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THE PREVALENCE OF FEAR AVOIDANCE AND PAIN CATASTROPHISING IN PATIENTS WITH CHRONIC NECK PAIN ATTENDING PRIVATE PHYSIOTHERAPY IN JOHANNESBURG

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A Research Report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirement for the degree

of

Master of Science in Physiotherapy

Johannesburg, 2017

DECLARATION

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



……

Signature

20th day of November, 2017.

ABSTRACT

Background: The cognitive elements of fear avoidance and pain catastrophising in individuals suffering from chronic pain, including chronic low back pain and chronic musculoskeletal conditions, have been found to be significant impediments to recovery. However, little is known about the influence of fear avoidance and pain catastrophising on chronic non-specific neck pain, especially in the context of a South African population.

The purpose of this study was to determine the prevalence of fear avoidance and pain catastrophising in patients suffering from chronic neck pain of three or more months' duration who were attending physiotherapy in private clinics in Johannesburg, South Africa. The objectives of this study were to establish the prevalence of fear avoidance, the prevalence of pain catastrophising, and to establish the association between demographic variables and fear avoidance and pain catastrophising respectively.

Methods: In order to fulfil the objectives, a cross-sectional design was used on the basis of the validated Tampa Scale for Kinesiophobia-11 (TSK-11) and the Pain Catastrophising Scale (PCS) questionnaires to determine the prevalence of fear avoidance and pain catastrophising respectively in patients suffering with chronic neck pain. The patients were sampled sequentially from randomly selected private practices in Johannesburg, South Africa, with the particular focus being on musculoskeletal conditions. The demographic data included gender, age, pain intensity, marital status, highest level of education attained, employment status, duration of neck pain, and whether or not the participant had had to reduce his/her work load as a result of the pain experienced. These factors were tested in terms of their association between fear avoidance and pain catastrophising respectively, and of the association between fear avoidance and pain catastrophising itself. A total of 106 participants were interviewed. The data from the questionnaires and the demographic questionnaires were analysed using Statistica, version 12. The results were considered significant when p-values of <0.05 were attained.

Results: A total of 106 participants with a mean age of 48.7 years (SD=14.8; range 20-80 years) were drawn sequentially from a randomly selected total of 25 private practices. Female participants constituted 81.1% (n=86) of the total participants and 76.4% had some form of tertiary education. The majority (76.4%) were working and most (79.2%) had not reduced their work load as a result of their pain. Many participants were in a relationship (67.9%) and the pain intensity showed a mean of 4.4 on the VAS (SD=2.2; range 0.3-8.7),

with the median pain duration being 96 months (8 years) (IQR=30-180 months) (2.5-15 years); range 3-756 months (0.25-63 years)).

The TSK-11–Total showed a mean score of 22.9 and 25.5% of the participants (n=106) presented with significant fear avoidance measured on theTSK-11-Total scale. The prevalence was based on a cut-off equivalent to the midpoint scale. The median score for the PCS-Total was 12. The prevalence of clinically relevant scores for the PCS-Total was 15.1% (n=106) of the population studied, based on a cut-off score of ≥=30. There was a significant, positive correlation between the TSK-Total and the PCS-Total and its subscales; and between the TSK-SF and the PCS-Total and its subscales.

Significant association was found between the highest level of education and the TSK-11-Total score. The mean TSK-11 score for those with secondary education (26.0 ± 3.4) was higher than that for patients with a tertiary education (21.9 ± 1.5), indicating that those with a secondary education were more likely to be fear avoidant than those with a tertiary education.

There was a significant, positive correlation between pain intensity and the TSK-Total score, and a significant positive correlation between pain intensity and the PCS-Total score. No significant association was found for fear avoidance and pain catastrophising in respect of any of the other demographic variables.

Conclusion: This prevalence study established that of the sample of adults attending physiotherapy for chronic non-specific neck pain, 25.5% suffer from fear avoidance and 15.1% suffer from pain catastrophising. An association was found between the total scores for fear avoidance and pain catastrophising. Furthermore, an association was also found between fear avoidance and its subscale, somatic focus, and between pain catastrophising and all its subscales, namely rumination, magnification and helplessness. Yet another positive association was found between secondary education and fear avoidance, and a positive correlation between pain intensity and both fear avoidance and pain catastrophising respectively.

Key words: prevalence, fear avoidance, pain catastrophising, pain, chronic non-specific neck pain, private practice, South Africa.

DEDICATION

I dedicate this work to my patients,
who have opened a window into their pain experience so that I can begin to understand what it means to be in pain, in all its varying forms.

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- Associate Professor Hellen Myezwa and Professor Mary Lou Galantino, my supervisors, for guiding me through this project.

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TABLE OF CONTENTS

		Page
	Declaration…….……..	ii
	Abstract……..……	iii
	Dedication……..……	v
	Acknowledgements.....……....	vi
	Table of Contents……..…….....	vii
	List of Tables……..……...	x
	List of Figures……..…….	xi
	List of Abbreviations……..…….....	xii
1.1	**Chapter One: Introduction**.....	1
1.1.2	Definition of Chronic Pain……	1
1.1.3	The Problem of Chronic Pain……..	2
1.1.4	The Prevalence of Chronic Pain…….	3
1.1.5	Management Approaches to Chronic Pain and Their Shortcomings……	4
1.1.5.1	The Interdisciplinary Approach……	5
1.1.5.2	The Biopsychosocial Approach in the Treatment of Chronic Pain: Self Management……..	5
1.1.6	Fear Avoidance and Chronic Pain…….	6
1.1.7	Pain Catastrophising and Chronic Pain…….	6
1.1.8	Fear Avoidance and Pain Catastrophising Beliefs……	7
1.1.9	Tests for Measuring Fear Avoidance and Pain Catastrophising……	7
1.2	Statement of Significance.....……..	8
1.3	Aim of the Study.....…….....	9
1.4	Objectives.....…….....	9
1.5	Overview of Research Report.....……..	9
2.	**Chapter Two: Literature Review**…….....	10
2.1	Introduction.....…….....	10
2.2	Neck Pain.....…….....	12
2.3	Disability and Its Impact……...	12
2.4	Clinical Predictors of Persistent Pain…….	14
2.5	Chronic Neck Pain.....…….....	15
2.5.1	Cognitive Factors Associated with Chronic Neck Pain……...	17
2.6	Fear Avoidance.....…….....	19
2.6.1	Fear Avoidance and Neck Pain.....…….	22
2.7	Pain Catastrophising.....……...	24
2.7.1	Catastrophising and Pain.....……...	25
2.8	Fear Avoidance, Pain Catastrophising and Chronic Neck Pain……	28
2.9	Fear Avoidance, Pain Catastrophising and Physical Activity and Disability…….	30
2.10	Review of the Methodology.....…….	31
2.10.1	Visual Analogue Scale.....……	32
2.10.2	Tampa Scale for Kinesiophobia (TSK)…..…….....	33

		Page
2.10.3	Pain Catastrophising Scale (PCS)……....	37
2.10.4	Demographic Variables……	39
2.11	Conclusion.....…….....	40
3.	**Chapter Three: Methodology**…….....	41
3.1	Introduction.....…….....	41
3.2	Study Design.....…….....	42
3.3	Ethical Clearance.....…….....	42
3.4	Confidentiality.....…….....	42
3.5	Study Period.....…….....	42
3.6	Sample.....…….....	43
3.6.1	Sample Frame.....…….....	43
3.6.2	Sampling.....…….....	43
3.6.3	Sample Size.....…….....	43
3.6.4	Sampling.....…….....	44
3.7	Study Variables and Questionnaires.....…….....	44
3.7.1	Validity and Reliability of the Study Questionnaires.....……..	45
3.8	Procedure.....…….....	45
3.8.1	How Practices were Approached.....……..	45
3.8.2	Pilot Study.....……....	45
3.8.3	Main Study.....…….....	47
3.8.3.1	How the Participants were Approached.....……..	47
3.9	Analysis of Data.....…….....	47
3.10	Summary.....…….....	49
4.	**Chapter Four: Results**…….....	50
4.1	Introduction.....…….....	50
4.2	Results of the Pilot Study.....…….....	50
4.3	Results of the Main Study.....…….....	50
4.3.1	Demographic Information.....…….....	51
4.3.1.1	Pain Behaviour.....…….....	53
4.3.2	TSK-11-Total and its two Subscales: TSK-SF and TSK-AA…….	54
4.3.3	PCS and its three Subscales: PCS-R, PCS-M and PCS-H……...	55
4.3.4	Prevalence of Fear Avoidance and Pain Catastrophising……..	56
4.3.4.1	The Prevalence of Fear Avoidance and its Subscales of Somatic Focus and Activity Avoidance in the Study Group……	56
4.3.4.2	The Prevalence of Pain Catastrophising and its Subscales of Rumination, Magnification and Helplessness in the Study Group……	57
4.3.5	Associations between Study Variables.....……	58
4.3.5.1	The Association between Fear Avoidance and Pain Catastrophising…..	58
4.3.6	The Association between the Demographic Variables, as well as Pain Intensity on the one hand, and Fear Avoidance and Pain Catastrophising on the other.....……	59
4.3.6.1	The Association between the Categorical Demographic Variables on	

		Page
	the one hand, and Fear Avoidance and Pain Catastrophising on the other.....	59
4.3.6.2	The Association between the Highest Level of Education and the TSK-Total ……	60
4.3.6.3	The Association between Pain Intensity and the TSK-Total and the PCS-Total respectively ……	61
4.4	Summary of Results.....	61
5.	**Chapter Five: Discussion**.....	63
5.1.1	Introduction……	63
5.1.2	Prevalence of Fear Avoidance and its Clinical Implications……..	63
5.1.3	Prevalence of Pain Catastrophising and its Clinical Implications……..	67
5.1.4	Pain, Fear Avoidance and Pain Catastrophising…….	68
5.1.5	Demographic Variables Affecting Fear Avoidance and Pain Catastrophising…….	69
5.1.5.1	Gender……	69
5.1.5.2	Age……..	70
5.1.5.3	Socioeconomic Status (income, level of education, employment status)	71
5.1.5.4	Sociodemographic Variables……..	75
5.1.6	Subscale Analysis……	76
5.1.7	Discussion of Correlations……...	78
5.1.8	Reliability Scores of the Study……	80
5.2	Key Findings.....	80
5.3	Clinical Implications.....	81
5.4	Limitations of this Study.....	83
6.	**Chapter Six: Conclusion**.....	86
6.1	Recommendations for further Research.....	89
7.	**References**.....	91
Appendix A	: Data Collection Form.....	101
Appendix B	: TSK-11 Form.....	104
Appendix C	: PCS-EN Form.....	105
Appendix D	: Ethical Clearance Form.....	106
Appendix E	: Participant Information Form.....	107
Appendix F	: Consent Form.....	110
Appendix G	: Letter to the Physiotherapy Practice.....	112
Appendix H	: Letter of Request.....	115
Appendix I	: Checklist for Physiotherapist/Researcher…..…….….....	116
Appendix J	: Form B – Practice Details and Data Records.....…….....	119
Appendix K	: Scatterplots Showing Correlation between TSK-11-TOTAL and PCS Subscales and TSK-SF and PCS-Total and its Subscales…	120
Appendix L	: Turn-It-In Report……	127

LIST OF TABLES

			Page
Table 4.1	:	The Demographic Profile of the Participants (n=106)……..	51
Table 4.2	:	The Ranges of Scores around the Mean and Median of the TSK and its Subscales, including the IQR and SD)…….....	55
Table 4.3	:	Cronbach's Alpha of TSK-11-Total and its Subscales……..……..	55
Table 4.4	:	Cronbach's Alpha of PCS and its Subscales…….....	56
Table 4.5	:	The Prevalence and CI of TSK-11 and its Subsets using the Scale Midpoint as a Cut-Off……..…….....	57
Table 4.6	:	The Prevalence and CI of PCS and its Subscales using the Clinically Relevant Scores (Sullivan et al., 1995)…….....	58
Table 4.7	:	Correlation between TSK and PCS Scales and their Subscales where p<0.0001 in all 12 Cases……..…….....	58
Table 4.8	:	Association between TSK and PCS and Demographic Variables…..	59

LIST OF FIGURES

			Page
Figure 4.1	:	Distribution of the Age of Participants…….…….....	52
Figure 4.2	:	Pain Duration……..……..…….....	53
Figure 4.3	:	Pain Intensity……..……..…….....	53
Figure 4.4	:	TSK-11-Total Score……..……..…….....	54
Figure 4.5	:	TSK-SF……..……..…….....	54
Figure 4.6	:	TSK-AA……..……..…….....	54
Figure 4.7	:	PCS - Total Score Distribution……..…….....	55
Figure 4.8	:	PCS - R Score Distribution……..…….....	55
Figure 4.9	:	PCS - M Score Distribution……..…….....	56
Figure 4.10	:	PCS - H Score Distribution……..…….....	56
Figure 4.11	:	Scatterplot Indicating the Correlation between TSK-11-Total and PSC-Total……..……..…….....	58
Figure 4.12	:	Association between Highest Level of Education and mean TSK-11-Total Score……..……..…….....	60
Figure 4.13	:	Scatterplot Shows Correlation between TSK-Total and Pain Intensity……..……..…….....	61
Figure 4.14	:	Scatterplot Shows Correlation between PCS-Total and Pain Intensity……..……..…….....	61

LIST OF ABBREVIATIONS

ADL – Activities of Daily Living
BDI-II – Beck Depression Inventory
CI – Confidence Interval
FABQ – Fear Avoidance Beliefs Questionnaire
FAPQ – Fear Avoidance of Pain Questionnaire
FPQ – Fear of Pain Questionnaire
GNP – Gross National Product
HLOE – Highest Level of Education
IAPT – Individually-administered Physiotherapy
IASP – International Association for the Study of Pain
ICC – Intraclass Correlation Coefficient
IBMT – Intensive Behavioural Modification Therapy
IQR – Interquartile Range
MCIC – Minimal Clinical Important Change
MCID – Minimal Clinical Important Difference
mFABQ – Modified Fear Avoidance Beliefs Questionnaire
MRI – Magnetic Resonance Imaging
NDI – Neck Disability Index
OA – Osteoarthritis
OMPTG of the SASP – Orthopaedic Manipulative Physiotherapy Group of the South African Society of Physiotherapy
PASS – Pain And Stress Self-management
PCS – Pain Catastrophising Scale
PCS-EN – Pain Catastrophising Scale – English
PCS-H – Pain Catastrophising Scale – Subscale of Helplessness
PCS-M – Pain Catastrophising Scale – Subscale of Magnification
PCS-R – Pain Catastrophising Scale – Subscale of Rumination
SD – Standard Deviation
SEM – Standard Error of the Mean
SES – Socioeconomic Status
SF – Somatic Focus
SRM – Standard Response Mean
TSK – Tampa Scale for Kinesiophobia
TSK-AA – Tampa Scale for Kinesiophobia – Subscale of Activity Avoidance
TSK-SF – Tampa Scale for Kinesiophobia – Subscale of Somatic Focus
VAS – Visual Analogue Scale
WAD – Whiplash Associated Disorders

CHAPTER ONE

1.1 INTRODUCTION

Pain is a complex but common condition which has been experienced by mankind since the beginning of time but it is only recently that its physiology has begun to be understood (Meldrum, 2003). Pain is described in the International Association for the Study of Pain (IASP) 2011 Taxonomy as, “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage” (IASP Task Force on Taxonomy, 1994). Historically, throughout the 19th century and into the early 20th century, opiates were used to treat acute and recurrent pain. Chronic “pain without lesion”, however, often did not respond to opiates (Meldrum, 2003). It was during World War II that doctors, such as Henry Beecher, while working with seriously wounded soldiers, began to recognise that physical pain was a complex phenomenon where an individual’s cognitive, emotional and physical aspects needed to be addressed (Meldrum, 2003). This understanding was the first serious recognition by the medical profession of the necessity for a biopsychosocial approach to the treatment of chronic pain. In order to address chronic pain as distinct from acute pain, the first multidisciplinary practice was established directly after the Second World War (Loeser, 2005).

1.1.2 Definition of Chronic Pain

The IASP description of pain suggests that the experience of pain may have components of a physiological and/or a psychological nature (Unruh et al., 2014). Acute pain is a protective mechanism of the body in response to actual or potential tissue damage and may take up to a few weeks to resolve. However, since pain usually ceases before tissue healing is complete, the pain would be considered to be chronic if it were still to be experienced beyond this period (Loeser and Melzack, 1999).

Chronic pain has been described as pain that persists for “approximately three to six months and beyond” (Carnes et al., 2013). Carnes et al. (2013) proposed that this time frame could refer more specifically to chronic musculoskeletal pain which may therefore last longer than the normal soft tissue healing time of approximately twelve weeks (Carnes et al., 2013). However, some studies have used the definition of chronic pain as pain occurring on most days for at least a month (Bair et al., 2003). Probably the most valuable insights were given by Loeser and Melzack (1999) who

noted that, while the duration of pain can be a useful way of distinguishing acute from chronic pain, the physiological understanding of the system is more important. In other words, in chronic pain the body is not able to regain its physiological functions in order to attain its normal homeostatic levels (Loeser and Melzack, 1999).

Chronic pain is therefore not easy to define. It can be seen that where acute pain would usually have a biological and protective purpose, chronic pain is unlikely to do so, making diagnosis difficult for practitioners (Bailey et al., 2010). Sluka (2009) offers three criteria on which a practitioner can assess whether or not pain could be considered chronic; "(1) the pain will have outlasted normal healing time, (2) the impairment will be greater than would be expected from the physical findings or injury, and/or (3) pain occurs in the absence of identifiable tissue damage" (Sluka, 2009 p. 7).

The literature appears to use the terms "persistent" and "chronic" interchangeably with regard to pain (Blyth et al., 2001, Siddall and Cousins, 2004). Persistent/ chronic pain has been defined as continuous pain for at least three of the previous six months (Siddall and Cousins, 2004, Blyth et al., 2001). Different pain syndromes can be viewed as having their origins predominantly in a cognitive and affective environment; as a result of a motor mechanism; or an autonomic mechanism; or a combination of some of them or all of them (Bolay and Moskowitz, 2002, Wiech et al., 2005).

In an attempt to clarify chronic pain disorders, Treede et al (2015) have developed a classification of chronic pain for inclusion in ICD-11 (the eleventh version of the International Classification of Diseases of the World Health Organisation due to be published in 2018. In this document, persistent or recurrent pain lasting longer than three months is defined as chronic pain (Treede et al., 2015). Furthermore, it is stated that pain intensity, pain-related distress and functional impairment can be used to grade pain severity (Treede et al., 2015).

1.1.3 **The Problem of Chronic Pain**

Aronoff (1991) referred to chronic pain as "a disability epidemic". He views it as a disease entity in its own right rather than as a nonspecific symptom of an underlying disease (Aronoff, 1991, Siddall and Cousins, 2004). If persistent pain is considered a disease entity, it would have its own pathology, signs and symptoms and because, in some instances, the underlying disease is resolved, but the pain itself still remains, the pathology of persistent pain could become self-perpetuating (Siddall and Cousins, 2004). The signs and symptoms of pain being described as a disease entity would

manifest in those associated with peripheral and central sensitisation, including wind-up and long-term potentiation. Siddall and Cousins (2004) make the important point that if a procedure were to resolve the primary pathology, then the secondary pathology, which is the consequence of chronic nociceptive inputs such as central sensitisation, mood changes (such as irritability, helplessness, depression, loss of belief in the ability to perform tasks, and fear avoidance) and disability, could also be resolved (Siddall and Cousins, 2004).

These authors also suggest that there are factors that could be considered “tertiary” pathology - although they are not as a direct consequence of the pain. They are factors that form the internal and external environment or context in which the pain occurs in each individual, such as genetic makeup, the level of spinal inhibition, psychological status and the societal litigation system. The identification of the tertiary pathological factors with which a patient presents can give a context to the practitioner-patient relationship for making decisions about assessment and treatment.

1.1.4 **The Prevalence of Chronic Pain**

The prevalence of chronic pain has been studied in Western Europe (Andersson et al., 1999) and North America (De Loose et al., 2008); and to a much smaller extent in Australia (Blyth et al., 2001) and New Zealand (James et al., 1991).

Blyth et al. (2001) reviewed fifteen prevalence studies in chronic pain. They noted considerable heterogeneity in the studies and found an estimated period prevalence (mean value 15%; range 2-40%) (Blyth et al., 2001). This prevalence was similar to that found by Andersson et al. (1999) in their study in Western Europe, where they demonstrated that 15-19% of 25-74 year olds who visited a primary health care facility were found to present with their complaint as a result of a musculoskeletal problem (Andersson et al., 1999).

The prevalence of chronic pain in South Africa, however, is under-documented. In a recent study, Rauf et al. (2013) demonstrated that the prevalence and intensity of chronic pain in primary healthcare clinics in Pretoria, Tshwane, was significant. Of the population surveyed, 41% suffered from chronic pain and of those, 46.59% were women and 34.65% were men (Rauf et al., 2013). In a study investigating the occupational health of women working in small-scale agriculture in South Africa, it was reported that 67% (n=574) of the women reported chronic musculoskeletal pain from any region of the body. While the 12-month prevalence of pain was seen to range from

63% to 73%, the prevalence of specific chronic pain, which lasted for more than three months, ranged from 42.8% to 48.3% (Naidoo et al., 2009).

These figures are in keeping with those applicable in the population subgroup studies of other developing countries. The chronic pain experience in Brazil, for instance, was reported to be 41%, while that for Nepal was 47% (Croft et al., 2010). The large prevalence survey (n=42,249) of chronic pain conducted by Tsang et al. (2008) in developed and developing countries, the latter including South Africa, estimated that 41% of the respondents from developing countries were suffering from chronic pain (Tsang et al., 2008).

In a World Health Organisation Survey conducted in 1998, persistent or chronic pain was found to have been reported by 22% of the patients attending primary care facilities, with the range in the prevalence rate varying widely from 5.5%-33%. The survey of 26 000 primary care patients was carried out on five continents, including Africa (Gureje et al., 1998). It was noted that those suffering from persistent pain were more likely to present with an anxiety or depressive disorder, to experience significant activity limitations, and to hold unfavourable health perceptions (Gureje et al., 1998).

1.1.5 Management Approaches to Chronic Pain and Their Shortcomings

Those who suffer from chronic or persistent pain look to health services for help to alleviate their pain and continue to do so if their needs are not met. This increases the economic burden on the health services of the country (Andersson et al., 1999, Harstall, 2003). These sufferers turn to pharmacotherapy and other passive strategies as an adjunct to reduce pain severity, but they find that these measures are unlikely to eliminate the pain totally (Blyth et al., 2005).

Complicating factors such as the side-effects of medication, which in turn may require further medication, or the possibility of addiction, that could add to the cost of pharmaceuticals, make this form of therapy less than ideal. Furthermore, pharmacotherapy is unable to address the social and occupational factors associated with chronic pain (Cunningham et al., 2009). As such, patients and practitioners seeking answers to chronic pain from a biomedical viewpoint, are often disappointed in the results.

1.1.5.1 The Interdisciplinary Approach

The treatment approach which guides the biomedical model, emanating from the biomedical viewpoint, was developed by Rene Descartes in the 17th century. These treatments have failed to offer sufficient relief to patients whereas the biopsychosocial approach has been shown to optimise treatment for the chronic pain sufferer in that it introduces treatment as an interdisciplinary measure (Schatman, 2012, Mehta, 2011). The approach of an interdisciplinary, biopsychosocial model incorporates to varying degrees medication management, graded physical exercise and cognitive behavioural techniques for pain and stress management.

By adopting this interdisciplinary style of management, the practitioner is always cognisant of the fact that chronic pain is a disease of the person and therefore treatment should be tailored to the individual (Schatman, 2012). By partnering with the patient through this model, the practitioner interviews the patient within the context of the person's life and does not exclusively focus on a possible disease that is limiting his/her functioning.

1.1.5.2 The Biopsychosocial Approach in the Treatment of Chronic Pain: Self Management

One aspect of this biopsychosocial approach that has been shown to be effective in the treatment of chronic pain is that of self-management. Barlow et al. (2002) define self-management as "the ability to manage the symptoms, treatment, physical and psychosocial consequences and life-style changes inherent in living with a chronic condition" (Barlow et al., 2002). Thus, self-management refers to supporting and educating patients in order to help them understand and manage their condition, to find strategies to pace themselves, and to recognise their triggers, so as not to exacerbate their pain (Bair et al., 2009, Crowe et al., 2010).

In order for patients to develop effective self-management strategies, it is important to recognise which barriers may hinder them. Pain itself, over-reliance on medications, fear of activity, ineffective pain relief from strategies already attempted, stressors, time constraints, and lack of motivation or self-discipline, could interfere in the development of self-management strategies. These barriers could further be affected by the phenomena of fear avoidance and pain catastrophising (Bair et al., 2009).

1.1.6 **Fear Avoidance and Chronic Pain**

The concept “fear avoidance” has been systematised as a model to facilitate an awareness of its components and the interactions between them, the relevant inputs and outputs. The model was postulated by Lethem et al. (1983) and further expanded by Waugh et al. (2014). These researchers propose that pain involves two components, namely a pain sensation component and an emotional reaction component. The expanded fear avoidance model suggests that a patient is likely to avoid rather than confront a painful stimulus or situation. The maladaptation arising from either or both of the physical and psychological responses of the patient is then reinforced (Lethem et al., 1983, Waugh et al., 2014). These researchers suggest that confronting and avoiding pain operates on a continuum and that the more confronting there is, the less fear avoidance there may be. Therefore “confrontation” and “avoidance” are the extremes of the continuum.

Vlaeyen et al. (1995b) developed this theory further, suggesting that by “confronting” the impact of pain, the fear of pain may subside over time (Vlaeyen et al., 1995a). If, however, there were to be predominant “avoidance” in response to the pain, the consequences to the individual could lead to a fear of movement and of injury or re-injury. From a psychological perspective, this could lead to a phobic situation or irrational fears (Vlaeyen et al., 1995b). This avoidance model suggests that when a patient develops pain and he/she then possibly presents with symptoms such as pain catastrophising, hypervigilance, or experiences pain-related fear, avoidance of movement could develop. Avoidance then leads to disuse, disability and possibly depression (Vlaeyen and Linton, 2012).

1.1.7 **Pain Catastrophising and Chronic Pain**

Pain catastrophisation, perhaps the most prevalent of the afore-mentioned symptoms, has emerged over the past 20 years as one of the most reliable and consistent psychological factors affecting pain and the prediction of the pain experience (Keefe, 2011). Waugh et al (2014) support Keefe et al in this viewpoint. They found that a patient’s pain experience and perception of pain can also be determined by personal devaluation or invalidation relating to self-esteem and pain self-efficacy, which can in turn lead to an individual catastrophising about pain and sensing the loss of control over his/her pain (Waugh et al., 2014).

In the light of the above, pain catastrophising should be viewed as a psychological distress factor rather than as a coping mechanism[1]. McCracken and Gross (1993) support this view in that they found that pain catastrophising and anxiety symptoms tend to overlap (McCracken and Gross, 1993).

In their turn, Sullivan et al. (2001) describe pain catastrophising as "an exaggerated negative 'mental set' brought to bear during actual or anticipated pain experience" (Sullivan et al., 1995, Sullivan et al., 2001). They further suggest that pain and illness behaviours in their many forms have been associated with catastrophising. Pain behaviours are defined as the different motor and verbal responses emitted in response to the experience of pain. Further to this, pain behaviours that assume the form of help-seeking or excessive preoccupation with symptom management have been referred to as illness behaviour (Sullivan et al., 2001).

1.1.8 Fear Avoidance and Pain Catastrophising Beliefs

Fear avoidance and pain catastrophising are cognitive components of pain-related fear of injury or re-injury, as shown by Vlaeyen et al. (1995) in their study of chronic low back pain (Vlaeyen et al., 1995b). Lamé et al. (2005) in their research also found an association between fear avoidance and pain catastrophising and the negative effects of these two components on patients. They found that high catastrophisers tend to have a lower quality of life than those who catastrophise less (Lamé et al., 2005). In fact, the former tend to be fearful of movement/(re)injury, the more serious consequences arising from these cognitive factors being disuse and disability, especially in the case of musculoskeletal complaints (Vlaeyen et al., 1995a).

1.1.9 Tests for Measuring Fear Avoidance and Pain Catastrophising

Because cognitive factors such as fear avoidance and pain catastrophising often present in patients with musculoskeletal problems such as neck pain, well-validated self-reported measures, have been developed to enable physiotherapists to test these cognitive factors. The Tampa Scale for Kinesiophobia (TSK) – 11 (Woby et al., 2005, Roelofs et al., 2007, Walton and Elliott, 2013), tests fear avoidance and contains eleven items. It has two subscales, namely activity avoidance and pathologic somatic focus (Roelofs et al., 2007).

[1] Pain catastrophising appears on the Coping Strategies Questionnaire as a coping mechanism

The Pain Catastrophising Scale (PCS) is used extensively for evaluating pain catastrophising (Sullivan et al., 1995). It consists of 13 items related to thoughts and feelings about pain. The three subscales of the PCS, namely rumination, magnification and helplessness, give further insight into the domain of pain catastrophisation.

Fear avoidance and pain catastrophising beliefs are learned behaviours and contribute more to the complexity of pain experienced by chronic pain sufferers than pain intensity itself (Turner et al., 2004). Addressing these two factors has been shown to reduce pain; and the patient benefits physically, psychologically and financially (Bailey et al., 2010). As such, the physiotherapist can play a valuable role in the treatment of chronic pain and pain catastrophising and fulfil his/her main objective and concern, namely to enable patients to achieve optimal pain relief, function and quality of life.

If physiotherapists and clinicians become more skilled at identifying the factors contributing to the disuse or disabilities of a chronic pain sufferer, they would be able to provide more tailored and thereby more cost-effective treatments to patients. Addressing chronic pain in a more holistic way is likely to have an added benefit of alleviating some of the burden that chronic pain problems place on health services as patients may then rely less on the medical system.

Fear avoidance and pain catastrophising have not been explored in a South African context, particularly in the case of chronic neck pain. This has implications for clinical practice and the optimisation of care for patients.

1.2 STATEMENT OF SIGNIFICANCE

Chronic pain is a non-communicable disease for which there is a dearth of epidemiological data in South Africa. However, regional studies conducted in South Africa show that the burden that it creates is statistically similar to that featured in studies reported internationally (Igumbor et al., 2011, Tsang et al., 2008, Rauf et al., 2013, Naidoo et al., 2009). Furthermore, an examination of the literature shows that studies specifically researching the prevalence of fear avoidance and pain catastrophising in a South African population are seriously lacking.

This study will therefore research the prevalence of these two issues in patients suffering from chronic neck pain who are visiting physiotherapists in private clinics in Johannesburg, South Africa, and thus add to the current literature. By identifying practices that have a special interest in musculoskeletal problems, it will be possible to

facilitate the recruitment of patients with chronic non-specific neck pain who are attending physiotherapy. This study was undertaken with the intention of providing pertinent information for clinical physiotherapy settings in South Africa and will hopefully give strength to the biopsychosocial approach to the treatment of neck pain.

1.3 AIM OF THE STUDY

The aim of the study is to determine the prevalence of fear avoidance and pain catastrophising in patients who have had neck pain for three or more months.

1.4 OBJECTIVES

The objectives of the study are to:

- Establish the prevalence of fear avoidance and subscales of activity avoidance and somatic focus in patients presenting with chronic neck pain who attend private physiotherapy clinics;

- Determine the prevalence of pain catastrophising and its subscales of rumination, magnification and helplessness in patients presenting with chronic neck pain who attend private physiotherapy clinics; and

- Establish the association between demographic variables and fear avoidance and pain catastrophising respectively.

1.5 OVERVIEW OF RESEARCH REPORT

The research report is organised as follows:

- Chapter Two presents the review of the literature
- Chapter Three discusses the methods
- Chapter Four presents the results
- Chapter Five elaborates and discusses the results
- Chapter Six provides the conclusions and recommendations for future research

CHAPTER TWO

2. LITERATURE REVIEW

2.1 INTRODUCTION

Fear avoidance and pain catastrophising are cognitive constructs that measure contributors or tertiary pathological responses to pain (Siddall and Cousins, 2004). This literature review will reveal what is currently known about their prevalence in those suffering from chronic neck pain.

The literature was reviewed to reveal the current information available around fear avoidance and pain catastrophising and their prevalence, particularly in patients with chronic neck pain. The search engines used were The Cochrane Library, EBSCO host, Pedro (Allied Health), PubMed incorporating Medline, and Google Scholar. The key words used were “fear avoidance”, “activity avoidance” and “somatic focus”; and “pain catastrophising”, “rumination”, “magnification” and “helplessness”. “Prevalence”, “neck pain” and “chronic neck pain” were used in association with the above key words.

Because the two psychological factors of fear avoidance and pain catastrophising were refined by Vlaeyen et al. (1995) and Sullivan et al. (1995) respectively, both in 1995, the search was started from that year until 2015 (Vlaeyen et al., 1995a, Vlaeyen et al., 1995b, Sullivan et al., 1995).

The literature search revealed the paucity of studies examining the prevalence of fear avoidance and pain catastrophising in chronic neck pain worldwide, and even more especially, in South Africa. On the other hand, the construct of fear relating to pain has been studied extensively and these studies show the impact of fear on persistent musculoskeletal pain (Lundberg et al., 2009) in general, and less extensively in chronic neck pain (Thompson et al., 2010b, Pedler et al., 2016).

Prevalence studies for pain catastrophising in chronic neck pain are also lacking. An example, however, can be quoted of a chronic musculoskeletal pain prevalence study which investigated the prevalence of pain catastrophising in patients who presented with anterior knee pain of more than three months’ duration (Domenech et al., 2013). The cross-sectional study on 97 patients (80 females and 17 males) was undertaken at a secondary healthcare facility, and their age, gender and the duration of the pain

were recorded. Other pain related variables were also measured, namely pain intensity that was measured using the Pain VAS (Visual Analogue Scale) and disability using the Coping Strategies Questionnaire (CSQ).

In this case, the TSK-17 was used to measure kinesiophobia (fear avoidance) and those patients with a score of >40 were considered to present with a high level of fear avoidance behaviour. On the other hand, the PCS, measuring pain catastrophising considered a score of ≥24 to be the cut-off. Unfortunately, the prevalence of kinesiophobia (fear avoidance) and pain catastrophising was not calculated *per se.* However, it was found that kinesiophobia and pain catastrophising are both associated with disability. In fact, 37% of the pain experienced at the time of the research could be attributed to pain catastrophising. Since chronic neck pain and chronic anterior knee pain are both symptoms of a chronic musculoskeletal condition, this study emphasises the importance that cognitive beliefs of fear and catastrophising play in these patients.

The impact of cognitive beliefs on chronic musculoskeletal conditions is further revealed in a prospective study conducted by Linton et al. (2000), where fear avoidance beliefs (using a modified Fear Avoidance Beliefs Questionnaire (mFABQ)) and catastrophising (using the Pain Catastrophising Scale) were evaluated as risk factors in a sample of people who had had no spinal pain within the previous 12 months. These results showed that, of those who scored low on both scales, approximately 20% suffered an episode of back pain. Those participants who on pre-test scored above the median on the mFABQ, had twice the risk of suffering back pain and were at 1.7 times higher risk of lowered physical function at the one-year follow-up, thus showing a moderate relationship between fear avoidance and physical function.

The relationship between pain catastrophising and physical function had a weaker effect and was not significant in this study. Linton et al. (2000) suggest that early in the pain experience, fear avoidance beliefs and associated activity problems may develop and the interaction of pain experience is intimately involved with the development of the fear avoidance beliefs. In particular, and finally, that fear avoidance beliefs and catastrophising are thought to be key factors in the development of a pain problem. They suggest that understanding these two factors and being proficient in screening for them might assist in the management of chronic pain (Linton et al., 2000).

In summary, the prospective study of Linton et al. (2000) and the cross-sectional study of Domenech et al. (2013) confirms the significance of fear avoidance and catastrophising in patients who experience low back pain and anterior knee pain respectively (Linton et al., 2000, Domenech et al., 2013). Moreover, Thompson et al. (2010b) show that in patients with chronic non-specific neck pain, disability and levels of pain are associated with cognitive factors, including fear avoidance and pain catastrophising (Thompson et al., 2010b). Although these studies were relatively small, they were sufficiently powered, and their results show the problem that fear avoidance and pain catastrophising pose for patients.

2.2 NECK PAIN

Neck pain has been identified as an important contributing factor to disability in the general population, where a lifetime prevalence of 66.7% (95% confidence interval, 63.8-69.5) of a population of the 2 184 Saskatchewan adults studied were found to suffer from neck pain, with a point prevalence of 22.2% (95% confidence interval, 19.7-24.7). Other studies indicate figures of between 4.6% and 6.3% of individuals who do not recover completely from their neck pain and consequent disability (Côté et al., 1998, Côté et al., 2004, Picavet and Schouten, 2003). These were large population-based, cross-sectional prevalence studies where the population sizes ranged between 1100 and 8000 individuals from Canadian and Dutch nationals. The prevalence statistics gathered, particularly that of neck pain as shown above, is indicative of the extent of the problem. Picavet et al. (2003) also found that musculoskeletal pain was seldom found in only one site, and that it was not confined to older age groups (Picavet and Schouten, 2003).

2.3 DISABILITY AND ITS IMPACT

The impact of disability resulting from pain goes beyond the environs of the individual and their families. In fact, it has consequences to the healthcare systems and society (Breivik et al., 2013, Haldeman et al., 2010). The financial burden that pain causes when it leads to disability was investigated by Hansson and Hansson (2005). Their study was undertaken over a two-year period in Sweden and gave an indication of the costs of back and neck pain among employed persons sick-listed for more than one month. Although neck pain costs were not distinguished from those associated with back pain, health service costs amounted to 10% of the total costs. In fact, for these 1 822 participants interviewed, the total cost for treatment amounted to 1% of Sweden's GNP. It was found that the back and neck problems that led these individuals to be

temporarily or permanently disabled equated to approximately 4% of the entire workforce of that country (Hansson and Hansson, 2005).

Epidemiological studies in the United Kingdom estimated neck pain to be prevalent in approximately 31% of the sample population (n=94) with a possible 14% experiencing some degree of disability and 2.8% unable to work at all (Thompson et al., 2010b). Since a significant number of people who experience neck pain do not recover completely, it is necessary to find out why this is the case.

In an attempt to determine what factors influence chronic neck pain and consequent disability, a large prevalence study was undertaken in Britain of 12,907 patients from randomly selected general practices who had suffered from neck pain in the previous year. Of this total number, 1 421 experienced pain that interfered with their normal activities (Palmer et al., 2001). The results of the research did not show any variation by occupation in the age-standardised prevalence of neck pain, even though symptoms were most prevalent among male construction workers (38% in the previous year with 11% experiencing pain that interfered with their activities), followed by nurses, armed services members and the unemployed.

Frequent headaches and frequent tiredness or stress were found to be more strongly associated with neck pain than the occupational activities investigated. Thus, the authors suggest that psychosocial factors could be considered more important since the association between neck pain and occupational physical activities had been found to be weak (Palmer et al., 2001).

Further attempts to identify and understand the nature of these psychosocial factors and their impact on disability were considered necessary and collaborative research has been undertaken during the first decade of the twenty-first century in order to assist in these endeavours. Research relating to The Bone and Joint Decade 2000-2010 Task Force for Pain campaign revealed in a best-evidence synthesis of 552 studies, that although most individuals will have experienced pain in their lifetime, it is unlikely that neck pain will impact on a person's activities significantly. It was also found that most individuals who experience neck pain, do not recover fully from the symptoms experienced (Haldeman et al., 2010). Between 50% and 85% of those who experience pain are likely to suffer from neck pain again - within the following one to five years. These percentages reflect people experiencing neck pain, this would be irrespective of whether these individuals were workers, people recovering from motor

vehicle accidents or merely members of the general population, indicating that the aetiology of the pain or the context of the individual does not appear to be significant. Furthermore, it was noted that prevalence estimates of between 30% and 50% of patients suffering from neck pain for the twelve month period prior to their interviews for research purposes were members of the general population and workers respectively. With a 12-month prevalence estimate ranging from 2% to 11% studies have shown that it is less common for neck pain to limit activities (Haldeman et al., 2010, Hogg-Johnson et al., 2008). Interestingly, in a study suggesting that fear of work and physical activities are separate constructs from fear of movement/(re)injury, Cleland et al. (2008) found that the level of disability observed in some patient populations might not be directly related to the level of pain experienced (Cleland et al., 2008). As such, other factors have been explored to gain a better understanding of the predictors of persistent pain.

2.4 CLINICAL PREDICTORS OF PERSISTENT PAIN

An important population cohort study was designed by Hill et al. (2004) to both determine the one-year persistence of neck pain in the general adult population, and investigate whether persistence of pain is related to life-style, socio-demographics, health, occupational and/or physical factors (Hill et al., 2004). The rationale for this study was that while a number of studies had identified clinical predictors of developing chronic neck pain, little was known about the extent of persistent neck pain and the factors associated with it.

It was found that 48% of the cohort experienced persistent pain; "persistence" being defined by the researchers as "neck pain at a point in time 12 months later, recalled as having been present during the previous month and having lasted for a day or longer"[2]. In their study, Hill et al. (2004) found that persistent neck pain could also apply to individuals experiencing both recurrent and continuous neck pain. Furthermore, these researchers also found that age was the strongest predictor for pain persistence, pointing out that the age group 45 to 59 years stood out as the one to experience persistent pain the most frequently (62%). Other strong predictors of persistent pain include absence from work, low back pain and cycling.

[2] Each participant in the cohort with neck pain at baseline indicated their area of pain on a blank body mannequin.

Hill et al. (2004) stressed the importance of distinguishing between patients experiencing isolated chronic neck pain and those suffering from additional chronic regional pain syndromes. These researchers suggested that the chronic neck pain group, experiencing no other regional pain, could be representative of a distinctive musculoskeletal syndrome, so that psychological factors in this group might not be as important as in other regional pain syndromes.

Hill et al. (2004) further commented on the apparent link between comorbidity of poor psychological health and neck pain persistence, and between the predispositions of patients to underlying regional musculoskeletal pain syndromes and neck pain persistence. Hogg-Johnson et al. (2008) confirmed Hill et al.'s findings in their research, stating that poor psychological health is often associated with neck pain. As such, they identified the former as a risk factor in causing neck pain (Hogg-Johnson et al., 2008).

The afore-mentioned predictors of neck pain, namely poor psychological health, co-existing low back pain and being in the 45 – 59 year age group, were found to be in keeping with a study by Schellingerhout et al. (2008) investigating the optimisation of treatment for non-specific neck pain. These researchers found that taking into account the intensity of the pain initially, and then in the longer term, the absence of low back pain and a younger age would increase the probability of recovery as long as physiotherapy management, spinal manipulation or general care were to be applied (Schellingerhout et al., 2008).

2.5 CHRONIC NECK PAIN

The terminology pertaining to chronic neck pain is interchangeable in the literature. The International Association for the Study of Pain (IASP) does not define the term in its Taxonomy. However, in the introduction, the authors acknowledge that, although factors that may make chronicity clinically relevant differ with various diagnoses, three or six months can be used as a point of reference. Six months is more commonly used for research purposes to separate acute conditions from chronic conditions (IASP Task Force on Taxonomy, 1994).

Chronic neck pain is often referred to as "persistent" in the literature and Hill et al. (2004) suggest that this term could reflect chronic, recurrent or continuous pain (Hill et al., 2004). Gatchel et al. (2007) however, offer a distinction between chronic pain and chronic recurrent pain. They define chronic pain as "prolonged and persistent pain of

at least three months' duration", whereas chronic recurrent pain is suggested to be "recurrent episodes of pain interspersed with pain-free periods extending over months or years" (Gatchel et al., 2007 p 581). A number of studies of the general adult population have shown that in estimates of their one-year prevalence, between 8% and 19% fall into the three and six month definitions of experienced chronic neck pain (Schellingerhout et al., 2010, Guez et al., 2002, De Loose et al., 2008, Palmer et al., 2001).

From the above, and from research conducted by Côté et al. (2004), it can be said that chronic neck pain may be termed as such if its course is continuous or episodic; and it is noted that even if there is improvement in the neck pain, the pain might not be completely resolved and the onset of a disability might ensue (Côté et al., 2004).

It has been proposed that "pain in one or more anatomical regions that persists or recurs for longer than three months and is associated with significant emotional distress or significant functional disability", and where the cause is not completely understood, is classified as chronic primary pain (Treede et al., 2015). Chronic non-specific neck pain would fall into this category. However, the terminology relating to neck pain that has lasted beyond local tissue healing time does not give information as to how the chronic problem started.

The origins of neck pain can be from systemic diseases, but most cases are "from mechanical disorders, including degenerative changes, and could be labelled as non-specific neck pain" Bogduk (1984) from (Borghouts et al., 1998 p 1). In a recent study evidence showed that by using invasive tests, an anatomical diagnosis could be made in 80% of the cases. It was found that most commonly, the zygapophyseal joints would be the source of the chronic neck pain (Yin and Bogduk, 2008). Furthermore, a systematic review undertaken by Brinjikji and colleagues (2015) showed that more than 50% of asymptomatic individuals who were between 30 and 39-years old, showed anatomical changes when subjected to MRI (magnetic resonance imaging).

Such changes generally result from disc degeneration or disc bulging, with height loss being the visible manifestation of the musculoskeletal degeneration. This suggests that the degenerative changes evident even in young adults may be incidental and not related to the cause of the presenting symptoms or the intensity of the pain experienced. Therefore, these changes may not be pathological and could be considered as part of the normal ageing process (Brinjikji et al., 2015).

Acute neck pain, if arising from a mechanical origin or from osteoarthritis (OA), may initially be driven by peripheral nociceptor inputs. It was initially thought that acute neck pain would continue as such but that it would eventually become chronic (Girbés et al., 2013). However, Phillips and Clauw (2011) make the point that even OA, which may have an anatomical cause, shows symptoms similar to those suffered by patients experiencing other supraspinally influenced or "centrally-driven" pain conditions. These include fatigue, insomnia, multifocal pain, memory difficulties and co-morbid mood disorders.

These authors point out that two important studies support the proposition that pain arising from an anatomical source could be augmented through central nervous system mechanisms, which in all likelihood would point to central sensitisation. The study using experimental pain testing and functional neuroimaging procedures supports this finding as does the study presenting the administration of a centrally acting analgesic, duloxetine, to help reduce pain in individuals with OA of the knee (Phillips and Clauw, 2011, Gwilym et al., 2009, Chappell et al., 2009).

Furthermore, a systematic literature review by Lluch et al. (2014) concludes that there is sufficient evidence to show that central sensitisation occurs in chronic OA cases. The literature suggests that in spite of the occurrence of peripheral sensitisation, hypersensitivity of the central nervous system was found to be evident in a significant subgroup of chronic OA sufferers (Lluch et al., 2014).

Central sensitisation is defined as an "increased responsiveness of nociceptive neurones in the central nervous system to their normal or subthreshold afferent input" (Loeser and Treede, 2008). Therefore, it is important to look in more depth at the factors that may influence the responsiveness of the central nervous system.

2.5.1 Cognitive Factors Associated with Chronic Neck Pain

Psychosocial factors have been recognised as being strongly associated with central sensitisation and neck pain. In fact, the data show that psychosocial factors may be more influential than the occupational physical activities that were analysed in the large sample of the population studied in Britain (Palmer et al., 2001).

Patients with musculoskeletal pain in general have altered psychological function, which includes increased levels of emotional distress, somatic awareness, psychosocial stress and maladaptive coping (Diatchenko et al., 2013).

Much work has been done to elucidate firstly the factors which contribute to the risk of developing chronic pain and then to identify the factors that contribute to the maintenance of the chronicity of pain. The literature suggests that, although much of the research has focused on the psychosocial factors contributing to chronic low back pain, heuristically, these factors can be translated throughout all chronic musculoskeletal conditions (Diatchenko et al., 2013). It may be possible, therefore, to understand the prognosis of neck pain by looking more closely at features associated with pain.

Papers published from 1980 to 2006 by the Bone and Joint Decade 2000 to 2010 Task Force on Neck Pain and its Associated Disorders (2010) indicate that, while the prognosis for neck pain is multifactorial, it is better for those in the younger age group both who are in the general population and for those with whiplash-associated disorders (WADs). However, research into the relevant literature has found that age does not impact on the prognosis for neck pain in workers (Haldeman et al., 2010). Furthermore, a poorer prognosis is generally associated with the general population or workers in poor health and who have previously experienced neck pain.

Other factors influencing a poorer prognosis in the general population include poor psychological health, anxiety and anger or frustration in response to the neck pain. In contrast, a better prognosis in the general population was found to be associated with enhanced optimism, a self-assured coping style and less of a need to socialise.

However, the factors were found to be slightly different in whiplash disorders, which showed poorer prognoses. Passive coping, depressed mood, feelings of helplessness, fear of movement, catastrophising and post-injury anxiety featured as the main problems. Unfortunately, these factors in workers who suffer from neck pain have not been well researched, and no data are available for this grouping (Haldeman et al., 2010). Clearly, psychosocial influences need to be understood in more detail.

Psychosocial factors influencing pain involve both emotion and cognition. However, emotion, which is more inclined to be midbrain-based, responds to nociception more immediately. Only then does cognition come into play to then attach meaning to those

emotions. Thus, emotions and cognition are then able to amplify the pain experience by increasing and even perpetuating the pain response. Chronic pain is then established through the vicious circle of nociception, pain, distress and disability (Gatchel et al., 2007). Emotions and cognition are dependent on how an individual appraises a situation.

Cognitive appraisal is the way in which an individual appraises a situation from his/her perspective. This may be in a positive or a negative way depending on, amongst others, environmental and emotional influences. Two maladaptive and negative appraisal and belief concepts are fear avoidance beliefs and pain catastrophising. Pain appraisal is defined as “the meaning given to pain by an individual” from (Sharp (2001) in (Gatchel et al., 2007 p 602)).

Primary appraisal is distinct from secondary appraisal in that primary appraisal is the “evaluation of pain in terms of it being threatening, benign or irrelevant” and secondary appraisal is the “evaluation of the controllability of pain and one’s coping resources” (Gatchel et al., 2007). Beliefs would be considered determinants of appraisal as they refer to assumptions about the reality that shape how events are interpreted by an individual (Gatchel et al., 2007). Such determinants of appraisal could be the beliefs influencing fear avoidance and pain catastrophising (Vlaeyen et al., 1995a, Siddall and Cousins, 2004).

For the purposes of this review, fear avoidance will be discussed first and then pain catastrophising. However, it is important to keep in mind how intertwined these concepts are for the individual. Interpretation of pain may mean harm and avoidance of activity, as described in the fear avoidance models of pain (Vlaeyen et al., 1995b, Vlaeyen and Linton, 2000).

2.6 FEAR AVOIDANCE

It is not always clear how the body’s response to pain in the case of nociceptive stimuli evolves into chronic or persistent pain. Behavioural and psychological changes may occur at the same time as the new pain state, or they may transition over time as the pain unfolds (Simons et al., 2014). These changes, while in the acute pain phase, may be adaptive. However, they become maladaptive in the chronic pain phase. For example, escaping from or avoiding an acute threat or noxious stimulus is normal and adaptive, whereas continuing to react in these ways when the pain is no longer ‘serving any protective purpose’ (i.e. when the pain is considered chronic), would be

considered to be maladaptive avoidance behaviour. In a broader context, hormones released in response to chronic stress assist in protecting the body and promoting adaptation (allostasis). However, should the stress continue, changes could occur to the brain and the body leading to disease (allostatic load or overload) and system failure (McEwen, 2012).

Kori et al. (1990) proposed that patients who suffer from chronic pain are subjected to a gradual psychobehavioural process that leads to anticipation of painful (re)injury as a result of a heightened set of fears and vulnerabilities. Phobic processes, rather than neurological processes, manifesting as a patient's response to fear rather than to actual pain, would seem to be more influential in chronic pain behaviour (Kori et al., 1990). The term kinisophobia [*sic*] for the former response was coined by Kori et al. (1990), who used the definition: "an irrational and debilitating fear of physical movement resulting from a feeling of vulnerability to painful injury or re-injury'' (Kori et al., 1990).

It is suggested that conditioned fear related to pain is an example of maladaptation. The adaptation/maladaptation conditioning may occur as a result of pain that is triggered by a traumatic episode or an experience of pain being intensified with activity. The individual interprets these experiences as ongoing 'threats', whether or not they are actual or perceived (Simons et al., 2014, Vlaeyen and Linton, 2012).

The experiences of these recurring 'threats' could be derived from emotional or sensory inputs into the nervous system. As the current definition of pain implies, pain can be viewed both as a sensory and an emotional experience. Furthermore, the pain experience comprises sensory, cognitive, affective, behavioural and social elements (Bailey et al., 2010). Fear that is associated with chronic pain may be an emotional reaction to an immediate threat of pain or (re)injury. The individual could reduce his/her fear levels in the short term by displaying defensive escape behaviours. However, this may only increase fear levels in the longer term (Leeuw et al., 2007).

Fear is related to immediate concerns of pain or (re)injury, whereas anxiety is a future-orientated affective state. In contrast, anxiety is likely to pose a less identifiable 'threat' and the defensive behaviours in response to anxiety will be different. Those suffering from anxiety may display preventative, avoidant and hypervigilant behaviour. In the short term, these behaviours may be beneficial, but in the long run they too may be detrimental to the individual (Leeuw et al., 2007).

The literature does not suggest that clinically there is much distinction between fear and anxiety in regard to fear avoidant behaviour, and the terms are used interchangeably when referring to pain responses. For the purposes of this review, the fear/anxiety distinction will be combined in the term 'pain-related fear' as described by Vlaeyen and Linton (2000) in their model of fear avoidance (Leeuw et al., 2007, Vlaeyen and Linton, 2000). This pain-related fear may develop depending on a person's fear avoidance beliefs.

A fear-avoidance belief is a term that has been used to refer to the behaviour that leads to "the avoidance of specific movements or activities based on fear of pain or (re)injury" (Linton et al., 2000 p 1052). The behavioural cognitive model developed by Vlaeyen and Linton (2000) for chronic low back pain offers an explanation as to how acute pain can be perceived by an individual. This model describes a chain of reactions that can proceed in one of two ways.

The first or adaptive reaction occurs when the individual perceives the pain experience as non-threatening (e.g. the pain is considered a temporary nuisance) and confronts the pain by continuing with his/her daily activities. The individual does not progress into the maladaptive fear avoidant cycle with the possible outcome of (re)injury, because his/her fear and anxiety levels are low. Functional recovery is therefore achievable (Vlaeyen and Linton, 2000, Crombez et al., 2012).

The other route describes a significant minority of people who perceive the pain experience as more of a 'threat'. They progress into the vicious circle where cognitive factors enhance catastrophic thoughts and emotions, such as negative affectivity and threatening illness information, and develop avoidance tactics, escape behaviour or hypervigilance through pain-related fear.

Deconditioning then develops because fewer and fewer activities are attempted as the avoidance beliefs become generalised in the individual (Turk and Wilson, 2010).This leads on to functional disuse, disability and depression or low mood which can lower the threshold at which pain is experienced and lead to further pain as a consequence (Leeuw et al., 2007, Linton et al., 2000, Vlaeyen and Linton, 2000). A patient may not show much avoidant behaviour, but hypervigilance may be more of a contributing factor in his/her maladaptive behaviour (Goubert et al., 2004b).

The relationship of the trait-like tendency and therefore stable characteristics, termed *neuroticism,* of patients having negative feelings has been investigated in 121 patients with chronic low back pain. Negative feelings, such as distress, worry and anxiety and their association with increased vigilance to attentional scanning of both their internal and external environment was observed (Goubert et al., 2004b) In their study using structural equation modelling to analyse the variables, pain catastrophising and pain-related fear were found to mediate the effect of the negative tendency of neuroticism on pain vigilance, suggesting that the immediate threat value of the pain is a critical component of how vigilant an individual's response will be. Goubert et al (2004b) proposed that if an individual tends towards distress, worry or anxiety, increased hypervigilance of the individual's internal and external environment can follow. Furthermore, an increase in pain severity was related to vigilance to pain. Two additional factors that may impact on the individual's response to how much attention he/she would give to a pain experience need to be considered. The individual's response could vary according to the situation that a person is in (for instance, whether or not he/she would normally be more averse to that situation) and what meaning the current or chronic pain holds for that individual's life.

Perhaps not surprisingly, the researchers also found that pain-related fear was negatively related to personality characteristics of openness to experience and agreeableness, and that extroverts were less likely to have catastrophic thoughts around pain. Causal effects cannot be deduced from the analysis of their cross-sectional and correlational data. The investigation into these psychological factors adds to our knowledge of pathways which could lead to increases in pain catastrophising and pain-related fear, however, there may yet be others (Goubert et al., 2004b). Theories around the cognitive and emotional elements of pain-related fear have been discussed but we cannot assume that the results translate from other musculoskeletal regions of the body to the neck, where our study is focusing.

2.6.1 **Fear Avoidance and Neck Pain**

The fear avoidance beliefs model of injury or re-injury that has been developed pertains specifically to chronic low back pain (Vlaeyen et al., 1995b, Lethem et al., 1983). The model has become an accepted part of understanding the cognitive elements that perpetuate chronic low back pain (Woby et al., 2004a, Lundberg et al., 2011, Turk and Wilson, 2010, Simons et al., 2014). It has since been shown that fear avoidance beliefs are present even when there is no pain (Linton et al., 2000). These

beliefs may increase the chance of pain developing and can be present during an acute pain phase of low back pain (Fritz et al., 2001).

While the fear avoidance model of Vlaeyen et al (1995b) proposed that in the acute phase of an injury, fear avoidance is adaptive and serves a protective purpose by reducing nociceptive input and thus further tissue damage, in the more chronic phase it becomes maladaptive (Vlaeyen et al., 1995b). However, later research by Fritz et al (2001) showed that fear avoidance, even in the acute phase, is related to a greater likelihood of persistent disability and more difficulty in returning to full work capacity (Fritz et al., 2001).

Since much of the earlier research focused on fear avoidance beliefs and pain-related fear in low back pain individuals, these cognitive elements were then tested in patients with other spinal and musculoskeletal conditions and were found to have similar consequences.

A study by Nederhand et al. (2004) aimed to assess the possibility of predicting chronicity in neck pain associated with acute whiplash injury, by using measures of fear avoidance and disability through the TSK (Tampa Scale for Kinesiophobia – the 17-item version) and the NDI (Neck Disability Index). Their study showed that by using the NDI, clinicians are able to predict disability six-months post whiplash injury, and if in their research they consider the neck pain disability in conjunction with the fear of movement, the prediction is improved (Nederhand et al., 2004).

Further to this, Westman et al. (2010) conducted a controlled three-year follow-up of a multidisciplinary pain rehabilitation programme among a diverse population of musculoskeletal pain sites, which included areas of the neck, shoulder and upper back (Westman et al., 2010). While this study was an intervention study, it was looking at baseline cognitive factors, including fear avoidance and pain catastrophising in various pain sites, namely in the spine, shoulder and leg (Westman et al., 2010).

The afore-mentioned experimental group received multimodal interventions that were designed to encourage each patient to take charge of his/her own independent and active lives – both in the workplace and outside the workplace. Because the experimental group showed a reduction in their utilisation of primary health care facilities and in their usage of medication compared with the control group, the researchers concluded that the experimental group was coping better with their pain

over the three-year period than their counterparts in the control group who had not been exposed to a multidisciplinary rehabilitation programme (Westman et al., 2010).

Therefore, by exposing patients in a 'confronting' rather than 'avoidant' way, it was possible for these participants to move out of the fear avoidant vicious cycle. Understanding the elements that contribute to fear avoidance more fully was necessary.

Following this, in a further study using the same data set, Westman and colleagues (2011) examined the psychological risk profiles from baseline, through one-year and three-year follow-ups with regard to pain, function and sick leave (Westman et al., 2011). This unusually long period of study enabled the researchers to show that fear avoidance, pain catastrophising and distress (measured by the mental health subscale of The SF-36 Health Survey) in patients suffering from musculoskeletal pain (including neck pain) were related to outcome in terms of dysfunction and sick-leave three years later (Westman et al., 2011). Pain catastrophising is one of the cognitive factors that feeds into the fear avoidance model and its involvement in chronic pain is confirmed repeatedly in numerous studies.

2.7 PAIN CATASTROPHISING

Proposed by the fear avoidance model (Vlaeyen et al., 1995b), pain catastrophising is the first step after a pain experience in the maladaptive loop leading to chronic pain. The model also suggests that the additional inputs of threatening illness information and negative affectivity could contribute to the catastrophising. It is generally thought that the construct of pain catastrophising involves an exaggerated negative orientation towards noxious stimuli (Alda et al., 2011).

Having acknowledged the impact of pain catastrophising on individuals, Sullivan et al. (1995) developed the Pain Catastrophising Scale (PCS) in 1995 in order to facilitate further research into the mechanisms whereby pain experiences that are influenced by pain catastrophising can be measured (Sullivan et al., 1995).

Catastrophic thinking could serve to increase the levels of pain and emotional distress experienced by an individual, and heightened catastrophic thinking can increase the probability of pain persisting and the risk of chronicity developing, although the aetiology of pain catastrophising is not clear (Sullivan et al., 1995).

In factor analyses, the PCS developed by Sullivan et al. (1995) has shown that catastrophising can be viewed as a multidimensional construct comprising elements of rumination (thinking about the pain continuously), magnification (a negative view of the pain), and helplessness (the impossibility of controlling the pain). These catastrophising cognitions are focused exclusively on pain and can be distinguished from depressive thoughts (Alda et al., 2011, Sullivan et al., 1995). It has been suggested that the PCS could be used as a two-factor model by analysing the scores of the subdomains of rumination and the combination of magnification and helplessness, but reliability and validity studies performed by Osman et al. (1997) revealed that the three-domain scale has proved to be the most useful (Iwaki et al., 2012, Osman et al., 1997).

Experimentally, data collected on catastrophic thinking in individuals with chronic low back pain suggest that a clinically relevant score of 30 on the PCS, corresponding to the 75th percentile of distribution, represents a useful cut-off score. It was found that within this subsample of patients, 70% remained unemployed one year post injury, 70% described themselves as totally disabled for occupationally-related activities, and 66% scored above 16 (moderate depression) on the BDI-II (Beck Depression Inventory).

The PCS has also been used as a screening tool for assessing the risk of prolonged pain and disability. Individuals who score between the 50th and 75th percentiles on the PCS are considered to be at moderate risk of developing chronicity, while those scoring above the 75th percentile would be considered at high risk of developing chronicity. This would be useful to know in the light of initiating timeous intervention programmes for those at risk of developing chronicity and disability (Sullivan et al., 1995).

2.7.1 **Catastrophising and Pain**

In a review of the theoretical perspectives on the relationship between catastrophising and pain, Sullivan et al. (2001) observe that their studies have shown consistent findings where catastrophising, during painful stimulation, leads to a more intense pain experience and increased emotional distress for an individual. The variance in pain ratings can be attributed to catastrophising in zero order correlations of between 7% and 31%. However, the development of a theoretical framework to facilitate an overall understanding of catastrophising has been lacking.

Sullivan et al. (2001) suggest that social factors and social goals may play a part in the development and maintenance of catastrophic thinking, whereas appraisal-related processes may point to the mechanisms that link catastrophising to the pain experience (Sullivan et al., 2001). These appraisal processes as postulated in the Sequential Check Theory of Emotion Differentiation include four appraisal objectives, namely the relevance, implications, coping potential and normative significance to the person and are evaluated by the afferent and efferent input from the neuroendocrine, autonomic and somatic nervous systems (Scherer, 2001).

Catastrophic thought can be assessed according to whether or not it is a situational/state reaction or a dispositional/trait reaction. The situational or state assessment would be measured immediately after exposure to a noxious stimulus, whereas the dispositional or trait assessment would be measured at any other time. The individual would be relying on the recollection of negative feelings and cognitions related to painful events, and not necessarily on one event or stimulus (Leung, 2012). It is important to note that memory, which is influenced by emotional processes and personality factors, could create a bias in the dispositional assessment of pain (Campbell et al., 2010).

The results from a study which compared situational and dispositional catastrophising using the PCS across individuals experiencing no pain, short-term pain and chronic pain, showed no significant correlation between situational and dispositional pain catastrophising in either the healthy individuals or the individuals with arthritic pain, whereas they were associated in temporomandibular disorder. It was noted, however, that lower pain thresholds were associated with higher levels of situational catastrophising, while higher pain ratings were obtained across all three sample groupings. Their results suggest that it may be useful to assess catastrophising when specific events occur as distinct from inherent catastrophising (Campbell et al., 2010).

Leung (2012) suggests that these results should not support the use of the dispositional type of assessment for pain catastrophising, bringing into question whether or not pain catastrophising is a separate construct from negative affectivity, such as depression or anxiety, as is argued by Sullivan and colleagues (Leung, 2012).

The conflicting evidence regarding the ability of the pain catastrophising construct to stand alone without being combined with negative affectivity factors or other negative pain-related cognitive variables, such as fear of pain, does not detract from the

important role pain catastrophising has in determining the experience of pain – both acute and chronic (Quartana et al., 2009). Furthermore, the context of the individual suffering from pain may also have an effect on his/her pain experience, as suggested by the biopsychosocial model. The contextual or psychosocial component of the biopsychosocial model may be addressed by The Communal Coping Model (Sullivan, 2012).

This theoretical model, namely The Communal Coping Model of pain catastrophising has been proposed and advanced by a number of researchers to address the interpersonal dimensions of coping. This model suggests that while in acute pain, the coping style used by high pain catastrophisers may be useful in that they get the support, attention and empathetic responses from their support network. However, in chronic pain, the prolonged nature of the pain and impact on others may result in increasing interpersonal conflict, rejection by society and ensuing depression. The Communal Coping Model distinguishes “interpersonal” coping from “intraindividual” pain catastrophising models, both being ascribed to be cognitive appraisal models (Sullivan, 2012).

Sullivan (2012) indicates that the cognitive behavioural model of pain-related disability was initially presented as a type of cognitive appraisal model. In his opinion, while intuitively workable in its previous mould, but having subsequently been refined by Vlaeyen and Linton (2000), it has since proved to be problematic in that it does not hold up to his clinical and research experience (Sullivan, 2012, Vlaeyen and Linton, 2000, Sullivan et al., 1995).

Sullivan (2012) argues that Vlaeyen and Linton’s cognitive models are “intraindividual” and do not take into account interpersonal processes that appear to have significant effects on pain catastrophising. Furthermore, he is of the opinion that Vlaeyen and Linton’s cognitive models tend to pathologise catastrophising by considering it as a precursor to emotional disorders. To clarify further, he argues that catastrophising can be observed in healthy individuals who display no evidence of emotional disorders. Clinical experience in fact shows that interindividual or interpersonal processes active in high catastrophisers are of value in that they promote positive processes/responses such as support seeking, communication and validation (Sullivan, 2012).

These theoretical models as proposed by Sullivan and Vlaeyen and Linton, search for explanations as to why people experience chronic pain. Furthermore, they illuminate

the complex role that cognitive factors play in the pain experience and in continually sustaining it, and while the exact mechanisms of fear avoidance and pain catastrophising are under investigation, these cognitive factors are important players in chronic pain.

2.8 FEAR AVOIDANCE, PAIN CATASTROPHISING AND CHRONIC NECK PAIN

Fear avoidance and pain catastrophising have been studied in sample groups of patients presenting with varying chronic pain conditions – chronic low back pain, chronic musculoskeletal conditions and chronic neck pain, to name a few. Fear avoidance and pain catastrophising are factors related to levels of pain and disability, no matter which area of the body is being affected.

The relative extent to which cognitive factors, namely self-efficacy beliefs, catastrophising, pain-related fear and pain vigilance and awareness, tend to be associated with levels of pain and disability in patients with idiopathic chronic neck pain was examined by Thompson et al (2010). Ninety-four participants (52% female), were found to have neck pain of no known origin and symptoms of at least three months' duration. Analysis indicated that greater levels of catastrophising and lower levels of pain vigilance and awareness are significantly related to higher pain intensity.

Pain intensity was measured using question one from the Neck Disability Index (NDI)[3]. This study, importantly, showed that for those suffering from an idiopathic chronic neck pain, pain intensity could be used as a strong predictor of disability. The researchers found that gender and pain duration were not related strongly to either pain intensity or disability, while older age was associated with increased levels of pain but not with levels of disability (Thompson et al., 2010b). The treatment of cognitive factors associated which chronic neck pain was shown to be effective.

At a later stage, Thompson et al. (2016) performed a multi-centred randomised controlled trial on fifty seven patients with chronic non-specific neck pain of at least three months' duration. They determined whether the outcome in those suffering from chronic neck pain had been improved subsequent to the addition of a physiotherapy-

[3] This was a useful way of not increasing the number of questionnaires for the participants to complete since disability was being measured on the basis of the total NDI.

led cognitive-behavioural intervention to an exercise programme (Thompson et al., 2016). The patients were followed-up at six months and the results analysed.

Among the cognitive factors measured, pain-related fear was measured using the TSK-17 (the 17-item TSK), while catastrophising was measured using the Pain Catastrophising Scale (PCS). Thompson et al. (2010) found no significant between-group differences in disability. However, when analysed, a minimal clinically important change (MCIC) in disability was noted in a significantly greater proportion of those in the group participating in this cognitive-behavioural intervention (Interactive Behavioural Modification Therapy (IBMT)). While more individuals benefitted from IBMT, reductions in disability at a significantly larger group-level did not occur. The authors suggested that the reason for this might be that not all patients need a cognitive behavioural approach as offered by the IBMT (Thompson et al., 2016). Therefore, it might be important to determine which patients need the added cognitive behavioural input in order to facilitate recovery. It is important to identify these patients, so that resources can be directed to the appropriate aspect of the chronic pain disorder.

This possibility of stratifying the management of patients with back pain according to certain criteria has been shown to be effective and is yet to be available for those with neck pain. Hill et al. (2011) showed that using prognostic screening in patients with low back pain in primary care management could give medium- and high-risk low back patients more sophisticated and therefore more appropriate treatment. Such measures would be likely to improve their clinical outcomes and be more cost effective with regard to improvements in their health-related quality of life, a reduction in health-care use and fewer days off work.

Among the secondary outcomes that were measured were the PCS (measuring how pessimistic an outlook the low back pain sufferer has) and TSK (fear avoidance beliefs) (Hill et al., 2011). This research was undertaken over 12 months so that the chronicity of the patient's pain could be taken into account.

More detailed knowledge of the predictors involved in neck pain may assist in the treatment and prognoses of these patients. Thus, in a further study investigating the significant independent predictors of a minimal clinically important change (MCIC) in neck pain disability and patient perceived global change after receiving physiotherapy, Hill et al. (2007) identified three significant independent predictors after six weeks.

They were a patient's social class (manual occupation), expectations of treatment success and the severity of the baseline neck pain/disability. However, catastrophising, anxiety and depression, the patients' expectations concerning the treatment, the severity of baseline neck pain/disability, the presence of co-morbid back pain, and older age, emerged as significant independent predictors after six months (Hill et al., 2007). This suggests that predictors in the acute phase of neck pain differ from those in the chronic neck pain phase.

In addition, Hill et al. (2007) showed in the results of their univariate analysis, that perceptions of poor treatment outcomes by the participants could be defined using the Minimal Clinically Important Differences (MCID) scale associated with the Northwick Park Pain Questionnaire and perceived global change. It was also found that the psychosocial factors measured in their study showed a similar level of association. The researchers acknowledged that they did not measure some of the psychological factors such as fear and catastrophising individually, and while this may have impacted on the sensitivity of the measures, they were, however, considered to be valuable as prognostic indicators and for secondary outcome assessment (Hill et al., 2007).

2.9 FEAR AVOIDANCE, PAIN CATASTROPHISING, PHYSICAL ACTIVITY AND DISABILITY

A study undertaken by Buer and Linton in 2002 investigated the role of fear avoidance beliefs and catastrophising in a low back pain sample from the general population. Although not a chronic pain population, results revealed that catastrophising was present even at low levels of pain and that the higher the level of catastrophising, the greater the frequency of reporting the pain.

These researchers found that fear avoidance beliefs (measured using a modified Fear Avoidance Beliefs Questionnaire, a component of the physical activity scale - not the TSK) were found to be present at moderate levels of pain. Furthermore, the relationship of fear avoidance beliefs and catastrophising to ratings of pain and Activities of Daily Living (ADL) or disability respectively, indicated that if fear avoidance was high, it would be likely for activities of daily living to decline. Against all expectations, the relationship between fear avoidance and pain was found to be limited (Buer and Linton, 2002).

These researchers also found that non-pain sufferers in the general population also display demonstrable fear avoidance and pain catastrophising beliefs, notwithstanding the findings of Gheldof et al. (2010), who suggested that pain-related fear appears as a result of pain severity rather than as a precursor to it. Furthermore, Gheldof et al. (2010) also found that evidence of pain-related fear and disability manifesting in low back pain sufferers after eighteen months could be predicted by determining the baseline pain severity level (Gheldof et al., 2010). Notably, Buer and Linton (2002) were investigating the risk factors in low back pain sufferers so that their results were not equivalent to those of Gheldorf which pertain to the sample of participants experiencing chronic low back pain who were assessed in 2010.

Fear avoidance suggests that a person in pain may avoid movement and therefore physical activity. In studies[4] which set out to determine the effects of low levels of physical activity in chronic low back pain patients, it was found that those who carried out little or no physical exercise in the week presented with significantly higher fear avoidance and pain catastrophising levels than those who performed higher levels of exercise (Elfving et al., 2007, Larsson et al., 2016).

This evidence supports the results of our study, since an association was found between the TSK-Total and PCS-Total. The researchers, however, suggested caution in translating their results into clinical practice, since they pointed out that their study was a cross-sectional design, and therefore it could not be concluded from their research that high fear avoidance beliefs cause low physical activity (Elfving et al., 2007). It is possible that the physical interventions of physiotherapy, as well as the encouraging support associated with physiotherapy may have mitigated their fears around physical activity.

2.10 REVIEW OF THE METHODOLOGY

Literature supports the evaluation of perceived pain, function, disability and psychosocial status using self-reported patient assessment tools for non-emergency neck pain (Nordin et al., 2009). This is particularly relevant in evaluating neck-related disability. It does not only involve evaluating pain and stiffness, but also the evaluation of the relevant cognitions and beliefs relating to the symptoms, fear of movement or re-injury, and social and environmental factors (Walton and Elliott, 2013). However, it

[4] Patients with chronic low back pain who suffer from increasing disability and interference in their ADL may also be compromised with regard to physical activity and exercise.

is suggested that caution should be exercised if relying solely on self-reporting tools. Multimodal and multimethod assessments are preferred but perhaps not always possible in the clinic since patients are often pressed for time in order to get back to work (Lundberg et al., 2011). The selection of the self-assessment tools for this prevalence study took the following points into consideration:

This study used the Visual Analogue Scale (VAS) to measure pain intensity, the Tampa Scale for Kinesiophobia-11 (TSK-11) to evaluate pain-related fear or fear avoidance and the Pain Catastrophising Scale (PCS) to measure pain catastrophising. Further questions were asked of the participants in the demographic questionnaire relating to gender, age, pain intensity, marital status, highest level of education, employment status, duration of neck pain and whether or not the participant had had to reduce their work load as a result of this pain. The selection of the self-assessment instruments is discussed in more detail.

2.10.1 **Visual Analogue Scale**

Several methods of assessing pain intensity in adults have been developed, and the single-item Visual Analogue Scale (VAS), an example of a unidimensional pain questionnaire, is one such method. This scale, a valid and reliable self-assessed measure of pain intensity in chronic pain patients, is a 10-cm horizontal line with no markings other than (0) on the left end of the line, representing “no pain” and (10) on the right end of the line, representing “most severe” pain (the patient’s maximum pain level) (Huskisson, 1974, Price et al., 1983, Breivik et al., 2000). This scale is most commonly used for recording current pain or pain “in the last 24 hours and takes less than one minute to complete (Hawker et al., 2011).

Nordin et al. (2009) confirmed in their systematic literature review that the Visual Analogue Scale is considered the gold standard for measuring pain intensity. Responsiveness proved to be high in patients who had improved. As such, this scale is suitable for evaluating pain intensity in patients with neck pain, and with or without arm pain (Nordin et al., 2009).

Boonstra et al. (2014) have since developed the usefulness of the VAS even more by examining possible cut-off points on the scale for mild, moderate and severe pain in patients with chronic musculoskeletal pain. The results revealed that mild pain corresponds to a VAS of $\leq$ 3.4; moderate pain to a VAS = 3.5 to 7.4; and severe pain to a VAS of $\geq$ 7.5 (Boonstra et al., 2014).

It may be questionable as to whether or not the VAS is an appropriate tool to use to assess pain intensity in a South African population. Yazbek et al (2009) researched the use of the VAS in Tswana-speaking participants who had been disadvantaged as a result of inferior education, leading to poor functional health literacy. The literacy and numerical content of these questionnaires or instruments for measuring certain aspects of health require participants to be able to understand, retain, recall and complete the questionnaires using abstract representational thought processes.

The authors suggested that these difficulties might have limited the participants in their ability to use the VAS (Yazbek et al., 2009). However, since the sample of participants in our study found themselves in the private physiotherapy clinic setting, they were likely to belong to a relatively high socioeconomic class in the South African population and would, therefore, be able to understand the abstract concepts behind the VAS in order to adequately represent their current pain intensity.

Other multidimensional pain measures such as the Short-form McGill Pain Questionnaire, the Brief Pain Inventory and the Neck Disability Index give information about the intensity and "quality" of the patient's pain, and the level of interference that it causes in his/her life. It is preferable to measure pain, especially chronic pain, in more than one dimension (Melzack, 2005, Hawker et al., 2011, Macdermid et al., 2009, Tan et al., 2004), but since this study was a prevalence study concerning fear avoidance and pain catastrophising and was using two questionnaires already, it was decided to use the unidimensional VAS. Therefore, the main reason for using the VAS for this study was for the sake of brevity. The participant's ability to use the tool would be confirmed in the pilot study.

2.10.2 **Tampa Scale for Kinesiophobia (TSK)**

In their critical review of pain-related fear, Lundberg et al. (2011) recognised that there are numerous self-reporting questionnaires that can be used to assess fear with regard to pain. They suggest that this is because fear is a construct rather than a disorder and could therefore be presented in its association with pain as pain-related fear, fear avoidance beliefs, fear of movement, and kinesiophobia (Lundberg et al., 2011).

Their review critically evaluates the above terminology through their systematic literature search. They suggest the instruments which best fit the constructs within the

fear of pain realm from which a patient with persistent musculoskeletal pain may be suffering. The definitions of the construct may be found in the literature (Lundberg et al., 2011).

The analysis by Lundberg et al (2011) of the literature sources brought to light two questionnaires for assessing the constructs of “fear avoidance beliefs”. They are the Fear Avoidance Beliefs Questionnaire (FABQ) and the Fear Avoidance of Pain Questionnaire (FAPQ).The review found no original definition for the construct of pain-related fear, however.

In their review, pain-related fear was found to “incorporate fear of pain, fear of injury, fear of physical activity and so forth”. There were also two instruments to measure this construct, namely the Fear of Pain questionnaire (FPQ) and the Pain and Anxiety Symptoms Scale (PASS). On the other hand, the Tampa Scale for Kinesiophobia (TSK) was used to measure the construct of “kinesiophobia”.

According to the review, no questionnaire was found to assess the construct of “fear of movement”, which was defined as “a specific movement and physical activity that is (wrongfully) assumed to cause re-injury” (Lundberg et al., 2011 p 21). Interestingly, Walton and Elliot (2013) argue that since kinesiophobia is a construct of irrational fear and that it may be completely rational for a patient to agree that “Pain lets me know when to stop exercising so that I don’t injure myself” (Item 9 in the TSK-11), the TSK may not be measuring a phobia or an irrational construct (Walton and Elliott, 2013).

Along with Lundberg et al. (2011), Walton and Elliot (2013) support the evidence that the current psychometric properties of measurement instruments for fear of pain and associated constructs in musculoskeletal pain are still incomplete. No firm diagnostic criteria exist for identifying these constructs, including kinesiophobia and fear avoidance in patients (Walton and Elliott, 2013, Lundberg et al., 2011).

Further to this, Nicholas and George (2011) suggest that the Tampa Scale for Kinesiophobia (TSK) is likely to be the most widely used measure for fear avoidance beliefs (Nicholas and George, 2011). Walton and Elliot (2013) suggest that, at best, “the TSK-11 provides a measure of general negative valence toward exercise, but not of an irrational fear or specific phobia” (Walton and Elliott, 2013 p 66).

The TSK, developed in 1991, was originally a 17-item questionnaire that questioned patients' understanding of how safe they felt with regard to movement and how robust they felt their condition was (Miller et al., 1991). Each item was scored from 1 (strongly disagree) to 4 (strongly agree).

As far back in time as 2005, Woby et al. (2005) developed a shortened version of the TSK17 having tested its psychometric properties on patients with chronic low back pain. After analysis, they removed the four reverse-scored items and another two items that performed poorly from the TSK-17, leaving a more easily scoring TSK-11 assessment tool (Woby et al., 2005).

In the study by Woby et al. (2005), the TSK-11 showed good internal consistency, test-retest reliability, concurrent validity and predictive validity. There is no specific cut-off score on this scale to indicate fear of movement, however. Instead, analysis showed that a reduction of at least four points indicated an important reduction of fear of movement for the patient, whereas, a less than four-point reduction would indicate that the reduction in movement would not be sufficient to be important to the patient (Woby et al., 2005).

Woby et al. (2005) found the four point reduction relevant for both the TSK-11 and the English version of the TSK-17 – i.e. the TSK with all 17 questions (Woby et al., 2005). However, Walton and Elliott (2013) found that the distribution is not equally meaningful for clinically important differences across the TSK-11 scale and that clinicians and researchers would do well to convert raw data from the ordinal scores to interval-level points in order to ensure that the change in the middle of the scale is similar to that in the upper and lower ends of the scale respectively (Walton and Elliott, 2013).

The authors suggest the use of this transformation matrix when evaluating a patient's fear of movement. In spite of the absence of a definitive cut-off score for the TSK-11, it was decided that this tool should be used on account of the brevity, validity and the good psychometric properties of its results (Woby et al., 2005, Tkachuk and Harris, 2012, Larsson et al., 2014). For our prevalence study, the problem of the definitive cut-off score was resolved by using the scale midpoint as a theoretical cut-off score.

Further support for the use of the TSK-11 in chronic neck patients has come from Walton and Elliott (2013). Using the Rasch analysis, their study confirmed that as an interval-level scale, the TSK-11 functions well in patients with neck pain - from acute to

chronic. However, the authors suggest that item 5, “My accident/problem has put my body at risk for the rest of my life”, may need to be removed in the case of assessments of patients with non-traumatic neck pain that originated less than six months prior to their completion of the questionnaire.

The Rasch analysis confirms also that the magnitude of change in interval levels is not consistent as in the raw ordinal scores. A transformational matrix would convert the scores to the interval levels for clinical use in patients with neck pain, especially those with chronicity and those suffering from pain originating in trauma. As noted by the authors, caution would need to be exercised, however, because the TSK-11 has not yet been supported in the literature as an interval-level scale (Walton and Elliott, 2013).

A study by Roelofs et al. (2007) using Dutch, Swedish and Canadian patients revealed that a two-factor model of the TSK-11 in patients with various musculoskeletal disorders, including upper extremity pain conditions, was invariant across pain diagnoses (upper extremity pain, chronic low back pain, fibromyalgia, osteoarthritis and musculoskeletal pain). The relevant factors were found to be ‘somatic focus’ (TSK-SF), described probably more accurately as ‘pathologic’ somatic focus, bodily harm or damage, reflecting a belief in underlying and serious medical problems; and ‘activity avoidance’, reflecting the belief that physical activity may result in (re)injury or increased pain (Roelofs et al., 2007).

Studies by Roelofs et al. (2007), Walton and Elliott (2013), Elfving et al. (2007), and French et al. (2007) suggest that activities that promote pain would be avoided (TSK-AA) if their fear of activity was high. Furthermore, the results from their studies showed overall that the TSK-11 and its two subscales are psychometrically sound and that there is a good measure of fear of movement and (re)injury in patients suffering from musculoskeletal disorders (Roelofs et al., 2007, Walton and Elliott, 2013, Elfving et al., 2007, French et al., 2007).

Confirmatory factor analysis was undertaken for the TSK-17 where the TSK-SF was called ‘Harm’ and the TSK-AA was termed ‘Fear Avoidance’. The two-factor model was found to be consistent across chronic low back pain and fibromyalgia patients (Goubert et al., 2004c). Walton and Elliott (2013) in their Rasch analysis. confirmed that the two subscales are strongly related (Walton and Elliott, 2013). However, the results of a factor analysis undertaken by French et al. (2007) suggest that these

subscales are not psychometrically distinguishable since a high correlation was found between the two (French et al., 2007).

The items that make up the TSK-SF (pathologic somatic focus) in the TSK-11 are Items 3,4,6,7 and 10, and the items for the TSK-AA (activity avoidance) are Items 1,2,5,8,9,and 11. The summation of the scores constitutes the TSK-11 total score, which gives an assessment of general levels of fear of movement and (re)injury (Roelofs et al., 2007). Roelofs et al. (2007) do point out, however, that the effects of the TSK scales on disability or performance are modest and should the researcher or clinician wish therefore to investigate predictors of these constructs more specifically, other psychosocial questionnaires might be more appropriate (Roelofs et al., 2007).

The TSK-11 Total was shown to have a Cronbach's alpha of 0.80 in a heterogeneous sample of patients with chronic pain (Hapidou et al., 2012), and 0.79 in patients with chronic low back pain (Woby et al., 2005). The test-retest reliability with a CI of 95% of the TSK-11 had an ICC (intraclass correlation) coefficient = 0.81 (0.71-0.88) and an SEM (standard error of the mean) = 2.54 (2.18-3.04). The mean of the test-retest reliability was an interval of 76±14 hours. The responsiveness was shown on the SRM (standard response mean) = -1.11 (n=62) and had both concurrent validity and predictive validity.

In order to be 95% confident that a change in a patient's fear of movement has occurred, the SEM demonstrated that on the TSK-11 a change of at least three points needs to have been noted (Woby et al., 2005). Similar results were reported by Hapidou et al. (2012).

The subscales of the TSK-11 were tested for internal reliability. The TSK-11-SF was found to have a Cronbach's alpha of 0.76 (mean = 11.3; SD = 3.2) and the TSK-11-AA to have a Cronbach's alpha = 0.67 (mean = 14.3; SD = 3.6) (Roelofs et al., 2007). Tkachuk and Harris (2012) measured Cronbach's alpha in patients with chronic pain (78.3% had musculoskeletal pain) which was 0.80 for the TSK-11-Total; 0.71 for the TSK-11-SF and 0.75 for the TSK-11-AA scales (Tkachuk and Harris, 2012).

2.10.3 **Pain Catastrophising Scale (PCS)**

The Pain Catastrophising Scale was developed by Sullivan et al. (1995) in order to facilitate our ability to recognise the role that catastrophic thoughts play in the pain experience (Sullivan et al., 1995). The PCS is a thirteen-item questionnaire which asks

patients to “reflect on past painful experiences, and to indicate the degree to which they experienced each of thirteen thoughts or feelings when experiencing pain” (Sullivan et al., 1995). The questions were each to be answered on a five-point scale; ranging from (0), not at all, to (4), all the time.

Catastrophising can be viewed as a multidimensional construct as has been shown through factor analyses of the PCS. Three factors have been identified; namely rumination (“I can’t stop thinking about how much it hurts” – Items 8,9,10 and 11), magnification (“I worry that something serious may happen” – Items 6,7,13) and helplessness (“There is nothing I can do to reduce the intensity of the pain” – Items 1, 2,3,4,5,12).

Sullivan et al. (1995) suggest that the cut-off score of 30 for the total PCS corresponds to the 75th percentile of the distribution of PCS scores in their clinical research samples of patients with chronic pain. However, a discrepancy was noted later in the paper where the authors described the cut-off score as being above 30 (75th percentile) on the PCS. They also calculated that a score of 11 for rumination, 5 for magnification and 13 for helplessness would be considered clinically relevant ‘cut-off scores’ for the PCS subscales as they also represent the 75th percentile in their category.

Of further interest in the analysis by Sullivan et al. (1995) of the sample of injured workers claiming compensation is that, of those who scored above the 75th percentile and were considered to have catastrophic thoughts in relation to pain, over two-thirds remained unemployed one year post injury. They believed themselves to be totally disabled for occupationally-related activities and scored moderate depression on the BDI-II (Beck Depression Inventory) scale.

Sullivan et al. (1995) discuss further that the PCS could be useful as a screening tool for those at risk of developing prolonged pain and disability. They suggest that those who score between the 50th and 75th percentiles have a moderate risk, while those who score above the 75th percentile would be considered to have a high risk of developing chronicity (Sullivan et al., 1995).

The study by Sullivan et al. (1995) demonstrated Cronbach’s alpha values for the PCS-total (alpha = 0.87) and factor scales (Rumination, alpha = 0.87; Magnification, alpha = 0.60 and Helplessness, alpha = 0.79) (Sullivan et al., 1995). A further study undertaken on pain-free university students found very little variation between the

genders (men; n=229 and women; n=276) but demonstrated the values similar to those of Sullivan et al. (1995) (D'Eon et al., 2004).

Further reliability of the PCS was reported by Lamé et al. (2005) in their research into a heterogeneous group of chronic pain patients. They found an intraclass correlation (ICC) of 0.63-0.71, while the test-retest ICC for the PCS was 0.67. The ICC of the PCS-total was not altered when tested over a longer period of time. The subscales of Rumination and Helplessness were not as stable over time, however. (Lamé et al., 2005, Lamé et al., 2008).

In a recent study of a population of idiopathic chronic neck pain patients, one of the assessment tools for investigating the association between cognitive factors, pain and disability was the PCS. It was found to have an internal consistency of 0.93 (Thompson et al., 2010b).

Considering the merits of the PCS as described above, it is not surprising that it was selected for this study as it is widely recognised and used as a tool for measuring pain catastrophising. A South African English version of the PCS (SA-PCS) with translations into Afrikaans and isiXhosa has been validated among patients with fibromyalgia in the Western Cape, South Africa (Morris et al., 2012). The wording in the South African English version is identical to that in the PCS-English version. It is noteworthy that the PCS was developed for chronic pain sufferers. Therefore, the data for pain catastrophising may not show a strong correlation to fear-avoidance beliefs in the general population currently not suffering from pain (Linton et al., 2000).

There are other instruments that measure pain catastrophising, including the recent Composite Catastrophising Measure – Short Form (CCM-SF) (Van Dyke et al., 2016). This scale was developed in an attempt to address some of the short-comings of the PCS. Although the initial study shows good internal consistency and was considered a valid and reliable measure of pain catastrophising, we decided to use the more widely known and tested PCS.

2.10.4 **Demographic Variables**

This study investigated the following demographic variables, namely gender, age, marital status, highest level of education, employment status, occupation, duration of neck pain and participant's ability to work. This is in keeping with the results of

Thompson et al (2010), who investigated cognitive factors in patients suffering from idiopathic neck pain (Thompson et al., 2010b).

2.11 CONCLUSION

Neck pain is a common problem in the general population with studies showing between 38% and 54% reporting neck pain in a six- to twelve-month period. Furthermore, between 4.6% and 14% may experience some form of disability or interference in their activities as a result of the pain, with almost 3% unable to work. A significant proportion of individuals never fully recover from their neck pain. One study showed that only 6.3% of individuals did not report their neck pain as recurrent.

The origins of the chronicity of neck pain are not always clear, but hypersensitivity of the central nervous system and psychosocial factors have been strongly associated with neck pain and therefore the development and maintenance of chronicity.

This review has shown that psychosocial factors increase emotional distress, somatic awareness, psychological stress and maladaptive coping. The resultant effect on adaptive/maladaptive conditioning processes or cognitive elements increases the chance of pain developing and even perpetuating chronic pain. This increases fears and vulnerabilities and fear avoidance behaviour. Furthermore, increased pain catastrophising can have the effect of intensifying pain, thus further raising the emotional distress levels of patients.

Since no cut-off scores are available for the TSK-11, prevalence studies have not been performed. However, this questionnaire is widely used in the fear avoidance literature, and its subscales of somatic focus and activity avoidance offer interesting insights into the maladaptive aspects of avoidance because of fear of (re)injury.

There is a paucity of prevalence studies for pain catastrophising in non-specific chronic neck pain, but this review has shown that chronic neck pain is a considerable burden both for world health economies and for the individual. Therefore, developing further insight into fear avoidance and pain catastrophising in chronic neck patients may be helpful.

CHAPTER THREE

3. METHODOLOGY

3.1 INTRODUCTION

This chapter outlines the methodology used in this study. The study design, sampling procedures, inclusion and exclusion criteria and questionnaires used are described. Procedures followed during the study, statistical analysis of data collected and ethical considerations are presented.

The methodology was designed to establish the prevalence of fear avoidance and pain catastrophising in patients attending private physiotherapy clinics in Johannesburg and to determine any association between these factors and demographic variables.

Data from 106 patients who had been suffering from neck pain for at least three months were collected (Appendix A, B, C). No record was made of those who chose not to participate in the study.

The following data were collected:

- Demographic: gender, age, marital status, highest level of education (HLOE), employment status, occupation (Appendix A)
- Duration of neck pain (months) (Appendix A)
- Whether or not ability to work was reduced due to pain (Appendix A)
- Current pain intensity (10 cm VAS) (Appendix A)
- Fear-avoidance as measured by the TSK – 11 scale (11 items; each range 1-4) (Appendix B)
  - Total score (range 11 – 44; α = 0.79 (Woby et al., 2005))
  - Somatic Focus (SF) subscale (range 5 – 20; α = 0.68 (Roelofs et al., 2011))
  - Activity Avoidance (AA) subscale (range 6 – 24; α = 0.67 (Roelofs et al., 2007))
- Pain catastrophising as measured by the PC scale (13 items; each range 0 – 4). All Cronbach's alpha from (Sullivan et al., 1995) (Appendix C)
  - Total score (range 0 – 52; clinically relevant: ≥=30; α =0.87)
  - PCS-R (Rumination) subscale (range0-16; clinically relevant: >11; α =0.87)
  - PCS-M (Magnification) subscale (range 0-12; clinically relevant: >5; α =0.66)
  - PCS-H (Helplessness) subscale (range 0-24; clinically relevant: >13; α =0.78)

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3.2 STUDY DESIGN

This prevalence study was a cross-sectional design using two validated questionnaires to investigate fear avoidance and pain catastrophising and a demographic questionnaire for individuals experiencing non-specific chronic neck pain.

3.3 ETHICAL CLEARANCE

Ethical clearance was obtained from the Human Research Ethics Committee (Medical) of the University of the Witwatersrand on 20/06/2014. Clearance Certificate no. M140434 (Appendix D).

3.4 CONFIDENTIALITY

Each participant was given a detailed letter outlining the procedures involved in the research (Appendix E). Each questionnaire was coded, de-identifying participants and any pertinent information contained in the documents and data was stored in a password encrypted file. Each participant signed two consent forms; one was kept by the researcher and one by the participant (Appendix F). Any identifying data was stored in a locked cabinet and separately from the questionnaires and the data set.

3.5 STUDY PERIOD

The pilot study was carried out from 17.7.2014 to 22.4.2015 and consisted of ten willing participants who signed an informed consent. This number was decided upon as it was above 10% of the expected total number of participants. Participants were asked to complete the questionnaires again one week later in order to establish the feasibility of the use of the questionnaires and the procedures for the study. The pilot study was unusually long. The first method of recruitment was by emailing the OMPT group and only two participants were gained from this method. Then practices were approached telephonically. The practices that responded positively were enthusiastic about recruiting and encouraging participants. However, it became apparent that the initial enthusiasm to assist the researcher with recruitment did not translate into actual data collection. The researcher tried to balance reminding practices with understanding how busy they are, but this meant that the researcher left a few weeks between following up with the practice and this further delayed the data collection process.

The main study then continued according to the sampling procedures until the target number of participants was reached on the 8.11.2015.

3.6 SAMPLE

3.6.1 Sample Frame

Musculoskeletal practices that affiliate with the Orthopaedic Manipulative Physiotherapy Group of the South African Society of Physiotherapy (OMPTG of the SASP) were included for homogeneity. The physiotherapists in the practices were also asked to identify appropriate participants for the study and by virtue of their experience and area of work their understanding of the inclusion and exclusion factors would add to the accuracy of the sample.

3.6.2 Sampling

The practices were selected randomly using Excel randomisation program and then approached sequentially.

3.6.3 Sample Size

Sample size estimation was based on the key research question to be answered, in this case the estimation of proportions (e.g. the proportion of patients with fear avoidance, or with pain catastrophising). Since we do not know, at the outset, the likely magnitude of these proportions, a worst-cases (for sample size calculation) estimate of 50% was used (either side of 50%, the required sample size decreases). Using 10% precision, a 95% confidence level, and an infinite population, a sample size of 97 was required. The actual sample size of 106 gave a precision of 9.5% (Pourhoseingholi et al., 2013). The study was powered to report the prevalence of patients with clinically relevant scores in scales (and subscales), but not to compare these statistically.

Sample size for prevalence was determined using the formula:

$$n = \frac{Z^2 P(1-P)}{d^2}$$

where:

n = sample size,

Z = Z-statistic for the chosen level of confidence,

P = expected prevalence or proportion

d = precision (Daniel, 1999, Pourhoseingholi et al., 2013)

3.6.4 Sampling

The sampling of the participants was carried out sequentially. After practices had agreed to participate in the study, as soon as a patient was identified as a possible candidate for the study, that patient was approached. Each practice was asked to

recruit willing participants until contacted by the researcher to terminate recruitment. No limit of recruitment of participants was set for any practice. The researcher contacted practices at three weekly intervals to collect completed questionnaires. When the calculated sample size was reached, recruitment was terminated.

3.7 STUDY VARIABLES AND QUESTIONNAIRES

The prevalence of fear-avoidance was measured using the self-report Tampa Scale for Kinesiophobia–11 (Woby et al., 2005, Roelofs et al., 2007) (Appendix B). Fear avoidance is a variable investigated using the Tampa Scale for Kinesiophobia-11 and two factors contained within the scale, namely activity avoidance and somatic focus, were also assessed.

The second objective, the prevalence of pain catastrophising was answered by using the self-report Pain Catastrophising Scale–English (PCS-EN) or (PCS) (Sullivan et al., 1995) (Appendix C). Pain catastrophising was also investigated with its subscales of rumination, magnification and helplessness.

The third objective used the Visual Analogue Score (VAS) (Crossley et al., 2004, Huskisson, 1974) for pain intensity which was part of the demographic questionnaire (Appendix A). Each participant was instructed to mark an X (cross) on the unmarked line anywhere between “no pain” and “the worst pain imaginable (most severe)” to denote the pain they were experiencing “now”.

The demographic questionnaire collected information regarding the participants’ gender, age, marital status, pain intensity measured using the VAS, duration of pain, highest level of education attained, whether or not the participants were employed and if they had reduced their work load because of pain. Participants were asked to record the area of pain on a body chart as confirmation that the pain was in the region of the body that was being studied. However, this was not used for analytical purposes.

3.7.1 Validity and Reliability of the Study Questionnaires

The TSK-11, PCS and VAS are valid and reliable questionnaires for use in patients with chronic neck pain as discussed in the Literature Review.

3.8 PROCEDURE

3.8.1 How Practices were Approached

The researcher contacted all physiotherapists who are members of the OMPTG of the SASP in the Johannesburg region by email regarding the study, after the chairperson of the group agreed to forward the letter (Appendix G) on her behalf. The SASP and its groups do not give out mailing lists. OMPTG member physiotherapists were selected as likely practices to encounter potential participants.

Only two practices responded to this method of contacting practices. Then a list was compiled of physiotherapy practices from the OMPTG website in the Johannesburg area and then randomised using the Microsoft Excel randomisation program. These practices were approached consecutively and, if they were willing to participate in identifying participants for the trial, they were trained on how to select participants, fill in the consent forms and supervise the participant in filling in the questionnaires. If the practice was unwilling or unable to supervise the participant with the forms, the researcher was on hand to do so. The practices were also shown how to store the completed questionnaires so that confidentiality was ensured.

The patients were approached sequentially as they presented at each practice.

Many practices were initially enthusiastic about being involved in the research, but this did not carry over into concrete data collection from the practices. An additional method for physiotherapists to approach possible participants was devised (on request by a physiotherapist). A letter, drafted by the researcher, was sent to a potential participant by that practitioner, asking if that person would be willing to participate in the research (Appendix H). This method was successful for a number of participants.

3.8.2 Pilot Study

Pilot testing was carried out using the first ten participants between 17.7.2014 and 22.4.2015. Participants were assessed for inclusion or exclusion in the study by a trained physiotherapist at the selected practices or by the researcher using the following criteria:

Inclusion Criteria

- Participants were included who had had neck pain for three or more months.
  - Neck pain for the purposes of this study was defined by the subjective opinion of the participant. In other words, it could include pain, muscle tension or

stiffness in the neck, shoulder area, upper back area and/or above their costal margin, with or without pain in their arms.

- People who presented at the selected private practices were considered for inclusion.
- The participant would be eligible for the study whether or not he/she had received physiotherapy before or after filling in the questionnaires.
- Participants could be male or female.
- Participants were not excluded on the basis of ethnicity or nationality.
- Participants needed to be 18 years or older.
- Participants needed to be able to read and speak English (Sullivan et al., 1995).

Exclusion Criteria

- Participants should have no neurological fallout.
- Participants should not have any progressive neuromuscular condition.
- Participants would not be eligible if they had experienced unexplained weight loss.
- Participants could not participate if they were receiving drugs via intravenous means.
- Participants would not be eligible if they had undergone any surgical intervention at all in the previous three months.

The first ten participants in the study were asked to complete the questionnaires for a second time, one week after the date that they had first completed the questionnaires. This ensured that the procedure adopted for testing the participants using the demographic questionnaire, the TSK-11 and the PCS questionnaires for the study was feasible. The pilot study confirmed that participants with chronic neck pain who were attending physiotherapy understood what was required of them in the experimental process and could complete the three questionnaires, and that the practices understood and could manage the selection process of participants. The confidential storage of the documents was also acceptable according to ethical requirements.

3.8.3 Main Study

Once the first 10 participants had been tested and the procedure and questionnaires were assessed to be adequate, the main study proceeded with selected participants being requested to fill in the questionnaires once only.

The data were collected from 17.7.2014 to 8.11.2015 and collated on an Excel spreadsheet from where the data could be analysed.

3.8.3.1 **How the participants were approached**

The researcher contacted a practice and if they showed an interest, a letter was sent to the practice explaining the background to the study and what the study would entail (Appendix G). The researcher then visited the practice to train the physiotherapists who would be involved in selecting the potential participants. The physiotherapists were shown the Checklist for Physiotherapist (Appendix I) which detailed the procedure to the physiotherapists and included the inclusion and exclusion criteria for participation in the study. If a patient was identified as a potential participant, the study was explained and the Participant Information Form (Appendix E) was given to him/her so that he/she could understand the purpose of the study and the extent of their involvement completely. If they agreed to participate they were asked to sign the consent form (Appendix F) in duplicate. One copy would be retained by the patient (including the Participant Information Form) and one by the researcher. This would ensure that there was no ambiguity around consent. The participant then completed the three questionnaires (Appendices A, B and C). The practice retained a form with the participant's name and the identifying code (Appendix J) to ensure that participants were not approached more than once. The identifying code was marked on each form that the participant completed.

The questionnaires and the consent form were then collated onto a Microsoft Excel spreadsheet with no identifying details.

3.9 **ANALYSIS OF DATA**

Data analysis was carried out using STATISTICA, version 12. (StatSoft, Inc. 2013) www.statsoft.com. The 5% significance level was used.

Descriptive analysis of the data was carried out as follows:

- Categorical variables were summarised by frequency and percentage tabulation, and illustrated in tabular form.
- Continuous variables were summarised by the mean, standard deviation, median and interquartile range, and their distribution illustrated by means of histograms (Cohen, 1988).

Cronbach's alpha was determined for the PCS and TSK scales, as well as their subscales.

There are no clinically relevant cut-off scores for the TSK-11 in the literature. For the purposes of this study, the scores above midpoint of the scale were taken to indicate that the participant was likely to be more fear-avoidant. The possible answers in the questionnaire were 'strongly disagree', slightly disagree' to 'slightly agree' and 'strongly agree'. Based on the cut-off points for the PCS and subscales, and the midpoint of the TSK-11 and its subscales; the scales and each of their subscales were dichotomised, and the prevalence of patients with clinically relevant scores was calculated.

The relationship between the PCS and TSK scales and sub-scales was assessed by Spearman's rank correlation coefficient (since the PCS data were not normally distributed). The strength of the associations was measured by interpreting the absolute value of the correlation coefficient (Cohen, 1988). The following scale of interpretation was used:

0.50 and above	: strong association
0.3 to 0.49	: moderate association
Below 0.3	: small association

The relationship between the scores for each of the PCS and TSK main scales and the categorical study variables was assessed by the unpaired t-test (or ANOVA in the case of more than two groups). Where the data did not meet the assumptions of these tests, a non-parametric alternative, the Wilcoxon rank sum test (or the Kruskal-Wallis test for more than two groups) was used. The strength of the associations was measured by the Cohen's d-value for parametric tests and the r-value for the non-parametric tests (Cohen, 1988). The following scale of interpretation was used:

0.80 and above	: strong association
0.50 to 0.79	: moderate association
0.20 to 0.49	: small association
below 0.20	: near zero association

The relationship between the scores for each of the PCS and TSK main scales and the continuous study variables was assessed by Pearson's or Spearman's rank correlation coefficient (depending on the distribution of the data), as described above (Cohen, 1988).

3.10 **SUMMARY**

A cross-sectional study, based on self-report questionnaires was conducted. Two validated and reliable tools were used and a demographic questionnaire was used using a validated VAS tool. The feasibility of testing participants with the three questionnaires was piloted. Since the process was found to be feasible, the data were collected from 106 participants. Fear avoidance and pain catastrophising characteristics were assessed using the TSK-11 and PCS respectively; and a demographic questionnaire, which gave association data regarding gender, age, pain intensity, marital status, highest level of education, employment status, duration of neck pain and whether or not the participant had had to reduce their work load as a result of this pain, was filled in by each participant. The demographic data were tested for association between fear avoidance and pain catastrophising, and the association between fear avoidance and pain catastrophising itself was tested. The data from the questionnaires and demographic questionnaires were analysed using STATISTICA, version 12. Results were considered to be significant when p-values were <0.05.

CHAPTER FOUR

4. RESULTS

4.1 INTRODUCTION

The data collected in support of the aims and objectives of this study will be presented in this chapter. The aim of this study was to determine the prevalence of fear avoidance and pain catastrophising in patients who have had neck pain for three or more months and are attending physiotherapy in private practices in Johannesburg, South Africa.

The study aimed to establish the prevalence of fear avoidance and pain catastrophising, including their respective subscales. It also aimed to establish the association between the various demographic variables investigated, as well as pain intensity, on the one hand, and fear avoidance and pain catastrophising on the other.

4.2 RESULTS OF THE PILOT STUDY

A pilot study was carried out using the first ten participants who volunteered for this project in order to test the feasibility of the process of the study. They were asked whether they were prepared to redo the same questionnaires a week later, and having agreed to this, they repeated the questionnaires.

The purpose of the pilot study was to test whether or not the participants could follow the procedure as described by the assessor and could answer the questions comfortably. Furthermore, it was an opportunity to test the response of the private practices approached and the collating of the confidential data. Since there were no problems encountered with the initial ten participants, the study continued, and the pilot study participants were included in the main study statistical analysis using the first questionnaire that they had filled in.

4.3 RESULTS OF THE MAIN STUDY

Of the 50 practices approached, a total of 25 practices participated in the study. When the minimum sample size calculated for this study was achieved, as described in the methodology, no further practices were contacted and the total sample size stood at 106 participants.

4.3.1 **Demographic Information**

The descriptive analysis of the categorical variables was summarised through frequency and percentage tabulation and presented in Table 4.1 below. The variables analysed here specifically were gender, highest level of education attained, employment status, marital status and whether or not participants had reduced their work load because of pain.

Table 4.1: The Demographic Profile of the Participants (n=106)

Variable	Category	N	%
Overall n		106	
Gender	Female	86	81.1
	Male	20	18.9
Highest level of education	Primary	1	0.9
	Secondary	22	20.8
	Tertiary	81	76.4
	Unknown	2	1.9
Employment status (ungrouped)	employed FT	38	35.8
	employed PT	9	8.5
	self-employed FT	22	20.8
	self-employed PT	12	11.3
	Retired	11	10.4
	Student	1	0.9
	Unemployed	12	11.3
	Unknown	1	0.9
Employment status (grouped)	FT	60	56.6
	PT	21	19.8
	retired/unemployed	23	21.7
	Student	1	0.9
	Unknown	1	0.9
Marital status	Married	64	60.4
	Single	16	15.1
	Divorced	9	8.5
	Widow	7	6.6
	co-habiting with partner	7	6.6
	Separated	2	1.9
	long distance relationship	1	0.9
Marital status (grouped)	in a relationship	72	67.9
	Single	34	32.1
Reduced work load due to pain	No	84	79.2
	Yes	14	13.2
	Unknown	8	7.5

Analysis of the results in Table 4.1 shows that 81.1% of the participants (n=106) were female. The majority of participants (76.4%) had some form of tertiary education. The percentage of those with only 'primary' education was relatively small; therefore this category was grouped with 'secondary' when its association with the TSK and PCS scores was analysed. Only 1.9% of participants did not respond to this question.

When employment status was analysed, certain categories were grouped together, namely those who worked full-time or part-time (including those who were employed and self-employed). The retired and unemployed participants were also grouped together. This showed that the majority of the participants were working full-time and the rest were fairly evenly distributed between working part-time and retired/unemployed. Only 0.9% of the data was missing.

Marital status showed that the majority (60.4%) of participants were married. They were further grouped into those 'in relationship' and those who were 'single'. This showed that 67.9% were 'in relationship'.

The majority (79.2%) of participants reported that they had not reduced their work load due to pain, although 7.5% did not respond to this question.

The distribution of the age of participants in the study is shown in Figure 4.1 below.

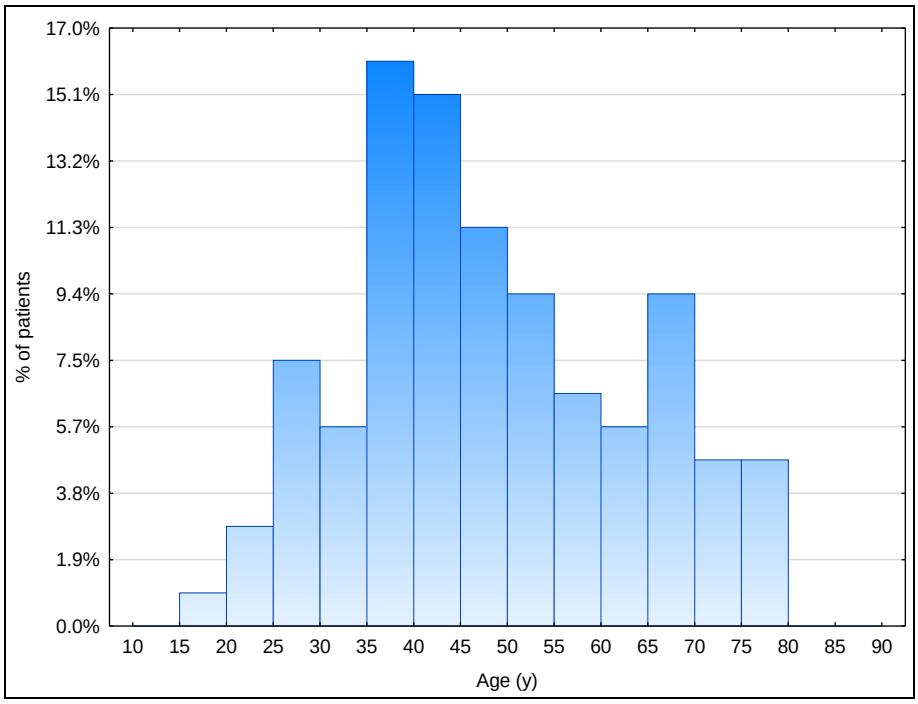

Figure 4.1: Distribution of the age of participants

The mean age of the participants was 48.7 years (SD=14.8y; range 20-80y). The majority of the participants were in the 35-55 year range.

4.3.1.1 **Pain behaviour**

The behaviour of the participants in terms of pain was examined by analysing the duration of the pain (Figure 4.2 below), the intensity of the pain (Figure 4.3 below) and whether or not the participants had had to reduce their work load due to the pain (Table 4.1 above).

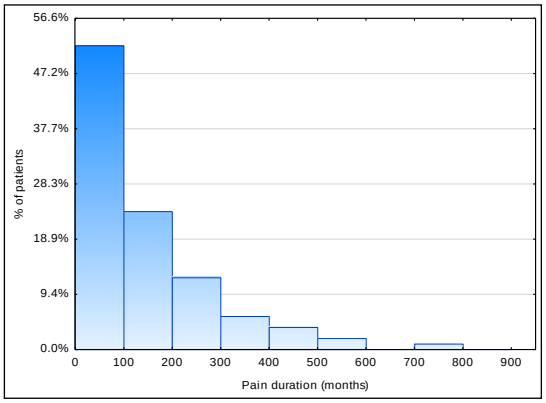

Figure 4.2: Pain duration

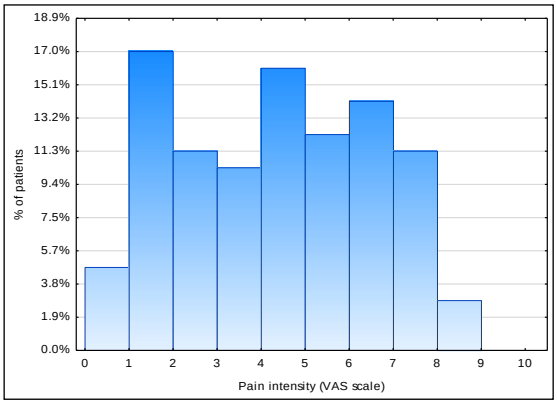

Figure 4.3: Pain intensity

Pain duration:

The distribution of the data for pain duration is shown in figure 4.2. The median pain duration was 96 months (8 years) (interquartile range (IQR=30-180 months (2.5-15y); range 3-756 months (0.25-63 years)). Most participants had suffered their pain for a few years and only a few had experienced pain for several decades.

Pain intensity:

Figure 4.3 shows the distribution of the data for pain intensity with the mean pain intensity being 4.4 (SD=2.2; range 0.3-8.7). The figure shows that pain intensity in the participants appears to be well-spread over the scale range, except at the very ends of the VAS scale i.e. at almost no pain or at 8-10 (‘most severe’ pain).

Reduced work load due to pain:

As indicated in Table 4.1, although 7.5% of the participants did not respond to this question, almost 80% of the participants did not reduce their work load on account of their pain.

4.3.2 TSK-11-Total and its two Subscales: TSK-SF and TSK-AA

The distributions of the TSK-11-Total score and its two subscales TSK-SF and TSK-AA are shown below in figures 4.4, 4.5 and 4.6 respectively.

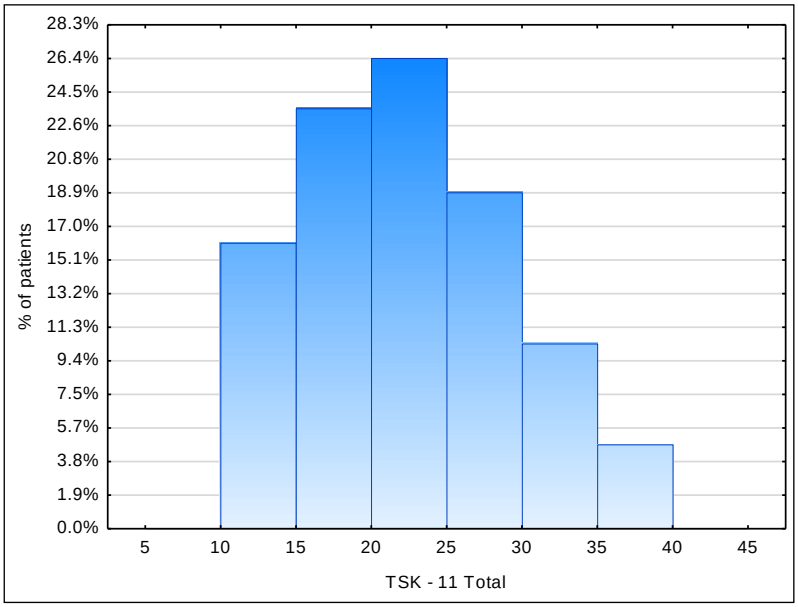

Figure 4.4: TSK-11-Total Score

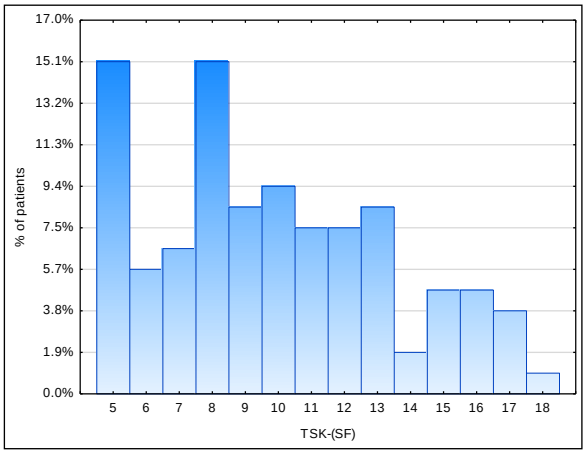

Figure 4.5: TSK – SF

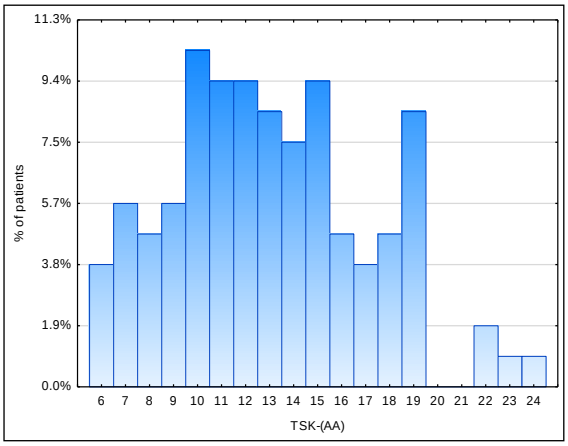

Figure 4.6: TSK – AA

The mean scores for the TSK-Total, the TSK - SF and the TSK- AA were 22.9, 9.8, and 13.0, respectively. Standard deviations and full ranges are tabulated below in Table 4.2. In all three cases, the data are spread widely over the range of the scales.

Table 4.2: The Ranges of Scores around the Mean and Median of the TSK and its Subscales, including the IQR and SD

Variable	n	Mean	Median	Minimum	Maximum	Interquartile Range		SD
TSK - 11 Total	106	22.9	22.5	11.0	40.0	17.0	28.0	7.0
TSK-(SF)	106	9.8	9.0	5.0	18.0	7.0	12.0	3.6
TSK-(AA)	106	13.0	13.0	6.0	24.0	10.0	16.0	4.1

The reliability of the scales, as measured by Cronbach's alpha, are tabulated below. The data from this study are all in excess of 0.70, and also exceed the available literature values (Roelofs et al., 2007, Woby et al., 2005, Tkachuk and Harris, 2012).

Table 4.3: Cronbach's Alpha of TSK-11-Total and its Subscales

Cronbach's alpha	
Variable	**This Study**
TSK–11-Total	0.85
TSK-(SF)	0.75
TSK-(AA)	0.77

4.3.3 PCS and its three Subscales: PCS-R, PCS-M and PCS-H

The distributions of the PCS-Total and the three subscales of rumination, magnification and helplessness are shown below.

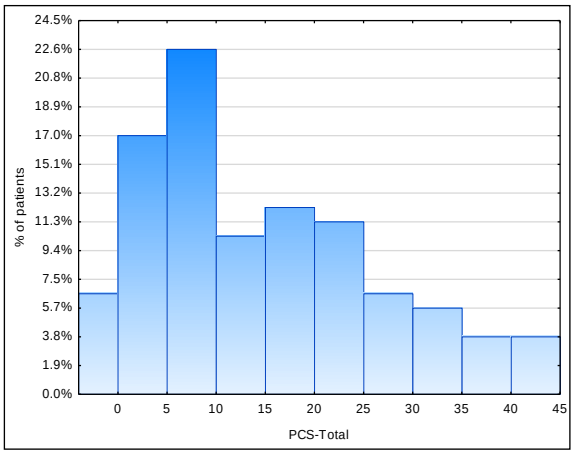

Figure 4.7: PCS - Total score distribution

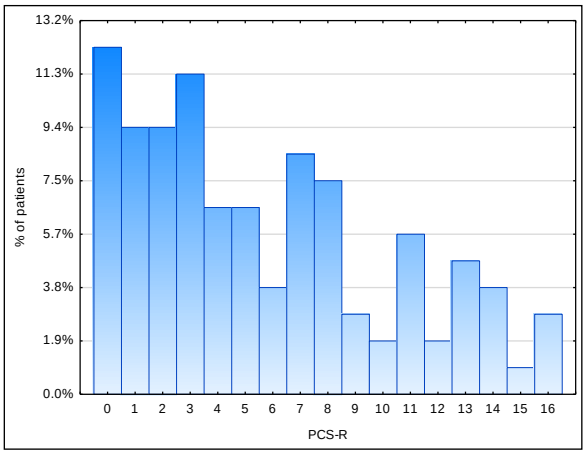

Figure 4.8: PCS - R score distribution

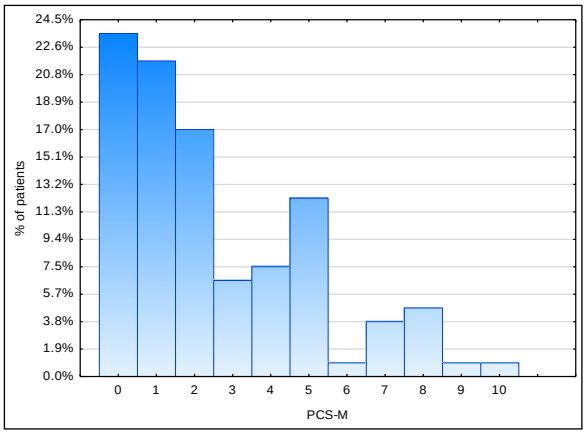

Figure 4.9: PCS - M score distribution

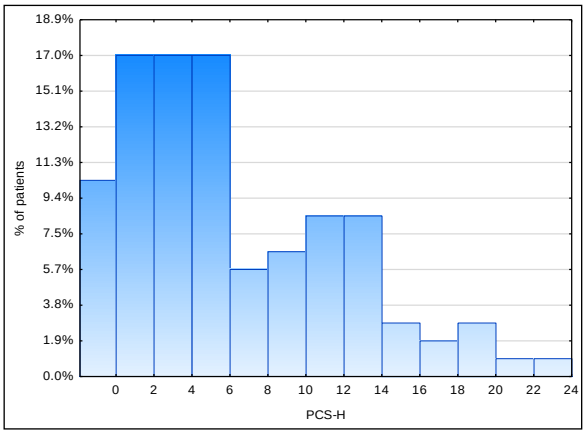

Figure 4.10: PCS - H score distribution

The median scores for the PCS-Total, the PCS-R, the PCS-M and the PCS-H were 12, 5, 2, and 5, respectively. As can be seen in the figures above, the data are concentrated in the lower end of the scales in all four cases, with relatively fewer patients reporting very high levels of pain catastrophising.

The reliability of the scales, as measured by Cronbach's alpha, are tabulated below. It can be seen from the data in this study that all are in excess of 0.70, and also exceed the literature values (Sullivan et al., 1995).

Table 4.4: Cronbach's Alpha of the PCS and its Subscales

Cronbach's alpha	
Variable	this study
PCS-Total	0.95
PCS-R	0.93
PCS-M	0.75
PCS-H	0.91

4.3.4 Prevalence of Fear Avoidance and Pain Catastrophising

4.3.4.1 The prevalence of fear avoidance and its sub-scales of somatic focus and activity avoidance in the study group

There are no clinically relevant cut-off scores for the TSK-11 in the literature. For the purposes of this study, the scores above midpoint of the scale were taken to indicate that the participant was likely to be more fear-avoidant. The possible answers in the

questionnaire were ‘strongly disagree’, slightly disagree’ to ‘slightly agree’ and ‘strongly agree’.

The prevalence of patients with clinically relevant scores, derived as indicated above, is tabulated in table 4.5 below.

Table 4.5: The Prevalence and CI of the TSK-11 and its Subsets using the Scale Midpoint as a Cut-Off

	Cut-Off for this Study (scale midpoint)	% of Participants	95% Confidence Interval
TSK –11-Total	>=28	25.5%	18.1 - 34.5%
TSK-(SF)	>=13	24.5%	17.3 - 33.5%
TSK-(AA)	>=16	25.5%	18.1 - 34.5%

It is noteworthy that the differences in the prevalence of participants above the cut-off scores in the two subscales are NOT significant. The confidence intervals are wide due to the relatively small sample size.

4.3.4.2 **The prevalence of pain catastrophising and its subscales of rumination, magnification and helplessness in the study group**

The prevalence of participants with clinically relevant scores is tabulated in Table 4.6 below.

Table 4.6: The Prevalence and CI of the PCS and its Subscales using the Clinically Relevant Scores (Sullivan et al., 1995)

	Clinically Relevant Scores (Sullivan et al., 1995)		
	Cut-Off	% of Participants	95% Confidence Interval
PCS-Total	≥30	15.1%	9.5 - 23.1%
PCS-R	>11	14.2%	8.8 - 22.0%
PCS-M	>5	23.6%	16.5 - 32.5%
PCS-H	>13	17.9%	11.8 - 26.3%

It is noteworthy that the differences in the prevalence of participants with clinically relevant scores in the three subscales are NOT significant. The confidence intervals are wide due to the relatively small sample size.

4.3.5 ASSOCIATIONS BETWEEN STUDY VARIABLES

4.3.5.1 The association between fear avoidance and pain catastrophising

The Spearman correlation coefficients between the TSK and PCS scales and subscales are tabulated below in table 4.7. All the coefficients were significant at the 5% significance level, and all corresponded to large effect sizes (r>=0.50).

Table 4.7: Correlation between the TSK and PCS Scales and their Subscales where p<0.0001 in all 12 Cases

Variable	Spearman Rank Order Correlations			
	PCS-Total	PCS-R	PCS-M	PCS-H
TSK - 11 Total	0.684	0.624	0.653	0.657
TSK-(SF)	0.684	0.608	0.602	0.678
TSK-(AA)	0.548	0.499	0.576	0.517

The marked correlations in yellow in Table 4.7 above correspond to those between the TSK-11-Total and the TSK-SF on the one hand, and all the PCS scales and subscales on the other that are of clinical interest. The correlation coefficients are all positive, indicating that the TSK score increases as the PCS score increases.

The scatterplot below in Figure 4.11 illustrates the positive correlation between the TSK-Total and the PCS-Total.

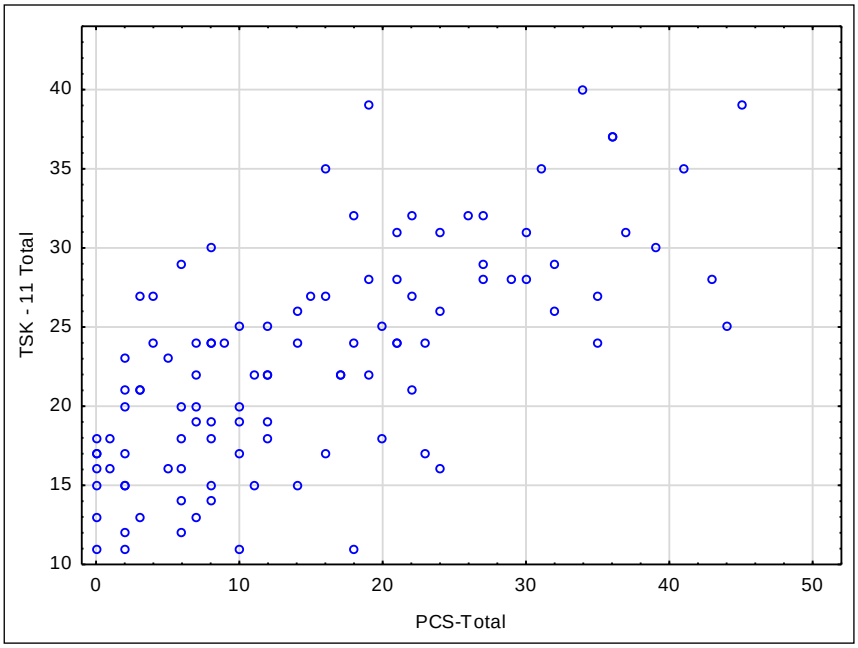

Figure 4.11: Scatterplot indicating the Correlation between the TSK-11-Total and the PSC-Total

The scatterplots illustrating the positive correlation between the TSK-11-Total and the PCS subscales and the TSK-SF and the PCS-Total and the PCS subscales are illustrated in Appendix K, Figures 1-7.

4.3.6 The Association between the Demographic Variables, as well as Pain Intensity on the one hand, and Fear Avoidance and Pain Catastrophising on the other

4.3.6.1 The association between the categorical demographic variables on the one hand and fear avoidance and pain catastrophising on the other

The relationships between the categorical study variables and the scores for the TSK and the PCS were assessed and are tabulated in Table 4.8 below.

Table 4.8: Association between the Demographic Variables and the TSK and the PCS

Variable	TSK	PCS
Gender	Unpaired t-test F(1,104)=1.7 p=0.19	Wilcoxon rank sum test Z=1.43 p=0.15
Age	Pearson's correlation coefficient rho= -0.08 p=0.43	Spearman's correlation coefficient rho= -0.11 p=0.27
Highest Level of Education	Unpaired t-test T=2.5 p=0.013	Wilcoxon rank sum test Z=0.99 p=0.32
Employment status	One-way ANOVA F(2,101)=0.79 p=0.46	Kruskal-Wallis test H(2, N= 104) = 0.06 p=0.97
Marital Status	Unpaired t-test F(1,104)=0.81 p=0.37	Wilcoxon rank sum test Z=0.29 p=0.29
Reduced Work due to Pain	Unpaired t-test F(1,96)=0.92 p=0.34	Wilcoxon rank sum test Z=1.56 p=0.12
Pain Duration	Spearman's correlation co-efficient rho = -0.08 p=0.43	Spearman's correlation coefficient rho= -0.16 p=0.09

No significant association was found either between gender and the TSK score or gender and the PCS score or between age and the TSK score or age and the PCS score.

There was no significant association between employment status, marital status, reduced work load due to pain or pain duration and the TSK score.

No association was found between employment status, marital status, reduced work load due to pain or pain duration and the PCS score.

4.3.6.2 The association between the highest level of education and the TSK-Total

A significant association was found between the highest level of education and the TSK-11 score, illustrated in figure 4.12, but not between the highest level of education and the PCS score.

For analysis of the highest level of education, 'primary' education was grouped with 'secondary' education because the proportion of participants with 'primary' education was relatively small. The mean TSK-11 score for those with a secondary education (26.0 ± 3.4) was higher than for those with tertiary education (21.9 ± 1.5). *The values following the ± denote the 95% confidence interval for the mean.* The effect size was moderate (Cohen's d = 0.60).

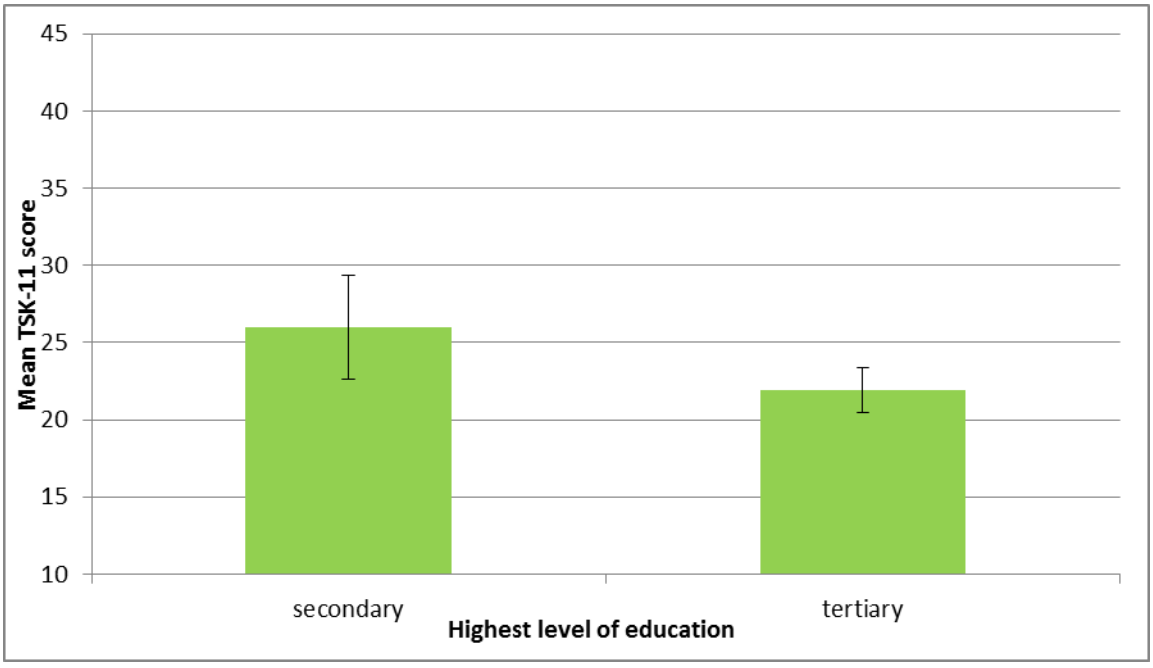

Figure 4.12: Association between highest level of education and the mean TSK-11-Total score

The significant association between the highest level of education and the mean TSK-11 score indicated that those with a secondary education were more likely to be fear avoidant than those with a tertiary education.

4.3.6.3 **The association between pain intensity and the TSK-Total and the PCS-Total respectively**

There was a significant positive correlation between pain intensity and the TSK score (Pearson's correlation; p=0.001; r=0.33). Similarly, there was a significant positive correlation between pain intensity and the PCS score (Spearman's correlation; p<0.0001; r=0.39). The effect size was moderate in both.

Figures 4.13 and 4.14 illustrate the correlation between pain intensity and the TSK score and between pain intensity and the PCS score.

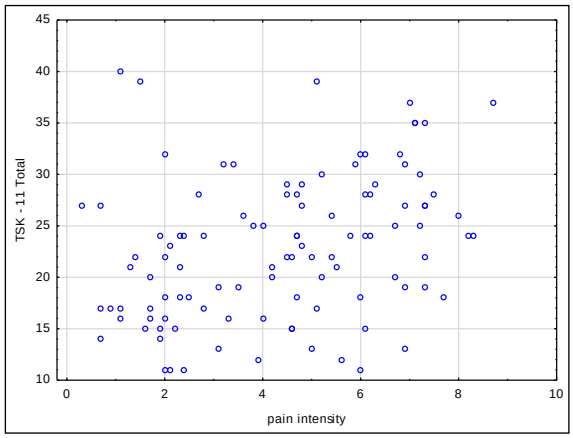

Figure 4.13 Scatterplot shows correlation between pain intensity and the TSK-Total

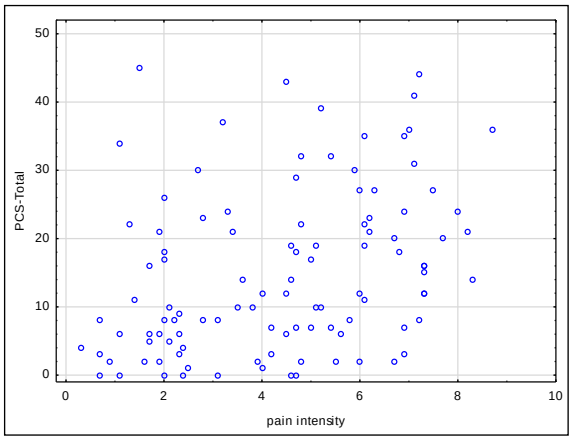

Figure 4.14 Scatterplot shows correlation between pain intensity and the PCS-Total

The correlation was positive in both cases, indicating increased fear avoidance and pain catastrophising as pain intensity increases.

4.4 SUMMARY OF RESULTS

The majority of participants were female, had a tertiary education and were working full-time. Over 66% were not living alone and most had not reduced their work load because of their pain. The ages of participants ranged between 20 and 80 years, with the highest concentration being between 35 and 45 years. Almost all patients had endured their pain for a few years (median 8 years); the mean pain intensity was 4.4 on the VAS scale, with very few in the 8-10 range.

The TSK-11–Total, the TSK-SF and the TSK-AA had mean scores of 22.9, 9.8 and 13.0 respectively.

The prevalence of the TSK-11-Total was 25.5% (n=106), while the prevalence values for the subscales TSK-SF and TSK-AA were 24.5% and 25.5% respectively. These prevalence results were based on a cut-off equivalent to the midpoint scale. The data are spread widely over the range of the scales in all three cases.

The median scores for the PCS-Total, the PCS-R, the PCS-M and the PCS-H were 12, 5, 2 and 5 respectively. The prevalence of clinically relevant scores for the PCS-Total, the PCS-R, the PCS-M and the PCS-H were 15.1%, 14.2%, 23.6% and 17.9% respectively (n=106).

Only the prevalence score for the TSK-Total (25.5%) and the prevalence score for the PCS-Total (15.1%) were significant. The scores of their subscales were not.

The reliability levels for the TSK-11-Total and its subscales, TSK-SF and TSK-AA, were $\alpha=0.85$, $\alpha=0.75$ and $\alpha=0.77$ respectively and the reliability level for the PCS-Total and its subscales, PCS-R, PCS-M and PCS-H, were $\alpha=0.95$, $\alpha=0.93$, $\alpha=0.75$ and $\alpha=0.91$ respectively.
There was a significant positive correlation between the TSK-Total and the PCS-Total and its subscales and the TSK-SF and the PCS-Total and its subscales.

There was a significant association between highest level of education and the TSK-Total score. The mean TSK-11 score for those participants with secondary education (26.0 ± 3.4) was higher than for those with tertiary education (21.9 ± 1.5), indicating that those with a secondary education were more likely to be fear avoidant than those with a tertiary education.

There was a significant positive correlation between pain intensity and the TSK-Total score and a significant positive correlation between pain intensity and the PCS-Total score. However, there was no significant association between any of the demographic variables and the TSK-Total score and the PCS-Total score respectively.

CHAPTER FIVE

5. DISCUSSION

5.1.1 Introduction

This cross-sectional design study was conducted in order to establish the prevalence of fear avoidance and pain catastrophising (using the TSK-11 and the PCS) in patients with chronic neck pain who presented to private physiotherapy practices in Johannesburg over a period of sixteen months. Having determined the prevalence of these factors, further analysis explored associations between fear avoidance and pain catastrophising and between various demographic variables and these two components. The demographic variables included gender, age, marital status, highest level of education attained, employment status, occupation, duration of neck pain, the participant's ability to work, and current pain intensity.

A sample frame of physiotherapy practices was randomised from a list of OMPTG (Orthopaedic Manipulative Physiotherapy Group) practices in Johannesburg listed on the OMPTG (a special interest group) of the SASP (South African Society of Physiotherapy) website using the Microsoft Excel randomisation programme. The practices were contacted sequentially and if they consented, were enrolled in the study. The sampling of participants was also carried out sequentially within each practice. Each practice was asked to recruit willing participants until the target number of participants was achieved. No limit of participants was set for any practice.

A pilot study was conducted by using the first ten participants who were then included in the main study. In all, twenty-five practices were included in the study and the total number of participants was 106 which gives a precision of 9.5% as per the sample size calculation (Daniel, 1999, Pourhoseingholi et al., 2013). Once the target number of participants was reached, no further practices were contacted and participant recruitment was terminated.

5.1.2 Prevalence of Fear Avoidance and its Clinical Implications

The prevalence of fear avoidance in this study population using the Tampa Scale for Kinesiology-11 (TSK-11) questionnaire was 25.5% of participants, while the prevalence of the population showing pathological somatic focus was 24.5%, and the prevalence of those showing activity avoidance was 25.5%. The midpoint scale was

used as a theoretical cut-off point to indicate whether or not a participant was more-or-less fear avoidant as no cut-off point has as yet been established in the literature.

This suggests that a quarter of the participants who are already suffering with chronic neck pain are fear avoidant and furthermore, they may be presenting with pathologic somatic focus thoughts or activity avoidance thoughts, or both. It could be seen the other way as well, that 75% of the participants are not fear avoidant but still suffer from chronic neck pain. These participants do not have a significant fear of hurting, harming or further injuring themselves through activity although they have chronic neck pain.

Participants with higher levels of fear avoidance have more than simply a physical sensation, because they experience emotional and/or psychological beliefs, as suggested by Nagarajan and Nair (2010). These beliefs may interfere with an individual's approach to physical movement and activities of daily living, thus suggesting that the central nervous system is involved in a more complex manner than just in the somato-sensory and motor cortex during noxious stimulus input (Nagarajan and Nair, 2010). We were not able to find prevalence studies for fear avoidance in patients with chronic neck pain, but studies generally vary in their results as to whether or not fear avoidance beliefs account for an increase in pain and disability (Thompson et al., 2010b, Cheung et al., 2013). More specifically, Thompson et al (2010b), using pain intensity and disability as dependent variables, found that greater pain catastrophising, rather than fear avoidance was responsible for an increase in pain intensity and disability in chronic non-specific neck pain.

Several experimental studies have laid the foundation for our understanding that both somato-sensory and motor processing are disrupted when the body is subjected to noxious stimuli (Gheldof et al., 2010). These studies further showed that associated movements (such as a rapid arm movement), when carried out at the same time as a lower back noxious stimulus is experienced, will elicit unintentional and automatic postural changes - even when the previously noxious lower back stimulus is no longer noxious. Interestingly, other body movements would not evoke a similar response.

These research studies uncovered a small proportion of participants who, in time, did not recover from pain; yet, notwithstanding the fact that there was no additional noxious stimulus, a response was still evoked in the back when that same arm was moved. When investigated further, these participants were shown to hold catastrophic thoughts (Moseley et al., 2004, Meulders et al., 2011). Furthermore, their trunk

muscles were also seen to have been used differently during walking, even though the speed and cadence of their walking had not changed.

These studies showed that in spite of a patient not registering a noxious stimulus, his/her muscle action and movements would change. Apart from that, these patients were also found to hold notable catastrophic thoughts. The fear avoidance model could explain why a patient would develop a reluctance to move if the central nervous system had become involved and pain was experienced where no noxious stimulus had been applied.

Researchers theorise that central nervous system changes are involved when patients present with fear avoidance (Lamoth et al., 2004). To support this theory, a recent study showed that the maintenance of chronic pain-related fear, avoidance and disability need not have an actual movement to trigger the fear response. Simply, the intention to perform the movement can produce the same effect (Meulders, 2013).

It is important to be cautious when extrapolating the low back pain results of the experimental studies by Meulders (2013) as they may not reflect the same responses in an individual suffering from neck pain. However, since thoughts have altered movement responses, it suggests that the fear response has already been centralised in the central nervous system and neck pain could respond in a similar way.

Furthermore, research using brain imagery has also shown that patients with general (fibromyalgia) and site-specific (low back pain) and chronic pain disorders, have experienced grey-matter loss in their brains, indicative of the centralising effects of chronic pain (Valet et al., 2009). This may offer an explanation as to why some patients are shown to be fear avoidant and others not, as our results reveal.

Literature sheds further light on the reasons why fear avoidance is present in some chronic pain sufferers but not in others. Suggestions have been made that fear avoidance responses in those who have task-specific chronic pain may differ from those who have generalised pain disorders such as fibromyalgia or from those who believe that their pain cannot be controlled (Meulders et al., 2011).

The prevalence results of fear avoidance show that not all chronic neck pain sufferers in this study are fear avoidant as only 25% of participants scored above the midpoint scale. The clinical significance is that for these participants, it is likely that central

sensitisation has played a part in the chronicity of their condition. Central sensitisation results from prolonged and increased but reversible nociceptor and synaptic excitability of the neurones in central nociceptive pathways which impacts on the central nervous system (Woolf, 2011).

Since emotions and cognition are also involved in the central sensitisation process in the brain, and affect the modulating effects of the descending pathways through varying levels of vigilance, attention and stress (Nijs et al., 2011), treatment targeting the sensitive nervous system with modalities such as pain neuroscience education is required (Louw et al., 2011, Nijs et al., 2011). Though used for decades, the fear avoidance and fear beliefs models, are perhaps too simplistic an explanation for life interference in the chronic pain sufferer (Moseley, 2011, Sullivan, 2012). It has been suggested that if fear avoidance beliefs are analysed in the general population, no difference can be found between the prevalence of these beliefs in people who have mild to moderate pain (Boonstra et al., 2014) and in those who have no pain at all (Buer and Linton, 2002, Goubert et al., 2004a).

Furthermore, the original fear avoidance model suggests that fear avoidant beliefs are followed by pain catastrophising. However, a hypothesis has been postulated to suggest that perhaps these fear avoidant beliefs are actually influenced by social factors or depression and anxiety (Pincus et al., 2010). It was not our objective to measure these factors that could influence fear avoidance but it is possible that if patients were suffering from depression or anxiety, they may have been more fear avoidant and therefore record a higher score.

The tools in this study may not reflect the nuances of influences that psychosocial factors may have on fear avoidance. For instance, the wording of the TSK may have been problematic for some of the participants. In a study of sub-acute neck pain sufferers, words such as “dangerous”, and “injury” which occur in six out of eleven of the questions, may evoke different subjective feelings and beliefs as opposed to those held by participants who suffer from chronic low back pain (Pool et al., 2009). Furthermore, it is possible that the TSK, used to measure fear avoidance may not be sensitive enough to differentiate between these avoidance scenarios, which could leave the management of the various pain conditions to be less than ideal.

Thus, when utilising these tools, consideration needs to be given to the broader influences that may impact on fear avoidance or pain catastrophising. It is tempting to

make assumptions about the generalisability of self-assessment tools, and analysis should be conducted with this in mind. Some of the considerations include research that has shown that patients with sub-acute neck pain have less pain-related fear compared with patients with low back pain. This suggests that pain-related fear may be a result of the duration of the pain or perhaps the psychological consequences of neck pain differ from those of other types of pain (Pool et al., 2009, Sterling et al., 2005). Thus, varying underpinnings of psychosocial influences are at play when the fear avoidance model is used to explain patients' experiences of chronic neck pain.

5.1.3 Prevalence of Pain Catastrophising and its Clinical Implications

The prevalence of clinically relevant total pain catastrophising in this study was found to be 15.1%. The prevalence of pain catastrophising and its subscales found in the participants above the 75th percentile suggests that between 14% and 24% were clinically relevant in our sample of patients with chronic neck pain. The 75th percentile, corresponding to a score of ≥30 on the PCS was adopted (Sullivan et al., 1995). The cut-off scores are higher than those used in other studies where cut-off scores were ≥21 in chronic neck pain (Park et al., 2016) and ≥24 in anterior knee pain (Domenech et al., 2013). The study by Park et al. (2016) revealed 33.5% of a total of 256 patients with chronic neck pain were identified as having high pain catastrophising.

We chose the 75th percentile as it was shown to reflect individuals who have a high risk of chronicity, affecting the possibility of their return to work. Interestingly, though, 79.2% of participants in this study had not reduced their work load as a result of pain, thus suggesting that in this sample of individuals suffering from chronic neck pain, disability was not a consequence of the intensity of their pain, their avoidance of fear or their pain catastrophising.

The median duration of their pain was eight years and while many researchers suggest that pain catastrophising before injury may lead to fear avoidant beliefs and behaviour, others propose that it may be a consequence of ongoing or persistent pain (Wideman et al., 2009). This suggests that catastrophic thought may be present in an individual in spite of not having pain. Many interventions, both physical and psychological, have been shown to modify catastrophising (Sullivan et al., 1995, Thorn et al., 2002) but it is not possible to deduce whether or not the pain catastrophising of these participants has altered over time as this aspect did not fall within the scope of this study.

5.1.4 **Pain, Fear Avoidance and Pain Catastrophising**

The mean pain intensity was scored at 4.4 on the VAS scale in this study and classified as moderate interference (Boonstra et al., 2014). Most patients had suffered from neck pain for a number of years (median 8 years). This supports the findings of the persistent nature of chronic pain in the literature even though no association was found between pain duration and either fear avoidance or pain catastrophising in this study.

Additional studies do not show that pain duration as a health index is associated with pain reduction in treatment programmes, thus confirming the ongoing suffering of the individual with chronic pain (Severeijns et al., 2004). Continued suffering shows the importance of identifying at-risk patients during the acute stage so that steps can be taken to reduce factors that may contribute to the possible development of chronic pain (Carroll et al., 2008, Jensen et al., 2007). However, both pain catastrophising and fear avoidance or pain-related fear have been identified as risk factors for developing chronicity and disability and have been shown to mediate treatment efficacy (Sullivan et al., 2002, Wertli et al., 2014a, Wertli et al., 2014b, Bahat et al., 2014, Zale et al., 2013, Verhagen et al., 2010). Therefore, it is important to identify risk factors including cognitive perspectives which may lead to fear avoidance and pain catastrophising.

Our study found an association between pain intensity and fear avoidance in those suffering from neck pain, just as Woby et al. (2007) found a strong association between cognitive factors and the levels of pain and disability (Woby et al., 2007). Therefore, as a patient's pain and pain-related fear increases, concomitant risk for fear avoidance become greater. Treatment using graded exposure exercise therapy has been found to be useful in patients who have developed movement-related pain memories, particularly if intensive pain neuroscience education is given beforehand (Nijs et al., 2015).

In our study, an association was found between pain intensity and pain catastrophisation (measured in terms of the PCS), thus suggesting the clinical need for intervention to target catastrophic thoughts. This result is supported by a study of patients suffering from non-specific chronic neck pain which explored the association between cognitive factors, pain and disability where a significant positive correlation was found between pain intensity and catastrophising (Thompson et al., 2010a). Since much of pain catastrophising arises from emotions and cognitions experienced by the

patient, psychotherapeutic interventions can be used to target catastrophic thoughts (Gellatly and Beck, 2016, Thompson et al., 2016, Wilson et al., 2017).

Pain neuroscience education and psychologically informed physiotherapy have expanded physiotherapists' armamentarium of treatment possibilities for those suffering with chronic pain. Research has shown that physiotherapists who are trained in and use psychologically informed physiotherapy, target psychological flexibility in patients more effectively, and the physiotherapists themselves, are more favourably orientated in their attitudes and beliefs towards treatment of these patients. Furthermore, physiotherapists were less likely to assume that patients would be disabled as a result of their condition (Jacobs et al., 2016).

Importantly, consideration should be given to the challenge that psychologically informed physiotherapy and pain neuroscience education can be for a patient. Research shows that establishing a supportive therapeutic alliance between patient and physiotherapist by focusing on communication, interpersonal relationship building and human-centred care, is beneficial to treatment outcomes (Wilson et al., 2017, Nijs et al., 2012, Nijs et al., 2014). As such if one were to apply human centred care, a biopsychosocial approach should be undertaken. A better understanding of the demographic variables will thus assist a physiotherapist to adapt treatment approaches more effectively.

5.1.5 **Demographic Variables Affecting Fear Avoidance and Pain Catastrophising**

5.1.5.1 **Gender**

The majority of participants in this study were female (81.1%). A prognostic study showed that in a general population sample, gender had a moderate effect on pain, where men were 33% more likely than women to have complete resolution of their pain at a one-year follow-up, and women were 19% more likely to suffer from persistent pain. However, interestingly, no gender differences were observed in rates of improvement, aggravation or recurrence of neck pain (Côté et al., 2004).

It is unlikely that definitive conclusions can be made regarding the influences of gender and recovery or persistence in this study as the literature reveals conflicting evidence. Carroll et al. (2008) in their synthesis of the best evidence for the course of neck pain and the factors affecting its prognosis in the general population, undertaken as part of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain campaign found that

there were no gender differences in three studies regarding recovery from neck pain (Carroll et al., 2008).

The literature regarding unique gender differences in musculoskeletal pain is further extended via two additional possibilities. Firstly, the exposure model, which suggests that women are more exposed to risk factors than men, and secondly, the vulnerability model, which suggests that women react in a different way from men to risk factors for musculoskeletal pain.

Although research is limited, the vulnerability has been suggested to be due to gender-linked biological factors such as hormones or physiology, different pain sensitivity, or differences in social or psychological factors. Therefore in both cases, women may be seen to have predominance over men in the prevalence of musculoskeletal pain. As such, this study showed that vulnerability to risk factors for chronic musculoskeletal pain may be explained in part by gender differences.

When it comes down to pain catastrophising in respect of the upper extremities, namely in neck pain in particular, however, men had a stronger association than women in their experience of chronic musculoskeletal pain (Wijnhoven et al., 2006). This could be attributed to the labour intensive requirements by men in more physical jobs.

The above-mentioned factors suggest that gender differences are considered in the literature, but in this study there was no significant association between gender and the TSK or the PCS.

5.1.5.2 **Age**

The results in this study include participants with an age range over the middle years. The ages of the participants were found to range between 20 and 80 years, with the mean age being 48.7 years and the largest concentration of participants being between 35 and 55 years. This is in line with the findings of Hill et al (2004) where the age group with persistent neck pain was found to be 45 to 59 years (Hill et al., 2004).

Pain intensity was ranked low to middle range. This result is supported by epidemiological research carried out by Haldeman et al. (2010) who listed age, (as

well as female gender and genetics) as a non-modifiable risk factor. More specifically, the incidence of neck pain is seen to peak in the middle years and then decreases with advanced age (Haldeman et al., 2010).

Our study did not find any correlation between age and fear avoidance (TSK) and pain catastrophising (PCS) respectively. However, a study by Ruscheweyh et al. (2011) reported differently. The study, which investigated whether or not pain catastrophising could be affected by age, suggested that although there was not a direct influence of age on pain catastrophising, those between the ages of 20 and 40 years of age were more likely to have been influenced by emotions, while those in the older age group of 50 to 70 years of age, were found to have their pain catastrophising scores related to pain intensity.

Theirs' was a retrospective, participant recall investigation, a potential limitation of Ruscheweyh's study in (Ruscheweyh et al., 2011). There is a paucity of information in the literature to suggest a definitive association between age and fear avoidance.

5.1.5.3 Socioeconomic Status (income, level of education, employment status)

Income

If looked at geographically, the practices selected for the sample were distributed across the environs of Johannesburg, a large metropolitan city. It is important to note that the participants were chronic pain sufferers attending physiotherapy in a private practice setting, typically a fee-for-service model. In a South African context, this implies that patients have the financial means to afford health care insurance or are able to afford to pay for their physiotherapy services. It is likely that their socioeconomic status (SES) could be considered to be at least equal to or higher than average. This group of patients is therefore homogenous but representing the economically advantaged section of society and not representative of the heterogeneous population of South Africa. As such many of the measures of socioeconomic status (income, education and employment) in this group are likely to be facilitators of better health outcomes.

Level of education

Socioeconomic status is linked to a person's level of education and a higher level of education can act as an enabler for employment opportunities, which provide assistance with payments for health care or healthcare insurance. In our study, 76.4% of the participants had a qualification in tertiary education, while 20.8% of the

participants had a secondary educational qualification. Poor health outcomes are generally associated with lower SES (Lantz et al., 1998, Valencia et al., 2011). Research shows that the association between SES and lower levels of formal education may be strongest when back pain is severe (Dionne et al., 2001). These investigators found also that a higher frequency of back pain and a less favourable outcome of back pain treatment is more likely in individuals with lower educational qualifications (Dionne et al., 2001).

Interestingly though, our study found an association between the highest level of education and a lower level of fear avoidance (in terms of the mean of the TSK), thus indicating that those with a secondary education were more likely to be fear avoidant than those with a tertiary education. Even though our study found this to be true in a population with higher SES, the literature linking SES and education suggests that over time, lower socioeconomic status with its associated stressors of lifestyle and health conditions may reduce an individual's ability to adapt to their internal stress reactivity, leading to a vulnerability to chronic disease (Valencia et al., 2011). It is interesting to speculate as to why approximately 75% of the participants in our study were found neither to be fear avoidant nor to entertain significant catastrophic thought because of the pain.

Perhaps some of these lower scores for fear avoidance and pain catastrophising may be explained in terms of the association of internal adaptive coping strategies or reappraisal and positive interpretations of patients' chronic pain over time (Büssing et al., 2010). An explanation may be that the 'psychosocial' aspect of 'biopsychosocial' may have more influence on an individual's coping mechanisms than was previously recognised, as postulated by Valencia et al. (2011). Furthermore, research emphasises the importance of the individual's state of mind and emotions in perceiving and dealing with his/her chronic pain (Valencia et al., 2011).

When physiotherapists, specifically trained in pain management, take further steps to understand internal coping strategies and social influences more comprehensively, and can fine-tune their therapeutic skillsets in the clinical setting, they are able to empower chronic pain sufferers in their self-management programmes by encouraging them to tap into their unique, yet appropriate, inherent resources to facilitate healing. These therapeutic skillsets will serve as interventions specifically targeting pain-related psychosocial risk factors with the intention of focusing on improving function

and quality of life as opposed to traditional rehabilitation that would target symptom management (Moore et al., 2016).

Our study found no significant association between the highest level of education attained and pain catastrophising. This is unsurprising as the logical inverse relationship has been reported where two studies show an association between a lower level of education and pain catastrophising (Edwards et al., 2006, Feldman et al., 2015). One study of total knee arthroplasty by Feldman et al. (2015), using SES as a marker of level of education, found a significant association between higher education and lower pain catastrophising (Feldman et al., 2015).

Interestingly, an opposing result was found in a study by Edwards et al. (2006) which, although these researchers were investigating patients with scleroderma, showed that those who had a less formal education were more likely to report affective pain, which is strongly associated with high levels of pain catastrophising (Edwards et al., 2006). In their turn, Valencia et al (2011) found that SES, in this instance level of education, has a limited influence on fear avoidance (Valencia et al., 2011). Therefore, given the disabling effects of chronic pain, in the light of the fact that SES or education as a proxy for SES, requires further exploration.

Employment status

Employment status is yet another component of SES and a variable that influences pain, fear of pain, pain avoidance and pain catastrophisation. In our study, the majority (76.4%) of the participants were working, with over half (56.6%) working full-time, while a fifth were retired or unemployed. Interestingly, while they were attending physiotherapy regularly or for periodic flare-ups of pain and the pain was mild to moderate, we observed that they were able to continue working in spite of the pain.

Our study found no correlation between employment status and fear avoidance (TSK). Valencia et al. (2011), however, found that SES influenced the Fear Avoidance Work Beliefs, one component of the Fear Avoidance Beliefs Questionnaire (FABQ), but not the Fear Avoidance Physical Activity Beliefs, another component of the FABQ. Their research was undertaken on patients suffering from low back pain, extending over a period of up to six weeks (Valencia et al., 2011). We could find no literature source that could find a direct link between employment status and either fear avoidance or pain catastrophising.

Thus, it is likely that no single SES factor works in isolation and that a combination of such factors would impact on an individual and influence his physical condition and lifestyle. For instance, a study investigating the health-related quality of life domains undertaken in an under-resourced area of Cape Town, South Africa, found that financial independence (specifically "being able to take care of your family or spouse financially") was ranked 28th out of a list totalling 57 questions. Of the sample population, 73% had attended secondary school, 13.7% had attained a post-secondary school qualification and 64.9% were found to be unemployed (Jelsma et al., 2008). These results suggest that we need to be cautious when generalising and publicising our results to a South African population as those who are unemployed and financially disadvantaged may not consider this a strong or important disabling factor in their lives.

Our study found that most of the participants (79.2%) had not reduced their work load because of their pain. However, in their research, Haldeman et al. (2010) suggest that such a picture is likely to be incomplete. They found that the amount of time lost at work as a result of neck pain has been under-investigated (Haldeman et al., 2010). In other words, chronic neck pain sufferers may not lose days or reduce their work load as a result of their pain. However, taking time off for treatment, poor work efficiency or requiring an hour or two off a day because of pain, would not be reflected in these studies. An analysis of these factors may be a better predictor of the interference of pain in the individual's working, social and home life.

No significant association was found in this study between the scores of a reduced work load due to pain and fear avoidance (TSK) or pain catastrophising (PCS). The literature, as reported by Marchand and colleagues (2015), uncovered a different situation. On investigating the influence of fear avoidance behaviour in work-focused interventions on patients with neck and back pain over the course of twelve months, Marchand et al. (2015) found that fear avoidance behaviour is a significant predictor for patients to return to work and that by mitigating fear avoidant beliefs regarding work as part of the treatment regimen, patients could be encouraged to return to work (Marchand et al., 2015).

In a similar vein, research by Moore et al. (2016) into pain catastrophising and pain-related fear in the case of chronic musculoskeletal conditions, shows that those who had not successfully maintained their post-treatment scores when tested a year later, were more likely to have attained high post-treatment scores for catastrophising and

for fear of pain (Moore et al., 2016). Furthermore, the patients in this study were not regarded as having recovered as long as they rated their pain as 4/10 or higher at the one-year follow-up (Moore et al., 2016).

The mean pain intensity determined in our study was 4.4/10, which falls into the moderate pain category. It was surprising to us that 80% of the participants had not reduced their work load, though it should be noted that in South Africa, there is limited social support provided by the state for those out of work. The participants in this study were attending physiotherapy at fee-charging private practices so that their financial commitments may have required continued employment and daily work.

In spite of the results discussed above, pathology may not even be a factor in whether an individual works. As Waddell (2006) points out, populations studied within the space of a month have shown that two thirds of normal, healthy people describe having suffered from one or other physical or mental symptom. This suggests that inability to work is not always a consequence of symptoms and disability arising from non-specific musculoskeletal conditions but may be from complaints that reflect little impairment or objective pathology, but are mainly subjective (Waddell, 2006).

5.1.5.4 **Sociodemographic Variables**

Over 66% of the participants in this study did not reside alone. Research investigating the relationship between marital status and psychological resilience in chronic pain sufferers showed a weak association between being married and presenting with lower levels of pain-related emotional suffering (Wade et al., 2013). Perhaps this may be explained by the following study showing an association between marital status and pain catastrophising, with a significant association between a solicitous partner and pain catastrophising. Reports of greater pain experienced were prevalent in those who were co-habiting, and the more caring the partner was, the greater the affective pain, (Giardino et al., 2003).

These findings are supported by Sullivan (2012), who uses the Communal Coping Model theory to hypothesise the relationship as discussed in the literature review (Sullivan, 2012). The literature, however, does not directly investigate the effects that there may be between relationship status and fear avoidance and pain catastrophising.

In our current study, neither pain catastrophisation (as measured on the PCS) nor fear of pain (as measured on the TSK) was found to be associated with marital status. Clinically, though, the consequences of chronic pain on the family unit should not be underestimated. It has in fact been suggested that equal partnership between a couple may become skewed and the dynamics within the family could change in situations where the pain sufferer depends on members within the family for emotional and physical support.

In cases where chronic pain sufferers become socially isolated and marital difficulties may occur, maladaptive coping techniques could emerge over time (Snelling, 1994, Wexler and Miser, 2014). It is therefore important to note that patients who suffer from chronic pain cannot be treated in isolation and without an understanding of their social context. The reason behind this is that social isolation and marital status affect the perceptions that the individual holds of his/her pain experience and his/her resultant behaviour (Schneider et al., 2008). Therefore, a successful treatment programme should incorporate group interaction for the social isolation tendency and psychotherapy should spousal/marital relations be affected by the patient's pain experience.

5.1.6 **Subscale Analysis**

A positive correlation was found between the fear avoidance and pain catastrophising and its subscales, and between fear of harm (TSK-SF) and pain catastrophising and its subscales. Therefore, if fear avoidance in general and fear of harm increase, so catastrophic thoughts will increase.

Interestingly, there was no positive association between the TSK-AA (part of the Tampa Scale for Kinesiophobia measuring the participant's tendency for avoidance of activity - Activity Avoidance) and any of the PCS factors. Our study also determined that if participants had a higher fear avoidance level, they were likely to have a higher level of pain catastrophising.

The positive correlation between the TSK-SF and the PCS-Total and its subscales requires some understanding as to which specific domain of fear avoidance the TSK-SF encapsulates. Somatic focus or 'harm', as it has been described, has been shown in other studies to evoke a hypervigilant response in the form of an exaggerated concern about bodily sensations such as an intensified experience of pain. This is

indicative of the physiological component of pain-related anxiety (O'Brien et al., 2008, Goubert et al., 2004b).

The literature (Goubert et al., 2004b) supports the positive correlation between somatic focus and pain catastrophising that was found in this study. Goubert et al. (2004b) show that increased somatic focus and dysfunctional beliefs in respect of physical activity in some chronic pain individuals are likely to result in an increase in catastrophic thoughts about pain. Somatic focus and pain catastrophising are likely to be influenced by the vulnerability factor of a person's tendency towards distress, worry and anxiety and the immediate threat value. The clinical implications of these findings suggest that an understanding of the cognitive vulnerabilities of a patient is necessary in order to treat such a patient effectively.

No association was found between the TSK-AA and the PCS-Total and its subscales. In our study, where analysis showed that there is no association between TSK-AA and the PCS and its subscales, the deduction could be made that pain catastrophising does not affect the elements of avoiding activity and the individual's concern for (re)injury.

Most participants had experienced their pain for a considerable length of time (median 8 years) so that it is likely that they had received some intervention in the form of physiotherapy for their pain. Their physiotherapy might have addressed the patients' associations of catastrophic pain with activity avoidance. Furthermore, these individuals could have been exposed, for instance, to therapeutic, graded physical activity which might have reduced their concerns around activity avoidance (Nijs et al., 2012). Such exposure might also have occurred either through some form of therapy or possibly, in the event of diminished catastrophic thought, by naturally performing these graded physical activities independently.

Previous studies investigated the role of fear avoidance beliefs on chronic neck pain sufferers. On comparing the responses of chronic neck pain sufferers (longer than three months) and healthy individuals, Cheung et al. (2013), found that activity levels were not affected in those with a mild disability as a result of their neck pain (Cheung et al., 2013). In yet another study of a small group of chronic low back pain sufferers who were being treated with exposure therapy, Boersma et al. (2004) noted that reductions in high levels of fear and fear avoidance were achieved. These authors suggested that this important aspect in the treatment programme was effected when

patients understood that their expectations around harm were not true (Boersma et al., 2004).

Our study found that the lack of association between pain catastrophising and activity avoidance might mean that activity avoidance for the individual is linked to a broader psychosocial problem than specifically to catastrophic thought. Garland et al. (2002) proposed recognising activity avoidance when treating individuals with depression and/or anxiety. Both of the afore-mentioned emotional factors could reduce activity through avoidance, restricting the individual physically or socially, and resulting in a worsening condition. The isolation of the individual and the deterioration in the person's emotional state, as well as the restrictions placed on him/her, could exacerbate factors such as depression and anxiety and in turn again the avoidance of activity. Thus, a vicious circle would be established which would in all probability be perpetuated unless help were to be sought (Garland et al., 2002).

Clinically, the practitioner who uncovers activity avoidance in a patient may need to look more closely at the cognitive factors that are involved in anxiety and depression. Even if a patient is being medically treated, he/she may have become linked through habit to this vicious cycle of physical activity avoidance. Thus, a physiotherapy programme that is better informed psychologically would be appropriate in such cases (Wilson et al., 2017).

To be effective, psychologically-informed physiotherapy involves a physiotherapist-led cognitive behavioural approach to the treatment of patients, from the screening process through to goal-setting and self-management. It requires that the patient and practitioner develop a therapeutic alliance. Thus, throughout the treatment process, the patient is fully engaged in decision-making and confronts his/her emotional or cognitive difficulties around pain in an environment that is emotionally and therapeutically safe and supported (Wilson et al., 2017).

5.1.7 **Discussion of Correlations**

Our study found that there is a positive association between pain intensity and the fear avoidance score; and pain intensity and the pain catastrophising score. Thus, if pain intensity increases, fear avoidance will increase, as will the tendency of the individual to catastrophise pain.

The above-mentioned results are supported by the findings in a study conducted by Eriksen et al. (2004), who investigated the development and recovery of patients from long-term pain. Psychosocial factors and depression were found to be stronger predictors of pain and recovery from pain than sociodemographic factors. These authors showed that females, the less educated, those in a state of poor self-rated health and those suffering from at least one long-standing disease, are significantly at risk of developing pain. Eriksen et al.(2004) found that recovery from pain is more likely in males, in those of a younger age, in those co-habiting, in those in a state of good self-rated health, as well as in good mental health, and in those earning a moderate income (Eriksen et al., 2004).

Exploring the positive association between pain intensity and fear avoidance in our study, it was noted that research has found that fear avoidance in patients with neck pain might be a factor that emerges over time from the inception of pain to the stage when fear becomes firmly and cognitively linked with pain (Buer and Linton, 2002). Thus, the clinician would need to be cognisant of the possibility of the patient developing fear-of-harm beliefs or avoidance strategies since the patient's pain intensity might not have been declining during physiotherapy (Buer and Linton, 2002). In contrast, pain catastrophising is more likely to occur in the early stages, with or without pain, and will continue to sustain its strong link with pain intensity (Sullivan et al., 2002).

A study by Crombez et al. (2012) offers a different perspective on the complex associations between the variables relating to pain. They found that it is possible for cognitive factors such as fear avoidance or pain catastrophising not to be affected by pain intensity, but rather that these cognitive factors could make a difference to a patient's disability. Thus, fear avoidance and pain catastrophising could add to the complexities in the competing personal goals of a pain sufferer, such as in challenges for improved functioning, recovery and optimal living (Crombez et al., 2012).

Furthermore, Crombez et al. (2012) point out that by focusing on the impact that cognitive factors have on the sufferer, one may be adding to the fundamental root of the problem of psychopathology. Bergner (1997) defined psychopathology as "a significant restriction in the ability of an individual to engage in deliberate action and, equivalently, to participate in available social practices" (Bergner, 1997).

A preferable focus for treatment in the case of psychopathology might be to focus on the disability and functional recovery by offering a motivational perspective. This could be done by setting goals, thus encouraging the patient to establish self-regulatory processes. Fear avoidance is associated with pain catastrophising. Thus, if strategies help to reduce fear avoidance, then conceivably pain catastrophising could be reduced as well (Crombez et al., 2012).

5.1.8 Reliability Scores of the Study

Of interest are the reliability scores obtained in this study. The reliability scores for the TSK and the PCS obtained in this study were compared with those reported in the literature. This study measured all the TSK-11 variables in excess of 0.70 (0.75 – 0.85 for the TSK-11-Total and its subscales), which is accepted in the literature as an acceptable cut-off score for internal reliability (Santos, 1999). Reliability measurements for the TSK-11-Total varied between 0.79 and 0.80; for the TSK-SF between 0.68 and 0.76, and for the TSK-AA between 0.67 and 0.75 (Woby et al., 2005, Roelofs et al., 2007, Tkachuk and Harris, 2012).

The reliability scores of the PCS in this study were compared with those in the literature and were found to be higher than the acceptable cut-off score of 0.70. Our study measured Cronbach's alpha for the PCS-Total, the PCS-R, the PCS-M and the PCS-H to be respectively 0.95, 0.93, 0.75 and 0.91. These were in excess of the literature scores of 0.87, 0.87, 0.66 and 0.78 respectively. (Sullivan et al., 1995).

These internal reliability scores show that in the population studied, the TSK and the PCS are testing fear avoidance and pain catastrophising respectively.

5.2 KEY FINDINGS

The findings in our study are related to the prevalence study of fear avoidance and pain catastrophising in patients suffering from chronic neck pain conducted in a narrowly focused cluster of private practices in Johannesburg, an urban area of South Africa. The median time that our sample of patients who had suffered from neck pain was eight years.

- The prevalence of fear avoidance in this sample population on the basis of the Tampa Scale for Kinesiophobia-11 (TSK-11) questionnaire, was found to be 25.5% of participants, while the prevalence of the population showing pathological

somatic focus was 24.5%, and the prevalence of those presenting with activity avoidance was 25.5%.

- The prevalence of pain catastrophising was found to be 15.1% of the sample population. The subscales of rumination, magnification and helplessness were found to be approximately 14.2%, 23.6% and 17.9% respectively.

- An association between fear avoidance and pain catastrophising was established.

- A positive correlation was found between the TSK-Total and the PCS-Total and its subscales, rumination, magnification and helplessness. This indicates that if participants had a higher fear avoidance level, they would also be likely to have a higher level of pain catastrophising. The individual subscale constructs of rumination, magnification and helplessness also increased in association with a higher level of fear avoidance.

- Positive correlations were found between the TSK-Somatic Focus and the PCS-Total, rumination, magnification and helplessness respectively. These correlations point to an increased concern around bodily harm or an evoked hypervigilance during the course of pain catastrophising, as subscales are scored higher.

- An association exists between pain intensity and the TSK-Total (fear avoidance); and between pain intensity and the PCS-Total (pain catastrophising). This may point to an increase in fear avoidance and/or pain catastrophising if pain intensity is high.

- In this sample population of patients with chronic neck pain, an association between highest level of education and fear avoidance was found. This result indicates that those with a secondary education are more likely to be fear avoidant than those with a tertiary education, thus suggesting that when clinicians assess patients, the level of education achieved is an important risk factor to assess for fear avoidance.

5.3 CLINICAL IMPLICATIONS

This study demonstrates a significant number of patients suffering from chronic neck pain who are fear avoidant and who have catastrophic thoughts regarding their pain. It

has also shown that not all patients experiencing chronic neck pain suffer in the same way or to the same extent with regard to cognitive factors such as fear avoidance and pain catastrophising.

The results of this study show that between a fifth and a quarter of the patients suffering from chronic neck pain are fear avoidant and have catastrophic thoughts around their pain. The literature suggests that these patients should not be overlooked by the clinician as they could eventually present with disabling consequences.

As has been shown, fear avoidance can result in activity avoidance which in turn may lead to reluctance to move, a sense of uselessness (disuse) and ultimately, disability; described in the literature as “impairment”. Another possible consequence of fear avoidance is that the fear may increase the individual’s stress responses and, over time, illness behaviour could result, even in the absence of demonstrable biological disease or impairment (Waddell, 2006). Patients suffering such complications stand the risk of not being identified as such, particularly in cases where the practitioner is inexperienced or where the self-report questionnaire is not sensitive enough to ascertain those at risk.

Therefore, it is recommended that patients are screened with these tools, by physiotherapists who have the skills to interpret the results. Fear avoidance can be assessed using the TSK-11. This questionnaire, though it does not have a specific cut-off score, has evidence suggesting that a reduction of more than 3 points after treatment indicates that there is a reduction in pain related fear and is clinically relevant (Woby et al., 2005). As a shortened form of the TSK-17, this scale is useful for the sake of brevity.

The PCS can be used to assess pain catastrophising in patients with chronic neck pain. Although the cut-off score of 30 at the 75th percentile has been shown to be clinically relevant (Sullivan et al., 1995), a study of individuals with subacute whiplash showed that the pre-treatment PCS score was 24 and that an improvement in return-to-work and lower pain intensity was associated with a reduction of between 38% and 44% of the PCS score (Scott et al., 2014). These figures could guide clinicians in their assessments of their patients.

Treatments for reducing fear avoidance and pain catastrophising specifically in chronic non-specific neck pain have not been identified, but it is likely that treatments

suggested for whiplash injuries and chronic non-specific low back pain would be effective. The first step in the intervention would be to target the beliefs of the patient using therapeutic pain neuroscience education, Using metaphors in particular in order to reconceptualise the pain would be a positive measure to help the patient see that "hurt does not necessarily equal harm". The second step would be cognition-targeted neuromuscular training by asking patients to perform an exercise for a certain length of time, rather than being guided by the pain (i.e. "stop when it hurts"). The third step would involve cognition-targeted dynamic and functional exercises which could be preceded by guided motor imagery. This allows the patient to approach the movement in a way that does not initiate a fear or catastrophic response (Nijs et al., 2014, Moseley and Butler, 2017). Throughout these steps with graded activity and graded exposure, the pain neuroscience education is reinforced.

Additional treatments may be necessary such as cognitive behavioural therapy. While great strides have been made in developing treatment strategies, it is important to remember that the research is still in its infancy (Scott et al., 2014, Moore et al., 2016, Gellatly and Beck, 2016). Physiotherapists need to treat each chronic patient with flexibility, which would allow him/her to be aware of the vulnerabilities that may result in the symptoms being affected by psychosocial stressors which could impact on the individual's rehabilitation (Wilson et al., 2017).

5.4 LIMITATIONS OF THIS STUDY

Several limitations are worth highlighting. The sample size was modest and it is possible that the outcomes were limited as a result of the wide confidence intervals. It is important though, not to over-interpret the different prevalences obtained. This study was powered to report the prevalence of patients with clinically relevant scores in the scales and subscales of the TSK-11 and the PCS, and not to compare them statistically. A large sample size could be investigated which would enable all differences, even small ones, to be statistically significant. However, it does not necessarily mean that all differences would be clinically meaningful.

The results show the prevalence of fear avoidance and pain catastrophising, but in a limited setting of private physiotherapy practices in South Africa. The results cannot be applied to other populations of South Africa, particularly to those where patients are from disadvantaged settings.

Furthermore, this study did not ask patients the origin of their chronic non-specific neck pain. The results may have been skewed if patients had suffered whiplash injuries since whiplash-associated disorders have been shown to have strong and specific cognitive associations, especially pain catastrophising (Walton and Elliott, 2017, Scott et al., 2014).

No prevalence studies in chronic non-specific neck pain could be found to compare directly with these results. Sullivan et al. (2002), however, showed in a study of pain catastrophising in patients with chronic whiplash pain, that the magnification subscale was correlated with a higher level of pain and perceived disability (Sullivan et al., 2002). It is of interest that in this study, magnification scored higher than the other subscales, though the score needs to be regarded with caution because of the small sample size.

There were a number of delays in completing the data collection. Physiotherapy practices were asked to identify possible participants who had experienced neck pain longer than three months. However, patients with ongoing neck pain are likely to have periods of exacerbation and remission (Côté et al., 2004). A practitioner who is unfamiliar with the course of chronic non-specific neck pain, may therefore have thought that the participant would need to have suffered continuous pain for at least three months.

Furthermore, it was not made clear in the instructions to the practices that regular flare-ups, even if they do not leave the patient in continuous pain for a total of three months, would be worthy of mention and acceptable for the research. As discussed in the literature review, persistence (and recurrence) is part of the chronic pain experience, and the criteria should have been more worded more explicitly in order to identify and enrol patients as potential participants in the research.

Another delay in data gathering may have been because a number of the practices were unfamiliar with outcome measures, specifically in the case of the biopsychosocial questionnaires. These practices were worried that by offering the questionnaires to patients, the psychosocial concerns of the patients might be exacerbated. As a result, some of the practices did not agree to participate. This may indicate a gap in physiotherapists' knowledge of pain science, and further education in this field would be recommended.

The theoretical cut-off score used in this study for fear avoidance might have had an effect on the conclusions made in this study. If the TSK-11 is to become a useful research tool, it would be important to develop cut-off scores. It might have been preferable to have used another tool with an established cut-off score such as the Fear Avoidance Beliefs Questionnaire – Physical Activity subscale (George et al., 2011).

Another aspect that might have affected the extent to which fear avoidance and pain catastrophising were found to occur was the length of time the individual had suffered from neck pain. Studies have shown that some cognitive influences affecting a patient's pain intensity and disability may be more relevant in the earlier stages of chronic pain. The participants in this study experienced neck pain for an average of eight years. The prevalence of the two factors may have been altered had the length of time of suffering from neck pain been restricted.

The significance of this research study is limited in that it concerns only private physiotherapy practices in Johannesburg, Gauteng. Furthermore, the fact that most South African physiotherapists work in a private practice setting (n=3288) (Diener, 2016), and are visited mainly by more affluent patients from the upper to middle class deserves mention. This means that the lower socioeconomic sector of the population in South Africa, being underserved with physiotherapy services (n=758 in public service including students) (Diener, 2016) did not feature in this research study and further research is required in patients of different economic strata.

CHAPTER SIX

6. CONCLUSION

This research was a prevalence study of chronic non-specific neck pain conducted in a physiotherapy private practice environment in Johannesburg, an urban area of South Africa. The sample consisted of a group of patients with chronic neck pain whose median time of suffering from neck pain was eight years. This research found a moderate prevalence of fear avoidance (25%) and pain catastrophising (15.1%) in this group. These results point to the need for greater awareness and better education among practitioners to address fear avoidance and pain catastrophising in their patients. This will enable them to effectively manage the patients' difficulties arising from these cognitive factors in order to optimise effective treatment and reduce additional episodes of care.

A positive association was observed between the total scores of fear avoidance and pain catastrophising; the total score of fear avoidance and helplessness, magnification and rumination (the subscales of pain catastrophising); and the somatic focus or 'harm' subscale of fear avoidance and pain catastrophising and its subscales. Therefore, clinical attention to these domains is important to proceed in a holistic manner with physiotherapy care.

The TSK-11 and the PCS have been shown to be reliable as measures to use in assessing South Africans with this background, and with the moderate prevalence of fear and catastrophising found in this study, it is important that patients be screened. Treatment for those patients presenting with fear and pain catastrophising should be examined and appropriate treatment implemented to accommodate these cognitive factors.

Pain neuroscience education therapy, together with a good therapeutic alliance, has been shown to have a positive effect on pain perception, disability, physical performance and pain catastrophising (Louw et al., 2011, Nijs et al., 2014). In fact, physiotherapists have a valuable role to play in leading their patients to a better understanding of their pain state and in mitigating the threat that the patients perceive of additional tissue injury. The development of a patients' understanding of pain mechanisms of neural sensitivity in relation to tissue injury lessens their fear of

movement. This will impact the cycle of deconditioning that accompanies fear avoidance and thus function is improved (Wilson et al., 2017, Louw et al., 2016).

Analysis showed that certain socioeconomic (demographic) factors are associated with pain catastrophising and fear avoidance respectively. Participants who had attained a secondary educational qualification, for instance, were more likely to be fear avoidant than those who had attained a tertiary educational qualification.

It was also noted that there are positive correlations between pain intensity and fear avoidance and between pain intensity and pain catastrophising. If pain intensity increases, it is likely that an individual's fear avoidance will increase, as will his/her pain catastrophising. These are complicating factors in the already opaque scenario of chronic pain.

Overall, the results of this study show that individuals with moderate pain can still attend to their daily activities, including work, but will seek physiotherapy when intense pain interrupts this daily flow. It is incumbent upon clinicians to develop further insight into the complexities of patient's needs and their current psychosocial situation. They should seek to gain a greater in-depth understanding around the patients' lack of engagement in various activities in order to be able to address the problem appropriately.

To deliver a treatment environment where an optimum psychologically-informed physiotherapy can be developed, it would be important to address the methods by which patients are assessed and how these investigations are conducted, so that the important psychosocial challenges of a patient can be revealed (Linton et al., 2000). Quality-of-life assessment tools, such as the NDI, would be useful to determine the impact of specific areas of a patient's life have been affected and then to measure over time to ascertain whether improvements have been made post-treatment. (Louw et al., 2016).

Under ideal conditions, physiotherapists may utilise outcome measures for pain, function and disability, psychosocial factors, movement and possibly healthcare utilisation. They would then introduce intensive pain neuroscience education to assist in the development of a therapeutic alliance whereby patients are empowered to take charge of their goal-setting and management through the deeper understanding that they have gained of their condition.

Behavioural change occurs when patients recognise that they have become more aware of themselves; the therapist has worked with 'the whole' of them, the therapist is 'more than just a professional', and the patient is able to 'work through challenges in the therapeutic relationship' (Wilson et al., 2017). Clinicians need to develop expertise around analysing the implications of avoidant and catastrophic responses, to name but a few of the wide range of psychosocial and behavioural factors that could impact on a patient's pain response in order to be able to treat the subset of more resistant and complex chronic pain sufferers.

The clinical implications of this study indicate that practitioners may need to be better equipped as to how to address fear avoidance, somatic focus and activity avoidance. Evidence suggests that these patients need a combination of therapeutic pain neuroscience education and cognition-targeted motor control education which assists in the cortical reorganisation and adaptation of the brain (Nijs et al., 2014).

Research has shown that there are extensive misconceptions among the general population about low back pain, but far fewer among the group of people with mild low back pain and no disability (Goubert et al., 2004a). A patient's beliefs, such as those around harm, restricting activity, medical diagnosis and cure, are corrected when they are actively involved in their own recovery. It is postulated that educating the community around these beliefs and correcting incorrect ideas and assumptions about spinal pain could prevent long-term disability (Goubert et al., 2004a).

Our prevalence study provides a 'snapshot' view in time of common cognitive factors, namely fear avoidance and pain catastrophising, that affect patients suffering from chronic pain conditions. Furthermore, the prevalence results show that cognitive factors could be affected by changes in pain intensity.

Physiotherapists may find this additional information useful when planning their treatment approach. This they can do by exploring the effects that fear avoidance and pain catastrophising have had on our sample population, and understanding that one or more of the elements (i.e. somatic focus, activity avoidance, rumination, magnification and helplessness), that make up these two cognitive factors might to a lesser or greater extent impact each patient.

In conclusion, this prevalence study has shown that fear avoidance and pain catastrophising can be present in a significant group of patients attending physiotherapy and that the level of an individual's education and pain intensity can impact on these two factors. The complexities of these and other beliefs and emotions can impact a person's pain profile. Neither beliefs and emotions, nor physical limitations can be treated in isolation or as separate constructs, however, as they are just a window into the whole person.

6.1 RECOMMENDATIONS FOR FURTHER RESEARCH

Although disability *per se* was not investigated in this study, it is often a consequence of the adverse effects of the relevant cognitive factors among other physical and social factors. It would be useful to investigate the nature of disablement that might affect chronic non-specific neck pain sufferers. The Neck Disability Index would serve this purpose. Alternatively, the European Quality of Life 5-Dimensions (EQ-5D), a widely used questionnaire measuring the health-related quality of life (HRQoL), which has been translated into isiXhosa for those patients who are first-language isiXhosa speakers (Mkoka et al., 2003).

Becoming familiar with translated assessment tools for use by South African citizens, and translating those which have not yet been, is important in respect of our local context as concepts are not translatable across language groups (Mkoka et al., 2003, Parker et al., 2016). Furthermore, our study, undertaken in a private practice setting, could be compared with results from a similar study in the context of a public healthcare facility, where the socioeconomic circumstances and levels of education of the patients differ.

Fear avoidance, somatic focus and pain catastrophising are cognitive factors that maybe reduced by pain neuroscience education. We do not know whether the participants in our study had received any neuroscience education as it was not part of our objectives. An interventional study comparing those with and without the application of neuroscience education may be worthy of future investigation.

Our study, undertaken in a private practice setting, could be compared with results from a similar study in the context of a public healthcare facility, where the socioeconomic circumstances and levels of education of the patients differ.

Much of the published literature investigates the psychological underpinnings of populations where participants suffer from chronic low back pain, general musculoskeletal pain, and chronic whiplash injuries in particular. There is less research to be found focusing specifically on chronic non-specific neck pain and yet a significant proportion of the population suffers with it. Since chronic non-specific neck pain may have its own profile of psychosocial difficulties, particularly with respect to fear avoidance and pain catastrophising, research into the psychosocial influences in this population group is recommended.

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APPENDIX A

- **DATA COLLECTION FORM**

  (Please note: this is a facsimile of the form given to the participants. The VAS in the original is exactly 10cm long.)

Form 4: Data Collection Form

Participant Code _____ **Date** _____

Form 4: Data Collection Form

Dear Physiotherapist,

Thank you for agreeing to allow me to use your facilities and to ask your chronic neck patients if they would be willing to participate in this study. It would be helpful if you would go through this questionnaire with the participant, after he or she has read the information document, this form and the consent form, and help the participant fill in the relevant questions.

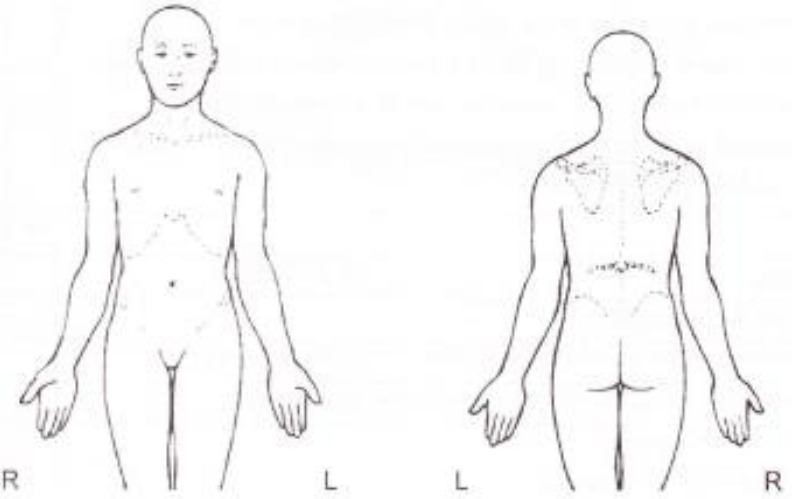
		Please circle	
1	**Confirm that the patient has suffered from neck pain for 3 months or more** a. The patient may participate in the study whether or not they have had treatment in the past or are having treatment currently. b. Neck pain is defined here as the subjective opinion of the participant, so it may include pain, muscle tension or stiffness in the neck, shoulder area upper back area and/or above their costal margin, with or without pain in their arms.	Y	N
2	**Gender**	M	F
3	**Age (years)**		
4	**Highest level of education**		
	5. a. Tertiary education (University, Institute of Higher Learning)		
	5. b. Secondary Education (Grade 8/ Std 6 and above)		
	5. c. Primary Education		
	5. d. Any other (Please specify)		
5	**Occupation**		
	6. a. Employed	Y	N
	6. b. Employed- Full-time (FT)/part-time (PT)	FT	PT
	6. c. Self-employed	Y	N
	6. d. Type of occupation		
	6. e. Unemployed		
	6. f. Any other (please specify)		
6	**Have you reduced your work because of your pain?**	Y	N

1

7	**Marital status**	Please tick
	7. a. Single	
	7. b. Married	
	7. c. Divorced	
	7. d. Separated	
	7. e. Widow/ widower	
	7. f. Co-habiting with a partner/companion	
	7. g. Any other (please specify)	
8	**How long have you had your neck pain for? (months/years)**	

9. Instructions for recording the subjective area of neck pain experienced by the participant

Please could you, the participant draw on the body chart, to show where you are experiencing the pain **NOW** (use pencil in case the participant would like to make changes).



10. Instructions for recording the pain intensity **NOW**

Please could you rate your pain **NOW** on this scale and to make an X on the line which starts at 0 and goes to 10. Please note that 0 means no pain and 10 means the worst pain imaginable (most severe). Please mark an X **on** the line.



Visual analogue scale (VAS)

2

APPENDIX B

- **TSK-11 FORM**

Participant Number: _____ **Date:**_____

FORM 5: **TSK - 11** (Woby et al., 2005)

TO BE COMPLETED BY THE PARTICIPANT

Please Read This First: This is a list of phrases which other patients have used to express how they view their condition. Please circle the number that best describes how you feel about each statement.

		Strongly disagree	**Somewhat disagree**	**Somewhat agree**	**Strongly agree**
1	I'm afraid that I might injure myself if I exercise	1	2	3	4
2	If I were to try to overcome it, my pain would increase	1	2	3	4
3	My body is telling me I have something dangerously wrong	1	2	3	4
4	People aren't taking my medical condition seriously enough	1	2	3	4
5	My accident/problem has put my body at risk for the rest of my life	1	2	3	4
6	Pain always means I have injured my body	1	2	3	4
7	Simply being careful that I don't make any unnecessary movements is the safest thing I can do to prevent my pain from worsening	1	2	3	4
8	I wouldn't have this much pain if there wasn't something potentially dangerous going on in my body	1	2	3	4
9	Pain lets me know when to stop exercising so that I don't injure myself	1	2	3	4
10	I can't do all of the things normal people do because it's too easy for me to get injured	1	2	3	4
11	No one should have to exercise when he/she is in so much pain	1	2	3	4

APPENDIX C

- **PCS-EN FORM**

Form 6: PCS

Participant Number: _____ Date: _____

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Michael JL Sullivan

Form 6 PCS-EN

Client No.: _____ Age: _____ Sex: M(__) F(__) Date: _____

Everyone experiences painful situations at some point in their lives. Such experiences may include headaches, tooth pain, joint or muscle pain. People are often exposed to situations that may cause pain such as illness, injury, dental procedures or surgery.

We are interested in the types of thoughts and feelings that you have when you are in pain. Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain. Using the following scale, please indicate the degree to which you have these thoughts and feelings when you are experiencing pain.

0 – not at all **1** – to a slight degree **2** – to a moderate degree **3** – to a great degree **4** – all the time

When I'm in pain …

1. ☐ I worry all the time about whether the pain will end.
2. ☐ I feel I can't go on.
3. ☐ It's terrible and I think it's never going to get any better.
4. ☐ It's awful and I feel that it overwhelms me.
5. ☐ I feel I can't stand it anymore.
6. ☐ I become afraid that the pain will get worse.
7. ☐ I keep thinking of other painful events.
8. ☐ I anxiously want the pain to go away.
9. ☐ I can't seem to keep it out of my mind.
10. ☐ I keep thinking about how much it hurts.
11. ☐ I keep thinking about how badly I want the pain to stop.
12. ☐ There's nothing I can do to reduce the intensity of the pain.
13. ☐ I wonder whether something serious may happen.

_____

…Total

Updated 11/11

APPENDIX D

- **ETHICAL CLEARANCE FORM**

R14/49 Mrs Clare Alison Cresswell

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M140434

NAME: (Principal Investigator)	Mrs Clare Alison Cresswell
DEPARTMENT:	Physiotherapy Private Practice
PROJECT TITLE:	The Prevalence of Fear Avoidance and Pain Catastrophising in Patients Suffering from Chronic Neck Pain Presenting in Private Practices in Johannesburg
DATE CONSIDERED:	25/04/2014
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Prof Hellen Myezwa and Mr Marnin Romm
APPROVED BY:	Professor P Cleaton-Jones, Co-Chairperson, HREC (Medical)
DATE OF APPROVAL:	20/06/2014

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

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

Principal Investigator Signature

Date 03/08/2014

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

APPENDIX E

- **PARTICIPANT INFORMATION FORM**

FORM 2: PARTICIPANT INFORMATION DOCUMENT

Title of my Study
I am undertaking a study that is looking at various factors that influence neck pain. Among the factors that I will be assessing are demographic variables, exercise levels of pain and fear avoidance and catastrophising

Dear Participant

Thank you for taking time to read this document which will give you information you need about this research. I am currently studying for my Master's degree in Physiotherapy at the University of the Witwatersrand and the focus of my degree is Pain Management and the title of my research is stated above. Should you need any further information about my course or the research, you are always welcome to contact me.

The title of my study may give you some idea that my interest is in understanding how patients can manage their chronic pain better, and how physiotherapists can tailor treatments to assist patients to achieve this. My research is attempting to find out how many chronic pain sufferers experience fear avoidance and/or pain catastrophising phenomena, especially those who have neck pain.

To do this research, I am asking you to complete short questionnaires for those who are 18 years or older. I also ask how much pain you are feeling at the time of filling in the questionnaires, and to record it on a scale. Finally, you will draw on a body chart where you experience your neck pain usually. You will be assisted with the procedure by myself or one of my physiotherapy colleagues from this practice.

You may find it interesting that I am confining my research to chronic neck pain sufferers (i.e. those who have suffered from neck pain for more than three months) who are visiting physiotherapy practices in the Johannesburg area. This is because we have data for those who experience fear avoidance and pain catastrophising in other countries but not for a group in South Africa. Once we know how a South African population responds to chronic neck pain, it will give us more accurate information so that we can target our treatments more effectively in the future.

The Fear avoidance questionnaire gives us an idea of how reluctant a person is to move when they experience pain. If a person is very fear avoidant, they will be very reluctant to move and may become less and less active and less involved in work and social activities. This could mean that their quality of life could be affected quite markedly.

The Pain catastrophising questionnaire can give us an idea of how much an individual may feel helpless and overwhelmed by their pain and how much a person may worry that because they have such a lot of pain that something serious might be happening to them. Another

aspect that pain catastrophising can show is how much of the time a person thinks about how much the pain hurts. With all this going on in one's mind, it can interfere in one's quality of life.

It is likely, since you are reading this information sheet, that you suffer from chronic pain. In other words, you have had pain in your neck region for 3 months or more and your physiotherapist has identified you as a candidate for this study. I would like to invite you to participate in this study as it will give us helpful information about aspects of problems that chronic neck pain sufferers have to confront.

I am hoping to involve about 100 participants for this study over the next couple of months. For each participant it will entail filling out two questionnaires, marking an X on a visual scale which will rate your level of pain and drawing on a body chart where you are experiencing your pain. This should take a maximum of 15 minutes. The person who asks you to read this information sheet in the practice is likely to be able to answer any questions you have, but if there are any concerns that have not been answered adequately, you may telephone or email me.

The questions in the paper surveys will ask you about how you feel about moving and will also ask you how you cope with your pain.

The risks of being involved in this study may be that your awareness is increased to some degree about some aspects of your quality of life or your coping mechanisms with regard to your pain. This may cause you some distress. If this should happen and you wish to discuss it further with me I am available 24 hours on the telephone or you may email me; or I can make an arrangement for you to discuss your concerns with an appropriate counsellor.

The benefits of participating in this study may not be apparent to you immediately, however, once we collect this data, we hope that it will support the therapies that are being offered in this country.

You will be given information on the study while you are involved in it should you wish. When the study is finished, if you wish to receive results of the study, please could fill out your name and email address and indicate this on the consent form.

Participation in this study is voluntary, refusal to participate will involve no penalty or loss of benefits which you are receiving in this physiotherapy clinic. You may discontinue your involvement in the study at any time without penalty loss of benefits. Your treatment in the clinic will continue as planned if you decide not to complete the surveys.

Confidentiality

Every effort will be made to keep your personal information confidential and I will be do this by giving your name a code and then working from that. Organisations that may inspect and/or copy my research records for quality assurance and data analysis include groups such as the Research Ethics Committee. However, when you agree to participate in the study, you will be identified by a code and from then on in the data collection, which is how you will be identified by any outside organisations.

Contact details of the Researcher

For further information about the research or the reporting of adverse effects relating to the study, please do not hesitate to contact me.
Clare Cresswell - 083-267-1818; clarecress@gmail.com

Contact details of the Research Ethics Committee administrator and chair

Should you need to report any complaints or problems relating to this study, please contact

1. Prof P Cleaton-Jones, Human Research Ethics Committee Chairperson,
   Tel 011 717 2301, e-mail Peter.Cleaton-Jones@wits.ac.za

2. Zanele Ndlovu and Anisa Keshav, Administrators, Tel 011 717 1252/2700
   Zanele.ndlovu@wits.ac.za /anisa.keshav@wits.ac.za

APPENDIX F

- **CONSENT FORM**

Participant Code_____ **Date**_____

FORM 3: CONSENT FORM
(To be completed by the patient in duplicate and the patient to retain one copy)

Fear Avoidance and Pain Catastrophising Prevalence in Chronic Neck Pain Patients attending Physiotherapy in Johannesburg

Clare Cresswell BSc Physiotherapy (Rand)
083-267-1818; clarecress@gmail.com

I understand that this study requires me, the participant, to answer questionnaires which may involve risks that are currently unforeseen and have unforeseeable consequences. Should I require debriefing from the researcher or an independent debriefing counsellor, such a facility will be provided.

The only anticipated circumstances under which this study may be terminated by the investigator without regard to my consent will be when the target number of participants has been reached.

I will not be liable for any costs for being involved in this study. The only requirement will be for me to read the information sheet, fill in the cover sheet with the help of the physiotherapist who has explained the study to me and complete the two questionnaires – the Pain Catastrophising Scale and the Tampa Scale for Kinesiophobia 11 and sign this consent form of participation.

Should I wish to withdraw from the study at any stage, there will be no consequences or costs to me, the participant. I understand that I should contact the researcher by telephone or by email and the researcher will destroy my contribution.

Should there be any significant findings developed during the course of the research which may relate to my willingness to continue, that information will be provided by the researcher, but I understand that I would only have access to my own personal results.

I understand that my identity will not be able to be identified when the data is collated and analysed.

Data will be stored in a password encrypted file.

Participant Code_____ **Date**_____

Declaration:

I, _____ (full name), the participant in the above study, have read and understood the consent form for the study detailed above. I understand, too, that if I have any questions or concerns pertaining to my involvement in this study that I may contact the researcher by telephone or email. If I feel I require any debriefing as a result of my participation in the study, I know that I can contact the researcher who will provide such a facility. I understand that my contact details will not be stored in the data collection.

Signed by participant: _____

Signed by witness: _____ Name of witness: _____

Contact phone number of participant: _____

Email address of participant: _____

Date: _____ Place: _____

APPENDIX G

- **LETTER TO THE PHYSIOTHERAPY PRACTICE**

Clare Cresswell BSc Physiotherapy (Rand)
2 Fifth Avenue
Parktown North 2193

6 July 2014

To _____ Physiotherapy Practice

Dear Colleague

Study: Fear Avoidance and Pain Catastrophising Prevalence in Chronic Neck Pain Patients attending Physiotherapy in Johannesburg

I am a currently doing research towards my Master's Degree in Physiotherapy under the auspices of the University of the Witwatersrand Physiotherapy Department in the School of Therapeutic Health Sciences. I have selected your practice because you have listed your practice under the Orthopaedic Manipulative Physiotherapy Group, a Special Interest Group of the South African Society of Physiotherapy and I am hoping that I will be able to recruit participants for my study from practices which treat musculoskeletal conditions.

My research topic is looking into the prevalence of pain catastrophising and fear avoidance in patients who have chronic neck pain and attend physiotherapy at private practices in Johannesburg.

My study is investigating the prevalence of these two factors in chronic neck pain sufferers (i.e. men and women over the age of 18 who have suffered from neck pain for three (3) months or more). We know from studies done in other countries that when we know what patients' responses are to pain catastrophising and fear avoidance, we can tailor their treatment programme more appropriately. However, we have no data with which to compare these studies in South Africa, and that is why I am conducting this research.

I am needing to recruit 97 patients and I would like you to consider helping me to recruit participants for my study by letting me use patients from your practice who would fit the profile of a participant. The commitment would be that you would look out for patients who are 18 years or older who have suffered from neck pain for 3 months or more. They may be currently receiving physiotherapy or may be presenting for treatment for the first time. Neck pain is defined for the purposes of this study by the subjective opinion of the participant, in other words, it may include pain, muscle tension or stiffness in the neck, shoulder area, upper back area and/or above their costal margin, with or without pain in their arms. Patients also need to be able to read and speak English.

Patients would be excluded for the following: Neurological fallout due to nerve compression resulting in absent/reduced reflexes, a progressive neuromuscular condition, unexplained

weight loss, cancer, pregnancy, intravenous drug use, psychiatric diagnoses other than anxiety or depression and/or surgical intervention at all in the past 3 months.

If you agree that your practice may be used to recruit participants for the study, I would contact you telephonically and we would arrange a time where I would be able to discuss the procedures involved in participating in the study.

If you agree to participate, I would ask you to allocate a colleague to be the liaison person who would take the responsibility of ensuring that all study documents are kept safe and confidential. Then I would show all professional staff how to go about recruiting patients and the procedure that will be used to introduce them to the study.

With each patient, once verbally introducing the possibility of the study to them, they will then be given the Information Document which will give the details about the study in writing. Each physiotherapist will then ensure that the patient understands what they have read before the consent form is signed, and then once signed, will give a duplicate copy to the patient so that they have my contact details. The physiotherapist, or the liaison physiotherapist, will allocate each participant a specific code for the data collection.

I will also show all those physiotherapists involved how to fill in the Data Collection Form (Form 4) with the participant and then how to give the two questionnaires to the participant to fill in (Forms 5 and 6). I will also advise you on how to store the forms that have been completed in their sealed envelopes so that confidentiality will be maintained. I will collect them at a regular intervals and replenish your envelopes as needed. I don't anticipate that the filling in of the forms will take longer than 15 minutes in total.

I have included at the end of this letter some more information about Pain Catastrophising and Fear Avoidance for your information should you be interested and would be happy to discuss the study further.

I am hoping that you will be able to help me with this study and I look forward to contacting by telephone soon.

Kind regards

Clare Cresswell
clarecress@gmail.com
083-267-1818

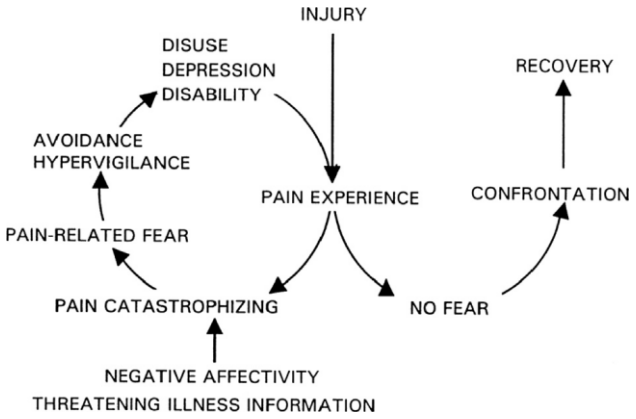
Further information about Pain Catastrophising and Fear Avoidance

Pain catastrophising is currently defined as: *"an exaggerated negative mental set brought to bear during actual or anticipated painful experience" (Sullivan et al., 2001).* Individuals who engage in catastrophic thoughts are likely to magnify or exaggerate the threat of the pain or the seriousness of the pain, ruminate on the pain (have thoughts that go over and over while thinking about the pain), and feel helpless and are pessimistic about coping with the pain.

An understanding of the degree of a patient's pain catastrophising through the use of the Pain Catastrophising Score has been shown to be a better predictor of pain-related disability and activity intolerance than just measuring a patient's level of pain.

Fear Avoidance: Protective behaviours are normal and often life saving in individuals when pain is perceived. However, when behaviours in response to pain become abnormal, they may result in pain disability, affective distress and/or physical disuse because of persistent avoidance of activities as a result of a fear of movement. The term fear-avoidance was introduced to describe these phenomena and various measures were sought to identify whether or not an individual was likely to be fear-avoidant.

For your interest, I have included a schematic representation of how researchers, Vlaeyen and Linton have described the process of injury leading to recovery in a normal process in one loop; and in another loop, where negative affectivity or threatening illness information becomes involved in the pain experience and is added to pain catastrophising. From there, pain catastrophising feeds into pain-related fear which in turn may lead onto fear-avoidance or hypervigilance, and this may result in disuse, disability and/or depression. The problem then may further be exacerbated by feeding into the loop again with the person experiencing more pain and the cycle continuing. One of the factors that has been noted to help in recovery is when patients are able to confront, rather than avoid – these are intrinsic factors that have been observed and are not helpful when they are forced on patients.



Graphical display of the fear-avoidance model, reproduced from Vlaeyen JWS, Linton SJ. Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. Pain 2000;85:317–32.

APPENDIX H

- **LETTER OF REQUEST**

Physio's address

1 February 2015

Dear Mr/Mrs _____

Physiotherapy Research being carried out at University of the Witwatersrand

I am writing to you in the hope that you will consider assisting one of my colleagues who is researching aspects of coping mechanisms in people who suffer from Chronic Neck Pain for her Master's degree in Pain Management in Physiotherapy. Her name is Clare Cresswell.

I have selected you as a possible participant because you have had neck pain for longer than three months.

I am forwarding the letter that my colleague has drafted and she will be following up with a phone call to see if you would be happy to complete the questionnaires. If you are happy to do so, she will arrange to meet with you to give you the forms to fill in and it should take about 15-20 minutes of your time. Or she will email the forms to you and you can fill them in on your own and she will arrange to pick them up from you.

Chronic Pain is of great concern to all who are affected by it and who treat it, and I try to be supportive of research that is conducted by my colleagues in the hope that we can develop our skills in overcoming pain.

Should you **definitely not** want to be contacted regarding this research, would you be so kind as to telephone, sms or email me as soon as possible, so that my colleague and I do not follow up this letter with a contact phone call.

Kind regards
Physio's name
Phone no
Email address

APPENDIX I

- **CHECKLIST FOR PHYSIOTHERAPIST/RESEARCHER**

Participant Code_____ **Date**_____

FORM 1: CHECKLIST AND PROCEDURE FOR PHYSIOTHERAPIST/RESEARCHER FOR EACH PARTICIPANT

This will help you, the clinician, decide if a patient is eligible for the study.
Then check that you have offered the forms in the order as described below.
Check list to see if patient fits the criteria for participating in the study.

Checklist for eligibility of participant in study

		Circle answer that applies to patient		**These are the answers if the patient is to be able to be asked to participate in the study**
Inclusion	**Age - Patient must be 18yrs or older**	Y	N	Y
Inclusion	Patient should have had **pain for 3 months or more**	Y	N	Y
Inclusion	Patient should be **complaining of neck pain (for the purposes of this study, neck pain is defined as the subjective opinion of the patient**. Therefore, it may include pain, muscle tension, stiffness in the neck, shoulder area, upper back area and/or above his or her costal margin. With or without pain in his or her arms).	Y	N	Y
Inclusion	The participant will be eligible for the study whether or not they have received physiotherapy however they will be asked if they have received physiotherapy before for the same condition.	Y	N	Y and N
Inclusion	Participants may be male or female			
Inclusion	Participants should be able to read and speak English	Y	N	Y
Inclusion	Participants will not be excluded on the basis of ethnicity or nationality			
Exclusion	**Neurological fallout due to nerve compression** resulting in:			
	1. Absent or reduced biceps or triceps reflexes	Y	N	N
	2. Muscle weakness	Y	N	N
	3. Sensation loss or decreased sensation in identifiable dermatomes (related to possible nerve compression diagnosis)	Y	N	N

Participant Code_____ **Date**_____

		Circle answer that applies to patient		These are the answers if the patient is to be able to be asked to participate in the study
Exclusion	**A progressive neuromuscular condition**	Y	N	N
Exclusion	**Unexplained weight loss**	Y	N	N
Exclusion	**Cancer**	Y	N	N
Exclusion	**Pregnancy**	Y	N	N
Exclusion	**Intravenous drug use** – please jog their memory because they may only have it once every 3 months for something like osteoporosis or an immune disorder and not related it to their pain (may be for another condition but would still be a reason for exclusion)	Y	N	N
Exclusion	**Surgical intervention at all in the past 3 months**	Y	N	N
Exclusion	**Psychiatric diagnoses other than anxiety and/or depression** (anxiety and depression often occur with chronic pain and so would not be reasons for exclusion in this study)	Y	N	N

1. If the patient is suitable for the study, he or she should be asked if they would be interested in participating in the study and therefore reading the Participant's Letter which would explain what the study is about and what it involves for the participant.
2. If the patient is willing to participate, ask him/her to read the Consent Form and then complete the Declaration at the end of the Consent Form – in duplicate.
3. Give the participant his/her own copy of the Participant's Letter and the signed Consent Form.
4. Give the participant the Data Collection Form and be available for any questions the participant may have. Please note that the body chart should be filled in in pencil and an eraser should be available in case the participant would like to make alterations.
5. After the Data Collection Form is completed, the participant fills in the TSK questionnaire.
6. After the TSK questionnaire, the participant fills in the PCS questionnaire.
7. When these are all completed, thank the participant for his or her time. Please remind him or her that they have a copy of the participant letter and the consent form and the researcher's contact details.
8. The first 10 participants will be regarded as a pilot study and will be asked to repeat the questionnaires in a week. This should be mentioned to them before they sign the consent form and let them know that they will be contacted by the researcher so that a suitable time can be set up to repeat the questionnaires. This is to test the reliability of the tools.

Participant Code_____ **Date**_____

9. After each participant has filled in their questionnaires, the consent forms should be stored in the Consent Form Envelope and the Participant's Data Collection Form, TSK and PCS forms should be stored in the envelope allocated for that participant number.

PROCEDURE FOR COLLECTING DATA

Please check each step for each participant and put this form in their envelope

	Procedure	**Please circle if completed**	
1	**Physiotherapist check list** completed to ensure that potential participant fills criteria for inclusion	Y	N
2	Potential participant has read the **Participant's Letter** and agrees to participate in study	Y	N
3	**Participant reads** the **Consent Form and signs the Declaration in duplicate**	Y	N
4	**Participant retains** one copy of the signed Consent Form and Declaration	Y	N
5	The **second copy** of the signed Consent Form and Declaration and **filed** in the Envelope	Y	N
6	**Participant number with practice code is allocated** to the Participant and **filled in on the top of all the questionnaires** that the participant will be using	Y	N
7	Participant has filled in the **Data Collection Form**	Y	N
8	Participant has filled in the **TSK-11**	Y	N
9	Participant has filled in the **PCS**	Y	N
10	**Researcher has thanked the participant** and reminded them that the researcher's contact details are on the Participant's letter	Y	N
11	**The 3 Questionnaires are filed** in the Envelope provided for completed questionnaires	Y	N
12	**Review Physiotherapy Checklist and Procedure (Form 1) to check all items have been completed and checked**	Y	N

APPENDIX J

- **FORM B – PRACTICE DETAILS AND DATA RECORDS**

Clare Cresswell

clarecress@gmail.com – 083-267-1818

Study: Fear Avoidance and Pain Catastrophising Prevalence in Chronic Neck Pain Patients attending Physiotherapy in Johannesburg

Name of Practice		
Contact Physiotherapist		
Address		
Phone Number		
Code allocated		
Participant number and practice code reflected on all the participant's forms	**Participant Name**	**Date**

APPENDIX K

- **SCATTERPLOTS SHOWING CORRELATION BETWEEN TSK-11-TOTAL AND PCS SUBSCALES AND TSK-SF AND PCS-TOTAL AND ITS SUBSCALES**

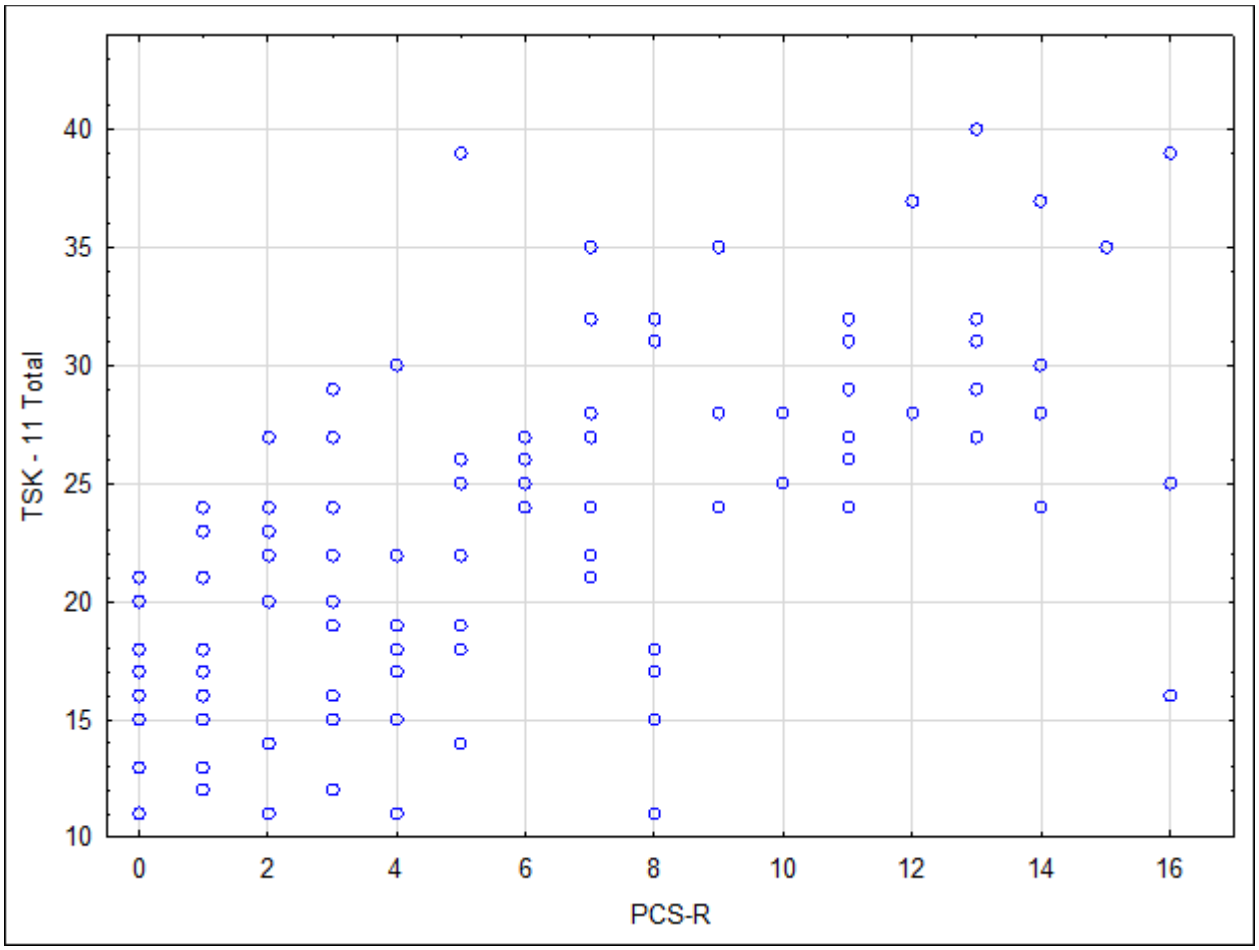


Figure 1: Scatterplot shows correlation between TSK-11-Total and PCS-R

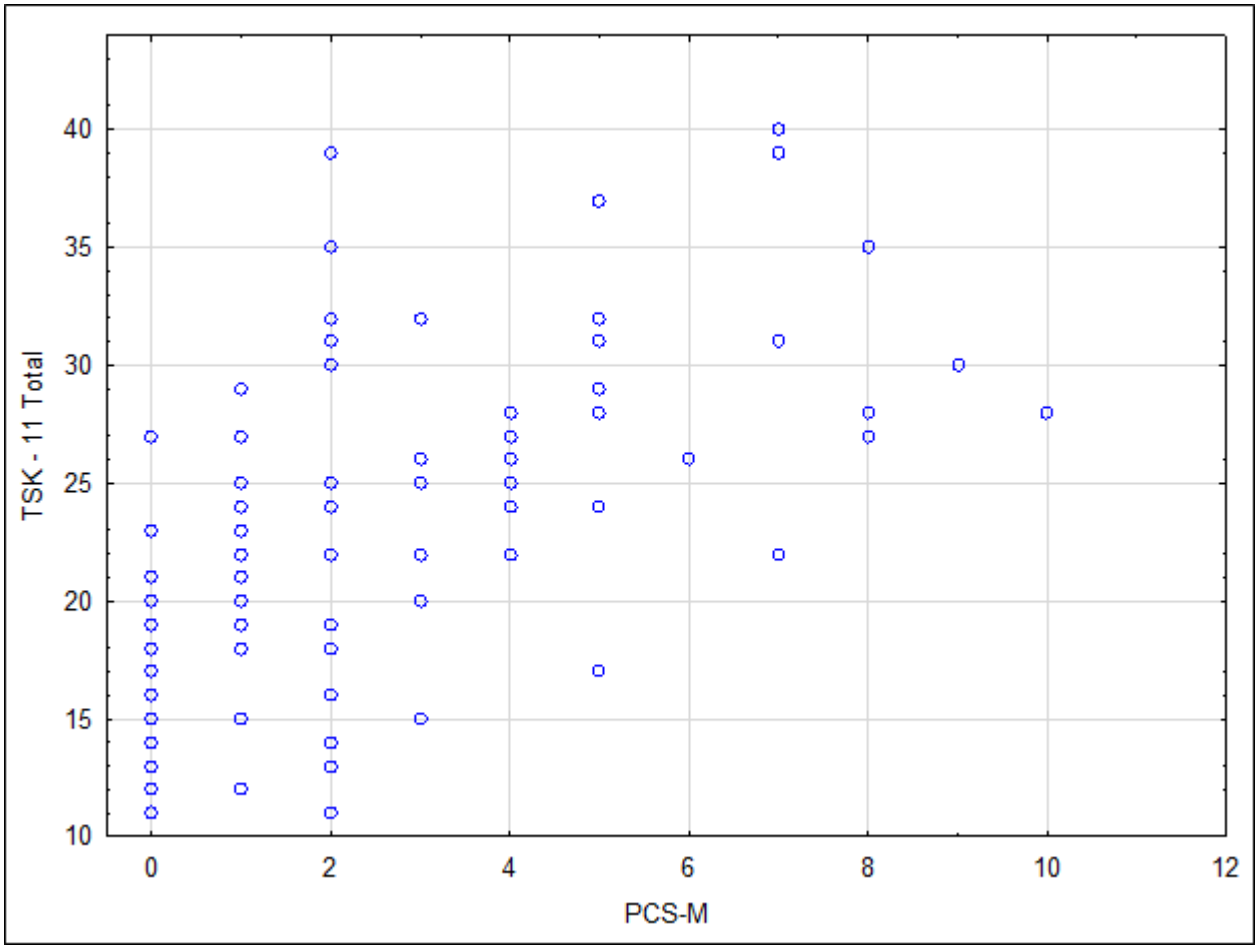


Figure 2 Scatterplot shows correlation between TSK-11-Total and PCS - M

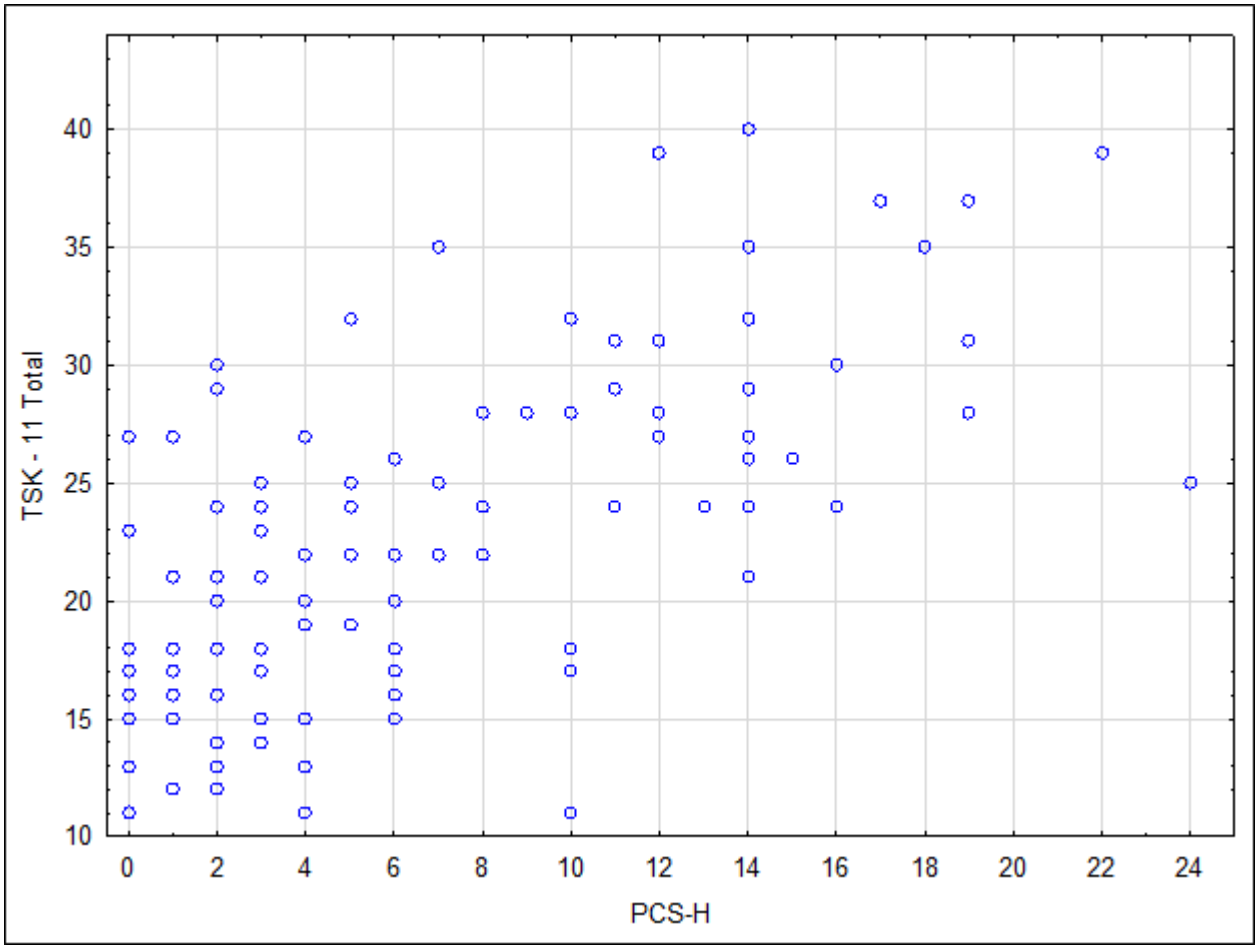


Figure 3: Scatterplot shows correlation between TSK-11-Total and PCS-H

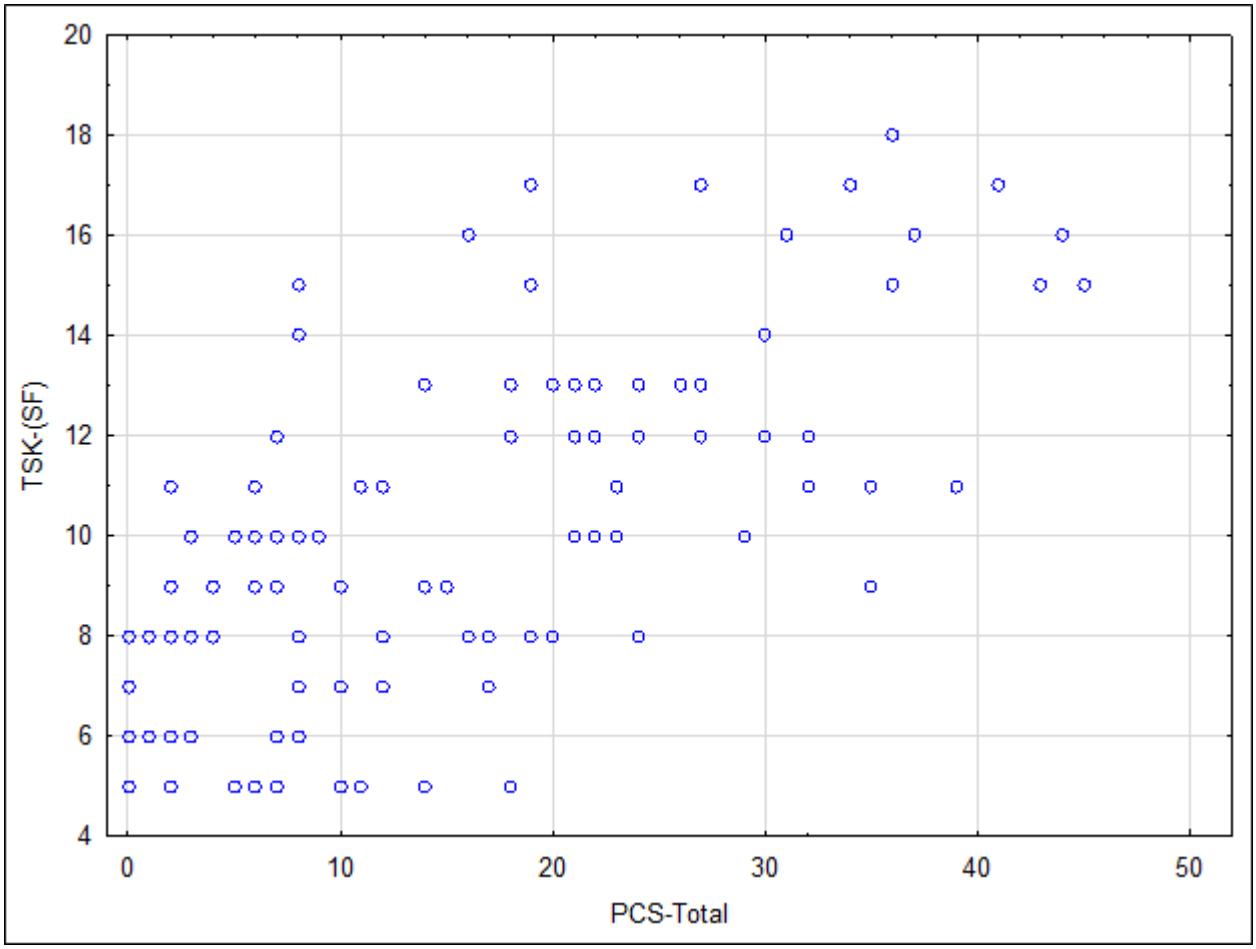


Figure 4: Scatterplot shows correlation between TSK-SF and PCS-Total

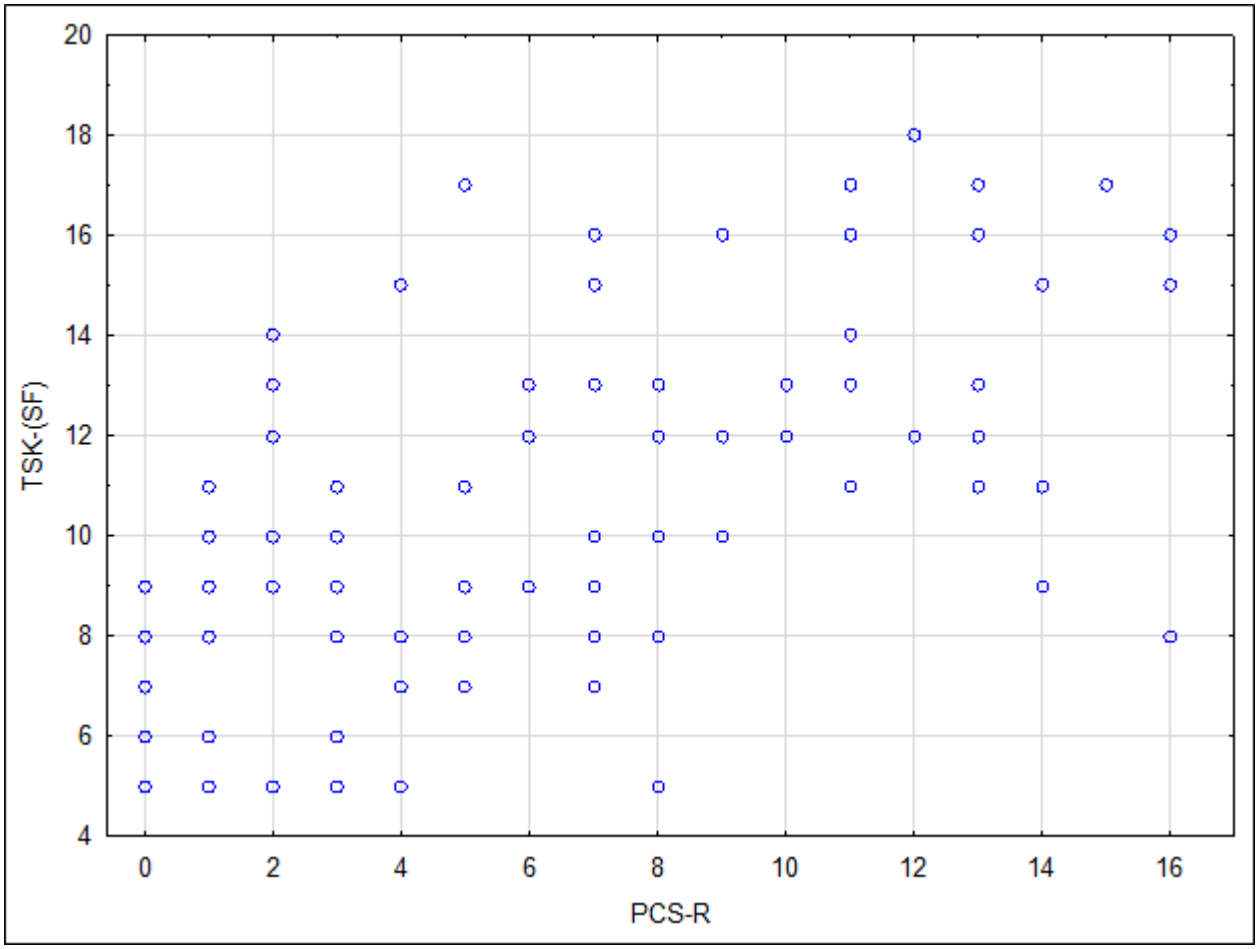


Figure 5: Scatterplot shows correlation between TSK-SF and PCS-R

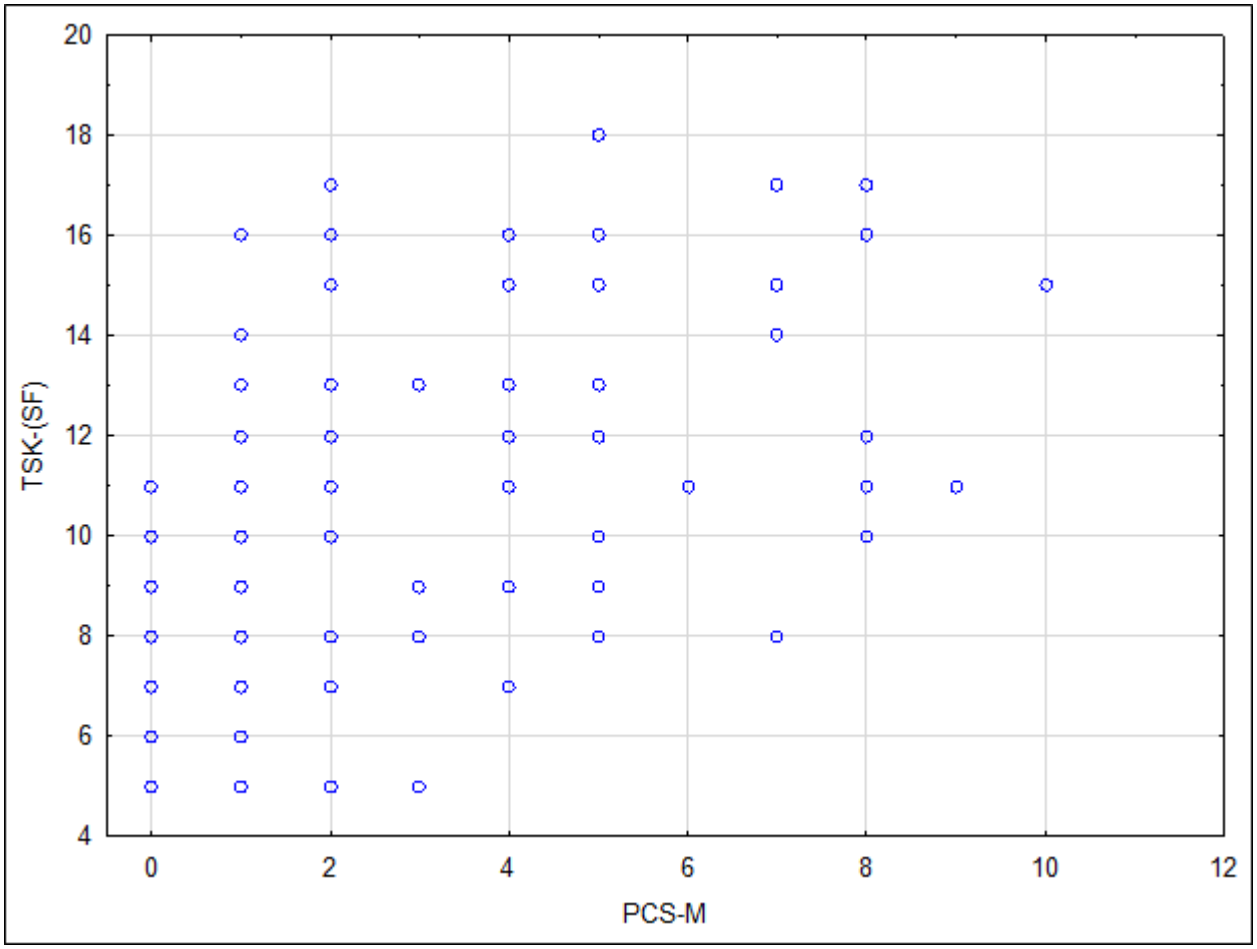


Figure 6: Scatterplot shows correlation between TSK-SF and PCS-M

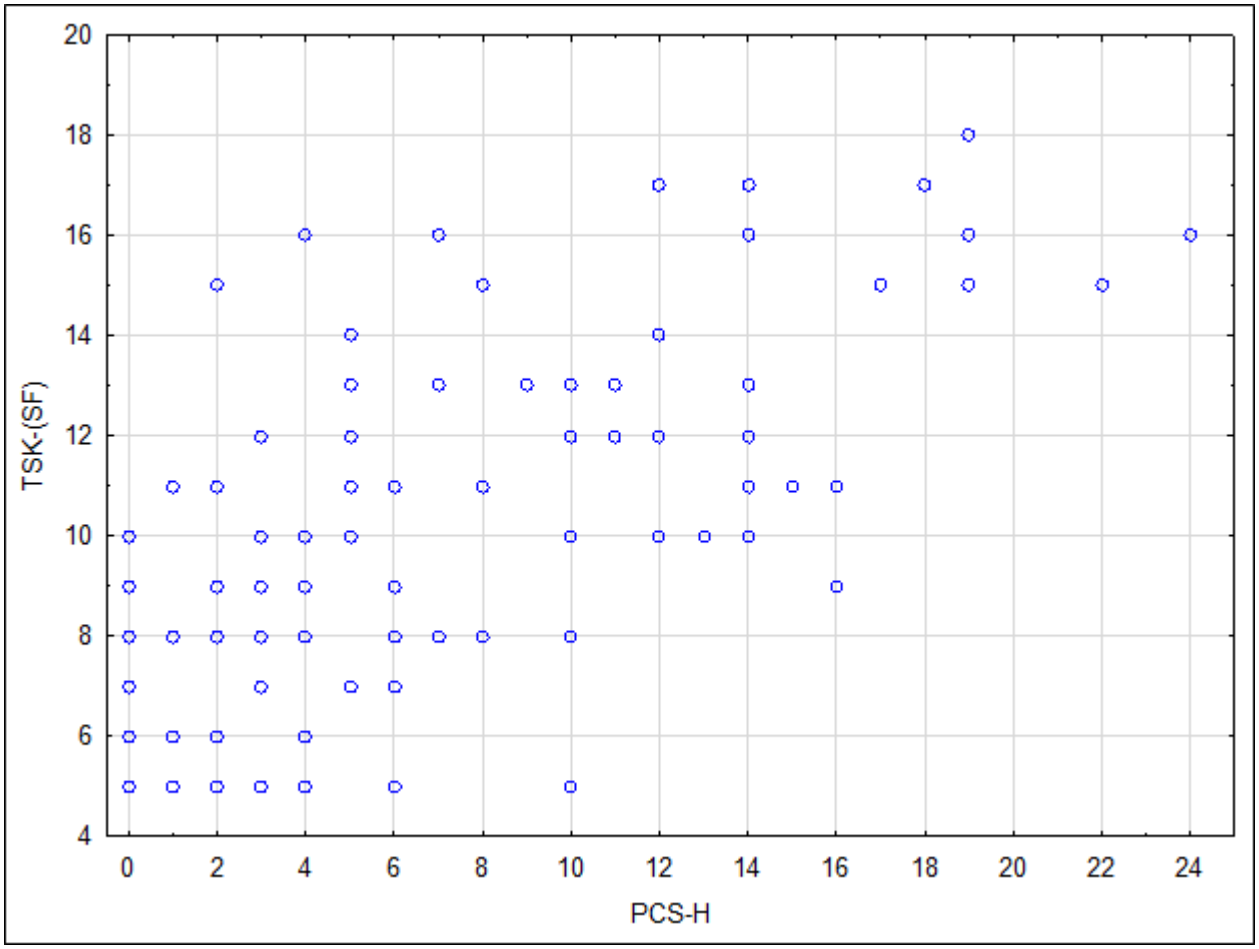
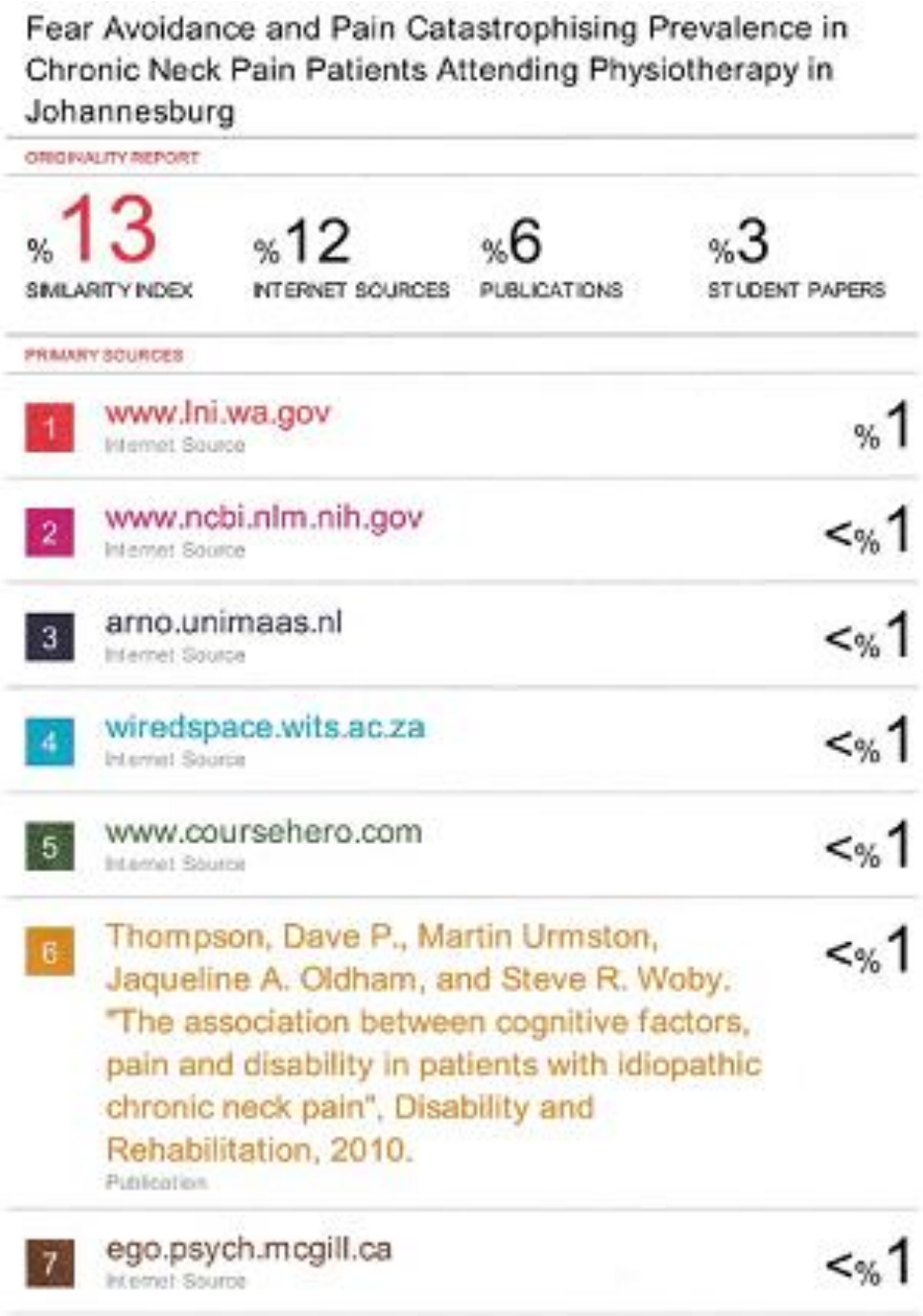


Figure 7: Scatterplot shows correlation between TSK-SF and PCS-H

APPENDIX L

- TURN-IT-IN REPORT



Fear Avoidance and Pain Catastrophising Prevalence in Chronic Neck Pain Patients Attending Physiotherapy in Johannesburg

ORIGINALITY REPORT

%13	%12	%6	%3
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.lni.wa.gov Internet Source	%1
2	www.ncbi.nlm.nih.gov Internet Source	<%1
3	arno.unimaas.nl Internet Source	<%1
4	wiredspace.wits.ac.za Internet Source	<%1
5	www.coursehero.com Internet Source	<%1
6	Thompson, Dave P., Martin Urmston, Jaqueline A. Oldham, and Steve R. Woby. "The association between cognitive factors, pain and disability in patients with idiopathic chronic neck pain", Disability and Rehabilitation, 2010. Publication	<%1
7	ego.psych.mcgill.ca Internet Source	<%1