are consistent with previous findings and theories of social causation.

This study also had limitations that require discussion. This study had a participation rate of less than 50%. This low participation may be attributed to recruitment issues as the questionnaires were given to health professionals to pass onto their patients. There were several steps taken to improve participation rate but not incentives were offered to participants. The test battery was piloted and the completion of the whole battery lasted between 30 to 40 minutes which it can also be considered as a deterrent to complete. All procedures recommended by Victoria University were implemented (aims for the study were explained clearly, a stamped self-addressed envelope was provided, all questionnaires have been widely used and have clearly listed questions).

Another limitation is that this study relied completely in self-reported information which may be influenced by subjective perception of the variables. However, previous studies in similar fields have also relied in reported information and in particular in relation to pain, psychological distress and disability which are subjective in nature. While there was no opportunity to verify diagnoses, the main aims of this study were not focussed in the causes of the pain but rather in its chronic nature.

#### **4.5 Applications**

The findings and discussion from this study set the basis for the creation of a new comprehensive tool to measure chronic pain. In addition, these findings have provided empirical and theoretical evidence towards a differential diagnosis of CBP to replace the existing one that considers it as longer lasting acute pain. Furthermore, they have provided additional support and to the Biopsychosocial Model of Health and the Theory of Social Causation. In fact, not only these findings confirmed the validity of both theoretical propositions but also utilize their framework in shedding light on treatment participation. Furthermore, we have established a clear connection between socio-economic factors and service utilization within an Australian sample. While previous research had established the connection between psychosocial factors in disability this study furthers the knowledge in this area contributing to a better understanding of the experience of chronic pain. Findings in relation to treatments provided a clear explanation of the reasons for the chronicity of back pain. The evidence provided has shown that individuals with higher levels of pain receive indeed fewer treatments perpetuating the incidence of back pain and its chronicity.

Level of education has been identified as a solid marker of the level of treatments received and not surprisingly level of disability both in physical and psychological terms. In addition, this group reported fewer treatments overall and minimal psychological interventions. These

findings contributed to identify at-risk populations such as lowered educated sufferer in both targeting higher levels of participation and tailoring the treatment to meet their needs ensuring prolonged and effective participation increasing functionality and decreasing recovery times.

The current findings have confirmed the multifaceted nature of CBP and by default advocated for a multidisciplinary style of treatments. There is a strong support for the need to address chronic back effectively by targeting all aspects of this condition to achieve efficacious outcomes. This research provided a novel and unique insight with significant and consistent findings in regards to the role of social support and more precisely the influence of “living alone” contributing to treatment participation and level of disability. Living alone was found to be associated with physical pain, psychological distress leading to lower levels of treatment and higher disability. In line with previously outlined support for the Biopsychosocial Model and in light of these convincing findings it is evident that social part of the chronic pain experience plays a pivotal role that needs to be addressed.

Multidisciplinary treatments contain physical and psychological elements, but there is virtual no evidence of social interventions to address CBP in the literature. Whether social support and living arrangements influenced the two dependent variables directly or indirectly via impacting on psychological distress remain unclear. However, their influence is undeniable and the need for treatments that include social interventions appears to be paramount to achieve positive outcomes both increasing treatment participation and reducing the impact of CBP on individuals’ everyday functioning.

Finally, the main implication of this study is the fact that those with higher levels of pain, psychological distress and disability are the ones receiving fewer treatments. This is even more evident in relation to depression. Given the intrinsic nature of depression in the

experience of chronic back these findings will suggest that a much more active and direct psychotherapeutic approach is required in this field.

#### **4.6 Recommendations for future research**

Further investigations in relation to coping strategies, motivational factors and catastrophising differences by BPS indicators are necessary to further understand the nature of the relationship between those indicators and physical and/or psychological impairment. There is also strong support for the creation of a new multifactorial measuring tool that encompasses all areas of disability. This tool would include physical, psychological and social indicators in line with the theoretical premises of the Biopsychosocial Model.

Further research is also recommended in the area of CBP. Findings showed major differences between acute pain and CBP. This research will have to focus in two main areas. The diagnosis of CBP as an independent condition and the formulation of treatment specifically targeted to remedy the cluster of symptoms and functional restrictions relevant to it.

Finally, further research in relation to psychological interventions that include pre and post measures is warranted to evaluate the benefits of psychotherapy in assisting sufferers in gaining higher level of physical and psychological functioning.

#### **4.7 Conclusion**

In light of the findings and previous discussion there were grounds to advocate for a new concept of disability that includes measures of physical and emotional impairment. This new concept will measure a global loss of functioning given the evidence of how emotional and physical symptoms interact to impact on the back pain sufferer. In addition, these findings added support for the consideration of CBP as a condition different from acute pain given its unique presentation and symptomatology and prognosis. Given these notable differences in

diagnosis and prognosis, it is essential that the therapeutic approach to CBP also differs from the treatment of pain as outlined in the Medical Model. Given the multifaceted aspects of disability caused by CBP, a multifaceted treatment design is required in order to address both physical and psychological symptoms of this condition. Furthermore, the findings reinforce the postulates of the Social Causation Theory (Warren, 2009) in relation to the impact of socio-demographic markers on disability (including both physical and psychological). The findings of this study confirm the Biopsychosocial Model of Health (Gatchel, 2004b; Gatchel et al., 2007; Gatchel and Kishino, 2011; Lumley et al., 2011; Pincus and Morley, 2011; Romano et al., 2000; Synott et al., 2015; Turk and Gatchel, 1999; Waddell, 1987 and Waddell, 2004) as the most appropriate theoretical background in the context of CBP.

This study offered a new insight into the care seeking of CBP sufferers with a BPS analysis of contributing factors. This analysis will assist in the formulation of treatments and the targeting of particular groups in order to improve outcomes for sufferers. Level of education, social support (including living arrangements) and psychological indicators have been established as significant and important determinants of the level of engagement in treatments. While the relationship between BPS variables and disability had been examined by previous studies, this study offers a unique perspective in the factors influencing service utilization. Furthermore, these findings assist in exploring relationships between psychosocial factors and levels of disability. Despite the high incidence of depression there were only a small number of participants that had received psychotherapy.

The findings highlighted an association between BPS factors and number of treatment sessions received. These treatments (or lack thereof) were also associated with higher levels of disability. Previous literature has widely accepted an association and relationship between psychosocial factors disability. The contribution of this research lays in exposing the role of treatments in the relation to psychosocial factors and disability. *The consistent nature of*



*these findings demonstrated that participants who were socio-economically disadvantaged and psychologically distressed not only had higher levels of disability but also received fewer treatments. In addition, this group also reported a longer duration of back pain. Further research is required in order to focus in the relationship between treatments and the transition from acute to chronic back pain.*

The level of participation in treatments was influenced by psychosocial factors rather than the level of pain experienced by participants. In the same manner, these factors also influenced the level of disability more strongly than the level of pain. These findings were in line with previous research (Gatchel et al, 2007) that indicated that the level of impairment or disability of an individual was more highly influenced by personal factors than the original injury (physical cause of pain). Therefore, the experience of chronic pain and all its implications is shaped by the individual's ability to deal with the original physical source of pain. This ability, determined by his or her own psychosocial reality, will certainly influence the transition from a short episode of acute pain related to a physical injury to a long term and chronic experience of pain even when the physical impact of this injury has resolved. One of the main reasons for the differences in this experience is the ability for an individual to deal effectively and promptly with the reality of acute pain. This research did not intend to find a directional causality between psychosocial factors and both number of treatment sessions and disability. It is possible that many psychosocial disadvantages are caused by chronic pain and loss of functionality. However, the role of education level and its strong impact on both research questions of this study may lead to recognise a directional relationship between this variable and chronic pain. There were several factors to support this theory. Education level has been found not only to be a stable marker of SES as once attained it cannot decrease or be lost in the presence of injury, disease or impairment. In addition, most individual complete their highest education levels before the occurrence of back injury (in most cases back

injuries or complaints occur in mid adulthood) clearly indicating that education level precede back pain. Furthermore, the findings indicated a robust and constant level of consistency and interrelatedness between education levels and other socio-economic indicators. Finally, education level was also consistent in relation to social, cultural and psychological measures with lower levels of education being associated with lower social support, lower degree of acculturation and higher psychological distress at all level of analysis. The existing literature overwhelmingly supported these findings in all areas. Therefore, and in absence of any other plausible explanation, it can be stated that individuals with lower levels of education are at much higher risk of experiencing CBP. In addition, it can also be stated that one the main reasons for this higher risk is the fact that individuals with lower levels engage in fewer number of treatment sessions which contributes to the lengthening of the experience of back pain leading to chronicity and further impairment.

Participation in treatment is in fact the key in preventing the transition from acute to chronic pain as mentioned earlier. Acute and chronic pains are two very different conditions. While the experience of acute pain is mainly determined by an identifiable source of pain, chronic pain has a social and psychological idiosyncrasy that overtakes the role of physical pain. This research did not intend to establish a causal relationship between psychological distress and CBP. Psychological distress, CBP and disability are so interrelated that despite multiple attempts previous literature has failed to find a causal relationship between them. This study focuses in highlighting the role of psychological distress as a core element of the experience of CBP and disability irrespective of causality and direction. Individuals suffering CBP are not only limited by physical dysfunction but also and perhaps more importantly limited by psychological distress.

Given the facts that acute and chronic pain are two different experiences each with different presentation and symptomatology there are several considerations in relation to

treatments that need to be made. Firstly, for individuals with acute pain it would be advantageous to have interventions with a focus on physical treatment. In particular early intervention for initial injury to ensure a prompt resolution and avoid a progression to a chronic phase. Secondly, for individuals already in a chronic stage there should be an emphasis in treating their psychological distress given the fact that psychological distress can not only magnify their actual pain but also can interfere on their cognitive ability preventing them from engaging in physical rehabilitation.

Despite the extremely high prevalence of CBP and the cost of this condition there are no specific diagnostic tools to diagnose it. The main diagnostic criteria to differentiate acute from chronic is duration, with most authors indicating that pain lasting for more than 6 months is to be considered chronic (some argued for a 3 months marker). The literature researched and the findings of this study clearly identified the strong presence of psychological distress as a pivotal component of chronic pain. In addition, many others have discussed that CBP appeared when the individual's symptoms fail to respond to the traditional medical model and its approach of diagnosis, treatment and recovery. This study utilises some of the most popular and widely used tools and questionnaires to measure, sociodemographic data, pain, disability, social support and psychological distress. Most studies for chronic pain also utilised a series of questionnaires to obtain information from a variety of elements present in the chronic pain experience. Despite an exhaustive search of the current literature there is no current tool or questionnaire specifically designed to encompass all areas involved in chronic pain. Perhaps, one of the reasons for the absence of this tool is the lack of uniformity in the diagnostic criteria for chronic pain and more in particular for CBP.

In conclusion, chronic back pain appears to have its own symptomatology that requires a specific diagnosis and treatment design.



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## **Appendices**

## Living with Back Pain: A Biopsychosocial Analysis of Contributing Factors.

### Gender

☐ Male ☐ Female

Age\_\_\_\_\_ (in years)

### Country of Birth

☐ Australia ☐ Other (please specify) \_\_\_\_\_

☐ Length of residence in Australia \_\_\_\_\_

First Language Spoken \_\_\_\_\_

Second Language Spoken\_\_\_\_\_

### Occupational status

☐ Fulltime ☐ Part-time ☐ Unemployed ☐ Retired

☐ Welfare ☐ Other (please specify) .....

### Employment Experience

☐ Services ☐ Manufacturing ☐ Construction ☐ Government

### Socio-economic status (income in dollars per year)

☐ 0-19,999 ☐ 20-39,999 ☐ 40-60,000 ☐ over 60,001

### Level of education

☐ Primary ☐ Secondary ☐ Tertiary ☐ Other\_\_\_\_\_

### Duration of pain experience

☐ 0 – 3 mths ☐ 3 – 6 mths ☐ 6 - 24 mths ☐ over 24 mths

### Diagnosis

☐ Sciatica ☐ Herniated disk ☐ Prolapsed disk ☐ Bulging disk

☐ Spondylosis ☐ Lordosis ☐ Osteoporosis ☐ Arthritis

## Living with Back Pain: A Biopsychosocial Analysis of Contributing Factors.

☐ Degenerative disease      ☐ Other (please specify) \_\_\_\_\_

Treatment/s	*Commenced Treatment	Number of Sessions	*Ceased Treatment
Surgery			
Medication			
Physiotherapy			
Chiropractic			
Acupuncture			
Hydrotherapy			
Massage			
Exercise			
Naturopath			
Psychologist			

## Living with Back Pain: A Biopsychosocial Analysis of Contributing Factors.

Psychiatrist			
Counsellor			
Hypnotherapist			
Other (please specify)			

\* Please specify approximate dates