Personality characteristics, perception of pain and the attainment of self-care in patients with spinal fusion.

Submitted by

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Declaration of own work:

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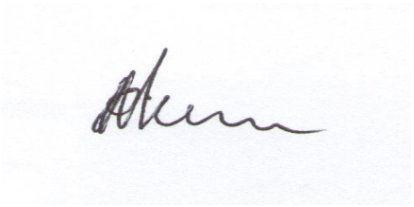

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CONCEPT CLARIFICATION

Personality

Based on the formal definition of personality one can describe personality as an active organisation of various characteristics that influence one`s thoughts, motivation and behaviour (American Psychological Association, 2010). Various researches over the years have tried to define personalities by differentiating between different styles and characteristics. Type theory, psychopathology and trait theory have since become the three pronounced theories, which have attempted to define how personality develop and can be explained (Cameron, 2011).

Since the chosen measurement instrument in this study is the 16 personality factor test, 5th edition (16PF5), which was developed by Cattell, personality is defined in this study according to trait theory. Trait theory focuses on specific characteristic that form an individual's personality. These traits are believed to follow a specific pattern of behaviour and therefore one can predict certain behaviour in accordance to personality traits (Cameron, 2011). "The three leading trait models that have been extensively researched and used are: Eysenck`s model of personality, the big five personality model and Cattell`s model of personality" (Cameron, 2011, p. 12).

Eysenck`s model of personality and the big five personality model have been criticised for over-simplifying personality traits and this led to the development of Cattell`s model of personality (Cameron, 2011). In this model 16 characteristics of personality is identified namely: warmth, reasoning, emotional stability, dominance, liveliness, rule consciousness, social boldness, vigilance, sensitivity, abstractness, privateness, apprehension, openness to change, self-reliance, perfectionism and tension (Cattell, 2004).

Pain

For the purpose of this study pain is defined as a subjective unpleasant sensory and emotional experience associated with actual or potential tissue damage (International Association of the Study of Pain, 2012). For the purpose of this study a score of six or above on the Numerical Rating Scale (NRS) is considered indicative of increased levels of pain. A score of 40% or more on the Oswestry Disability Index (ODI) or Neck Disability Index (NDI) is considered an indication of increased functional impairments. Results below these values (6/10 or 40%) will indicate that those experienced pain ratings or disability indexes are within normal limits.

Individualised self-care occupational therapy outcomes

For the purpose of this research individualised occupational therapy outcomes will focus only on basic activities of daily living (self-care), which are obtainable outcomes within the first six weeks post surgery. These activities are inclusive of: showering, dressing, performing functional ambulation, personal hygiene and grooming, sexual activity and toilet use (The American Occupational Therapy Assosiation, 2002). "Setting of individualised treatment outcomes is based on the collaborative assessment of occupational needs of a specific patient in their own environment" (Heinicke, Sumsion, & Tischler-Draper, 2011, p. 86). The patient will therefore indicate what self-care outcomes he or she would like to achieve within therapy and therefore indicate what is important to them (Baptiste, 2008). Based on the patients` needs and capacity, these self-care outcomes will be formulated in a quantifiable manner with clear parameters as to measure attainment of individualised goals (Krasny-Pacini, Hiebel, Pauly, Godon, & Chevignard, 2013).

LIST OF ABBREVIATIONS

The following list will provide the terms abbreviated in this dissertation:

BADL	Basic activities of daily living
NRS	Numerical Rating Scale
VAS	Visual Analogue Scale
ODI	Oswestry Disability Index
NDI	Neck Disability Index
16PF5	The 16 personality factor test, 5th edition
MMPI	Minnesota Multiphasic Personality Inventory
NEO-I	Neuroticism-Extraversion-Openness Inventory
COPM	Canadian Occupational Performance Measure
OTPF	Occupational Therapy Practice Framework
GAS	Goal Attainment Scale

Abstract

Background

Self-care activities are often most affected after a spinal fusion and are priority goals of the individualised treatment approach. Many patients undergo spinal fusions with similar levels and instrumentation. Despite procedural similarities, some patients return to participation within self-care activities effortlessly, whilst others display delayed independence. Literature suggests that personality traits and patients` perceived experience of pain is two contributing factors in rehabilitation. The aim of this study was to investigate the associations between these factors.

Methods

A descriptive cross-sectional study design was used. The study population included 61 patients who underwent a spinal fusion amid October 2015 and June 2016. Data was gathered pre-operatively and post-operatively. Self-compiled - and standardised questionnaires were used to measure pain, personality and self-care activities.

Results

Perfectionism (57.4%), tension (44.3%) and apprehension (44.3%) were high-indicated primary factors. Low emotional stability and seriousness were found in majority (73.8%) of the participants.

Study participants (49.2%) who had high functional impairments due to pain displayed high levels of anxiety. Low levels of functional impairments were related to high levels of independence, tough-mindedness and self-control.

Caring for toe nails, drying hair and engaging in sexual intercourse were the most affected self-care areas pre- and post-operatively. 68.9% of participants attained both self-care goals.

Conclusion

Participants with high anxiety and low independence, tough-mindedness and self-control, experienced more pain. Higher levels of pain are associated with decreased goal attainment. However, despite a higher pain perception, the presence of certain personality characteristics namely: low extraversion, high independence and self-control leads to higher goal attainment. Results confirm that personality characteristics influence pain perception and the attainment of self-care goals.

CHAPTER 1 - INTRODUCTION AND ORIENTATION

1.1 INTRODUCTION

Self-care activities, also known as basic activities of daily living (BADL) are often the most affected activities after a spinal fusion (Skolasky, Maggart, Li, & Wegner, 2015). These activities are deemed priority goals of the individualised treatment approach related to spinal fusion surgery. Occupational therapy rehabilitation thus focuses on return to independent participation in these activities (van Langeveld, Post, van Asbeck, Gregory, Halvorsen, Rijken, Leenders, Postma & Lindeman, 2011). Many patients undergo spinal fusions with similar fusion levels and instrumentation. Despite the procedural similarities, some patients return to participation within self-care activities effortlessly, whilst others display delayed independence. Personality traits of the various patients and their perceived experience of pain are two contributing factors that can account for this discrepancy related to return to independent participation in self-care activities (Skolasky et al., 2015; Eakman & Eklund, 2012). In order to ensure effective rehabilitation it is therefore important to understand the possible associations between personality traits, pain and the achievement of individualised self-care outcomes.

Spinal fusion involves insertion of instrumentation to two or more spinal vertebrae, allowing joint stabilisation thereby compensating for varied spinal pathology (Reed Group, 2012). Spinal fusions are commonly necessitated by either injury or degenerative, long-standing joint pathology and are associated with chronic and often debilitating pain that alters activity participation. Instrumentation insertion generally decreases pain but also restricts joint mobility (Sciubba, Scheer, Smith, Lafage, Klineberg, Gupta,

Mundis, Protopsaltis, Kim, Hiratzka, Koski, Shaffrey, Bess, Hart, & Ames, 2015). Activity participation is affected by this restricted mobility and requires rehabilitation to enable occupational engagement (Reed Group, 2012). Post-surgery the patient should adhere to various precautionary measures as to ensure optimal healing of the fused site. These precautionary measures often restrict participation in vocational- and leisure activities during the initial post-operative phase. Patients are able to participate in all self-care activities immediately, although how they perform these activities may require adaptation to ensure that they adhere to precautionary measures and protect the fused site. Hence participation in self-care activities is the primary focus during the initial post-operative rehabilitation phase (Bear-Lebman & Maher, 2008).

In occupational therapy there are many models and frames of references to guide the rehabilitation process. Occupational therapists in the field of orthopedic rehabilitation utilise a biomechanical frame of reference (Lee, Taylor, Kielhofner, & Fisher, 2008). This approach postulates that improvement of a patient`s physical capacity will increase his/her independence in self-care activities (Jackson & Schkade, 2001). The researcher noted that a purely biomechanical approach to treatment was inadequate for most of the spinal fusion patients and the need for alternate approaches became evident.

The latter could be ascribed to the many factors, which influence attainment of independence within self-care activities. Cultural and habitual factors influence one's perception of importance pertaining to self-care activities and therefore an individualised approach is required to render appropriate treatment (Baptiste, 2008). The Canadian Model of Occupational Performance (COPM) supports the use of an individualised treatment approach and has propelled client-centered treatment regimens (Cup, Scholte op Reimer, Thijssen, M, & van Kuyk-Minis, 2003). This approach allows patients to indicate the importance of certain self-care activities, as well as gauge their present performance and satisfaction levels during occupational performance

(Baptiste, 2008). This information is used to set individualised treatment outcomes, thereby increasing the probability of their attainment. In the case of spinal fusions, the treatment outcomes will remain within the self-care domain due to post-operative restrictions. The setting of individualised self-care outcomes addresses cultural and habitual factors. However, the attainment of individualised self-care outcomes is still influenced by personal factors such as the individual`s perception of pain. Pain often leads to immobilisation with subsequent continuation of maladaptive patterns of activity participation (Barata & Gagulic, 2014).

Attention to and interpretation of pain, beliefs and attitudes regarding pain, pain expectations, cognitive processing, emotional responses, coping strategies and past pain behaviour have all been identified as part of the psychological component involved in pain perception (Linton & Shaw, 2011). One`s personality characteristics have a great influence on the afore-mentioned components and thus in effect, influence pain experience (Cameron, 2011).

The American Academy of Pain Medicine (2014) defines pain as a subjective experience. Although it encompasses a physiological process, the psychological component of pain greatly accounts for variant pain experiences between patients (Aprile, Arezzo, Carlo, Onlus, Padua, & Pazzaglia, 2012; Antoni, Kamp, Lattie, Millon, & Walker, 2013).

Personality characteristics have been linked to development and maintenance of pain and should be considered a key factor in understanding pain (Cameron, 2011; Antoni, Kamp, Lattie, Millon, & Walker, 2013). Previous studies have confirmed a consistent interaction between psychological influences and pain. (Linton et al., 2011; Cameron, 2011; Antoni et al., 2013). Perceived pain and activity participation may therefore be similarly affected.

1.2 PROBLEM STATEMENT AND SCOPE OF RESEARCH

Based on the researcher's clinical experience, the rehabilitation process and the attainment of rehabilitation goals is greatly affected by the experience of pain. Although evidence from existing research confirms a distinct relation between personality and pain (Cameron, 2011; Antoni et al., 2013), studies conducted thus far have not related these two factors on a clinical level with the individualised outcomes in occupational therapy within the South African context. Currently there is no research evidence available that describes the association between personality traits, the perception of pain and the attainment of individualised self-care outcomes. Should occupational therapists understand the associations between personality, pain and achievement of individualised self-care outcomes, they would be better able to manage the interplay of these factors in rehabilitation, and anticipate the impact that these factors have on intervention planning and functional outcomes. Knowledge of these factors may lead to timely prediction, and management of critical aspects that need to be considered when planning individualised intervention programmes. An understanding of these factors may further assist the interdisciplinary alliance of rehabilitation focus, as it aligns with person-centered outcomes.

1.3 RESEARCH AIM

The aim of this study is to determine the association between personality characteristics, pain perception and the attainment of individualised self-care outcomes in patients with spinal fusion.

1.4 SCOPE OF THE RESEARCH

Clinical experience has shown that both the rehabilitation process and the attainment of rehabilitation goals are greatly affected by the patient`s experience of pain. Pertinent literature, although limited, has indicated that an individual`s perception of pain is closely related to his/her personality. This study sets out to describe the association between personality characteristics, pain perception and the attainment of individualised self-care outcomes in patients after a spinal fusion.

1.5 METHODOLOGY

A detailed description of the research methodology can be found in Chapter 3. Therefore, for the purpose of this section, only a brief overview of the methodology will be provided.

A cross-sectional study design was undertaken. The study population comprised patients referred by two neurosurgeons in the Port Elizabeth area who were admitted to a private hospital (Netcare Greenacres). Participants were patients who were scheduled to undergo either a cervical or lumbar spinal fusion over the period October 2015 to June 2016. A convenience sample was utilised and patients who met the inclusion criteria and consented to participate, were included in the study.

Ethical approval to conduct the study was obtained from the Research Ethics Committee of the University of the Free State after which the process of data collection commenced. Data was collected in two phases namely, the pre-operative and post-operative phase.

The patients` contact details and medical information pertaining to the scheduled spinal fusions were communicated via email by the

neurosurgeons` secretary to the researcher. The researcher then contacted these patients and scheduled pre-operative appointments at a time that suited them. Sessions were held at any of the three practice rooms according to the patient`s request. Each of the patients had received a booklet with the Numerical Rating Scale (NRS), the Oswestry Disability Index (ODI) (Fairbank, 1980) or the Neck Disability Index (NDI) (Vernon & Mior, 1991) and a self-care rating questionnaire at the neurosurgeons` practice. These they completed in their own time and brought with them to the pre-operative session. These routine questionnaires form part of the spinal fusion protocol and were established prior to initiation of the research study.

During the pre-operative contact session the researcher informed the patient of the research (verbal and written information) after which the patient was invited to participate in the research. In instances where patients did not wish to participate, the routine pre-operative session was conducted. Patients who were willing to participate gave their informed consent and completed a written demographic questionnaire. The researcher verbally explained any questions regarding the demographic questionnaire and the participant indicated the answer in the block provided on the demographic questionnaire. Secondly the participant completed Cattell`s 16 Personality Factor Model (16PF5) at the pre-operative contact session. The researcher was available whilst they completed the questionnaire, to address any question that might have been unclear. The researcher handed the completed personality questionnaires (16PF5) to a psychologist registered with the HPCSA, for scoring and interpretation, as it is not within the researcher`s scope of practice to interpret the 16PF5.

Whilst the participant completed the 16PF5, the researcher scored their completed self-care rating questionnaire, which they brought with them to the pre-operative session. The two self-care activities with the highest importance rating were determined. These two self-care activities with the highest importance rating were used to compile a Goal Attainment Scale

(GAS) (Kiresuk & Sherman, 1968) for each participant. Once the participant had completed the demographic questionnaire and the 16PF5, the researcher verbally completed the GAS together with the participant.

After the pre-operative contact session, 87 participants had their spinal fusions as scheduled, at Greenacres Hospital (nine patients had their surgery cancelled due to medical aid restrictions). The multidisciplinary team members routinely administered the rehabilitation protocol, regardless of patient`s participation in the research study. The in-hospital occupational therapy rehabilitation was conducted by occupational therapists who have been trained to execute the protocol correctly. The GAS compiled for each participant was handed to the occupational therapists to address patient specific treatment goals. Whilst in-hospital each of the participants received an appointment card for their post-operative consultation with the occupational therapist for the second phase of data collection.

At the post-operative session, the participants again completed a demographic questionnaire, NRS, ODI/NDI, self-care rating and GAS. Post-operative sessions can occur anytime after six weeks, as most precautions are only applicable for the first six weeks. The date of the post-operative session was determined by the participants. Most sessions were scheduled for the same day as the participant`s follow-up with the neurosurgeon. Some participants did not require a six week follow-up with the neurosurgeon and they then made separate appointments. Other participants did not keep their appointments but after their consultation with the neurosurgeon who encouraged them to attend their session, they then rescheduled.

The researcher scored all questionnaires completed in the pre-operative and post-operative sessions and transferred data into an EXCEL spreadsheet. This spreadsheet was then handed over to the department of Biostatistics at the University of the Free State for analysis.

1.6 ETHICAL CONSIDERATIONS

The protocol was first submitted to the Expert Research Committee of the Department of Occupational Therapy and secondly to the Evaluation Research Committee of the School of Allied Health Professions. After both committees had approved the protocol, it was submitted to the Ethics Committee of the Faculty of Health Sciences of the University of the Free State for approval (ECUFS NR 165/2015).

Permission was obtained from the two referring neurosurgeons and Netcare Greenacres Hospital where the participants were admitted.

Information was given to the participants and consent to participate was obtained from the participants. Participants were informed about the aim of the study, the method of data collection and that their participation in the study would incur no risk.

Throughout the study, the participants were reminded that participation was voluntary and that if they wished to withdraw from the study, they could do so without any penalty or loss of benefits.

They were also assured that the information they provided would be treated with confidentiality, and that there would be no violation of their rights or privacy. Confidentiality was maintained throughout the study by assigning a participant number to each questionnaire.

The participants were made aware of the fact that the researcher intended to use the data obtained in the study as part of a dissertation. They were also informed that the research might be published in an accredited journal, and or presented at professional forums.

1.7 IMPORTANCE AND VALUE OF THE STUDY

Occupational therapists are known for their holistic approach in evaluating and treating patients (The American Occupational Therapy Assosiation, 2002). In order for occupational therapists to be true to this approach they require a comprehensive understanding of the various aspects of an individuals` occupational performance capacity (The American Occupational therapy Assosiation, 2002). Personality characteristics are one of these aspects that therapists should understand; especially when addressing patients` pain as it is evident that personality influence experienced pain (Cameron, 2011; Antoni et al., 2013). A better understanding of the association between pain and personality characteristics enables the occupational therapist to determine treatment barriers and estimate treatment prognosis more accurately. This in turn assists in setting more realistic and attainable rehabilitation goals in therapy.

An improved understanding of how personality characteristics influence pain and attainment of therapy outcomes enables the therapist to utilise this knowledge to design and grade the patient`s treatment approach. The therapist is better able to plan, present and implement an intervention approach in a manner that is appropriate to the patient`s personality. For example, should the patient display high perfectionistic traits, information may be provided in a detailed fashion with frequent repetition. Should the patient display high sensitivity traits, in which case increased details will cause anxiety, the opposite approach would be utilised. Information may then be presented in a general overview.

The results of this research are therefore expected to enable the occupational therapist to better accommodate the patient's personality and perception of pain in the planning of patient specific treatment interventions. Focus may shift from a purely biomechanical approach to a more individualised approach. Furthermore research results may assist the multidisciplinary rehabilitation

team in understanding, anticipating and addressing pain and rehabilitation barriers more effectively.

Should the research results indicate that the presence of certain personality characteristics renders a person prone to an increased pain experience; this information can be communicated in advance to the treating specialist to ensure that the appropriate pain treatment regime is followed. In addition, should the research results indicate that the presence of certain personality characteristics render a person prone to rehabilitation complications and poor attainment of treatment outcomes, interventions can occur timeously. These interventions may include patient referral to the team psychologist prior to the surgical procedure to assist with the post-operative rehabilitation process. When hospital authorisation is requested from the medical aid, additional days could be included to prevent a scenario where treatment goals have not been reached and hospital days are exhausted. Where applicable, possible assistive devices could be applied for in advance to ensure their availability should the patient require additional assistance later.

As alluded to earlier, the afore-mentioned strategies can be implemented based on research results and will ensure more effective, economical rehabilitation and timely return to functional participation. The information obtained during this research will not only contribute to the existing body of knowledge but also be valuable for planning appropriate individualised intervention in future. Improved patient evaluation will ensure optimal and patient specific intervention.

1.8 OUTLINE OF CHAPTERS

Chapter 1 - Introduction and Orientation

Chapter 1 is intended to familiarise the reader with the outline of this research study. It provides a brief background to the problem statement, aim of the study, description of the methodology and an overview of the ethical implications.

Chapter 2 - Literature Perspectives

This chapter will provide a thorough account of the literature pertaining to spinal fusions, occupational therapy intervention in spinal fusion rehabilitation, pain perception, personality characteristics and individualised self-care outcomes. The contributions, discrepancies and shortfalls of the literature will also be covered in this chapter.

Chapter 3 - Research Approach and Methodology

The research approach utilised in this study is a quantitative approach with a descriptive and cross-sectional design. In this chapter the research methodology will be discussed in terms of: the research design, target population, measurement instruments, pilot study, data collection procedure, data analyses, reliability and measurement errors. Ethical considerations will be reviewed in detail in this chapter.

Chapter 4 - Research results

This chapter will present the results obtained from the study. Results will be presented in the form of tables.

Chapter 5 - Discussion of the results

The results depicted in the previous chapter will be discussed and interpreted in Chapter 5. The associations between the relevant research results will be noted. Since the aim of the study is to describe pain perception, personality

characteristics and the attainment of individualised self-care outcomes, the participants` results will not be used to draw comparisons.

Chapter 6 - Conclusion and Recommendations

Based on the results obtained, a critical evaluation of the study and implication of the findings will be discussed in this chapter. The researcher will make final recommendations and suggestions for future research.

1.9 SUMMARY

The first chapter serves as a brief introduction to the study to familiarise the reader with the context and outline of the dissertation. It is evident that there is a gap in the literature concerning the association between personality characteristics, pain perception and the attainment of individualised self-care outcomes in patients after a spinal fusion. This information will contribute to the existing body of knowledge and will benefit the planning of appropriate patient-focused intervention in future.

The next chapter provides an in-depth review of the literature pertaining to spinal fusions, occupational therapy intervention in the rehabilitation of spinal fusion patients, pain perception, personality characteristics and individualised self-care outcomes.

CHAPTER 2 – LITERATURE REVIEW

2.1 INTRODUCTION

In the previous chapter the reader was introduced to the scope of the study. An orientation was provided to the background, problem statement, aims, methodology, ethical considerations and value of the study.

This chapter provides an account of theory and evidence that relate to the scope of the study, and position the research within other related research. The main emphases for the literature review include the following:

- spinal fusions,
- occupational therapy intervention
- individualised occupational therapy outcomes,
- perception of pain, and
- personality characteristics

The contributions, discrepancies and shortfalls in the study literature will also be covered in this chapter.

2.2 SPINAL FUSION

Literature indicates that the first spinal fusion was performed by Albee more than a century ago in 1911. A posterolateral fusion was performed on a patient suffering from tuberculosis. Albee (1911) utilised bone from the tibia during this procedure. There is no mention of the rehabilitation process that might have followed the spinal fusion. It is also not clear when occupational therapists first became involved in the treatment of patients who has undergone a spinal fusion. However what we do know is that an estimated 30 000 South Africans suffer from back and neck pain daily, and that an estimated 5% to 20% of these cases require surgical intervention (van

Vuuren, van Heerden, Zinzen, & Becker, 2006). Research indicates that after surgery, patients struggle to regain optimal independence in their performance of activities of daily living (ADL`s) and these calls for treatment by an occupational therapist. One needs to address key concepts that relate to the procedure that is termed a 'spinal fusion' in order to understand the rehabilitation challenges faced by the occupational therapist (Trombly, Radomski, Trexel & Burnet-Smith, 2002; Skolasky et al., 2015).

A spinal fusion involves the insertion of instrumentation into two or more spinal vertebrae, in order to allow joint stabilisation and thereby compensate for varied spinal pathology (Reed Group, 2012).

For the purpose of this study, the following section will briefly describe the basic structure of the spine, procedural techniques and instrumentation used during a spinal fusion surgery, the after-effects of the surgery, as well as which precautionary measures are called for after surgery.

2.2.1 Basic structure of the spine

In order for the reader to understand the procedural techniques utilised and the subsequent effect these techniques have on the experience of pain and functionality, basic anatomical aspects will now be reviewed.

The spinal column consists of 26 vertebrae extending from the base of the skull to the coccyx. These vertebrae are grouped together and referred to as the cervical, thoracic, lumbar and sacral regions of the spine. The S-curve naturally formed by the convex curve at the cervical spine and concave curve at the lumbar spine contributes to the strength of the spinal column (Middelton, 2006; Drake, Vogl, & Mitchell, 2009). As the participants in this study underwent either a cervical or a lumbar fusion, focus is placed on these regions of the spine.

The cervical spine allows more movement than the lumbar spine and can produce complex movement patterns, which are not confined to one plane. A coupling motion is possible in the cervical region and this is evident when observing the movement of the first cervical vertebrae, also referred to as the atlas. The atlas extends whilst the cervical spine is flexing and flexes whilst the cervical spine extends (Swartz & Cendoma, 2005; Ivancic, Dvorak, Goel, Fairchild, White, & Di Angelo, 2012).

Most of the body`s movement and weight bearing occurs in the area of the lumbar spine as it is connected to the pelvis. Investigation of biomechanical changes indicated that lumbar extension accompanied by an anterior pelvic tilt occurs during the loading process. This indicates that the lumbar spinal segments move in response to the motion of the lower limbs (Crosbie, 1997). In contrast, Rowe and White noted that minimal rather than maximal flexion of the lumbar spine occurred at initial contact and that flexion increased early in the single-support phase of the gait cycle (Rowe, 1996). Due to the size of its vertebrae and its connection with the pelvis, the lumbar region of the spine is mainly used when manipulating increased mechanical loads (Jaumard, Welch, & Winkelstein, 2011). When a person approaches maximal lumbar flexion the forces that the discs and ligaments must contend with reach approximately 40% of their elastic limit. However, the end range of lumbar flexion recruitment of the interspinous ligament complex imposes considerable anterior shear force on the lumbar spine, which has the potential to damage the spine at much lower forces than the spine can withstand in compression (Mawston & Boocock, 2007).

In between the vertebrae of the cervical, thoracic and lumbar regions lie intervertebral discs which reduce the friction between the bones by acting as cushions (Middelton, 2006; Vogl, Mitchell, & Drake, 2009). The discs provide room between the vertebrae to allow the upper vertebrae to tilt forward without the lower edge of the vertebrae making contact with the adjacent vertebrae. This creates increased mobility and allows the vertebrae to

mobilise in different planes of movement (Bogduk, 2005). In a spinal fusion, instrumentation aids in maintaining the disc space between the vertebrae. This instrumentation however, is not as mobile as an intervertebral disc and therefore range of motion is restricted (Christensen, 2004). Spivak (2006) indicated that motion at the fused site is severely limited. Should patients however, have had very poor range of motion prior to the fusion, there might be clinically observed improved motion post fusion. This movement though would be as a result of the increased mobility of the surrounding discs. Initial research in 1995 found that the total flexibility of the lumbar spine was decreased after a single-level fusion and further decreased after a double-level fusion (Luk, Chow, Evans, & Leong, 1996). More recent literature however, has found that mobility of the spine five years post fusion is similar to mobility prior to the surgery (Axelsson, Johnsson, & Strömqvist, 2007).

The intervertebral discs together with, spinal ligaments and facet joints connect adjacent vertebrae of the spine. The articulation of these structures provides mechanical stability during movement of the spine and ensures that the spinal cord is protected at all times. The facet joints and intervertebral discs transfer loads and guide ranges of motion to ensure healthy functioning of the spine. In cases such as: failed back surgery syndrome (revision surgery), degenerative instability, considerable essential deformity, symptomatic spondylolysis, refractory degenerative disc disease, and adjacent segment disease, these structures are unable to manage physiological loads. This leads to pain during movement and often necessitates a spinal fusion (Omidi-Kashani, Hasankhani, & Ashjazadeh, 2014).

2.2.2 Procedural techniques and instrumentation

Since the 1950`s spinal fusion techniques and instrumentation have evolved from merely posterior approaches to include anterior approaches. Reasons for this evolution are: an increased knowledge in pathophysiology and biomechanics of the spine, continuous innovations in bone grafting

techniques, and instrumentation, as well as rapid advances in imaging (Pakzaban & Kopell, 2016).

A variety of techniques are used today including *posterolateral gutter fusion*, *posterior lumbar interbody fusion*, *transforaminal lumbar interbody fusion* and *anterior fusion*. The three primary types of instrumentation utilised in modern day intervention practices include pedicle screws, anterior interbody cages, and posterior lumbar cages (Mohamed, 2012; Pakzaban & Kopell, 2016). The instrumentation that is inserted during a spinal fusion varies according to the level of fusion and pathology. The level of the fusion refers to the number of vertebrae involved in the fusion and the region of the spine in which they are found. Fusion of only one motion segment of the spine, for instance C5 and C6, is referred to as a single level fusion. A multilevel spinal fusion involves the fusion of more than one motion segment of the spine, for instance L3, L4 and L5 (Smorgick, Park, Baker, Lurie, Tosteson, Zhao, Herkowitz, Fischgrund & Weinstein, 2013). In addition to instrumentation to allow further structural support/stability, a bone graft is performed and placed in the segment of the spine. This requires growth in order to result in a bone fusion (Ullrich, 2009).

Although modern day practice makes use of sophisticated technological advances, the focus of a spinal fusion remains to prevent further neurological deficits and to restore spinal stability (Rajaee, Bae, Kanim & Delamarter, 2012).

2.2.3 Outcomes of surgery

The improvement of anterior approaches to spinal fusion, and the development of microsurgical and minimally invasive methods has occurred in the recent decades. These advances in technology have made it possible to stabilise every segment of the spine successfully and has led to an increased use of spinal fusion and instrumentation (Costanzo, Zoccali, Maykowski, Walter, Skoch, & Baaj, 2014).

Instrumentation insertion generally decreases pain but as it is aimed at stabilisation of the spine it also restricts joint mobility (Sciubba et al., 2015).

In cervical fusion cases mobility restrictions were noted in terms of neck extension and neck rotation and decreased range of motion remained after one-year post surgery (Kazunari, Toru, Atsushi, Takuya, Kanichiro, & Taito, 2008). In lumbar fusion cases mobility restrictions were noted in terms of forward flexion and lateral flexion (Sherman, 2006).

Early research found that for several back pathology there was no advantages for fusion over surgery without fusion (Turner, Ersek, Herron, Haselkorn, Kent, & Coil, 1992). In 1998 however, Kuslich et al. indicated that after an interbody fusion, successful fusion occurred in 91% of patients at 24 months after surgery, and pain was eliminated or reduced in 84% of cases. Function was improved in 91% of patients (Kuslich, Ulstrom, Griffith, Ahern, & Dowdle, 1999). Christensen (2004) found similar results in his study and indicated that 70% of patients experienced improved functionality post spinal fusion surgery. However, there was limited change in terms of quality of life in patients who had undergone spinal fusions.

In 2010 Carragee and Cheng conducted research to determine what patients would accept as the minimal acceptable outcomes after a spinal fusion. This study concluded that patients with spondylolisthesis and degenerative disc disease expect relatively high minimum acceptable outcomes from a spinal fusion. These participants indicated that the minimum acceptable outcomes should include a decrease in pain intensity to 3/10 or less, an improvement in Oswestry Disability Index (ODI) of 20 or more, a discontinuation of opioid medications, and a return to some occupational activity. Participants also suggested that they would not undergo a spinal fusion if they could not expect to achieve these minimal outcomes. Furthermore, this study found that patients with increased psychological factors such as distress were more

likely to indicate poor satisfaction with the outcome of their surgery (Carragee & Cheng, 2010).

2.2.4 Pre-cautionary measures

The aim of spinal fusion remains joint stabilisation. Certain biomechanical- and activity limitations should be adhered to ensure optimal healing of the fused site (Sherman, 2006; Reed Group, 2012).

A recent report by the Cochrane Back Review Group (CBRG), concluded that active rehabilitation is more effective than usual care with respect to functional recovery following a laminectomy for lumbar stenosis (McGregor, Probyn, Cro, Dore, Burton, Balague, et al., 2013). The latter suggests that active rehabilitation can facilitate recovery from some forms of spinal surgery.

Few published studies have looked at rehabilitation following spinal fusion. Christensen, Laurberg & Bunger (2003) showed rehabilitation involving directed exercise and a 'back café' (peer support group) improved pain and function to a greater degree than traditional care. Abbot, Tyni-Lenne, & Hedlund (2010) reported similar results and their study found that psychomotor therapy (home exercises and outpatient appointments targeting maladaptive pain cognition, behaviour and motor control exercises) significantly reduced disability and pain compared to a purely physical rehabilitation regime.

Although the above-mentioned studies recognise the need for a rehabilitation regime, limited research results are available regarding precautionary measures following a spinal fusion. What did emerge in the 1950s however, was Paul Harrington`s finding that breakage or loosening of the hardware often occurred after a spinal fusion and the need for immobilisation to allow

for optimal bone healing was introduced (Idowa, Adewole & Majekodunmi, 2012).

With the evolution of surgery and fusion techniques the need for the development of post-operative protocols with specific precautions was evident to various institutes. However these protocols remain internal protocols and although various institutes have utilised these protocols for a number of years, no formal research has been done, to broaden the research knowledge base. The protocols referred to in this literature review are the most recent that the author was able to obtain.

According to these institutes, the biomechanical- and activity limitations applicable after a lumbar spinal fusion are as follows:

According to the Marsh Brook Rehabilitation Services and Frisbie Memorial Hospital (2009) one should avoid any repetitive movements after a lumbar spinal fusion. The Royal National Orthopedic Hospital (2013) advocates no bending at the waist, rotation of the spine, squatting or stooping. Various institutes support avoidance of excessive loading and distraction.

The Issada-Thongtrangan lumbar fusion protocol (2013) further advises that one should refrain from pushing, pulling, or lifting objects with a weight greater than 2 kg for the first four weeks after surgery, where-after weight may slowly be increased. Braces should be worn during all positions except when lying down (Mayfield Clinic, 2013; Royal National Orthopedic Hospital, 2013). According to the University of Michigan lying, standing or walking is permitted, whilst sitting is only permitted for 20 minutes a day during the initial four weeks after surgery. Emory Healthcare supports the afore-mentioned and suggests that after four weeks one may slowly progress from 20 minutes to 40 minutes several times per day. Verkuilen (2006) however, disagrees with precautions regarding sitting posture and suggets that sitting does not result in damage to the fused site. She does however emphasise

that sitting should be done in the correct posture as an incorrect sitting posture may lead to discomfort. Climbing stairs, one at a time, is usually permitted, after two weeks, if it has been practised at least once under supervision (Mayfield Clinic, 2013; Rockford Orthopedic, 2014). The Vanderbilt University Medical Centre indicated no sexual intercourse for four to six weeks, depending on the level of the fusion. After four weeks, intercourse as the passive partner in the least exerting and most comfortable position, is allowed. The treatment protocol of the Mayfield Clinic (2013) states that depending on the specialist, driving is not permitted for the first four to six weeks post-surgery. Due to the excessive stresses placed on the lumbar spine, during entering and exiting a bathtub, it is recommended that only showers be taken for the first three months following surgery (Mayfield Clinic, 2013; Rockford Orthopedic, 2014; Royal National Orthopedic Hospital, 2015). Avoidance of household chores for four to six weeks is strongly supported and can slowly be increased in accordance with recovery. Gardening and exterior home maintenance tasks should be avoided for at least two to three months. After this period it can slowly be reintroduced if frequent breaks are taken (Issada-Thongtrangan lumbar fusion protocol, 2013; Royal National Orthopedic Hospital, 2015).

Given the anatomical and biomechanical differences between the cervical and lumbar spine, precautions differ after a cervical spinal fusion. The following precautions are applicable:

In the case of an anterior cervical fusion literature suggests that extension should be avoided whilst in the case of a posterior cervical fusion the movement to avoid is flexion. Active range of motion is patient dependent and will be based on specialists' preference and the level of fusion (Kazunari et al., 2008; Abott, Halvorsen & Dedering, 2012). All cervical spinal fusion patients should however avoid rotation of the spine and should not cross their legs when seated (Abott et al., 2013; The Vanderbilt University Medical Centre, 2015).

During the first four to six weeks whilst the initial post-operative pain settles and soft tissue begins to heal, literature suggests caution in the performance of activities of daily living. It is important to gradually increase activities and also pace activities throughout the day dependent on pain. South Bay Hospital`s treatment protocol (2013) indicates that one should refrain from pushing, pulling, or lifting weights greater than two kg for the first two weeks after which time this may slowly be increased. Furthermore, it is indicated that one should not lift above shoulder level or perform overhead activities. If a collar is prescribed, it should be worn in accordance with specialist`s directions. Sexual activities may be resumed after two weeks, however literature advocates that the patient should choose the least exerting and most comfortable positions (Issada-Thongtrangan cervical fusion protocol, 2013). Driving is contra-indicated whilst still wearing a hard collar and can commence after four weeks upon specialist`s discretion. In cases where a hip graft is done, the patient should not bath and only shower for at least four weeks. Household chores should be avoided for three to six weeks and gardening for six to eight weeks (South Bay Hospital`s treatment protocol, 2013).

2.2.5 Occupational therapy intervention in rehabilitation

In a systematic review done in 2008, it was found that there is uncertainty regarding the content of a post-spinal fusion rehabilitation programme (Ostelo, de Vet, Waddell, Kerckhoffs, Leffers & van Tulder, 2008). Furthermore, reviews indicate that no studies have been conducted to determine whether active rehabilitation should commence immediately post-fusion or only after four to six weeks. In a revised review in 2009 however, (Ostelo, Costa, Maher, de Vet & van Tulder) found that exercise programmes starting four to six weeks post-surgery seem to lead to a faster decrease in pain and disability than no treatment. McGregor et al. (2013) supported this finding and indicated that active rehabilitation is more effective than usual care in improving both short- and long-term functional status. However earlier

research conducted by Oestergaard et al. in 1976 contradicted these findings and indicated that initiating rehabilitation at 6 weeks as opposed to 12 weeks after surgery is on average more costly and less effective. In 2016, (Rolving, Sogaard, Nielsen, Christensen, Bunger & Oestergaard) proposed the use of pre-operative cognitive behavioural therapy to enhance post-surgical rehabilitation and functional outcome. Rolving et al. also support a multidisciplinary approach to the management of pain and treatment of spinal fusion patients. There is however limited other research conducted pertaining to what role an occupational therapist should play in the rehabilitation of patients who undergo a spinal fusion. However a study conducted by Oestergaard utilised an occupational therapy evaluation instrument to determine what problem areas should be addressed post fusion. The use of the COPM during hospitalisation was found to help in identifying more ADL problems encountered by patients during the first 3 months post-discharge period as COPM served to identify more treatment goals and plans of action (Oestergaard, Maribo, Bunge &, Christensen, 2012).

Although there is limited research available and the intervention of occupational therapy is not specified, it is clear that activity participation is affected after spinal fusions due to restricted mobility (Reed Group, 2012). Given the fact that activity participation falls within the domain of occupational therapy one can conclude that the role of occupational therapy post spinal fusion is to address functionality (The American Occupational Therapy Association, 2002).

As highlighted previously in this chapter, there are numerous precautionary measures that should be taken to ensure stability of the fused site. These precautionary measures often restrict participation in vocational- and leisure activities during the initial post-operative phase. Patients may participate in all self-care activities immediately, although the manner in which they perform these activities requires adaptation in order to ensure that they adhere to precautionary measures. Self-care activities namely: bathing, dressing lower

limbs and cleaning body after toileting have proved to be significantly affected after a spinal fusion (Sciubba et al., 2015). Independent participation in self-care activities is hence the primary focus during the initial post-operative rehabilitation phase (Bear-Lebman & Maher, 2008).

Research has indicated the need for occupational therapists to investigate several approaches when addressing patients` needs. Addressing the patients` psychosocial needs in addition to his or her physical impairments is key to successful rehabilitation (Snodgrass, 2011). Furthermore, research emphasises that a biopsychosocial, client-centered approach that includes actively involving the patient in the rehabilitation process should be undertaken at the commencement of therapy. The latter has led to individualised therapy outcomes and will be discussed in more detail in the section below (Cup et al., 2003).

2.3 INDIVIDUALISED OCCUPATIONAL THERAPY OUTCOME

The occupational therapists` focus during the acute post-operative phase after a spinal fusion is on returning the patient to independent participation in self-care activities (Sciubba et al., 2015). Research evidence proves that motivation, participation and functional recovery are enhanced when patients' choice and self-evaluation are incorporated in the assessment and treatment process (Cup et al., 2003). Therefore, a client-centered approach is supported during rehabilitation post spinal fusion whereby individualised outcomes are identified and used to direct rehabilitation.

Historically however, within the field of orthopedic rehabilitation a strong focus was placed on a patient`s physical capacity and on a biomechanical approach (Brotzman & Manske, 2011). In 1985 Kielhofner developed the model of human occupation, which marked the commencement of a focus shift towards a client-centered approach (Christiansen, Baum, & Bass, 2014). This approach was found to be effective in the treatment of patients suffering

from orthopedic conditions and numerous positive outcomes were associated with the implementation of the approach, such as (a) increased client satisfaction, (b) increased patient adherence to and compliance with treatment programmes, (c) decreased length of stay in hospital, and (d) improved functional outcomes (Ben-Sira, 1998; Maitra & Erway, 2006).

Maitra & Erway (2006) indicate that there is a misperception amongst patients and occupational therapists regarding the application of the approach as set out by Kielhofner. The development of the Canadian Occupational Performance Measure was based on the need to direct implementation and measure the efficacy of this approach (Warren, 2002). The capability of the COPM to detect changes in perceived occupational performance issues is supported. However, the reproducibility of the performance and satisfaction scores was found to be poor for the individually identified problems (Eyssen, Steultjens, Oud, Bolt, Maasdam & Dekker, 2011). The test-retest reliability of performance and satisfaction ratings of the COPM has been found to be high. Although the validity of the COPM varies it has proved to be valid as a measure of occupational performance (Cup et al., 2003). Doig et al. (2010) found that combining the use of the COPM with that of the Goal Attainment Scale (GAS) led to subjective and objective demonstration of goal achievement, thereby supporting the clinical utility and treatment validity of the combined use of these tools (Doig, Fleming, Kuipers & Cornwell, 2010).

2.3.1 Occupational Therapy Practice Framework

Occupational therapy is an evolving profession and core concepts and constructs have developed over the years as the study of human occupation continues. According to the Occupational Therapy Practice Framework (OTPF) the objective of occupational therapy intervention is to support participation in context by means of engagement in occupation. Both the subjective (emotional or psychological i.e. personality) aspects of performance and the objective (physically observable) aspects of performance define engagement.

As occupational therapists have always treated patients from a holistic point of view, this dual perspective is clearly incorporated in treatment as to address all the aspects of performance (physical, cognitive, psychosocial, and contextual) when providing interventions designed to support engagement in occupations and in activities of daily life (The American Occupational Therapy Association, 2014).

The OTPF is based on the fundamental belief that both the therapist and patient contribute unique resources to the Framework process. The therapist would contribute specific knowledge about pathology; disability and the effect engagement in occupation would have on performance. Furthermore, the therapist would be able to use these theoretical concepts and clinical reasoning to evaluate and modify engagement in occupation and enhance performance. Patients on the other hand, contribute valuable knowledge pertaining to their personal beliefs, goals and life experiences, which aids in directing therapy and prioritising intervention (The American Occupational Therapy Association, 2014).

The OTPF has been developed in order to describe the concepts and domain of occupation as well as to outline the process of evaluation and treatment within occupational therapy. The OTPF has defined occupational performance as "the ability to carry out activities of daily life, including activities in the areas of occupation: activities of daily living (ADL) [also called basic activities of daily living (BADL) and personal activities of daily living (PADL)], instrumental activities of daily living (IADL), education, work, play, leisure, and social participation" (The American Occupational Therapy Association, 2014, p. 612).

For the purpose of this study, the focus is placed on BADL as these activities are addressed in the acute treatment of patients who undergo a spinal fusion.

According to The American Occupational Therapy Association (2014) BADL

consists of the following:

- Bathing, showering—Obtaining and using supplies; soaping, rinsing, and drying body parts; maintaining bathing position; and transferring to and from bathing positions.
- Bowel and bladder management— Includes complete intentional control of bowel movements and urinary bladder and, if necessary, use of equipment or agents for bladder management.
- Dressing—Selecting clothing and accessories appropriate to time of day, weather, and occasion; obtaining clothing from storage area; dressing and undressing in a sequential fashion; fastening and adjusting clothing and shoes; and applying and removing personal devices, prostheses, or orthoses.
- Eating—The ability to keep and manipulate food/fluid in the mouth and swallow it.
- Feeding—The process of setting up, arranging, and bringing food or fluids from the plate or cup to the mouth.
- Functional mobility— Moving from one position or place to another (during performance of everyday activities), such as in-bed mobility, wheelchair, mobility, transfers (wheelchair, bed, car, tub, toilet, shower, chair, floor). Performing functional ambulation and transporting objects.
- Personal device care— Using, cleaning, and maintaining personal care items, such as hearing aids, contact lenses, glasses, orthotics, prosthetics, adaptive equipment.
- Personal hygiene and grooming—Obtaining and using supplies; removing body hair (use of razors, tweezers, lotions, etc.); applying and removing cosmetics; washing, drying, combing, styling, brushing, and trimming hair; caring for nails (hands and feet); caring for skin, ears, eyes, and nose; applying deodorant; cleaning mouth; brushing and flossing teeth; or removing, cleaning, and reinserting dental orthotics and prosthetics.
- Sexual activity—Engagement in activities that result in sexual

satisfaction.

- Sleep/rest—A period of inactivity in which one may or may not suspend consciousness.
- Toilet hygiene—Obtaining and using supplies; clothing management; maintaining toileting position; transferring to and from toileting position; cleaning body; and caring for menstrual and continence needs (including catheters, colostomies, and suppository management).

2.3.2 Overview of frames of reference and models

There are many models and frames of references within occupational therapy that can be utilised in the treatment of patients who undergo a spinal fusion. These models and frames of reference aid in setting appropriate treatment goals to guide the rehabilitation process (Tufano & Cole, 2008; Brown, 2011; Brotzman & Manske, 2011).

Most occupational therapists within the field of orthopedic rehabilitation utilise a biomechanical frame of reference (Lee et al., 2008). A biomechanical frame of reference applies the concept of physics to human movement and posture, specifically forces of gravity. Remediation of muscle strength, endurance and range of motion are the focus areas within a biomechanical frame of reference (Jackson & Schkade, 2001). According to Dirette (2005), a biomechanical frame of reference is based on the following principles:

- Deficits in muscle strength, endurance and range of motion can be remediated by occupation.
- Improvement in muscle strength, endurance and range of motion will enhance functionality.
- The human body requires rest prior to activation.
- Rest followed by stress increases structural stability
- Basic cognition is required to produce coordinated movements.
- Graded increase in duration and intensity of movements improves

strength/ endurance/ range of motion.

This approach focuses on physical occupational performance capacity and it is hypothesised that improvement within this domain leads to increased independence in self-care activities (Jackson & Schkade, 2001).

In occupational therapy however, the principles of range of motion, strength, endurance, ergonomics, and the effects or avoidance of pain, must be considered within the context of occupation (Tufano & Cole, 2008). Furthermore, the frame of reference utilised in treatment should consider both the physical and mental features of occupational performance to ensure a successful rehabilitative approach. "Occupational performance refers to the ability to choose, organise and satisfactorily perform meaningful daily activities that are deemed culturally- and age appropriate for looking after one's self (self-care), enjoying life (leisure), and contributing to the social and economic fabric of a community (productivity)" (Canadian Association of Occupational Therapists, 1997, p. 34).

The need for a renewed focus on occupation within the profession of occupational therapy has coincided with the development of occupation-focused conceptual practice models. These occupation-focused models form the theoretical basis for clinical application as they describe the process and practice of the profession (Duncan, 2011). The use of occupational models and assessments in practice will ensure occupation-based practices. The model used will determine the focus of the therapy and the choice of intervention (Berry & Ryan, 2002; Lee et al., 2008).

The Canadian Model of Occupational Performance, first developed in 1980 and introduced to occupational therapists in 1982, focuses on the interaction and relationship between the person, their environment and the occupations they perform (Kavanagh, 2006). The model views these three aspects as dynamic and a person's ability to engage independently is dependent on the interplay between these aspects.

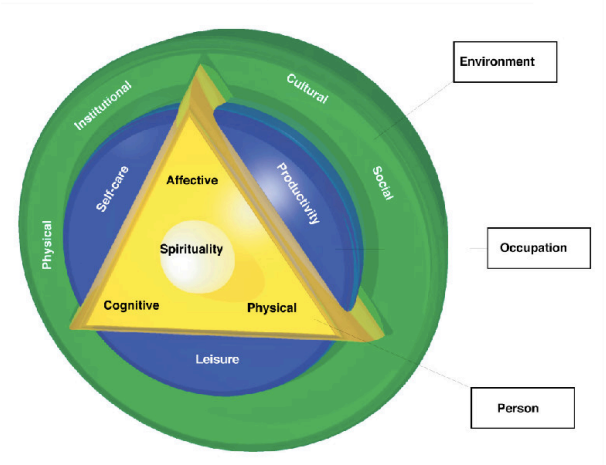

Figure 2-1 Canadian Model of Occupational Performance (Kavanagh, 2006)

Spirituality is placed at the core of the model as it describes the characteristics of the person, which makes them unique. It refers to a person's value, personality characteristics, belief system and personal goals (Kavanagh, 2006).

When focusing on the person, the model proposes three additional components that should be considered besides spirituality namely: affective, cognitive, and physical components. These components are the different aspects of function that a person requires in order to engage in various occupations. The 'affective', or 'feelings' domain, refers to intrapersonal and interpersonal functions. The 'cognitive' or 'thinking' domain includes cognitive functions such as memory, comprehension, abstract reasoning and intellectual capacity. Lastly, the 'physical' component is also referred to as the 'doing domain' and includes motor, sensory and sensory motor functions (Kavanagh, 2006).

The concept of occupation refers to productivity, self-care and leisure performance areas. Self-care is divided into three broader categories to ensure a comprehensive overview. These categories include personal care, functional mobility and community management. Quiet recreation entails

hobbies, crafts and reading, active recreation includes sports, outings and travel and socialisation includes leisure activities such as parties, phone calls and visiting. Lastly, the performance area referred to as 'productivity' is divided into work, household management and play/school (Kavanagh, 2006).

The environment encompasses both the performance areas (occupation) and the performance components (person) in the model. The environment is the context in which all occupations occur and refers to the physical-, natural-, institutional-, cultural- and social environment (Kavanagh, 2006).

2.3.3 Setting of individualised goals

Setting of individualised treatment outcomes is based on the collaborative assessment of occupational needs of a specific patient in their own environment (Heinicke, Sumsion, & Tischler-Draper, 2011). Cultural and habitual factors influence one's perception of importance pertaining to self-care activities and therefore an individualised approach is required to render appropriate treatment (Baptiste, 2008). This approach allows the patient to determine the importance of their self-care activities as well as gauge their present performance and satisfaction levels in this regard (Baptiste, 2008). The afore-mentioned information is used to set individualised self-care outcomes, thereby enhancing the probability of their attainment.

2.3.4 Measuring attainment of individualised goals

The Canadian Occupational Performance Measure (COPM) is an example of a client-centered measure, which can be used in the setting and measurement of individualised goals. Measurement is done according to a semi-structured interview that is formulated to identify performance problems, concerns and aspects important to the patient (Cup et al., 2003). The interview ascertains which tasks within the domain of self-care; productivity and leisure are important to the patient. Each activity area has two self-reporting domains

namely: performance and satisfaction. This measure detects change in patients' perception of their occupational performance over time. The COPM measures which activities the patient finds difficult and unproductive and which activities they feel are important. The COPM rates each challenging activity according to its importance to the patient. This helps to prioritise problems and the five problem areas indicated as the most important are rated according to performance and satisfaction. The rating allows one to ascertain which goals have been addressed sufficiently and allows for the measuring of set goals (Cup et al., 2003).

Horn et al. (2012) propose the use of The Patient-Specific Functional Scale (PSFS) as a self-reported, patient-specific measure, designed to assess functional change after rehabilitation. The PSFS asks patients to identify up to five important activities they are unable to perform or which they find difficult. Patients are also asked to rate, on an 11-point scale, the current level of difficulty associated with each activity. Upon completion of the intervention, patients again rate these activities and can add activities they would want to address in therapy. Although the PSFS has become more commonly used in clinical research reports and is viewed as user-friendly, the evidence supporting its clinometric and psychometric properties remains incomplete. An alternative valid instrument has been sought for use in the current study (Horn, Jennings, Richardson, van Vliet, Hefford, & Abbott, 2012).

The goal attainment scale (GAS) has been identified as the alternative instrument, to measure goal attainment. The GAS is an evaluation scale, which quantifies the progress achieved in terms of goal attainment (Krasny-Pacini et al., 2013). Generally a five-point scale, which ranges from '-2' until '+2' is used. The scale is individualised according to the patient`s functioning and realistic goals. '-2' will indicate the patient`s pretreatment level. '-1' will represent progression towards that goal. '0' will indicate attainment of the treatment goal and '+1' and '+2' will signal that the goal has been attained

and even exceeded. Different ranges of the GAS are described according to measurable, observable target behaviour. The interval difference between ranges must be the same. It should be equally difficult to go from a '-2' to a '-1' as it is to go from '-1' to '0' (Krasny-Pacini et al., 2013). The GAS is compiled according to a patient`s expectations, environmental factors and prognosis and is therefore individualised (Ertzgaard, Ward, Wissel, & Borg, 2011).

A combined approach has proved to be valuable and is therefore utilised in the present study. Doig et al. (2010) found that the use of these tools in combination resulted in goals that were consistently perceived to be client-centered. The combined approach enhanced subjective and objective demonstration of goal achievement, thereby supporting the clinical utility and treatment validity of the combined use of the GAS and COPM. The COPM allows the patient to direct rehabilitation and set specific goals, whilst the GAS allows the therapist to rate and measure goal attainment (Cup et al., 2003).

Setting of individualised self-care outcomes addresses cultural and habitual factors. However, attainment of individualised self-care outcomes is still influenced by personal factors such as experience of pain. Pain often leads to immobilisation and subsequently prolongs maladaptive activity participation (Barata & Gagulic, 2014).

2.4 PAIN

Willems (2013) found that pain is the most feared complication after a spinal fusion and is therefore considered to be one of the most important aspects that require rehabilitation focus post-surgery. The International Association of the Study of Pain (2012) defines pain as 'a subjective unpleasant sensory and emotional experience associated with actual or potential tissue damage.' This definition clearly underlines both the physiological aspect of pain as well as

the psychological aspect. Based on the afore-mentioned, the management of post-operative pain has developed over the years and focus has shifted from a purely physiological approach to a multidisciplinary approach addressing the sensory and emotional aspect surrounding pain (Greenwood, McGregor, Jones, & Hurley, 2015).

In order to understand the multidisciplinary approach towards addressing pain, the concepts of physiology, classification, measurement, rehabilitation, management, complications and factors influencing pain need to be understood.

2.4.1 Classification of pain

According to Cole (2002), pain can be classified according to the location, duration, frequency, underlying cause, and intensity of the pain. The World Health Organization (WHO) in 2012 supported the afore-mentioned classification with the exclusion of 'intensity of pain'.

When considering the location of pain, two classification systems exist. The one system classifies pain according to the anatomy of the site and will utilize a regional perspective, for example pelvic pain or lower back pain. The body system pain classification however, classifies pain according to the body system that is affected, for example musculoskeletal pain (Cole, 2002; The World Health Organization, 2012).

Secondly, pain can be classified according to the duration of pain. It is vital to distinguish between acute and chronic pain in order to ensure effective pain management. Pain that lasts less than 30 days would be considered acute pain, whilst pain that persists for more than six months would be considered chronic pain. Pain that occurs between 30 days and six months would be classified as sub-acute pain. If isolated episodes of pain occur over a period of time exceeding 30 days it is referred to as recurrent acute pain. Post-

operative pain is experienced after surgery due to increased inflammation since tissue trauma has occurred. This is a specific type of acute pain that will be present irrespective of the success of surgery (Cole, 2002; The World Health Organization, 2012).

The intensity of pain is a third way to classify pain. It is a subjective system of classification as a patient`s response to pain intensity of pain can be influenced by various factors. Patients with similar diagnoses or who have undergone similar surgeries may display great discrepancies in their interpretations of pain intensity. Due to the subjectivity of the experienced intensity of pain, it may be more reliable to determine the impact pain has on activity participation. The interruption in participation in activities of daily living would be more indicative of the intensity of the pain experienced. Over time, most patients manage to adapt to their pain; they may exhibit either very little or markedly exaggerated pain behaviour (Cole, 2002; The World Health Organization, 2012).

Lastly, pain is classified according to the etiology of pain. This refers to the underlying cause of the pain. Treatment of the etiology would ideally resolve experienced pain. However, if the pain was not resolved at least etiologic clarification would guide the clinician in causative or symptomatic treatment (Cole, 2002).

2.4.2 Physiology of pain

Pain is a complex sensory modality, which activates behavioural patterns in order to prevent or limit tissue damage and ensure survival (Patel, 2010; International Association of the Study of Pain, 2010).

The sensory process that is triggered is referred to as nociception. Nociception can lead to pain, which is then the perceived level of discomfort and hurt. These two concepts are separate from one another and a person

can experience pain without any evidence of nociception activity. On the other hand a person with tissue damage may not display any behavioural indication of experiencing pain (Patel, 2010).

Pain receptors are present everywhere in the body, especially the skin, surfaces of the joints, periosteum (the specialised lining around the bones), walls of the arteries, and certain structures in the skull. Other organs, such as the intestines and muscles, have fewer pain receptors. Nociceptors are the free, unmyelinated nerve endings that convert a variety of stimuli into nerve impulses, which produce the sensation of pain (Patel, 2010; International Association of the Study of Pain, 2010).

The nociceptor is classified according to the nerve fibre at the terminal end. C-fibres and Aδ-fibres are the two kinds of nerve fibres. C-fibres are small in diameter and responsible for slow nerve conduction as these fibres are unmyelinated. The pain impulse can only be transmitted slowly to the brain at a speed of less than 2 metres per second due to the small diameter of the C-fibres. The response of the body is to keep the affected body part immobile (guarding against spasm or rigidity), so that healing can take place. Should a person lift an increased load and exert force surpassing the muscle`s elastic limit, the C-fibres will register the stimuli. The person will not be aware of the pain immediately but only hours later will he/she experience the muscle spasm (Marchand, 2008).

The Aδ-fibres are larger in diameter and conduct nerve impulses faster. The activation of Aδ nerve fibres allows the body to withdraw immediately from the painful and harmful stimulus in order to avoid further damage. Touching a hot object is a good example. Fast pain is well localized, which means that a person can normally describe very accurately exactly where the pain is (Marchand, 2008).

The two categories of pain can be attributed to the differences in speed of conduction between the C-fibre nociceptors and Aδ-fibre nociceptors. The first category of pain is the initial sharp sensation of pain also referred to as

epicritic pain. A slow, dull, long-lasting pain referred to as protopathic pain is the second category of pain (Patel, 2010; International Association of the Study of Pain, 2010).

In the pain-processing parts of the brain a system of natural opioids can be found. When a pain impulse reaches the brain, these opioids are released from their storage areas and bind with receptors in the pain pathway to block the transmission and perception of pain (Marchand, 2008). Should a chemical imbalance exist within the brain as in the case of psychiatric disorders, the afore-mentioned process would be adversely influenced and cause chronic pain.

2.4.3 Measurement of pain

Although pain remains a subjective phenomenon a number of evaluation tools have been developed in an attempt to quantify experienced pain (Hawker, Mian, Kendzerska, & French, 2011). For the purpose of this study, three of these measurement tools have been utilised and will be discussed in more detail. These three tools have proved to be reliable, user-friendly and pathology specific and are therefore deemed the most appropriate tools for this study (Hawker et al., 2011).

The first assessment tool referred to in this study is the Numerical Rating Scale (NRS), which is a unidimensional measure of pain intensity in adults. The NRS is a scale where the patient rates their own pain on a scale from zero - indicating no pain; five - indicating moderate pain and ten - indicating the worst pain ever. The patient assigns a number to their perceived pain level on the scale from zero to ten. The NRS can be administered verbally or graphically for self-completion. Chronic pain patients prefer the NRS to other measures of pain intensity, including the pain Visual Analogue Scale (VAS), due to its comprehensibility and ease of completion (Hawker et al., 2011). "The NRS has been found to be a valid and reliable scale to measure pain intensity" (Hawker et al., 2011, p. 242). High test–retest reliability has been

observed when using the NRS before and after medical intervention and a retest at the six-week post-operative session provides reliable data (Hawker et al., 2011).

The NRS focuses on the quantification of pain intensity. It is evident that pain intensity is not the only classification of pain and the extent to which pain prevents functionality should also be considered. The Oswestry Disability Index (ODI) is a self-report questionnaire specifically designed to determine to what extent back pain influences activity participation. The ODI is deemed to be the 'gold standard' for low back functional outcome tools (Fairbank, 2012). It was specifically developed for use in condition-specific disability namely low back pain but has been found to be useful in all spine related conditions (Fairbank & Pynsent, 2000). Different authors have confirmed the internal consistency to be of an acceptable level (Fairbank & Pynsent, 2000; Vianin, 2008). Test-retest reliability has been shown to be high. The ODI can be re-administered in six weeks and has proved to be reliable in re-administration within this period. The Neck Disability Index (NDI) is a modification of the ODI, which was developed to determine to what extent neck pain influences activity participation. It was formulated based on the ODI and was proved to be valid through peer-review and patient feedback sessions. Results obtained via the NDI were compared with those obtained via the VAS and McGill Pain Questionnaires and correlation proved to be high. The NDI has stable psychometric characteristics, evidenced by high internal consistency (Vernon & Mior, 1992). Both the ODI and NDI consists of ten sections focusing on different activity areas and the patient is required to indicate under each section, the statement that is most applicable to them. For each section the highest possible score is five, if the first statement is marked, the score is zero, if the last statement is marked, it is five. If the patient completes all sections, the score they obtain will be divided by 50. If the patient does not complete all ten sections then five is subtracted from 50 every time a section is omitted. A total percentage is calculated and indicates the percentage of functional impairment. A percentage of disability is

obtained and interpreted as follows: Scores from 0% to 20% indicate minimal disability; 20% to 40% - moderate disability; 40% to 60% - severe disability; 60% to 80% - crippled; and 80% to 100% - bedbound or exaggerated (Lewis & Maughan, 2010).

2.4.4 Pain and rehabilitation

The effective management of pain is considered to be an important clinical outcome in postsurgical rehabilitation. The development of pain is one the most feared complications of patients who undergo orthopedic surgery and is considered to be a predictor of inadequate rehabilitation and patient dissatisfaction. The reduction of pain via pharmacotherapy or multidisciplinary approaches has indicated an improvement in satisfaction and general quality of life estimation (Aprile et al., 2012).

Aprile et al. (2012) found that experience of pain interfered with the rehabilitation process in more than half of their study population and subsequently led to self-reports of a decreased quality of life. According to Cane et al. chronic pain has been linked to three activity patterns during rehabilitation namely: avoidance, pacing and over-doing. During 'avoidance' behaviour the patient attempts to avoid pain-associated activities and their level of active participation declines. Avoidance behaviour has been linked to an increased experience of chronic pain and disability. 'Over-doing' refers to the continuation of certain activities despite increased discomfort and pain. The latter may lead to further injuries, as the patient does not heed the warning signs that relate to overexertion. Another consequence of increased pain, is that the patient may not continue with activities the following day, leading to inconsistent activity participation. Lastly, 'pacing' refers to activity patterns that are moderate and alternated with periods of rest. Activity levels are determined by time rather than pain. Here, the patient may partake in activities for a period of 20 minutes and follow this with a period of rest for 10 minutes. This pattern remains consistent and will have a positive affect on

rehabilitation outcomes (Cane, Nielson, McCarthy, & Mazmanian, 2013).
In addition to the afore-mentioned factors, factors such as gender, age, pre-operative expectation and actual experience of pain relief have been found to influence a patient`s satisfaction with rehabilitation. The main characteristics of the dissatisfied patient were age and sex (Svenssona, Sjöströmb, & Haljamäe, 2001).

2.4.5 Complications of pain

Acute pain is a physiological defensce mechanism, vital for survival, that warns against dangerous stimuli that could result in tissue damage. Chronic pain persists despite recovery of the injured site and has no protective significance. Activity participation is often negatively impacted due to experienced chronic pain (Cole, 2002).

Recent studies have indicated that chronic pain lowers oxygen levels, increases cardiac load and metabolic rate, alters immune functionality, interferes with blood clotting functions, enhances water retention, impairs wound healing and negatively affect sleep patterns and mood. Poorly managed postoperative pain can lead to gastro-intestinal symptoms. Untreated or poorly managed acute pain can lead to the development of chronic pain, which in turn negatively affects one`s quality of life and increases disability (Cole, 2002). A patient`s predisposition to anxiety, affective or substance abuse disorders was found to relate to chronic pain and functional limitations (Kelsall, McKenzie, Forbes, Roberts, Urquhart, & Sim, 2014).

Pain can be chronically disabling, resulting in a significant reduction in function and in quality of life (Scotland, 2011). According to a European survey, 50-66% of individuals with chronic pain reported a reduced ability to exercise, sleep, perform household chores, attend social activities, drive a car, walk or have sexual relations (Breivik, Collett, Ventafridda, & Gallacher, 2006;

Fricker, 2006). These impairments are of significant relevance to occupational therapy intervention.

2.4.6 Effective management of pain

Changes in functionality following therapy were significantly affected by changes in pain, psychological distress, and fear-avoidance beliefs. Successful rehabilitation occurs not just by reducing pain but also by managing the psychological variables (Mannion, Junge, Taimela, Müntener, Lorenzo, & Dvorak, 2001).

Chronic pain should therefore be addressed via a multidisciplinary approach in order to address the physical, psychosocial, and spiritual barriers. Understanding and treating pain effectively will improve patient satisfaction and boost the rehabilitation process (Cane et al., 2013).

A multi-model approach to managing pain has proved to reduce the hospitalisation period after orthopedic surgery. A multidisciplinary rehabilitation approach to pain sees the link between the physical and mental aspects of pain and in turn on the patient`s quality of life. This calls for the involvement of a psychologist in orthopedic rehabilitation (Cane et al., 2013).

2.4.7 Factors influencing experience of pain

According to Ramirez-Maestre et al. the experience of pain is determined by: (i) the capacity of the individual to deal with an intrinsically stressful situation (i.e., the concept of coping); (ii) the inner and external resources that individuals have; and (iii) their personal characteristics (sex, age, and personality variables) which, in interaction with the factors mentioned in (i) and (ii), act as differential variables to determine how pain is experienced (Ramırez-Maestre, Martinez, & Zarazaga, 2004). The influence personal characteristics have on pain experience in terms of gender, ethnicity, age,

body mass index and personality shall now be discussed.

When reviewing the relation between gender and differences in terms of pain intensity, women have proved to be more prone to pain than men. A study by Unruh found that women experienced pain that was more intense, occurred more frequently and continued for a longer period than it did for men. Unruh further described women as being at greater risk of developing pain-related disabilities (Unruh, 1996). Fillingim (2000) concurred with the findings that women are at greater risk of developing chronic pain and added that women exhibit greater sensitivity to noxious stimuli in the laboratory compared to men. He further indicated that sex hormones influence the feeling of pain and this contributes to the variation in pain experience between women and men.

Ethnicity has been identified and researched as another personal factor, which may influence pain experience. A study conducted amongst 50 Black, Irish, Italian, Jewish and Puerto Rican participants found that reported pain experience was generally similar amongst participants. The factors which influenced participants` response to pain however, was different in the five ethnic groups (Lipton & Marbach, 1984). Yosipovitch et al. (2004) found similar results in their study and concluded that there was no variance in pain occurrence amongst different races (Yosipovitch, Meredith, Chan, & Goh, 2004). In 2011 however, Merry et al. illustrated that although white and African- American participants expressed similar pain experiences prior to treatment. White participants displayed the greatest reduction in pain after being treated (Merry, Campbell, Buenaver, Haythornthwaite, Doleys, & Edwards, 2011). Similarly, ethnic differences have also been reported in studies of acute clinical pain including post-operative pain, where African-American patients reported greater pain intensity than Caucasians (Edwards, Moric, & Husfeld, 2005).

Younger black and white American participants indicated higher levels of pain than older participants within their ethnic group. Furthermore younger participants displayed increased depressive symptoms and decreased coping

skills related to pain management (Baker & Green, 2005). Wandner et al. (2012) however, found contradicting results and found that pain sensitivity was higher in older participants than in middle-aged or young participants (Wandner, Scipio, Hirsh, Torres, & Robinson, 2012).

A significant positive association was found between Body Mass Index (BMI) and the risk of developing low back pain in both women and men. It has been hypothesised that an increased BMI may be a predisposing factor in the development of low back pain (Heuch, Heuch, Hagen, & Zwart, 2013).

Attention to and interpretation of pain, beliefs, attitudes regarding pain, cognitive processing, emotional responses, coping strategies and past pain behaviour have all been identified as part of the psychological component involved in pain perception (Linton & Shaw, 2011). One`s personality characteristics influence the afore-mentioned components greatly which in turn influences the pain experience (Cameron, 2011). Personality is discussed in greater detail in the following section.

2.5 PERSONALITY

In recent literature more attention has been paid to personality and its influence on pain and well-being (Cameron, 2011; Pulvers & Hood, 2013; Friedman & Kern, 2014; Tarescavage & Scheman, 2015). Personality theories have been developing since the early 1900`s and the influence that personality has on one`s health started being researched soon thereafter (Boyle, Matthews, & Saklofske, 2008).

"Personality refers to individual differences in characteristic patterns of thinking, feeling and behaving. The study of personality focuses on two broad areas: One is understanding individual differences in particular personality characteristics, such as sociability or irritability. The other is understanding how the various parts of a person come together as a whole."

(American Psychological Association, 2010).

In order to understand the relationship between personality and pain, one needs to comprehend the development of personality theory, personality characteristics and the influence that personality has on rehabilitation.

2.5.1 Defining personality by means of theory

"Personality is a broad construct which has been defined as a dynamic but organized collection of characteristics held by a person that uniquely influences his or her cognitions, emotions, motivations, and behaviours" (Ryckman, 2004, p. 4).

The conceptualisation of personality is recognised in most cultures and is set in motion by personality traits. Based on the formal definition, one can describe personality then as an active organisation of various characteristics that influence one`s thoughts, motivation and more importantly behaviour (Eakman & Eklund, 2012). Various studies over the years have tried to define personalities by differentiating between different styles and characteristics. Type theory, psychopathology and trait theory have emerged as three prominent theories, which attempt to define how personality develops and can be explained (Cameron, 2011; Weiner, Tennen & Suls, 2012).

Type theorists suggest that personality can be divided into clusters of characteristics and that a person will display one trait or the opposite thereof, and that there is no in-between. Therefore, two people with the same personality type will posessess the same traits to the same extent (Cameron, 2011).

Psychopathology focuses on how personality traits and mental disturbances correlate and to what extent these traits can influence mental stability. The focus is therefore on symptoms of pathology (Cameron, 2011).

Trait theory focuses on specific characteristics that form an individual's personality. These traits are believed to follow a specific pattern of behaviour and therefore one can predict certain behaviour in accordance with personality traits. The three leading trait models that have been extensively researched and used are: Eysenck`s model of personality (Eysenck & Eysenck, 1964), the Big Five personality model (McCrae & Costa, 1997) and Cattell`s model of personality (Cameron, 2011).

Eysenck`s (1964) initial research indicated the presence of neuroticism and extraversion as independent entities and as key definers of personality and subsequently of behaviour. Later, after continual criticism of over-simplification, psychoticism was added to the model (McCrae & Costa, 1997).

The Big Five model used Eysenck`s initial traits namely: neuroticism and extraversion, and added to these traits, conscientiousness, agreeableness and openness to experience. This model is successfully used in psychopathology but it is widely used by the general population. The Big Five model proved to be effective with the general population but was still criticised by many as being too narrow (Vearing & Mak, 2007).

This led to the development of Cattell`s model of personality. In this model, 16 personality traits are identified namely: warmth, reasoning, emotional stability, dominance, liveliness, rule consciousness, social boldness, vigilance, sensitivity, abstractness, privateness, apprehension, openness to change, self-reliance, perfectionism and tension (Cattell, 2004). Given the comprehensiveness of this model of personality, it has been chosen as the measuring instrument in the present research.

2.5.2 Constructs of Cattells` model of personality

Based on research conducted by Cattell, the 16 Personality Factor Model (16PF) was developed and adapted over the years. This model comprises 16 primary factors and five global factors (Cattell, 2004; Jopie van Rooyen &

partners SA, 2006; Boyle, Matthews, & Saklofske, 2008). These factors are discussed in more detail in the following tables.

Table 2-1 Primary Factors and Descriptors in Cattell's 16 Personality Factor Model (Adapted From Conn & Rieke, 1994).

Descriptors of Low Range	Primary Factor	Descriptors of High Range
Reserved, impersonal, distant, cool, detached, formal, aloof (sizothymia)	Warmth	Warm, outgoing, attentive to others, kind, easy going, participative, likes people (affectothymia)
Concrete thinker, lower general mental capacity, less intelligent, unable to handle abstract problems (lower scholastic mental capacity)	Reasoning	Abstract-thinker, more intelligent, bright, higher general mental capacity, fast learner (higher scholastic mental capacity)
Emotionally reactive, changeable, affected by feelings, emotionally less stable, easily upset (lower ego strength)	Emotional Stability	Emotionally stable, adaptable, mature, faces reality calmly (higher ego strength)
Deferential, cooperative, avoids conflict, submissive, humble, obedient, easily led, docile, accommodating (submissiveness)	Dominance	Dominant, forceful, assertive, aggressive, competitive, stubborn, bossy (dominance)
Serious, restrained, prudent, taciturn, introspective, silent (desurgency)	Liveliness	Lively, animated, spontaneous, enthusiastic, happy go lucky, cheerful, expressive, impulsive (surgency)
Expedient, nonconforming, disregards rules, self-indulgent (low super ego strength)	Rule-Consciousness	Rule-conscious, dutiful, conscientious, conforming, moralistic, staid, rule bound (high super ego strength)
Shy, threat-sensitive, timid, hesitant, intimidated (threctia)	Social Boldness	Socially bold, venturesome, thick skinned, uninhibited (parmia)
Utilitarian, objective, unsentimental, tough minded, self-reliant, no-nonsense, rough (harria)	Sensitivity	Sensitive, aesthetic, sentimental, tender minded, intuitive, refined (premsia)
Trusting, unsuspecting, accepting, unconditional, easy (alaxia)	Vigilance	Vigilant, suspicious, sceptical, distrustful, oppositional (protension)
Grounded, practical, prosaic, solution-orientated, steady, conventional (praxernia)	Abstractedness	Abstract, imaginative, absent minded, impractical, absorbed in ideas (autia)
Forthright, genuine, artless, open, guileless, naive, unpretentious, involved (artlessness)	Privateness	Private, discreet, nondisclosing, shrewd, polished, worldly, astute, diplomatic (shrewdness)
Self-assured, unworried, complacent, secure, free of guilt, confident, self-satisfied (untroubled)	Apprehension	Apprehensive, self-doubting, worried, guilt prone, insecure, worrying, self-blaming (guilt proneness)
Traditional, attached to familiar, conservative, respecting traditional ideas (conservatism)	Openness to Change	Open to change, experimental, liberal, analytical, critical, free thinking, flexibility (radicalism)
Group-oriented, affiliative, a joiner and follower dependent (group adherence)	Self-Reliance	Self-reliant, solitary, resourceful, individualistic, self-sufficient (self-sufficiency)
Tolerates disorder, unexacting, flexible, undisciplined, lax, self-conflict,	Perfectionism	Perfectionistic, organised, compulsive, self-disciplined, socially precise, exacting will

impulsive, careless of social rues, uncontrolled (low integration)		power, control, sentimental (high self-concept control)
Relaxed, placid, tranquil, torpid, patient, composed low drive (low ergic tension)	Tension	Tense, high energy, impatient, driven, frustrated, over wrought, time driven. (high ergic tension)

In addition to the primary factor the 16PF5 indicate the presence of five global factors. Certain primary factors are combined in order to place personality traits within the five global factors. These global factors include: extraversion, anxiety, tough-mindedness, independence and self-control. The descriptions of lower and higher ranges of these global factors are provided in table 2-2.

Table 2-2 Global Factors and Descriptors in Cattell's 16 Personality Factor Model (Jopie van Rooyen & partners SA, 2006).

Descriptors of Low Range	Global Factor	Descriptors of High Range
Introverted, socially inhibited	Extraversion	Extraverted, socially participating
Low anxiety, unperturbed	Anxiety	High anxiety, perturbable
Receptive, open-minded	Tough-Mindedness	Tough-minded, resolute
Accommodating, agreeable, selfless	Independence	Independent, persuasive, wilful
Unrestrained, follows urges	Self-Control	Self-controlled, inhibits urges

Extraversion was first identified by Jung in 1971 and has since been included in most popular personality theories. It was originally orientated around general social participation and it is noted that extraverts tend to be people-orientated and to pursue relationships (Jopie van Rooyen & partners SA, 2006).

Just like 'extraversion', 'anxiety' was also described in early personality research. Anxiety can be the cause of external events, which may activate the 'fight-or-flight' state due to a perceived or actual threat. This response can also be generated internally. Although people with low anxiety tend to be unruffled they may be poorly motivated to change or may minimise the effect

of certain events. Anxious people on the other hand experience events more intensely and may tend to overreact and have difficulty in controlling their emotions (Cattell, 2004; Jopie van Rooyen & partners SA, 2006).

Tough-mindedness, originally referred to as 'Cortertia' describes ones ability to tend to problems in an alert fashion on a cognitive level. Tough-minded people tend to express a feeling of establishment and may be rigid in their patterns of behaviour. They are practical and logical but may be unwilling to consider another`s point of view or to alter their own. Lack of flexibility and openness to change may be present when this factor is high (Cattell, 2004; Jopie van Rooyen & partners SA, 2006).

Independence illustrates a tendency towards self-determined thinking and behavioural patterns. The latter may negatively impact on a person`s ability to accommodate others. People with a high tendency towards independence express strong opinions and are often perceived as socially forceful. They remain curious and continue to push beyond what is expected to challenge the status quo (Cattell, 2004; Jopie van Rooyen & partners SA, 2006).

Self-control refers to the ability to inhibit urges and impulses and to restrain oneself. This ability may be due to a disregard of one`s own urges or a lack of spontaneity and adjustability. A sense of responsibility and total self-control is considered important to people who display high scores in this factor (Cattell, 2004; Jopie van Rooyen & partners SA, 2006).

2.5.3 Personality and rehabilitation

Way back in 1969, Mary Reilly proposed that within the behavioural sciences, personality theory was a promising research area that had direct implications for occupational therapy as a profession. Occupational science has since had an interest in the role personality traits may play in influencing one`s

engagement in an occupation (Eakman & Eklund, 2012). Both occupation and personality have been identified as significant in the understanding of personal well-being. These concepts are therefore most important when a person engages in the process of rehabilitation.

It has become evident over the years that personality and personality characteristics have a directly proportional relationship with health and well-being (Eakman & Eklund, 2012; Krok & Baker, 2014). According to Eakman and Eklund (2012) openness, agreeableness and conscientiousness are personality traits that are positively associated with increased well-being. It has further been indicated that type D personality traits, especially negative affect and social inhibition, have a strong correlation with health related risks (Condén, Leppert, Ekselius, & Åslund, 2013). The prevalence of type D personality traits is also related to psychological distress that affects psychological and physical health. The latter leads to poor illness management and prolonged experience of symptomology (Condén et al., 2013).

Not only has personality been linked to general well-being but also mood. According to the Big Five model, neuroticism is an underlying factor in depressive mood and increased anxiety with regard to bodily functions (Muris, Meesters, van den Hout, Wessels, Franken, & Rassin, 2007).

Muris et al. (2007) agree that pain catastrophising plays an important role in the development of chronic pain and further states the assumption that it enhances vigilance and fear of pain, which in turn may result in avoidance behaviour and ultimately chronic pain complaints. Neuroticism-related personality and temperament traits in turn account for variance in pain catastrophising, which is generally considered to be an important underlying cognitive factor in chronic pain. Neuroticism has been coupled with an amplified experience of bodily sensation. High levels of neuroticism lead to increased awareness of minor bodily aches and increased anxiety pertaining

to these bodily symptoms. What is more, is people with increased levels of neuroticism tend to view pain as imminent and coping strategies as ineffective. They tend to place more focus on possible pain and subsequently catastrophise (Muris et al., 2007). Research results indicate that attentiveness to pain is associated with pain severity and subsequent catastrophic thinking regarding pain. Neuroticism has been found to decrease the pain-threatening threshold and is therefore associated with increased catastrophic thinking (Gouberta, Crombeza, & Van Damme, 2004). The latter is an ineffective coping strategy for dealing with pain (Ramirez et al., 2004).

Together with neuroticism, conscientiousness has also been linked to a depressive mood (Vearing & Mak, 2008) and extraversion to heightened anxiety (Kristensen, Mortensen, & Mors, 2009). These correlations again confirm the suspicion that certain personality traits can lead to affective impairments which have a negative effect on pain.

Introversion and extraversion have also been thought to affect selective attention to pain. Introversion has proved to be more sensitive to physical stimuli whereas extraversion has been linked to higher pain thresholds (Eakman & Eklund, 2012).

Extraversion, openness to experience and agreeableness is negatively related to pain catastrophising. Extraversion is associated with the application of active, positive coping strategies in the management of pain (Ramirez et al., 2004). Neuroticism on the other hand, prove to be a predictor of passive, ineffective coping strategies.

Positive health perceptions have been linked to high levels of openness to experience and agreeableness (Gouberta, Crombeza, & Van Damme, 2004).

According to McCrae and Costa (1991) personality has temperamental, experiential and instrumental effects on well-being. This was evident when

reviewing the effect extraversion, neuroticism, agreeableness, openness and consciousness have on well-being. Extraversion points to a cheerful temperament, which in turn contributes to an improved well-being. Neuroticism leads to catastrophised thinking and subsequently affects both mood and well-being negatively. People with high levels of agreeableness tend to be kind and warm towards others, thereby creating conditions that would improve well-being. The effect that agreeableness has on well-being is referred to as an indirect effect and is classified as an instrumental effect. In the case of openness, well-being is promoted due to these individuals` creativity and imagination, which in turn creates new experiences. Conscientiousness has been linked to high levels of self-motivation that enhances well-being as personal goals are more likely to be attained (Eakman & Eklund, 2012).

2.5.4 Personality and pain experience

It is evident based on the literature review that pain perception is influenced by personality. Neuroticism has been identified in past studies as one personality trait that is associated with increased somatosensory experience of pain and catastrophising of pain (Goubert, Crombeza, & van Damme, 2004; Pilar, 2011). It has also been identified as a personality trait that leads to a dysfunctional way of interpreting the meaning of pain (Muris et al., 2007). Pilar (2011) found that extraversion is not coupled with a heightened pain experience but Krok and Baker (2014) found that low extraversion was a predictor for a greater pain experience. In support of Krok and Baker`s findings, extraversion has been linked to increased pain tolerance (Ramirez-Maestre et al., 2004). Conscientiousness has been found to be a contributing factor in the catastrophising of pain (Pilar, 2011). The latter however, is contrary to the findings of Goubert et al. (2004) who proved the relationship between conscientiousness and attentiveness to pain to be more strongly correlated than that between the conscientiousness and catastrophising of pain. Krok and Baker (2014) found the opposite to be true and linked lower

conscientiousness with higher pain experience. No definite findings have been made with regard to agreeableness as a personality trait that influences pain. Only Pilar (2011) found that agreeableness has a strong connection to focusing on pain.

2.6 CONCLUSION

The literature reviewed supports findings that pain is a feared complication of spinal fusions and negatively influences the rehabilitation process. Secondary complications such as immobilisation, extended hospitalisation and poor attainment of individualised goals have been related to chronic pain (Aprile et al., 2012). Moreover, it is evident from the literature review that pain perception is influenced by personality (Goubert et al., 2004; Pilar, 2011).

The studies to date only relate to cases outside South Africa where rehabilitation and medical interventions are different and thus results cannot be generalised to the South African population. Furthermore, most studies conducted focused on describing the phenomena in a controlled setting. In controlled groups subjects know the stimulus of pain is of a short duration and this influences their perception and description thereof. Pain experienced post fusion however is not in a controlled environment and may yield different results.

Existing studies only focus on the association between personality and pain. There are consequently inadequacies within the body of knowledge that relates to the effect of personality and pain on the attainment of individualised rehabilitation outcomes (Aprile et al., 2012). There has been no research to date that investigates the association between pain, personality characteristics and the attainment of individualised therapy goals within the South African context.

The next chapter addresses the methodology adopted in this study.

CHAPTER 3 – RESEARCH METHODOLOGY

3.1 INTRODUCTION

It has become evident when reviewing existing research that a distinct relation exists between personality and pain (Antoni et al., 2013; Cameron, 2011). The researcher has observed the relation between personality and pain in the clinical field. This relation subsequently attributed to variations in goal attainment between different patients. Afore-mentioned indicate that personality characteristics and pain may influence the attainment of rehabilitation goals. This is of clinical note as this information may proof vital for clinicians to optimise the outcome of rehabilitation, with specific reference to attainment of individualised goals. The researcher works predominantly with patients who undergo spinal fusions. Due to pre-cautionary measures post fusion, treatment is mainly focused on self-care activities, with a client-centered approach.

As alluded to in Chapter 1, a gap exists in evidence pertaining to the association between personality characteristics, the perception of pain and the attainment of individualised self-care outcomes in patients with spinal fusion.

This chapter discusses the study design and research methodology followed during the execution of this research study.

3.2 RESEARCH AIM

The aim of the study is to determine the association between personality characteristics, perception of pain and attainment of individualised self-care outcomes in patients with spinal fusion.

3.3 RESEARCH DESIGN

A descriptive cross-sectional study design was undertaken. The study was descriptive in that it described the prevalence of personality traits and perception of pain within the study population (Bam, Cronje, & Joubert, 2008). Furthermore the association between various personality traits, perception of pain and attainment of individualised self-care outcomes in occupational therapy were explored subsequently necessitating the use of an analytical cross-sectional design (Bam et al., 2008).

Although pain and personality are abstract concepts and often within a qualitative category of description, standardised measurements have been used to quantify these concepts. Therefore during the research a quantitative approach was utilised as pain, prevalence of certain personality traits and self-care ratings were quantified. The quantitative approach allowed statistical analyses of data in order to describe the personality traits, pain perception and attainment of individualised self-care outcomes in spinal fusion patients.

3.4 RESEARCH POPULATION

The study population in this study included patients who were referred by two neurosurgeons in the Port Elizabeth area, who consult and admit patients to Netcare Greenacres Hospital. Participants were patients who underwent a spinal fusion.

3.5 RESEARCH SAMPLE

All patients of the two neurosurgeons, who were scheduled for a spinal fusion amid October 2015 and June 2016, were eligible for participation in the research. A convenience sample was utilised. The researcher utilised a period

of eight months to collect data and included all patients who consented to participation and met the inclusion criteria.

3.5.1 Inclusion Criteria

In a quantitative study, researchers decide to eliminate certain factors from the study population by setting specific eligibility criteria (Profetto-McGrath, Polit, & Tatano Beck, 2010). Inclusion criteria are therefore criteria that dictate factor compliance of participants in order to form part of the study population.

In the current study all participants met the following inclusion criteria:

- Patients who were scheduled to undergo a spinal fusion (either cervical or lumbar)
- Patients who were comfortable to complete questionnaires in English.
- Patients who gave informed consent to participate in the study.

3.5.2 Exclusion Criteria

The researcher therefore establishes criteria to determine if a participant is suitable to form part of the study population, as depicted in the inclusion criteria. However some criteria requires defining as to indicate what traits or factors should not be applicable to the participant and this would be one`s exclusion criteria (Profetto-McGrath et al., 2010).

Patients were excluded from the study in the following instances:

- Patients who were scheduled for a fusion of more than five vertebrae levels
- Patients who were diagnosed with fibromyalgia
- Patients who required a fusion due to traumatic injuries
- Patients who had a comorbid traumatic brain injury

- Patients with mental retardation
- Patients with spinal tumour which influences sensation capacity
- Patients who were illiterate
- Patients diagnosed with a psychiatric condition

3.6 DATA COLLECTION

According to Grove, Burns & Gray (2013) data collection is the process where participants are selected and information obtained in order to answer a research question.

All data were collected by means of questionnaires, which was completed initially at a pre-operative contact session and again at a post-operative contact session more than six weeks after surgery, depending on their availability. The following section will discuss relevant measurement instruments and thereafter the method of data collection used in the study.

3.6.1 Measurement instruments

Kimberlin & Winterstein (2008) found that within health care and social science research, many of the variables and outcomes of relevance are abstract. Therefore they have stressed the importance of using tests or instruments that are valid and reliable to measure such constructs as a crucial component of research quality.

The measurement instruments selected for gathering of demographic information, personality traits, level of pain and individualised self-care outcomes will be discussed in the section below.

3.6.1.1 Measurement instrument: Demographic information

A self-compiled, data specific questionnaire was used to gather information pre-operatively that pertained to: gender, age, occupation, home language, proposed surgery, level of fusion, pre-existing formally diagnosed conditions, pain medication use in terms of dosage, frequency and type of medication (cf. Addendum J). A post-operative demographic questionnaire was used to gather information regarding complications experienced post surgery, length of hospitalisation, pain medication usage in terms of dosage, frequency and type of medication (cf. Addendum K).

3.6.1.2 Measurement instrument: Personality

A variety of personality tests are available, of which the most popular are The Myers Briggs Personality Test (Myers, 1962), Minnesota Multiphasic Personality Inventory (MMPI-2) (Hathaway & McKingley, 1989), Neuroticism-Extraversion-Openness Inventory (NEO-I) (Costa & McCrae, 1985) and 16PF5 (Cattell, 1993). The 16PF5 however provides comprehensive information regarding personality characteristics and traits, and was thus selected by the researcher to use for data collection on personality. It further allowed for a detailed description of the influence personality characteristics have on pain and rehabilitation and was therefore the chosen tool for the research (Cattell, 2004).

The 16PF5 consist of 185 questions pertaining to personality. In the majority of the questions the participant indicated whether the statement made was true or false for them. Some questions were more elaborate and options were more descriptive. In these instances the participant chose the option most applicable to them (cf. Addendum L). The characteristics that were established during the test were: warmth, reasoning, emotional stability, dominance, liveliness, rule consciousness, social boldness, vigilance, sensitivity, abstractness, privateness, apprehension, openness to change, self-

reliance, perfectionism and tension. These 16 characteristics were further divided into five global factors namely: extraversion, independence, tough-mindedness, self-control and anxiety (Cattell, 2004).

3.6.1.3 Measurement instrument: Pain

The Numerical Rating Scale (NRS) is a ten point rating scale on which participants rated their experienced pain. On the NRS a score of zero indicating no pain; five indicates moderate pain and ten indicates worst pain ever (cf. Addendum M). The participant assigned a number to their perceived pain level on a scale from one to ten. The participant was asked to rate their average pain, therefore five out of seven days as to provide a more accurate quantification of pain intensity and make provision for possible level variations.

The NRS has been shown to be as sensitive as a visual analogue pain scale, irrespective of whether a '0 – 10' or a '0 – 100' NRS rating is utilised. The visual analogue pain scale tends to have higher failure rate than the NRS (Hawker et al., 2011). Thus the NRS was selected as the preferred pain rating scale for use in the research.

In addition to the NRS the researcher also decided to make use of the Oswestry Disability Index (ODI), which is considered to be the 'gold standard' of low back functional outcome tool (Fairbank, 1980). The ODI is a self-report questionnaire specifically designed to determine to what extent back pain influences activity participation (cf. Addendum N). The ODI was the chosen evaluation instrument to determine level of functional loss amongst lumbar fusion participants in the research.

The Neck Disability Index (NDI) is a modification of the ODI, which was developed by the Canadian Memorial Chiropractic College in Toronto Canada (Vernon & Mior, 1992). The NDI is an instrument to assess neck pain

complaints and is effectively utilised in cervical fusion cases (cf. Addendum O). The participant was asked to choose the answer that describes their experience of pain for the majority of the time, therefore five out of seven days and not just based on their experience of pain whilst completing the questionnaire.

Both the ODI and NDI consisted of ten sections focusing on different activity areas and the participant was required to indicate under each section the statement that was most applicable to them. For each section the total possible score was five, if the first statement was marked the score would be zero, if the last statement was marked it would be five. If the participant completed all sections, the score they obtain was divided through 50. If the participant completed less than ten sections five was subtracted from 50 for every section omitted. For example if the participant only completed nine sections, the score they obtain was divided through 45. Dividing obtained score through total of sections completed and multiplying the answer with 100 calculated a total percentage. The total percentage indicated the percentage of functional impairment. A percentage of disability was obtained and interpreted as follow: Scores from 0% to 20% indicated minimal disability; 20% to 40%, moderate disability; 40% to 60%, severe disability; 60% to 80%, crippled; and 80% to 100%, bedbound or exaggerating (Lewis & Maughan, 2010).

3.6.1.4 Measurement instrument: individualised occupational therapy outcomes

In an attempt to quantify and measure attainment of individualised self-care outcomes, two measurement instruments were utilised. The first instrument utilised was the self-compiled individualised self-care rating scale. The second instrument utilised was the Goal Attainment Scale (GAS) (Kiresuk & Sherman, 1968).

The individualised self-care rating scale (cf. Addendum P) listed components that were representative of each self-care activity that was applicable to spinal fusion patients. The participant indicated on the checklist whether they performed these components or not. Participants who indicated yes next to a self-care activity went on to rate that self-care activity in the adjacent columns.

The researcher compiled the individualised self-care rating scale, in accordance with the Occupational Therapy Practice Framework (OTPF) and Canadian Occupational Performance Measure (COPM) (Baptiste, 2008; The American Occupational Therapy Association, 2002). The participant firstly indicated on a rating scale ('1-4') how important each self-care activity was to him or her, secondly what their performance rating was at the time of completion for each activity and lastly what their satisfaction rating was for each activity.

The second instrument utilised in the measurement of individualised self-care outcomes was the Goal Attainment Scale (GAS). This is an evaluation scale, which aids in providing quantification of progress achieved in terms of goal attainment (Krasny-Pacini et al., 2013). A five-point scale is generally utilised and ranges from '-2' up to '+2'. The scale is individualised according to the participants` functioning and realistic goals in which instances '-2' will indicate the participants` pre-treatment level, '-1' will represent progression towards goal, but not yet attainment thereof, '0' indicates attainment of treatment goal and '+1' and '+2' surpasses attainment of goal. Based on the individualised self-care rating scale an individualised GAS was compiled. The two self-care activities with the highest importance ratings formed the two goals on the GAS. In cases where there were more than two self-care activities with equally high importance ratings the participant was asked to choose the two he or she would like to address. Different ranges of the GAS were described according to measurable, observable target behaviour. The interval difference between ranges was the same; therefore it was equally

difficult to go from a '-2' to '-1' than from '-1' to '0' (Krasny-Pacini et al., 2013). The GAS was compiled in accordance with participants` expectations, environmental factors and prognosis and was therefore individualised (Ertzgaard et al., 2011). Thus a generic GAS for the research study could not be compiled, as it would differ from participant to participant (cf. Addendum Q for an example). The GAS allowed quantification of goal achievement as to determine to what extent the individualised therapy outcome was achieved.

3.6.2 Data collection process

Data was collected in two phases namely pre-operative and post-operative phase.

Patients who undergo a spinal fusion are routinely referred by the neurosurgeons for a pre-operative information session conducted by the occupational therapist. All patients therefore are seen by the occupational therapist prior to surgery. The administrative staff from the neurosurgeons rooms routinely emails the occupational therapist with the contact details of patients who are scheduled for a fusion. The occupational therapy rooms then contact the patients to schedule a pre-operative appointment at a time convenient for the patient. Sessions are held at any of the three practice rooms according to the patient`s convenience and request. Patients treated by the two neurosurgeons routinely receive a booklet with NRS, ODI/NDI and self-care rating questionnaire from the neurosurgeon, which they complete in their own time and bring with to their pre-operative session. Generally the researcher or one other occupational therapist, according to availability, conducts routine pre-operative sessions. During the data collection of this study the researcher conducted all pre-operative sessions as to ensure consistency.

During the pre-operative contact session the researcher informed the patient of the research (verbal and written information) after which the patient was invited to participate in the research. The routine pre-operative session was conducted with patients who did not wish to participate. Patients who were willing to participate provided informed consent to participate in the study.

The research participants then proceeded to complete a written demographic questionnaire. The researcher verbally explained any questions or uncertainties regarding the demographic questionnaire as to ensure that the participant clearly understood each question. The participants then indicated their answer in the block provided on the demographic questionnaire.

Upon completion of the demographic questionnaire each participant completed the 16PF5 at the pre-operative contact session. The researcher was available whilst they completed the questionnaire, to address any question that required clarification. The questionnaire took on average 30 minutes to complete. To ensure comfort a counter of convenient height for writing whilst standing was made available to participants who wanted to adjust their position, from the option of sitting at a desk. As it is not within the researcher's scope of practice to interpret the 16PF5 test, a clinical psychologist who is registered with the Health Professions Council of South Africa performed scoring and interpretation of the questionnaires. The psychologist scored each test and provided the researcher with completed scoring sheets. The 16PF5-scoring sheet provided results on 16 personality characteristics (referred to as primary factors) and these characteristics divided into five domains (referred to as global factors). The five global factors were utilised in data analyses.

Whilst the participant completed the 16PF5, the researcher scored their completed self-care rating questionnaire, which they brought with to the pre-operative session. The two self-care activities with the highest importance

rating were established. These two self-care activities with the highest importance rating were utilised to compile a GAS for each participant.

After the participant had completed the demographic questionnaire and 16PF5 the researcher verbally verified and compiled the GAS together with the participant.

The majority of patients (87) underwent their spinal fusion as scheduled after the pre-operative contact session; the nine remaining patients` surgery was cancelled due to medical aid restrictions. The rehabilitation protocol utilised, at the time of the research by the multidisciplinary team members was administered regardless of patient's participation in the research study. The occupational therapy rehabilitation in-hospital was conducted by two occupational therapists that were both trained to execute the treatment protocol. Therapy protocol differed between cervical fusion and lumbar fusion as hospitalisation periods differed. In both protocols however the focus was on independence within self-care activities (cf. Addendum F). Therefore all individualised outcomes were addressed, as the options provided for the participants on the self-care rating scale were all aspects that were included within the rehabilitation protocol. The GAS compiled for each participant was handed over to the occupational therapist who treated the participant in-hospital as to help with selecting appropriate self-care activity from the list provided in the protocol. All participants received an appointment card whilst in hospital for their six-week follow up with the neurosurgeon and occupational therapist.

At the post-operative follow-up session the data collection process as described above was repeated, whereby the participants again completed a demographic questionnaire, NRS, ODI/NDI, self-care rating and GAS. The 16PF5 was not repeated post-operatively as personality characteristics remain consistent.

3.6.3 Study procedure

The steps that indicate the procedure, which the researcher followed during the study are presented in figure 3.1

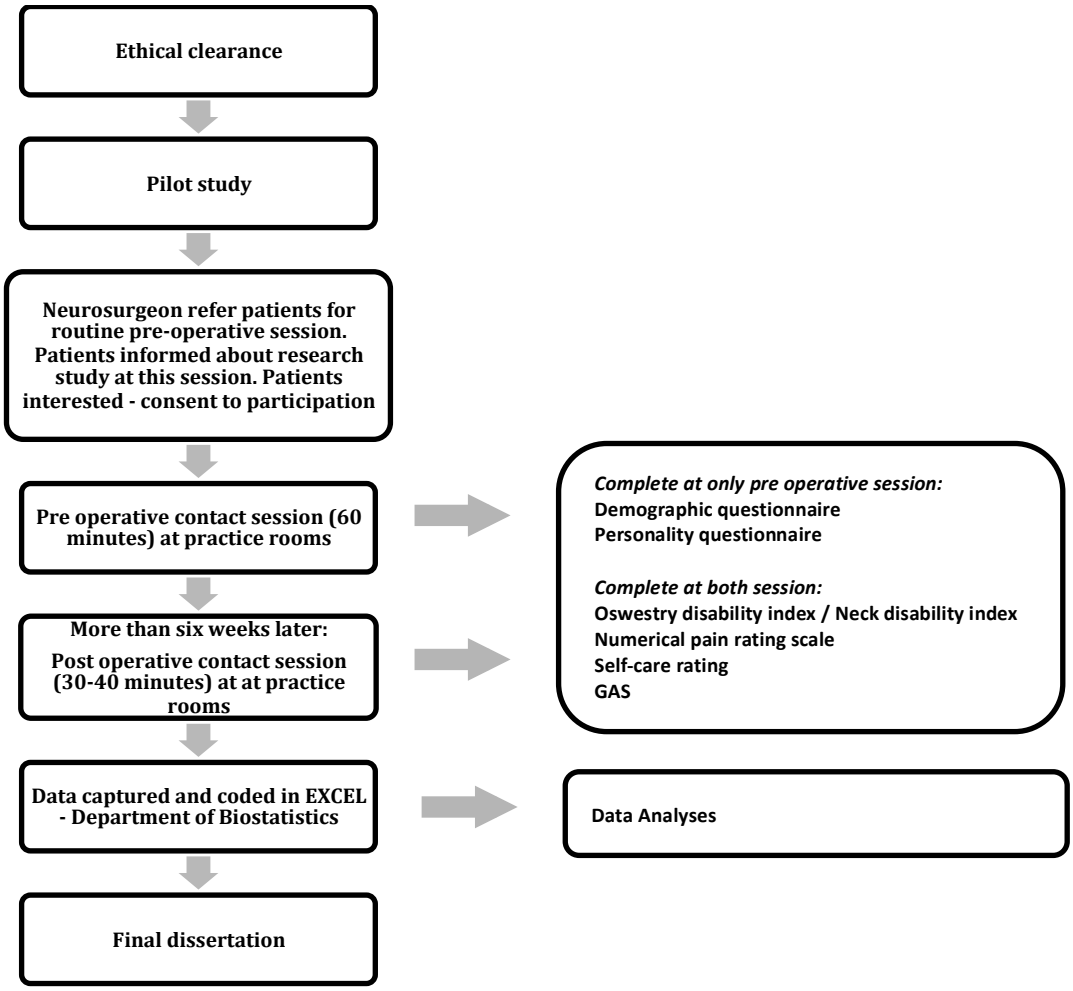

Figure 3-1: Procedure followed

3.7 MEASUREMENT ERRORS

Grove et al. (2013) indicated that measurement errors are inevitably part of the research process and that there are three common factors that contribute to these errors. In this section of the chapter, the researcher explores these factors and how it was addressed during the study.

The first contributing factor according to Grove et al. (2013) is situational factors. Situational factors address the conditions under which data collection occurs. The following situational contaminants were present in the study and addressed in the manner mentioned below:

- Pre-operative and post-operative sessions were conducted at one of the practice rooms most suitable for the participant thereby decreasing possible inconvenience.
- There were counter tops with convenient height for writing whilst standing available at the rooms as to allow postural adaptations.
- Sessions were conducted individually to ensure that participants do not influence one another's answers. Additionally the researcher was present to address any questions.

Transitory personal factors are the second contributing factors identified. These factors refer to factors within the participant, which can influence their participation in the study.

- Due to the length of questionnaires, lack of motivation was anticipated as a possible barrier. In order to address this factor, participants were well informed of the importance of the study, and the convenience of the participant was reasonably and optimally ensured throughout the data collection process.
- The post-operative session occurred only once at least six weeks has past since surgery. Prior to six weeks many activities are not yet allowed and therefore this session could only occur after the initial six weeks period past. As participants could forget their appointment, participants received a text message from the researcher a week and a day respectively before their appointment to remind them thereof. In instances where the participant did not arrive on the day of the appointment they were contacted and a new appointment date was rescheduled. At their follow-up session with the neurosurgeon

participants was again encouraged to attend their post-operative appointment.

The third contributing factor identified is referred to as administration variations. Administration variations refers to errors that can occur during data collection and whilst administering the measurement instrument. In this study the following administration variations were identified and addressed:

- The pain and personality questionnaires are standardised questionnaires and were administered according to standardised test protocol.
- The self-care rating was a self-compiled questionnaire with content based on literature findings. Additionally the Expert Research Committee and Evaluation Research Committee reviewed the rating to ensure its clarity and efficacy. The self-care rating was administered constantly and presented in a set format to all participants throughout the research study as to decrease inconsistency.
- A pilot study was conducted to ensure that the most effective administration process were utilised.
- The inclusion and exclusion criteria were clearly outlined and consistently applied throughout the study.
- Data coding and capturing on EXCEL spread sheet was done twice by the researcher and checked by a colleague to ensure correct capturing.
- The cooperation of referring neurosurgeons to ensure referral was vital and was initially viewed as a possible challenge. To overcome this challenge, the aims of the study and the value it would contribute to rehabilitation in future was emphasised. Focus was placed on the contribution the research would make to the future intervention provided by the multidisciplinary team and the improvement of rehabilitation results thereby supporting success of surgical intervention.

- As there were two neurosurgeons who referred patients a possible error identified was that discrepancies could exists in terms of surgery. Both the neurosurgeons however used the same prosthesis in surgery and the same analgesic administration regime after surgery. Rehabilitation team members were also the same and therefore post-operatively a set protocol was followed for all patients with same area of fusion, irrespective of referring surgeon.

3.8 PILOT STUDY

A pilot study was performed with the first five patients referred from the neurosurgeons upon approval of the research study by the ethics committee.

Data collection for the pilot study was conducted before surgery. The participants completed demographic questionnaire, 16PF5, NRS, ODI or NDI, individualised self-care rating and GAS at this session. Given the time constraints, six weeks post operative, repeat of NRS, ODI or NDI, individualised self-care rating and GAS were not done. This however did not influence the efficacy of the pilot study as the six weeks post-operative session utilised the same method and questionnaires as at the pre-operative session.

The purpose of the pilot study was to establish the user-friendliness of the questionnaires. It provided a clear indication of the time that was required of participants and therefore ensured that questionnaires and scales were not too cumbersome to complete.

All questionnaires and scales completed by participants in the pilot study were coded and entered into an EXCEL spreadsheet. This ensured that there were no errors on coding form and that coding blocks were correct. It also gave an indication whether EXCEL spreadsheet contained all relevant information.

There were no changes made to the original questionnaires and therefore the data obtained via the pilot study was used in research study results. As these five participants data was included in the final data analyses, the post-operative data collection session was also performed.

3.9 DATA ANALYSIS

The results of the study were processed by the Department of Biostatistics at the University of the Free State.

Descriptive statistics namely frequencies and percentages for categorical data and medians with their indications of spread for continuous data, was calculated per session. The sessions were compared and associations were calculated and described by means of 95% confidence intervals for the percentage or median difference. If the sample size was too small, Wilcoxon two sample test for unpaired data and Wilcoxon Singed Rank test for paired data was calculated, when applicable.

3.10 DATA QUALITY CONTROL

3.10.1 Reliability and validity of measurement instruments

Reliability refers to the uniformity with which a measuring instrument yields a specific result when the factor being measured has not changed (Leedy & Ormrod, 2013). Validity, according to McMillan and Schumacher (2001, p. 181) refers to "the judgment of the appropriateness of a measure for specific uses that result from the scores that are generated." Although there are also other measures to ensure validity such as criterion related or construct validity, the following measures were carried out to ensure validity of the data gathering in this research:

The research study utilised standardised measurement instruments in the form of the 16PF5, NRS and ODI/NDI. Additionally two self-compiled measurement instruments namely the Self-care Rating Scale and Goal Attainment Scale were used. The validity and reliability of these instruments will be discussed in the section below.

16PF5:

Moderate to good reliability rating have been reported for the 16 Personality Factors. "The primary scales internal consistency on a sample of 4,660, range from 0.66 to 0.86, with a mean of 0.75. The Global Factors test-retest range was .84-.91 indicating a strong reliability coefficient" (McGilloway, 2010, p. 10).

Numerical rating pain scale (NRS):

The NRS and VAS might be considered first when particularly sensitive and responsive measures of pain intensity are needed. The NRS has been found to be a valid and reliable scale to measure pain intensity (Hawker et al., 2011). High test–retest reliability has been observed when using the NRS before and after medical intervention and retest therefore at six-week post-operative session provided reliable data (Hawker et al., 2011).

Oswestry Disability Index (ODI):

The ODI is a valid and comprehensive assessment tool indicating the level of disability experienced due to pain. It was specifically developed for use in condition-specific disability namely low back pain but has been found to be useful in all spinal related conditions (Fairbank & Pynsent, 2000). "Internal consistency has been shown to be of acceptable level by different authors" (Vianin, 2008, p. 162). Test-retest reliability has been shown to be high. The ODI can be re-administered in six weeks and is proven reliable in re-

administration within his period (Fairbank & Pynsent, 2000).

Neck Disability Index (NDI):

The NDI is an objective means of assessing the disability of patients suffering from neck pain. It was formulated based on the ODI and was proven valid through peer-review and patient feedback sessions. Results obtained via NDI was compared with that obtained via VAS and McGill Pain Questionnaire and correlation was proven to be high. "The NDI has stable psychometric characteristics, evidenced by high internal consistency" (Vernon & Mior, 1992, p. 409).

Self-care rating:

Although the self-care rating is an instrument designed by the researcher the foundation of this rating originated from researched frames of references. The self-care rating has been designed based on components of the COPM. The test-retest reliability of performance and satisfaction ratings of the COPM has been found to be high. Although the validity of the COPM vary it has been proven valid as a measure of occupational performance (Cup et al., 2003). Components of self-care activities were derived from the OTPF, which has been proven to be valuable in applying specific knowledge and skills in helping patients attain and resume daily life activities (The American Occupational Therapy Assosiation, 2002).

Goal Attainment Scale (GAS):

"The inter-rater reliability of the GAS has been demonstrated as high, with correlation coefficients greater than 0.90" (Ertzgaard et al., 2011, p. 10). Research has indicated that various demographic factors do not influence efficacy of GAS as goal attainment is individualised. Furthermore the GAS has

proven high validity in measuring obtainment of goals (Ertzgaard et al., 2011).

3.10.2 Reliability of the study

"The reliability of research is reliant on the reliability of the measurement instrument and to the extent the instrument yields the same results on repeated trials. Reliable measurement instruments will therefore produce consistent results between repeated measurements" (Scholtes, Terwee, & Poolman, 2011, p. 237).

The following measures were taken as to increase reliability of measurement during the research:

- Standardised questionnaires were utilised to evaluate pain and personality.
- The self-compiled questionnaires, inclusive of demographic forms and self-care rating were compiled based on extensive literature review, theoretical models and frames of references.
- Questionnaires were administered in a consistent manner and the researcher was available to address any question, which was unclear.
- A pilot study was performed with five participants to ensure forms were reliable.
- Throughout data capturing in EXCEL the researcher ensured that data was entered in a consistent manner. Data was entered twice as to evaluate accuracy of capturing.

3.10.3 Validity of the study

When discussing validity of the study one must firstly differentiate between internal and external validity. Internal validity is concerned with how well a research study is done, especially whether it avoids confusion. The less chance for confusing in a study, the higher its internal validity is. In this study

the research was conducted according to a set protocol to eliminated variable factors as far as possible and ensure internal validity.

External validity refers to how well data and theories from one setting apply to another and therefore can be generalised. This study focus on a target population of spinal fusion patients in Port Elizabeth, however results can be applied to various orthopedic patients within the South African context as the constructs described i.e. pain, personality traits and self-care can be generalised.

Validity of measurement instruments can be defined as the degree to which a test measures what it is supposed to measure. There are three basic approaches to the validity of tests and measures as shown by Bannigan & Watson (2009). These are construct validity, criterion-related validity and content validity.

Construct validity must be investigated when no standard of content is accepted as solely adequate to define the quality to be measured. However in this study pain, personality traits and self-care have been defined in literature and the definitions have been accepted, thus rendering the need for investigation of construct validity unnecessary.

Criterion-related validity is concerned with finding the presence or absence of one or more criteria considered to represent traits or concepts of interest. In the selection of measurement instruments all constructs have been extensively investigated and the research did not focus on detecting absence of any criteria.

The aspect of validity that was applicable to this study was content validity. Content validity measures the degree to which the test items represent the area of the trait or aspect being measured. In the case of the research study content validity was proven for all questionnaires, indicating that these

questionnaires measured pain, personality traits and self-care rating as it intended.

The following measures were taken as to increase validity of measurement during the research:

- The validity of ODI, NDI, NRS and 16PF5 has been well established in literature and all questionnaires are proven to be valid measuring instruments.

- The Research Expert Committee of the Department of Occupational therapy and the Research Evaluation Committee of the School of Allied Health Profession reviewed the self-compiled questionnaires and assisted with altercations in order to improve content validity.

- The content and construction of self-compiled questionnaires were based on extensive literature review and assessed during the pilot study as to ensure validity of these questionnaires.

- The pilot study provided feedback regarding user-friendliness and non-ambiguity of questions in self-compiled questionnaires.

3.11 ETHICAL CONSIDERATIONS

Processes pertaining to UFS` research ethics were followed.

The research protocol was submitted to the following committees in indicated order to obtain approval:

1. Research Expert Committee of the Department of Occupational Therapy.
2. Department of Biostatistics (cf. Addendum A).
3. Research Evaluation Committee of the School of Allied Health Sciences (cf. Addendum B).

4. Research Ethics Committee of the Faculty of Health Sciences of the University of the Free State (cf. Addendum C). (Date of approval 16 September 2015).

In addition to the approval from the above-mentioned committees the following approval was also obtained from:

- Neurosurgeons who perform the spinal fusion operations namely Dr. Ansari & Dr. Francis (cf. Addendum E)
- Netcare Greenacres Hospital in Port Elizabeth (cf. Addendum D)

Consent was obtained from:

- Study participants

- The participants were only included in the study once they were duely informed about their participation in the study (cf. Addendum H), and consented in writing (cf. Addendum I). All information were made available in both Afrikaans and English. The Information letter included the names and contact details of the researcher and the purpose of the study.

- Participants were informed about the method of data collection and that their participation in the study involves no risks.

- Participants were assured that all the information they provided would be treated as confidential, and that there would be no violation of their rights or privacy.

- The participation in this study was voluntary and if the participants wished to withdraw from the study, they could withdraw without any penalty or losing of benefits.

- Participation in this study had no financial implications for the participants.

- Participants were informed that the results of this study may be published, and possible authorship was confirmed between the parties involved.

- The information letter explained that the results would be made available on request of the participant.

3.11.1 Confidentiality

Confidentiality was maintained throughout the data collection process by ensuring that all forms, scales and questionnaires completed had the participants number on it and all forms were placed in one file with participant number on the top of file. This ensured that if at any stage during data capturing a form was misplaced from its file it was easy to correlate with the file. Only numbers were indicated on forms to ensure confidentiality was maintained. A list was available with participants' numbers and corresponding names on. The researcher was the only person who had access to this list. Confidentiality will be maintained in future during publication and or presentation of results by not including any names or personal details of participants.

All participants in the research study have the right to privacy, informed consent and the right not to be harmed in any manner (Bam et al., 2008) In addition when the risks are found to outweigh the potential benefits or when there is conclusive proof of definitive outcomes the study should be modified or stopped (World Medical Association, 2013). All vulnerable groups and individuals should receive specifically considered protection (World Medical

Association, 2013). The researcher has ensured that these rights was protected by applying the following strategies:

3.11.2 Informed consent

Full disclosure about the aim of study, implication of results, possible publication of results and anticipated consequences were given to participants. Afore-mentioned was provided in the form of a written information letter as well as verbal explanation to participants as to ensure cognisance of information. Informed consent to above-mentioned was obtained before data gathering commenced.

Participants were firstly made aware of the fact that they had the right to refuse participation in any form (interview, questionnaires etc.). The researcher further ensured that pre- and post-operative contact sessions were done at an opportune time and place (not during lunch, at night or extended periods) to ensure that the participants are not inconvenienced.

The participant had a participant number, which was used throughout the study, and only the researcher had knowledge of participants' identity. The researcher has protected the participant`s right to privacy in all possible aspects and ensured that all parties involved in capturing and working with data abide to confidentiality and privacy agreement.

3.11.3 Influence on provided treatment

Participation or non-participation in the research study had no influence on the treatment that patients receive within hospital or after their spinal fusion operation had been done. All patients who underwent a spinal fusion received in-hospital treatment according to the protocol and by the standard rehabilitation team members. This was at no stage influenced by the research study and patient rights were in no way infringed upon.

3.12 SUMMARY

Chapter 3 focused on providing a description of the research methodology. A descriptive cross-sectional study design was used in order to achieve the research aim. The study population included 61 patients who underwent a spinal fusion amid October 2015 and June 2016. Data was gathered during two phases, a pre-operative phase and a post-operative phase. Self-compiled questionnaires as well as three standardised questionnaires were used to measure pain, personality and self-care activities. Possible measurement errors were identified prior to the study and strategies were put in place to enhance reliability and validity of data. The researcher coded all questionnaires and provided the Department of Biostatistics at the University of the Free State with data for analyses. Ethical aspects were addressed in the final section of this chapter.

Chapter 4 will depict the results of descriptive statistics and will be presented in different tables and figures.

CHAPTER 4 – RESULTS

4.1 INTRODUCTION

The main aim of the study was to determine the association between personality characteristics, perception of pain and attainment of individualised self-care outcomes in patients with spinal fusion.

In order to achieve this aim the following objectives were undertaken, namely to:

1. Establish the personality characteristics of each participant (cf. 4.3).
2. Determine participants' level of pain pre-and post-operatively (cf. 4.4).
3. Establish self-care rating pre-and post-operatively (cf. 4.5).
    3.1. Establish performance rating of individualised self-care outcomes pre-and post-operatively (cf. 4.5).
    3.2. Establish satisfaction rating of individualised self-care outcomes pre- and post-operatively (cf. 4.5).
    3.3. Establish goal attainment value pre- and post-operatively (cf. 4.6).
4. Determine the association between personality characteristics, perception of pain and attainment of self-care outcomes (cf. 4.7).

In this chapter results are presented to address the afore-mentioned objectives. As to provide a concise structure for the reader, results will be depicted in accordance with questionnaires completed by the participants:

- Demographic information (cf. Addendum J and Addendum K)
- Personality characteristics (cf. Addendum L)
- Pain experience (cf. Addendum M, Addendum N and Addendum 0)
- Self-care rating (cf. Addendum P)
- Goal attainment (cf. Addendum Q)

Lastly pre-operative and post-operative results will be integrated to highlight associations and descriptions.

Note to the reader confidence interval will be abbreviated as CI in the discussion of results.

4.2 DEMOGRAPHIC DESCRIPTION OF PARTICIPANTS

Data were collected from all patients (n=96) who were scheduled to undergo a spinal fusion procedure. From the 96 patients seen pre-operatively, nine patients` surgery was canceled, 13 patients were diagnosed with a mental illness, 11 patients were undergoing a second fusion and two patients did not follow up for their post-operative session. These 35 patients were therefore excluded from the study results. Unless otherwise indicated the results discussed in this chapter pertain to the remaining patients (n=61) who formed the total study participants. Thirty-seven (60.7%) of the participants comprised of women and more than half (54.1%) of the participants indicated Afrikaans as home language. The median age amongst the participants was 60.6 years with the youngest participant being 30.8 years and the eldest 78.2 years.

Participants were required to indicate their occupation on the demographic questionnaire and the following table depicts these results.

Table 4-1 Occupations of participants

Occupation	Frequency	Percentage
Nurse	6	9.8%
Correctional officer	2	3.3%
Financial advisor	4	6.6%
Home executive	11	18.0%
Teacher	6	9.8%
Doctor	1	1.6%

Engineer	2	3.3%
Human Resource consultant	1	1.6%
Pensioner	20	32.8%
Information Technologist	2	3.3%
Admin clerk	4	6.6%
Banker	2	3.3%

It is evident from results depicted in table 4-1 that the highest percentage of the study participants (32.8%) were pensioners. Home executives accounted for the other larger representation of the participants (18.0%). There was only one doctor and one Human Resource consultant amongst participants.

Table 4-2 Secondary medical conditions of participants

Secondary conditions	Frequency	Percentage
Diabetes Mellitus	7	11.5%
Hypertension	10	16.4%
Cholesterol	6	9.8%

Few (37.7%) participants indicated experiencing secondary medical conditions namely: Diabetes Mellitus, Hypertension and/or Cholesterol. No other secondary medical conditions were recorded.

The type of fusion refers to the area of the spinal column where the vertebrae are fused. For the purpose of this study all cervical fusions are classified as neck fusions and all other fusions as back fusions. The spinal level is named according to the vertebra above and below that level i.e. L4-5. The level of fusion therefore refers to the number of spinal levels fused. In the example of L4-5 it would therefore be one level fused.

Table 4-3 Type and level of fusion

Type of fusion	Level	Frequency	Percentage
Neck	1	17	27.9%
Neck	2	14	23.0%
Neck	3	1	1.6%

Neck	4	2	3.3%
Back	1	9	14.8%
Back	2	17	27.9%
Back	3	1	1.6%

All participants underwent a spinal fusion for the first time, in compliance with the inclusion criteria. More than half (n=34, 55.7%) of the participants underwent a neck fusion. The median levels of fusion for both neck and back fusions were 2 levels (range: 1.0 - 4.0).

The median Body Mass Index (BMI) of participants was 28.7 (range: 24.5-42.4). A BMI value above 30 indicates obesity (World Health Organisation, 2016) and was found in 29.5% of the participants.

Table 4-4 Type and level of fusion and BMI group

Type of fusion	Level	BMI Group	Frequency	Percentage
Neck	1	Normal	13	21.3%
Neck	1	Obese	4	6.6%
Neck	2	Normal	10	16.4%
Neck	2	Obese	4	6.6%
Neck	3	Normal	1	1.6%
Neck	4	Normal	1	1.6%
Neck	4	Obese	1	1.6%
Back	1	Normal	7	11.5%
Back	1	Obese	2	3.3%
Back	2	Normal	10	16.4%
Back	2	Obese	7	11.5%
Back	3	Normal	1	1.6%

Most (70.4%) participants presented with a BMI within normal ranges and most of these participants (73.5%) underwent a neck fusion.

Table 4-5 Pre- and post-operative pain medication usages

	Pre-operative		Post-operative		
Type of medication	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**95% CI for the % dif for paired data**

Tramacet	25	41.0%	17	27.9%	[-22.9% ; -2.9%]*
Ibupain	34	55.7%	26	42.6%	[-22.6% ; -3.0%]*
Morphine	4	6.6%	1	1.6%	[-13.8% ; 2.4%]
Neurontam	14	23.0%	12	19.7%	[-11.1% ; 4.3%]
Lyrica	11	18.0%	11	18.0%	[-7.9% ; 7.9%]

* Indicates statistically significant difference

Ibupain was used by most (55.7%) of participants and Morphine was used by 6.6% of participants pre-operatively. Few (39.3%) of participants indicated using more than one type of pain medication to manage their pain experience pre-operatively. Ibupain remained the medication used most frequently (42.6%) post-operatively. Morphine usage was the lowest at 1.6% after a fusion.

Pre-operative sessions were conducted upon referral from the neurosurgeon and the time frame between pre-operative session and surgery therefore has no significance. Post-operative sessions however could be conducted any time after 6 weeks, and fewer weeks between surgery and post-operative session could indicate earlier return to functional participation and was therefore noted. The median weeks at which participants returned for the post-operative session was 10.3 weeks (range: 7.0-19.0).

Table 4-6 Type of fusion, weeks followed up post-operatively and days hospitalised

	Weeks followed-up		Days Hospitalised
Type of fusion	**Median (range)**	**95% CI for the % dif for paired data**	**Median (range)**
Neck (n=34)	10.5 (7.3-19.0)	[-0.3 ; 1.8]	1.0 (1.0-3.0)
Back (n=27)	10.3 (7.0-14.8)		4.0 (4.0-5.0)

Participants undergoing neck - and back fusion were compared regarding post-operative follow up period and there was no significant difference (95% CI [-0.3; 1.8]) in weeks to the post-operative follow up session. Participants remained in hospital after their fusion for a minimum of one day and a

maximum of 5 days, with the median number of days being two. Participants who underwent a back fusion were hospitalised statistical significantly longer than those undergoing a neck fusion (Wilcoxon two-sample test p-value: <0.01).

The post-operative demographic questionnaire also enquired if any complications developed post surgery. This was an open-ended question and participants specified what complication developed. The complications specified were: bladder infection (n=3, 4.9%), Deep Venous Thrombosis (n=3, 4.9%), Nerve impingement (n=3, 4.9%) and Sepsis (n=2, 3.3%).

4.3 PERSONALITY CHARACTERISTICS OF PARTICIPANTS

One`s personality characteristics remain relatively consistent throughout life and therefore the personality questionnaire was only completed pre-operatively and not repeated post-operatively. The 16PF5 (Cattell et al., 1993) provides comprehensive information regarding personality characteristics and traits, and was therefore the selected measurement instrument used for data collection on personality (cf. 3.6.1.2). Based on results obtained via the 16PF5 pre-operatively the following data pertain to the personality characteristics of the participants.

Firstly when reviewing the 16 primary factors as indicated by the 16PF5, all participants present with all 16 primary factors to a greater or lesser extent. A score between '1' and '3' is considered a low presentation of that specific personality characteristic, a score between '4' and '7' suggests moderate presentation of that specific personality characteristic and a score between '8' and '10' is considered a high presentation. For example if a participant obtains a score of '2' pertaining to warmth, he / she is considered to be more emotionally distant from others, whereas he / she obtained a score of '8' he / she is considered more attentive and warm towards others.

***Table 4-7 Primary factors of personality in participants* (n=16)**

Primary factor	Low	Moderate	High	Median (range)
Warmth	3.3%	95.1%	1.6%	5.0 (2.0-8.0)
Reasoning	27.8%	29.5%	42.6%	5.0 (1.0-10.0)
Emotional Stability	73.8%	26.2%	0	2.0 (1.0-7.0)
Dominance	8.2%	72.1%	19.7%	5.0 (3.0-10.0)
Liveliness	65.6%	8.2%	26.2%	3.0 (1.0-10.0)
Rule-consciousness	34.4%	45.9%	19.7%	4.0 (1.0-10.0)
Social Boldness	4.9%	91.8%	3.3%	5.0 (3.0-8.0)
Sensitivity	0	95.1%	4.9%	5.0 (4.0-9.0)
Vigilance	0	91.8%	8.2%	5.0 (4.0-10.0)
Abstractedness	3.3%	93.4%	3.3%	5.0 (3.0-8.0)
Privateness	0	91.8%	8.2%	5.0 (4.0-8.0)
Apprehension	44.3%	11.5%	44.3%	7.0 (1.0-10.0)
Openness to Change	4.9%	93.4%	1.6%	5.0 (3.0-8.0)
Self-Reliance	19.7%	75.4%	4.9%	5.0 (1.0-10.0)
Perfectionism	27.9%	14.8%	57.4%	8.0 (1.0-10.0)
Tension	42.6%	13.1%	44.3%	6.0 (1.0-10.0)

Emotional stability and liveliness presented with the lowest median value and perfectionism with the highest. The remaining ten primary factors depicted median values indicating neither an inclination for or opposite to the said primary factor.

Perfectionism (57.4%), tension (44.3%) and apprehension (44.3%) presented as high-indicated primary factors. Apprehension however was also indicated as low in 44.3% of the participants. Those indicating low apprehensiveness are more self-assured and unworried. Most (73.8%) participants indicated low emotional stability therefore they are more reactive and emotionally changeable. Liveliness was found in only 26.2% of the participants; indicating that the majority of the participants (65.6%) are more serious and cautious. Few (34.4%) participants indicated low rule-consciousness resulting in more expedient, non-conforming behaviour. High indication of reasoning was found in 42.6% of participants. Only 4.9% of the participants indicated being self-reliant and 19.7% of the participants are more group orientated and affiliated. Primary factors such as warmth

(95.1%), social boldness (91.8%), sensitivity (95.1%), vigilance (91.8%), abstractedness (93.4%), privateness (91.8%) and openness to change (93.4%) presented with moderate prevalence amongst participants.

The 16 primary factors are grouped together to form five global factors namely extraversion, independence, tough-mindedness, self-control and anxiety. When reviewing the median values of the global factors it should be noted that a value above 5.5 would be described as high and below 4.8 as low. Values between 4.8 and 5.5 are considered moderate.

The following table indicates frequency of participants whom indicated high experience of the specific five global factors.

Table 4-8 Global factors of personality in participants

Global factor	Frequency	Percentage	Median (range)
Extraversion	11	18.0%	3.3 (1.2-6.4)
Independence	32	52.5%	6.0 (1.6-8.5)
Tough-mindedness	35	57.4%	5.9 (1.2-9.1)
Self-Control	38	62.3%	6.1 (1.8-8.4)
Anxiety	34	55.7%	6.8 (1.1-10.0)

Extraversion presents as the global factor with the lowest median value and anxiety as the global factor with the highest median value. The maximum median value for anxiety is 10.0. Most participants (82.0%) displayed introverted characteristics. The characteristic of self-control was found to be the second most (62.3%).

4.4 PAIN PERCEPTION OF PARTICIPANTS

The NRS scale is an 11-point rating scale on which participants rated their experienced pain (cf. 3.6.1.3). On the NRS a score of '0' indicates no pain; '5' indicates moderate pain and '10' indicates the worst pain ever (Hawker et al., 2011). Pain on a level of 6/10 and higher is considered significant (Pag, Katz,

Stinson, Isaac, Martin-Pichora, & Campbell, 2012) and can be relayed as high-perceived intensity of pain. Experienced pain lower than 6/10 would be considered mild and can be classified as low experience of pain.

Table 4-9 Pre- and post-operative level of pain according to NRS

	Pre-operatively		Post-operatively	
Level of pain indicated	**Frequency**	**Percentage**	**Frequency**	**Percentage**
0	0	0	11	18.0%
1	10	16.4%	13	21.3%
2	11	18.0%	6	9.8%
3	5	8.2%	0	0
4	1	1.6%	3	4.9%
5	1	1.6%	0	0
6	3	4.9%	0	0
7	0	0	2	3.3%
8	11	18.0%	16	26.2%
9	12	19.7%	10	16.4%
10	7	11.5%	0	0
Low pain NRS <6	28	45.9%	33	54.1%
High pain NRS ≥6	33	54.1%	28	45.9%

(n=61)

The median pre-operative NRS score is 6 (range: 1 – 10) and post-operative NRS score is 4 (range: 0 – 9).

Pre-operatively few (11.5%) participants indicated on the NRS experiencing 10/10 pain, indicating the worst possible level of pain, whilst 16.4% of participants indicated experiencing 1/10 pain, which is a low intensity of pain. Post-operatively a few (18.0%) participants indicated experiencing no pain at all post fusion, whilst only 10 participants expressed severe pain rated as 9/10. No one rated their pain as the worst possible pain ever post fusion.

Pre-operatively 54.1% of the participants indicated pain above 6/10 on the NRS pre-operatively, whilst less than half (45.9%) indicated high pain post-operatively. The median level of difference in pre-and post-operative NRS scores is 1.0 (range: 0-9.0), this indicates a statically significant improvement in NRS score from pre-operative to post-operative phase (Wilcoxon Signed

Rank test p-value <0.01), indicating an improvement in the overall pain perception of participants.

In addition to the NRS participants completed either the Oswestry Disability Index (ODI) (Fairbank, 1980) or the Neck Disability Index (NDI) (Vernon, 1992).

The ODI is a self-report questionnaire specifically designed to determine to what extent back pain influences activity participation thereby indicating the functional impairment due to pain. There are ten different sections and participants rate their pain according to descriptions from '0' to '5' in each section. Zero would typically be the description that indicates the least amount of impairment due to pain, whilst '5' would be the worst impairment i.e. in section four the description 'I have no pain on walking' is indicated as '0', whilst the description 'I cannot walk at all without increasing pain' is indicated as '5'. Only the 27 participants who underwent a back fusion completed the ODI questionnaire.

Table 4-10 Pre- and post-operative ODI section results (n=27)

	Pre-operative			Post-operative		
Score	**Frequency**	**Percentage**	**Median range**	**Frequency**	**Percentage**	**Median range**
Section 1: Pain intensity			3.0 (0-5.0)			2.0 (0-5.0)
0	1	3.7%		5	18.5%	
1	7	25.9%		7	25.9%	
2	3	11.1%		3	11.1%	
3	3	11.1%		4	14.8%	
4	7	25.9%		5	18.5%	
5	6	22.2%		3	11.1%	
Section 2: Personal care			3.0 (1.0-5.0)			2.0 (0-4.0)
0	0	0		2	7.4%	
1	4	14.8%		10	37.0%	
2	9	33.3%		2	7.4%	
3	5	18.5%		6	22.2%	
4	8	29.6%		7	25.9%	
5	1	3.7%		0	0	
Section 3: Lifting			3.0 (0-5.0)			3.0 (0-5.0)
0	1	3.7%		7	25.9%	

1	8	29.6%		4	14.8%	
2	2	7.4%		2	7.4%	
3	7	25.9%		7	25.9%	
4	7	25.9%		6	25.9%	
5	2	7.4%		1	3.7%	
Section 4: Walking			3.0 (0-5.0)			2.0 (0-5.0)
0	1	3.7%		5	18.5%	
1	5	18.5%		5	18.5%	
2	4	14.8%		5	18.5%	
3	8	29.6%		5	18.5%	
4	5	18.5%		6	22.2%	
5	4	14.8%		1	3.7%	
Section 5: Sitting			2.0 (0-5.0)			2.0 (0-5.0)
0	1	3.7%		1	3.7%	
1	1	3.7%		9	33.3%	
2	13	48.2%		6	22.2%	
3	3	11.1%		2	7.4%	
4	4	14.8%		6	22.2%	
5	5	18.5%		3	11.1%	
Section 6: Standing			3.0 (0-5.0)			2.0 (0-4.0)
0	1	3.7%		5	18.5%	
1	11	40.7%		8	29.6%	
2	1	3.7%		3	11.1%	
3	7	25.9%		6	22.2%	
4	5	18.5%		5	18.5%	
5	2	7.4%		0	0	
Section 7: Sleeping			3.0 (1.0-5.0)			2.0 (0-5.0)
0	0	0		5	18.5%	
1	9	33.3%		7	25.9%	
2	3	11.1%		2	7.4%	
3	9	33.3%		7	25.9%	
4	4	14.8%		5	18.5%	
5	2	7.4%		1	3.7%	
Section 8: Social Life			3.0 (0-5.0)			2.0 (0-5.0)
0	3	11.1%		6	22.2%	
1	5	18.5%		5	18.5%	
2	5	18.5%		4	14.8%	
3	1	3.7%		1	3.7%	
4	11	40.7%		10	37.0%	
5	2	7.4%		1	3.7%	
Section 9: Traveling			2.0 (0-4.0)			2.0 (0-4.0)
0	1	3.7%		7	25.9%	
1	8	29.6%		6	22.2%	
2	5	18.5%		1	3.7%	
3	6	22.2%		11	40.7%	
4	7	25.9%		2	7.4%	

Section 10: Changing degree of pain			4.0 (1.0-5.0)			3.0 (0-5.0)
1	10	37.0%		5	18.5%	
2	2	7.4%		8	29.6%	
3	1	3.7%		6	22.2%	
4	9	33.3%		7	25.9%	
5	5	18.5%		1	3.7%	

Pre-operative results indicate that only one participant indicated a '0' in section one stating that the pain 'comes and goes and is very mild'. Almost half (48.1%) of the participants indicated a score of '4' and above, which indicates that their pain experience is very severe. Almost half (48.1%) of the participants did not need to change the way they bath and dress although participation in these activities may increase pain (scores below 3). Only one participant indicated that they are unable to do any washing and dressing without help. More than half (59.2%) of participants struggle lifting weights with two participants being completely unable to lift any weights (scores above 2). The majority (62.9%) of participants are only able to walk less than 800m due to pain (scores above 2). Sitting is most affected due to pain and the majority (92.6%) of participants could sit for only an hour or less (scores above 1), with five participants avoiding to sit at all. Only one participant reported being able to stand for extended time periods without pain. More than half (55.5%) of participants experience sleep disturbance due to pain (scores above 2). Social life participation is not affected (scores below 3) for less than half (48.1%) of participants. Most (66.6%) participants experience difficulty with traveling and are forced to alter their mode of travel (scores below 2). The majority (51.8%) of participants relayed that their pain is worsening (scores above 3).

Post-operative results indicated that the majority (55.5%) of participants experienced mild to moderate pain (scores below 3). In the second section most (51.8%) participants indicated that they remain independent in self-care tasks even if mild pain is experienced during participation (scores below 3). More than half (55.5%) of participants continue to struggle with load handling

post fusion and is unable to manage heavy weights (scores above 2). Less than half (44.4%) of participants are unable to walk 800m or less (scores above 2). Sitting remains affected in less than half (40.8%) of participants being unable to sit for more than half an hour (scores above 1). Post fusion, fewer (48.1%) of participants indicated being able to stand as long as they wish to (scores below 2). More than half (51.8%) of participants have limited reduction in sleep due to pain post fusion (scores below 3). Only one participant felt they hardly have any social life because of the pain after their back fusion. Less than half (48.1%) of participants are compelled to utilise alternative forms of travel due to pain (scores above 2). The majority (70.3%) of participants indicated that their level of pain is improving after their fusion (scores below 4).

The results of the ten sections of the ODI are combined to calculate a percentage of functional impairment. The total percentage is interpreted as follow: Scores from 0% to 20% indicates minimal disability; 20% to 40%, moderate disability; 40% to 60%, severe disability; 60% to 80%, crippled; and 80% to 100%, bedbound or exaggerating.

These percentages classification is grouped from 1 to 5, '1' being 0% to 20% and '5' being 80% to 100% (Fairbank, 1980).

Table 4-11 Pre- and post-operative ODI functional impairment (n=27)

	Pre-operative		Post-operative	
ODI Group	**Frequency (n=27)**	**Percentage**	**Frequency (n=27)**	**Percentage**
1	2	7.4%	10	37.0%
2	10	37.0%	3	11.1%
3	1	3.7%	2	7.4%
4	8	29.6%	10	37.0%
5	6	22.2%	2	7.4%

Bhapkar test p-value 0.04

The median value of the ODI results was 66.0% with the minimum value being 16.0% and the maximum value being 92.0%. The median value falls within the functional classification of 'crippled' (Fairbank, 1980) pre-operatively. Post-operatively the median value of the ODI results was 46.0% with the minimum value being 6.0% and the maximum value being 86.0%. The median value falls within the functional classification of 'severe disability' (Fairbank, 1980), which indicates an improvement in group classification from pre-operative to post-operative session. Impairment due to pain is statistically significant less from pre-operative to post-operative session (95% CI for the median difference [4; 14]).

The NDI (Vernon, 1992) is a modification of the ODI and pertains to neck pathologies. It also consists of ten sections although the descriptions of these sections differ from ODI sections as descriptions relate to specific pathology. Zero however still remains the least functionally impairing and '5' the most i.e. in section four the description 'I can read as much as I want to with no pain in my neck' is indicated as '0', whilst the description 'I cannot read at all' is indicated as '5'. The rest of the scoring remains the same as the ODI and the NDI has the same classification. The 34 participants who underwent a neck fusion completed this questionnaire.

Table 4-12 Pre- and post-operative NDI section results (n=34)

	Pre-operative			Post-operative		
Score	**Frequency**	**Percentage**	**Median (range)**	**Frequency**	**Percentage**	**Median (range)**
Section 1: Pain intensity			3.0 (1.0-5.0)			1.0 (0-5.0)
0	0	0		9	26.5%	
1	13	38.2%		9	26.5%	
2	2	5.8%		1	2.9%	
3	3	8.8%		3	8.8%	
4	8	23.5%		8	23.5%	
5	8	23.5%		4	11.8%	
Section 2: Personal care			2.5 (0-5.0)			1.0 (0-5.0)
0	11	7.4%		15	44.1%	
1	5	37.0%		4	11.8%	

2	1	7.4%		0	0	
3	3	22.2%		3	8.8%	
4	11	25.9%		11	32.4%	
5	3	8.8%		1	2.9%	
Section 3: Lifting			3.0 (0-5.0)			2.5 (0-5.0)
0	5	14.7%		11	32.4%	
1	9	26.5%		5	14.7%	
2	0	0		1	2.9%	
3	6	17.7%		5	14.7%	
4	11	32.4%		11	32.4%	
5	3	8.8%		1	2.9%	
Section 4: Reading			3.5 (0-5.0)			1.0 (0-5.0)
0	3	8.8%		9	26.5%	
1	8	23.5%		9	26.5%	
2	5	14.7%		0	0	
3	1	2.9%		2	5.9%	
4	10	29.4%		12	35.3%	
5	7	20.6%		2	5.9%	
Section 5: Headaches			3.0 (0-5.0)			1.0 (0-4.0)
0	2	5.8%		7	20.6%	
1	13	38.2%		11	32.4%	
2	1	2.9%		0	0	
3	4	11.8%		6	17.7%	
4	13	38.2%		10	29.4%	
5	1	2.9%				
Section 6: Concentration			2.5 (0-5.0)			1.0 (0-5.0)
0	3	8.8%		9	26.5%	
1	12	35.3%		9	26.5%	
2	2	5.9%		8	23.5%	
3	7	20.6%		6	17.7%	
4	7	20.6%		2	5.9%	
5	3	8.8%		0	0	
Section 7: Work			2.0 (0-5.0)			1.0 (0-5.0)
0	1	2.9%		9	26.5%	
1	10	29.4%		9	26.5%	
2	7	20.6%		1	2.9%	
3	0	0		1	2.9%	
4	8	23.5%		10	29.4%	
5	8	23.5%		4	11.8%	
Section 8: Driving (n=33)			3.0 (0-5.0)			1.0 (0-5.0)
0	10	30.3%		12	36.4%	
1	4	12.1%		5	15.2%	
2	2	6.1%		0	0	
3	4	12.1%		5	15.2%	
4	8	24.2%		9	27.3%	
5	5	15.2%		2	6.1%	

Section 9: Sleeping			2.5 (0-5.0)			1.5 (0-5.0)
0	8	23.5%		14	41.2%	
1	7	20.6%		3	8.8%	
2	2	5.9%		2	5.9%	
3	5	14.7%		8	23.5%	
4	8	23.5%		6	17.7%	
5	4	11.8%		1	2.9%	
Section 10: Recreation			3.0 (0-5.0)			2.0 (0-5.0)
0	1	2.9%		6	17.7%	
1	9	26.5%		10	29.4%	
2	6	17.7%		2	5.9%	
3	2	5.9%		4	11.8%	
4	10	29.4%		8	23.5%	
5	6	17.7%		4	11.8%	

Pre-operative results indicate that more than half (55.8%) of the participants experienced severe pain (scores above 3). Personal care tasks were affected and required assistance (scores above 2) in the half (50.0%) of participants. The majority (58.9%) of participants struggled with load handling and is bound to lift only light weights (scores above 2). Reading is disturbed (scores above 1) in most (67.6%) participants and have been affected to such an extent that ten participants can hardly read at all due to pain. Only two participants indicated having no headaches, the rest (94.2%) all struggle with headaches with 1 participant indicating having headaches all the time. More than half (55.9%) of the participants indicated struggling with concentration (scores above 1) to a lesser or greater extent. Work is greatly affected in almost half (47.0%) of the participants (scores above 2). Less than half (48.5%) of the participants can drive for periods as long as they want to (scores above 1). Severe sleep disturbances were recorded by the lesser (35.3%) of participants (scores above 3). The majority (70.6%) of participants experience difficulty engaging in their usual recreation activities due to pain (scores above 1).

Post-operative results indicate that more than half (55.9%) of participants reported mild to no pain (scores below 3). The minority (44.1%) of

participants still requires assistance with personal-care tasks due to pain (scores above 2). Half (50%) of the participants can continue to manage moderate to heavy load handling (scores below 3). Reading remains unaffected in more than half (58.9%) of participants (scores below 2) and more than half (53%) of the participants experience no or mild headaches (scores below 2). Concentration difficulties were reported in the majority (52.9%) of participants (scores above 1). More than half (55.9%) of participants indicated that their work is mildly influenced by pain but that they could continue with their usual work tasks (scores below 3), 4 participants however indicated that they could not work because of pain. Fewer (48.6%) participants were unable to drive as long as they wish to due to pain (scores above 2), than the amount of participants independent in driving. Sleep and recreational participation are not affected in more than half (55.9% and 53% respectively) of the participants after their neck fusion (scores below 2).

Again as with ODI the results of the 10 sections of the NDI are combined to calculate a percentage of functional impairment. These percentages classification is grouped from 1 to 5, '1' being 0% to 20% and '5' being 80% to 100% (Fairbank, 1980).

Table 4-13 Pre- and post-operative NDI functional impairment (n=34)

	Pre-operative		Post-operative	
NDI Group	**Frequency (n=34)**	**Percentage**	**Frequency (n=34)**	**Percentage**
1	10	29.4%	16	47.1%
2	6	17.7%	2	5.9%
3	2	5.9%	1	2.9%
4	11	32.4%	10	29.4%
5	5	14.7%	5	14.7%

Bhapkar test p-value 0.39

Pre-operatively the median value of the NDI results was 49.0% with the minimum value being 8.0% and the maximum value being 86.0%. This

median value falls within the functional classification of 'severe disability' (Vernon, 1992). The median value of the NDI results post-operatively was 24.2% with the minimum value being 2.0% and the maximum value being 90.0%. This median value falls within the functional classification of 'moderate disability' (Vernon, 1992). The NDI group has improved from severe impairment to moderate impairment, the difference in median values from pre-operative to post-operative sessions is however not statistically significant (95% CI [-2; 8]).

As previously indicated the ODI and NDI scoring classification is the same and therefore these results could be combined to provide 5 groups of functional impairments. Group 1 being the least impaired with scores from 0% to 20% and group 5 being the most impaired with scores from 80% to 100%. Group 1 and 2 indicates low functional impairment, whilst group 3, 4 and 5 indicates high functional impairments (Fairbank, 1980).

Table 4-14 Pre- and post-operative combined ODI and NDI functional impairment (n=61)

	Pre-operative		Post-operative		
Functional group	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**95% CI for the % dif for paired data**
1	12	19.7%	26	42.6%	[11.7% ; 33.6%]*
2	16	26.2%	5	8.2%	[-29.1% ; -7.9%]*
3	3	4.9%	3	4.9%	[-7.6% ; 7.6%]
4	19	31.2%	20	32.8%	[-11.7% ; 8.5%]
5	11	18.0%	7	11.5%	[-2.2% ; 16.0%]
Functional impairment					
Low	28	45.9%	31	50.8%	[1.3% ; 11.0%]*
High	33	54.1%	30	49.2%	

* Indicates statistically significant difference

A third (31.2%) of the participants indicated experiencing crippling pain with impairments ranging between 60% and 80% pre-operatively. More than half

(54.1%) of the participants had high functional impairments due to experienced pain pre-operatively.

Few (42.6%) of the participants indicated experiencing minimally disabling pain post fusion with functional impairments ranging between 0% and 20%. Less than half (49.2%) of the study participants had high functional impairments after their fusion due to experienced pain.

There was not a statistically higher pain experience pre-operatively than post-operatively, according to combined NRS and ODI/NDI results (95% CI [-1.3% ; 11.0%].

4.5 SELF-CARE RATING OF PARTICIPANTS

The individualised self-care rating scale (cf. Addendum P) listed components that were representative of each self-care activity that was applicable to spinal fusion patients. The participant indicated on the checklist whether they performed the activity or not. Participants who indicated yes next to a self-care activity went on to rate that self-care activity in the adjacent columns according to level of performance, importance and satisfaction (cf. 3.6.1.4).

Table 4-15 Pre- and post-operative self-care rating (performance, importance and satisfaction) (n=61)

	Pre-op	Post-op	p-value	Pre-op	Post-op	p-value	Pre-op	Post-op	p-value
	Performance	Performance		Importance	Importance		Satisfaction	Satisfaction	
Self-Care tasks (n=61)	Median (range)	Median (range)		Median (range)	Median (range)		Median (range)	Median (range)	
Mobilise in and out of shower	4.0 (2.0-4.0)	4.0 (3.0-4.0)	0.5000	4.0 (4.0-4.0)	4.0 (4.0-4.0)		4.0 (1.0-4.0)	4.0 (3.0-4.0)	0.25
Washing body within the shower	4.0 (2.0-4.0)	4.0 (2.0-4.0)	<.0001	4.0 (4.0-4.0)	4.0 (4.0-4.0)		4.0 (1.0-4.0)	4.0 (2.0-4.0)	<.0001
Dry body after shower	4.0 (2.0-4.0)	4.0 (2.0-4.0)	<.0001	4.0 (3.0-4.0)	4.0 (3.0-4.0)		4.0 (1.0-4.0)	4.0 (2.0-4.0)	<.0001
Retrieve clothing from its storage place	4.0 (3.0-4.0)	4.0 (4.0-4.0)	0,5	4.0 (4.0-4.0)	4.0 (4.0-4.0)		4.0 (1.0-4.0)	4.0 (4.0-4.0)	0.5
Apply socks and/ shoes	4.0 (1.0-4.0)	4.0 (2.0-4.0)	<.0001	4.0 (3.0-4.0)	4.0 (3.0-4.0)	1.0	4.0 (1.0-4.0)	4.0 (1.0-4.0)	<.0001
Apply underwear and pants	4.0 (2.0-4.0)	4.0 (2.0-4.0)	<.0001	4.0 (3.0-4.0)	4.0 (3.0-4.0)		4.0 (1.0-4.0)	4.0 (2.0-4.0)	<.0001
Apply over garments	4.0 (2.0-4.0)	4.0 (2.0-4.0)	0,125	4.0 (4.0-4.0)	4.0 (4.0-4.0)		4.0 (1.0-4.0)	4.0 (2.0-4.0)	0.125
Walk from one area to another	4.0 (3.0-4.0)	4.0 (4.0-4.0)	1	4.0 (4.0-4.0)	4.0 (4.0-4.0)		4.0 (1.0-4.0)	4.0 (4.0-4.0)	1
Roll in bed	4.0 (2.0-4.0)	4.0 (2.0-4.0)	1	4.0 (4.0-4.0)	4.0 (4.0-4.0)		4.0 (1.0-4.0)	4.0 (1.0-4.0)	1
Move from lying position to sitting	4.0 (2.0-4.0)	4.0 (2.0-4.0)	0,0625	4.0 (3.0-4.0)	4.0 (3.0-4.0)		4.0 (1.0-4.0)	4.0 (2.0-4.0)	0.0313
Get up from a sitting position	4.0 (2.0-4.0)	4.0 (2.0-4.0)	0,0005	4.0 (3.0-4.0)	4.0 (3.0-4.0)		4.0 (1.0-4.0)	4.0 (2.0-4.0)	0.0001
Remove body hair (n=50)	4.0 (1.0-4.0)	4.0 (1.0-4.0)	0,0005	4.0 (2.0-4.0)	4.0 (2.0-4.0)	1	4.0 (1.0-4.0)	4.0 (2.0-4.0)	0.0005
Applying and removing cosmetics (n=32)	4.0 (2.0-4.0)	4.0 (3.0-4.0)	0,002	4.0 (2.0-4.0)	4.0 (2.0-4.0)		4.0 (2.0-4.0)	4.0 (4.0-4.0)	0.001
Washing hair (n=59)	4.0 (2.0-4.0)	4.0 (2.0-4.0)	0,001	4.0 (2.0-4.0)	4.0 (2.0-4.0)	1	4.0 (1.0-4.0)	4.0 (2.0-4.0)	0.0039

Drying and styling hair (n=34)	4.0 (1.0-4.0)	4.0 (2.0-4.0)	<.0001	4.0 (2.0-4.0)	4.0 (2.0-4.0)	1	4.0 (1.0-4.0)	4.0 (1.0-4.0)	<.0001
Caring for finger nails (n=52)	4.0 (2.0-4.0)	4.0 (3.0-4.0)	0,5	4.0 (3.0-4.0)	4.0 (3.0-4.0)		4.0 (1.0-4.0)	4.0 (3.0-4.0)	0.5
Caring for toe nails (n=48)	3.0 (1.0-4.0)	3.0 (2.0-4.0)	<.0001	4.0 (2.0-4.0)	4.0 (2.0-4.0)		4.0 (1.0-4.0)	4.0 (2.0-4.0)	<.0001
Caring for skin	4.0 (2.0-4.0)	4.0 (2.0-4.0)	0,0313	4.0 (2.0-4.0)	4.0 (2.0-4.0)		4.0 (1.0-4.0)	4.0 (2.0-4.0)	0.0313
Cleaning mouth; brushing/ flossing teeth	4.0 (1.0-4.0)	4.0 (2.0-4.0)	<.0001	4.0 (4.0-4.0)	4.0 (4.0-4.0)		4.0 (1.0-4.0)	4.0 (2.0-4.0)	<.0001
Engage in sexual intercourse (n=46)	3.0 (1.0-4.0)	3.0 (2.0-4.0)	<.0001	4.0 (2.0-4.0)	4.0 (2.0-4.0)		3.0 (1.0-4.0)	3.0 (1.0-4.0)	<.0001
Manipulate clothing when going to the toilet	4.0 (2.0-4.0)	4.0 (3.0-4.0)	0,25	4.0 (4.0-4.0)	4.0 (4.0-4.0)		4.0 (1.0-4.0)	4.0 (2.0-4.0)	0.125
Maintain toileting position	4.0 (3.0-4.0)	4.0 (3.0-4.0)	1	4.0 (3.0-4.0)	4.0 (3.0-4.0)		4.0 (1.0-4.0)	4.0 (4.0-4.0)	1
Transferring to and from toileting position	4.0 (3.0-4.0)	4.0 (4.0-4.0)	0,5	4.0 (4.0-4.0)	4.0 (4.0-4.0)		4.0 (1.0-4.0)	4.0 (4.0-4.0)	0.5
Cleaning body after toileting	4.0 (2.0-4.0)	4.0 (2.0-4.0)	0,0078	4.0 (4.0-4.0)	4.0 (4.0-4.0)		4.0 (1.0-4.0)	4.0 (1.0-4.0)	0.0156

The Wilcoxon Signed Rank test for paired nonparametric data was used in the above table. Median values` of '1' indicates that the participant requires maximal assistance, '2' indicates moderate assistance, '3' indicates some assistance and '4' indicates that participants are completely independent in these tasks. The following self-care tasks median values suggest that participants required some assistance with these tasks pre-operatively: drying body after shower, applying underwear and pants and washing hair. Self-care tasks namely: applying socks and shoes, drying and styling hair, caring for toe nails and engaging in sexual intercourse median values suggest that participants require moderate assistance in performing these activities pre-operatively.

Post-operatively there was a statically significant improvement noted in the level of independence in: washing body within the shower, drying body after shower, applying socks and/ shoes, applying underwear and pants, applying and removing cosmetics, drying and styling hair, cleaning mouth and brushing/flossing teeth. Although an improvement was noted, median values suggest that participants still require some assistance with caring for toenails and engaging in sexual intercourse.

Participants indicating a value of '4' for a specific self-care task are considered to be completely independent in that self-care task. The following table depicts the percentage of participants that is considered fully independent in specific self-care tasks.

Table 4-16 Pre- and post-operative fully independent in self-care tasks (n=61)

	Pre-operatively		Post-operatively		
Self-Care tasks (n=61)	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**95% CI for the % dif for paired data**
Mobilise in and out of shower	51	83.6%	53	86.9%	[-10.4%; 3.1%]
Washing body within the shower	36	59.0%	51	83.6%	[-35.6%; -13.1%]*
Dry body after shower	29	47.5%	47	77.1%	[-40.5% ; -17.1%]*
Retrieve clothing from its storage place	59	96.7%	61	100.0%	[-11.2% ; 3.1%]
Apply socks and/ shoes	11	18.0%	32	52.5%	[-45.8% ; -21.4%]*
Apply underwear and pants	16	26.2%	35	57.4%	[-42.1% ; -18.5%]*
Apply over garments	52	85.3%	55	90.2%	[-13.0% ; 2.1%]
Walk from one area to another	60	98.4%	61	100.0%	[-8.7% ; 4.4%]
Roll in bed	58	95.1%	59	96.7%	[-9.0% ; 4.9%]
Move from lying position to sitting	49	80.3%	53	86.9%	[-14.9% ; 0.8%]
Get up from a sitting position	36	59.0%	43	70.5%	[-19.9% ; -2.8%]*
Remove body hair (n=50)	27	54.0%	36	72.0%	[-28.7% ; -6.5%]*
Applying and removing cosmetics (n=32)	21	65.6%	31	96.9%	[-48.6% ; -13.0%]*
Washing hair (n=59)	27	45.8%	37	62.7%	[-26.4% ; -6.7%]*
Drying and styling hair (n=34)	2	5.9%	18	52.9%	[-62.8% ; -27.3%]*
Caring for finger nails (n=52)	41	78.9%	43	82.7%	[-11.7% ; 3.4%]
Caring for toe nails (n=48)	5	10.4%	21	44.7%	[-47.5% ; -19.2%]*
Caring for skin	53	86.9%	59	96.7%	[-20.0% ; -1.5%]*

Cleaning mouth; brushing/flossing teeth	38	62.3%	53	86.9%	[-35.8% ; -13.2%]*
Engage in sexual intercourse (n=46)	1	2.2%	14	30.4%	[-42.6% ; -14.1%]*
Manipulate clothing when going to the toilet	49	80.3%	51	83.6%	[-10.1% ; 3.0%]
Maintain toileting position	59	96.7%	60	98.4%	[-9.2% ; 5.0%]
Transferring to and from toileting position	59	96.7%	61	100.0%	[-11.2% ; 3.1%]
Cleaning body after toileting	38	62.3%	45	73.8%	[-20.1% ; -2.8%]*

* Indicates statistically significant deference

The most affected areas of self-care pre-operatively as seen in table 4-16 are caring for toe nails (only 10.4% of participants independent), drying and styling hair (only 5.9% of participants independent) and engaging in sexual intercourse (only 2.2% of participants independent).

Self-care tasks with the highest percentage of independence pre-operatively are: walking from one area to another (98.4%), maintaining toileting position (96.7%) and transferring to and from toileting position (96.7%).

The most affected areas of self-care post-operatively remains caring for toe nails, drying and styling hair, applying socks and shoes and engaging in sexual intercourse.

All participants are independent in the following self-care tasks post fusion: mobilising in and out of shower, retrieving clothing from its storage place, walking from one area to another, applying and removing cosmetics, caring for finger nails, manipulating clothing when going to the toilet, maintain toileting position and transferring to and from toileting position.

4.6 GOAL ATTAINMENT OF PARTICIPANTS

The second instrument utilised in the measurement of individualised self-care outcomes was the Goal Attainment Scale (Kiresuk & Sherman, 1968). This is an evaluation scale, which assists in providing quantification of progress achieved in terms of goal attainment. A 5-point scale is generally utilised and ranges from '-2 up to 2'. The scale is individualised according to the patients` functioning and realistic goals in which instances '-2 ' will indicate the patients` pre-treatment level, '-1 ' will represent progression towards goal, but not yet attainment thereof, '0' indicates attainment of treatment goal and '+1' and '+2' surpasses attainment of goal (cf. 3.6.1.4).

Based on the self-care rating results each participant established 2 goals and then rated these goals on the GAS.

Pre-operatively both the first and second goals of participants` median were -2.0 with the minimum value being '-2' and maximum value being '-1.0'. The median value indicates that participants still functioned at their pre-treatment level and that goals were not obtained yet. The maximum value of -1.0 indicates that those participants had started progressing towards their goals, but goals had still not been reached.

Post-operatively both the first and second goals of participants displayed a median of 2.0 (range: -2 - 2). The median value indicates that participants surpassed attainment of goals. Additionally 73.8% of participants indicated achieving their first goal and 70.5% indicated achieving their second goal. Most (75.4%) participants achieved their goals.

4.7 ASSOCIATIONS BETWEEN RESULTS

Pre-operative and post-operative results were utilised to determine certain associations amongst results. The following section will focus on these

associations and results will again be depicted in accordance with questionnaires completed by participants.

4.7.1. Personality Characteristics

Emotional stability (2.0) and liveliness (3.0) presented with the lowest median value and perfectionism with the highest (8.0). The remaining primary factors depicted median values indicating neither an inclination for or opposite to the said primary factor (cf. table 4-6). Based on afore-mentioned these 3 primary factors were highlighted and compared with goal attainment.

No difference was found between participants with low (73.3%) and moderate (81.3%) emotional stability and their goal attainment (95% CI [-26.7%; 18.6%]).

Table 4-17 Specific primary factors and goal attainment (n=61)

	Frequency	Low	Frequency	Medium	Frequency	High
Liveliness (n=61)	40	100.0%	4	80.0%	2	12.5%
Perfectionism (n=61)	5	29.4%	6	66.7%	35	100.0%

More participants who displayed serious traits (n=40) rather than lively traits (n=2) attained their goals (95% CI [62.4%; 96.6%]).

Statistically significant more participants with high perfectionism traits attained their goals than participants with low perfectionism traits (95% CI [-86.7%; -44.9%]). All participants who displayed high perfectionistic traits (n=35) attained their rehabilitation goal.

As previously indicated emotional stability (2.0) and liveliness (3.0) presented with the lowest median value and was therefore further associated with pre- and post-operative high intensity pain according to the NRS (≥6) (Pag et al., 2012).

Table 4-18 Primary factors and High Pre-operative/ Post-operative NRS (n=61)

	Pre-operative						Post-operative					
n=61	Freq	Low	Freq	Mod	Freq	High	Freq	Low	Freq	Mod	Freq	High
Emotional Stability	29	64.4 %	4	25.0%	0	0	27	60.0 %	1	6.3%	0	0
Liveliness	16	40.0 %	4	80.0%	13	81.3 %	13	32.5 %	2	40.0 %	13	81.3 %

Results indicated statistically significant higher pre-operative pain experience amongst participants with low emotional stability (95% CI [10.9%; 58.7%]) than those with high emotional stability. Similar results were obtained post-operatively (95% CI [27.3%; 67.7%]). Participants with high liveliness displayed statistically significant more pain than those with low levels of liveliness (95% CI [-59.5%; -12.5%]) pre-operatively and post-operatively (95% CI [-66.1%; -20.0%]).

The five global factors were associated with pre- and post-operative high intensity pain according to the NRS (≥6) (Pag et al., 2012).

Table 4-19 Global factors and High Pre-operative/ Post-operative NRS (n=61)

	Pre-operative						Post-operative					
n=61	Freq	Low	Freq	Mod	Freq	High	Freq	Low	Freq	Mod	Freq	High
Anxiety	0	0	0	0	33	97.1%	0	0	0	0	28	82.4%
Independence	19	90.5%	7	87.5%	7	21.9%	16	76.2%	5	62.5%	7	21.9%
Tough-mindedness	15	100.0%	10	90.9%	8	22.9%	14	93.3%	9	81.8%	5	14.3%
Self-control	18	85.7%	0	0.0%	15	39.5%	16	76.2%	0	0.0%	12	31.6%
Extraversion	26	52.0%	4	66.7%	3	60.0%	23	46.0%	3	50.0%	2	40.0%

Anxiety measures as the global factor associated with the highest experience of pain both pre- and post-operative. Tough-mindedness is associated with the lowest experience of pain both pre- and post-operative.

Table 4-20 95% CI for comparison of levels of global factors and High Pre-operative/ Post-operative NRS (n=61)

Pre-operative	Low-Moderate	Low-High	Med-High
Anxiety		[-99.5%; -79.8%]*	
Independence	[-19.0%; 38.2%]	[42.9%, 81.4%]*	[27.1%; 80.6%]*
Tough-mindedness	[-12.6%; 37.7%]	[51.1%; 87.9%]*	[35.2%; 81.2%]*
Self-control	[16.9%; 95.0%]*	[20.5%; 62.9%]*	[-55.3%; 27.7%]
Extraversion	[-41.9%; 24.3%]	[-39.3%; 31.2%]	[-39.6%; 50.5%]
Post-operative			
Anxiety		[-91.7%; -62.2%]*	
Independence	[-18.2%; 48.2%]	[27.2%; 71.4%]*	[4.5%; 66.8%]*
Tough-mindedness	[-15.1%; 41.5%]	[51.4%; 88.8%]*	[34.4%; 82.8%]*
Self-control	[7.1%; 89.4%]*	[18.1%; 62.8%]*	[-47.5%; 35.4%]
Extraversion	[-37.8%; 30.1%]	[-33.2%; 37.3%]	[-38.4%; 52.1%]

* Indicates statistically significant difference

A statistically significant difference (95% CI [-99.5%; -79.8%]) between participants with low or high presence of anxiety and their pre-operative rating of pain on the NRS was found. Similar results were obtained post-operatively (95% CI [-91.7%; -62.2%]). High anxiety attributed to high scoring on the NRS indicating that these participants experienced pain on or above 6/10 pre-operatively and post-operatively.

Pre-operatively participants with low independence characteristics had statistically significant more pain when compared to participants with high independence characteristics (95% CI [42.9%; 81.4%]). Participants with moderate independence characteristics also displayed statistically significant more pain when compared to participants with high independence characteristics (95% CI [27.1%; 80.6%]). There was no statistically significant difference between participants with low independence characteristics compared to participants with moderate independence characteristics (95% CI [-19.0%; 38.2%]). Similarly post-operatively it was found that statistically significant more participants with low independence characteristics compared to participants with high independence characteristics had pain (95% CI [27.2%; 71.4%]) and for participants with

moderate independence characteristics compared to participants with high independence characteristics had pain (95% CI [4.5%; 66.8%]). Participants with low independence indicated high levels of pain on NRS both pre-operatively and post-operatively.

Pre-operatively participants with low tough-mindedness characteristics displayed statistically significant more pain when compared to participants with high tough-mindedness characteristics (95% CI [51.1%; 87.9%]). This was also the case post-operatively (95% CI [51.4%; 88.8%]). Participants with moderate tough-mindedness characteristics also displayed statistically significant more pain when compared to participants with high tough-mindedness characteristics both pre-operatively (95% CI [35.2%; 81.2%]) and post-operatively (95% CI [34.4%; 82.8%]).

Participants with low self-control characteristics displayed statistically significant more pain when compared to participants with moderate self-control characteristics pre-operatively (95% CI [16.9%; 95.0%]) and post-operatively (95% CI [7.1%; 89.4%]). Participants with low self-control characteristics also displayed statistically significant more pain when compared to participants with high self-control characteristics pre-operatively (95% CI [20.5%; 62.9%]) and post-operatively (95% CI [18.1%; 62.8%]). There was no statistically significant difference between participants with moderate self-control characteristics compared to participants with high self-control characteristics pre-operatively (95% CI [-55.3%; 27.7%]) or post-operatively (95% CI [-47.5%; 35.4%]).

No statistically significant difference was found between participants with low, moderate or high extraversion and their perception of pain pre-operatively (95% CI [-39.3%; 31.2%]) or post-operatively (95% CI [-33.2%; 37.3%]).

4.7.2. Pain perception of participants

Functional groups 1 and 2 of the ODI/NDI were grouped together as low functional impairment due to pain, whereas functional groups 3, 4 and 5 were grouped together as high functional impairment due to pain.

In the following table the frequency of participants with high experienced of specific global factors and low or high functional experience due to pain is depicted.

Table 4-21 High presence of global factor and Functional impairment due to pain (n=61)

	Frequency	Low	Frequency	High	95% CI
Anxiety	5	16.1%	29	96.7%	[-90.0%; -59.3%]*
Independence	24	77.4%	8	26.7%	[26.0%; 67.5%]*
Tough-mindedness	28	90.3%	7	23.3%	[43.7%; 80.2%]*
Self-control	26	83.9%	12	40.0%	[19.7%; 61.7%]*
Extraversion	3	9.7%	2	6.7%	[-22.0%; 17.0%]

* Indicates statistically significant difference

Participants with high functional impairments due to pain displayed statistically significant higher levels of anxiety than participants with low functional impairments (95% CI [-95.6%; -70.0%]).

Participants with high functional impairments due to pain displayed statistically significant lower levels of independence than participants with low functional impairments (95% CI [26.0%; 67.5%]).

Participants with high functional impairments due to pain displayed statistically significant lower levels of tough-mindedness than participants with low functional impairments (95% CI [43.7%; 80.2%]).

Participants with high functional impairments due to pain displayed statistically significant lower levels of self-control than participants with low functional impairments (95% CI [19.7%; 61.7%]).

Participants with high levels of extraversion displayed no statistically significant difference in pain experience when compared to those with low levels of extraversion (95% CI [-22.0%; 17.0%]).

Table 4-22 Pre-operative and post-operative functional impairment (ODI/NDI groups) and attainment of goals (n=61)

		Goal attainment		
Functional impairment	**Frequency**	**Pre-operative**	**Frequency**	**Post-operative**
Low	25	89.3%	28	90.3%
High	21	63.6%	18	60.0%

Participants with a low functional impairment due to pain pre-operatively displayed a statistically significant higher attainment of goals (95% CI [3.9%; 44.1%]). Participants with a low functional impairment due to pain post-operatively displayed statistically significant higher attainment of goals (95% CI [8.7%; 49.1%]).

In the scoring of NRS, pain on a level of 6/10 and higher is considered significant and can be relayed as a high-perceived intensity of pain. Experienced pain lower than 6/10 would be considered mild and can be classified as low experienced pain.

Table 4-23 Level of pain on NRS post-operatively and attainment of goals (n=61)

NRS scale	Frequency	Attained
<6	30	90.9%
≥6	16	57.1%

There is a statistically significant difference in the level of pain post-operatively and attainment of goals (95% CI [11.9%; 52.8%]). Participants with low experienced pain post-operatively, displayed higher goal attainment.

4.7.3 Self-Care Rating of participants

Self-care performance rating 1-2 was combined and classified as dependent and self-care performance rating 3-4 was combined and classified as independent. The following table depicts the percentage of participants undergoing either a neck or back fusion and level of self-care performance pre-operatively.

Table 4-24 Comparing percentage independence in self-care task performances between neck and back fusion patients pre-operatively and post-operatively (n=61)

	Pre-operative			Post-operative		
	Neck	Back		Neck	Back	Neck VS Back post
Self-care task	Independent performance		95% CI	Independent performance		95% CI
Mobilise in and out of shower	100.0%	96.3%	[-6.9% ; 18.3%]	100.0%	100.0%	[-10.2% ; 12.5%]
Washing body within the shower	94.1%	88.9%	[-9.8% ; 22.7%]	100.0%	92.6%	[-4.1% ; 23.4%]
Dry body after shower	91.2%	67.7%	[4.1% ; 44.2%]*	100.0%	88.9%	[-1.4% ; 28.1%]
Retrieve clothing from its storage place	100.0%	100.0%	[-10.2% ; 12.5%]	100.0%	100.0%	[-10.2% ; 12.5%]
Apply socks and/ shoes	73.5%	11.1%	[38.7% ; 76.3%]*	82.4%	70.4%	[-9.0% ; 33.0%]
Apply underwear and pants	82.4%	33.3%	[24.4% ; 66.4%]*	94.1%	77.8%	[-1.3% ; 35.4%]
Apply over garments	82.4%	96.3%	[-30.1% ; 3.3%]	88.2%	100.0%	[-26.6% ; 2.6%]
Walk from one area to another	100.0%	100.0%	[-10.2% ; 12.5%]	100.0%	100.0%	[-10.2% ; 12.5%]
Roll in bed	97.1%	100.0%	[-14.9% ; 9.7%]	97.1%	100.0%	[-14.9% ; 9.7%]

Move from lying position to sitting	100.0%	81.5%	[4.0% ; 36.7%]*	100.0%	85.2%	[1.3% ; 32.5%]*
Get up from a sitting position	82.4%	70.4%	[-9.0% ; 33.0%]	88.2%	100.0%	[-26.6% ; 2.6%]
Remove body hair (n=50)	71.4%	77.3%	[-28.2% ; 18.8%]	92.9%	90.9%	[-14.9% ; 21.4%]
Applying and removing cosmetics (n=32)	75.0%	100.0%	[-49.5% ; -0.6%]*	100.0%	100.0%	[-19.4% ; 19.4%]
Washing hair (n=59)	84.4%	100.0%	[-31.8% ; -0.4%]*	93.8%	100.0%	[-20.1% ; 7.0%]
Drying and styling hair (n=34)	6.3%	33.3%	[-50.6% ; 0.8%]	62.5%	72.2%	[-38.1%; 20.2 %]
Caring for finger nails (n=52)	96.4%	100.0%	[-17.7% ; 10.5%]	100.0%	100.0%	[-12.1% ; 13.8%]
Caring for toe nails (n=47)/ (n=48)	29.6%	14.3%	[-9.2% ; 36.4%]	70.4%	50.0%	[-7.2% ; 44.7%]
Caring for skin	85.3%	100.0%	[-30.1% ; 0.2%]	97.1%	100.0%	[-14.9% ; 9.7%]
Cleaning mouth; brushing/flossing teeth	55.9%	96.3%	[-57.1%; -19.3%]*	94.1%	100.0%	[-19.1% ; 7.3%]
Engage in sexual intercourse (n=46)	65.4%	25.0%	[11.3% ; 60.9%]	84.6%	70.0%	[-9.2% ; 38.4%]
Manipulate clothing when going to the toilet	97.1%	96.3%	[-11.6% ; 15.5%]	100.0%	100.0%	[-10.2% ; 12.5%]
Maintain toileting position	100.0%	100.0%	[-10.2% ; 12.5%]	100.0%	100.0%	[-10.2% ; 12.5%]
Transferring to and from toileting position	100.0%	100.0%	[-10.2% ; 12.5%]	100.0%	100.0%	[-10.2% ; 12.5%]
Cleaning body after toileting	79.4%	88.9%	[-27.2% ; 10.3%]	79.4%	100.0%	[-36.8%; -4.5%]*

* Indicates statistically significant difference

Pre-operatively: There is a statistically significant difference in the level of independence pertaining to moving from lying to sitting position between participants with a back fusion and those with a neck fusion (95% CI [4.0%; 36.7%]). Participants with a neck fusion were statistically significant more

dependent in cleaning their body after toileting than those who had a back fusion (95% CI [-27.2%; -10.3%]).

Post-operatively: Independence in moving from lying to sitting position (95% CI [1.3%; 32.5%]) and cleaning body after toileting (95% [-36.8%; -4.5%]) were the only two self-care tasks indicating statistically significant difference in performance between participants who underwent neck fusion and those who underwent a back fusion.

Table 4-25 Comparison between independence in specific self-care tasks and functional impairments due to high pain (ODI/NDI) levels pre-operatively and post-operatively

Self-care task			Pre-operative	95% CI for percentage dif		Post-operative	95% CI for percentage dif
Mobilise in and out of shower	Dependent	1	100%	[-33.6% ; 59.1%]	61	49.2%	
	Independent	60	53.3%				
Washing body within the shower	Dependent	5	40.0%	[-46.1% ; 23.8%]	2	100.0%	[-14.4% ; 64.7%]
	Independent	56	55.4%		59	47.5%	
Dry body after shower	Dependent	12	66.7%	[-15.0% ; 39.4%]	3	66.7%	[-29.2% ; 48.2%]
	Independent	49	51.0%		58	48.3%	
Retrieve clothing from its storage place	Dependent						
	Independent	61	54.1%		61	49.2%	
Apply socks and/ shoes	Dependent	33	63.6%	[-4.0% ; 42.4%]	14	85.7%	[18.1%; 63.6%]*
	Independent	28	42.9%		47	38.3%	
Apply underwear and pants	Dependent	24	70.8%	[2.1% ; 48.0%]*	8	100.0%	[23.4%; 70.7%]*
	Independent	37	43.2%		53	41.5%	
Apply over garments	Dependent	7	85.7%	[-3.5% ; 53.1%]	4	100.0%	[3.8% ; 66.6%]*
	Independent	54	50.0%		57	45.6%	
Walk from one area to another	Dependent						
	Independent	61	54.1%		61	49.2%	
Roll in bed	Dependent	1	100.0%	[-33.6% ; 59.1%]	1	100.0%	[-28.6% ; 63.8%]
	Independent	60	53.3%		60	48.3%	
Move from lying position to sitting	Dependent	5	80.0%	[-16.0% ; 49.0%]	4	75.0%	[-19.1% ; 51.5%]
	Independent	56	51.8%		57	47.4%	
Get up from a sitting position	Dependent	14	57.1%	[-24.1% ; 29.6%]	4	100.0%	[3.8%; 66.6%]*
	Independent	47	53.2%		57	45.6%	
Remove body hair	Dependent	13	69.2%	[-15.5% ; 39.1%]	4	75.0%	[-22.0% ; 49.7%]
	Independent	17	54.1%		46	50.0%	

Applying and removing cosmetics	Dependent	4	25.0%	[-55.1% ; 19.7%]			
	Independent	28	53.6%		32	43.8%	
Washing hair	Dependent	5	40.0%	[-48.2% ; 21.8%]	2		[-65.0% ; 14.3%]
	Independent	54	57.4%		57	52.6%	
Drying and styling hair	Dependent	27	55.6%	[-24.2% ; 44.6%]	11	81.8%	[19.9%; 74.5%]*
	Independent	7	42.9%		23	26.1%	
Caring for finger nails	Dependent	1	100.0%	[-33.3% ; 60.5%]			
	Independent	51	52.9%		52	48.1%	
Caring for toe nails	Dependent	37	56.8%	[-26.7% ; 32.5%]	18	77.8%	[17.4%; 65.8%]*
	Independent	11	54.6%		29	31.0%	
Caring for skin	Dependent	5	20.0%	[-57.5% ; 7.3%]	1	100.0%	[-28.6% ; 63.8%]
	Independent	56	57.1%		60	48.3%	
Cleaning mouth; brushing/ flossing teeth	Dependent	16	56.3%	[-23.9% ; 28.0%]	2	100.0%	[-14.4% ; 64.7%]
	Independent	45	53.3%		59	47.5%	
Engage in sexual intercourse	Dependent	24	70.8%	[19.3%; 67.1%]*	10	90.0%	[24.9%; 74.4%]*
	Independent	22	22.7%		36	30.6%	
Manipulate clothing when going to the toilet	Dependent	2	50.0%	[-46.5% ; 38.2%]			
	Independent	59	54.2%		61	49.2%	
Maintain toileting position	Dependent						
	Independent	61	54.1%		61	49.2%	
Transferring to and from toileting position	Dependent						
	Independent	61	54.1%		61	49.2%	
Cleaning body after toileting	Dependent	10	60.0%	[-24.5% ; 33.8%]	7	71.4%	[-12.7% ; 49.1%]
	Independent	51	52.9%		54	46.3%	

* Indicates statistically significant difference

Pre-operatively: Participants experiencing high levels of pain displayed a statistically significant difference in the level of independence in applying underwear and pants (95% CI [2.1% ; 48.0%]) and engaging in sexual intercourse (95% CI [19.3% ; 67.1%]) indicating that participants with high levels of pain are statistically significant more dependent in these tasks.

Post-operatively: Participants experiencing high levels of pain displayed a statistically significant difference in the level of independence in applying socks and/ shoes (95% CI [18.1% ; 63.6%]), applying underwear and pants (95% CI [23.4% ; 70.7%]), applying over garments (95% CI [3.8% ; 66.6%]), drying and styling hair (95% CI [19.9% ; 74.5%]), caring for toe nails

(95% CI [17.4% ; 65.8%]) and engaging in sexual intercourse (95% CI [24.9% ; 74.4%]). Indicating that participants with high levels of pain are statistically significant more dependent in these tasks.

4.7.4 Goal Attainment of participants

Most (68.9%) of the participants attained both self-care goals, whilst 24.6% did not attain any of their self-care goals. A small group of participants (6.6%) attained only one self-care goal.

Table 4-26 Type of fusion/ BMI group/ complications developed and attainment of goals

Variable	Frequency	Goal attainment
Neck Fusion (n=34)	26	76.5%
Back Fusion (n=27)	20	74.1%
Normal BMI (n=43)	30	69.8%
Obese BMI (n=18)	16	88.9%
Development of bladder infection (n=3)	2	66.7%
Development of DVT (n=3)	1	33.3%
Development of nerve impingement (n=3)	3	100.0%
Development of sepsis (n=2)	1	50.0%

No statistically significant difference was found between site of fusion and goal attainment (95% CI [-18.4%; 24.2%]). There was also no statistically significant difference in BMI group and goal attainment (95% CI [-36.0%; 5.5%]). Most (66.7%) of the participants who experienced bladder infection still attained their goals, whilst 66.7% of participants who suffer from a DVT did not attain their goals. All three participants who had a nerve impingement attained their rehabilitation goals. One of the participants (50%) who suffered from Sepsis still attained their self-care goal.

Further associations were explored regarding gender with BMI groups and goal attainment.

Table 4-27 Gender compared to BMI group and goal attainment (n=61)

	BMI Group		
Gender	**Normal**	**Obese**	**Goal Attainment**
Male (n=24)	54.2%	45.8%	79.2%
Female (n=37)	81.1%	18.9%	73.0%

Statistically significant more male participants were obese compared to female participants (95% CI [3.3%; 48.2%]), though male`s and female`s attained goals similarly (95% CI [-16.6%; 25.9%]).

There was a tendency for participants with obese BMI to attain their goals more than normal BMI participants (95% CI [-5.5%; 36.0%]).

Table 4-28 Pre-operative self-care independence and attainment of goals (n=61)

	Dependent	**Independent**	
Self-care task	**Frequency**	**Frequency**	**95% CI for dif**
Mobilise in and out of shower	30.0%	84.3%	[-75.0% ; -21.6%]*
Washing body within the shower	72.0%	77.8%	[-28.0% ; 15.2%]
Dry body after shower	75.0%	75.9%	[-21.7% ; 20.6%]
Retrieve clothing from its storage place	100.0%	74.6%	[-41.0% ; 37.8%]
Apply socks and/ shoes	70.0%	100.0%	[-43.8% ; -1.9%]*
Apply underwear and pants	68.9%	93.8%	[-40.3% ; 0.1%]
Apply over garments	44.4%	80.8%	[-63.2% ; -4.8%]*
Walk from one area to another	100.0%	75.0%	[-54.9% ; 37.2%]
Roll in bed	100.0%	74.1%	[-31.1% ; 38.4%]
Move from lying position to sitting	41.7%	83.7%	[-65.7% ; -12.7%]*
Get up from a sitting position	60.0%	86.1%	[-46.9% ; -3.9%]*
Remove body hair (n=50)	65.2%	77.8%	[-36.0% ; 11.9%]
Applying and removing cosmetics (n=32)	100.0%	52.4%	[15.3% ; 67.6%]*
Washing hair (n=59)	53.1%	100.0%	[-63.6% ; -26.6%]*
Drying and styling hair (n=34)	68.8%	100.0%	[-48.6% ; 35.8%]
Caring for finger nails (n=52)	36.4%	82.9%	[-69.4% ; -14.9%]*
Caring for toe nails (n=47)/ (n=48)	65.1%	100.0%	[-49.8% ; 10.3%]
Caring for skin	100.0%	71.7%	[-5.7% ; 41.6%]
Cleaning mouth; brushing/flossing teeth	82.6%	71.1%	[-11.5% ; 30.5%]

Engage in sexual intercourse (n=46)	73.3%	100.0%	[-41.0% ; 53.4%]
Manipulate clothing when going to the toilet	33.3%	85.7%	[-73.2% ; -22.1%]*
Maintain toileting position	100.0%	74.6%	[-41.0% ; 37.8%]
Transferring to and from toileting position	100.0%	74.6%	[-41.0% ; 37.8%]
Cleaning body after toileting	39.1%	97.4%	[-75.3% ; -35.4%]*

* Indicates statistically significant difference

Participants who were more independent pre-operatively in mobilising in and out of the shower, applying socks and/ shoes, applying over garments, moving from lying position to sitting, getting up from a sitting position, applying and removing cosmetics, washing hair, caring for finger nails, manipulating clothing when going to the toilet and cleaning their body after toileting obtained their goals statistically significant more than those who were dependent in these tasks pre-operatively.

Table 4-29 Global factors and attainment of goals (n=61)

		Goal attainment	
Global factor		**Frequency**	**Percentage**
Anxiety	Low	24	88.9%
	High	22	64.7%
Independence	Low	7	33.3%
	Moderate	7	87.5%
	High	32	100.0%
Tough-mindedness	Low	3	20.0%
	Moderate	11	100.0%
	High	32	91.4%
Self-control	Low	6	28.6%
	Moderate	2	100.0%
	High	38	100.0%
Extraversion	Low	43	86.0%
	Moderate	2	33.3%
	High	1	20.0%

Goal attainment refers to attaining one or both individualised self-care goals. There is a statistically significant difference between participants with low levels of anxiety compared with those with high levels of anxiety and goal attainment (95% CI [2.3%; 42.5%]).

There is a statistically significant difference between low and moderate level of independence and goal attainment (95% CI [-73.3%; -13.5%]). Between low and high level of independence and goal attainment there is also a statistically significant difference (95% CI [-82.8%; -42.8%]). No statistical difference was found between moderate and high independence regarding attainment of goals (95% CI [-47.1%; 2.3%]).

Participants with low tough-mindedness attained their goals statistically significant less than those with moderate tough-mindedness (95% CI [-93.0%; -43.9%]) and high tough-mindedness (95% CI [-85.5%; -42.7%]). No statistical difference (95% CI [-17.9%; 22.4%]) was found between participants with moderate and high tough-mindedness and both groups showed high attainment of goals.

Participants with low self-control had a statistically significant lower attainment of goals compared to those with moderate self-control (95% CI [-86.2%; -2.3%]) and high self-control (95% CI [-86.2%; -43.2%]). Participants with moderate self-control and high self-control displayed similar attainment of goals (95% CI [-65.8%; 9.2%]).

There is a statistically significant higher attainment of goals for participants with low extraversion than those with moderate extraversion (95% CI [14.0%; 77.4%]) and high extraversion (95% CI [21.8%; 83.8%]). No statistical difference was found between participants with moderate and high extraversion and goal attainment (95% CI [-35.3%; 53.5%]).

Participants were divided into four groups. These groups consisted of:

1. Participants who experienced low pain and displayed high goal attainment,

2. Participants who experienced low pain but displayed poor goal attainment,
3. Participants who experienced high pain and still displayed high goal attainment,
4. Participants who experienced high pain and displayed poor goal attainment.

The five global factors are depicted in Table 4-30 in terms of the four groups as mentioned above.

Table 4-30 Level of pain, goal attainment and presence of global factors

Low experienced pain and high goal attainment (n=25)						
Extraversion	**Independence**	**Tough-minded**	**Self-control**	**Anxiety**	**Frequency**	**Percentage**
Low	High	Moderate	High	Low	1	4.0%
Low	High	High	Moderate	Low	1	4.0%
Low	High	High	High	Low	21	84.0%
Moderate	High	High	High	High	1	4.0%
High	Low	High	High	High	1	4.0%

Low experienced pain and poor goal attainment (n=3)						
Extraversion	**Independence**	**Tough-minded**	**Self-control**	**Anxiety**	**Frequency**	**Percentage**
Moderate	Moderate	High	Low	Low	1	33.3%
High	Low	High	Low	Low	2	66.7%

High experienced pain and high goal attainment (n=21)						
Extraversion	**Independence**	**Tough-minded**	**Self-control**	**Anxiety**	**Frequency**	**Percentage**
Low	Low	Low	Low	High	2	9.5%
Low	Low	Moderate	Low	High	1	4.8%
Low	Low	High	Low	High	3	14.3%
Low	Moderate	Moderate	High	High	5	23.8%
Low	Moderate	High	High	High	1	4.8%
Low	High	Moderate	High	High	4	19.1%
Low	High	High	Moderate	Low	1	4.8%
Low	High	High	High	High	3	14.3%
Moderate	Moderate	Low	High	High	1	4.8%

High experienced pain and poor goal attainment (n=12)						
Extraversion	**Independence**	**Tough-minded**	**Self-control**	**Anxiety**	**Frequency**	**Percentage**
Low	Low	Low	Low	High	7	58.3%
Moderate	Low	Low	Low	High	3	25%
High	Low	Low	Low	High	2	16.7%

As presented in Table 4-30, 40.9% of participants experienced low pain and high goal attainment, of which 84% had the following combinations of the five global factors namely: low extraversion, high independence, high tough-minded, high self-control and low anxiety. Results further indicate that only three participants (4.9%) experienced low pain and poor goal attainment. The sample sizes of the respective four groups are too small for further analysis.

4.8 SUMMARY

This chapter presented results obtained during the study in two sections: the pre-operative phase and post-operative phase and lastly the integration of results as to determine associations and describe the study participants. Descriptive statistics namely frequencies and percentages for categorical data and medians with their indications of spread for continuous data, was calculated per session and summarised in tables throughout the chapter. The sessions were compared and associations were calculated and described by means of 95% confidence intervals for the percentage or median difference. If the sample size was too small, Wilcoxon two sample test for unpaired data and Wilcoxon Singed Rank test for paired data was calculated, when applicable.

Most (60.7%) of the study participants comprised of women and 54.1% of the participants were Afrikaans speaking. The median age within the study participants was 60.6 years and the majority of the study participants

(32.8%) were pensioners. The median BMI of participants was 28.7. More participants underwent a neck fusion (55.7%) than a back fusion.

Perfectionism (57.4%), tension (44.3%) and apprehension (44.3%) presented as the most significant high-indicated primary factors. Majority (73.8%) of the participants indicated low emotional stability therefore they are more reactive and emotionally changeable. Liveliness was found in only 26.2% of the participants; indicating that the majority of the participants (65.6%) was more serious and cautious. In terms of global factors, the highest percentage of participants (82.0%) displayed introverted characteristics. The characteristic of self-control was found to be the second highest with 62.3%. The other three global factors displayed similar percentages.

More than half (54.1%) of the participants indicated high-perceived intensity of pain pre-operatively. The median value of the Oswestry Disability Index (ODI) results was 66.0% falling within the functional classification of 'crippled'. The median value of the Neck Disability Index (NDI) results was 49.0% falling within the functional classification of 'severe disability'. More than half (54.1%) of the study participants had high functional impairments due to experienced pain pre-operatively. Post-operatively 54.1% of the participants experienced low-perceived intensity of pain. The median value of the ODI results post-operatively was 46.0% falling within the functional classification of 'severe disability'. The median value of the NDI results post-operatively was 24.2% falling within the functional classification of 'moderate disability'. Less than half (49.2%) of the study participants had high functional impairments after their fusion due to experienced pain. The differences in pre-operative and post-operative experience of pain were statistically significant for NRS and ODI results. NDI difference was not statistically significant, although there was a tendency towards improvement. Participants with low independence indicated high levels of pain on Numerical Rating Scale (NRS) both pre-operatively and post-operatively. Participants

with high functional impairments due to pain displayed high levels of anxiety. Low levels of functional impairments due to pain were related to high levels of independence, high levels of tough-mindedness and high levels of self-control.

The most affected areas of self-care pre-operatively were caring for toe nails (only 10.4% of participants independent), drying and styling hair (only 5.9% of participants independent) and engaging in sexual intercourse (only 2.2% of participants independent). Whereas self-care tasks with the highest percentage of independence were: walking from one area to another (98.4%), maintaining toileting position (96.7%) and transferring to and from toileting position (96.7%). The most affected areas of self-care post-operatively remained caring for toe nails (38.6% of participants dependent), drying and styling hair (32.3% of participants dependent), applying socks and shoes (22.9% of participants dependent) and engaging in sexual intercourse (21.7% of participants dependent).

Both the first and second goals, as set by participants themselves, displayed a median value of -2.0 during the pre-operative session. However both the first and second goals of participants displayed a median value of 2.0 at the post-operative session. The median value indicates that participants surpassed attainment of goals. 68.9% of participants attained both self-care goals, whilst 24.6% did not attain any of their self-care goals. More participants who displayed serious traits rather than lively traits attained their goals and all participants who displayed high perfectionistic traits (n=35) also attained their rehabilitation goal. There is a statistically significant difference between different global factors and goal attainment. It was found that participants with low extraversion, high independence, high tough-mindedness, high self-control and low anxiety tend to attain goals better.

In the following chapter results will be discussed as well as compared to appropriate literature.

CHAPTER 5 – DISCUSSION

5.1. INTRODUCTION

This study sets out to describe the association between personality characteristics, perception of pain and the attainment of individualised self-care outcomes in patients after a spinal fusion. This will assist in developing a patient profile and possible future model to adapt rehabilitation approaches in occupational therapy and ensure timely goal attainment. Chapter 4 made a valuable contribution towards answering the research question. Firstly, results were significant in that they showed a low pain experience to be closely associated with the successful attainment of goals. Furthermore, a low pain experience was associated with personality characteristics such as: low anxiety, high independence and high self-control. What was interesting however was the number of participants who attained their goals despite a high perception of pain and the presence of high anxiety. The personality characteristics of these participants revealed low extraversion, high independence and high self-control, suggesting that the presence of these personality characteristics can positively influence goal attainment despite pain.

In this chapter the afore-mentioned results will be discussed in more detail. The format of the discussion will remain consistent with that of Chapter 4 i.e. in accordance with the completed questionnaires. The only addition is 5.5 highlighting pain and personality as it is relevant to the discussion. The following headings will appear as follows:

5.2 Demographic description of participants (cf. Addendum J and Addendum K)

5.3 Personality characteristics of participants (cf. Addendum L)

5.4 Pain perception of participants (cf. Addendum M, Addendum N and Addendum O)
5.5 Personality and pain
5.6 Self-care rating of participants (cf. Addendum P)
5.7 Goal attainment of participants (cf. Addendum Q)

Brief recommendations will be made in this chapter but will be discussed in depth in Chapter 6. Throughout Chapter 5 the researcher will use three voices, namely: a research voice based on research results obtained in Chapter 4, a theoretical voice based on the various literature available and a clinical voice based on own experience. The specific voice will be presented to support the context of the discussion, and will not be used in any specific order. When highlighting own clinical experience a first person approach will be used, in which instances the author will refer to 'patients' and not 'participants' as it relates to a clinical setting, and the author will mostly refer to herself in text as *my.* Therefore, in every instance where the term 'patient' is used, the reader can assume that the statement made is based on clinical experience and not on research results. In discussing the results of the current research, reference will be made to 'participants' and it will be written in the third person, thus referring to self as the current researcher.

5.2 DEMOGRAPHIC DESCRIPTION OF PARTICIPANTS

Although demographic information does not directly answer to the research aim, it is nevertheless important information to include. Observed demographic trends may shed light on potential barriers to effective rehabilitation and subsequent goal attainment. Important clinical information may affect future options for spinal fusion patients.

Classic research has shown women to be more prone to experience of pain than men (Unruh, 1996). In a study conducted by Unruh in 1996, it was found that women experienced pain that was more intense, occurred more

frequently and continued for a longer duration than men. Unruh further reported that women are at greater risk of developing pain-related disabilities that necessitate surgical interventions (Unruh, 1996). There is however, limited literature available regarding the prevalence of females` requiring spinal fusion as opposed to males. In private practice, I have observed that more female patients undergo spinal fusions. This occurrence confirms Unruh`s findings, that women tend to experience increased levels of pain. The current research results indicated that 60.7% of the population is comprised of women, which is congruent with clinical observation in the practice as well as in classic research.

Between 1998 and 2008, the mean age for spinal fusion increased from 48.8 years to 54.2 years in the USA (Rajee et al., 2012). Andersson and Watkins-Castillo (2014) supported Rajaee et al.`s findings in that the average age of patients undergoing spinal fusion had risen. Their research indicated that between 1998 and 2011, the average age of patients undergoing a fusion procedure had increased from 49 years to just under 56 years (Andersson & Watkins-Castillo, 2014). The current research results demonstrate a median age of 60.6 years. These results correspond with afore-mentioned authors` theory that the population requiring spinal fusions is becoming older. This is however slightly older than the suggested average age (of between 54.2 years and 56 years) indicated by Rajaee et al. (2012) and Andersson et al. (2014).

With an ageing population, secondary medical conditions may become more pertinent. Asadian et al. indicated that diabetes mellitus might be a predisposing factor for the development of lumbar spinal stenosis, which can ultimately lead to the need for a spinal fusion (Asadian, Haddadi, Aarabi, & Zare, 2016). Furthermore, Wukich (2015) posits that not only is diabetes mellitus often associated with the need for spinal surgery but poorly controlled diabetes mellitus may also have a negatively impact on the outcome of the surgery. Whereas diabetes mellitus has enjoyed preference in

many literature studies and has been highlighted as a secondary medical condition of note in spinal fusion cases, information on other secondary conditions appears to be limited (Wukich, 2015; Asadian et al., 2016). Contrary to expectation, the current study, found only a small number of participants (37.7%) to have a secondary medical conditions namely: diabetes mellitus, hypertension and/or cholesterol. Diabetes mellitus (11.5%) was less than what could be expected based on Asadian et al.`s findings. The lower prevalence of secondary medical conditions in the current study population could be the sterner selection process of the two referring neurosurgeons in their attempt to reduce unfavorable surgical outcomes.

The level of the fusion, and the prevalence thereof was also reported on in the current study. Results indicate that more than half of the fusions (55.7%) were on a cervical (neck) level. This is inconsistent with the findings by Cowan, Dimick, Wainess, Upchurch, Chandler, & La Marca (2006), Rajee et al. (2012) and Anderson & Watkins-Castillo (2014) who indicate lumbar (back) fusions to be on the rise in the USA. In addition Anderson and Watkins-Castillo (2014) found that lumbar fusions remain the most common level of fusion in the USA, constituting 52% of all spinal fusion procedures in 2011. Health services in first world countries may be more readily available to patients from all socio-economic environments (World Health Organization, 2012). However in the South African context, in the Eastern Cape especially, more white-collar workers have access to private health services (Lehohla, 2006). This might be the reason for a higher percentage cervical (neck) spinal fusions in current research since more strain is placed on the neck during sedentary tasks, specifically computer work.

Ullrich found that spinal fusions of more than two levels are less effective and therefore less common (Ullrich, 2013). The median level for both neck and back fusions in the current research is two levels. This is congruent with available literature, which suggests higher success rates at fewer levels (Andersson & Watkins-Castillo, 2014).

The current research found that most of the participants (70.4%) presented with a BMI within normal ranges. Other literature indicates that obesity contributes to disc degeneration and low back pain and potentially increases the risk of developing pathology, which requires surgery (Mehta, Babu, Karikari, Grunch, Agarwal, Owens, Friedman, Bagley, & Gottfried, 2012; Heuch, Hagen, & Zwart, 2013; Jackson & Devine, 2016). It must again be mentioned that the two referring neurosurgeons' follows stricter criteria pertaining to pre-operative weight. Many patients were requested by the surgeons to lose weight prior to their surgery. Half of the participants with a high BMI underwent a lumbar fusion. There is therefore no link in the current study between high BMI and the need for a lumbar fusion as suggested by Jackson and Devine (2016). The current researcher argues that occupational variations may play a role and although literature indicates a correlation between back pain and obesity, the type of work done together with obesity may place additional strain on patients' cervical spine region rather than lower back resulting in increased deterioration of the cervical vertebrae's.

Within my practice clinical data over a period of 6 years indicates that patients undergoing a neck fusion typically spend 1-2 days in hospital. Patients who undergo a back fusion remain hospitalised for longer - about 4-5 days. Should patients be unable to independently perform basic self-care tasks or mobilise independently after this period they are referred to a sub-acute facility. A study was conducted in the USA over a 10-year period found that the length of hospitalisation for spinal fusions had decreased from 4.4 days to 3.7 days (Dyrda, 2012). According to Dyrda (2012) the length of stay for primary neck fusions was reduced from 3 days to 2.7 days, which is slightly longer than the length of stay (2 days) found in the current research study. The medical aid scheme allowance in South Africa could be one of the reasons for this difference (Econex, 2013). In the current research, participants who underwent back fusions remained hospitalised for a minimum period of 4 days and maximum period of 5 days, which is slightly

longer than the length of stay (3.9 days) cited by Dyrda (2012). Despite inconsistencies within existing literature, the length of hospitalisation period found in current research correlated well with my clinical observation.

The complications specified by participants post-operatively in the current research results were: bladder infection, deep venous thrombosis, nerve impingement and sepsis. These complications are indicated infrequently in both clinical experience and literature, and their appearance in current research is therefore congruent with expected frequency. Sherman (2006) states that sepsis, deep venous thrombosis, blood clotting and continued numbness in leg are very rarely reported.

5.3 PERSONALITY CHARACTERISTICS OF PARTICIPANTS

Current results from Cattell's 16-personality factor test (16PF5) indicate low median values in primary factors namely: emotional stability (2.0) and liveliness (3.0). Low median values in these two factors suggest that participants are more emotionally reactive, affected by feelings, emotionally less stable, easily upset, serious, restrained, introspective and silent (Jopie van Rooyen & partners SA, 2006; Boyle et al., 2008). The patients` emotional instability was reported as early as the 1950`s in Hanvik`s study, which indicated that patients who undergo a spinal fusion display significantly higher levels of neuroticism (Hanvik, 1951). Wilfling et al. (1973) later supported Hanvik`s findings and more recently Hagg et al. (2003) confirmed the prevalence of neuroticism amongst spinal fusion patients. In the current study, perfectionism was identified as a primary factor with high median value (above 6 out of 10). The presence of high perfectionism values indicates that participants are more inclined to be perfectionists, organised, compulsive, self-disciplined, socially precise, sentimental and to display exacting willpower (Jopie van Rooyen & partners SA, 2006). Other primary factors that tended to be high in the current research (above 6 out of 10) - were reasoning and

tension. According to Boyle et al. (2008) high frequency of these primary factors would indicate that patients presented with higher abstract-thinking, greater intelligence, higher general mental capacity, increased tension, elevated energy, impatience, were overworked and time-driven. Within the clinical setting, I have experienced the most of the patients scheduled to undergo a spinal fusion are tense, serious, apprehensive and very precise in their reasoning. Many patients become emotional during the clinical session and struggles with emotional control. These clinical observations are supported by current research results, which indicate high levels of perfectionism and tension and low levels of liveliness and emotional stability.

In the 16PF5 test that was used in the current study, 16 primary factors are divided into 5 global factors. Results from the current research indicate that 'anxiety' presents as the global factor with the highest median value. Jopie van Rooyen argues that anxious people tend to experience events more intensely and to overreact and may have difficulty in controlling their emotions (Jopie van Rooyen & partners SA, 2006). The second highest global factor is 'self-control'. Most participants were inclined to display introverted characteristics, which is in line with clinically observed 'seriousness' and a low presence of the primary factor liveliness.

It can be concluded that, participants who are scheduled for a spinal fusion display the significant primary personality factors of high perfectionism, tension, apprehension, emotional changeability and seriousness. Based on the grouping of global factors, these participants can be described as introverted, self-controlled and anxious.

5.4 PAIN PERCEPTION OF PARTICIPANTS

Within the current research study, the Numerical Rating Scale (NRS) results showed that pre-operatively, more than half of the participants (54.1%) indicated pain above 6/10, which signifies a high prevalence of pain. An

earlier study conducted by Palit et al., it was found that patients presented with a median NRS score of 8.3 (Palit, Schofferman, Goldthwaite, Reynolds, Kerner, & Keaney, 1999). The Swedish Lumbar Spine Study Group (2002) also found an elevated perception of pain amongst patients who undergo a spinal fusion. The current research depicts a median post-operative NRS score of 4/10, which although an improvement is still higher than Carragee & Cheng`s (2010) established minimum acceptable outcome post-fusion of 3/10. Palit et al. (1999) indicate a median NRS score of 4.1 after surgery, which is also above what is now considered the minimum acceptable outcome, but is more in line with current research findings.

Breivik (2006) and Fricker (2006) suggest that pain reduces a patient's ability to exercise, sleep, perform household chores, attend social activities, drive a car, walk or have sexual relations. Scotland (2011) supports the latter notion and suggests that pain could lead to a significant reduction in function. These functional limitations are evident in the current results of the Oswestry Disability Index (ODI) and Neck Disability Index (NDI). The most significant functional impairments due to pain differed between back- and neck fusion participants. Both Sherman (2006) and Kazunari et al. (2008) found that there are differences in functional limitations between back- and neck fusion patients.

Results from the current research note that *pre-operatively* participants who are scheduled for a back fusion struggle most with sitting (92.6%), travelling (66.6%) and long distance walking (62.9%). Earlier authors cite pain as the cause for limiting patients` tendency to drive a car (Breivik, 2006; Fricker, 2006; Scotland, 2011). The latter is also reported as a functional impairment by Kose & Hatipoglu (2012). These authors further established that difficulties with sleeping and standing where additional prominent functional impairments (Breivik, 2006; Kose & Hatipoglu, 2012). The current research results however do not allude to significant sleep impairments. Many participants reported using strong pain medication and sleeping agents, which

may have attributed to continuation of sleep despite high pain. Pre-operatively one would expect lifting weight and the performance of personal care tasks to be of great difficulty for patients undergoing back fusion. The latter is supported by Kose and Hatipoglu (2012). However, the current research results pertaining to the performance of these activities deemed them to be difficult, but to a lesser extent. *Post-operatively* though more than half (55.5%) of participants continue to struggle with load handling.

Clinically I have found that patients who are about to undergo a neck fusion generally complain about: pain whilst reading, struggling to concentrate or frequent headaches. The current results illustrate that patients with neck pain experience headaches (94.2%). Neck pain further affected the participants' ability to engage in their usual recreational activities (70.6%) and partake in reading (67.6%). Furthermore, similar to clinical observations, current results indicate that more than half (55.9%) of the participants struggled with concentration. The high percentage of recreational restrictions in the current study can be attributed to the participants` occupations. Most of the participants were pensioners or home executives, therefore recreational activities, which account for a greater part of their day may have had a greater influence on their perception of pain.

Post-operatively the median value of the ODI results indicated that participants experienced 'severe disability', whilst the NDI results suggests 'moderate disability'. Carragee & Cheng (2010) state that an improvement in the disability index rating of 20 or more would be considered acceptable and the current post-operative ODI (46.0%) and NDI (24.2%) research results adhere to this standard. Overall results indicate a greater improvement in functional pain in neck fusion patients than in back fusion patients. This could be attributed to the period of pre-cautionary measures. Back fusion patients for example are not allowed to sit for longer than 20 minutes a day during the first 4 weeks and are therefore more frequently bedbound than neck fusion patients who do not have to adhere to these stern pre-cautionary measures.

All participants in the current study irrespective of the type of fusion displayed a greater improvement in their level of disability than in their level of pain before and after surgical intervention. Both pain and disability levels displays a tendency to improve following spinal surgery.

5.5 PAIN AND PERSONALITY

Research has focused mainly on types of personality; rather than the personality traits portrayed in Cattell`s 16 primary factor test and pain perception. Subsequently in current results the author has compared personality traits according to the 16PF5 with similar personality traits available in literature.

Literature indicates that introversion and extraversion effect selective attention to pain. Introversion has proved to be more sensitive to physical stimuli than extraversion, which has been linked to higher pain thresholds (Eakman & Eklund, 2012). Pilar (2011), on the other hand found that extraversion does not equate to a heightened perception of pain. Low extraversion is deemed a predictor for greater pain perception according to Krok and Baker (2014). In support of Krok and Bakers` findings, extraversion was linked by Ramirez-Maestre to increased pain tolerance (Ramirez-Maestre et al, 2004). Current research results do not support any of the afore-mentioned authors` findings and depict no statistically significant association between extraversion and pain experience either pre- or post operatively.

Based on the description of personality traits, 'neuroticism' can be indicated as emotional instability according to the 16PF5. Neuroticism has been associated with increased somatosensory experience of pain and catastrophising of pain (Gouberta et al., 2004; Pilar, 2011). Ramirez et al. (2004) and Muris et al. (2007) propose that catastrophic pain perception can be viewed as ineffective pain management. Both these authors concur with the classic research of McCrae and Costa (1991) that catastrophised thinking

has a negative effect on one`s health and well-being. Current research results correspond with literature and participants with low emotional stability display pain that is statistically significant (both pre- and post-operatively) compared to those with moderate emotional stability.

It has been established that serious traits found in the low median values of liveliness increase sensitivity to physical stimuli, which heightens feelings of pain (Eakman & Eklund, 2012). It is statistically significant however, that current research results found participants with low liveliness to have a lower perception of pain both pre- and post-operatively. Therefore, in the current research, 'seriousness' decreases one`s perception of pain.

Anxiety can be caused by external events, which may activate the 'fight-or-flight' state due to a perceived or actual threat. This response can however also be generated internally. Events and situations, as in the case of pain, are experienced more intensely when increased anxiety is present (Jopie van Rooyen & partners SA, 2006). Research proposes that in a state of anxiety, the hippocampal formation amplifies aversive events to prime behavioural responses that are adaptive to the worst possible outcome. According to literature then, one would expect patients with high levels of anxiety to experience pain more intensely (Ploghaus, Narain, Beckmann, Clare, Bantick, Wise, 2001). The current research results corresponds, and are statistically significant in that participants with high levels of anxiety have a heightened perception of pain both pre- and postoperatively.

Independence traits illustrate a tendency towards self-determined thinking and behavioural patterns. According to Jopie van Rooyen et al. the latter may have a negative impact on a person`s ability to accommodate others and one may also be perceived as strongly opinionated, rigid and socially forceful (Jopie van Rooyen & partners SA, 2006). Tough-mindedness describes one`s readiness to manage problems on a cognitive level. Just as with 'independence', 'tough-mindedness' is associated with practical and logical

thinking combined with a lack of flexibility and a reduced openness to change (Jopie van Rooyen & partners SA, 2006). Independence and tough-mindedness are opposite to personality traits such as 'openness to experience' and 'agreeableness'. 'Conscientiousness' was found to be a causal factor in the catastrophising of pain (Pilar, 2011). Krok and Baker (2014) linked lower conscientiousness with higher pain experience. Gouberta et al. (2004), on the other hand, found the relationship between conscientiousness and caution of pain to be more closely correlated than that between conscientiousness and catastrophising of pain. There has been limited research into 'agreeableness' as a personality trait that influences one`s perception of pain. Only Pilar (2011) found that 'agreeableness' is strongly connected to a focus on pain. One can therefore deduce from the available evidence that 'independence' would by implication be positively related to a heightened perception of pain. The current research results support Pilar, Krok & Baker`s findings. In the pre-operative phase of the current study, it is statistically significant that participants who are less independent have a more elevated perception of pain than participants who are more independent. The same is true for participants who are moderate independent and those who are highly independent. Similarly in the post-operative phase, it is statistically significant that participants who are less independent or moderately independent perceive the pain to be greater than those participants who are highly independent. The same is true for tough-mindedness. Both pre- and postoperatively, it is statistically significant that participants who are less tough-minded perceived pain to be greater than those participants who are more tough-minded. Again, both pre-operatively and post-operatively, it is statistically significant that participants who are moderately tough-minded also perceive pain more intensely than those participants who are more tough-minded. Therefore patients who are less independent and tough-minded and subsequently highly conscientious and agreeable are inclined to perceive pain more intensely.

Jopie van Rooyen et al. (2006) explain that self-control refers to the ability to inhibit urges and impulses and to restrain one-`self. Clinically I have observed that those patients who are able to exercise adequate self-control are more compliant with treatment and tend to indicate lower perceptions of pain. The current research results affirm my clinical observation with regard to the above. It is statistically significant that pre- and postoperatively, participants with low self-control percieve pain more intensely than those participants with moderate or high self-control. Low self-control is a personality characteristic associated with a heightened perception of pain.

Based on the current research findings one can deduce that a heightened perception of pain is associated with high anxiety, low independence, low tough-mindedness and low self-control.

5.6 SELF-CARE RATING OF PARTICIPANTS

Patients who struggle with back and neck pain prior to undergoing a spinal fusion show signs of increased dependence in performing self-care tasks. This lack of independence is often most frustrating to patients as self-care tasks are perceived as personally very meaningful tasks. In my experience certain aspects of dressing have challenged patients, caring for their toenails and engaging in sexual intercourse. I have also observed that the type of self-care tasks that require more assistance is greatly dependent on whether the patient has back or neck pathology. Patients with back pathology tend to struggle more with self-care tasks that require bending (putting on shoes) and rotation (cleaning body after toileting), whereas patients with neck pathology tend to struggle more with self-care tasks that require reaching (washing and styling their hair). In most cases though, I detected a significant increase in the patients` level of independence after surgical intervention.

The current research results indicated that pre-operatively, participants require *some* assistance with drying their bodies after showering, putting on underwear and pants and washing their hair. *Moderate* assistance was required for putting on socks and shoes, drying and styling hair, caring for toenails and engaging in sexual intercourse. The areas of self-care *most* affected prior to surgery were: caring for toenails, drying and styling hair and engaging in sexual intercourse. *Post-operatively* there was a statistically significant improvement in the level of independence within all areas of self-care tasks. The exceptions were: caring for toenails and engaging in sexual intercourse, still required some assistance. The areas of self-care *most* affected post-operatively were: caring for toenails, drying and styling hair, putting on socks and shoes and engaging in sexual intercourse. Kazunari et al. (2008) indicate that tasks, which require neck extension and rotation are most challenging post cervical fusion, hence the continued difficulty with drying and styling hair. In lumbar fusion cases Sherman (2006) notes mobility restrictions in terms of forward flexion and lateral flexion, hence the continued difficulty with caring for toenails and putting on socks and shoes. Both authors Breivik (2006) and Fricker (2006) support the current findings by confirming that sexual engagement is negatively influenced by spinal fusions.

Current research results are statistically significantly in that they offer further proof that pre-operatively, back fusion participants struggle more with putting on socks and shoes as well as underwear and pants, whereas neck fusion participants struggle more than back fusion participants with washing their hair. These results are consistent with clinical observation and literature that certain movement patterns and therefore specific self-care tasks are more affected based on the type of fusion (Sherman, 2006; Kazunari et al., 2008). Clinically observed results also indicate that pre-operatively, back fusion participants struggle more than neck fusion participants in caring for toenails. Contrary to expectation, this finding was not statistically significant.

Results display a statistically significant difference *pre-operatively* in the ability of participants requiring neck fusions and those requiring back fusions` to independently dry their bodies after showering and to move from a lying position to a sitting position. In the past these two tasks were not seen to be problematic for back fusion patients within the clinical setting. These tasks elicit trunk rotation, forward flexion of spine as well as extension of spine once upright (Davies, 1990). It is therefore reasonable to assume that back pain would hamper the completion of these tasks and hence current study results should be deemed as valid. It is statistically significant that neck fusion participants are more dependent in applying and removing cosmetics and managing dental care. These tasks require more neck flexion, extension and rotation than back movement and Kazunari et al.`s (2008) finding that neck rotation and flexion is increasingly difficult, supports this finding. *Post-operatively* the higher independence shown by neck fusion participants in moving from a lying position to a sitting position is statically significant. The higher independence shown by back fusion participants in cleaning their body after toileting is not only interesting but also statically significant. Given the amount of trunk rotation involved in cleaning one`s body after toileting it is surprising to find that back fusion participants are more independent in this task. The latter could be attributed to the support of the back brace and improved biomechanical movement patterns. Minimised rotation would improve back fusion participants` capacity to perform this activity. Neck fusion participants, on the other hand, are not found to be as independent in performing this activity. The most likely explanation for this finding is that cleaning one`s body after toileting is one of the focus areas in the back fusion in-hospital treatment protocol, but not part of the neck fusion in-hospital treatment protocol.

5.7 GOAL-ATTAINMENT OF PARTICIPANTS

`As self-care activities are often the most affected activities after a spinal fusion, they are deemed priority goals of the individualised treatment

approach' (Skolasky et al., 2015, p. 1209). 'The Occupational therapy rehabilitation focuses on return to independent participation in these activities' (van Langeveld et al., 2011, p. 211). Heinicke et al. (2011) explain that when setting individualised treatment outcomes, a collaborative assessment of occupational needs and the environment should be conducted. Cultural and habitual factors that may influence one's perception of importance pertaining to self-care activities should be considered (Baptiste, 2008). This approach allows patients to direct their self-care activities according to importance as well as to gauge their present performance and satisfaction levels in this regard (Baptiste, 2008). The afore-mentioned information is utilised in setting individualised self-care outcomes, thereby enhancing the probability of their attainment.

Clinically I have found that most patients who undergo a spinal fusion attain their self-care goals. This observation is supported by current research results, which indicate that most of the participants (68.9%) attained both self-care goals, 73.8% of participants attained their first goal and 70.5% of participants attained their second goal. This is partly due to a rehabilitation protocol that has been adapted over several years to address observed barriers to goal attainment and to ensure optimal level of independence within self-care task performance. Despite optimal rehabilitation as well as procedural similarities (i.e. level and type of fusion), some patients nevertheless display delayed independence and do not attain their self-care goals. This clinical observation is supported by the current research results, which indicate that 24.6% of participants do not attain any of their goals and a small group of participants (6.6%) attain only one self-care goal. According to literature personality traits of the various patients and their perceived experience of pain are two contributing factors that can account for this discrepancy of self-care goals (Skolasky et al., 2015; Eakman & Eklund, 2012).

During my first year of clinical experience I ascribed variations in goal attainment amongst patients undergoing similar procedures, solely to pain perception. I found that patients, who experienced high levels of pain, tended to be more fearful of engaging in self-care activities and subsequently attained self-care goals much later than those patients who experienced pain to a lesser degree. Aprile et al. (2012) alludes to this observation and indicated that pain is one of the most feared complications post surgery. Aprile et al. consider pain as a predictor of inadequate rehabilitation and dissatisfaction in patients. Rehabilitation delays can be attributed to the link between pain and the activity pattern namely, 'avoidance'. In 'avoidance' behaviour patients attempts to avoid pain-associated activities and their level of active participation declines. Avoidance behaviour has been connected with increased experience of chronic pain and disability (Cane et al., 2013). This finding is in line with Aprile et al.`s (2012) results, which demonstrate that experience of pain interfered with the rehabilitation process in more than half of their study population and subsequently led to poor goal attainment. The results of the current study coincide with available literature since post-operatively there is a statistically significant difference in the level of pain (based on Numerical Rating Scale (NRS)) and attainment of goals. Participants, who experience less pain post-operatively, display higher goal attainment. In addition, participants with low functional impairment due to pain pre- and postoperatively display a statistically significant higher attainment of their goals.

Conversely, in the researcher`s clinical experience, there are many clinical cases in which patients with reportedly high levels of pain still attain their self-care goals, whilst others who report low levels of pain do not. What is even more interesting is that the same patient who reports high levels of pain may attain self-care goals in one session but not in another. The researcher argues that the difference could be ascribed to the variations in presentations of the sessions, colleagues with a more focused psychological approach- who elicit higher goal attainment than other colleagues with reduced knowledge of

psychology. The adaptation to treatment approach in terms of presentation occurs naturally for those colleagues with supplementary psychology knowledge. The latter phenomenona leads me to believe that there may be other personality characteristics that influence not only pain perception as already discussed, but also the attainment of rehabilitation goals. Current research results are statistically significant in that they indicate that participants who display serious traits rather than lively traits are more likely to attain their goals. It is also statistically significant that participants with high perfectionism traits are more likely to attain their goals than participants with low perfectionism traits. In fact, all the participants who display high levels of perfectionism attained their rehabilitation goals. Lower anxiety levels as well as high levels of independence can also be associated with higher levels of goal attainment. It is statistical significantly that participants with low tough-mindedness attained their goals less frequently than those with moderate tough-mindedness and high tough-mindedness. Low self-control can be associated with lower goal attainment. It is statistically significant that the participants with low extraversion attain their goals more easily than the participants with moderate extraversion and high extraversion.

Therefore, based on the current research results it can be concluded that seriousness, perfectionism, low anxiety, high independence, high tough-mindedness, high self-control and low extraversion are associated with increased goal-attainment.

I endeavoured to address the research aim further by looking more closely at the associations between pain, personality characteristics and goal attainment.

Clinically, I observed that patients with low levels of pain, combined with low anxiety and high self-control generally attained their rehabilitation goals. High perfectionism and high independence irrespective of pain and anxiety also have a positive influence on goal attainment. No literature was found

pertaining to the associations of these components and this necessitated the current research.

In the current research only data pertaining to the 5 global factors of personality characteristics was used due to the number of participants available and the statistical significance of the data. Primary factors such as perfectionism were therefore not utilised in the analyses of data. The current research results indicated that regardless of goal attainment low pain is associated with less anxiety and greater tough-mindedness. High levels of pain associated with high anxiety illustrating that statistically more highly anxious participants also experienced higher levels of pain. An early experimental study however found that an increased experience of pain is not caused by anxiety but rather by attention to the pain stimulus (Arntz, Dreessen, & Merckelbach, 1991). Ploghaus et al. (2001) highlight contrary results, which stipulate that it is common clinical experience that anxiety exacerbates the pain sensation. Kain et al. concurr with Ploghaus et al.`s earlier findings and add that pre-operative anxiety is associated with more painful post-operative recovery (Kain, Mayes, Caldwell-Andrews, Karas, & McClain, 2006). This association has been accepted clinically and has been proved in existing literature thereby cementing the current research findings. High self-control is associated with high goal attainment, whereas low self-control and low independence are associated with poor goal attainment irrespective of the level of pain experienced. These results correlate with clinical observations and it is evident that self-control and independence are key personality characteristics in the attainment of goals.

The current research results identify categories, which are strongly related. There is an association between high extraversion, poor goal attainment, low self-control, low independence and low tough-mindedness. The categories of high anxiety, high pain and moderate independence also relate. A strong link between high self-control, high goal attainment, low extraversion and moderate tough-mindedness is noted. Lastly the association between low

anxiety, moderate self-control, low pain experience, high tough-mindedness and high independence is observed.

One cannot merely attribute goal attainment to pain and or personality characteristics and literature was therefore reviewed to identify other possible factors involved in the attainment of goals. In the current research the influence of type of fusion, BMI, gender and development of complications are associated with goal attainment.

The current research results indicate that there is no statistically significant difference between the site of fusion or BMI group and goal attainment. A tendency for participants with obese BMI to attain their goals more frequently than normal BMI participants is noted. These results are contrary to literature, especially studies by Heuch et al. which hypothesise that an increased BMI is a predisposing factor in the development of pain and subsequent poor rehabilitation (Heuch, Heuch, Hagen, & Zwart, 2013). Sheffler et al. signify that high BMI is associated with unsatisfying rehabilitation outcomes (Sheffler, Knutson, Gunzler, & Chae, 2012). The small number of participants displaying these aspects in the current research, limits the statistical significance of the association between BMI and goal attainment. Further research is therefore required to support or explain current findings. Gender was found to be an insignificant factor in goal attainment. Male and female participants were comparable in their goal attainment. Most of the participants with bladder infections still attained their goals, whilst most of the participants who suffered from a DVT did not attain their goals. The three participants who had a nerve impingement attained their rehabilitation goals. Half of the participants who suffered from sepsis still attained their self-care goals. The population who developed secondary complications however was minor thereby influencing statistical significance.

Participants who were more independent pre-operatively in mobilising in and out of the shower, putting on socks and/ shoes, dressing themselves, moving

from a lying position to a sitting position, getting up from a sitting position, applying and removing cosmetics, washing hair, caring for finger nails, manipulating clothing when going to the toilet and cleaning their body after toileting, obtained their goals more frequently than those who were dependent in these tasks pre-operatively. All participants who were independent pre-operatively in putting on socks and/ shoes, washing, drying and styling their hair, caring for toe nails and engaging in sexual intercourse attained their self-care goals. Pre-operative independence in these activities can therefore be seen as a positive indicator for goal attainment.

5.8 SUMMARY

In this chapter results obtained in this study were discussed in terms of participants demographics, personality characteristics, pain experience, self-care rating and lastly goal-attainment. Associations between all these constructs were highlighted under the goal-attainment section as the associations between these constructs directly influence the participants` attainment of self-care goals. Relevant literature as well as clinical expectations were emphasised in this chapter as they relate to the current research results.

In Chapter 6 conclusions will be drawn based on the results of the research study. These conclusions will highlight the therapeutic value of the results obtained and how these results can contribute to the existing body of knowledge within Occupational therapy. Limitations of the study as well as possible future research avenues will also be discussed in Chapter 6.

CHAPTER 6 – CONCLUSION

6.1 INTRODUCTION

In Chapter 5 the research results were discussed in accordance with the research methodology. Associations between the aspects of personality traits of participants, pain perception, personality and pain interaction, self-care activities and goal attainment were discussed. Chapter 5 also highlighted literature findings as they pertained to the current research results. Limitations of the current research were also identified.

Chapter 6 is a summary of the information pertaining to personality characteristics, perception of pain and the attainment of self-care goals. Recommendations for future assessment tools, treatment protocols and research studies will be examined and determined. The value of the current research as it relates to the body of knowledge in occupational therapy will be described.

6.2 SUMMARY OF RESULTS

Personality characteristics of participants

Participants undergoing a spinal fusion displayed a statistically significant lower presence of *emotional stability* and *liveliness*. They also displayed a statistically significant higher presence of *perfectionism*, indicating that participants were emotionally more reactive, affected by feelings, easily upset, serious, restrained, introspective, organised, compulsive, self-disciplined, socially precise with exacting will power. Other primary factors that showed a tendency to be high this group of participants was *reasoning* and *tension*. The latter indicates that participants presented with higher abstract-thinking and intelligence and a greater general mental capacity. They

displayed increased tension and elevated energy levels. These participants were also inclined to be impatient, overwrought and time-driven.

Anxiety presents as the global factor with the highest median value and *self-control* as the global factor with the second highest median value in the current research. Most of the research participants displayed introverted characteristics.

Pain perception of participants

According to the Numerical Rating Scale (NRS) more than half of the participant's pre-operative pain levels were above 6/10. The median level of post-operative pain was 4/10, which indicates an improvement, although not a statistically significant one.

Functional impairments ascribed to pain differed between back- and neck fusion participants. The most prominent *pre-operative* functional impairments in participants who underwent a back fusion were: sitting, travelling and long-distance walking; whereas participants who underwent a neck fusion struggled most with headaches, engaging in their usual recreational activities and reading.

The median value of the post-operative Oswestry Disability Index (ODI) results suggests that participants experienced with low back pain experienced 'severe disability', whilst the post-operative Neck Disability Index (NDI) results suggest that participants with neck pain experienced 'moderate disability'. The improvement in both the pre-operative and post-operative ODI and NDI scores is statistically significant. Overall results indicate a more significant functional pain improvement amongst neck fusion patients than back fusion patients.

Pain and personality

The difference in the perceived pre- and post-operative pain levels of highly anxious participants versus less anxious participants is statistically significant. The difference in the perceived pre- and post-operative pain levels of less independent participants versus highly independent participants is statistically significant. There is also a statistically significant difference between the perceived pain levels of tough-minded participants and less tough-minded participants pre- and post-operatively. The difference in the perceived pre- and post-operative pain levels of participants with low self-control compared to participants with moderate or high self-control is statistically significant.

High anxiety, low independence, low tough-mindedness and low self-control are characteristics associated with high levels of perceived pain.

Self-care rating of participants

The most affected areas of pre-operative self-care were caring for toenails, drying and styling hair and engaging in sexual intercourse. The most affected areas of post-operative self-care remained caring for toenails, drying and styling hair, engaging in sexual intercourse and putting on socks and shoes.

Current research results reveal a statistically significantly pre-operative difference between the self-care of back fusion participants and neck fusion participants. Back fusion participants struggle to put on socks and/ shoes, underwear and pants, whereas neck fusion participants struggle to wash their hair.

Post-operatively, there is a statically significant difference between the independence of back fusion participants and neck fusion participants. Back fusion participants are far more independent in cleaning their bodies after toileting than neck fusion participants.

Goal-attainment of participants

Most of the participants attained their individualised self-care goals. Post-operatively, participants with a decreased perception of pain, displayed higher goal attainment. Also, participants with decreased functional impairment and lower perceptions of pain, and who scored low on ODI/NDI pre- and postoperatively, displayed a statistically significant higher attainment of goals. Current research results are statistically significant in that more participants who display serious-, perfectionism- and independence traits are likely to attain their rehabilitation self-care goals. An investigation of global personality factors and goal attainment found lower levels of anxiety and low extraversion to be associated with statistically significant higher levels of goal attainment. Furthermore, the fact that participants with low tough-mindedness and low self-control are less able to attain their goals than their counterparts is statistically significant. Additional data analyses indicate high self-control to be associated with high goal attainment, whereas low self-control and low independence to be associated with poor goal attainment irrespective of the level of pain perception. Self-control and independence can therefore be considered key personality factors in the attainment of rehabilitation goals.

Goal attainment is also influenced by independent self-care. All the participants who were independent in putting on socks and/ shoes, washing, drying and styling their hair, caring for their toe-nails and engaging in sexual intercourse pre-operatively, attained their self-care goals. Pre-operative independence in these activities is therefore a positive indicator for goal attainment.

6.3 LIMITATIONS OF STUDY

Study design limitations:

Complications that were expected based on clinical experience are not evident in the current research results. One of the goals of the post-operative demographic questionnaire was to elicit any complications the participants may have had. Complications were asked in an open-ended question on the post-operative demographic questionnaire and subsequently participants may have not indicated all possible complications. A suggestion for future research would be to allow participants to select a 'complication' from a list of possible options. The option 'other' should be added to the list to allow participants the opportunity to add any other 'complication' that might not have been mentioned.

Impact limitations:

The study population comprised only patients from a middle or high socio-economic class who have access to private medical care. Results can therefore not be generalised to patients in the public health sector or patients from a lower socio-economic class.

Statistical limitations:

There was a tendency for participants with an obese BMI to attain their goals more readily than those participants with a normal BMI. However, this finding is limited due to the sample size of the participants. These findings therefore, are not statistically significant and require further investigation.

Participants were divided into four groups. These groups comprised of:

- Participants who experienced a low measure of pain and displayed high goal attainment;

- Participants who experienced a low measure of pain but displayed poor goal attainment;
- Participants who experienced a high measure of pain and still displayed high goal attainment'
- Participants who experienced a high measure of pain and displayed poor goal attainment.

The respective sample sizes of the 4 groups were too small to allow further analysis and only the 5 global factors were commented upon. Should a greater sample size be available, analysis pertaining to the 16 primary factors, pain and goal attainment could be done.

6.4 VALUE OF THE STUDY

Research studies investigating the influence of personality characteristics and pain perception on goal attainment is limited, especially within the South African context. The current study provides quantitative data pertaining to the association between the personality characteristics, pain perception and goal attainment of spinal fusion patients.

The research results highlight the association between pain and personality characteristics. The latter will enable the occupational therapist to determine and predict treatment barriers and estimate treatment prognosis with more scientific certainty. This in turn will assist in setting more realistic and attainable rehabilitation goals in therapy.

An improved understanding of how personality characteristics influence pain and attainment of therapy outcomes enables the therapist to design and grade a more individualised treatment approach.

The current research results will enable the multidisciplinary rehabilitation team to address rehabilitation barriers more effectively. They will have a

better understanding of how personality factors influence the patients` perception of pain and their attainment of rehabilitation goals. The research results show that the presence of high anxiety or low self-control, low independence and low tough-mindedness renders a person prone to increased pain experience. This information can now be communicated to the treating specialist in advance to ensure that the appropriate pain relief regime is followed. The team psychologist will also be involved in these cases to assist with psychological interventions to address pain perception.

Patients with a lower degree of self-control, independence, tough-mindedness and a high degree of extraversion are prone to poor attainment of treatment goals. Interventions can thus be tailored accordingly. These interventions may include patient referral to the appropriate professionals prior to the surgical procedure to prepare the patient for the post-operative rehabilitation process. Results from this study add scientific weight to the motivation for extended hospital stays to prevent situations where treatment goals have not been reached and hospital days are exhausted.

It was found that participants who experienced high levels of post-operative pain displayed a statistically significant difference in their level of independence in the following areas: putting on socks and/ shoes, underwear, pants, and over garments, drying and styling hair, caring for toe-nails and engaging in sexual intercourse. This provides valuable planning information. Requests for possible assistive devices could be made in advance to ensure their availability should the patient later require them.

The abovementioned strategies can be implemented prior to surgery and will ensure more effective, economical rehabilitation and a timely return to functional participation.

6.5 RECOMMENDATIONS BASED ON RESEARCH RESULTS

Research results provide important data for the development of assessment- and treatment protocol within our private practice. These protocols can be used to better identify possible risk factors for rehabilitation and to adjust our treatment approach to ensure improved functional outcomes. The research results make recommendations pertaining to assessment procedure, treatment protocol and future research.

- ***Assessment procedure:***

The Cattell`s 16 personality factor questionnaire (16PF5) is lengthy and tends to deter patients from completing this form accurately. One could however select certain sections from the questionnaire and this would make the process less cumbersome. Prior to this research, there was no available literature to suggest which sections would be valuable in terms of pain perception and goal attainment. However one can now identify which personality characteristics should be ascertained.

As an indicator of possible high pain perception, personality characteristics namely: anxiety, self-control, independence and tough-mindedness should be investigated. High levels of anxiety and low levels of the other three personality characteristics are associated with high pain perception. As an indicator of good goal attainment, despite level of pain**,** the assessment should explore self-control, independence, tough-mindedness and extraversion. High self-control, independence, tough-mindedness and low extraversion are associated with high goal attainment.

The research results also indicate a greater statistically significant difference between pre- and post-operative ODI/ NDI results than NRS results. Unlike the NRS results, the ODI/ NDI results were indicative of functional outcomes and related more to goal attainment than general pain perception. It is

recommended that in future, the ODI/NDI and not the NRS be utilised in the pre- operative assessment of fusion patients. Despite indicators of increased pain perception on the NRS, many participants still attained their rehabilitation goals. Since the latter is of more functional importance, emphasis should rather be placed on how pain impairs function, rather than on how intense that pain is.

Independence in the following areas: putting on socks and/ shoes, washing, drying and styling hair, caring for toe-nails and engaging in sexual intercourse is a good pre-operative indicator of goal attainment. These activities of daily living should be focused on prior to surgical intervention. Should these activities prove to be problematic upon pre-operative assessment, it would be advisable for intervention to occur prior to surgery. Tackling the development of independence in these activities would aid in goal attainment post-surgery.

- ***Treatment protocol:***

Based on the pre-operative personality assessment, patients who display personality characteristics associated with high pain perception should be made known to the relevant multidisciplinary team members i.e. the treating anesthesiologist, surgeon and psychologist. Adaptations to a medication regime might be required to better manage their pain perception and subsequent functional prognosis. In addition, the team psychologist should be notified and should consult with these patients. The requisite psychological intervention can thus be timeously provided.

In addition, patients who display personality characteristics associated with poor goal attainment should be identified in a pre-operative session. Provision should be made for possible additional in-hospital time when applying for hospital authorisation. A hospital discharge may be delayed by a failure to reach an appropriate level of independence. Should a patient display personality characteristics both strongly related to high pain perception and

poor goal attainment and be dependent in the key daily living activities identified in this research, pre-authorisation should be obtained for a sub-acute facility post hospital discharge.

Given the fact that many participants displayed a proclivity to experiencing high levels of anxiety additional inclusion of relaxation therapy as a standard treatment modality after a fusion may be valuable.

The participants` high attainment of goals despite pain indicates that the current self-care treatment protocol is effective. However, there was a statistically significant difference between participants who underwent a back fusion and those who underwent a neck fusion in terms of cleaning their bodies after toileting. This activity appeared to be far easier for back fusion participants. It is therefore recommended that this task be added to the current neck fusion in-hospital treatment protocol.

Lastly, research results reveal a greater improvement in functional abilities as opposed to pain experience post-surgery. It is therefore recommended that treatment protocols include educating patient about realistic expectations post-surgery. These expectations should then include improved functional performance and independence rather than pain relief.

- ***Future research:***

It is recommended that future research investigate associations between Body Mass Index (BMI) and goal attainment. It would be valuable to investigate the influence that BMI has on goal attainment within the orthopedic field, since many patients with a high BMI are regarded as being at risk.

Based on the research results the current in-hospital treatment approach leads to high goal attainment, despite pain. It would however be valuable to

investigate current, individualised self-care, goal-orientated treatment approaches further and to compare these results with other occupational therapy spinal fusion treatment approaches. The efficacy of the practice`s in-hospital treatment approach could be tested in this way.

The adjusted treatment protocol based on the current research results would need to be examined further to determine its efficacy. Based on the results of said research, a model could be developed to identify and manage risk factors in spinal fusion goal attainment.

Similar research should be conducted in different areas of orthopedics i.e. joint replacement surgery to ascertain whether these results could apply to pathologies other than neck- or back fusions.

6.6 CONCLUSION

The aim of this study was to determine the association between personality characteristics, pain perception and the attainment of individualised self-care outcomes in patients after a spinal fusion. Based on the data obtained via 61 participants, the researcher managed to achieve the research aim.

Participants who are scheduled for a spinal fusion who display high levels of anxiety and low levels of independence, tough-mindedness and self-control, experience pain more intensely. Higher levels of pain are associated with decreased goal attainment. However, despite a higher pain perception, the presence of certain personality characteristics leads to higher goal attainment. These personality characteristics include: low extraversion, high independence and self-control. Seriousness, perfectionism, low anxiety and high tough-mindedness are also associated with increased goal-attainment.

The research results confirm the influence that personality characteristics have on pain perception and the attainment of self-care goals. It is the

researcher`s firm belief that the implementation of this study`s recommendations will positively impact the functional independence and rehabilitation outcomes for patients.

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Addendum A

Department of Biostatistics approval letter

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA

UFS·UV
HEALTH SCIENCES
GESONDHEIDSWETENSKAPPE

14 August 2015

For attention: Ethics Committee
Faculty of Health Sciences

Title of project:

Personality characteristics, perception of pain and the attainment of self-care in patients with spinal fusion.

Researcher:

C van der Merwe

I have given input regarding the above mentioned project's protocol on the following aspects of the protocol, namely the study design, sample, measurement, measuring instrument and statistical analysis.

The input will be implemented under supervision of the study leader Mrs PA Hough.

Yours faithfully

M. Nel

Departement Biostatistiek
Department of Biostatistics
T: +27(0)51 401 3114/5/6/7, F: +27(0)51 401 3641
205 Nelson Mandela Drive/Rylaan, Park West/Parkwes, Bloemfontein 9301, South Africa/Suid-Afrika
P.O. Box/Posbus 339 (G31), Bloemfontein 9300, South Africa/Suid-Afrika, www.ufs.ac.za

Addendum B

Research Evaluation Committee of the School of Allied Health Sciences approval letter

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS·UV
HEALTH SCIENCES
GESONDHEIDSWETENSKAPPE

17 Augustus 2015

Beste Ronette Hough

Evalueringskomitee: Me C van der Merwe

Dankie vir die geleentheid om betrokke te wees by die evalueringskomitee van Me C van der Merwe op 12 Augustus.

Aangeheg is die evalueringsverslag vir u aandag.

Alle voorspoed en sukses word die kandidaat toegewens.

Vriendelike groete

Ronette Lategan
Voorsitter: Evalueringskomitee

Skool vir Aanvullende Gesondheidsberoepe / School for Allied Health Professions
Fakulteit Gesondheidswetenskappe / Faculty of Health Sciences
Departement Voeding en Dieetkunde/ Department of Nutrition and Dietetics
T: (051) 401 2894 / (+2751) 401 2894 | F: (051) 401 2869 / (+2751) 401 2869 | E: dietetics@ufs.ac.za / nutrition@ufs.ac.za
205 Nelson Mandela Drive/Rylaan | Park West/Parkwes | Bloemfontein 9301 | South Africa/Suid-Afrika
P.O. Box/Posbus 339 (G24) | Bloemfontein 9300 | South Africa/Suid-Afrika | www.ufs.ac.za

SCHOOL FOR ALLIED HEALTH PROFESSIONS
SKOOL VIR AANVULLENDE GESONDHEIDSBEROEPE

UITSLAG EVALUASIEKOMITEE - NAVORSING
REPORT EVALUATION COMMITTEE - RESEARCH

DISSERTATION / VERHANDELING:	Master of Occupational Therapy
CANDIDATE/KANDIDAAT:	Ms C van der Merwe
DATUM/DATE:	12 Augustus 2015
INITIAL TITLE/ AANVANKLIKE TITEL:	The association between personality characteristics, perception of pain and the attainment of individualized self-care outcomes in Occupational Therapy.

MEMBERS OF THE COMMITTEE/ LEDE VAN DIE KOMITEE

Chairperson:	Dr R Lategan
Expert:	Prof D Coetzee
Expert from other school:	Prof Y Bothma (apology – student received written inputs)
Biostatistician:	Ms R Nel
Study leader:	Ms R Hough
Co-study leader:	Dr R van Heerden (apology – student received written inputs)

All members are welcomed to the meeting and the protocol discussed page by page. Grammar, editorial changes and minor corrections proposed are indicated on the hard copies provided by the student and are not listed. Hard copies will be provided to the student after the meeting to consider changes recommended. The title of the study was discussed at the end of the meeting and a new title proposed.

RECOMMENDATIONS/AANBEVELINGS

The committee recommends the following:

- Grammar and small editorial changes as indicated on the hard copies be corrected;
- Language editing recommended;
- All changes as indicated on the hard copies and written feed-back be addressed;
- Check reference method and use of et al and page numbers;
- Clarify concepts after background is provided;
- Expand on factors influencing pain – provide a picture of the broad field;
- Correct and adapt objectives as indicated on hard copies – objectives to include all activities in the study;

- Expand on sample selection and add language to inclusion and exclusion criteria with reference to standardized questionnaires; Keep information document and consent form in both languages;
- Add demographic information in measurements section;
- Provide interpretations in measurements section;
- In section 5.4 – mention free service provided;
- Include measurement of height and weight to baseline information;
- Expand and provide cut-off points for measurements at each section;
- Make sure that all techniques are described;
- Shift the focus to associate pain level with personality – focus on description in the population;
- Change addenda as indicated on hard copies – ensure appropriate use of language in translations.
- Add data analysis sheet which will be used to enter data and remove data capturing blocks as researcher will enter data herself.

It is recommended that all changes be made under supervision and to the satisfaction of the study leaders.

Feasibility of the study? (✓/×)	√
Adhere the study to the level descriptors (NQF) (✓/×) of a Masters degree?	√
Will the candidate be able to complete the study? (✓/×)	√
Is the title correct? (✓/×)	X

New proposed title: Personality characteristics, perception of pain and the attainment of self-care in patients with spinal fusion.

Dakega

.....
CHAIRPERSON COMMITTEE/

16 August 2015
DATE

Addendum C

Research Ethics Committee of the Faculty of Health Sciences of the University of the Free State approval letter

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA

UFS·UV
HEALTH SCIENCES
GESONDHEIDSWETENSKAPPE

IRB nr 00006240
REC Reference nr 230408-011
IORG0005187
FWA00012784

16 September 2015

MS C VAN DER MERWE
DEPARTMENT OF OCCUPATIONAL THERAPY
FACULTY OF HEALTH SCIENCES
UFS

Dear Ms C van der Merwe

ECUFS NR 165/2015
MS C VAN DER MERWE
DEPARTMENT OF OCCUPATIONAL THERAPY
PROJECT TITLE: PERSONALITY CHARACTERISTICS, PERCEPTION OF PAIN AND THE ATTAINMENT OF SELF-CARE IN PATIENTS WITH SPINAL FUSION

1. You are hereby kindly informed that, at the meeting held on 15 September 2015, the Ethics Committee approved the above project.

2. Any amendment, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

3. A progress report should be submitted within one year of approval of long term studies and a final report at completion of both short term and long term studies.

4. Kindly use the ECUFS NR as reference in correspondence to the Ethics Committee Secretariat.

5. The Ethics Committee functions in compliance with, but not limited to, the following documents and guidelines: The SA National Health Act. No. 61 of 2003; Ethics in Health Research: Principles, Structures and Processes (2015); SA GCP(2006); Declaration of Helsinki; The Belmont Report; The US Office of Human Research Protections 45 CFR 461 (for non-exempt research with human participants conducted or supported by the US Department of Health and Human Services- (HHS), 21 CFR 50, 21 CFR 56; CIOMS; ICH-GCP-E6 Sections 1-4; The International Conference on Harmonization and Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH Tripartite), Guidelines of the SA Medicines Control Council as well as Laws and Regulations with regard to the Control of Medicines, Constitution of the Ethics Committee of the Faculty of Health Sciences.

Yours faithfully

.....
DR SM LE GRANGE
CHAIR: ETHICS COMMITTEE

Cc: Ronette Hough

Ethics Committee
Office of the Dean: Health Sciences
T: +27 (0)51 401 7795/7794 | F: +27 (0)51 444 4359 | E: ethicsfhs@ufs.ac.za
Block D, Dean's Division, Room D104 | P.O. Box/Posbus 339 (Internal Post Box G40) | Bloemfontein 9300 | South Africa
www.ufs.ac.za

Addendum D

Hospital consent letter

Attention: CEO of Greenacres Hospital/ CEO of St. George`s Hospital

Researcher: Chanette van der Merwe
Occupational Therapist
0732005438
chanette.ot@gmail.com

As part of the requirements to obtain ones masters' *degree in Occupational therapy* at the University of the Free State, the performance of a research study is mandatory.

The title of the proposed research study is: Personality characteristics, perception of pain and the attainment of self-care in patients with spinal fusion.

The information gathered from the research will contribute to the existing body of knowledge and will be beneficial in planning appropriate holistic intervention in future. Should the Occupational Therapist understand the associations between personality, pain and achievement of client- centered outcomes, she would be able to utilise appropriate frame of reference during treatment as to ensure the use of a specific approach that will lead to the best rehabilitative outcome for the individual client.

The study population for this research includes participants who are scheduled for spinal fusion. The study will involve that participants complete a questionnaire on personality traits and pain prior to their surgery. Upon participants 6-week follow up with their treating neurosurgeon the questionnaire will again be completed.

During the conduction of research, protocol as set out by neurosurgeons will be followed uninterruptedly. The research conduction will not interfere with any hospital administration or clinical functions in any way.

Participation is completely voluntarily, at no risk or cost to the participant and the participant can withdraw at any given time without providing reason for withdrawal.

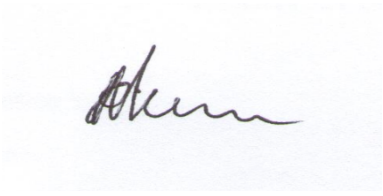
Consent is therefore requested to fill in forms prior to surgery on hospital premises.

I have provided you with a copy of my proposal, which includes copies of the measure, and consent and assessment forms to be used in the research process, as well as a copy of the approval letter received from the Ethics Committee of the faculty of Health Sciences.

Upon completion of the study, I undertake to provide the Department of Occupational therapy with a bound copy of the full research report.

If you require any further information, please do not hesitate to contact me. Thank you for your time and consideration in this matter.

Yours sincerely,



Chanette van der Merwe
University of the Free State

Netcare Greenacres Hospital

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Fax: +27 (0) 41 390 7089
Cnr. Cape and Rochelle Roads, Greenacres, South Africa
PO Box 27488, Greenacres, 6057, South Africa
www.netcare.co.za

LETTER CONFIRMING KNOWLEDGE OF NON-TRIAL RESEARCH TO BE CONDUCTED IN THIS NETCARE FACILITY

Dear Ms Chanette van der Merwe
Occupational Therapist
0732005438
chanette.ot@gmail.com

Re Personality characteristics, perception of pain and the attainment of self-care in patients with spinal fusion.

We hereby confirm knowledge of the above named research application to be made to the Netcare Research Operational Committee and in principle agree to the research application for Netcare Greenacres Hospital/site/division, subject to the following:

i) That the research may not commence prior to receipt of FINAL APPROVAL from the Sustainability Committee of Netcare (Research Operational Committee).

ii) A copy of the research report will be provided to Netcare Research Operational Committee once it is finally approved by the tertiary institution, or once complete.

iii) Netcare has the right to implement any Best Practice recommendations from the research.

iv) That the Hospital/Site/Division Management reserves the right to withdraw the approval for research at any time during the process, should the research prove to be detrimental to the subjects / Netcare or should the researcher not comply with the conditions of approval.

We wish you success in your research.

Yours faithfully

Tamp — 28 August 2015

Signed by Hospital/Site/Division Management — **Date**

Nursing Manager

(Specify designation)

Addendum E

Neurosurgeons` consent letter

Dr. Ansari and Dr. Francis

Researcher: Chanette van der Merwe
Occupational Therapist
0732005438
chanette.ot@gmail.com

As part of the requirements to obtain a masters' *degree in Occupational therapy* at the University of the Free State, the performance of a research study is mandatory.

The title of the proposed research study is: Personality characteristics, perception of pain and the attainment of self-care in patients with spinal fusion.

The information gathered from the research will contribute to the existing body of knowledge and will be beneficial in planning appropriate holistic intervention in future. This in turn will insure needed adaptations to existing treatment protocol is made as to insure the most effective rehabilitation of our patients.

The study population for this research includes participants who are scheduled for spinal fusion. The study will involve that participants complete several questionnaires regarding personality traits, pain and personal care outcomes prior to their surgery. Upon participants` 6-week follow-up appointment, these questionnaires will again be completed.

During the conduction of research, the rehabilitation protocol as performed at present will be followed uninterruptedly. The research conduction will not

interfere with clinical functions in any way.

Participation is completely voluntarily, at no risk or cost to the participant and the participant can withdraw at any given time without providing reason for withdrawal.

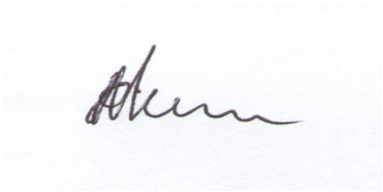
Your consent is therefore requested to contact referred patients as to ascertain whether they are interested in participating in the study. Should a patient be scheduled for either a cervical or lumbar fusion, the patients' details can be send through to me and I will then contact them for their pre-operative session and possible participation in the research.

I have provided you with a copy of my proposal, which includes copies of the measure, consent and assessment forms to be used in the research process, as well as a copy of the approval letter received from the Ethics Committee of the faculty of Health Sciences.

Upon completion of the study, I undertake to provide the Department of Occupational therapy with a bound copy of the full research report. A copy of the findings will also be provided to you.

If you require any further information, please do not hesitate to contact me. Thank you for your time and consideration in this matter.

Yours sincerely,

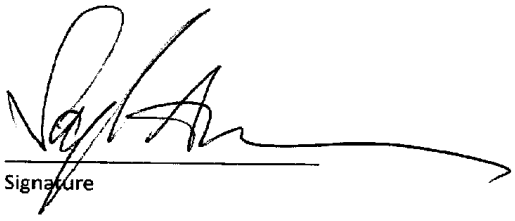


Chanette van der Merwe
University of the Free State

Informed approval

I, Dr. Ansari, practice number 0479675 /0467995, herewith give consent to Chanette van der Merwe to contact referred patients to participate in her research study.

Signed at Port Elizabeth this day 20 of August 2015.

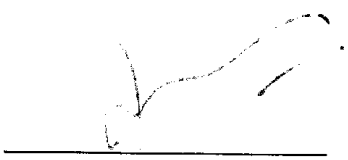


Signature

Informed approval

I, Dr. Francis, practice number 0479615 / 0405172, herewith give consent to Chanette van der Merwe to contact referred patients to participate in her research study.

Signed at Port Elizabeth this day 19th of August. 2015.



Signature

Addendum F

Current in-hospital treatment protocol

Cervical Fusion

Cervical fusion patients are usually admitted for two days after which they are discharged. Sessions in-hospital therefore allows for less practical exercise and necessitates the need for more demonstration and theoretical sessions.

Below is a summary of protocol presently used in our practice for patients who undergo a cervical fusion.

1st session:

- Information with regards to precautions
- Demonstrate correct sleeping position
- Self-care activity (Demonstrate and practical application of components)

One or more as needed:

- Dressing lower limb (pants, underwear, socks)
- Dressing upper limb (shirt and jacket)
- Washing, drying and styling hair
- Correct posture whilst showering

2nd session:

- Give following information through, apply and/ exercise where applicable

- Correct seated posture
- Correct posture during standing
- Correct way of bending
- Safe sexual positions

- Consultation on pain management strategies (thermal, relaxation therapy, progressive breathing)
- Liaise with family/ relevant parties

Lumbar Fusion

Lumbar fusion patients are usually admitted for four - five days after which they are discharged. Due to the fact that the patients are often drowsy on day one, the protocol stipulates three sessions to insure that all aspects are covered within their stay, even if one needs to start first session on day two. Treatment sessions vary from 60 – 90 minutes depending on how well the patient is able to mobilise.

Below is a summary of protocol presently used in our practice for patients who undergo a lumbar fusion.

1st session:

- Information with regards to pre-cautions
- Reiterate log roll and practice log roll into sitting position. Apply brace and come into standing
  * NB: If physiotherapist have given clearance for mobilisation

- Mobilise to bathroom and practice toilet transfer (show assistive device if needed)
- Demonstrate correct sleeping position

2nd session:

- Self-care treatment session (Demonstrate and practical application of components)

One or more as needed:

- Dressing lower limb (pants, underwear, socks)
- Dressing upper limb (shirt and jacket)
- Getting in and out of shower correctly
- Washing whilst in shower (Pre-cautions, assistive devices)
- Drying body
- Washing, drying and styling hair

3rd session

- Give following information through, apply and/ exercise where applicable

    - Correct seated posture
    - Correct posture during standing
    - Correct way of bending
    - Standing for long periods of time
    - Safe sexual positions

- Car transfer
- Consultation on pain management strategies (thermal, postural adaptations i.e. bending knee, relaxation therapy)
- Liaise with family/ relevant parties

Addendum G

Current pre-cautions indicated in treatment protocol

Pre-cautions after cervical fusions

Biomechanical limitations

- With Anterior Cervical Fusion – avoid extension
- With Posterior Cervical Fusion – avoid flexion
- Active range of motion is patient dependent and will be based on Physician preference and the level and number of fusions
- Avoid rotation of the spine
- Do not cross legs

Activity limitations

During the first 4-6 weeks whilst the initial post-operative pain settles and tissue begins to heal, it is advised to be careful with some activities. It is important to

gradually increase activities and also pace activities throughout the day dependent on pain. The following activity limitations serve as pre-cautionary measures:

- Refrain from pushing, pulling, or lifting greater than 2 kg for first two weeks, progress slowly
- Do not lift above shoulder level, no overhead lifting or activity
- If a brace was prescribed, it should be worn whilst patient is not in bed
- Sit as tolerated, posture must be changed every 30 minutes, insure well aligned spine, avoid slouching
- Sexual activities can be participated in after two week, use the least exerting and most comfortable positions
- Driving is contra-indicated whilst still wearing hard collar, commence after four weeks upon specialists discretion
- Should a hip graft be done, no bathing for at least four weeks, only

showering

- Avoid household chores for 3-6 weeks, or as approved by physician
- Avoid yard work for 6-8 weeks, or as approved by physician

Pre-cautions after lumbar fusions

Biomechanical limitations

- Avoid any movements which are repetitive, or sudden
- **No** bending at the waist
- **No rotation of the spine**
- **No** squatting or stooping
- Allowance of range of motion is physician dependent
- Avoid excessive loading and distraction

Activity limitations

- Refrain from pushing, pulling, or lifting greater than 2 kg for first four weeks, progress slowly
- Braces should be worn during all positions except when lying down
- Lying, standing or walking permitted, sitting only for 20 minutes a day for 4 weeks, after 4 weeks progress slowly, from 20 minutes to 40 minutes several
  times per day.
- Climbing stairs, one at a time, are usually permitted, after two weeks, if it has been practiced at least one time with supervision
- No sexual intercourse for 2 weeks. After 2 weeks intercourse as the passive partner in least exerting and most comfortable positions
- No driving for 4-6 weeks, depending on specialist
- Due to the excessive stresses placed on the lumbar spine, during entering and exiting a bathtub, it is recommended that only showers be taken during the first 3 months following surgery
- Avoid household chores for 4-6 weeks, slowly progress
- Avoid yard work for at least 2-3months, then begin slowly and take frequent breaks

Addendum H

Information Sheet

Purpose of the Study. As part of the requirements for masters' degree in Occupational therapy at UFS, I have to carry out a research study. The study is concerned with investigating what association exists between personality traits, perception of pain and achievement of individualised self-care outcomes in Occupational therapy.

What will the study involve? The study will involve completing a questionnaire on personality traits, pain and self-care questionnaire prior to surgery. This session will take about 60 minutes and will be scheduled for a time of your convenience. On the same day as your 6-week follow up with the neurosurgeon, pain and self-care questionnaire will again be completed. This session will take about 30-40 minutes of your time. Again an appointment time of your convenience will be made with you in advance.

Why have you been asked to take part? You have been asked because you are scheduled for a spinal fusion and the study focuses on the association of personality, pain and achievement of individualised outcomes after a spinal fusion.

Do you have to take part? Participation is voluntary and no person will be forced to participate. If you do decide to participate you will complete a consent form giving permission to the researcher to use data obtained. If at any point in time you wish to withdraw from the study, you can do so irrespectively of signed consent. The data obtained from you up until that point in research project will then be destroyed and you can completely withdraw from study should you wish to do so. Participation or withdrawal will have no financial consequences for the participant.

Will your participation in the study be kept confidential? Yes. I will ensure that no clues to your identity appear in the dissertation. You will also have a participation number throughout the research and your name will not appear on any of the questionnaires completed.

What will happen to the information, you provide? Data will be analysed and findings deducted. The data will be kept confidential for the duration of the study. On completion of the dissertation, it will be retained for a further fifthteen years and then destroyed.

What will happen to the results? The results will be presented in the dissertation. My assessors will see the results. Future students on the course may read the dissertation. The study may be published in a research journal. Participants' identity will in no way be reflected in the dissertation or article and will remain confidential. Should you wish to discuss the results of your personality test in more detail you can arrange an appointment with psychologist, Dr. Schafer (042 291 0088), this would be for your own account.

What are the possible disadvantages of taking part? I don't envisage any negative consequences for you in taking part.

Who has reviewed and approved this research proposal? This protocol has been reviewed and approved by the Research Ethics Committee of the Faculty of Health Sciences of the University of the Free State.

Any further queries? If you need any further information, you can contact the researcher Chanette van der Merwe at 073 200 5438 or at chanette.ot@gmail.com. You can also contact the Research Ethics Committee of the Faculty of Health Sciences if you have any questions pertaining your rights as a research participant: Mrs. (MGE) Maré Marais or Mrs. (J) Jemima Du Plessis at tel.: +27(0) 51 401 7794/5

If you agree to take part in the study, please sign the consent form overleaf.

Addendum I

Consent form

Participant nr:

Title of study: Personality characteristics, perception of pain and the attainment of self-care in patients with spinal fusion.

Name of researcher: Chanette van der Merwe

I……agree to participate in the research study.

The purpose and nature of the study has been explained to me in writing and I was provided the opportunity to ask questions and given adequate time to rethink my participation in this research. The aim and objectives of the study have been explained to me, and are sufficiently clear to me. I have not been pressurized to participate in any way.

I understand that participation in this study is completely voluntary and that I may withdraw from it at any time and without supplying reasons. This will have no influence on the regular treatment that holds for my condition neither will it influence the care that I receive from my doctor.

I give permission for my information to be recorded on paper and for my questionnaires to be scored and used in data gathering.

I understand that confidentiality will be ensured in the write-up by disguising my identity.
I know that the Ethics Committee of the Faculty of Health Sciences University of the Free State has approved this study. I am fully aware that the results of this study will be used for scientific purposes and may be published. I agree to this, provided my privacy is guaranteed.

I hereby give consent to participate in this study.

....
Name of participant Signature of participant

....
Place Date Witness

Statement by the Researcher

I provided verbal and written information regarding this study.
I agree to answer any future questions concerning the study as best as I am able.
I will adhere to the approved protocol.

....
Name of Researcher Signature Date Place

Addendum J

Pre-operative Demographic questionnaire

Participant nr:

Instructions
Mark the appropriate block with a X or write your answer on the space provided.

1. Date questionnaire is completed (dd/mm/yy) …./…./….

Gender

1	Male
2	Female

2. What is your birthdate?(dd/mm/yy)……/……/….

3. What is your occupation? …….

4. What is your home language?

1	Afrikaans
2	English
3	Sotho
4	Tswana
5	Xhosa
6	Zulu
7	Other, specify……

5. What is your height?

……

6. What is your weight?

……

7. Do you suffer from any one or more of the following conditions?

	Diabetus Mellitus
	Hypertension
	Cholesterol
	Other, specify……..

8. What type of fusion are you scheduled for?

1	Neck
2	Back

9. What is the level of fusion?

……

10. Have you undergone a fusion before?

Yes(1)	No(2)

11. Do you use pain medication to alleviate neck or back pain?

Yes(1)	No(2)

If yes please specify most generally used pain medication:

……
……
……
……
……

12. What dosage of pain medication do you use?

…… mg
…… mg
…… mg
…… mg
…… mg

13. How frequently do you use pain medication?

…… x / day
…… x / week
…… x / day
…… x / week
…… x / day
…… x / week
…… x / day
…… x / week

Addendum K

Post-operative Demographic questionnaire

Participant nr:

Instructions
Mark the appropriate block with a X or write your answer on the space provided.

1. Date questionnaire is completed (dd/mm/yy) …./…./….

2. How many days were you hospitalized post fusion?

…….days

3. Did you experience any complications after your fusion, please specify if yes?
……..
……..
……..
……..

4. Do you use pain medication to alleviate neck or back pain?

Yes	No

If yes please specify most generally used pain medication:
……
……
……
……
……

5. What dosage of pain medication do you use?
…… mg
…… mg
…… mg
…… mg
…… mg

6. How frequently do you use pain medication?
…… x / day
…… x / week
…… x / day
…… x / week
…… x / day
…… x / week
…… x / day
…… x / week

Addendum L

Cattell 16 Primary Factor Questionnaire (16PF5)

Addendum M

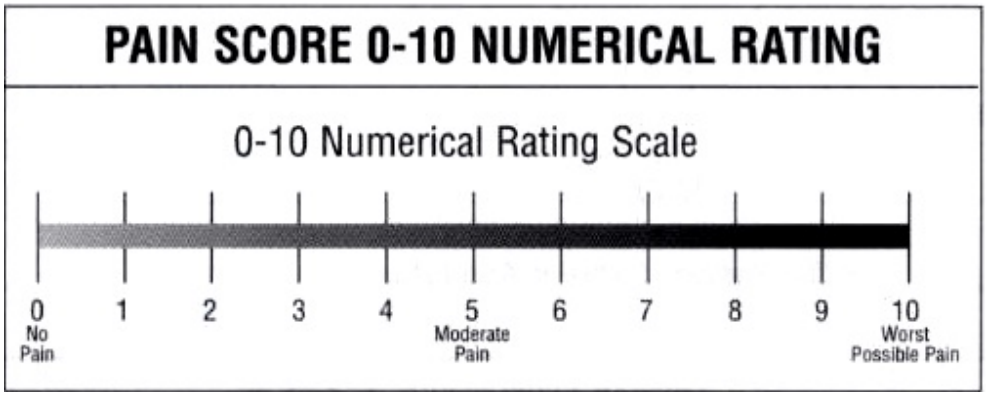
Numerical Rating Scale (NRS)

Pre - operative	Post- operative

Participant nr:

The Numerical Rating Scale

Instructions:
" How would you rate your pain on a scale of zero to ten, zero being that you experience no pain at all, five being you experience moderate pain and 10 being you experience the worse possible pain? Rate your experience of pain for the majority of the time, therefore five out of seven days"



Write your pain rating out of 10 in block below:

	/ 10

Addendum N

Oswestry Disability Index (ODI)

Pre - operative	Post- operative

Participant nr:

Instructions: Please circle the number of the statement in each section that describes you best. You should only circle one statement in each section.

SECTION 1-PAIN INTENSITY	
The pain comes and goes and is very mild.	0
The pain is mild and does not vary much.	1
The pain comes and goes and is moderate.	2
The pain is moderate and does not vary much.	3
The pain comes and goes and is very severe.	4
The pain is severe and does not vary much.	5
SECTION 2-PERSONAL CARE	
I would not have to change my way of washing or dressing in order to avoid pain.	0
I do not normally change my way of washing or dressing even though it causes some pain.	1
Washing and dressing increases the pain, but I manage not to change my way of doing it.	2
Washing and dressing increases the pain and I find it necessary to change my way of doing it.	3
Because of the pain, I am unable to do some washing and dressing without help.	4
Because of the pain, I am unable to do any washing and dressing without help.	5
SECTION 3-LIFTING	
I can lift heavy weights without extra pain.	0
I can lift heavy weights, but it causes extra pain.	1
Pain prevents me from lifting heavy weights off the floor, but I manage if they are conveniently positioned (e.g., on a table).	2
Pain prevents me from lifting heavy weights off the floor.	3
Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are conveniently positioned.	4
I can only lift very light weights at the most.	5
SECTION 4-WALKING	
I have no pain on walking.	0
I have some pain on walking, but it does not increase with distance.	1
I cannot walk more than 1.6 km without increasing pain.	2
I cannot walk more than 800 meter without increasing pain.	3
I cannot walk more than 400 meter without increasing pain.	4
I cannot walk at all without increasing pain.	5
SECTION 5-SITTING	
I can sit in any chair as long as I like.	0
I can only sit in my favorite chair as long as I like.	1
Pain prevents me from sitting more than one hour.	2
Pain prevents me from sitting more than 1/2 hour.	3

Pain prevents me from sitting more 10 minutes.	4
I avoid sitting because it increases pain right away.	5
SECTION 6-STANDING	
I can stand as long as I want without pain.	0
I have some pain on standing, but it does not increase with time.	1
I cannot stand for longer than one hour without increasing pain.	2
I cannot stand for longer than 1/2 hour without increasing pain.	3
I cannot stand for longer than 10 minutes without increasing pain.	4
I avoid standing because it increases the pain right	5
SECTION 7-SLEEPING	
I get no pain in bed.	0
I get pain in bed, but it does not prevent me from sleeping well.	1
Because of pain, my normal night's sleep is reduced by less than 1/4.	2
Because of pain, my normal night's sleep is reduced by less than 1/2.	3
Because of pain, my normal night's sleep is reduced by less than 3/4.	4
Pain prevents me from sleeping at all.	5
SECTION 8-SOCIAL LIFE	
My social life is normal and gives me no pain.	0
My social life is normal, but increases the degree of pain.	1
Pain has no significant effect on my social life apart from limiting my more energetic interests, e.g., dancing, etc.	2
Pain has restricted my social life and I do not go out very often.	3
Pain has restricted my social life to my home.	4
I have hardly any social life because of the pain.	5
SECTION 9-TRAVELLING	
I get no pain while travelling.	0
I get some pain while travelling, but none of my usual forms of travel makes it any worse.	1
I get extra pain while travelling, but it does not compel me to seek alternative forms of travel.	2
I get extra pain while travelling, which compels me to seek alternative forms of travel.	3
Pain restricts all forms of travel.	4
Pain prevents all forms of travel except that done lying down.	5
SECTION 10-CHANGING DEGREE OF PAIN	
My pain is rapidly getting better.	0
My pain fluctuates, but is definitively getting better.	1
My pain seems to be getting better, but improvement is slow at present.	2
My pain is neither getting better nor worse.	3
My pain is gradually worsening.	4
My pain is rapidly worsening.	5

Addendum O

Neck Disability Index (NDI)

Pre - operative	Post- operative

Participant nr:

Instructions: Please circle the number of the statement in each section that describes you best. You should only circle one statement in each section.

SECTION 1 - PAIN INTENSITY	
I have no pain at the moment.	0
The pain is very mild at the moment.	1
The pain is moderate at the moment.	2
The pain is fairly severe at the moment.	3
The pain is very severe at the moment.	4
The pain is the worst imaginable at the moment.	5
SECTION 2 – PERSONAL CARE	
I can look after myself normally without causing extra pain.	0
I can look after myself normally but it causes extra pain.	1
It is painful to look after myself and I am slow and careful.	2
I need some help but manage of my personal care.	3
I need help every day in most aspects of self-care.	4
I do not get dressed I wash with difficulty and stay in bed.	5
SECTION 3 – LIFTING	
I can lift heavy weights without extra pain.	0
I can lift heavy weights but it gives extra pain.	1
Pain prevents me from lifting heavy weights off the floor but I can manage if they are conveniently positioned (on a table etc.).	2
Pain prevents me from lifting heavy weights but I can manage light to medium weights if they are conveniently positioned.	3
I can lift very light weights.	4
I cannot lift or carry anything at all	5
SECTION 4 – READING	
I can read as much as I want to with no pain in my neck.	0
I can read as much as I want to with slight pain in my neck.	1
I can read as much as I want to with moderate pain in my neck.	2
I can't read as much as I want because of moderate pain in my neck.	3
I can hardly read at all because of severe pain in my neck.	4
I cannot read at all.	5

SECTION 5 – HEADACHES	
I have no headaches at all.	0
I have slight headaches which come infrequently.	1
I have moderate headaches which come infrequently.	2
I have moderate headaches which come frequently.	3
I have severe headaches which come frequently.	4
I have headaches almost all the time.	5
SECTION 6 – CONCENTRATION	
I can concentrate fully when I want to with no difficulty.	0
I can concentrate fully when I want to with slight difficulty.	1
I have a fair degree of difficulty in concentrating when I want to.	2
I have a lot of difficulty in concentrating when I want to.	3
I have a great deal of difficulty in concentrating when I want to.	4
I cannot concentrate at all.	5
SECTION 7 – WORK	
I can do as much work as I want to.	0
I can only do my usual work but no more.	1
I can do most of my usual work but no more.	2
I cannot do my usual work.	3
I can hardly do any work at all.	4
I can't do any work at all.	5
SECTION 8 – DRIVING	
I can drive my car without any neck pain.	0
I can drive my care as long as I want with slight pain in my neck.	1
I can drive my car as long as I want with moderate pain in my neck.	2
I can't drive my car as long as I want because of moderate pain in my neck.	3
I can hardly drive at all because of severe pain in my neck.	4
I can't drive my car at all.	5
SECTION 9 – SLEEPING	
I have no trouble sleeping.	0
My sleep is slightly disturbed (less than 1 hour sleepless).	1
My sleep is mildly disturbed (1-2 hours sleepless).	2
My sleep is moderately disturbed (2-3 hours).	3
My sleep is greatly disturbed (3-5 hours).	4
My sleep is completely disturbed (5-7 hours).	5
SECTION 10 – RECREATION	
I am able to engage in all my recreation activities with no neck pain at all.	0
I am able to engage in all my recreation activities with some pain in my neck.	1
I am able to engage in most but not all of my usual recreation activities because of pain in my neck.	2
I am able to engage in a few of my usual recreation activities because of pain in my	3

neck.	
I can hardly do any recreation activities because of pain in my neck.	4
I can't do any recreation activities.	5

Addendum P

Self-care rating

Pre - operative	Post - operative

Participant nr:

Do you perform the following self-care tasks? Indicate with an "x" in the applicable no or yes column.
If your answer is ***yes***, please rate each self-care task in the block provided, in accordance to importance, your performance and satisfaction utilising the following key:

Rating	Interpretation		
	Performance	**Importance**	**Satisfaction**
1	Maximal assistance required	Not important	Not satisfied at all
2	Moderate assistance required	Mildly important	Mildly satisfied
3	Some assistance required	Moderately important	Moderately satisfied
4	Fully independent in all components	Extremely important	Extremely satisfied

Self-care activity	**Applicable**		**Ratings**		
	No	**Yes**	**Performance**	**Importance**	**Satisfaction**
Mobilise in and out of shower					
Washing body within the shower					
Dry body after shower					
Retrieve clothing from its storage place					
Apply socks and/ shoes					
Apply underwear and pants					
Apply over garments					
Walk from one area to another					
Roll in bed					
Move from lying position to sitting					
Get up from a sitting position					
Remove body hair					
Applying and removing cosmetics					
Washing hair					
Drying and styling hair					
Caring for finger nails					
Caring for toe nails					
Caring for skin					
Cleaning mouth; brushing and flossing teeth; or removing, cleaning, and reinserting dental orthotics					
Engage in sexual intercourse					
Manipulate clothing when going to the toilet					
Maintain toileting position					
Transferring to and from toileting position					
Cleaning body after toileting					

Addendum Q

Goal Attainment Scale (GAS)

Pre - operative	Post - operative

Participant nr:

Please indicate with "x" what scale has been achieved for each of the three individualised goals (as set according to self-care rating).

Goal	Scale	Description	Achieved
E.g. Applying socks	-2	Fully dependent on husband to apply socks.	
	-1	Apply socks with assistance of husband to lift leg up onto other leg and place sock over toes. Use reacher to pull socks up.	
	0	Apply socks with assistance of husband to lift leg up onto other leg and use shoehorn to pull socks over toes and reacher to pull socks up.	X
	+1	Use reacher to hold onto pants and lift leg up onto other leg and use shoehorn to pull socks over toes and reacher to pull socks up.	
	+2	Use reacher to hold onto pants and lift leg up onto other leg and use bending techniques to place sock over toes and pull sock up independently.	
1.	-2		
	-1		
	0		
	+1		
	+2		
2.	-2		
	-1		
	0		
	+1		
	+2		