THE RELATIONSHIP BETWEEN DEPRESSIVE SYMPTOMS AND POST-OPERATIVE SUBJECTIVE PAIN PERCEPTION AFTER THIRD MOLAR SURGERY.

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Thesis presented in fulfillment for the degree of Master of Science (Psychology) at the University of Stellenbosch

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DECLARATION

I, the undersigned, hereby declare that the work contained in this thesis is my own original work, and that I have not previously in its entirety or in part submitted it at any university for a degree.

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Signature Date

ABSTRACT

Postoperative pain is still the most common and anticipated problem following surgery and inadequate post-operative pain management remains problematic. There is a significant variation in post-operative pain experience of patients following identical surgical procedures and this has been related to a variety of psychological factors. Depression has been considered a predictor of post-operative pain. The overall aim of the study was to determine the relationship between depressive symptoms and subjective pain experienced in dental surgery. The Beck Depression Inventory (BDI) was administrated to a sample of 35 patients presenting with dental impaction to assess general depression severity. Participants were assigned to one of two groups using a cutoff score of 10 on the BDI. Pain was measured by a Visual analog pain scale. The results showed that participants with pre-operative depressive symptoms had a trend to experience more pain pre-operatively but less pain post-operatively than participants without depressive symptoms this difference was however not statistically significant. No significant correlations were found between the presence of depressive symptoms pre-operative and pain perception pre-operatively and post-operatively. However significant relationships were found between the absence of depressive symptoms pre-operative and pain perception pre-operatively and post-operatively. Pre-operative depressive symptoms were also found to be predictive of post-operative depressive symptoms. The study concluded that pain and depression co-occur, but the direction of causality is not clearly understood. The use of psychotherapeutic tools for identifying pre-operative predictors for intense post-operative pain will enhance the quality of pain management and therefore has a positive impact on the quality of life of the patient.

ABSTRAK

Post-operatiewe pyn is een van die mees algemene en verwagte probleme na afloop van chirurgie en onvoldoende behandeling van die pyn bly problematies. Daar is 'n beduidende verskil in die ervaring van post-operatiewe pyn van pasiënte na identiese chirurgiese prosedures en dit hou verband met 'n verskeidenheid van sielkundige faktore. Depressie word beskou as 'n voorspeller van post-operatiewe pyn. Die hoof doel van die studie was om die verhouding tussen depressiewe simptome en subjektiewe pyn ervaring in tandheelkundige chirurgie te bepaal. Die Beck Depression Inventory (BDI) is gebruik om die erns van algemene depressie onder ‘n steekproef van 35 pasiënte wat presenteer met tand impaksie te evalueer. 'n Afsny-telling van 10 is gebruik om die deelnemers toe te wys aan een van twee groepe. Pyn was gemeet deur 'n Visuele analog pynskaal (VAS). Die resultate het getoon dat deelnemers met pre-operatiewe depressiewe simptome 'n neiging het om meer pyn pre-operatief, maar minder pyn post-operatief te ervaar as deelnemers sonder depressiewe simptome. Die verskil was egter nie statisties beduidend nie. Geen beduidende korrelasies is gevind tussen die teenwoordigheid van pre-operatiewe depressiewe simptome en die persepsie van pyn pre-operatief en post-operatief nie. Beduidende verbande is egter gevind tussen die afwesigheid van pre-operatiewe depressiewe simptome en persepsie van pyn pre-operatief en post-operatief. Pre-operatiewe depressiewe simptome het ook post-operatiewe depressiewe simptome voorspel. Die studie het bevind dat pyn en depressie saam voorkom maar die rigting van oorsaak is nie uitgewys. Die gebruik van psigoterapeutiese instrumente vir identifisering van pre-operatiewe voorspellers vir intense post-operatiewe pyn sal die gehalte van pynbehandeling verbeter en sodoende 'n positiewe impak op die kwaliteit van lewe van die pasiënt hê.

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Chapter 1

Introduction

Depression and pain symptoms are highly prevalent conditions encountered by physicians and specialists. Studies indicate that the lifetime prevalence of pain symptoms (back pain, arm and leg pain, abdominal pain, headache, chest pain and joint pain) ranges from 24% to 37% (Kroenke, 2001). Major depression is also common with a prevalence of 5% to 10% in primary care patients (Bair, Robinson, Katon & Kroenke, 2003). During recent years clinicians and researchers in the field of pain management have increasingly recognized the important relationship between the experience of pain and psychological variables. The relationship between pain and depression is frequently emphasized and there is little doubt that high co-morbidity exists between pain and depression (Willoughby, Hailey, Mulkana & Rowe, 2002).

The traditional understanding of pain and depression as separate conditions with overlapping symptoms has evolved through research into an understanding that pain and depression share pathophysiological mechanisms. These shared pathophysiological mechanisms include origins, mechanisms and neurotransmitters, resulting in shared treatments (Greden, 2008). In addition, pain and depression have a reciprocal relationship in that each heightens the severity of the other (Jain, 2008). This important relationship affects clinical practice and patient outcomes. Following considerable research among chronic pain patients, Greist (2008) concluded that depression with pain is common, recurrent, debilitating, and potentially lethal through suicide; but treatable. He also emphasized the importance of the correct diagnosis for depression and recognition of pain as both a symptom and a predictor of depression.

Post-operative pain is still the most common and anticipated problem following surgery. Inadequate post-operative pain management remains problematic. In addition to medical aspects, patient related factors, such as the presence of pre-operative pain and the expectation of pain may influence post-operative pain (Wickström, Nordberg & Johansson, 2005). There is a significant variation in post-operative pain experience of patients following identical surgical procedures, which has been related to a variety of psychological factors (Özalp, Sarioglu, Tuncel, Aslan & Kadiogullari, 2003). Anxiety and depression have been considered predictors of post-operative pain. In the study done by Wickström et al. (2005) these authors found a significant correlation between pre-operative depression and high post-operative pain scores. In this study, there was a positive correlation between the presence of depression and pain (Wickstrom et al, 2005). Pre-operative depressive symptoms were also related to reports of higher levels of post-operative pain in studies done by Caumo et al. (2002) and Özalp et al. (2003).

Investigating the relationship between acute post-operative pain and depression may be useful for designing specific preventive interventions to relieve patient suffering (Caumo et al., 2002). Hinrichs-Rocker et al. (2008) also suggested that prompt interventions must be carried out to optimize pain management. For this reason the earliest possible identification of patients at increased risk of developing chronic post-operative pain is called for. Nielsen, Rudin and Werner (2007) further suggested the importance of implementation of clinically relevant pre-operative screening methods. These screening methods may lead to more aggressive pain management interventions, targeted at individuals at higher risk for pain, which may improve post-operative rehabilitation and a decrease in post-operative morbidity.

Few studies have been conducted on the influence of psychological factors on the outcome of dental surgery, but it has been noted that oral health conditions have significant relationships with mental illness. A study done in Lagos, Nigeria, (Coker, Awotile and Ogunbanjo, 2008) found that a high percentage of dental patients also suffer from anxiety and depression. They concluded that the acquisition of psychotherapeutic tools by dental surgeons for assessing and managing dental patients will enhance the quality and service delivery of dental surgeons.

The current study will investigate the relationship between depressive symptoms and acute post-operative pain perception associated with surgery and treatment of dental impaction.

Chapter 2

Literature Review

2.1 Pain

The definition of pain as, "an unpleasant sensory and emotional experience associated with actual or potential tissue damage" was formulated by the Task Force on Taxonomy for the International Association for the Study of Pain (IASP; Merskey & Bogduk, as cited in King, 2000, p86). Pain is classified into acute and chronic pain. The differentiating point is temporal, with acute pain present for a period of less than 6 months and chronic pain present for a period longer than 6 months (King, 2000). This system is helpful to differentiate between time-limited pain, like post-operative pain and longer-standing conditions. Dividing between chronic and acute became more difficult when dealing with pain related to a long-term terminal illness. According to King (2000) definitions of acute and chronic pain are usually based only on physical abnormalities and the influence of psychosocial factors is not taken into account when differentiating between the two conditions and this can be problematic. Acute pain is viewed as primarily a function of nociceptive input, while chronic pain as heavily influenced by psychological and social factors (Kolber, 2007).

Bob (2007) described pain as "a multidimensional experience that includes discriminative, affective, motivational and cognitive components mediated by spinal, brainstem and cerebral functioning, modulated through forebrain mechanisms (p 354)". The definition of pain, given by IASP, emphasizes the complexity of pain and highlights several phenomenological components. These include sensory components, such as perceived intensity and localization in the body, while affective and evaluating components include emotional distress (Kolber, 2007). Because pain has an affective component, emotional states like anxiety and depression influence

pain perception. Therefore, the severity of pain does not only bear a simple relationship to the degree of tissue damage, as the emotional state of a person modulates the mode of pain perception (Bär, Greiner, Letsch, Köbele & Sauer, 2003). Processing of the sensory and affective components of pain, also take place in different regions of the brain (Kolber, 2007).

2.1.1 Biological pathways of pain

Pain differs from other sensations because of its protective function. Pain demands a motor, autonomic and emotional reaction; therefore emotion can completely alter how pain is felt (Stein & Stoodley, 2006). Acute pain is divided into two phases, namely fast pain (which is sharp, easily localizable and does not cause much emotional anguish) and slow pain (which is burning, aching, throbbing and triggers autonomic and emotional reactions). The two phases are mediated by separate receptors (Stein & Stoodley, 2006): fast pain by small lightly myelinated Aδ (A-delta class)-fibers, and slow pain by unmyelinated C-fibers which are stimulated by nociceptive chemicals (serotonin, substance P, prostaglandins) released after the damage (Tate & Acs, 2002).

2.2 Depression

Disorders of mood (the pervasive and sustained feeling tone that is experience internally), are characterized by a loss of sense of control and a subjective experience of great distress (Sadock & Sadock, 2007). Depression has been known as a condition that produces both emotional and physical symptoms. The criteria for a Major Depressive Episode (MDE), according to the DSM-IV-TR (Diagnostic and Statistical Manual of Mental Disorders (4th Edition) Text Rev.),

specifies five or more symptoms to be present during the same two-week period and represent a change from previous functioning. At least one of the symptoms present is either a) depressed mood or b) loss of interest or pleasure (American Psychiatric Association (APA), 2000). The list of symptoms includes changes in appetite and weight, changes in sleep and activity, lack of energy, feelings of guilt, problems thinking or concentrating, recurrent thought of death or suicide. Physical symptoms associated with depression include body aches and pains, headaches and gastro-intestinal disturbance (Delgado, 2004)

2.3 Common Pathways of Pain and Depression

In a study done by Ohayon and Schatzberg (2003), 17.1% of the subjects reported having a chronic painful physical condition, while major depressive disorder was present in 4% of the subjects. Among the subjects with major depressive disorder, more than 40% also had a chronic painful physical condition. In this study the authors found that pain, that was present for a period of 24 hours, made an independent contribution to the presence of major depressive disorder. This indicates that continuous pain independently increases the likelihood of having a major depressive disorder (Ohayon & Schatzberg, 2003; Keefe, Wilkens, Cook, Crisson, & Mullbaier, 1986). Ohayon (2004) also reported that the presence of a chronic painful condition increased the severity and frequency of depressive symptoms, and specifically physical symptoms of depression. These symptoms could be produced by pain rather than by the depressive illness. Studies by McWilliams, Goodwin and Cox (2004) of the relationship between pain conditions and psychopathology, found significant positive associations between depression and migraine, back pain and arthritis. Further logistical regression analysis by

McWilliams et al. (2004) indicated that patients with multiple physical complaints had higher rates of psychopathology including depression than participants without or with a single complaint.

Clinical depression manifests in various emotional and physical symptoms which often include chronic physical pain. The co-morbidity of chronic pain and chronic depression makes it difficult to pinpoint the temporal and causal relationship, but the correlation between the two conditions is clear (Schatzberg, 2004). Depression in patients with pain is associated with more pain complaints and greater impairment (Bair et al., 2003). Willoughby et al. (2002) concluded that although depression can be a consequence of living with pain, a depressed mood or clinical depression may also significantly influence the experience of pain.

It is important and necessary to know the complex biological relationship between pain and depression as the convergence of the two conditions are reflected in the circuitry of the nervous system (Agüera et al., 2010). Brain receptors and neurotransmitters interact with one another in circuits or pathways to regulate various functions of the brain. Psychiatric disorders can be the result of a dysfunction of certain specific pathways or circuits (Stahl, Zhang, Damatarca & Grady, 2003). Brain pathways that manage pain signal reception, eg. limbic system, use some of the same neurotransmitters involved in mood regulation, especially serotonin and norepinephrine (Agüera et al., 2010).

2.3.1 Gate control theory

Recent research has established that this gate control is mediated via serotonergic and noradrenergic systems. Melzack and Wall introduced the gate control theory in 1965 that proposed a control system that modulated sensory input

from the skin before it evoked pain perception and response. This theory suggests that pain phenomena are determined by interactions among different neurologic systems (Tate & Ace, 2002). The gated control has two parts: peripheral, in the spinal cord and central, specific brain centers. The perception of pain is controlled by the brain by allowing us to feel pain, using past experiences and emotions to determine the reaction to a stimulus (Wall & Melzack, 1962). The gated control takes place in the dorsal horn of the spinal cord. Control over spinal cord transmission is affected by the afferent impulses acting on a gating mechanism in the dorsal horn and by impulses descending from the brain. Melzack and Wall (1965) proposes that this gating mechanism is influenced by the relative amount of activity in large and small fibers of the central nervous system. Whereby the large fibers inhibit the transmission (close the gate) and the small fibers facilitate transmission (open the gate). The brain is also capable of modifying the peripheral input from the injured areas via this gating mechanism located in the spinal cord. When the output from the transmission cells in the spinal cord exceeds a critic level it activates the neural areas that underlie the complex patterns of behavior and experiences of pain (Melzack & Wall, 1965) The emphasis of Melzak and Wall (1965) on the modulation in the dorsal horn of the spinal cord and the role of the brain in pain processes resulted in the integration of psychological variables into current research and therapy of pain. According to Stein and Stoodley (2006) the main mechanism whereby strong emotions can reduce pain input, and anticipation of pain can increase painful sensations correspond with the theory by Turk (1996) where the integration of peripheral stimuli with cortical variables, such as mood and anxiety in the perception of pain are described by the gate control model. During the experience of pain or depression symptomatology, communication between the

different areas of the brain occurs through biologic mechanisms such as neurotransmission of monoamine neurotransmitters (serotonin and norepinephrine).

2.3.2 Serotonin and norephinephrine pathways

There is a neurobiological link between depression and pain. Both conditions are associated with serotonin, also known as 5-hydroxytryptamine (5-HT) and norephinephrine (NE) pathways. Response to painful physical stimuli is moderated in the brain by 5-HT and NE, which also affect mood. Patients with neurotransmitter dysregulation may have an imbalance of 5-HT and NE, which may explain the connection between painful physical symptoms and depression (Trivedi, 2008). Both 5-HT and NE have ascending pathways from the brainstem to the cerebral cortex and limbic areas where they mediate many emotional and physical functions. The descending 5-HT and NE pathways in the spinal cord, modulate and inhibit ascending pain signals. Therefore, increasing the availability of 5-HT and NE, may promote central pain inhibition (Trivedi, 2008).

Extensive research, in animals and humans, has been done on the existing relationship between pain and depression. Animal studies (Iyengars, Bymaster, Wang & et al., 2002) have shown that paroxetine, a selective serotonin reuptake inhibitor (SSRI), and the selective norepinephrine reuptake inhibitor (NRI), thionisoxetine, were associated with reduction in pain. In human studies, dual-action serotonergic/noradrenergic reuptake (SNRI) inhibiting antidepressants such as venlafaxine and duloxetine, have demonstrated efficacy in the treatment of a wider range of depressive symptoms, including the relief of painful physical symptoms (Delgado, 2004).

2.3.3 Evidence from functional magnetic resonance imaging

Functional magnetic resonance imaging (fMRI) of the brain confirmed that depressive symptoms are related to the cerebral processing of pain (Schweinhardt, 2008). fMRI studies indicated an overlap in the areas for pain processing and sensation, and major depressive-related alterations in the brain. Pain processing has been associated with involvement of primary and secondary somatosensory cortex, thalamus, insular cortex, amygdala, anterior cingulate cortex, and the prefrontal cortex. Major depressive disorder (MDD) often exhibited lateral and medial frontal hypo- and hyper-metabolism, and metabolic changes in limbic regions such as insula and amygdala. Bär et al. (2007) investigated thermal pain perception in females with MDD using functional brain imaging. The authors used an fMRI-compatible thermode to deliver thermal painful stimuli to the right arm after they assessed individual thermal pain thresholds in female patients suffering from MDD. In this investigation Bär et al. (2007) demonstrated a trend for a positive correlation between depression and pain thresholds, indicating that more severe depression is associated with increased pain thresholds. The investigators also reported enhanced prefrontal cortical activity during pain perception and speculated that this activation of the prefrontal cortices might reflect an underlying prefrontal psychopathology in depression. Negative affective states thus influence pain processing in terms of augmented pain experience (Wagner, Koschke, Leuf, Schlősser & Bär, 2008).

2.4 Post-Operative Pain

Post-operative pain is associated with psychological and physiological distress that may influence post-operative recovery. High intensity of acute post-operative pain is a risk factor in the development of chronic post-surgical pain

(Nielsen, Rudin & Werner, 2007). Psychological factors add to the complexity of pain. Researchers have examined psychological factors such as mood disorders (e.g. depression) and post-operative pain, as predictors for the development of post-operative pain (Caumo et al., 2002; Ozalp, Sarioglu, Aslan & Kadiogullari, 2003). There seems to be a correlation between pre-operative depression scores and the level of post-operative pain (Nielsen et al., 2007). Higher acute pain intensity was reported due to psychological distress and depression after molar surgery.

Patients with acute pain reported a fourfold increase in pain intensity due to psychological distress (Vickers et al., 2006). Acute pain is associated with emotional arousal. The four most prominent emotions that affect acute pain are anxiety, depression, anger and fear (Williams, 1996). Pre-operative anxiety has a prevalence rate of 11 – 80% (Nielsen et al., 2007). Caumo et al. (2002) stated that trait-anxiety is an important predictor of moderate to intense pain and is associated with higher pre-operative anxiety and higher post-operative pain. Gilles, Smith and Parry-Jones (1999) found among adolescents undergoing elective surgery, that depression increased from less than 4% on the Hospital Anxiety and Depression Scale (HADS: Zigmond & Snaith, 1983) pre-operatively, to 29% post-operatively, in order words, the proportion of adolescents with symptoms of depression increased as pain intensity increased. The pain experienced by these patients was highly influenced by the presence of depression and anxiety. Taezner, Melzack and Jeans (1986) found that high levels of pre-operative depressive symptoms, measured with the Beck Depression Inventory (BDI), correlated with post-operative pain scores following elective surgery. Kudoh, Katagai and Takazama (2002) investigated post-operative pain and current pain perception thresholds in chronic depression in patients who were treated with antidepressants. Sixty patients who underwent abdominal surgery

with general anesthesia, thirty with major depression and thirty control patients, were included in the study. The severity of depression was measured, pre-operative and post-operative, using the Hamilton Depression Rating Scale (HAM-D; Hamilton, 1960). Post-operative pain scores were evaluated at eight hour intervals, using the visual analog pain scale (VAS). This study demonstrated higher post-operative pain scores in patients with chronic depression at 8 and 16 hours after the end of anesthesia compared to non-depressed controls. They found that post-operative pain scores in patients with depression and receiving antidepressants were significantly higher for the first 16 hours after surgery than the control group. However, this difference between the groups disappeared in the late post-operative phase. The post-operative VAS scores of the patients with depression, showed a positive correlation with their scores on the pre-operative HAM-D score. The authors concluded that the degree of post-operative pain in patients with depression who take antidepressants depends on severity of their depression.

Brander et al. (2003) found one year post-operatively; that the most severe cases of chronic post-surgical pain were present in those patients with the most severe levels of pre-operative depression. Hinrichs-Rocker et al. (2008) reviewed fifty relevant publications in which psychosocial predictors and correlates for chronic post-surgical pain were identified. The authors concluded that depression can emerge from the experience of pain. Hinrichs-Rocker et al. (2008) also suggested that in severe cases, depression represent a risk factor for the development of chronic post-operative pain.

Patients perceived most dental procedures to be painful and often postpone the treatment thereof, because of their concerns about post-operative pain (Chong & Ford, 2005). Acute pain following surgical tooth extraction is viewed by dentists as a

physiologic-sensory response to tissue injury and inflammation. Psychological factors add to the complexity of dental pain (Vickers et al., 2006). Patients expect the resolution of acute pain when they undertake dental treatment, but persistent unexpected chronic pain can and does occur. Patients with serious chronic pain after surgery have a poor quality of life and are extensive consumers of health care services (Breivik et al., 2008).

According to a study by Vickers et al. (2006), psychological morbidity such as depression and distress, with an early onset, occur in a substantial number of patients with acute pain after molar surgery. Chronic pain unexpectedly does occur in dental patients and the factors that are important in chronic dental pain include psychological morbidity, secondary pain phenomena, such as intensity of pain remaining the same or getting worse after the healing phase, and deterioration of normal social function. Therefore, early identification and treatment of the presence of pain is very important to improve patients' outcomes (Vickers et al., 2006). Tate and Acs (2002) recommend the thoughtful management of pre- and post-operative pain, as the pain experience often determines whether individuals will seek or avoid utilizing healthcare services, such as dentistry, for routine care. Vickers et al. (2006) suggested that the development and validation of a dental psychological inventory at the pre-operative stage to identify patients at risk is needed since, by definition, pain is both a sensory and emotional experience.

Chapter 3

Statement of Research Hypotheses

3.1 Rationale

The relationship between the experience of acute pain and depression is still poorly understood. Post-operative pain is a common form of acute pain. Research demonstrated that about 50 -70% of patients experience moderate to severe pain after surgery indicating that post-operative pain remains poorly treated (Pogatzki-Zahn, Zahn & Brennan, 2007).The results of a study done by Caumo et al. (2002) showed that depressive symptoms were related to reports of higher levels of post-operative pain. Negative effects of depressive symptoms on post-operative pain immediately after surgery include: transient suppression of the immune function, higher mortality, longer convalescence and the development of post-operative chronic pain. Caumo et al. (2002) concluded that depressive symptoms must be taken into account to improve post-operative pain management and possibly disrupt the processes responsible for the transition to chronic pain. There are very few studies on post-operative pain after dental surgery.

3.2 Aim

The overall aim of the proposed study was to determine the relationship between the presence of depressive symptoms and subjective pain in dental surgery.

3.3 Research Hypotheses

1. Patients with depressive symptoms will experience significant more pre-operative pain than patients without depressive symptoms.
2. Patients with depressive symptoms will experience significant more post-operative pain than patients without depressive symptoms.

Chapter 4

Research Methodology

4.1 Research Design

The study followed a prospective cohort design.

4.2 Participants

A sample of 40 patients presenting with dental impaction were recruited at the dental clinic at Tygerberg hospital. The participants were recruited into the study by means of convenience sampling.

Inclusion criteria:

- male or female outpatients,
- aged between 18 and 45 years,
- in need of surgical relief of dental impaction

Exclusion criteria:

- on psychopharmocological treatment pre-operative
- a lifetime exposure of more than 4 weeks of antidepressant medication
- significant co-morbid illness associated with pain (such as osteoarthrosis, rumatoid arthritis, diabetes mellitus, carcinoma, etc.)
- patients that are unable to read or write

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4.3 Procedures

On the day before patients were scheduled for surgery, all the patients on the list for surgery were contacted and invited by telephone to meet the investigators at the clinic on the day of surgery for possible recruitment in the study. As patients presented themselves for treatment, they were invited to join the study. All suitable

patients were informed about the nature and methodology of the study. Written, informed consent was obtained and assessment took place on the day of the surgery. Participants were recruited into two groups, using a cutoff score of 10 on the 21 item BDI, to determine group status.

Once a sample size of 40 was reached, recruitment stopped.

Participants were withdrawn from this study when post-operative complications, other than pain occurred that need further interventions or when consent was withdrawn.

Patients were assessed by means of an interview and rating scales by the investigators at two time points, pre-operative and two weeks post-operative.

4.4 Measuring instruments

All measures were administered in Afrikaans or English, according to patient preference.

4.4.1 Interview

The interviews were performed in the waiting room at the dental clinic. Information related to socio-demographic variables, gender and age, was collected. Participants were also asked about substance use and significant co-morbid illness associated with pain.

4.4.2 Mental status

The Mini International Neuropsychiatric Interview (M.I.N.I.; Sheehan, Lecrubier, Sheehan et al., 1998) was used to screen participants for the presence of major depressive episode, generalized anxiety disorder, drug and alcohol abuse.

The M.I.N.I. was developed to meet the need for a brief, reliable and valid structured diagnostic interview. The M.I.N.I. is organized in diagnostic modules. For most modules two or four screening questions are used to rule out the diagnosis when answered negatively. Positive responses to screening questions are explored by further investigation of other diagnostic criteria. Excellent interrater- and test-retest reliabilities of the M.I.N.I. were reported at kappa values of 0.87.The M.I.N.I. has gained international acceptance as a rapid screening tool for homogenous samples, with potential applications as a diagnostic screening tool for psychiatric disorders in primary care settings (Otsubo et al., 2005).

Each participant was administered the M.I.N.I. pre-operative by the interviewer. All participants with a history of drug and alcohol abuse or a lifetime exposure of more than four weeks of antidepressant medication were excluded from this study.

4.4.3 Quality of life

The World Health Organization Quality of Life Scale (WHOQOL-BREF; , Skevington, Lotfy & O'Connell, 2004), a cross-culturally validated assessment of well-being, was used to assess quality of life of the participants. The WHOQOL-BREF is an abbreviated 26-item version of the WHOQOL-100. The WHOQOL-BREF assesses individuals' satisfaction with regard to four domains: 1. Physical health, 2. Psychological health, 3. Social relations and 4. Environment. Internal consistency for Physical health was calculated at 0.82, Psychological health at 0.81, Environment at 0.80 and 0.68 for Social relationships. In their international field trail on the psychometric properties of the WHOQOL-BREF, Skevington, Lotfy and O'Connell (2004) supplied evidence of the cross-cultural validity of the WHOQOL-BREF and

suggested that the 4-domain model may have a place among the leading generic Quality of Life instruments.

The participants were asked to complete the WHOQOL-BREF pre-operative, on the day of surgery. The translation from English to Afrikaans of the WHOQOL-BREF was conducted by means of the Brislin method of back translation.

4.4.4 Perception of Pain

The Visual Analogue Scale (VAS; Ong & Seymour, 2004) consists of a line, usually 10 cm long, whose ends are labeled as the extremes of pain (no pain to unbearable pain). Our VAS was 10 cm long with 0 cm indicating no pain and 10 cm indicating unbearable pain. Participants were asked to rate the unpleasantness of their pain experience by indicating a point along the line best representing their pain intensity. The distance from the “no pain” end to the mark made by the participant is the pain intensity score (Ong & Seymour, 2004). The VAS has excellent pain measurement properties according to Price, Patel, Robinson and Staud (2008) because of the capacity of VAS to measure very small differences. An advantage of the VAS is its ratio scale properties and therefore may be use statistically (Ong & Seymour, 2004). Price et al. (2008) highly recommended the VAS for use in clinical research, due to its superior psychometric characteristics compared to other numerical rating scales. All the participants were asked to rate their pain experience before the operation and again two weeks later at the follow-up visit.

4.4.5 Depression

The Beck Depression Inventory (BDI; Beck, Steer & Garbin, 1988) assesses symptoms which are associated with depression. The BDI consists of 21 items, each

of which focuses on a symptom of depression, including mood, pessimism, crying and irritability, and the participants are requested to rate each item on a four-point scale ranging from 0 (neutral) to 3 (maximum severity). The Centre for Cognitive Therapy, Philadelphia, PA, recommends the following guidelines for BDI cut-off scores for persons having an affective disorder: <10 - none or minimal depression; 10 – 18 - mild to moderate depression; 19 – 29 - moderate to severe depression; and 30 – 63 - severe depression (Beck, Steer & Garbin, 1988). We used a cut-off score of ten as recommended by Beck for use among medical patients (Beck et al, 1988, Stromberg et al, 2008). Research has shown that the BDI successfully discriminates between clinically depressed and normal individuals (Jooste & Foxcroft, 2007). Internal consistency of the BDI yielded a mean coefficient alpha of 0.86 for psychiatric patients and 0.81 for non-psychiatric subjects (Beck et al., 1988). The participants were asked to complete the BDI pre-operative on the day of surgery and again post-operative at the follow-up visit. The translation of the BDI from English to Afrikaans was authorized by the Foundation for Cognitive Therapy and Research in 1988 (Moller, 1990). The translation was conducted by means of the Brislin method of back translation. The Afrikaans version of the BDI (Moller, 1990) was not standardized of validated for use with local population but has been successfully used in recent studies (Westwood, 2006). Participants fulfilling the criteria for major depression were referred to the appropriate mental healthcare facilities to undergo treatment.

4.4.6 Medication

The medication was prescribed by the surgeon and the dosage prescribed was documented on a separate form after surgery. Routine post-operative analgesic

prescriptions consisted of paracetamol (500mg tds po for three days) and ibuprofen (400mg tds po for three days). The use of the painkillers during the acute one week post-operative period was documented by means of pill count by the patient on a pain control form supplied by the investigators. All additional painkillers that the participants used were also documented on the form. The investigators did not have any input with regard to or usage of medications. The pain control forms were given to the investigator at the follow-up visit. The usage of the prescribed painkillers and all additional painkillers that was taken by the participants was monitored.

4.5 Data Analysis

Data analyses were performed with STATISTICA version 9. Statistical analyses were conducted with the assistance of a biostatistician. Results are represented as means and standard deviations (SD). Mean pre-operative and post-operative pain rating scores were calculated and the relationship with pre-operative and post-operative depressive symptoms and pre-operative Quality of life scores were determined. To investigate the relationships among depression (obtained with the BDI), pain perception (obtained with the VAS) and Quality of life (obtained with the WHOQOL-BREF), Spearman's rank correlation coefficients were computed. Non-parametric Mann-Whitney U tests were used to compare the VAS and BDI scores of the different groups of participants. The groups were: Total Group, No Depression Group and Depression Group. Mixed model repeated measures of variance analysis (ANOVA) were conducted to examine mean BDI and VAS score changes over time (F- ratio). The mixed model included only the participants who completed the study. Within analyses of specific variables (for ANOVA and mixed models) Fisher LSD was used for multiple testing corrections.

4.6 Ethical Considerations

Approval to conduct the study was obtained from the Health Research Ethics Committee of the Faculty of Health Sciences, the Ethics Committee of the Psychology Faculty of the University of Stellenbosch, and the Department of Dentistry, University of the Western Cape. Ethics Reference number: NO9/10/264. The study was conducted in accordance with Research Guidelines issued by the Medical Research Council of South Africa, and complied with Guidelines for Good Practice in the Conduct of Clinical Trials in Human Participants (2001) and the Declaration of Helsinki (2000).

Recruitment took place at the dental clinic at Tygerberg Hospital with the help of the clinic personnel. Informed consent was obtained from the research participants. The consent forms highlighted the purpose of the research, the number of interviews to be conducted and the questionnaires to be used. Participation in the present study was entirely voluntary**.** Participation would not affect routine care. Participants were also free to withdraw from the study at any point. In order to protect the identity of the participants and the information provided by them, no names were used on the forms or interviews and participants were assigned numbers. Their identity was not revealed at any time to people outside of the study team.

CHAPTER 5

Results

5.1 Demographic Data

Sixty four patients with dental impaction and scheduled for third molar surgery were invited to participate in the study. Of these patients, 42 consented to participation. A total of 7 participants were unable to complete the study, and therefore excluded from the analysis: two participants were not suitable for surgery, while five participants did not return for the follow-up visit.

5.2 Age and Gender

The final sample (N = 35) consisted of 11 (31%) males and 24 (69%) females. The average age of the participants was 25 (± 4) years, with the majority (77%), of the patients being young adults, ranging between 20 and 30 years. See figure 1.

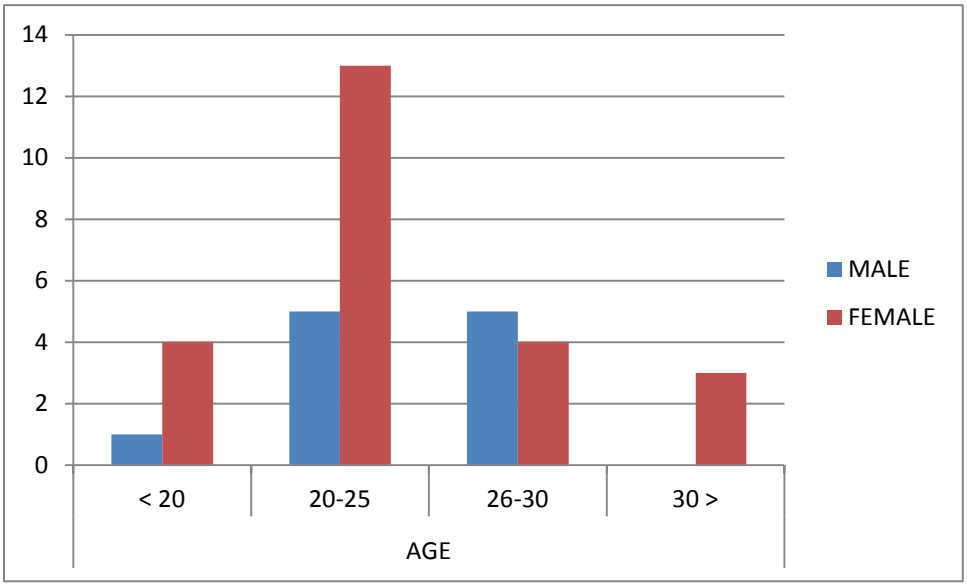

Figure 1: Age distribution of sample. (N = 35)

5.3 Groups

The participants were assigned to one of two groups pre-operatively. The first Group DP (depression pre-operative), consisted of participants with a BDI score of ≥10 (mild to moderate depression) and the second Group NDP (no depression pre-operative), consisted of participants who obtained a score < 10 on the BDI. Table 1 displays the group sizes and the mean age of the two groups.

Table 1

Age and gender composition of the two groups.

		Group DP (N = 9)	Group NDP (N = 26)
Male	(N)	3	8
	%	33	31
Female	(N)	6	18
	%	67	69
Mean age		24 (±3)	24 (±4)

5.4 Depression

5.4.1 Total group

The mean depression score on the BDI for the total group (N = 35) pre-operative was 9.03 (± 10.58) and post-operative 6.37 (± 10.13).

Although the mean depression score for the total group pre-operative was higher than the post-operative mean depression score, this difference was not statistically significant (p>0.05). See Figure 2.

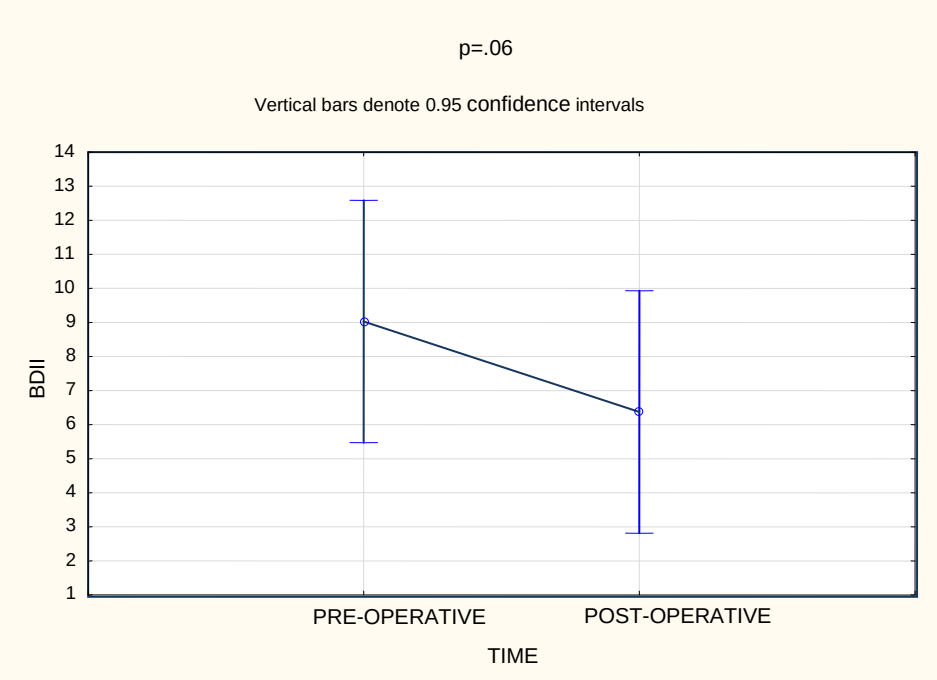

Figure 2. Comparison of mean pre- and post-operative depression scores for total group. (N = 35)

5.4.2 Group DP versus Group NDP

5.4.2.1 Pre-operative

The mean depression score on the BDI for group DP and group NDP pre-operative are displayed in Table 2.

Table 2

Comparison of mean pre-operative depression scores for Group DP and Group NDP.

	N	Mean	SD
Group DP	9	23.77	±10.83
Group NDP	26	3.92	±3.04

There was a statistically significant difference ($p < 0.05$), in severity of depression between group DP and group NDP, with group DP obtaining significantly higher scores than group NDP. See figure 3.

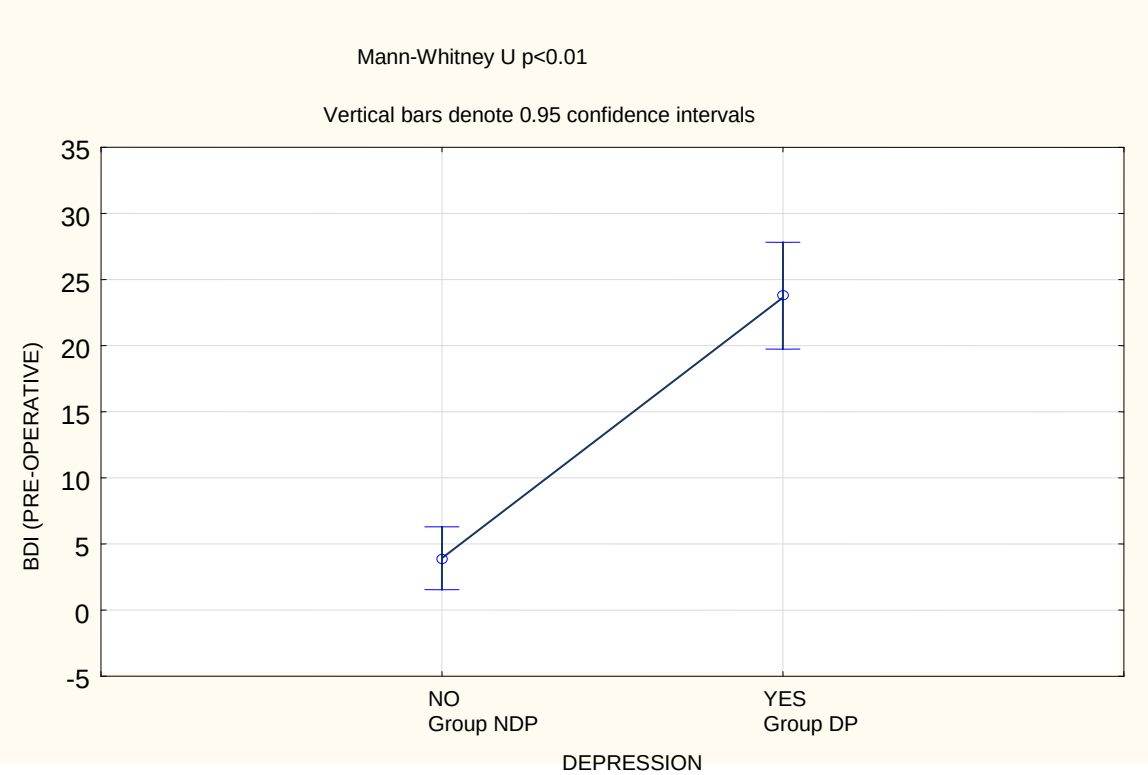

Figure 3. Mean pre-operative depression scores for Group DP and Group NDP.

5.4.2.2 Post-operative

The participants of group DP obtained higher depression scores (BDI) post-operative (15.33, ± 14.66) than the participants of group NDP (3.26, ± 5.65). This difference was statistically significant ($p < 0.05$). See figure 4.

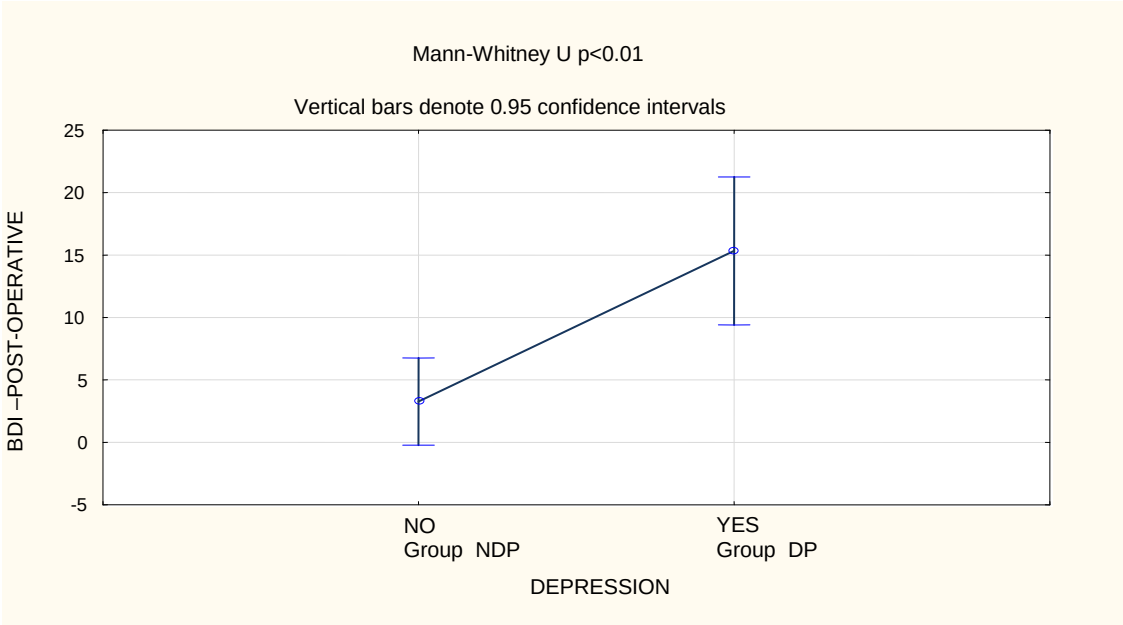

Figure 4. Mean post-operative depression scores for Group DP and Group NDP.

5.4.2.3 Comparison of mean depression scores for 2 groups, pre-operative and post-operative

Figure 5 displays the difference in the depression levels of the two groups pre-operatively and post-operatively. For group DP (depression group) the mean post-operative BDI score was significantly lower than the mean score for the group pre-operative ($p < 0.05$). For group NDP (without depression) the difference between the mean score on the BDI from pre-operative to the post-operative assessment, was not statistically significant ($p>0.05$). The difference between the

mean depression scores of the two groups, post-operatively, was not statistically significant ($p > 0.05$). See Figure 5.

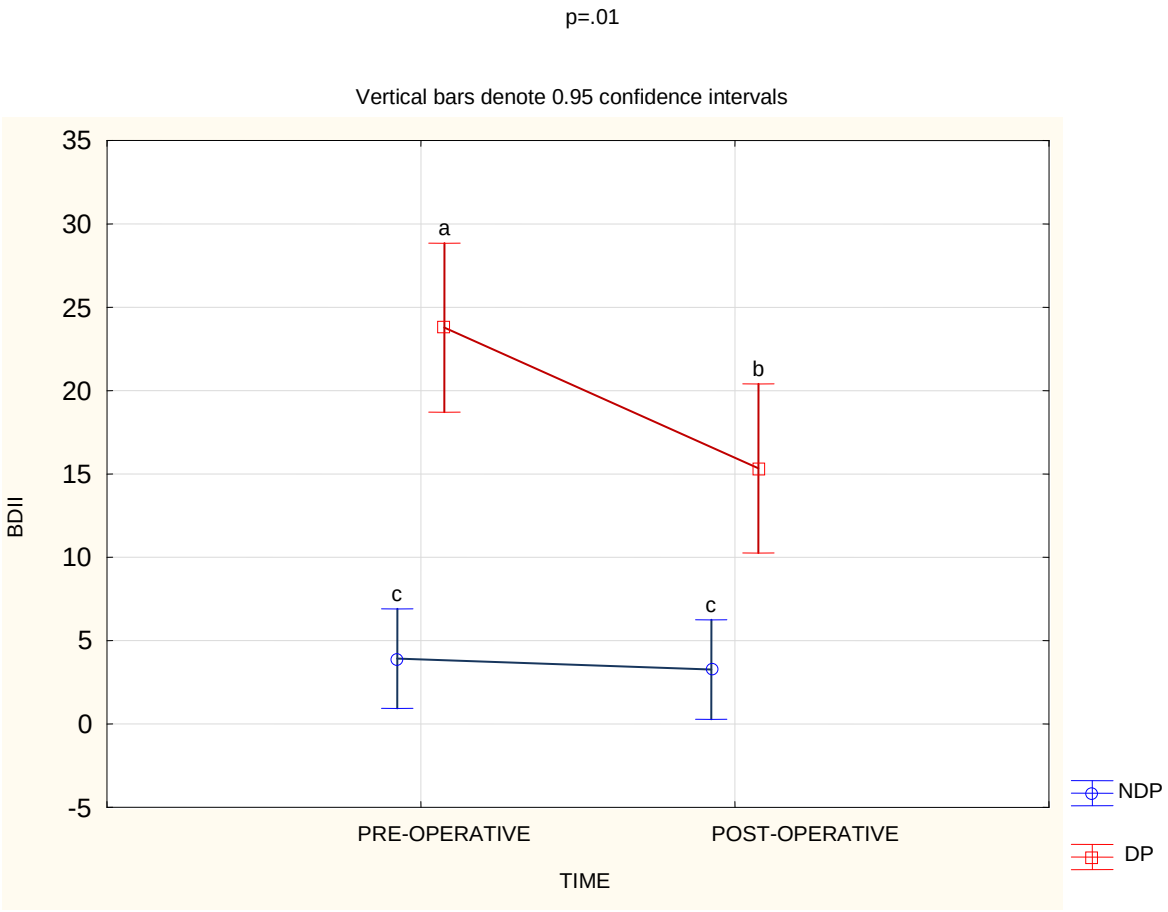

Figure 5. Comparison of mean pre-operative and post-operative depression scores for 2 groups.

5.5 Pain Perception

5.5.1 Total group

The subjective experience of pain (pain perception) of participants, as measured by the VAS, was greater pre-operative (23.54, ± 30.04) than post-operative (16.94, ± 28.37). The difference was not statistically significant (p >0.05). See Figure 6.

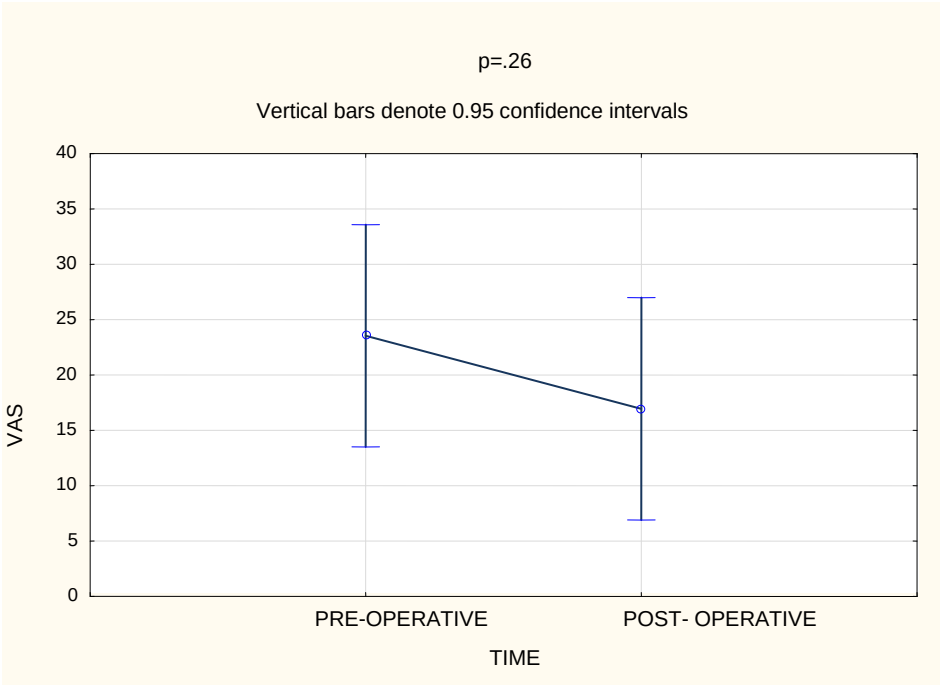

Figure 6. Mean pre-operative and post-operative pain perception scores for total group. (N = 35)

5.5.2 Group DP versus Group NDP

5.5.2.1 Pre-operative

The mean VAS score for group DP pre-operative was higher than the mean VAS score for group NDP (32.77, ±37.42 versus 20.30, ±27.15). This difference was not statistically significant (p >0.05). See Figure 7.

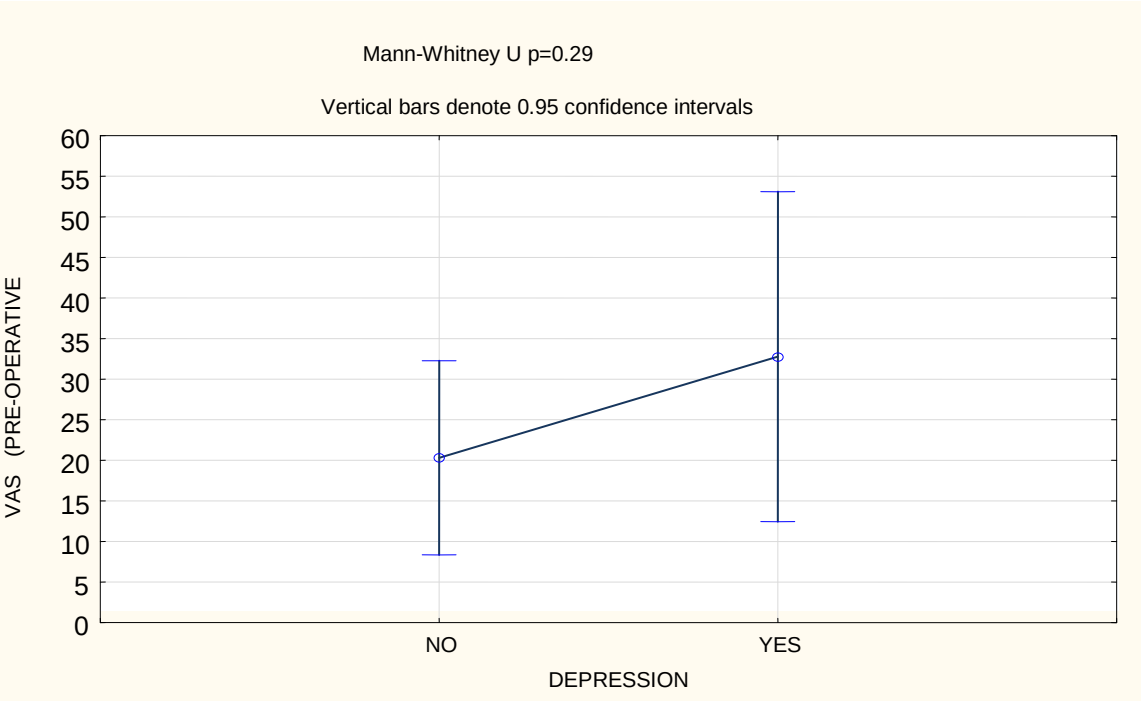

Figure 7. Comparison of the mean pre-operative pain perception scores for group DP and group NDP.

5.5.2.2 Post-operative

The participants of group DP experienced less pain post-operatively than the participants of group NDP. This difference was not statistical significant ($p > 0.05$). See Table 3.

Table 3

Mean post-operative pain perception scores for group DP and group NDP.

	N	Mean	SD
Group DP	9	10.50	±15.24
Group NDP	26	19.15	±31.65

5.5.2.3 Comparison of pain perception scores for 2 groups pre-operative and post-operative

Figure 8 display the difference in the VAS scores of the two groups pre-operative and post-operative. The difference between the mean VAS scores of the two groups post-operatively was not statistically significant (p >0.05).

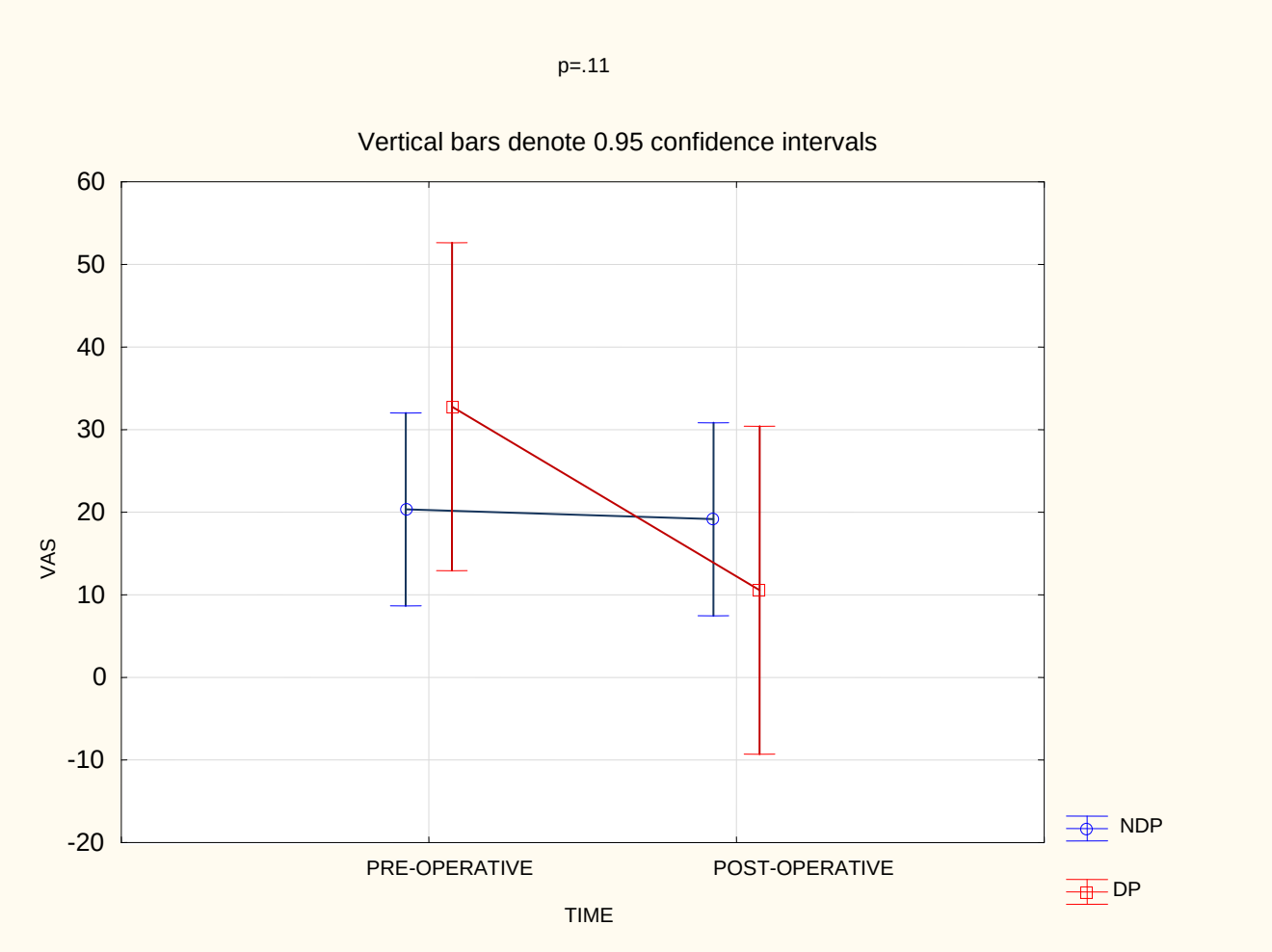

Figure 8. Comparison of mean pre-operative and post-operative pain perception scores for 2 groups.

5.6 Quality of Life

5.6.1 Total Group

All thirty five participants completed the WHOQOL-BREF pre-operative, as a subjective indication of their Quality of Life, i.e. their satisfaction with their Physical Health, Psychological Health, Social relationships and Environment. The raw scores were transformed to percentages, where higher percentages represent more satisfaction (with 100% the ideal). The Quality of Life ratings as obtained by the WHOQOL-BREF, for the total group, group DP and group NDP are displayed in Table 4.

Table 4

Participants' pre-operative Quality of Life scores.

		Total group N = 35	Group DP N = 9	Group NDP N = 26
Physical Health	M (SD)	54.23 (±11.55)	43.89 (±11.70)	57.81 (±9.27)
Psychological Health	M (SD)	58.66 (±15.45)	45.80 (±14.16)	63.08 (±13.47)
Social relationships	M (SD)	64.37 (±25.08)	45.11 (±29.45)	71.04 (±19.95)
Environment	M (SD)	61.34 (±17.25)	44.56 (±17.02)	67.15 (±13.25)

Pre-operative quality of life ratings (WHOQOL-BREF) indicated that participants with no pre-operative depression were more satisfied with their quality of life than participants with depressive symptoms pre-operative ($p < 0.05$).

The WHOQOL-BREF was not administrated at the follow-up visit, because of time constrains. No formal appointments were made for the follow-up visits. For

their follow-up visit, the participants waited in the waiting-room and could be called at any moment to see their doctor. As a result the participants may not have had time complete the WHOQOL-BREF.

5.7 Correlations between depression scores and pain perception scores

5.7.1 Total group

5.7.1.1 Pre-operative

Figure 9 displays the correlation between pre-operative depression scores and pre-operative pain perception scores of all the participants (N = 35). A statistical significant relationship was found ($p < 0.05$).

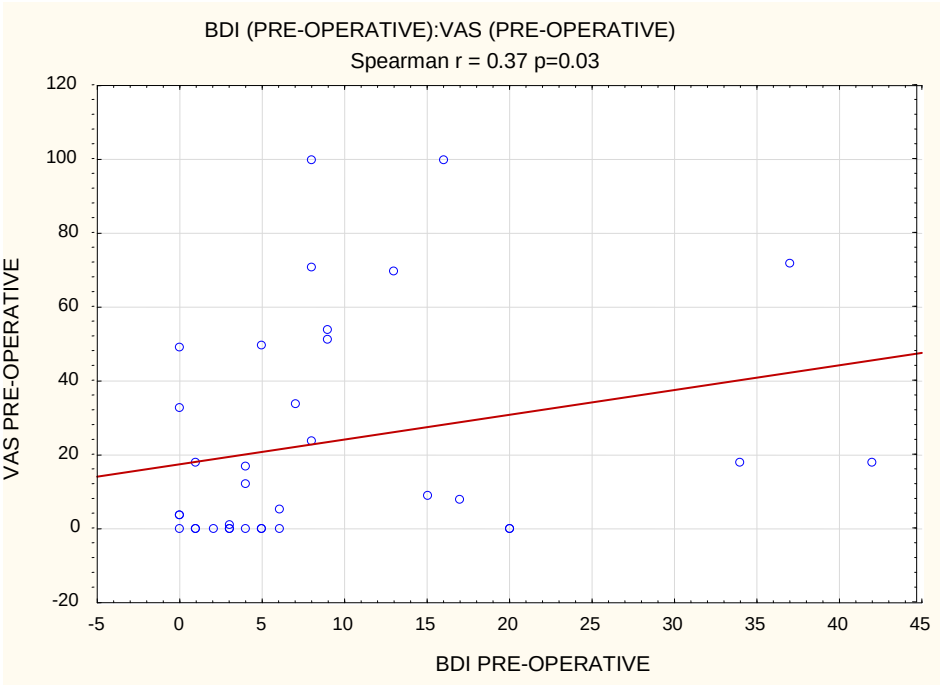

Figure 9. The relationship between pre-operative depression scores and pre-operative pain perception scores. N = 35.

5.7.1.2 Post-operative

No correlation was found between pre-operative depression scores and post-operative pain perception scores for the total group, *(p*>0.05). See Figure 10.

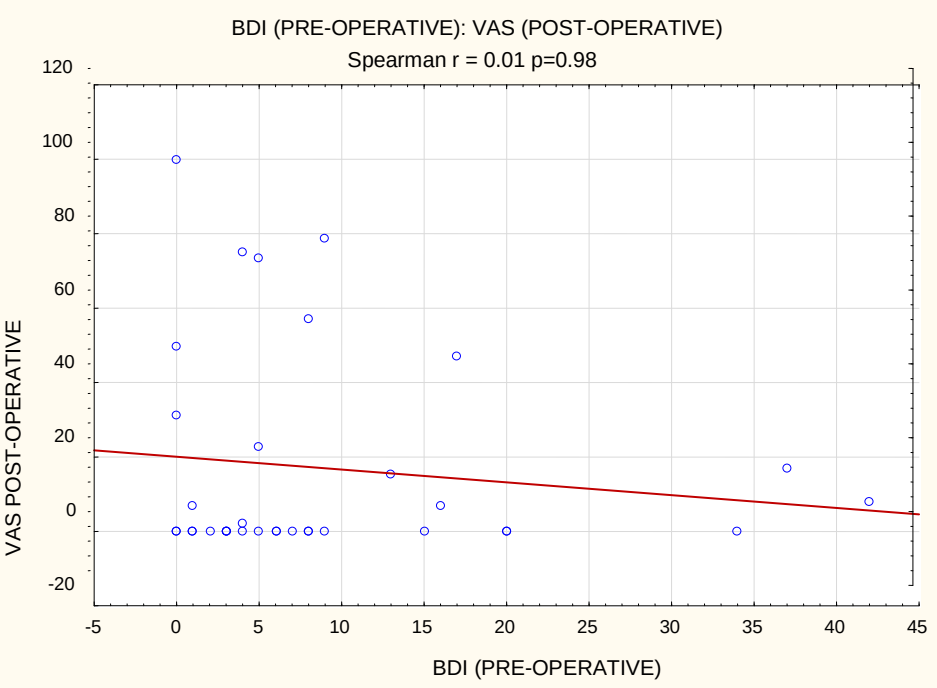

*Figure 10.*The relationship between pre-operative depression scores and post-operative pain perception scores. Total group (N = 35).

5.7.2 Groups

Table 5 and Table 6 display the Spearman's correlation matrix for pre-operative and post-operative depression and pain perception scores for group DP and group NDP.

Table 5

Correlations between pre-operative and post-operative depression and pain perception scores for Group DP (N = 9).

	BDI (Pre-op)	BDI (Post-op)
VAS (Pre-op)	-.042 (p = 0.91)	- .24 (p = 0.53)
VAS (Post-op)	.02 (p = 0.96)	.21 (p = 0.59)

*p < 0.05

For the group with pre-operative depression, no significant correlations were found between their depressive scores and pain perception scores before and after the operation.

Table 6

Correlations between pre-operative and post-operative depression and pain perception scores for Group NDP (N = 26).

	BDI (Pre-op)	BDI (Post-op)
VAS (Pre-op)	0.44* (p = 0.03)	0.50* (p < 0.01)
VAS (Post-op)	-0.06 (p = 0.78)	0.63* (p < 0.01)

*p <.05

Significant correlations were found between an absence of pre-operative depression and perception of pain before the operation for the group with no depression pre-operative. A significant correlation was also found between post-operative depression scores and post-operative pain perception scores after the operation for the group with no depression before the operation.

5.7.3 Correlations between Quality of Life scores and depression scores.

Table 7, 8 and 9 display the correlations between the four domains of Quality of life and depression scores for the different groups.

Table 7

Correlations between depression and Quality of Life scores for total group. (N = 35)

	BDI (Pre-op)	BDI (Post-op)
Physical Health	-0.49*	-0 .29
Psychological Health	-0.52*	-0 .32
Social Relationships	-0 .27	-0 .20
Environment	-0 .60*	- 0.25

*p <.05

The domains of the WHOQOL-BREF, which showed a significant negative correlation with depression pre-operative for the total group were Physical Health, Psychological Health and Environment. There were no significant correlations between depression post-operative and any of the domains of the WHOQOL-BREF.

Table 8

Correlations between depression and Quality of Life scores for Group DP. (N = 9).

	BDI (Pre-op)	BDI (Post-op)
Physical Health	-0.58	-0 .18
Psychological Health	-0 .78*	-0 .35
Social Relationships	-0 .92*	-0 .61
Environment	-0 85*	-0 .38

*p <.05

For the group with pre-operative depressive symptoms the domains Psychological Health, Social Relationships and Environment showed significant negative correlations with pre-operative depression scores. No relationship was found between the presence of depressive symptoms before the operation and the domain of Physical Health. No significant correlations were found between any of four domains and depressive symptoms post-operative.

Table 9

Correlations between depression and Quality of life scores for Group NDP (N = 26).

	BDI (Pre-op)	BDI (Post-op)
Physical Health	-0.19	- 0.09
Psychological Health	-0.26	- 0.19
Social Relationships	-0.21	- 0.15
Environment	-0. 33	- 0.16

The group with no depression pre-operative showed no significant correlations between pre- and post-operative depression and Quality of Life scores.

5.8 Group Changes

5.8.1 Depression post-operative: Group DPO and NDPO

Participants were assigned to one of two groups pre-operatively according to the score they received on the BDI. However post-operatively when they were re-assessed, some of the participants no longer fulfilled the criteria for the specific group they were assigned to pre-operatively. The participants were re-assigned to one of two groups. Group DPO (depression post-operative) consisted of participants with a BDI score of ≥ 10 after the operation and group NDPO (no depression post-operative) consisted of participants with a BDI score of < 10 after the operation. Three of the participants assigned to Group DP pre-operatively who presented with symptoms of depression pre-operatively, achieved low scores on the BDI after the operation. These participants therefore no longer fulfilled the criteria for depression post-operatively, and were assigned to a new group NDPO. One participant scored < 10 on the BDI pre-operatively and was assigned to the no-depression group. However, the same participant had obtained a score of 27 on the BDI post-operatively and therefore presented with depression post-operatively and was assigned to the DPO Group.

Table 10 summarizes mean BDI scores of the two groups.

Table 10

Mean post-operative depression scores for group DPO and NDPO.

	N	Mean BDI score	SD
Group DPO	7	22.14	±13.11
Group NDPO	28	2.42	±28.65

5.8.2 Pain perception post-operative: Group DPO and Group NDPO.

Table 11 displays the mean post-operative pain perception scores of group DPO and group NDPO.

Table 11

The mean post-operative pain perception scores for Group DPO and Group NDPO.

	N	Mean VAS score	SD
Group DPO	7	21.00	±29.15
Group NDPO	28	15.91	±28.65

Group DPO experienced more pain post-operative than group NDPO. The difference between the mean pain perception scores of the groups was not statistically significant (*p* >.05). See Figure 11.

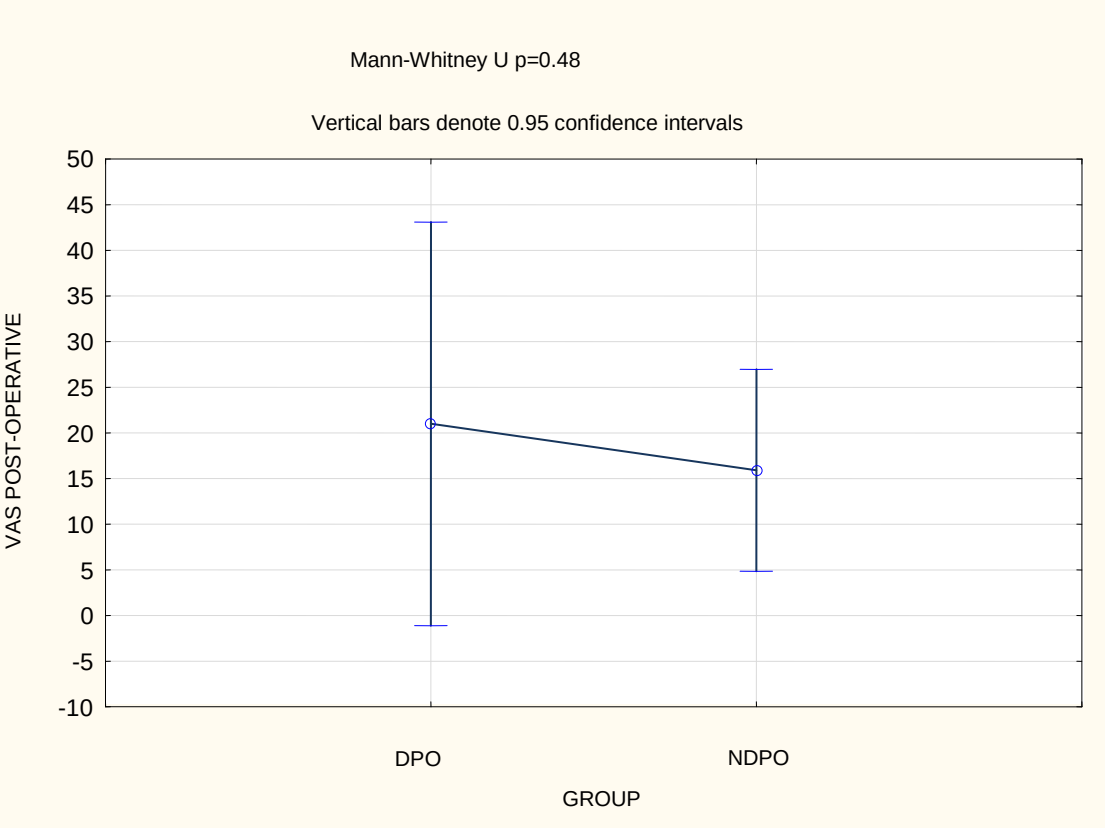

Figure 11. Mean post-operative pain perception scores: Group DPO and Group NDPO.

5.8.3 Correlations of depression, pain perception and Quality of Life for groups DPO and NDPO

5.8.3.1 Group DPO

There was no correlation between depression scores (pre-operative and post-operative) and pain perception scores (pre-operative and post-operative) for group DPO.

There was no significant correlations (p>0.05) between the three domains of the WHOQOL-BREF (Physical Health, Psychological Health and Environment) and BDI scores pre-operative and post-operative. However, there was a significant correlation between BDI scores pre-operative and Social Relationships (r = -0.97; p <0.05). There were significant correlations between pain perception (VAS) pre-operative and WHOQOL-BREF Physical Health (r = -0.92, p <0.05) and WHOQOL-BREF Environment (r = -0.88, p <0.05).

5.8.3.2 Group NDPO

The correlations between depression scores pre-operative and post-operative and pain perception scores pre-operative and post-operative are depicted in Table 12.

Table 12

Correlations between depression and pain perception scores pre-operative and post-operative for Group NDPO (N = 28).

	BDI (Pre-op)	BDI (Post-op)
VAS (Pre-op)	0.55*	0.64*
VAS (Post-op)	-0.02	0.59*

*p <.05

None of WHOQOL-BREF domains (Physical Health, Psychological Health, Social Relationships and Environment) correlated with depression scores (pre-operative and post-operative) and pain perception scores (pre-operative and post-operative).

5.9 Medication

A standard regimen of post-operative painkillers, ibuprofen 600mg (10 tablets) and paracetamol 500mg (10 tablets) were prescribed and issued to all participants. Patients were instructed to take the painkillers as needed for 3 days. Twenty one of the participants took all their medications or less than the number of pills prescribed. A total of 14 participants took more pills and for longer than the three days or supplemented the prescription with drugs of their choice.

Only two participants from the pre-operative depression group (DP) used medication for longer than the prescribed duration. One participant took medication for six days (double the prescription) and the other participant was referred to a psychiatrist and was put on an antidepressant regime.

Twelve participants from the no depression pre-operative group (NDP) needed more pain medication. Eight of these participants were still taking medication seven days after surgery.

5.9.1 Total Group, Group DP and Group NDP

5.9.1.1 Paracetamol usage

The mean paracetamol usage for the total group, Group DP and Group NDP are displayed in table 13.

Table 13

Paracetamol usage for Total group, Group DP and Group NDP.

	N	MEAN	SD
Total Group	35	10.11	±6.27
Group 1 (DP)	9	10.33	±5.74
Group 2 (NDP)	26	10.04	±6.55

Participants used similar amounts of paracetamol ($p > 0.05$). See Figure 12.

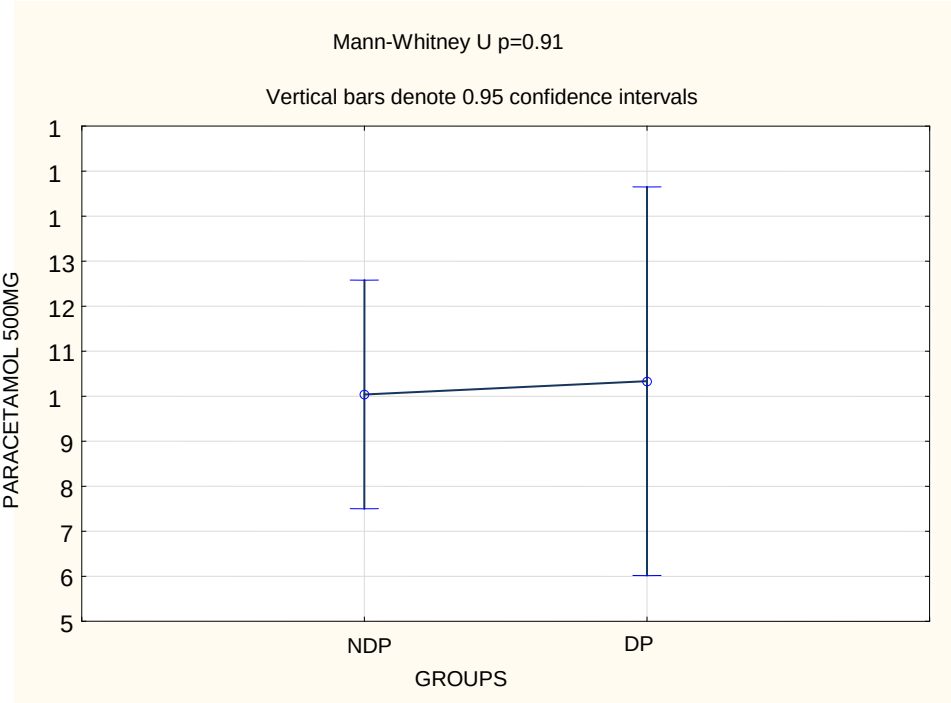

Figure 12. Paracetamol usage for Group DP and Group NDP.

5.9.1.2 Ibuprofen usage

The mean Ibuprofen usage for the total group, Group DP and Group NDP. See Table 14.

Table 14

Ibuprofen usage for Total group, Group DP and Group NDP.

	N	MEAN	SD
Total Group	35	9.24	±5.98
Group 1 (DP)	9	8.22	±6.20
Group 2 (NDP)	26	9.73	±5.98

The participants of the two groups did not differ much in their usage of ibuprofen ($p > 0.05$). See Figure 13.

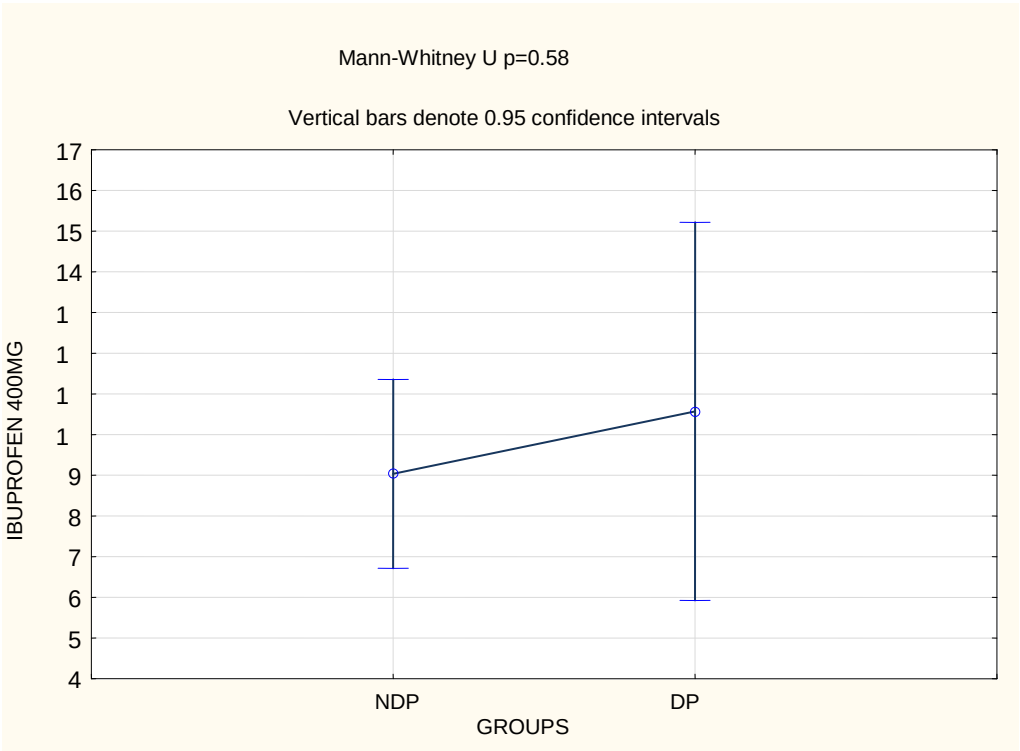

Figure 13. Ibuprofen usage for Group DP and Group NDP.

5.9.2 Group DPO and Group NDPO

5.9.2.1 Paracetamol usage

There was a trend for participants in Group DPO to use more paracetamol than in Group NDPO (13.29, ±5.62 versus 9.32, ±6.27). The difference was not statistical significant (p>0.05). See Figure 14.

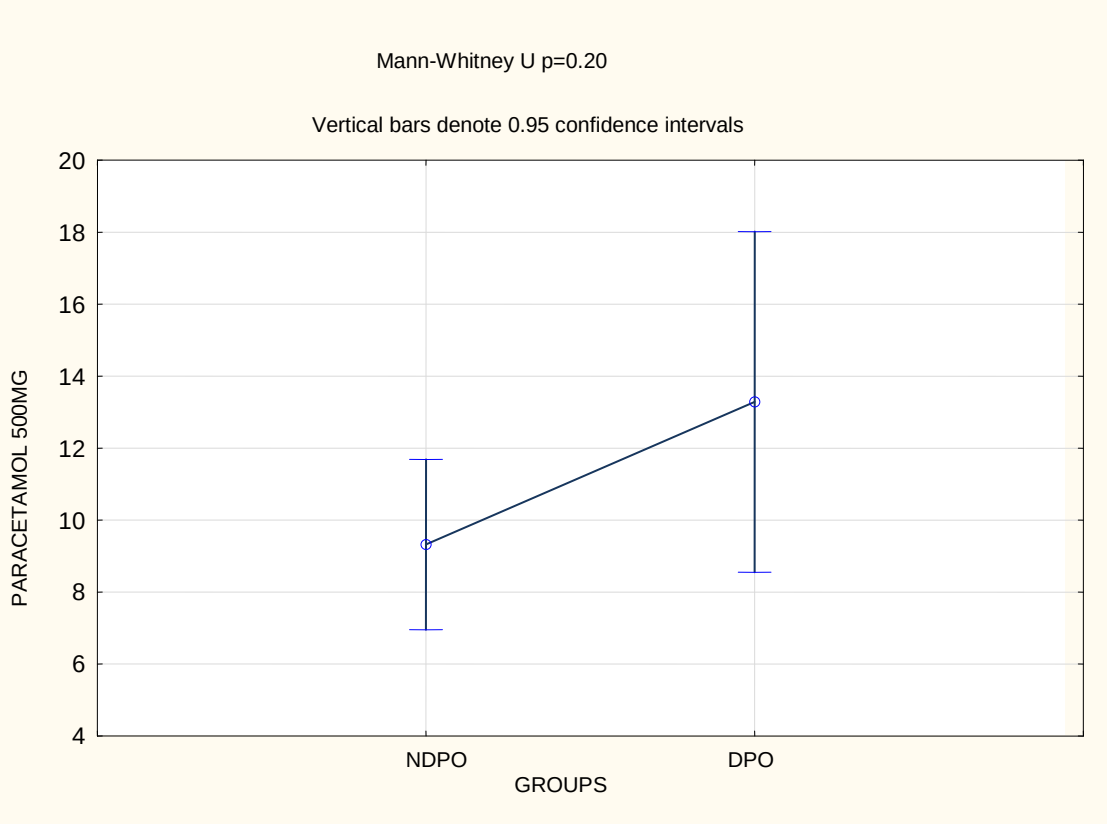

Figure 14. Paracetamol usage for Group DPO and Group NDPO.

5.9.2.2 Ibuprofen usage

More ibuprofen was used by the participants in group DPO than in group NDPO (10.57, ±7.46 versus 9.04, ±5.68). However this difference was not statistical significant (p > 0.05). See Figure 15.

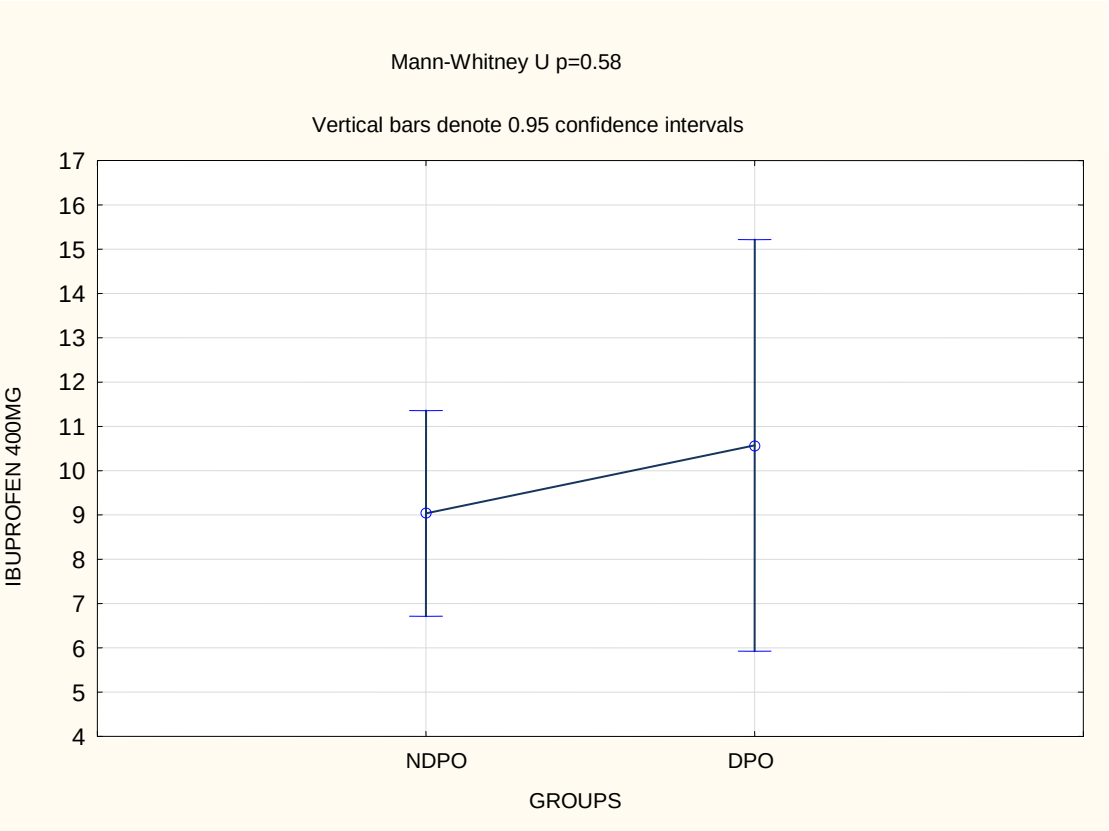

Figure 15. Ibuprofen usage for Group DPO and Group NDPO.

5.10 Sample size

The sample size required, for the depression group, to have adequate power (.8) to detect a real difference between the groups, for a small effect size (r = .1) is 21 participants.

Chapter 6

Discussion and Conclusion

The aim of this study was to determine the relationship between the presence of depressive symptoms and subjective pain experienced in dental surgery. Empirical results from studies on pain-depression comorbidity have shown that pain is strongly associated with depressive disorders (Romano & Turner, 1985). According to Korff and Simon (1996) pain and depression should be viewed as having reciprocal psychological and behavioural effects that involve processes of illness expression and adaption, therefore behavioural function and emotional state are influenced by pain (Korff & Simon, 1996).

Postoperative pain is an expected phenomenon and the prolonged duration of post-operative pain beyond acceptable limits is a common and often costly experience (Coll, Ameen & Mead, 2004). Coll et al. (2004) reported that this is especially problematic in day surgery, this can be attributed to an increasing demand to reduce waiting lists; a lack of knowledge about how patients experience post-operative pain as well as inappropriate pain measurement instruments.

The current research was based on the hypotheses that patients with pre-operative depressive symptoms will experience significantly more pre-operative pain than patients without depressive symptoms and, secondly, that patients with depressive symptoms will also experience significantly more post-operative pain than patients without depressive symptoms pre-operatively. Few studies have investigated the influence of depressive symptoms on the outcome of dental surgery, in particular the effect of depression on pre-operative and post-operative pain perception. Results obtained for this study are discussed in terms of previous studies as well as available literature on depression and pain comorbidity.

6.1 General

Participants scheduled for third molar surgery at the Dental Clinic at Tygerberg Hospital, took part in current study. All participants were screened using the M.I.N.I (Otsubo et al., 2005). The following candidates were excluded: (a) any participants who had been exposed to more than four weeks of antidepressant medication (b) generalized anxiety disorder and/or (c) drug or alcohol dependence. A final sample of 35 patients was included in the study. This sample size compares favorably with a study by Rudin, Eriksson, Liedholm, List and Werner (2010). In aforementioned study 38 patients were evaluated in order to predict the potential of pre-operative psychological and psycho-physiological variables in estimating the severity of post-operative pain after third molar surgery. Bjørnsson, Haanæs and Skoglund (2003) had similar participation (N = 36) in their study: they compared the effect of ibuprofen and paracetamol on acute swelling, pain and other inflammatory events after third molar surgery. Our sample demographics were also comparable to theirs with 69% females (versus 72%), 31% males (versus 28%) and mean age of 24 ± 4 years (versus 23 ±4 years).

6.2 Depression

The BDI was used to measure the presence of depressive symptoms, and the severity thereof, in all the participants pre-operatively and post-operatively.

6.2.1 Pre-operative depression

Results from the current study show that 26% of the participants had clinically significant levels of depressive symptoms, pre-operatively. This is in comparison with other studies conducted in which researchers found the presence of depressive

symptomatology in some of the participants. In a comparison of psychological morbidity between the general population and patients with chronic oro-facial pain done by Vickers and Boocock (2005), results showed that the prevalence rates of psychological problems were similar in the control as well as the pain group. Vickers and Boocock (2005) concluded that 20 - 25 % of the population is severely troubled by anxiety, worry, sadness, distressing thoughts, frustration and anger. Coker, Awotile and Ogunbanjo (2008) found that 15% of patients attending a dental clinic in Lagos for restorative and oral surgery, had high depression scores on the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983).

A 5% to 10% prevalence of major depressive disorder (MDD) in primary care patients was also reported by Katon and Schulberg (1992) in their research on epidemiology of depression in primary care. In a study on the epidemiology of major depression in South Africa, Tomlinson, Grimsrud, Stein, Williams and Myer (2009) found a 10% prevalence of major depression among South Africans. Many people who use primary care have depressive symptoms but these people do not always meet the major depressive disorder diagnostic criteria of the DSM IV-R. Depression is common in non-psychiatric settings, especially in chronically ill patients, as well as among patients who are recovering from acute medical illnesses (Ebmeier, Donaghey & Steele, 2006).

A literature review examining the comorbidity of pain and depression by Bair et al. (2003), revealed a prevalence of 85% for symptoms of major depressive disorder among patients visiting dental clinics to seek treatment for facial pain.

In the present study, 67% of the participants who presented with depressive symptoms were female while 33% were male; thus twice as many females as males.

This is similar to a study by Ebmeier et al. (2006) where they found that women were twice as likely as men to display a prevalence of depression. Tomlinson et al. (2009) also found the prevalence of MDE significantly higher in females - females were 1.75 times more likely than males to experience lifetime depression.

6.2.2 Post-operative depression

This study found a decrease in the mean depression score of the entire group of 35 participants. Pre-operative and post-operative assessments indicated that on average the participants had lower levels of depression at the post-operative state. This is in agreement with research by Gironda et al. (2009) on predictors of depressive symptoms following mandibular fracture repair. Gironda et al. (2009) concluded that for patients with third molar impaction the mean for depressive symptoms was low at admission and that a further decrease was evident when aforementioned patients returned for subsequent appointments.

The mean BDI score for the no depression group in the current study did not change significantly for pre-operative and post-operative assessments. However, the mean BDI score for the depression group decreased i.e. the post-operative score was less than the pre-operative score. In addition to this, the participants of the depression group had lower pain perception scores after the operation confirming the reciprocal relationship between depression and pain in that each heightens/lessens the severity of the other (Jain, 2008).

In a study exploring the impact of psychological variables such as anxiety and depression, on pain experience over a period of time following surgery, Carr, Thomas and Wilson-Barnet (2005) found that depression levels peaked on the fourth day after surgery and declined again by the tenth day, however, it is important to

take note that depression levels did not return to pre-operative levels. The prevalence of depression scores on the Hospital Anxiety and Depression Scale (HADS; Zigmund & Snaith, 1983) stayed fairly consistent throughout the post-operative period: 21% - 30 % of the patients suffered from moderate to severe depression (Carr, Thomas & Wilson-Barnet, 2005). The authors concluded that pre-operative depression scores predicted post-operative experience of depression. Thus patients who enter the hospital feeling depressed are likely to continue to do so post-operatively.

In the present study we found nine participants (26%) with depressive symptoms pre-operatively, and six participants (17%) continued to score high on the BDI post-operatively. Participants with mild depressive symptoms were less depressed post-operatively suggesting that the relief of pain after the operation influenced the feelings of depression thus confirming the reciprocal relationship suggested by Jain (2008) between depression and pain in that each heightens/lessens the severity of the other.

A total of 20% of the participants in the present study had mild to severe depression seven days post-operatively.

6.3 Quality of life

Participants in this study expressed dissatisfaction with regard to their quality of life, especially in areas of physical and psychological health as well as in their immediate environment.

The participants who presented with depressive symptoms in our study indicated less satisfaction in the four domains of the WHOQOL-BREF. The severity of depression had a significant influence on the participants' quality of social

relationships, physical health, psychological health as well as environment. A negative correlation between depression and each of the following; psychological health, social relationships and environment, for the depression group were found. However, no significant negative correlation was found between depression and physical health for the depression group pre-operatively thus indicating that physical health may be regarded as less important as a result of the influence of depressive symptoms on psychological health and the impact of depressive symptoms on social relationships.

The quality of life was not assessed after third molar surgery due to time constrains. No formal appointments were made for follow-up visits - participants were expected to sit and wait in the waiting-room; and could be called at any moment to see their doctor. As a result the participants may not have had time to complete the WHOQOL-BREF.

The results of a study reviewing aspects that affect quality of life in the early post-operative period by Savin and Ogden (1997) showed that some patients could experience deterioration in their quality of life. In a later study McGrath, Comfort, Lo and Luo (2003) also found a significant deterioration in oral health-related quality of life in the immediate post-operative period following third molar surgery; pre-operative quality of life slowly re-established itself over a period of seven days. The decrease in the quality of life of the patients in the study undertaken by McGrath, Comfort Lo and Luo (2003) could be a result of depression levels that peaked in the early post-operative period and in return, this could indicate less satisfaction with their physical and psychological health.

6.4 Pain

6.4.1 Pre-operative pain experience

Pain was measured with the visual analogue scale (VAS). Katz and Melzack (1999) described VAS as a valid and reliable tool. In the present study 43% of the participants had no pain; 31% had mild pain; 21% had moderate pain; and 6% had severe pain, pre-operatively, as assessed by VAS. Pre-operative pain, either acute or chronic, is an important predictor of mild to severe post-operative pain (Nielsen et al., 2007). Caumo et al. (2002) investigated the pre-operative predictors of moderate to intense acute post-operative pain and found that higher levels of pain immediately before surgery predicted moderate to intense post-operative pain. Impacted third molars can result in pain, infections and other dental problems. However, in some cases impacted third molars may cause no apparent /immediate problems or pain yet the third molars are removed nevertheless in order to prevent future problems. In the present study, operations were done after infections had been treated, thus resulting in participants with no or mild pre-operative pain.

6.4.2 Post-operative pain experience

The surgical removal of third molars is a common oral surgical procedure - post-operative pain is known to be a common problem thereafter. Rudin et al. (2010) reported severe and acute pain in 16 – 20% of participants, directly after third molar surgery as well as in the postoperative period, while 60% of participants reported one or more episodes of moderate to severe pain. In a preliminary report regarding aspects affecting quality of life in the early post-operative period after third molar surgery, Savin and Ogden (1997) found that two-thirds of the patients experienced

pain the day after surgery and approximately 50% of the patients continued to experience pain one week after the operation.

In our study 40% of the participants reported mild to severe post-operative pain while 60% of the participants had no post-operative pain. Those participants who experienced pain can be divided into the following groups: 20% reported mild pain; 11% reported moderate pain; and 9% reported severe post-operative pain. These results are in agreement with Seymour, Meechan and Blair (2004) who suggested that post-operative pain after third molar surgery is of short duration and it reaches its maximum intensity early in the post-operative period. Bocanegra, Seijas and Yibirin (2005) stated that pain following extraction of impacted third molars is acute; they also stated this pain lasted from 2 hours to 3 days reaching its maximum intensity in the first 4 hours after extraction.

Our findings are also in agreement with Van Wijk, de Jongh and Lindeboom (2010) who found that 58% of the patients in their study had no pain on day seven post-operatively and those who did report pain, reported low intensity levels of pain. Post-operative pain was assessed seven days after the operation in the current study. As post-operative pain in third molar operations is usually of short duration, this may explain the low intensity level of pain reported by the participants in this study.

6.5 Relationship between depressive symptoms and pain experience

6.5.1 Total group

The results of this study showed a general decrease in the mean depression score of pre-operative followed by post-operative assessments. This difference was not statistically significant, participants were on average slightly less depressed

seven days after the operation. The mean pain perception score for the entire group also showed a small decrease when pre-operative and post-operative assessments were compared. Although participants experienced less pain after the operation, this difference was not statistically significant. However, a significant positive correlation ($r = 37$, $p = 0.03$) between depressive symptoms and subjective experience of pain before the operation for the total group was found. Pain can affect patients physically as well as mentally and emotionally, this may explain the relationship between pain and depression for the group pre-operatively. Again confirming the reciprocal relationship suggested by Jain (2008). No relationship was found between depressive symptoms pre-operatively and pain perception post-operatively. Kavakci, Aluntas, Kugu and Muderris (2012) studied the effects of pre-operative anxiety and depression on pain in rhinoplasty and septoplasty patients and they found minimum positive correlations between their anxiety and depression levels and their score on the VAS before the patients were discharged from the hospital. This correlation was however, also not statistically significant and the authors concluded that the presence of anxiety and depression pre-operatively had not affected the pain level post-operatively. Post-operative pain and depression were assessed seven days after the operation in the present study. Post-operative pain peak in the immediate post-operative period and 60% of the participants had no pain post-operatively influencing the relationship between pain and depression in the post-operative phase.

6.5.2 Comparison of two groups pre-operatively

Pre-operative BDI scores were used to divide the participants into two groups. The depression group had 9 (26%) participants with mild to severe depressive symptoms (BDI > 10) whereas the no depression group had 26 (74%) participants.

In our study we found that participants with more depressive symptoms pre-operatively had higher levels of pre-operative pain. Although the mean VAS score for the depressive group was higher than for the no depressive group, the result was not statistically significant. Our results do not support the hypothesis that patients with depressive symptoms will experience significant more pre-operative pain than patients without depressive symptoms and were rejected.

Results of some previous studies have demonstrated that pre-operative depression could be an important variable in the experience of pain (Özalp et al., 2003; Caumo et al., 2002). Although the group with pre-operative depressive symptoms had higher pain perception scores, no significant correlation between pre-operative pain perception and pre-operative depression was found. The small sample size could have influenced our findings. However, we found a highly significant correlation ($r = 0.44$, $p = 0.03$) between pre-operative pain perception, and pre-operative depression for the group without pre-operative depressive symptoms. Results indicated that participants without depressive symptoms generally have low levels of pain perception yet any change in their feelings or mood could change their perception of pre-operative pain; in addition to the above a change in level of pain experience could change their feelings.

6.5.3 Comparison of two groups post-operatively

The present study showed that participants with higher levels of pre-operative depressive symptoms had lower post-operative pain compared to patients without pre-operative depressive symptoms. Although the mean VAS score for the depressive group was lower than the no depressive group, the result was not statistically significant. Our results do not support the hypothesis that patients with depressive symptoms will experience significant more post-operative pain than patients without depressive symptoms. Kavakci et al. (2012) reported that while the presence of pre-operative anxiety a predictor of post-operative pain seem to be, no relationship was found for depression and post-operative pain.

This was in agreement with a previous study by Kudoh et al. (2002) where the post-operative pain scores for the depression group were higher than the control group in the early post-operative phase (first 16 hours), but not in the late post-operative phase. The pain scores for the depression group at 8 and 16 hours after the end of the anesthesia were significantly higher than that of the control group. However, Kudoh et al. (2002) found no significant difference between the post-operative scores of the two groups four days after the operation. In our study post-operative pain perception was assessed after seven days. Comparing pain perception in the early post- operative phase with the results of our study, could have been proven to be interesting but the former was not measured.

Kudoh et al. (2002) ascribed their results to the relationship that exists between psychological disturbances and increased cortisol secretion. Activation of the hypothalamic-pituitary-adrenal (HPA) axis in depressed patients has been implicated in the impairment of cognitive function, as well as an increase in depressive symptoms. The increased cortisol concentration, as a result of surgical

stress, in the plasma persists for approximately 24 hours in depressed patients. The increased pain sensitivity of depressed patients is potentially amplified by the impairment of cognitive function due to the increased cortisol concentration (Kudoh, et al., 2002).

Wickström et al. (2005) found a significant correlation between pre-operative depression and high post-operative pain score in patients. The findings of a subsequent study by Wickström et al. (2006) suggest that patients with pre-operative depression had higher post-operative pain scores and these patients remained depressed for three months after surgery.

Our study found significant positive relations ($r = 0.50$, $p < 0.01$) between post-operative depressive symptoms and post-operative pain perception for the group with no pre-operative depressive symptoms. Participants with little or no depressive symptoms had little or no pain, but as soon as the levels of depressive symptoms change, their pain perception changed as well.

6.6 Change in group membership

An observation very different from most other observations can bias statistics such as the mean of a group (Field, 2005). In the present study we found that three of the participants (33%) that scored high on the BDI pre-operatively and that were assigned to the depressive group, did not score as high on the BDI post-operatively. Their scores were included in the statistical analysis. This could explain why the depression group had a lower mean score for depression post-operatively ($M = 15.33$; ± 14.66) than pre-operatively ($M = 23.77$; ± 10.83).

One of the participants that was assigned to the no depression group pre-operatively, had a score of 27 on the BDI post-operatively which means that the

participant displayed moderate to high depression. The onset of psychological morbidity can take place rapidly. Vickers et al. (2006) reported that a substantial number of acute third molar patients demonstrated early onset of psychological morbidity (distress and depression) after molar surgery. A BDI high score can also be attributed to other factors i.e. factors not associated with the operation.

The mean BDI score for the no depression group did not change from the pre-operative to post-operative period. Our sample was skewed towards participants without depression (N = 26 versus N = 9) and this might explain the small difference in scores. The small sample size, especially of the group with depressive symptoms, was due to time constraints and availability of participants. The participants were recruited when they presented themselves at the hospital. Some of the patients failed to attend their scheduled surgery and as a result of this they could not be recruited. Participants who failed to appear at their follow-up appointments were withdrawn from the study and thus excluded from analysis.

The participants were divided into two groups post-operatively to check for bias. The post-operative BDI scores were used to assign the participants to the depression group (group DPO) and the no depression group (group NDPO). The depression group consisted of participants that scored ≥ 10 on the BDI post-operative. Seven participants were assigned to this group. The NDPO group consisted of 28 participants who scored < 10 on the BDI. The post-operative mean depression score obtained on the BDI was higher for group DPO (depression post-operatively) than for group DP (depression pre-operatively). The post-operative mean depression score for group NDPO (no depression post-operatively) was also lower than for group NDP (no depression pre-operatively).

Mean pain perception scores of the groups were compared. The mean post-operative pain perception score was twice as high for group DPO (depression post-operative) than for group DP (depression pre-operative). The mean pain score for group NDPO (no depression post-operatively) was lower than the mean pain score for group NDP (no depression pre-operatively).

There was no significant difference between the mean pain perception scores of group DPO (depression post-operatively) and group NDPO (no depression post-operatively). The different observations therefore, had no influence on the results of this study. The results also do not support the hypothesis that patients with depressive symptoms will experience significant more post-operative pain than patients without depressive symptoms.

Positive correlations were found between post-operative depressive symptoms and post-operative pain perception for the group with no depression post-operatively suggesting that a person's perception of pain may be more accurate if no depressive symptoms are suffered.

6.7 Medication

The use of medication during the acute one week post-operative period was documented. Participants used ibuprofen and paracetamol combination as prescribed medication; for the most part our participants did not need additional medication. The combination of ibuprofen and paracetamol proved to be an effective treatment in acute dental pain (Mehlisch, Aspley, Daniels, Southerden & Christensen, 2010; Moore, Straube, Paine, Derry & McQuay, 2011).

Twelve (34%) of the 35 participants needed more pain medication for a longer period of time or an alternative drug was used. One participant (11%) from the pre-

operative depression group took additional medication and one participant (11%) from the same group was put on an antidepressant. Ten participants (38%) of the no pre-operative depression group used more medication for a longer period. No statistical difference in the use of pain medications between the depression and no depression groups was found. Therefore the difference in the use of medication by the participants cannot be attributed to depressive symptoms but rather to other variables such as personality differences, coping skills and resilience. Moore et al. (2011) highlighted the differences between individuals both in terms of response to analgesics and in pain perception after surgery. While most patients need analgesics after surgery, some do not (Moore et al., 2011).

6.9 Sample size

We used data of this study to calculate the sample size necessary to achieve the recommended power of .8 (Field, 2005). We used a small effect size (r = .1) to calculate how many participants presenting with depressive symptoms we would need in our sample to detect a small effect. The depression group needs to increase with 12 participants to 21 participants to detect the small effect.

6.10 Limitations of the study

Consummate care was taken in planning and execution of this study. However, a number of study limitations may have affected the results and therefore these should be addressed in future research.

Firstly, the study group was limited by the relatively small and non-random nature of the sample and this affects the generalizability of the findings. If the sample

size were to be increased and if more participants were to be recruited, more analyses regarding the influence of age and gender on findings could be done.

The present study was conducted with a sample from one clinic only. Patients from the surrounding areas attended the clinic for removal of third molars. Patient appointments are made but some of the patients do not adhere to their appointments and therefore could not be included in the study and this affected the sample size. In addition to this, some of the patients did not come back for their follow-up visit and as a result these patients were also excluded from the study.

Secondly, the group sizes were different, an unbalanced design (Field, 2005). Time constraints limited the recruitment of participants. One of the problems may be large variation due to a small and limited sample size - enlarging sample sizes could remedy this problem. The prevalence of depressive symptoms in the present study was however, comparable to those of other studies.

Thirdly, pain and depression scores were taken seven days post-operatively. Pain levels peak in the early post-operative period and therefore the peak of severity could have been missed. It was not possible to assess pain perception at shorter intervals as the participants were discharged directly after surgery and were scheduled for a follow-up visit seven days later. Future research may include an assessment of pain perception on the third or fourth day after the operation in order to compare results.

Fourthly, quality of life was assessed with WHOQOL-BREF pre-operatively but no informative quality of life scores were available post-operatively thus no comparison could be made between the participants' perceptions of quality of life pre-operatively and post-operatively. For their follow-up visit, the participants waited in the waiting-room and could be called at any moment to see their doctor. No formal

appointments were made for the follow-up visits. As a result, the participants may not have had time to complete the WHOQOL-BREF. Future research, undertaken to investigate the influence of the removal of third molars on the quality of life of the participants could prove to be an interesting topic.

A further limitation is the exclusion of participants with a history or diagnosis of major depressive episodes or major depressive disorder(s). A future study could include participants presenting with depressive symptoms, rather than the opposite. At the screening stage none of the participants presented with major depressive disorder therefore the final group did not include participants diagnosed with major depressive disorder.

A recommendation for future research is the implementation of formal diagnosis to aid in dividing the participants into three groups. The groups could be divided as follows: Group A - participants presenting with major depressive disorder; Group B - participants without major depressive disorder but with mild to moderate depressive symptoms; and Group C - participants without MDD and without depressive symptoms.

Future research could also include the assessment of personality as well as the coping skills and resilience of the participants.

6.11 Conclusion

In conclusion, pre-operative and post-operative pain scores in participants with depressive symptoms were not significantly higher than pre-operative and post-operative pain scores of participants without depressive symptoms. The results of this study do no support the hypotheses that 1) Patients with depressive symptoms will experience significant more pre-operative pain than patients without depressive

symptoms and 2) Patients with depressive symptoms will experience significant more post-operative pain than patients without depressive symptoms. Pain and depression co-occur, but the direction of causality is not clearly understood. Berna et al. (2010) used brain imaging to examine the interaction between depression and pain. The responses of healthy volunteers were examined when they were subjected to pain while feeling low. Berna et al. (2010) found that the brain processes pain more emotionally when in a depressed state and this resulted in an experience that is even more unpleasant. Being depressed disables the ability to regulate the negative emotion associated with pain. Berna et al (2010) concluded that depression becomes a driving cause of pain and not just a consequence of pain. The gate control theory of Melzak and Wall (1965) emphasis the existence of control systems in the brain, these control systems modulate pain perception. Tracey and Manthy (2007) stated that pain modulation such as stress and anxiety is mediated by descending neuro-physiological pathways from the brainstem to the spinal cord. Extensive research of the gate control theory confirmed the exacerbation or inhibition of afferent nociceptive input and the experience of pain by psychological states via these descending pathways (Bruehl and Chung, 2004).

Results of this study indicated that 40% of participants still had pain seven days after the removal of their third molars despite analgesic therapy, while 20% of participants still presented with depressive symptoms seven days post-operatively. It is clear that depression is common in dental patients. These findings re-confirm the comorbidity of pain and depression. The need for psychological measures in assessing the prevalence of depression in dental patients was illustrated. Adequate post-operative pain relief has a positive impact on the quality of life of the patient.

The development and use of psychological measures for identifying pre-operative predictors for intense post-operative pain will enhance the quality of pain management and therefore reduce the risk of chronic post-operative pain.

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INDEX OF ACRONYMS AND ABBREVIATIONS.

NRI		
	Norepinephrine reuptake inhibitor	9
SNRI		
	Serotonergic/noradrenergic reuptake inhibitor	9
SSRI		
	Serotonin reuptake inhibitor	9
VAS		
	Visual Analog Pain Scale	12
WHOQOL-BREF		
	The World Health Organization Quality of Life Scale – BREF	17

Appendix A

UNIVERSITY OF STELLENBOSCH

PATIENT INFORMATION AND CONSENT FORM.

THE RELATIONSHIP BETWEEN DEPRESSIVE SYMPTOMS AND POST-OPERATIVE SUBJECTIVE PAIN PERCEPTION AFTER THIRD MOLAR SURGERY.

Principal investigator: Winnie Janse van Rensburg

Co-investigators: Dr Renata Schoeman, Prof Ashraf Kagee.

Address: Department of Psychology

University of Stellenbosch

Dear Volunteer

We phoned you and you were willing to talk to us today. We now want to invite you to take part in a research project carried out at the Dental Clinic at Tygerberg Hospital by researchers affiliated to the University of Stellenbosch. The following information will describe the study and your role as participant. Please read this carefully and feel free to ask any questions. It is very important that you are fully satisfied and that you clearly understand what is going to happen during this study. Your participation is **entirely voluntary.** If you decided not to participate in the study, this will not affect you, your current or your future treatment negatively in any way. You are also free to withdraw from the study at any point, even if you do agree to take part.

Why are we doing this research?

Depression and pain symptoms are common conditions experienced by patients. Research in previous years showed that there is a relationship between pain and depression. Depression can be a consequence of living with pain, but a depressed mood may also influence the experience of pain.

Acute pain after tooth extraction is experienced by most patients but it is usually of short duration. However, there is a significant variation in the experience of this pain, despite identical surgical procedures. This may be due to personal and psychological factors. Acute

pain, after surgery, may become chronic pain in 50% of cases. The development of chronic postoperative pain is influence by physical, psychological and social factors. It is possible that depression may influence the experience of acute pain and the risk of developing chronic pain.

Patients with serious chronic pain after surgery have a poor quality of life. It is therefore important to investigate the factors that play a role in the development of chronic pain, such as depression. The early identification and treatment of these factors that influence the development of chronic pain is very important to improve patient outcomes.

We hope this study will help us to understand more about pain and the treatment thereof. We hope that in time this will help us develop more effective treatments for people in the future. We are asking people between the ages of 18 and 45 years who are having their wisdom teeth removed to participate in the study. We plan to include a total of 40 people in this study which will be conducted at Tygerberg Hospital.

What happens during the study?

We have phoned you to ask about your willingness to talk to us today. During the screening visit with the study doctor or psychologist, we interviewed you, much like a normal visit to your family doctor to assess whether you are eligible for our study. This visit included questions on your emotional and physical health. We now want to give you the opportunity to participate in the study since you are suitable. We will invite you to go through this information and consent form (you are currently reading) to ensure that you understand everything about the study. Once we have addressed any questions you may have and you provide written consent (permission) to your participation, we will continue with the study.

After you have signed your informed consent form/ gave permission, you will then be asked to complete questionnaires on the pain you experience and your quality of life. We will then conduct an interview with you about your mental health.

You will then have the operation to remove your wisdom teeth as explained to you by your dentist. After the operation, you will get medication for pain relief and will go home. We will ask you to write down carefully all the pain medication you use in the week following the operation on a separate form.

We will ask you to return to the clinic, after two weeks, for a second visit. During the second visit, we will again complete the questionnaires on your emotional and physical health as

well as the pain you experienced and your quality of life. You will also be asked to hand back the form for the pain medication you used in the week following your operation.

1 Are there any risks?

There are only low or minimal risks associated with your participation in this study. If you feel tired at any point during any of the visits, you should please ask your study doctor/psychologist to rest. If for some reason you cannot complete a visit on a particular day we will make another appointment to complete the tests.

You should not experience any other problems in addition to the discomfort associated with the extraction. If you experience any complications other than pain after the operation, that needs further interventions, you will be withdrawn from the study.

2 Are there any benefits?

There may be no direct benefits to you for participating in this study. However, you will be making an important contribution to this research that may benefit others in the future. We expect that the results of this study will help us understand the link between depression and pain and the risk for acute pain to become chronic.

3 Will you be compensated?

While you will not be paid to take part in this study, all evaluations will be provided at no cost to you or your medical aid. We will reimburse you for your travel expenses in order to attend the scheduled appointments.

Has this study been approved?

This study has been approved by the Committee for Human Research at Stellenbosch University, the Ethics Committee of the Psychology Faculty of the University of Stellenbosch and the Department of Dentistry, University of the Western Cape. The study will comply with South African Guidelines for Good Clinical Practice and the international Declaration of Helsinki.

Contact details for local Ethics Committee:

Chairman, Ethics Committee (Research Committee), Faculty of Health Sciences, University of Stellenbosch, P O Box 19063, Tygerberg, 7505, Cape Town. Telephone: 021 9389207; Fax: 021 9336330

4 Is the information confidential?

Your participation in the study will be regarded as strictly confidential. In order to protect your identity and the information provided by yourself, no names will be used on the forms or interviews. Your identity will not be revealed at any time to people outside of the study team. If results of the study get published, your identity will be protected.

Who can I contact if I have questions?

You can ask questions at any time on any aspect of the study. If you have any queries, you can contact Me Winnie Janse van Rensburg at 0825564239 or Dr Renata Schoeman at 083 589 6988.

If you agree to take part, please complete the following section:

I)…….....

Have been invited to take part in the above research project entitled: **THE RELATIONSHIP BETWEEN DEPRESSIVE SYMPTOMS AND POST-OPERATIVE SUBJECTIVE PAIN PERCEPTION AFTER THIRD MOLAR SURGERY.**

The study doctor/psychologist has explained the details of the study to me and I understand what they have said to me.

- They have also explained that this study will involve 2 assessments over the next two weeks which include interviews and filling out of questionnaires.
- I also know that I am free to withdraw from the study at any time if I am unhappy.
- By writing my name below, I voluntary agree to take part in this research project. I confirm that I have not been forced in any way or by anyone to take part.

.....

Name of Participant (printed)

..... **.....**

Signature of Participant ..... Date

in case of minor:

.....

Name of parent/ legal guardian

....

Signature of parent/ legal quardian Date

5 Declaration by investigator

I *(name)* …….. declare that:

- I explained the information in this document to

  ……..
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understand all aspects of the research, as discussed above
- I did/did not use an interpreter (i*f an interpreter is used, then the interpreter must sign the declaration below).*

Signed at (*place*) ..... On (*date*) ……..……..

.....

Signature of investigator

6 Declaration by interpreter

I *(name)* …….. declare that:

- I assisted the investigator (*name*) ……. to explain the information in this document to ……... using the language medium of Afrikaans/Xhosa.
- We encouraged him/her to ask questions and took adequate time to answer them.
- I conveyed a factually correct version of what was related to me.
- I am satisfied that the parent/legal guardian fully understands the content of this informed consent document and has had all his/her questions satisfactorily answered.

Signed at (*place*) .....……. On (*date*) ……..……..

.....

Signature of interpreter

Appendix B

In hierdie vraelys is groepe stellings. Lees elke stelling noukeurig deur. Kies dan uit elke groep die een stelling wat die beste beskryf hoe jy die afgelope week, INSLUITENDE VANDAG, gevoel het. Trek 'n sirkel om die nommer van die stelling wat jy kies. As meer as een stelling in die groep van toepassing is, omsirkel elkeen. Maak seker dat jy al die stellings in die groep lees voordat jy jou keuse maak.

1. 0 Ek voel nie swaarmoedig of teneergedruk nie
   1 Ek voel swaarmoedig of teneergedruk
   2 Ek is gedurig swaarmoedig of teneergedruk en kan nie die gevoel afskud nie
   3 Ek is so swaarmoedig of ongelukkig dat ek dit nie kan verduur nie

2. 0 Ek is nie besonder pessimisties of ontmoedig oor die toekoms nie
   1 Ek voel ontmoedig oor die toekoms
   2 Ek voel ek het niks om na uit te sien nie
   3 Ek voel die toekoms is hopeloos en dat dinge nie kan verander nie

3. 0 Ek voel nie soos 'n mislukking nie
   1 Ek voel ek het meer as die gewone mens misluk
   2 As ek op my lewe terugkyk, sien ek net mislukkings
   3 Ek voel ek is 'n algehele mislukking as mens

4. 0 Ek kry soveel bevrediging soos voorheen uit dinge
   1 Ek geniet dinge nie soos gewoonlik nie
   2 Ek kry nie werklik bevrediging uit enigiets meer nie
   3 Ek is ontevrede of verveeld met alles

5. 0 Ek voel nie besonder skuldig nie
   1 Ek voel 'n groot deel van die tyd skuldig
   2 Ek voel die meeste van die tyd taamlik skuldig
   3 Ek voel altyd skuldig

6.	0	Ek voel nie ek word gestraf nie
	1	Ek voel ek mag gestraf word
	2	Ek verwag ek mag gestraf word
	3	Ek voel ek word gestraf
7.	0	Ek voel nie teleurgesteld in myself nie
	1	Ek is teleurgesteld in myself
	2	Ek het 'n teensin in myself
	3	Ek haat myself
8.	0	Ek voel nie ek is slegter as enigiemand anders nie
	1	Ek is krities teenoor myself oor my swakhede en foute
	2	Ek blameer myself altyd vir my foute
	3	Ek blameer myself vir alle slegte dinge wat gebeur
9.	0	Ek het geen gedagte aan selfmoord nie
	1	Ek dink aan selfmoord, maar sal dit nie uitvoer nie
	2	Ek wil myself graag om die lewe bring
	3	Ek sal selfmoord pleeg as ek die kans kry
10.	0	Ek huil nie meer as gewoonlik nie
	1	Ek huil nou meer as gewoonlik
	2	Ek huil nou gedurig
	3	Ek kon vroeër huil, maar nou kan ek nie al wil ek ook
11.	0	Ek is nie meer geirriteerd as gewoonlik nie
	1	Ek word makliker ergerlik of geirriteerd as voorheen
	2	Ek voel nou gedurig geirriteerd
	3	Ek word glad nie geirriteer deur dinge wat my gewoonlik geirriteer het nie

12.	0	Ek het nie belangstelling in ander mense verloor nie
	1	Ek stel minder belang in ander mense as voorheen
	2	Ek het die meeste van my belangstelling in ander mense verloor
	3	Ek het al my belangstelling in ander mense verloor
13.	0	Ek neem besluite net so goed soos gewoonlik
	1	Ek stel meer uit om besluite te neem as voorheen
	2	Ek neem besluite moeiliker as voorheen
	3	Ek kan glad nie meer besluite neem nie
14.	0	Ek voel nie dat ek slegter as gewoonlik lyk nie
	1	Ek is bekommerd daaroor dat ek oud of onaantreklik lyk
	2	Ek voel daar is blywende veranderinge in my voorkoms wat my onaantreklik laat lyk
	3	Ek glo ek lyk lelik
15.	0	Ek kan byna net so goed soos tevore werk
	1	Dit vereis meer inspanning om te begin om iets te doen
	2	Ek moet myself probeer forseer om enigiets te doen
	3	Ek kan geen werk doen nie
16.	0	Ek slaap net so goed soos gewoonlik
	1	Ek slaap nie so goed soos gewoonlik nie
	2	Ek word 1 tot 2 ure vroeër as gewoonlik wakker en sukkel om weer aan die slaap te raak
	3	Ek word etlike ure vroeër as gewoonlik wakker en kan nie weer slaap nie
17.	0	Ek word nie moeër as gewoonlik nie
	1	Ek word makliker moeg as gewoonlik
	2	Ek word moeg van omtrent enigiets wat ek doen
	3	Ek is te moeg om enigiets te doen

18. 0 My eetlus is nie slegter as gewoonlik nie

1 My eetlus is nie so goed as wat dit was nie

2 My eetlus is nou baie slegter

3 Ek het glad geen eetlus meer nie

19. 0 Ek het nie onlangs veel, indien enige, gewig verloor nie

1 Ek het meer as twee en 'n half kilogram (5 pond) verloor

2 Ek het meer as 5 kg (10 pond) verloor

3 Ek het meer as sewe en 'n half kg (15 pond) verloor

(Ek probeer doelbewus gewig verloor deur minder te eet.)

20. 0 Ek is nie meer bekommerd oor my gesondheid as gewoonlik nie

1 Ek is bekommerd oor liggaamlike probleme soos pyne of 'n omgekrapte maag of hardlywigheid

2 Ek is baie bekommerd oor liggaamlike probleme en dit is moeilik om aan iets ander te dink

3 Ek is so bekommerd oor my liggaamlike probleme dat ek aan niks anders kan dink nie

21. 0 Ek het nie onlangs enige verandering in my belangstelling in seks opgemerk nie

1 Ek stel minder in seks belang as gewoonlik

2 Ek stel nou baie minder in seks belang

3 Ek het heeltemal belangstelling in seks verloor

Appendix C

Die volgende vra handel oor hoe jy voel oor jou lewenskwaliteit, gesondheid en ook ander aspekte van jou lewe. Ek sal elke vraag aan jou voorlees met die verskillende opsies as antwoorde. Kies asseblief die antwoord wat jou die beste pas. As jy onseker is oor wat om te antwoord, kies die eerste wat opkom. Dis gewoonlik die beste antwoord.

Hou assblief jou eie verwagtinge, bekommernisse en geluk in gedagte. Dink aan jou lewe die laaste vier weke.

		Baie sleg	Sleg	Gemiddeld	Goed	Baie goed
1.	Hoe sal jy jou lewenskwaliteit beskryf	1	2	3	4	5

		Baie ontevrede	Ontevrede	Gemiddeld	Tevrede	Baie tevrede
2.	Hoe tevrede is jy met jou gesondheid	1	2	3	4	5

Die volgende vrae handel oor hoe goed jy sekere ondervindings die afgelope vier weke ervaar het

		Glad nie	Effens	Gemiddeld	Baie	Uiters baie
3.	Tot watter mate hou fisiese pyn jou terug om dinge te doen wat jy moet doen	5	4	3	2	1
4.	Hoe gereeld het jy mediese behandeling nodig om met jou dag aan te gaan	5	4	3	2	1
5.	Hoe baie geniet jy die lewe	1	2	3	4	5
6.	Hoe betekenisvol voel jy is jou lewe	1	2	3	4	5

		Glad nie	Effens	Gemiddeld	Baie	Uiters baie
7.	Hoe goed kan jy konsentreer	1	2	3	4	5
8.	Hoe veilig voel jy in jou daaglikse lewe	1	2	3	4	5
9.	Hoe gesond is jou omgewing	1	2	2	4	5

Die volgende vrae behandel hoe goed jy dinge ervaar het asook om dit uit te voer die afgelope vier weke

		Glad nie	Effens	Gemiddeld	Baie	Uiters baie
10.	Het jy elke dag genoeg energie	1	2	3	4	5
11.	Kan jy met jou liggaamsbou saamleef	1	2	3	4	5
12.	Het jy genoeg geld om jou behoeftes te bevredig	1	2	3	4	5
13.	Hoe beskikbaar is inligting wat jy daagliks benodig	1	2	3	4	5
14.	Hoeveel toegang het jy tot ontspanning	1	2	3	4	5

		Baie sleg	Sleg	Gemiddeld	Goed	Baie goed
15.	Hoe goed kan jy van punt A na punt B kom	1	2	3	4	5

		Baie Ontevrede	Ontevrede	Gemiddeld	Tevrede	Baie tevrede
16.	Hoe tevrede is jy met jou slaap	1	2	3	4	5
17.	Hoe tevrede is jy met jou vermoë om daaglikse take uit te voer	1	2	3	4	5
18.	Hoe tevrede is jy met jou vermoë om te werk	1	2	3	4	5
19.	Hoe gelukkig is jy met jouself	1	2	3	4	5
20.	Hoe tevrede is jy met jou persoonlike verhoudings	1	2	3	4	5
21.	Hoe tevrede is jy met jou sekslewe	1	2	3	4	5
22.	Hoe tevrede is jy met jou vriende se ondersteuning	1	2	3	4	5

23.	Hoe tevrede is jy met die omstandighede waarin jy lewe	1	2	3	4	5

24.	Hoe tevrede is jy met gesondheidsdienste tot jou beskikking	1	2	3	4	5
25.	Hoe tevrede is jy met jou vervoer	1	2	3	4	5

Die volgende vraag verwys na hoe gereeld jy sekere dinge gevoel of ervaar het die afgelope vier weke

		Nooit	Soms	Gereed	Baie gereeld	Altyd
26.	Hoe gereeld het negatiewe gevoelens soos angs, depressie, moedeloos, blou Maandag, ens.	5	4	3	2	1

HET JY ENIGE KOMMENTAAR OP DIE ASSESSERING?
