AN INVESTIGATION INTO THE PREVALENCE AND OCCUPATIONAL RISK FACTORS OF LOW BACK PAIN IN EMERGENCY MEDICAL SERVICES PERSONNEL

By

James Vlok

Dissertation submitted in partial compliance with the requirements for the Masters Degree in Technology: Chiropractic at the Durban Institute of Technology.

I, James Vlok, do declare that this dissertation is representative of my own work in both conception and execution.

James Vlok **Date:**

APPROVED FOR FINAL EXAMINATION BY:

Supervisor

Dr Charmaine Korporaal **Date:**

M.Tech:Chiropractic (SA), CCFC (SA), CCSP (USA), ICSSD (FICS)

Dedication

This is dedicated to my parents who have supported me above and beyond the call of duty. I have a great deal of love and respect for you both and I am truly grateful for all the two of you have sacrificed and done for me.

Acknowledgements

To Jenny, I thank you for all your unfailing love and support, and for all that you have sacrificed for me. Without you the triumph of my achievements would be made so much less.

To Dr Charmaine Korporaal, I have the greatest respect for you. Thank you for guiding me, not only through this research, but through my years as a chiropractic student as well.

To Nicole de Montille. Without you this research would probably have ground to a halt before it even got started. You helped me time and again and for this I cannot thank you enough.

To my friends and colleagues who struggled through this course with me. I thank you for all the laughs that made it all seem possible. I especially need to thank those involved in T&S evenings. Pearler's will never be the same again.

To the clinicians and staff. I don't know how you did it, but here we are, about to be unleashed onto an unsuspecting public. For this I thank you.

Thank you to all those who participated in this study. Without you this study would not have been possible.

Abstract

Objectives

The objectives of this study were: to determine if emergency medical personnel have a higher risk factor for the development of low back pain due to their occupation than the general population; as well as determine if an increase in the number of years working in the field (i.e. years of exposure) leads to an increased incidence and / or prevalence of low back pain.

Summary of Background Data

Emergency medical personnel have a number of occupational risk factors that are listed in the reviewed literature (Davis and Heaney 2000, Volinn 1997 and Andersson 1999) as risk factors for low back pain. Physical lifting and carrying of patients and equipment increases stress on the lower back, while occupational stress and a high level of patient responsibility are mental risk factors (Davis and Heaney, 2000). Emergency medical personnel that spend long hours in response vehicles, ambulances or helicopters are exposed to vibrational stressors and may therefore have an increased risk of low back pain due to this whole body vibration (Palmer *et al*, 2000). In addition it has been noted that the number of motor vehicle accidents will also increase the risk of low back pain due to mechanical injury (Cassidy *et al,* 2003).

Low back pain could therefore interfere with their ability to carry out their duties, affect their attitude towards patients and colleagues, impact on the level of patient care required of them, and result in increased absenteeism. Persistence of chronic low back with the inability to perform their duties may result in the need to find alternative employment or result in premature dismissal.

Methods

This study was therefore structured as a survey, which was quantitative in nature, and made use of a structured questionnaire to collect data. The data was collected in the Durban Metropolitan area by the researcher by means of a questionnaire,

which was developed from the literature, refined for content and construct validity through a focus group and then piloted for face validity prior to being used in this study. In order to obtain an accurate recording of the data that the questionnaire sourced, the purpose of this study was not initially explained fully to prospective participants until after the research questionnaire had been completed. This was followed in order to minimize bias due to over-reporting of LBP since this condition is very hard to characterize, however this was additionally minimized by defining LBP and withholding the true nature of the study until after the questionnaires had been completed. The participants where then approached and were asked whether their responses could be utilized, at which time the participant signed the informed consent or the completed questionnaire was destroyed in the presence of the participant that did not wish to have their information utilized in this study. Thus the sample group that self selected would have been representative of emergency medical personnel ensuring that the results of this study had increased validity and reliability, with respect to obtaining the required information in respect of low back pain.

A sample size of 131 participants was composed of Basic Ambulance Assistant (BAA), Ambulance Emergency Care Assistant (ANA), and Ambulance Emergency Care Technology (ANT) qualifications was used by the researcher in order for the sample to be representative of the total population. This sample was taken from three private emergency medical companies, in addition to this a sample was also taken of the 2nd and 3rd year students studying one of the above qualifications, in order to allow for intragroup analysis.

Quantitative responses were described using means, standard deviations and ranges. Prevalence and 95% confidence intervals, as well as incidence density and 95% confidence intervals were calculated using Epi Info version 6.5's Epitable module. Associations between categorical variables and LBP prevalence was achieved using chi square tests or Fisher's exact tests where appropriate. Student's t-tests were used with quantitative variables.

Results and Conclusions

The results of this study show that there are significant occupational risk factors for low back pain facing those actively working in the emergency medical services. There was a high prevalence of LBP detected in this study (76%), although a higher percentage was probably aggravated by occupational risk factors. This figure is higher than seen in the average ranges found in previous studies (Masset and Malchaire, 1994; Andersson, 1999; Walker, 2000). The incidence of episodes of LBP was 21.25% or 2.55 episodes per person per year. The 21.25% annual incidence found in this study is significantly higher than that found in literature for the general population (Andersson, 1999; George, 2002).

With respect to the possible cause 86% of LBP; the participants believed that their current LBP was caused by their occupation. It was also found that 91% of participants believed that their previous LBP had an occupational cause. Furthermore, it was found that 74% of participants did not suffer from LBP prior to working in emergency services. This means that 74% of the prevalent cases (56.24% of total sample) had LBP that occurred after the onset of working in emergency services, and was likely caused by exposure to working in emergency services. This is significant as it supports the hypothesis that emergency medical personnel have a higher risk for the development of low back pain due to their occupation than the general population.

It was shown that there was a significantly higher exposure time for qualified participants in years working in ambulances, helicopters and in total. This infers that there would be an increased exposure time to occupational risk factors for low back pain. This can be seen in the fact that there was a significantly higher prevalence of low back pain in qualified participants (84%) compared to students (61%). This result supports the hypothesis that the prevalence of low back pain should be directly proportional to the number of years exposed to risk factors in the field.

Table of Contents

Dedication 2

Acknowledgements 3

Abstract 4

List of tables 12

List of Bar Charts 14

Chapter One

1.1 Background to the Problem 15

1.2 Aims of the Study 17

1.3 Rationale for the Study 18

Chapter Two

2.1 Introduction 20

2.2 Incidence and Prevalence of LBP 20

2.3 Smoking Habits and its relation to low back pain 22

- 2.3.1 Disc pathology, smoking and LBP 22
- 2.3.2 Vascular compromise and its relation to LBP 24
- 2.3.3 Bone mineral content, smoking and LBP 26
- 2.3.4 Smoking, depression and LBP 27

2.4 Biomechanical Factors Relating to LBP 27

2.5 Whole Body Vibration and LBP 33

2.6 Psychological Factors Relating to LBP 36

2.7 The impact of LBP on the industry 38

2.8 Conclusion 39

Chapter Three

3.1 Introduction 40

3.2 Study Design 40

3.3 Allocation of Participants 40
- 3.3.1 Sampling 40
- 3.3.2 Sample size 41
- 3.3.3 Study Limitations 42

3.4 Criteria for Participation in the Study 42
- 3.4.1 Inclusion Criteria 43
- 3.4.2 Exclusion Criteria 43

3.5 Development of the Questionnaire 44

3.6 Data Collection and Analysis 46

3.7 Statistical Methods 48

Chapter Four

4.1 Demographics 49

4.2 Descriptive statistics of exposure variables 52
4.2.1 Qualification 52
4.2.2 Demographic factors for LBP 54

4.3 Prevalence and Incidence of LBP among Emergency Medical Personnel 60

4.3.1 Current Low Back Pain 60
4.3.2 Previous history of LBP among Emergency Medical Personnel 65
4.3.3 Absenteeism due to LBP 68
4.3.4 Low Back Pain before working in the emergency services industry 70

4.4 Analytical statistics: Associations between exposures and LBP 71
4.4.1 Lifestyle risk factors for LBP 71
4.4.1.1 Exercise and its association with LBP 71
4.4.1.2 Smoking and its association with LBP 73

4.5 Occupational risk factors for LBP 78
4.5.1 Occupational exposure 78
4.5.2 Type of stretcher used and the association with LBP 82
4.5.3 Traveling and exposure to whole body vibration 84
4.5.4 Motor vehicle accidents 87
4.5.5 Psychological factors associated with LBP 88

4.6 Summary and limitations 93

Chapter Five

5.1 Conclusions 103

5.2 Recommendations 104

References 106

List of Appendices 112

List of tables

Table 1:	Racial distribution of study participants (n=100)	51
Table 2:	Association between qualification (student vs. qualified) and low back pain	53
Table 3:	Association between qualification type and low back pain	53
Table 4:	Race and LBP	55
Table 5:	Association between race and exercise (n=100)	55
Table 6:	Association between race and smoking (n=100)	56
Table 7:	Association between exercise and smoking (n=100)	57
Table 8:	Gender and LBP	57
Table 9:	Age group and LBP	59
Table 10:	Duration of episodes of LBP	61
Table 11:	Intensity of episodes of LBP	62
Table 12:	Frequency of episodes of LBP	62
Table 13:	Responses of participants on whether their LBP was caused by their occupation	63
Table 14:	Duration of previous LBP in subjects who reported a previous history (n=75)	66

Table 15:	Intensity of previous LBP in participants who reported a previous history (n=75)	66
Table 16:	Absence from work due to LBP in the past year in participants who reported suffering from LBP (n=76)	68
Table 17:	Days booked off for light duty in past year due to LBP	69
Table 18:	Pre-existing LBP	70
Table 19:	Frequency of exercise in study participants (n=100)	71
Table 20:	Length of exercise session in study participants (n=100)	72
Table 21:	Exercise and LBP	72
Table 22:	Amount of cigarettes smoked daily in current smokers	74
Table 23:	Distribution of duration of smoking in current smokers	74
Table 24:	Daily amount smoked in ex-smokers	75
Table 25:	Duration of smoking in ex-smokers	75
Table 26:	Length of time since quitting smoking in ex-smokers	75
Table 27:	Smoking and LBP	76
Table 28	Non-parametric statistics and tests to compare exposure time in students and qualified group	79
Table 28a	Non-parametric statistics and tests to compare exposure time in students and qualified group	79

Table 29:	Cumulative years of occupational exposure and LBP	81
Table 30:	Duration of exposure per month and LBP	82
Table 31:	Self loading stretcher by low back pain	83
Table 32:	Non - self loading stretcher by low back pain	83
Table 33:	Total kilometers traveled per shift in study participants (n=100)	84
Table 34:	Distance traveled per shift and LBP	85
Table 35:	Driver and LBP	85
Table 36:	Number of motor vehicle accidents participants had while on duty (n=100)	87
Table 37:	MVA while on duty and LBP	87
Table 38:	Occupational stress and LBP	91
Table 39:	Insomnia and LBP	91
Table 40:	Depression and LBP	92

List of Bar Charts

Figure 1:	Percentage of participants by qualification (n=100)	50
Figure 2:	Percentage of participants by age group (n=100)	52
Figure 3:	Percentage of participants who experienced pain currently	60
Figure 4:	Occupational causes of LBP in participants with LBP (n=76)	63
Figure 5:	Occupational causes of previous LBP (n=75)	67
Figure 6:	Distribution of number of hours per month spent in the field	78
Figure 7:	Boxplot of time exposed to emergency medical environments in all participants (n=100)	80
Figure 8:	Occupational stress rating of participants (n=100)	89
Figure 9:	Percentage of participants who responded positively to each of the likely stressors (n=100)	89
Figure 10:	Symptoms suffered by participants (n=100)	90

Chapter One

Introduction

1.1 Background to the Problem

Back injuries are one of the most costly health care problems for industrialized nations and are by far the most costly musculoskeletal malady (Bigos *et al*, 1991). Mikheev (1993), as cited by Manga *et al* (1993), reports that the World Health Organization has described occupational low back pain as an epidemic that can only be controlled through multidisciplinary management, including chiropractic.

Emergency medical personnel have a number of occupational risk factors that are listed in the reviewed literature (Davis and Heaney 2000, Volinn 1997 and Andersson 1999) as risk factors for low back pain (LBP). Physical lifting and carrying of patients and equipment increases stress on the lower back, while occupational stress and a high level of patient responsibility are mental risk factors (Davis and Heaney, 2000).

Smoking has been increasingly implicated as a risk factor for low back pain, with evidence pointing to a nominal increase in back pain prevalence in smokers (Boshuizen *et al*, 1992; Palmer *et al*, 2003). Emergency medical personnel have high occupational stress and anxiety and are therefore more likely to smoke (Palmer *et al*, 2003). This increases their risk for the development of low back pain.

Biomechanical factors have been hypothesized to cause low back pain through two mechanisms: excessive load, and repetitive loading on the spinal structures. Excessive loads can result from heavy lifting, awkward postures, and high trunk velocities (Davis and Heaney, 2000). Volinn (1997) states that heavy or repetitive lifting and low back pain are at least to some extent related to each other. Due to heavy repetitive lifting of patients and equipment emergency medical personnel are a high risk group for developing low back pain, but the amount of time spent in the field as well as the type of equipment used should influence the incidence of low back pain.

There is also a growing body of evidence that regular vibration and jolting contributes to an excess of low back pain in drivers of cars, vans, buses, tractors, and fork lift trucks, crane operators, and helicopter pilots (Palmer *et al*, 2000). Emergency medical personnel that spend long hours in response vehicles, ambulances or helicopters may therefore have an increased risk of low back pain due to this whole body vibration. The number of motor vehicle accidents will also increase the risk of or compound low back pain due to mechanical injury (Cassidy *et al,* 2003).

Furthermore various studies indicate an association between psychological factors and the occurrence of low back pain. Davis and Heaney (2000) found that psychosocial factors may also influence the relationship between biomechanical factors and low back pain, such that biomechanical demands have a greater effect on low back pain under poor psychosocial work conditions. Individuals who have a poor psychosocial work environment may be more likely to report low back pain or call in sick, even when low back pain is not severe, in order to avoid stressors at work. It was also found that an important psychosocial stress for low back pain was having the responsibility for the well-being of others (Davis and Heaney, 2000). Many people who witness traumatic events experience posttraumatic stress disorder (Merck Manual, 2004:556). This puts emergency medical services personnel, who witness repeated traumatic events, into a high risk category for posttraumatic stress. This may contribute to their incidence of low back pain.

From the above literature it can be shown that emergency medical personnel have a high occupational risk for developing mechanical low back pain. From this it can be hypothesized that emergency medical personnel would have a higher prevalence of low back pain than the general population. Low back pain has a large economic impact on the emergency services industry as employees with low back pain are assigned to light duty while another employee is given the task of responding to emergency situations. This means that two people are employed to perform the responsibilities usually allocated to one employee (de Montille, 2004). This also puts greater occupational stress on the substitute employee, thereby increasing their risk of low back pain.

In addition low back pain could interfere with their ability to carry out their duties, affect their attitude towards patients and colleagues, impact on the level of patient care required of them, and result in increased absenteeism. Persistence of chronic low back with the inability to perform their duties may result in the need to find alternative employment or premature dismissal.

Thus the aim of this study was to identify the prevalence and incidence of low back pain specific to emergency medical personnel, including selected risk factors.

1.2 Aims of the Study

The aim of this study was to identify the annual prevalence and risk factors for mechanical low back pain specific to emergency medical personnel, including selected risk factors.

The first objective was data collection and documentation with respect to:

- Patient demographics
- Lifestyle factors relating to LBP
  - Smoking
  - Exercise
- Working History:
  - Length of time in the field
  - Equipment used
  - Time spent in transit (viz. vehicle / helicopter)
  - Motor Vehicle Accidents

- Occupational stress

- History of Low Back Pain
  - Low back pain history
  - Absenteeism/Light duty due to low back pain
  - Perceived cause of low back pain

The second objective was to interpret the data to assess the strength of the relationships of the various factors documented in objective one. This was to identify the prevalence, incidence and risk factors of low back pain.

1.3 Rationale for the Study

1. A review of the related literature suggested that no such study had been conducted in South Africa. Such research would help in identifying occupational factors that were high-risk for low back pain as well as quantifying the extent of the problem.

2. Emergency medical personnel had a number of known occupational risk factors for mechanical low back pain. It could therefore be hypothesized that they were a high risk group for mechanical low back pain (Davis and Heaney 2000, Volinn 1997 and Andersson 1999).

3. Low back pain has an economic impact on the emergency services industry as employees with low back pain were assigned to light duty or were absent from work. That meant that two people were employed to perform the responsibilities usually allocated to one employee (de Montille, 2004).

4. Emergency medical personnel have a high level of responsibility toward their patients. Low back pain may have limited their performance thus impacting on their patient care. This study would aid in identifying high-

risk potential risk factors and therefore lead to potential recommendations that could be used to implement an educational program in the course structure. This would highlight the occupational risk factors and what measures could be taken to combat these factors.

Chapter Two

Review of Literature

2.1 Introduction

This chapter is concerned with reviewing the literature of occupational risk factors that have been suggested as causes for LBP in emergency care personnel. The literature will be presented in the following manner:

- Incidence and Prevalence of low back pain (LBP)
- Smoking and its relationship to LBP
- Biomechanical factors relating to LBP
- Whole body vibration and LBP
- Psychological factors relating to LBP
- The impact of LBP on the industry

2.2 Incidence and Prevalence of LBP

LBP is the number one cause of disability in people less than 45 years of age, and in those older than 45 years it is the third leading cause of disability (Gatchel *et al*, 1995). Back injuries / LBP are one of the most costly health care problems for industrialized nations and are by far the most costly musculoskeletal malady (Bigos *et al*, 1991). Mikheev (1993), as cited by Manga *et al* (1993), reports that the World Health Organization has described occupational LBP as an epidemic that can only be controlled through multidisciplinary management, including chiropractic.

Walker (2000) conducted a literature review of 56 studies of low back pain prevalence between 1969 and 1998. He found that point prevalence ranged from 12% to 33%, with the one year prevalence having ranged from 22% to 65%, and lifetime prevalence from 11% to 84 %. Masset and Malchaire (1994) found a 53% prevalence in the last 12 months (preceding the study), where Andersson (1999) found the annual prevalence of low back pain ranged from 15% to 45%, with a point prevalence of 30%.

In congruence with this Papageorgiou *et al* (1995) found that 39% of participants had experienced low back pain for one day or longer in the month before completion of the questionnaire (35% in males and 42% in females). This started to reflect that the proportion was consistently higher in women than in men at all ages over 30 years, although the 18-29 year olds the prevalence was virtually identical (Papageorgiou *et al*, 1995). Walker *et al* (2004) found that woman tended to experience a higher prevalence of low back pain at all intervals measured.

With respect to work, Hagen and Thune (1998) found that the overall 1-year incidence rate for LBP with at least 2 weeks of compensated absence from work was significantly higher in women than in men. In addition to this (viz gender) and over a 3 year period, age and site symptoms, were the two most important variables associated with absences from work 6 months or longer. This is further complicated when one considers that a 23-year increase in age doubled the chances of accumulating at least 6 months of absence, and that lumbar symptoms were 2.86 times more likely than thoracic symptoms to become chronic (Andersson, 1999).

With respect to psychosocial parameters, emergency medical personnel have a number of mental and physical high risk factors for mechanical LBP. Physical lifting and carrying of patients and equipment that increases stress on the lower back, while occupational stress and a high level of patient responsibility are mental risk factors (Davis and Heaney, 2000). These will be discussed more fully under the following headings.

2.3 <u>Smoking Habits and its relation to low back pain</u>

A positive association has been found between smoking and back pain in many of the epidemiological surveys that have examined the link (Boshuizen *et al*, 1992; Palmer *et al*, 2003; Campion and Maricic, 2003). Smoking has been increasingly implicated as a risk factor for LBP, with evidence pointing to a nominal increase in back pain prevalence in smokers (Boshuizen *et al*, 1992). In addition current and ex-smokers were more likely to have a physically demanding occupation, and more often reported feelings of frequent tiredness, stress, and headaches (Palmer *et al*, 2003). In support of these findings, some of the studies investigating smoking habits have been able to predict episodes of incident back pain based on the dose-response relationship (Palmer *et al*, 2003).

As a result several theories have been postulated for the association between back pain and smoking. These include but are not limited to:

2.3.1 Disc pathology, smoking and LBP

The intervertebral discs are plates of fibrocartilage that correspond in shape to the articular surfaces of the vertebral bodies. These discs play an important role in weight bearing and a lesser role in movement (Moore and Dalley, 1999: 451).

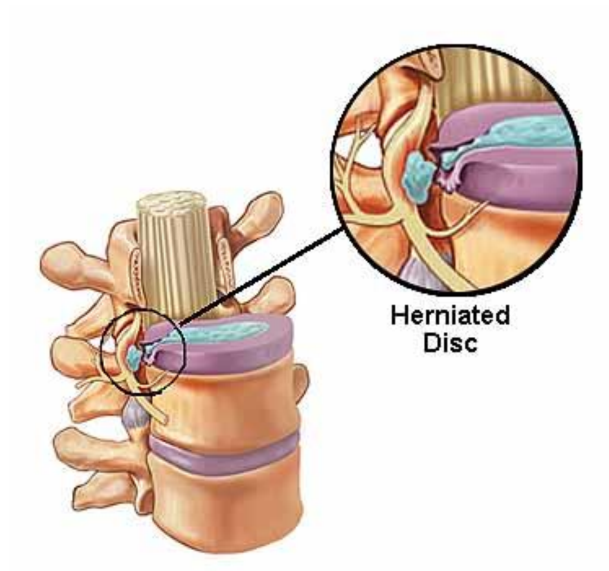
Each disc is made up of the following components:

- The first component is the centrally located nucleus pulposus. This central core is highly elastic and has a water content which decreases with age (White and Panjabi, 1990: 4). The nucleus pulposus acts like a shock absorber for axial forces and like a semi-fluid ball bearing during flexion, extension, rotation and lateral flexion of the vertebral column. It is avascular and receives its nourishment by diffusion from blood vessels at the periphery of the annulus fibrosis and adjacent surfaces of the vertebral bodies (Moore, 1992: 342)

- The second component is the nucleus pulposus, which is surrounded by the fibocartilaginous lamellae of the annulus fibrosus. The fibers in one lamella are at right angles to those in adjacent ones. This arrangement, while allowing some movement between adjacent vertebrae, provides a very strong bond between them. The lamellae are thinner and less numerous posteriorly than they are anteriorly or laterally (Moore, 1992: 342).

There is an association between smoking and an increase in coughing (Palmer *et al*, 2003), this is thought to increase the intradiscal pressure of the intervertebral discs, thus straining the spine or provoking disc herniation (Boshuizen *et al*, 1992; Palmer *et al*, 2003). This would present with herniation or protrusion of the nucleus pulposus into or through the weaker posterior / posterolateral anulus fibrosis, resulting in a well recognised cause of LBP (Moore and Dalley, 1999: 452; Kirkaldy-Willis and Bernard, 1999: 138).

Herniations usually occur posteriorly / posterolaterally where the anulus fibrosus is relatively thin and poorly supported by the anterior or posterior longitudinal ligaments (Moore and Dalley, 1999: 452), in addition to which posterior / posterolateral herniations are more likely to be symptomatic due to the proximity of the spinal nerve roots. Localised back pain results from pressure on the longitudinal ligaments and periphery of the annulus fibrosus, and from local inflammation resulting from chemical irritation from the ruptured nucleus pulposus. Chronic pain results from the spinal nerve roots being compressed by the herniated disc (Moore and Dalley, 1999: 452).



-

Herniated Disc

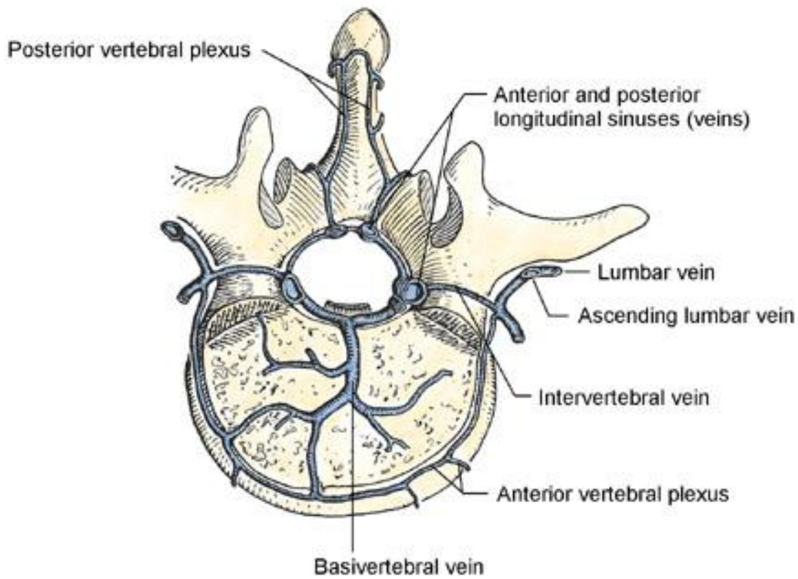
As available at

http://www.lieberson.com/en/neuro_medical_info/major_procedures/cervical_discectomy_files/image004.jpg. (2005)

Furthermore with approximately 95% of lumbar disc herniations occur at L4/L5 or L5/S1 levels (Moore and Dalley, 1999: 451), the degree of spinal pain caused by this association is predominantly skewed towards a higher incidence of LBP.

2.3.2 Vascular compromise and its relation to LBP

The blood supply of a typical lumbar vertebra arises from the segmental lumbar arteries. The lumbar arteries supply branches to the vertebral body and dorsal branches to the spinous process and back muscles. The spinal branches enter the vertebral canal through the intervertebral foramina to supply the bones, periostium and ligaments that form the internal aspects of the walls of the vertebral canal (Moore and Dalley, 1999: 466).



Lumbar Spine Blood supply

As available at http://hippocrates.ouhsc.edu/showcase/Gross/Lab3/Fig2-6.jpg. (2005)

The intervertebral disc is avascular and receives its nourishment by diffusion from blood vessels at the periphery of the annulus fibrosis and adjacent surfaces of the vertebral bodies (Moore, 1992: 342).

Smoking has been associated with a reduced vertebral body blood flow which can promote intervertebral disc degeneration (Boshuizen *et al*, 1992; Palmer *et al*, 2003), due to the reduced vertebral blood flow, which reduces the amount of nourishment received by the intervertebral disc. This may lead to pathological changes within the intervertebral disc such as disc degeneration (Palmer *et al*, 2003), which results in a decrease of disc height and an increase the compressive forces on the posterior facet joints (Gatterman, 1990: 160).This can lead to segmental dysfunction and secondary changes in the posterior facet joint (Kirkaldy-Willis and Bernard, 1999: 138) related to instability (usually in the L4 – L5 level), degenerative spondylolisthesis and / or spinal stenosis which have all been implicated in LBP (Kirkaldy-Willis and Bernard, 1999: 133).

2.3.3 Bone mineral content, smoking and LBP

The lumbar spine consists of 5 vertebrae which make up 25% of the total length of the vertebral column. The lumbar vertebrae are distinguished by their massive bodies, sturdy laminae, and absence of costal facets, with respect to the other spinal vertebrae. In addition the bodies of the lumbar vertebrae are short and cylindrical, with a kidney shaped cross section. These vertebrae increase in size from L1 to L5, with L5 being the largest of all moveable vertebrae. Their transverse processes project somewhat posterosuperiorly as well as laterally. The articular processes facilitate flexion, extension and lateral bending of the vertebral column (Moore and Dalley, 1999: 441).

Tobacco-related bone loss is linked to smoking duration and quantity. The mechanism is thought to be through a combination of decreased body weight, decreased calcium absorption, decreased estradiol levels, and a direct toxic effect on bone metabolism (Campion and Maricic, 2003). Thus there has been a link in all societies where tobacco use and excessive alcohol consumption are both independently associated with an increased incidence of osteoporotic fractures (Campion and Maricic, 2003).

Pathological changes of decreased bone density include thinning of the bone cortices and trabeculae of the vertebral body (Gatterman, 1990: 201), where on a microscopic level, the transverse trabeculae are absent, and the longitudinal trabeculae are depleted in number and size (Gatterman, 1990: 201).
Thus there is a correlation between smoking and diminished mineral content of bone, thereby increasing the risk of microfractures of the vertebrae or pathological changes within the intervertebral disc (Boshuizen *et al*, 1992; Palmer *et al*, 2003). Microfractures can manifest clinically as ill defined back pain, with sudden sharp pain as the fragile bone fractures. This may be produced with minimal trauma and is often accompanied by painful muscle spasm (in the acute phase) (Gatterman, 1990: 201). Central or lateral canal stenosis may result from a fracture of the vertebral body (Kirkaldy-Willis and Bernard, 1999: 82) resulting in further causes of low back pain.

2.3.4 Smoking, depression and LBP

Smoking may be associated with anxiety or depression, which exacerbate back pain (Boshuizen *et al*, 1992). The association between psychological factors and LBP will be discussed later in this chapter in section 2.6.

Emergency medical personnel have a number of risk factors for smoking, such as high occupational stress, anxiety, and physically demanding work conditions (Palmer *et al*, 2003). They are therefore more likely to smoke, which would increase their risk of LBP.

2.4 Biomechanical Factors Relating to LBP

Biomechanical factors have been hypothesized to cause LBP through two mechanisms:

- excessive load and
- repetitive loading on the spinal structures.

Excessive loads can result from heavy lifting, awkward postures, and high trunk velocities (Davis and Heaney, 2000). In this respect Volinn (1997) states that heavy or repetitive lifting and LBP are at least to some extent related to each other. In addition Marras *et al* (1993) (as cited by Yeung *et al*, 2002) found that a combination of five workplace and trunk motion factors, viz.:

- lifting frequency,
- load amount,
- trunk lateral velocity,
- trunk twisting velocity, and
- trunk sagittal angle

were significantly associated with the risk of low back disorders.

As a result work-related cases of LBP based on the above workplace and trunk factors are believed to result from the following mechanisms (Keyserling, 2000):

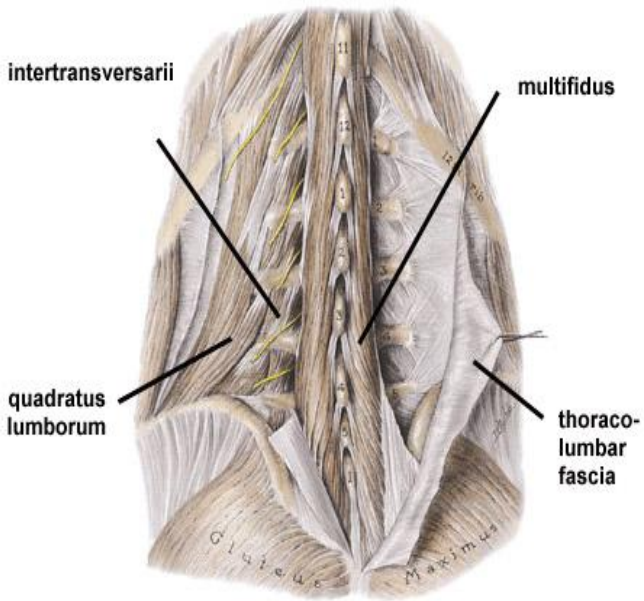
(1) Muscle or ligamentous injury,
(2) Herniation of the intervertebral disc with irritation of adjacent nerve roots, and
(3) Degenerative changes in the intervertebral discs.

In order to systematically assess the effects of the above biomechanical factors, it is imperative to understand that each lumbar spinal motion segment[1] is composed of three joints; two synovial posterior facet joints and an intervertebral disc.

The articular processes arise at the junction of the pedicles and laminae, where each process has an articular facet. The articulation between the superior and inferior facets at the facet joints helps to prevent anterior movement of the superior vertebra on the inferior vertebra. This joint allows some flexion and extension as well as varying degrees of lateral flexion and rotation (Moore, 1992: 331). Facet syndrome as pertains to posterior joint dysfunction is characterised by an overriding of the facets of adjacent vertebrae. Excessive facet loads can stretch the joint capsule and can cause pain. Overriding of the facets may also produce narrowing of the intervertebral foramina (Gatterman, 1990: 161).

The fourth component of the spinal motion segment is the paraspinal musculature. These muscles have direct and indirect influence on the function of the spinal motion segment (Kirkaldy-Willis and Bernard, 1999: 250).

[1] Two adjacent vertebral bodies and the disc space between them, the two posterior joints and the ligamentous structures binding the two vertebrae to one another (Gatterman, 1990: 416)



Muscles of the Lumbar Spine

As available at http://www.thebackpage.net/ anatomy.htm. (2005)

The mechanisms for the development of symptoms for acute, subacute or chronic back pain are discussed in the following table:

Anatomical part of the spine	***Cause of the deviation from the normal***	***Resultant change in the normal anatomy***	***Causes for the development of LBP***
Disc	Rotation / twisting and flexion movements with compression	Annulus tearing	Inflammation, Long term disc protrusion or herniations
Facets	Rotation / twisting and extension movements	Capsular tears leading to posterior joint capsule synovitis and impaction of the facet joints limiting normal movement	Inflammation, Joint movement restriction (subluxation). Degeneration or fibrosis may follow at a later stage
Muscles	Overuse, fatigue, inability to splint	Muscle spasm due to joint changes, restricted movement	Ischemia, metabolite build up, aggravation of pain and sustained hypertonic contraction.

(Kirkaldy-Willis and Bernard, 1999: 250; Gatterman, 1990: 137)

The principle muscles of the lumbar spine consist of the following:

- *Erector Spinae (Sacrospinalis):* The sacrospinalis muscle arises from the posterior aspects of the iliac crest, sacrum, sacral and inferior lumbar spinous processes, and supraspinatus ligament. It then splits to form 3 columns in the upper lumbar region; laterally it becomes the iliocostalis, intermediately the longissimus, and medially the spinalis. The erector spinae are extensors of the spinal column. The iliocostalis and longissimus muscles also assist lateral flexion of the trunk. These muscles are innervated by the dorsal rami of the spinal nerves (Moore, 1992: 357).

- *Transversospinal muscles:* This group of muscles consists of the multifidus and rotatores in the lumbar spine. These muscles originate from transverse processes of vertebrae and pass to spinous processes of more superior vertebrae. The interspinalis and intertransversarii muscles connect spinous and transverse processes respectively. These muscles are innervated by the dorsal rami of the spinal nerves (Moore and Dalley, 1999: 471).

- *Deep Lateral Muscles*: This pair of muscles is made up of the quadratus lumborum and psoas major muscles. The psoas major attaches inferiorly to the lesser trochanter of the femur and superiorly to the transverse processes of the lumbar vertebrae, vertebral bodies of L2 – L5, and intervening intervertebral discs. It is innervated by the ventral branches L2 – L4 nerves. The quadratus lumborum attaches inferiorly to the iliolumbar ligament and iliac crest, and superiorly to the lumbar transverse processes and medial half of the inferior border of the 12th rib. It is innervated by the ventral branches of T12 and L1 – L4 nerves (Moore and Dalley, 1999: 300).

The principle muscles producing movement of the lumbar intervertebral joints are the following: (Moore and Dalley, 1999: 473).

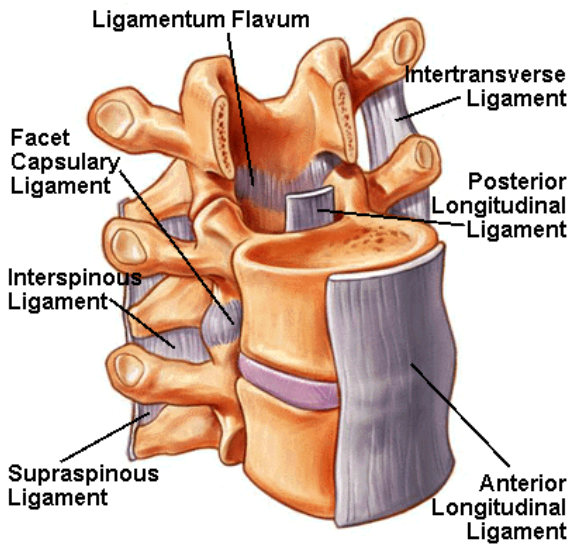
Flexion	**Extension**	**Lateral bending**	**Rotation**
Bilateral action of: - Rectus abdominis - Psoas major	*Bilateral action of:* - Erector spinae - Multifidus	*Unilateral action of:* - Multifidus - internal and external Oliques - Quadratus lumborum	*Unilateral action of:* - Rotatores - Multifidus - External oblique acting with opposite Internal oblique

Movement of the lumbar spine is further restricted via the following lumbar ligaments:

- The anterior and posterior longitudinal ligaments, which interconnect the vertebral bodies anteriorly and posteriorly respectively (Moore and Dalley, 1999: 455).

- The ligamenta flava, interspinous ligaments, and supraspinous ligaments are responsible for maintaining the relationship of the posterior elements of successive lumbar vertebrae. The ligamenta flava bind the lamina if the adjoining vertebra together, forming part of the posterior wall of the vertebral canal, and is thickest in the lumbar region. Adjacent spinous processes are joined by weak interspinous and strong cord like supraspinatous ligaments. The intertransverse ligaments connect adjacent transverse processes and are thin and membranous in the lumbar region (Moore and Dalley, 1999: 457).

- Articular capsules are strengthened by accessory ligaments, which are either part of their fibrous capsules (intrinsic ligaments), or separated from them (extrinsic ligaments). The articular capsule and its accessory ligaments are important in maintaining the relationship between the articulating lumbar joints (Moore and Dalley, 1999: 23).



Ligaments of the Lumbar Spine

As available from http://www.spineuniverse.com/displayarticle.php/article107.html. (2005)

Electromyographic studies have shown that EMG activity in the erector spinae muscles increases with increased load in the hands and/or forward bent postures. Intradiscal pressure measurements have shown that hydrostatic pressure in the nucleus pulposus of the disc increases with increased load in the hands and/ or forward bent postures (Keyserling, 2000). To counteract the movements created by loads in the hand and body weight the extensor muscles of the lower back must exert high forces, creating a compression load on the lumbar spine. Thus based on biomechanical analysis, the critical task factors associated with lifting are (Keyserling, 2000):

(1) the amount of weight lifted,

(2) the location of the load (horizontal distance from the lower back), and

(3) body posture.

Thus spasm of the muscles themselves is thought to be a primary or secondary source of back pain (White and Panjabi, 1990: 389). Any of the musculotendinous or ligamentous structures of the spine may suffer sprain, strain, or rupture, which may result in pain and inflammation and may be a stimulus for paraspinal muscle spasm, a cause of considerable spinal pain (White and Panjabi, 1990: 389). Furthermore there is neurophysiological evidence that stresses in the lumbar vertebrae cause reflex muscle activity in paraspinal muscles. This increases mechanical stresses on lumbar spine joints and muscles, which may lead to the activation of sensitised nociceptors (Kirkaldy-Willis and Bernard, 1999: 55). The most common diagnosis given for sudden low back pain is lumbar strain. Lumbar strain involves stretching or tearing of the spinal muscles and their attachments, which results from muscle contraction associated with uncontrolled movement, direct trauma, or overuse following repetitive tasks (Gatterman, 1990: 157).

Due to heavy repetitive lifting and carrying of patients and equipment, many times in awkward positions, emergency medical personnel would have a large amount of strain on their lumbar spine which may result in an increased incidence of lumbar strain. This would increase their risk of LBP, but the amount of time spent in the field as well as the type of equipment used should influence the incidence of LBP. Direct trauma from motor vehicle accidents or slips and falls may also contribute to an increased incidence of low back pain. One of the aims of this study was to investigate this effect.

2.5 Whole Body Vibration and LBP

The sacro-iliac joint is a synovial joint between the sacrum and the ilia of the pelvis. The articular cartilage on the sacrum (hyaline cartilage) is more than twice as thick as that of the ilium (fibrocartilage) (Kirkaldy-Willis and Bernard, 1999: 84) and ligamentous support of the joints consists of the thicker and stronger posterior sacro-iliac ligament supporting the posterior joint, and the less dense anterior capsules supporting the front of the joints. The interosseous sacro-iliac ligaments are massive and form the chief bond between the sacrum and the ilia. They fill the irregular grooves above and behind the joint and are covered by the posterior sacro-iliac ligament. The sacro-iliac joint is ‘C’ shaped, with a convexity that faces anteriorly and inferiorly (Gatterman, 1990: 112).

Motion of the sacro-iliac articulations is considered 3º – 5º and is affected by factors such as age, sex, and configuration of the joint. Motion occurs primarily in the oblique sagittal plane with the axis of rotation centered around the iliac tubercle, located posterior to the sacro-iliac joint (Gatterman, 1990: 113). The sacro-iliac joint allows for a small degree of movement until middle age. Thereafter movement is reduced by articular cartilage degeneration by fibrosis and bony ankylosis. This occurs more rapidly in males than in females (Gatterman, 1990: 113).

It is possible that minor dysfunction of this joint and sustained contraction of muscle overlying the joint could lead to pain and the development of sacro-iliac syndrome (Kirkaldy-Willis and Bernard, 1999: 125). In this respect pain accompanying sacro-iliac syndrome is typically unilateral, dull in character, and located over the buttocks. It may radiate posteriorly down the thigh or to the groin and anterior thigh. It may occasionally extend down the lateral or posterior calf to ankle, foot, and toes (Gatterman, 1990: 115). There are rarely associated neurological symptoms (Kirkaldy-Willis and Bernard, 1999: 127).

These symptoms are aggravated by bending, sitting, and driving in motor vehicles (Kirkaldy-Willis and Bernard, 1999: 127). In support of this there is a growing body of evidence that regular vibration and jolting contributes to an excess of LBP in drivers of cars, vans, buses, tractors, and fork lift trucks, crane operators, and helicopter pilots (Palmer *et al*, 2003). Additional contributing factors include poor posture and exposure to vibration and mechanical shocks (Mansfield and Marshall, 2001). In most studies examining the trend in back pain, sciatica and herniated discs with years of employment or years of vibration exposure, the risk and / or prevalence increased with duration (Teschke *et al*. 1999), have been noted.

Wilder and Pope (1996), as stated by Teschke *el al* (1999), investigated the biological plausibility of a relationship between whole body vibration exposure and back disorders. They conducted an extensive review of over one hundred such studies. Their review describes the following:

- Bending and rotating postures increase vibration transmission.
- Sitting postures, which rotate the pelvis backwards and flatten the lumbar spine, may amplify vibration transmission to the spine, and increase movement of the sacroiliac joint.
- Muscles are fatigued by vibration exposure, and oxygen consumption increases.
- Movement of the intervertebral discs causes stress on the annular fibers.
- Vibration increases pressure within the intervertebral discs.
- Vibration causes mechanical forces which reduce the “fatigue life” of a material (biological or man-made).
- Herniated discs were produced in cadavers subject to vibration.

Therefore it would seem that Teschke *el al* (1999) found conclusive data to support a causal link between back disorders and both driving occupations and whole body vibration. Thus numerous back disorders are implicated including lumbago, sciatica, generalized back pain, and intervertebral disc herniation and degeneration, with elevated risks consistently observed after five years of exposure.

In congruence with this Cassidy *et al* (2003) found a high incidence and prolonged recovery for individuals with low back pain caused by traffic collisions. In this study 84% of those who had had one or more motor vehicle accidents reported low back pain. This number is higher when compared to the study done by Cassidy *et al* (2003), with at least 50% of all motor vehicle accident claimants reporting low back pain, but this did not include those who did not seek health care or file an injury claim.

In respect of emergency medical personnel that spend long hours in response vehicles, ambulances or helicopters there may be an increased risk of LBP due to whole body vibration. This may contribute to muscle fatigue which may exacerbate low back pain, especially when combined with lifting and carrying of patients and equipment. Increased risk for sacroiliac pain or pain from disc degeneration or herniation may also be present, once again being exacerbated by lifting and carrying. The number of motor vehicle accidents will also increase the risk of LBP due to mechanical injury.

2.6 Psychological Factors Relating to LBP

Various studies indicate an association between psychological factors and the occurrence of low back pain. These factors include anxiety, depression, stressful responsibility, job dissatisfaction and mental stress at work (Andersson, 1999). Psychosocial work factors may directly influence work related musculoskeletal disorders through two mediating routes, namely neuromuscular tension and local sensitivity to pain (Devereux *et al*, 1999).

Neuromuscular tension has been correlated with psychosocial risk factors at work and the development of work related musculoskeletal disorders. Three mechanisms have been proposed for this possible correlation (Devereux *et al*, 1999):

> ***Firstly,*** psychosocial factors act through increased neuromuscular tension. These factors may include anxiety, depression, stressful responsibility, job dissatisfaction, and mental stress at work (Andersson, 1999). In this respect Davis and Heaney (2000) found that psychosocial factors may influence the relationship between biomechanical factors and LBP, such that the biomechanical demands have a greater effect on LBP under poor psychosocial work conditions. Thus individuals who have a poor psychosocial work environment may be more likely to report LBP or call in sick, even when LBP is not severe, in order to avoid stressors at work.

It was also found that an important psychosocial stress for LBP was having responsibility for the well-being of others (Davis and Heaney, 2000), as is well identified in the profession of emergency medicine.

In addition to this many people (including emergency personnel) who witness traumatic events experience posttraumatic stress disorder (Merck Manual, 2004: 556). This puts emergency medical personnel who witness repeated traumatic events into a high risk category for posttraumatic stress. Symptoms range from panic attacks to flashbacks, nightmares, insomnia, lethargy and other symptoms of depression (Merck Manual, 2004: 556). One of the aims of this study is to investigate the correlation between depression in emergency medical personnel and the incidence of low back pain.

Secondly, psychosocial factors may act through an interaction with neuromuscular tension brought about by physical work demands (Devereux *et al*, 1999). This correlates with the results of the study done by Kerr *et al* (2001), where it was shown that there are significant strengths of association for work-related psychosocial and biomechanical variables, suggesting that workplace efforts directed toward the primary prevention of LBP will be most effective if they focus on both of these aspects of work with the primary focus on the biomechanics of LBP.

Thirdly, psychosocial factors may act through an alternative mechanism independent of neuromuscular activity, where the strain from psychosocial exposure may indirectly modify the biological effect of the biomechanical load upon the development of work related musculoskeletal disorders. For example, people experiencing high exposure to physical and psychosocial risk factors at work may have increased sensitization to discomfort and distress (Devereux *et al*, 1999).

Local sensitivity to pain was found by Nahit *et al* (2003), where psychosocial factors were associated with symptoms throughout the body and concluded that there was a general musculoskeletal sensitivity to mental stress. Distress and depression were also found to predict musculoskeletal morbidity at various anatomical locations, including the neck and shoulders, the low back, arms and legs.

Emergency medical personnel have a high level of responsibility for their patients in stressful environments. They are witnesses to many traumatic events in the course of their occupation and have a high occupational stress. This according to the literature would put them in a high risk group for the development of psychological disorders such as depression and anxiety. One of the aims of this study was therefore to investigate the affect of occupation stress relating to depression and incidence of low back pain.

2.7 The impact of low back pain on the industry

Emergency medical personnel have a high level of responsibility toward their patients. Low back pain may limit their performance thus impacting on their patient care, decrease their ability to carry out their duties, and affect their attitude towards colleagues and patients. LBP also has an economic impact on the emergency services industry as employees with LBP are assigned to light duty or may be absent from work (de Montille, 2004). Thus this study would aid in identifying high-risk potential risk factors and what measures can be taken to combat these factors; therefore leading to potential recommendations that could be used to implement an educational program in the course structure.

2.8 Conclusion

From the above literature it can be shown that emergency medical personnel have a high occupational risk for developing LBP. This may be due to whole body vibration, psychological factors or mechanical factors such as lifting and carrying of patients and equipment. It could therefore be hypothesised that they are a high risk group for mechanical LBP and as such research would help in identifying occupational factors that are high-risk for mechanical LBP as well as quantifying the extent of the problem in order that appropriate resolutions are found to deal with the problems identified.

Chapter Three

Materials and Methods

3.1 Introduction

This chapter deals with the collection of data and the research methodology utilized. The statistical analysis process is also discussed.

3.2 Study Design

This study was a survey, which was quantitative in nature and made use of a structured questionnaire to collect data.

3.3 Allocation of Participants

3.3.1 Sampling

Stratified sampling was used in this study. The sampling was done in such a way that there was proper representation of the population of emergency medical personnel in the Durban Metropolitan area. Stratification was done according to gender (the male / female ratio as indicated by de Montille (2004) indicated an approximate ratio of 80% male and 20% female), as well as qualifications for which the emergency personnel was registered with the Health Professionals Council of South Africa (HPCSA).

This included one or more of the following qualifications:

- Basic Ambulance Assistant (BAA),
- Ambulance Emergency Care Assistant (ANA), or
- Ambulance Emergency Care Technology (ANT).

Qualification	BAA	ANA	ANT	Total
Maximum	524	333	111	968
Male	419	266	89	774
Female	105	67	22	194
Minimum	52	33	11	96
Male	42	26	9	77
Female	10	7	2	19

The data was collected by questionnaire self selection, as on data capture any information omitted on a questionnaire rendered the questionnaire invalid, thus ensuring only fully completed questionnaires were used.

3.3.2 Sample size

According to the HPCSA there were 968 registered BAA's, ANA's, and ANT's in the Durban Metropolitan area at the time of this study (Appendix G). This total consisted of 524 BAA's, 333 ANA's and 111 ANT's (Daffue, 2005). A sample size of 131 participants (14%) was used by the researcher in order for the sample to be representative of the total population. This sample was taken from the following companies: STAR, Netcare 911 and ER24. A sample was taken of the 2nd and 3rd year students studying one of the above qualifications at the Department of Emergency Medical Care and Rescue at the Durban Institute of Technology for comparison. The larger the sample size, the less likely inaccurate results will be obtained (Mouton, 2002).

3.3.3 Study Limitations

The effects of the home situation and other routine activity outside the work place may have impacted equally as factors in the development of low back pain. This study was however limited in that it focused predominantly on the influence of the working environment.

This study was also limited to private Emergency Medical Care and Rescue companies where there is greater financial reward, and facilities at these bases are better. This may decrease the number of occupational stressors experienced by the personnel involved in this study. This may affect the outcomes of this study when looking at the profession as a whole.

3.4 Criteria for Participation in the Study

Prior to commencing the research the researcher approached companies that employed emergency medical personnel to gain permission to conduct the research. The researcher also gained permission to attend the monthly meetings of emergency medical personal to recruit prospective participants into the study.

Permission was granted by:

- The Department of Emergency Medical Care and Rescue at the Durban Institute of Technology gave permission for the researcher to approach 2nd and 3rd year students to complete the questionnaire (Appendix H).
- Permission was granted by STAR to recruit at these monthly meetings and conduct research at their base at Virginia Airport (Appendix I).
- Permission was also given to approach Netcare 911 and ER24 employees (Appendix J and Appendix K).

It was agreed that for the period of the research prospective participants were to be approached at periods of the shift change so as not to interfere with their normal schedules and duties. Students would be approached at a time specified by the Department of Emergency Medical Care and Rescue at the Durban Institute of Technology.

3.4.1 <u>Inclusion Criteria</u>

In order to be accepted for participation in the study, emergency medical personnel had to comply with the following criteria:

- Participants had to be qualified emergency medical personnel (BAA, ANA, or ANT)
- Participants had to be registered with the Health Professionals Council of South Africa.
- Participants could include 2nd or 3rd year students studying at the Department of Emergency Medical Care and Rescue at the Durban Institute of Technology.
- All participants had to be working in the emergency medical field at the time of the study.
- All the critical questions of the questionnaire had to be completed for those questionnaires to be used in this study.
- All participants had to sign the correct informed consent form after completion of the questionnaire in order for their questionnaires to be included in the study.

3.4.2 <u>Exclusion Criteria</u>

Participants were excluded if they had any of the following:

- Did not comply with the above inclusion criteria.
- Incomplete questionnaires.

3.5 <u>Development of the Questionnaire</u>

The foundation of the questionnaire was based on previous work experience in the emergency medical field by the researcher. The researcher looked at possible risk factors of low back pain in the emergency medical field and related those risk factors to previous valid and reliable research on causes and risk factors of low back pain (Davis and Heaney 2000, Volinn 1997 and Andersson 1999). The questionnaire was then designed using this information to develop a tool to investigate the causes of low back pain in emergency medical personnel as well as quantifying the extent of the problem.

The questionnaire initially looked at the participants demographics including qualification, ethnic group, gender and age; smoking history and exercise history; number of years working in the emergency medical field; type of equipment used; the average number of kilometers traveled per month and the number of occupational motor vehicle accidents; occupational stress; current and previous low back pain history including duration, frequency, intensity, absenteeism, light duty, and perceived cause of low back pain. It was then developed further by a focus group.

Validity refers to the accuracy and trustworthiness of instruments, data, and findings in research, thereby ensuring that future research utilizing the particular tool is accurate (Bernard, 2000: 46). The components of validity are face validity, content validity, construct validity and criterion validity, where:

1) *Face validity* is determined by an agreement between researcher and those with a vested interest in the questionnaire, that on “the face of it” the tool seems valid (Bernard, 2000: 49).

2) An instrument has *content validity* when the content of the questionnaire is considered effective and appropriate enough to be able to asses a particular concept (Bernard, 2000: 49).

3) *Construct validity* measures the degree of closeness between the construct being measured and the actual observation made with the instrument. How accurately it answers questions in a scale that reflect theoretical predictions of a particular construct (Bernard, 2000: 50).

4) *Criterion or concurrent validity* is measured when a particular tool produces similar results when compared to another tool already known to be trustworthy (Bernard, 2000:51). Predictive validity falls under this category as well. If a tool can predict a future situation accurately it has predictive validity (Mouton, 1996:128).

Construct and content validity were insured in this questionnaire by the focus group in that the meaning and concepts were apparent and related to emergency medical personnel in a South African context.

A ‘focus group’ is a qualitative research technique that collects data and insights through group interaction based on topics supplied by the researcher, who takes the role of moderator (Greenbaum, 2000: 3).

Literature suggests that a focus group should consist of 6 to 10 participants (Greenbaum, 2000: 4). The focus group for this study consisted of 9 participants, including 5 emergency medical personnel, 3 chiropractors and the researcher. This group gathered and discussed the questionnaire and the factors that it covered, ruling out any :

- Ambiguity.
- Inconsistencies with practice.
- Questions that where deemed to be in excess or were omitted.
- Questions / areas not covered were further developed.

Before commencing the focus group, the participants read the letter of information (Appendix L) and signed the letter of informed consent (Appendix M). A confidentiality statement was signed by all participants (Appendix N), in order to ensure that especially the emergency medical personnel did not communicate their experiences to colleagues that would later have potentially participated in this study.

The questions were discussed in sequential order. If inconsistencies were found or changes proposed, a unanimous vote was required to institute a change. The questionnaire was discussed in terms of it accurately reflecting concepts relating to emergency medical personnel. The focus group included some relevant questions, such as equipment used, while some irrelevant questions were omitted.

Suggestions for change were analyzed and discussed before being implemented. After achieving the outcomes of the focus group in terms of content and construct validity, face validity for this questionnaire was achieved through the use of a pilot procedure, where the focus group finalized questionnaire was piloted on 5 sample subjects in order to determine readability, remaining ambiguity and errors or grammar / language or questionnaire construction and comprehensibility. The 5 sample subjects were all qualified emergency medical personnel working in the field at the time of the study. None of these subjects participated in the study.

3.6 Data Collection and Analysis

The data was collected in the Durban Metropolitan area by the researcher by means of a questionnaire (Appendix A), which was developed from the literature, refined for content and construct validity through a focus group and then piloted for face validity prior to being used in this study. In order to obtain an accurate recording of the data that the questionnaire sourced, the purpose of this study was not initially explained fully to prospective participants until after the research questionnaire had been completed. This was followed in order to not influence the participants into only responding if they had low back pain as this would have resulted slight bias due to over-reporting of LBP since this condition is very hard to characterize, but this was minimized by defining LBP and withholding the true nature of the study until after the questionnaires had been completed. The participants where then approached and were asked whether their responses could be utilized, at which time the participant signed the informed consent, or the completed questionnaire was destroyed in the presence of the participant that did not wish to have their information utilized in this study. Thus the sample group that self selected would have been representative of emergency medical personnel ensuring that the results of this study had increased validity and reliability with respect to obtaining the required information in respect of low back pain.

The questionnaire initially had an incomplete letter of information attached (Appendix B) and an informed consent form (Appendix C) which gave the purpose of the study as a general risk factor analysis of occupational injuries. At the completion of the questionnaire by the participants, the researcher produced the complete letter of information (Appendix D) and informed consent form (Appendix E), which requested the use of the results in the study portrayed in this research which was aimed at investigating the prevalence and risk factors for low back pain specifically.

Participants filled out the face-validated questionnaire (Appendix A) with respect to:

- Patient demographics including qualification, ethnic group, gender and age
- Smoking history and exercise history
- Number of years working in the emergency medical field
- Type of equipment used
- The average number of kilometers traveled per month and the number of occupational motor vehicle accidents
- Occupational stress
- Current and previous low back pain history including duration, frequency, intensity, absenteeism, light duty, and perceived cause of low back pain

The data collected from each questionnaire was then used for data capturing purposes.

Ethically anonymity was maintained in respect of the questionnaires, as no names were filled in on the questionnaire and no questionnaire was associated with the completed informed consent forms. Furthermore no participant names were revealed in the analysis or reporting of the results (including this dissertation).

A voucher which entitled the participant to one free initial consultation at the Chiropractic Day Clinic at the Durban Institute of Technology was also attached as a token of appreciation to the participants for completing the questionnaire and taking part in the study (Appendix F).

3.7 Statistical Methods

One way frequency tables (reporting percentages and counts) and bar charts were used to describe categorical responses from the questionnaire. Quantitative responses were described using means, standard deviations and ranges.

Prevalence and 95% confidence intervals, as well as incidence density and 95% confidence intervals were calculated using Epi Info version 6.5's Epitable module. Incidence was calculated from the reported number of episodes of LBP experienced over the past year. Number of episodes over the last year were totaled and divided by total person-months (100 * 12 = 1200).

Associations between categorical variables and LBP prevalence was achieved using chi square tests or Fisher's exact tests where appropriate. Student's t-tests were used with quantitative variables.

Chapter Four

Results

4.1. <u>Demographics</u>

Thirty-three out of a population of 41 ***students*** submitted valid responses (80%). Seventy-four percent (67/90) of the ***qualified*** emergency medical personnel at the bases covered participated in the study. There was a 1:3 ratio of students to qualified personnel in the study. Thus the overall response rate was 76.3% (100/131) of the private bases covered.

As according to the Health Professionals Council of South Africa (HPCSA) there were 968 registered BAA's, ANA's, and ANT's in the Durban Metropolitan area at the time of this study (Appendix E). This total consisted of 524 BAA's (54%), 333 ANA's (34%) and 111 ANT's (12%) (Daffue, 2005). Therefore there was a 10.3% actual response rate relative to the profession.

Of the 100 participants in the study, 33% were students, 22% were BAA qualified, 25% were ANA qualified and 20% were ANT qualified. This is a notable difference in the representation of the different qualifications within this study as compared to the total population. This is reflected mostly in the decreased number of BAA qualified personnel (-32% difference), with a decrease of ANA qualified personnel (-9% difference) and an increased number of ANT qualified personnel (+8% difference). The noted difference in the distribution of qualifications may be as a result of this study being conducted within the private sector, with more highly qualified personnel being attracted to this sector due to greater financial reward.

Figure 1 is a graphic representation of the above statistics.

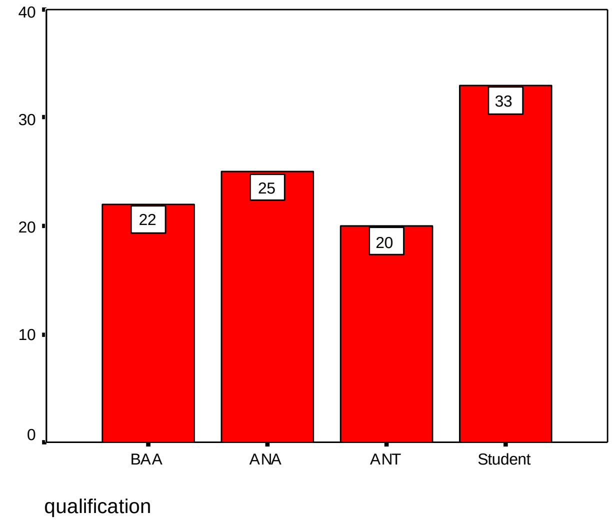


Figure 1: Percentage of participants by qualification (n=100)

According to the de Montille (2005) the ***male : female*** ratio of emergency medical personnel was 80% male and 20% female in 2005. This estimate was derived from experience in the emergency medical field as well as lecturing at the department of Emergency Medical Care and Rescue at the Durban Institute of Technology. In this study 75% of participants were male while 25% were female. The male to female ratio was therefore representative of the population as based on the best available anecdotal evidence.

The majority of the participants were White (49%), followed by Indian (26%), Blacks (13%), and Coloured (12%). The ***racial / ethnic distribution*** is shown in *Table 1*. The Department of Health states the following ethnic distribution for emergency medical personnel in the Kwazulu-Natal province: White (1.5%), Coloured (2.5%), Indians (33%), and Blacks (64%) (Maharaj, 2005). As can be seen there is a significant difference in the ethnic ratio found in this study. This could be explained by the fact that this study was conducted at private companies in an urban setting only. Due to the greater financial rewards and relative exclusive nature of these companies and the larger density of Whites in the urban environment, a larger percentage of Whites will be attracted to these private companies. The fact that it was an urban setting also rules out the rural communities where a larger percentage of the emergency medical personnel are Black (de Montille, 2005). This is one of the limitations of this study and an investigation into the risk factors for LBP should be undertaken on a provincial level.

	Frequency	Percent
Black	13	13.0
White	49	49.0
Indian	26	26.0
Coloured	12	12.0
Total	100	100.0

Table 1: Racial distribution of study participants (n=100)

Relative to ***age***, the majority (72%) were in the youngest age group (20-30 years). The age distribution is shown in *Figure 2*. This younger age trend is due to the fact that 33% of the participants were still students who tended to fall into the 20 – 30 age category. However, 39% of the qualified emergency medical personnel who partook in this study also fell into this category. This trend is seen throughout the emergency medical services as those working in the field tend to be younger due to the physical demands of the occupation. As these employees get older they tend to take posts in administrative settings which remove them from the field (de Montille, 2005).

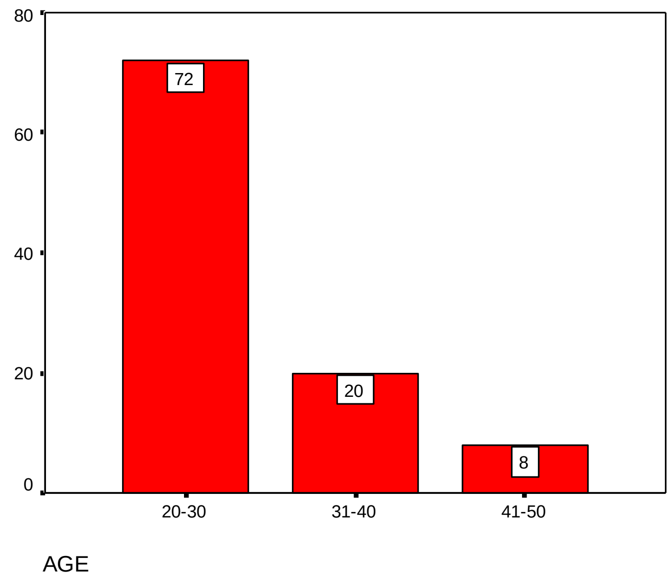


Figure 2: Percentage of participants by age group (n=100)

4.2 Descriptive statistics of exposure variables (potential risk factors)

4.2.1. Qualification:

Students vs. qualified personnel: There was a significantly higher prevalence of LBP in qualified participants (84%) compared to students (61%) (p =0.023- *Table 2).* This result supports the hypothesis that the prevalence of low back pain should be directly proportional to the number of years worked in the field.

Teschke *et al* (1999) found that the risk and / or prevalence of back pain, sciatica and disc herniation increased with years of exposure to whole body vibration; and other studies have shown that there is also a definite link between repetitive lifting and LBP (Volinn, 1997; Davis and Heaney, 2000; Yeung *et al*, 2002). In addition Andersson (1999), Devereux *et al* (1999) and Davis and Heaney (2000) have found an association between the occurrence of low back pain and psychological factors such as anxiety, depression, stressful responsibility, job dissatisfaction, and mental stress at work. These would affect those qualified personnel working in the industry more than the students, as an increased amount of time working in the field would increase the exposure to these potential risk factors and therefore increase the risk of developing low back pain.

			low back pain		Total
			yes	No	
STUDENT	yes	Count	20	13	33
		Row %	60.6%	39.4%	100.0%
	no	Count	56	11	67
		Row %	83.6%	16.4%	100.0%
Total		Count	76	24	100
		Row %	76.0%	24.0%	100.0%

Fisher's exact p value 0.023

Table 2: Association between qualification (student vs. qualified) and low back pain

Type of qualification: There was a non-significant association between type of qualification and LBP (p =0.084). The prevalence was highest in BAA qualified participants (*Table 3*).

			low back pain		Total
			yes	no	
qualification	BAA	Count	19	3	22
		Row %	86.4%	13.6%	100.0%
	ANA	Count	21	4	25
		Row %	84.0%	16.0%	100.0%
	ANT	Count	16	4	20
		Row %	80.0%	20.0%	100.0%
	Student	Count	20	13	33
		Row %	60.6%	39.4%	100.0%
Total		Count	76	24	100
		Row %	76.0%	24.0%	100.0%

Pearson's chi square 6.635, p = 0.084

Table 3: Association between qualification type and low back pain

Although the prevalence was highest in BAA qualified participants, there is little difference between the association of low back pain and the different qualifications (BAA 86.4%, ANA 84%, and ANT 80%). This similarity may be due to the fact that all qualifications face many of the same occupational risk factors and therefore have the same risk for developing low back pain.

The slightly higher prevalence of low back pain in BAA qualified personnel is difficult to explain, but may be due to the fact that they are the least qualified personnel and therefore receive less financial reward. This may increase occupational stress which is found to have a positive association with low back pain (Andersson, 1999). Another reason may be due to the fact that BAA qualified personnel are responsible for more manual tasks such as lifting, carrying and loading patients into an ambulance. This will increase the repetitive loading on the spinal structures which is a known risk factor for LBP (Davis and Heaney, 2000).

Demographic factors for LBP

Race: Race was significantly related to LBP prevalence ($p = 0.018$). The prevalence was lowest among Black participants (53.8%) and highest among Indian participants (92.3%). Whites had a prevalence of 69.4% while Coloureds showed a 91.7% prevalence (*Table 4*).

Docrat (1999) found a lifetime incidence of low back pain among Indians in South Africa being 78.2%, while Coloureds showed a lifetime prevalence of 76.6%, whereas Van der Meulen (1997) found the lifetime incidence for low back pain among Black South Africans to be 57.6%. This is a significant difference, especially since these figures are for lifetime prevalence compared to the annual prevalence investigated in this study.

			low back pain		Total
			yes	no	
RACE	black	Count	7	6	13
		Row %	53.8%	46.2%	100.0%
	white	Count	34	15	49
		Row %	69.4%	30.6%	100.0%
	Indian	Count	24	2	26
		Row %	92.3%	7.7%	100.0%
	coloured	Count	11	1	12
		Row %	91.7%	8.3%	100.0%
Total		Count	76	24	100
		Row %	76.0%	24.0%	100.0%

Pearson's chi square 10.078, p = 0.018

Table 4: Race and LBP

			EXERCISE		Total
			yes	no	
RACE	black	Count	13	0	13
		Row %	100.0%	.0%	100.0%
	white	Count	44	5	49
		Row %	89.8%	10.2%	100.0%
	indian	Count	20	6	26
		Row %	76.9%	23.1%	100.0%
	coloured	Count	5	7	12
		Row %	41.7%	58.3%	100.0%
Total		Count	82	18	100
		Row %	82.0%	18.0%	100.0%

Pearson's chi square 18.5, p <0.001

Table 5: Association between race and exercise (n=100)

Table 5 above shows that there was a highly significant association between race and exercise (p<0.001). All of the black participants exercised, while only 41.7% of the Coloureds exercised and 77% of the Indians exercised. This may significantly influence the prevalence of low back pain (Richardson *et al*, 2002; Aure *et al,* 2003; Petersen *et al*, 2002).

			SMOKE		Total
			Yes	no	
RACE	black	Count	0	13	13
		Row %	.0%	100.0%	100.0%
	white	Count	7	42	49
		Row %	14.3%	85.7%	100.0%
	indian	Count	9	17	26
		Row %	34.6%	65.4%	100.0%
	coloured	Count	7	5	12
		Row %	58.3%	41.7%	100.0%
Total		Count	23	77	100
		Row %	23.0%	77.0%	100.0%

Pearson's chi square 16.4, p =0.001

Table 6: Association between race and smoking (n=100)

Table 6 above shows that there was also a strong association between race and smoking (p=0.001). None of the Blacks smoked, while smoking prevalence was highest amongst Coloureds (58.3%), and followed by Indians (35%). A positive association has been found between smoking and back pain in many of the epidemiological surveys that have examined the link (Boshuizen *et al*, 1993; Palmer *et al*, 2003).

It could be that these two lifestyle behaviours of smoking and exercise are linked. *Table 7* below shows that smoking and exercise were very highly related (p<0.001) Those participants who exercised were likely to be non-smokers and vise versa. It had been shown (*tables 21 and 27*) that LBP is very strongly linked to smoking and lack of exercise (lifestyle). Thus the apparent association observed between race and LBP could be spurious and instead are due to the lifestyle choices observed in the different race groups.

			SMOKE		Total
			yes	no	
EXERCISE	yes	Count	11	71	82
		Row %	13.4%	86.6%	100.0%
	no	Count	12	6	18
		Row %	66.7%	33.3%	100.0%
Total		Count	23	77	100
		Row %	23.0%	77.0%	100.0%

Pearson's chi square 23.6, p <0.001

Table 7: Association between exercise and smoking (n=100)

Gender: There was no association between LBP and gender (p =0.597). The proportions of males and females with LBP were very similar (77% and 72%) (*Table 8*). The small sample size of this study may affect the results of the trend seen in the proportion of male and female incidence of low back pain. It may also be that these differences are minimal due to the fact that emergency medical personnel tend to exercise more than the general population just by virtue of their work. Males and females will also be exposed to the same occupational risk factors for LBP and will therefore have the same risk for developing LBP.

			low back pain		Total
			yes	no	
GENDER	male	Count	58	17	75
		Row %	77.3%	22.7%	100.0%
	female	Count	18	7	25
		Row %	72.0%	28.0%	100.0%
Total		Count	76	24	100
		Row %	76.0%	24.0%	100.0%

Fisher's exact p =0.597

Table 8: Gender and LBP

Papageorgiou *et al* (1995) found the 1 month prevalence of low back pain was 39% (35% in males and 42% in females). The proportion was consistently higher in women than in men at all ages over 30 years, but in the 18-29 year old category the prevalence was virtually identical (Papageorgiou *et al*, 1995). Walker *et al* (2004) found that woman experience a higher prevalence of low back pain at intervals of 24 hours, 2 weeks, 1 month, 6 and 12 months, but did not take age into consideration. Factors such as pregnancy and different sex hormones have been suggested for the higher incidence of low back pain amongst woman (Sydsjo *et al*, 2003).

Sydsjo *et al* (2003) found that there was no significant difference in absence related to LBP in men and nonpregnant woman for their total study population 16 – 44 years of age. However, the woman in the oldest age group (35 – 44 years) had higher absence related to LBP diagnosis than men in this age group. This may be explained by the woman's natural loss of bone mineral matter beginning before menopause which may cause pain through microfractures of the vertebrae or pathological changes within the intervertebral disc (Boshuizen *et al*, 1992; Palmer *et al*, 2003).

The fact that the proportion of males and females suffering from low back pain are very similar in this study may be explained by the fact that 72% of participants were in the 20-30 year age group. This means that woman in this age group will be unaffected by the hormonal effects of menopause such as loss of bone density (Sydsjo *et al*, 2003). Another reason for this trend may be due to the fact that only a small proportion of female participants would be affected by factors related to pregnancy.

Age: Age was not associated with LBP ($p = 0.572$) in this study. The prevalence was highest in the 31-40 year age group (85%) and lowest in the 20 – 30 year age group (73.6%). The 41 – 50 age group showing a 75% prevalence (*Table 9*).

			low back pain		Total
			yes	no	
AGE	20-30	Count	53	19	72
		Row %	73.6%	26.4%	100.0%
	31-40	Count	17	3	20
		Row %	85.0%	15.0%	100.0%
	41-50	Count	6	2	8
		Row %	75.0%	25.0%	100.0%
Total		Count	76	24	100
		Row %	76.0%	24.0%	100.0%

Fisher's exact p =0.572

Table 9: Age group and LBP

It cannot be inferred that an increase in age means an increase in years spent working in the emergency medical field as some people may enter the profession later in life, but a possible increased amount of time in the field will increase the exposure to potential risk factors for low back pain.

Walker *et al* (2004) found that the prevalence of low back pain increased with age until the fifth decade and then remained constant as supported by Papageorgiou *et al* (1995) who found that the prevalence of low back pain increased with age until the age of 45. The prevalence then decreased until the age of 60 where it increased once again. This trend is seen in this study with a slight decrease in prevalence in the 41-50 age group. There were, however, only 8 participants in this group which may influence the result due to the small sample.

Prevalence and Incidence of Low Back Pain among Emergency Medical Personnel

4.3.1. Current Low Back Pain

Prevalence of LBP: Cervical (57%), thoracic (44%) and low back pain (76%) were common among the participants (*Figure 3*). The annual prevalence of LBP was found to be 76% (95% confidence interval with a range of 66.23 % to 83.73%) in this study.

In this respect Walker (2000) conducted a literature review of 56 studies of low back pain prevalence between 1969 and 1998. He found that point prevalence ranged from 12% to 33%, one year prevalence ranged from 22% to 65%, and lifetime prevalence ranged from 11% to 84 %. Masset and Malchaire (1994) found a 53% prevalence in the last 12 months, where Andersson (1999) found the annual prevalence of low back pain ranged from 15% to 45%, with a point prevalence of 30%. This is not comparable with this study as can be seen from Figure 3.

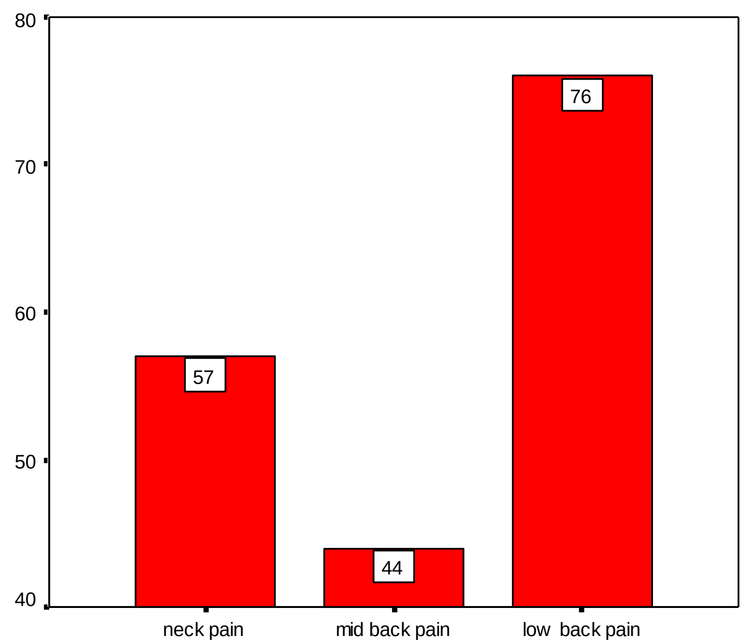


Figure 3: Current regional Pain Percentage of participants

This study found a 76% prevalence of low back pain in the emergency medical personnel sampled. This is considerably higher than the average ranges found in previous studies (Masset and Malchaire, 1994; Andersson, 1999; Walker, 2000). From this it could be inferred that emergency medical personnel fall into a high risk group for the development of low back pain. The occupational risk factors that emergency medical personnel face include physical risk factors such as lifting and carrying of patients and equipment, whole body vibration, and motor vehicle accidents (Volinn, 1997; Teschke *el al*, 1999; Cassidy *et al*, 2003; Keyserling, 2000; Palmer *et al*, 2003). Mental risk factors include occupational stress and a high level of patient responsibility (Davis and Heaney, 2000). These will be discussed later in section 4.5.5, where the results are analysed.

Duration of LBP: It was found that 66% of participants with current LBP reported that the duration of their episodes of LBP lasted 1-6 days. Fewer (15%) reported episodes lasting 7-13 days. Nine participants (12%) had 28+ day long episodes. This is shown in *Table 10.* This is not comparable to any known data.

	Frequency	Percent
1-6 days	50	65.8
7-13 days	11	14.5
14-20 days	1	1.3
28+ days	9	11.8
N/A	5	6.6
Total	76	100.0

Table 10: Duration of episodes of LBP

Intensity of LBP: Most participants reported that their pain was mild (41%). Since LBP occurs in episodes, 15% reported no pain at the moment. *Table 11* shows the intensity of the pain in participants with LBP. This is not comparable to any known data.

Hadler (1997) states that most workers are able to cope successfully with their regional backache due to the fact that the majority of participants reported their pain as mild in nature, it can be inferred that their LBP did not limit their functional ability, even though they had discomfort. This may affect the rates of absenteeism amongst emergency medical personnel. This will be discussed later in section 4.3.3.

	Frequency	Percent
none at the moment	11	14.5
Mild	31	40.8
Moderate	16	21.1
Severe	12	15.8
worst imaginable	1	1.3
N/A	5	6.6
Total	76	100.0

Table 11: Intensity of episodes of LBP

Frequency of LBP: When asked about pain frequency 66% of participants with LBP responded that their pain was infrequent, 15% frequent and 13% were in constant pain (*Table 12*). This is not comparable to any known data.

	Frequency	Percent
Infrequent	50	65.8
Frequent	11	14.5
Constant	10	13.2
N/A	5	6.6
Total	76	100.0

Table 12: Frequency of episodes of LBP

Subjective occupational causes for current LBP: With respect to the possible causes 86% of participants with LBP thought that their current low back pain was caused by their occupation (*Table 13*). This is significant as it lends credibility to the hypothesis that emergency medical personnel have a higher risk for the development of low back pain due to their occupation than the general population.

	Frequency	Percent
yes	65	85.5
no	6	7.9
N/A	5	6.6
Total	76	100.0

Table 13: Responses of participants on whether their LBP was caused by their occupation

Lifting patients (75%) was the most frequently reported cause of LBP in participants suffering from LBP. This was followed by lifting equipment (68%) and carrying stretchers (61%). Causes and their frequencies are shown in *Figure 4*.

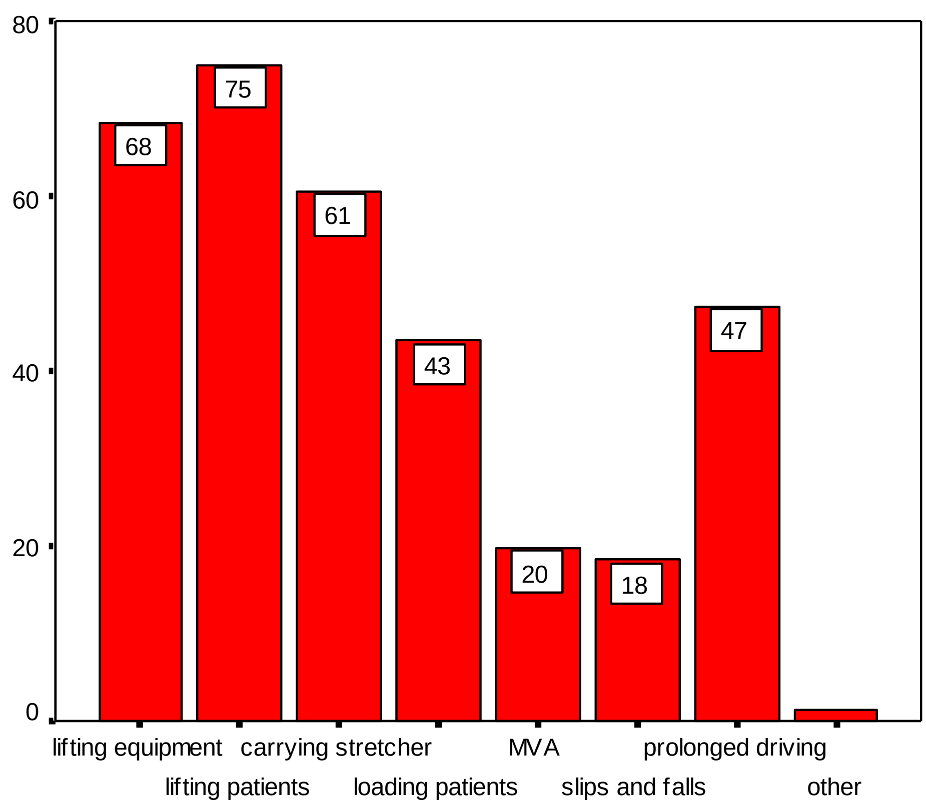


Figure 4: Occupational causes of LBP in participants with LBP (n=76)

In this respect biomechanical factors have been hypothesized to cause LBP through two mechanisms, namely excessive load and repetitive loading on the spinal structures. Excessive loads can result from heavy lifting, awkward postures, and high trunk velocities (Davis and Heaney, 2000), which is supported by Volinn (1997) who states that heavy or repetitive lifting and LBP are at least to some extent related to each other. In this respect Marras *et al* (1993) (as cited by Yeung *et al*, 2002) found that a combination of five workplace and trunk motion factors: lifting frequency, load amount, trunk lateral velocity, trunk twisting velocity, and trunk sagittal angle were significantly associated with the risk of low back disorders.

In addition electromyographic studies have shown that EMG activity in the erector spinae muscles increases with increased load in the hands and/or forward bent postures. Intradiscal pressure measurements have shown that hydrostatic pressure in the nucleus pulposus of the disc increases with increased load in the hands and/ or forward bent postures (Keyserling, 2000). To counteract the moments created by loads in the hand and body weight, the extensor muscles of the lower back must exert high forces, creating a compression load on the lumbar spine. Therefore based on biomechanical analysis, the critical task factors associated with lifting are (Keyserling, 2000):

(1) the amount of weight lifted,
(2) the location of the load (horizontal distance from the lower back), and
(3) body posture.

Due to repetitive lifting of patients and equipment and carrying stretchers, many times in awkward positions, emergency medical personnel would have a large amount of strain on their lumbar spine. This may result in increased lumbar strain which has shown to be a significant risk factor for the development of low back pain (Marras *et al*,1993; Volinn, 1997; Keyserling, 2000; Davis and Heaney, 2000).

To compound the situation, prolonged periods of driving also featured prominently in the subjective causes for LBP, with 47% believing it to be a contributing factor. This is associated with whole body vibration and will be discussed in detail later in section 4.5.3.

4.3.2 Previous history of LBP among Emergency Medical Personnel

***Incidence of LBP**:* All participants were asked how many episodes of LBP they had experienced over the past year. There were a total of 255 episodes of LBP reported over 1200 person-months. Thus the incidence rate was 21.25% (95% CI 18.97 – 23.67), or 2.55 episodes per person per year.

In contrast to this Andersson (1999) found an annual incidence of 10% to 15% in the adult population, where George (2002) found that the cumulative 6 month incidence of low back pain to be 8% and Biering-Sorenson (2000) (as cited by George, 2002) reported an annual incidence of 11% among 30 year old individuals in the general population. Therefore the 21.25% annual incidence found in this study is higher than is found in literature for the general population (Andersson, 1999; George, 2002). From this it can be inferred that emergency medical personnel have an increased occupational risk for the development of low back pain than the general population.

Duration of LBP: Most participants who reported a previous history of LBP had an average duration of between 1 - 6 days (69%). This was followed by 12% of participants who stated their duration as 7 – 13 days. Nine participants (12%) of stated their duration as 28 days or longer (*Table 14*). This is not comparable to any known data.

	Frequency	Percent
1-6 days	52	69.3
7-13 days	9	12.0
14-20 days	4	5.3
21-27 days	1	1.3
28+ days	9	12.0
Total	75	100.0

Table 14: Duration of previous LBP in subjects who reported a previous history (n=75)

Intensity of LBP: In this study 37.3% of participants rated their pain as mild, 41.3% as moderate, 18.7% as severe and 2.7% rated their pain as worst imaginable (see *table 15*).

	Frequency	Percent
Mild	28	37.3
Moderate	31	41.3
Severe	14	18.7
worst imaginable	2	2.7
Total	75	100.0

Table 15: Intensity of previous LBP in participants who reported a previous history (n=75)

Walker (2004) found the following pain ratings, where applicable in his study with respect to the reported percentage outcomes:

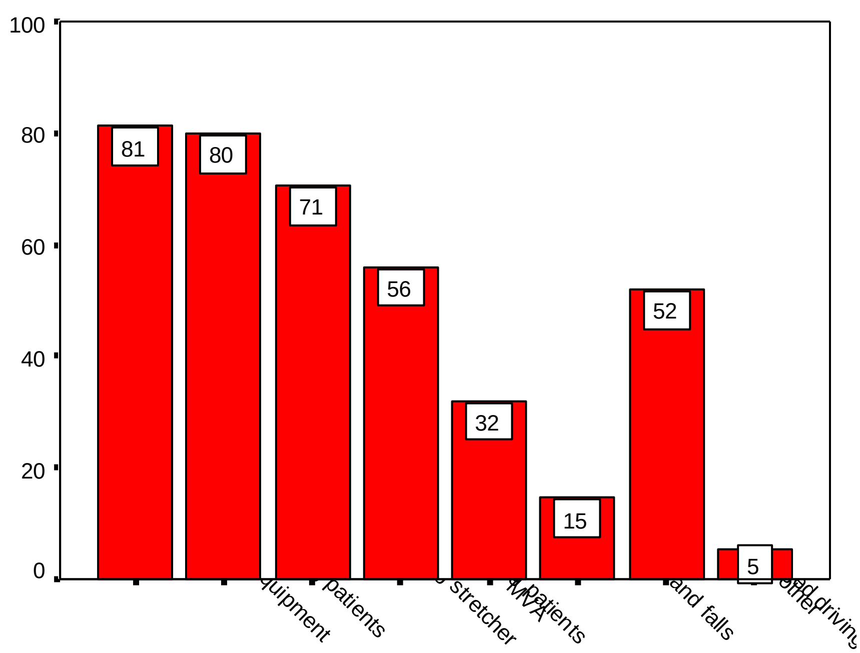
- Grade 1 (Low Intensity Pain) 36.3%,
- Grade 2 (High Intensity Pain – Low Disability) 42.5%,
- Grade 3 (High Disability – Moderately Limiting) 10.8%, and
- Grade 4 (High Disability – Severely Limiting) 10.4%.

These intensity ratings correspond with this study, especially the ‘mild’ and ‘moderate’ intensities. There is a slight difference in the ‘severe’ and ‘worst imaginable’ categories, but this is probably due to the difference in the way the question was asked leading to a difference in response. Also, the groups under study were exposed to different possible causative agents. It is also difficult to determine if the groups were of different ethnographic makeup, which may give rise to differences in pain perception.

Subjective causes of previous episodes of LBP: It was found that 91% believed that their previous LBP had an occupational cause. This lends credibility to the hypothesis that emergency medical personnel have a higher risk for the development of low back pain due to their occupation than the general population.

Lifting equipment was the main reported cause for previous LBP (81%), followed by lifting patients (80%) and carrying stretchers (71%). This is shown in *Figure 5*. This correlates with the previous results of participant's belief for current low back pain which showed lifting patients (75%) was the most frequently reported cause. This was followed by lifting equipment (68%) and carrying stretchers (61%)

.



<u>Figure 5: Occupational causes of previous LBP (n=75)</u>

These subjective causes for low back pain correlate with literature on risk factors for the development of low back pain and have already been discussed earlier in 4.3.1.

4.3.3 Absenteeism due to LBP

In participants who currently experienced LBP, the number of days absent from work in the last year due to LBP is shown in *Table 16*. The majority (62%) did not take leave from work and it was found that 22.4% of participants took one to four day's leave in the past year. In total 36.8% of participants with low back pain took less than 30 days leave in the past year. One participant took more than 30 days leave due to LBP.

	Frequency	Percent
0	47	61.8
1-4	17	22.4
5-9	5	6.6
10-14	3	3.9
15-19	2	2.6
20-24	1	1.3
30 +	1	1.3
Total	76	100.0

Table 16: Absence from work due to LBP in the past year in participants who reported suffering from LBP (n=76)

Table 17 shows the amount of days the participants had booked off for light duty due to LBP in the last year. It was found that 82% had not booked off any days, 15.7% had booked off less than 30 days, while 2.6% had booked off more than 30 days.

	Frequency	Percent
0	62	81.6
1-4	7	9.2
5-9	2	2.6
10-14	3	3.9
30 +	2	2.6
Total	76	100.0

Table 17: Days booked off for light duty in past year due to LBP

Hagen and Thune (1998) found that the overall 1-year incidence rate for low back pain with at least 2 weeks of compensated absence from work was 2.27% and Gheldof *et al* (2005) found that 65% of workers reporting LBP continued to work despite the presence of LBP, with short term (less than 30 days) sick leave reported by 27% of workers. Long term (more than 30 days) sick leave was reported by 8% of workers. Short term sick leave was associated with high pain severity, physical workload, high fear of work related activities, and high fear of re-injury. Long term sick leave was associated with high pain severity, pain radiating into the ankle / feet, and fear of work related activities (Gheldof *et al*, 2005).

Although the results of this study show a higher incidence of absenteeism due to LBP than the study done by Gheldof *et al* (36.8% compared to 27%) it must be noted that the sample size in this study was much smaller which may influence these results. This higher incidence compared to other studies (Gheldof *et al*, 2005; Hagen and Thune, 1998) means that absenteeism will have a significant economic impact on the emergency services industry. In contrast to this Hadler (1997) states that most workers are able to cope successfully with their regional backache. This may be the case with this study as the total prevalence of LBP was 76%. This may infer that personnel where reluctant to take off work or that the LBP was mild in nature and therefore did not limit their functional ability, even though they had discomfort. The difference may also be due to the fact that groups under study may be exposed to different possible causative agents. It is also difficult to determine if the groups were of different ethnographic makeup which may give rise to differences in pain perception.

Furthermore it was found in this study that 15.7% of participants had booked off less than 30 days, while 2.6% had booked off more than 30 days in the last year. It is difficult to compare the percentage of participants booked off for light duty such as working in the control room, as most other professions do not have this alternative. Once again this has a large economic impact on the emergency services industry as another employee is given the task of responding to emergency situations. This means that two people are employed to perform the responsibilities usually allocated to one employee (de Montille, 2004).

4.3.4 Low Back Pain before working in the emergency services industry

Of the participants with current LBP, 74% did not suffer from LBP prior to working in emergency services. This means that 74% of the prevalent cases (56.24% of total sample) had LBP that occurred after the onset of working in emergency services, and was therefore likely to be causally associated with exposure to working in the emergency services (*Table 18*).

		Frequency	Percent	Valid Percent
Valid Response	yes	20	20.0	26.3
	no	56	56.0	73.7
	Total	76	76.0	100.0
Missing	N/A	24	24.0	
Total		100	100.0	

Table 18: Pre-existing LBP

This supports the hypothesis that emergency medical personnel have a high occupational risk factor for developing LBP. The specific risk factors for emergency medical personnel investigated in this study will be discussed next in section 4.4.

4.4 Analytical statistics: Associations between exposures and LBP

4.4.1 Lifestyle risk factors for LBP

4.4.1.1 Exercise and its association with LBP

It was found that 82% of participants reported that they performed some form of exercise. Of those who exercised, 39% exercised 1-2 times per week, 41.5% 3-4 times per weeks, and only 19.5% 5-6 times per week. This is shown in *Table 19*. The majority exercised for 30 minutes per session (36.6% of those who exercised), with the length of exercise session shown in *Table 20*.

		Frequency	Percent	Valid Percent
Valid	1-2	32	32.0	39.0
	3-4	34	34.0	41.5
	5-6	16	16.0	19.5
	Total	82	82.0	100.0
Missing	N/A	18	18.0	
Total		100	100.0	

Table 19: Frequency of exercise in study participants (n=100)

		Frequency	Percent	Valid Percent
Valid	30 mins	30	30.0	36.6
	45 mins	19	19.0	23.2
	60 mins	24	24.0	29.3
	90 mins	4	4.0	4.9
	>90 mins	5	5.0	6.1
	Total	82	82.0	100.0
Missing	N/A	18	18.0	
Total		100	100.0	

Table 20: Length of exercise session in study participants (n=100)

Of those who did not exercise 100% suffered from LBP, while 71% of those who exercised had LBP (*table 21*). Thus the prevalence of low back pain was inversely proportional to exercise. This difference was statistically significant (p = 0.005). The number of times exercised and duration of exercise were however not associated with LBP.

			low back pain		Total
			yes	no	
EXERCISE	yes	Count	58	24	82
		Row %	70.7%	29.3%	100.0%
	no	Count	18	0	18
		Row %	100.0%	.0%	100.0%
Total		Count	76	24	100
		Row %	76.0%	24.0%	100.0%

Fisher's exact p = 0.005

Table 21: Exercise and LBP

General exercise for the whole body and encouraging a patient to stay active has been shown to be beneficial for the patient with chronic low back pain (Richardson *et al*, 2002). As cited by Aure *et al* (2003) the International Paris Task Force (2000) stated that there is sufficient scientific evidence to recommend that patients who have chronic low back pain perform physical, therapeutic, or recreational exercises, keeping in mind that no specific active technique is superior to another.

There is strong evidence showing exercise therapy is more effective than the usual care by general practitioners, and equally effective as conventional physiotherapy (Petersen *et al*, 2002).

In addition Gatterman (1990: 163) states that exercise will result in postural correction. This will decrease anterior pelvic tilt which in turn will reduce compressive forces on the posterior facet joints. Strength and flexibility of the postural muscles and the large muscles of the upper and lower extremities will reduce stress on the spinal structures during performance of daily activities. Furthermore cardiovascular exercise will also increase the release of endorphins, which act as natural pain killers (Kirkaldy-Willis and Bernard, 1999: 292).
The results of this study therefore support studies that show that exercise will decrease the incidence of low back pain (Gatterman, 1990; and Richardson *et al*, 2002; Petersen *et al*, 2002; Aure *et al,* 2003). In this study 100% of participants who did not exercise suffered from low back pain, as compared to a 71% prevalence of LBP in those that did exercise. From this it can be inferred that an exercise program for emergency medical personnel will be of great benefit in decreasing the incidence and prevalence of low back pain.

However, it must be noted that this may not mean causality due to the cross sectional design of the study and the lack of the temporality criteria. The strong association between not exercising and LBP may not mean that lack of exercise causes LBP, but rather the other way around – LBP caused lack of exercising.

4.4.1.2 Smoking and its association with LBP

It was found that 23% of participants reported that they currently smoked cigarettes. The majority smoked 6-10 cigarettes per day, with the distribution of amount smoked in current smokers shown in *Table 22*. The mode for duration of smoking in current smokers was both 3-4 years (26%) and 9+years (26%). This is shown in *Table 23*.

		Frequency	Percent	Valid Percent
Valid	1-5	5	5.0	21.7
	6-10	9	9.0	39.1
	11-15	4	4.0	17.4
	16-20	4	4.0	17.4
	21+	1	1.0	4.3
	Total	23	23.0	100.0
Missing	N/A	77	77.0	
Total		100	100.0	

Table 22: Amount of cigarettes smoked daily in current smokers

		Frequency	Percent	Valid Percent
Valid	1-2 yrs	2	2.0	8.7
	3-4 yrs	6	6.0	26.1
	5-6 yrs	5	5.0	21.7
	7-8 yrs	4	4.0	17.4
	9+ years	6	6.0	26.1
	Total	23	23.0	100.0
Missing	N/A	77	77.0	
Total		100	100.0	

Table 23: Distribution of duration of smoking in current smokers

Fifteen percent (n=15) of participants were ex-smokers. The majority of the ex-smokers had smoked 21+ cigarettes a day (40%- *Table 24*). The duration they had smoked for is shown in *Table 25*. The majority smoked for between 5 and 8 years (67%) with 60% having stopped smoking 0-2 years previously (*Table 26*).

		Frequency	Percent	Valid Percent
Valid	1-5	3	3.0	20.0
	6-10	1	1.0	6.7
	11-15	1	1.0	6.7
	16-20	4	4.0	26.7
	21+	6	6.0	40.0
	Total	15	15.0	100.0
Missing	N/A	85	85.0	
Total		100	100.0	

Table 24: Daily amount smoked in ex-smokers

		Frequency	Percent	Valid Percent
Valid	0-1 year	1	1.0	6.7
	1-2 yrs	2	2.0	13.3
	3-4 yrs	2	2.0	13.3
	5-6 yrs	5	5.0	33.3
	7-8 yrs	5	5.0	33.3
	Total	15	15.0	100.0
Missing	N/A	85	85.0	
Total		100	100.0	

Table 25: Duration of smoking in ex-smokers

		Frequency	Percent	Valid Percent
Valid	0-2 yrs	9	9.0	60.0
	3-5 yrs	5	5.0	33.3
	6-8 yrs	1	1.0	6.7
	Total	15	15.0	100.0
Missing	N/A	85	85.0	
Total		100	100.0	

Table 26: Length of time since quitting smoking in ex-smokers

There was a significant relationship between smoking and LBP ($p = 0.012$). It was found that more participants who smoked (96%) than those who did not smoke (70%) had LBP. Duration and amount smoked did not influence LBP, and ex smokers were not at any increased risk of LBP compared to non-smokers (*Table 27*).

			low back pain		Total
			yes	no	
SMOKE	yes	Count	22	1	23
		Row %	95.7%	4.3%	100.0%
	no	Count	54	23	77
		Row %	70.1%	29.9%	100.0%
Total		Count	76	24	100
		Row %	76.0%	24.0%	100.0%

Fisher's exact p = 0.012

Table 27: Smoking and LBP

A positive association has been found between smoking and back pain in many of the epidemiological surveys that have examined the link (Boshuizen *et al*, 1993; Palmer *et al*, 2003), this is thought to be as a result of the association between smoking and an increase in coughing (Palmer *et al*, 2003). Coughing is thought to increase the intradiscal pressure of the intervertebral discs, thus straining the spine or provoking disc herniation (Boshuizen *et al*, 1992; Palmer *et al*, 2003), leading to pathological changes within the intervertebral disc such as disc degeneration (Palmer *et al*, 2003).

These degenerative changes result in a decrease of disc height and an increase in the compressive forces on the posterior facet joints (Gatterman, 1990: 160).This can lead to segmental dysfunction and secondary changes in the posterior facet joint (Kirkaldy-Willis and Bernard, 1999: 138). As a result instability (usually in the L4 – L5 level), degenerative spondylolisthesis or spinal stenosis which have been implicated in the development of LBP (Kirkaldy-Willis and Bernard, 1999: 133) could develop.

In addition smoking has been associated with a reduced vertebral body blood flow which can promote intervertebral disc degeneration (Boshuizen *et al*, 1992; Palmer *et al*, 2003), due to the reduced vertebral blood flow, which reduces the amount of nourishment received by the intervertebral disc. There is also a correlation between smoking and diminished mineral content of bone, thereby increasing the risk of microfractures of the vertebrae or pathological changes within the intervertebral disc (Boshuizen *et al*, 1992; Palmer *et al*, 2003)

According to the National Centre for Health Statistics (2003) an estimated 21.6% of the adult population (over 18 years of age) in the United States are smokers[2]. Smoking prevalence was higher among those with 9 -11 years of education (35.4%) compared with those with more than 16 years of education (11.6%) (National Centre for Health Statistics, 2003).

In this study there was a slightly higher prevalence of smoking among emergency medical personnel (23%) compared to the National Centre for Health Statistics (21.6%), but this could be due to the sample size or character and the fact that it is a comparison of American statistics in a South African context. Although it could be inferred that emergency medical personnel have a higher risk for smoking due to the stressful nature of their occupation in addition to the criteria stipulated in the National Centre for Health Statistics (2003) may be inaccurate due to the assumption being flawed. From this it does not seem likely that emergency medical personnel have a higher risk factor for developing LBP due to smoking than the general population. However, there was a significant relationship between smoking and LBP in this study, which supports the latter argument. In addition it was found that more participants who smoked (96%) than those who did not smoke (70%) had LBP. This could therefore imply that emergency medical personnel have a decreased ability to adapt to changes related to smoking due to exposure to other risk factors such as whole body vibration and increased lumbar strain from lifting and carrying of patients and equipment (Volinn, 1997; Teschke *el al*, 1999; Cassidy *et al*, 2003; Davis and Heaney, 2000; Keyserling, 2000; Palmer *et al*, 2000),

[2] Smokers were defined as those who smoked more than 100 cigarettes in their lifetime and now smoke every day or some days (National Centre for Health Statistics, 2003).

4.5 Occupational risk factors for LBP

4.5.1 Occupational exposure:

The majority of participants spent >161 hours in the field per month (36%), i.e. they spent more than 8 hours per working day in the field. This is shown in *Figure 6.*

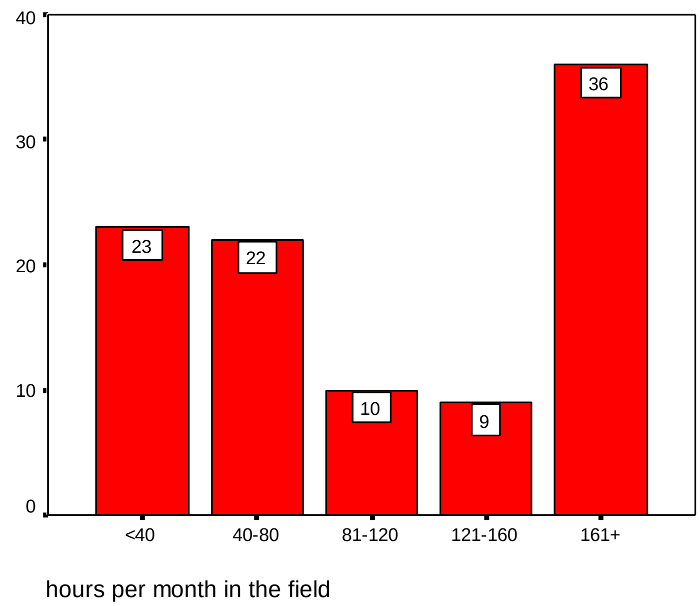


Figure 6: Distribution of number of hours per month spent in the field

The median time in years that participants had worked in ambulances was 3.5 years (range 0-18 years). For time working in response unit and helicopter the median time was 0 years (range 0-18 years and 0-16 years respectively). Median total time working in emergency services was 4.75 years (range 0.08 years to 34 years) (*Figure 7*).

When the sample was split into qualified participants and students, as expected it was evident that there was a difference in the amount of time exposed to the job between the two groups (*Table 28*). There was a significantly higher exposure time for qualified participants in years working in ambulances, helicopters and in total.

STUDENT		Years in ambulance	Years in response unit	Years in helicopter	Total years
Students	Median	2.4167	.0000	.0000	3.8333
	Minimum	.00	.00	.00	.83
	Maximum	18.00	4.67	2.00	18.00
Qualified	Median	5.0000	.0000	.0000	7.1667
	Minimum	.00	.00	.00	.08
	Maximum	15.00	18.00	16.00	34.00
Total	Median	3.5000	.0000	.0000	4.7500
	Minimum	.00	.00	.00	.08
	Maximum	18.00	18.00	16.00	34.00

Table 28: Non-parametric statistics and tests to compare exposure time in students and qualified group

Test Statistics(a)

	Years in ambulance	Years in response unit	Years in helicopter	Total years
Mann-Whitney U	708.000	1004.000	857.500	635.000
Wilcoxon W	1269.000	3282.000	1418.500	1196.000
Z	-2.918	-.929	-2.714	-3.452
Asymp. Sig. (2-tailed)	.004	.353	.007	.001

Table 28a: Non-parametric statistics and tests to compare exposure time in students and qualified group

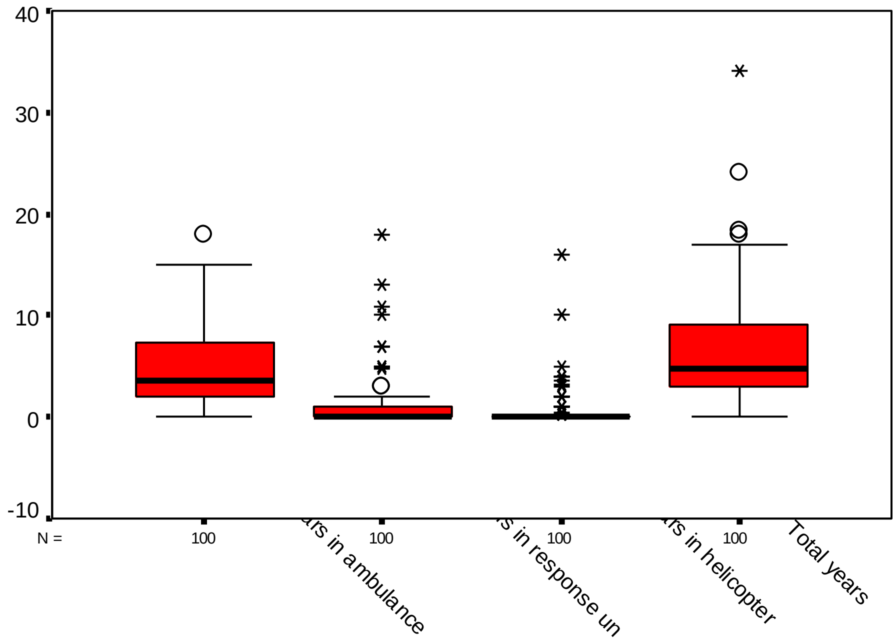


__Figure 7: Boxplot of time exposed to emergency medical environments in all participants (n=100)__

These results infer that increased years of exposure to occupational risk factors lead to an increased incidence of low back pain. This can be seen in the fact that there was a significantly higher prevalence of LBP in qualified participants (84%) compared to students (61%) (p =0.023- *Table 2).* This result supports the hypothesis that the prevalence of low back pain should be directly proportional to the number of years exposed to risk factors in the field.

There was no significant difference in mean time of exposure to ambulance, response unit, helicopter or total years between the groups with LBP and without. A slight trend was visible towards a higher mean time of exposure and prevalence of LBP in ambulance workers and total time of exposure (*Table 29*). However this is also related to the degree of exposure of all participants to these various modes of transport and may be a greater reflection on the type of transport to which they have been allocated as opposed to the exposure related to low back pain. Nevertheless associations are noted and it is suggested that future studies look at identifying each more of transport as a causative agent with larger sample sizes.

	low back pain	N	Mean	Std. Deviation	Std. Error Mean	P value
Years in ambulance	yes	76	5.1360	3.48504	.39976	0.059
	no	24	3.4792	4.33649	.88518	
Years in response unit	yes	76	1.0252	2.57660	.29556	0.540
	no	24	1.4410	3.71367	.75805	
Years in helicopter	yes	76	.5428	1.53070	.17558	0.592
	no	24	.8056	3.30008	.67363	
Total years	yes	76	6.6919	4.82263	.55319	0.396
	no	24	5.5938	7.27697	1.48541	

Table 29: Cumulative years of occupational exposure and LBP

Palmer *et al* (2003) looked at the association of back symptoms lifting and occupational whole body vibration. It was found that risks were significantly increased for all outcomes in subjects who lifted at work, but associations of back symptoms with occupational whole body vibration were weaker with no relation to time of exposure. The results of this study show that the driver of the vehicle, but not the co-driver / passenger, has an increased risk of developing LBP. The results also showed that many of the participants believed that long periods of driving contributed to their low back pain. This will be discussed in detail later in section 4.5.3.

Duration of exposure per month: There was a significant association between hours per month spent in the field (irrespective of the transport type) and LBP (p =0.004). The prevalence was lowest in those who spent the shortest amount of time in the field (57%) and highest in those who spent the most amount of time (94%- *Table 30*).

			low back pain		Total
			yes	no	
Hours per month in the field	<40	Count	13	10	23
		Row %	56.5%	43.5%	100.0%
	40-80	Count	17	5	22
		Row %	77.3%	22.7%	100.0%
	81-120	Count	5	5	10
		Row %	50.0%	50.0%	100.0%
	121-160	Count	7	2	9
		Row %	77.8%	22.2%	100.0%
	161+	Count	34	2	36
		Row %	94.4%	5.6%	100.0%
Total		Count	76	24	100
		Row %	76.0%	24.0%	100.0%

Pearson's chi square 15.24, p =0.004

Table 30: Duration of exposure per month and LBP

This supports the hypothesis that the prevalence of low back pain will be directly proportional to the amount of time spent in the field. The more time the participant spent in the field per month would result in more exposure to risk factors for low back pain such as lifting and carrying of patients and equipment, whole body vibration for the driver of the vehicle, and psychological stress (Volinn, 1997; Teschke *el al*, 1999; Cassidy *et al*, 2003; Davis and Heaney, 2000; Keyserling, 2000; Palmer *et al*, 2003).

4.5.2 Type of stretcher used and the association with LBP

Many emergency medical personnel (34%) used both self and non-0self loading stretcher, while 37% used only a self loading stretcher and 29% only used a non-self loading stretcher.

Use of self loading stretchers was not associated with low back pain (p =0.612). The proportion of low back pain in those participants who used the self loading stretcher was similar to that of those who did not (*Table 31*). Non-self loading stretchers were also not associated with LBP (p =0.954). The proportions with low back pain were almost identical in both groups (*Table 32*)

			low back pain		Total
			yes	no	
self loading stretcher	yes	Count	55	16	71
		Row %	77.5%	22.5%	100.0%
	no	Count	21	8	29
		Row %	72.4%	27.6%	100.0%
Total		Count	76	24	100
		Row %	76.0%	24.0%	100.0%

Pearson's chi square 0.288, p =0.612

<u>Table 31: Self loading stretcher by low back pain</u>

			low back pain		Total
			yes	no	
non self loading stretcher	yes	Count	48	15	63
		Row %	76.2%	23.8%	100.0%
	no	Count	28	9	37
		Row %	75.7%	24.3%	100.0%
Total		Count	76	24	100
		Row %	76.0%	24.0%	100.0%

Pearson's chi square 0.003, p =0.954

<u>Table 32: Non- self loading stretcher by low back pain</u>

This result did not support the theory that the use of the self loading stretcher would place less strain on the lumbar spine than the non-self loading type. This may be due to the fact that many participants use both types of stretcher, while those who work exclusively with the self loading stretcher have only recently done so. Emergency medical personnel are also exposed to many other potential occupational risk factors for low back pain such as lifting and carrying of patients and equipment (many times in awkward positions), whole body vibration, motor vehicle accidents, and occupational stress, which may obviate the explicit results obtained with respect to the stretcher type utilized (Volinn, 1997; Teschke *el al*, 1999; Cassidy *et al*, 2003; Davis and Heaney, 2000; Keyserling, 2000; Palmer *et al*, 2000). Thus the use of a self loading stretcher in isolation may not be significant on its own to influence the incidence of low back pain.

4.5.3. Traveling and exposure to whole body vibration

The majority of participants traveled between 200 and 399 kilometers per shift, although there were 6 participants who traveled more than 1000 kilometers per shift. This is shown in *Table 33*. Of the participants 53% were the driver of the vehicle and 47% were not.

	Frequency	Percent
0-199	36	36.0
200-399	46	46.0
400-599	6	6.0
600-799	4	4.0
800-999	2	2.0
1000+	6	6.0
Total	100	100.0

Table 33: Total kilometers traveled per shift in study participants (n=100)

There was no relationship between the distance traveled per shift and low back pain (0=0.615 - *Table 34*). However, the driver of the vehicle had a higher risk of LBP than participants who did not drive the vehicles (p =0.027 – *Table 35*).

			low back pain		Total
			yes	no	
How many kms traveled per shift	0-199	Count	25	11	36
		Row %	69.4%	30.6%	100.0%
	200-399	Count	35	11	46
		Row %	76.1%	23.9%	100.0%
	400-599	Count	5	1	6
		Row %	83.3%	16.7%	100.0%
	600-799	Count	3	1	4
		Row %	75.0%	25.0%	100.0%
	800-999	Count	2	0	2
		Row %	100.0%	.0%	100.0%
	1000+	Count	6	0	6
		Row %	100.0%	.0%	100.0%
Total		Count	76	24	100
		Row %	76.0%	24.0%	100.0%

Pearson's chi square 3.55, p= 0.615

<u>Table 34: Distance traveled per shift and LBP</u>

			low back pain		Total
			yes	no	
Are you the driver?	yes	Count	45	8	53
		Row %	84.9%	15.1%	100.0%
	no	Count	31	16	47
		Row %	66.0%	34.0%	100.0%
Total		Count	76	24	100
		Row %	76.0%	24.0%	100.0%

Pearson's chi square 4.903, p =0.027

<u>Table 35: Driver and LBP</u>

Palmer *et al* (2003) looked at the association of back symptoms lifting and occupational whole body vibration. It was found that risks were significantly increased for all outcomes in subjects who lifted at work, but associations of back symptoms with occupational whole body vibration were weaker with no relation to dose. A similar pattern can be seen in this study, as there was no relation between the distance traveled per shift (dose of whole body vibration) and low back pain.

However, this study looks at the short term exposure (average distance per shift) and does not take years of exposure into account.

Teschke *el al* (1999) found conclusive data to support a causal link between back disorders and both driving occupations and whole body vibration. Numerous back disorders were involved, including lumbago, sciatica, generalized back pain, and intervertebral disc herniation and degeneration, with elevated risks consistently observed after five years of exposure.

In this study only the driver of the vehicle had an increased risk of developing LBP. This may be due to the fact that the driver is exposed to more vibration through constant contact with the steering wheel of the vehicle. Mansfield and Marshall (2001) found that discomfort in the upper arm, wrist, and hand was greater for the drivers than the co-drivers. From this it can be inferred that there is increased vibration coming through the upper limb to the rest of the body. Another reason for drivers having an increased risk for LBP may be the fact that drivers spend more time in a fixed seated position. Co drivers will spend more time in the back of the ambulance monitoring and treating patients and are therefore able to move around. Sitting postures which rotate the pelvis backwards and flatten the lumbar spine may amplify vibration transmission to the spine and increase movement of the sacroiliac joint (Teschke *el al*, 1999).

The results of this study show that the driver of the vehicle but not the co-driver / passenger, has an increased risk of developing LBP. The results also showed that 47% of participants who suffered from low back pain believed that long periods of driving contributed to their current low back pain, while 52% believed it to be a contributing factor to their previous episodes of LBP. Due to the fact that more than half the emergency medical personnel (53%) act as drivers shows that whole body vibration from motor vehicles may act as a significant risk factor for the development or increased incidence of low back pain.

4.5.4 Motor vehicle accidents

Fifty percent of the participants had had a motor vehicle accident while on duty. The majority (21%) had had one accident, and 16% had two accidents. There was one participant who had had 6+ accidents while on duty. This is shown in *Table 36*.

There was a higher risk of LBP for those who had had one or more motor vehicle accidents (84%) while on duty compared to those who had not had any (68%), but this association was not statistically significant (p = 0.061 – *Table 37*). A reason for this result not being statistically significant in this study may be due to the small sample size. It must also be noted that motor vehicle accidents outside of the occupation were not taken into account in this study.

	Frequency	Percent
0	50	50.0
1	21	21.0
2	16	16.0
3	11	11.0
4	1	1.0
6+	1	1.0
Total	100	100.0

Table 36: Number of motor vehicle accidents participants had had while on duty (n=100)

			low back pain		Total
			yes	no	
motor vehicle accidents while on duty	None	Count	34	16	50
		Row %	68.0%	32.0%	100.0%
	>=1 accident	Count	42	8	50
		Row %	84.0%	16.0%	100.0%
Total		Count	76	24	100
		Row %	76.0%	24.0%	100.0%

Pearson's chi square 3.509, p =0.061

Table 37: MVA while on duty and LBP

Cassidy *et al* (2003) found a high incidence and prolonged recovery for individuals with low back pain caused by traffic collisions. In this study 84% of those who had had one or more motor vehicle accidents reported low back pain. This number is higher when compared to the study done by Cassidy *et al* (2003), with at least 50% of all motor vehicle accident claimants reporting low back pain, but this did not include those who did not seek health care or file an injury claim. Also it cannot be inferred that motor vehicle accidents were the principle cause of low back pain, as back pain may have already been present before the motor vehicle accident.

In this study half the participants had had one or more motor vehicle accidents while on duty. From this it can be inferred that motor vehicle accidents are a high occupational risk factor for emergency medical personnel. However, motor vehicle accidents may amplify the presence of existing low back pain, and may not be the initiator or the contrary may be true. The association between those who had had one or more motor vehicle accidents was not quite statistically significant in this study, but this may be due to the small sample size which may affect the results.

4.5.5 <u>Psychological factors associated with LBP</u>

The majority of the participants (49%) rated their job as stressful. This is shown in *Figure 8*. Of those participants that had occupational stress 70% responded that emotional stress was the likely cause of the occupational stress, while 47% said that it was lack of resources such as necessary equipment, new equipment and facilities at their base of operations. (*Figure 9*).

Figure 8: Occupational stress rating of participants (n=100)

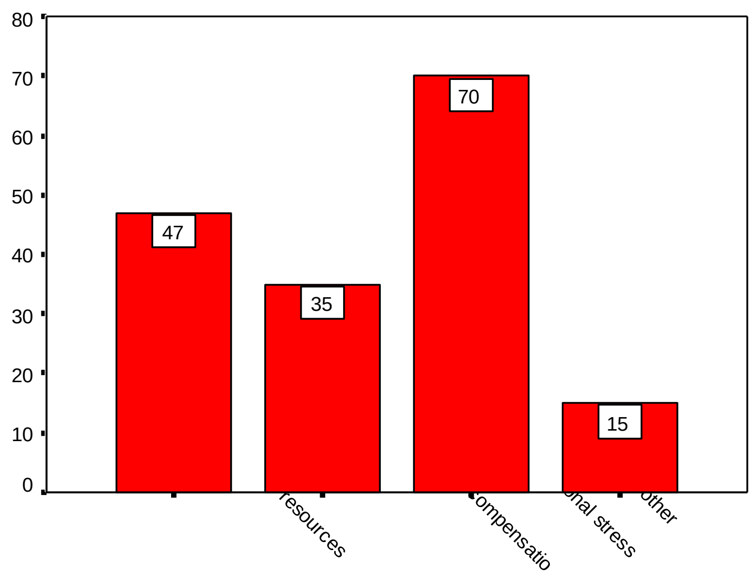


Figure 9: Percentage of participants who responded positively to each of the likely stressors (n=100)

A relatively high percentage (40%) of participants suffered from lethargy, 37% from insomnia and 25% from depression (*Figure 10*). Three percent were on anti-depressive medication. However, it cannot be assumed that depressive states or anti-depressive medication are due only to occupational factors.

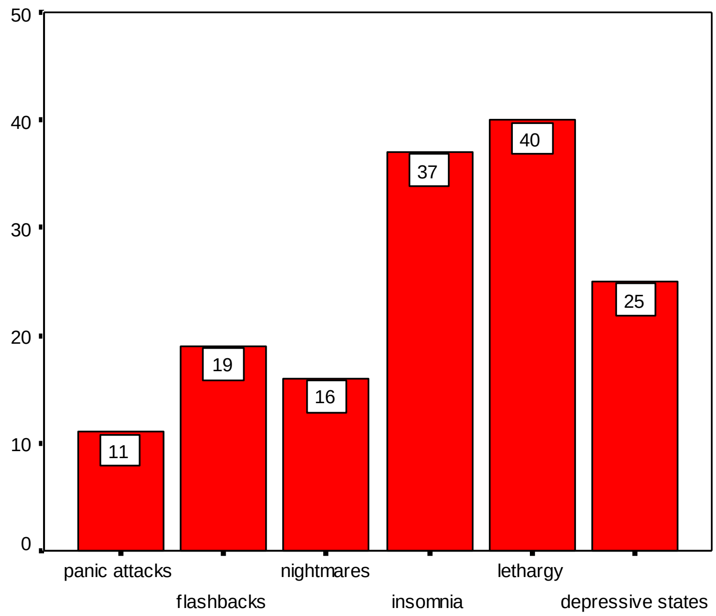


Figure 10: Symptoms suffered by participants (n=100)

Occupational stress: Participants who rated their job as very stressful had the highest levels of LBP (92%) compared to those who reported little or no stress (62%) (*Table 38*). This association was statistically significant (p =0.039). This result supports the theory that occupational stress could be a risk factor for low back pain.

As seen earlier in this chapter the results do not support the theory that emergency medical personnel may smoke more due the stressful nature of their occupation. However, the use of coping mechanisms such as recreational drugs or extreme recreational activities, which may increase the incidence of LBP, were not taken into account in this study and therefore constitute a limitation of the study.

			low back pain		Total
			no	yes	
occupational stress	very stressful	Count	2	23	25
		Row %	8.0%	92.0%	100.0%
	stressful	Count	12	37	49
		Row %	24.5%	75.5%	100.0%
	little or no stress	Count	10	16	26
		Row %	38.5%	61.5%	100.0%
Total		Count	24	76	100
		Row %	24.0%	76.0%	100.0%

Pearson's chi square 6.496, p = 0.039

Table 38: Occupational stress and LBP

Symptoms relative to stress: Neither panic attacks, flashbacks, lethargy, nor nightmares were associated with LBP (p = 0.632, p = 0.738, p = 0.848, p =0.240 respectively). However, there was a significant association between insomnia and LBP (p= 0.004 – *Table 39*) and between depression and LBP (p = 0.007- *Table 40*).

			low back pain		Total
			no	Yes	
Insomnia	yes	Count	3	34	37
		Row %	8.1%	91.9%	100.0%
	no	Count	21	42	63
		Row %	33.3%	66.7%	100.0%
Total		Count	24	76	100
		Row %	24.0%	76.0%	100.0%

Pearson's chi square 8.132, p =0.004

Table 39: Insomnia and LBP

			low back pain		Total
			no	Yes	
Depressive states	yes	Count	1	24	25
		Row %	4.0%	96.0%	100.0%
	no	Count	23	52	75
		Row %	30.7%	69.3%	100.0%
Total		Count	24	76	100
		Row %	24.0%	76.0%	100.0%

Pearson's chi square 7.310, p =0.007

Table 40: Depression and LBP

Various studies indicate an association between psychological factors and the occurrence of low back pain (Andersson, 1999; Davis and Heaney, 2000; Devereux *et al*, 1999). These factors include anxiety, depression, stressful responsibility, job dissatisfaction, and mental stress at work (Andersson, 1999). It has been found that an important psychosocial stress for LBP was having responsibility for the well-being of others (Davis and Heaney, 2000), and is therefore recognised as an identified part of the profession of emergency medicine.

Psychosocial work factors may directly influence work related musculoskeletal disorders are through two mediating routes, namely neuromuscular tension and local sensitivity to pain (Devereux *et al*, 1999). Psychosocial factors may act through an alternative mechanism independent of neuromuscular activity, where the strain from psychosocial exposure may indirectly modify the biological effect of the biomechanical load upon the development of work related musculoskeletal disorders (Devereux *et al*, 1999).

In addition many people (including emergency personnel) who witness traumatic events experience posttraumatic stress disorder (Merck Manual, 2004: 556). This puts emergency medical personnel, who witness repeated traumatic events, into a high risk category for posttraumatic stress. Symptoms could include panic attacks, flashbacks, nightmares, insomnia, lethargy and other symptoms of depression (Merck Manual, 2004: 556).

In this study insomnia was to be the dominant symptom of depression, with a directly proportional increase in low back pain. Those suffering from depressive states also showed a directly proportional increase in low back pain, thereby supporting the theory that occupational stress or posttraumatic stress in emergency medical personnel may be associated with an increase in the incidence of low back pain.

Again it must be noted that causality is not implied, since this was a cross-sectional study and we cannot be sure that the psychological factor pre-existed before the LBP or the other way around. However, since 74% of participants did not suffer from LBP prior to working in emergency services it could be inferred that occupational stress remains a contributing risk factor for the development of low back pain.

4.5 Summary and limitations

The aim of this study was to identify the prevalence and risk factors of mechanical low back pain specific to emergency medical personnel, including selected risk factors.

The first objective was data collection and documentation with respect to:

- Patient demographics
- Lifestyle factors relating to LBP
    - Smoking
    - Exercise
- Working History:
    - Length of time in the field
    - Equipment used
    - Time spent in vehicle/helicopter

- Motor Vehicle Accidents
- Occupational stress

- History of Low Back Pain
  - Low back pain history
  - Absenteeism/Light duty due to low back pain
  - Perceived cause of low back pain

The second objective was to interpret the data to assess the strength of the relationships of the various factors documented in objective one. This was to identify the prevalence and risk factors for low back pain.

With the hypotheses of this study being that

- Emergency medical personnel should have a higher risk factor for the development of low back pain due to their occupation than the general population.
- An increase in the number of years working in the field (i.e. years of exposure) should lead to an increased incidence and / or prevalence of low back pain.

In this respect the results showed the following:

Demographics: There was a 1:3 ratio of ***students to qualified personnel*** in the study. Thus the overall response rate was 76.3% (100/131) of the private bases covered and a 10.3% actual response rate relative to the profession. Of the 100 participants in the study, 33% were students, 22% were BAA qualified, 25% were ANA qualified and 20% were ANT qualified, with the result that there was a significantly higher prevalence of LBP in qualified participants (84%) compared to students (61%). This result supports the hypothesis that the prevalence of low back pain should be directly proportional to the number of years worked in the field. Although the prevalence was highest in BAA qualified participants, there is little difference between the association of low back pain and the different qualifications (BAA 86.4%, ANA 84%, and ANT 80%). This similarity may be due to the fact that all qualifications face many of the same occupational risk factors and therefore have the same risk for developing low back pain.

Relative to ***age***, the majority (72%) were in the youngest age group (20-30 years)., thus it was found that age was not associated with LBP. This younger age trend is due to the fact that 33% of the participants were still students who tended to fall into the 20 – 30 age category. In addition 39% of the qualified emergency medical personnel who partook in this study also fell into this category. With the result that the prevalence was highest in the 31-40 year age group (85%) and lowest in the 20 – 30 year age group (73.6%) and the 41 – 50 age group showing a 75% prevalence. Walker *et al* (2004) found that the prevalence of low back pain increased with age until the fifth decade and then remained constant. In congruence with this Papageorgiou *et al* (1995) found that the prevalence of low back pain increased with age until the age of 45, with the prevalence then decreasing until the age of 60 where it increased once again. This trend is seen in this study with a slight decrease in prevalence in the 41-50 age group.

With respect to ***gender***, 75% of participants were male while 25% were female. There was no association between LBP and gender. The fact that the proportion of males and females suffering from low back pain are very similar in this study may be explained by the fact that 72% of participants were in the 20-30 year age group. This means that woman in this age group will be affected by the hormonal effects of menopause such as loss of bone density which may cause pain through microfractures of the vertebrae or pathological changes within the intervertebral disc (Boshuizen *et al*, 1992; Palmer *et al*, 2003). Another reason for this trend may be due to the fact that only a small proportion of female participants would be affected by factors related to pregnancy. Males and females are also exposed to the same occupational risk factors and will therefore have the same risks for developing low back pain.

With respect to ***race*** the majority of the participants were White (49%), followed by Indian (26%), Black (13%), and Coloured (12%). Race was significantly related to

LBP prevalence, where the prevalence was lowest among Black participants (53.8%) and highest among Indian participants (92.3%). Whites had a prevalence of 69.4% while Coloureds showed a 91.7% prevalence. In addition to this there was a highly significant association between race and exercise. All of the Black participants exercised, while only 41.7% of the Coloureds exercised and 77% of the Indians exercised. There was also a strong association between race and smoking. None of the Blacks smoked, while smoking prevalence was highest amongst Coloureds (58.3%), followed by Indians (35%). Therefore it could be stated that there is a link between these two lifestyle behaviours and race. Those participants who exercise were likely to be non-smokers and vise versa. However the apparent association observed between race and LBP could be spurious and instead are due to the lifestyle choices observed in the different race groups.

Smoking: In this study there was a slightly higher prevalence of smoking among emergency medical personnel (23%) compared to the National Centre for Health Statistics (21.6%), but this could be due to the sample size or character and the fact that it is a comparison of American statistics in a South African context. Although it could be inferred that emergency medical personnel have a higher risk for smoking due to the stressful nature of their occupation in addition to the criteria stipulated in the National Centre for Health Statistics (2003) may be inaccurate due to the assumption being flawed. From this it does not seem likely that emergency medical personnel have a higher risk factor for developing LBP due to smoking than the general population. However, there was a significant relationship between smoking and LBP in this study. It was found that more participants who smoked (96%) than those who did not smoke (70%) had LBP. This could imply that emergency medical personnel have a decreased ability to adapt to changes related to smoking due to exposure to other risk factors such as whole body vibration and increased lumbar strain from lifting and carrying of patients and equipment (Volinn, 1997; Teschke *el al*, 1999; Cassidy *et al*, 2003; Davis and Heaney, 2000; Keyserling, 2000; Palmer *et al*, 2000),

Exercise: It was found that 82% of participants reported that they performed some form of exercise. Of those who did not exercise 100% suffered from LBP, while 71% of those who exercised had LBP. Thus the prevalence of low back pain was inversely proportional to exercise, at a statistically significant level. The results of this study support studies that show that exercise will decrease the incidence of low back pain (Gatterman, 1990; and Richardson *et al*, 2002; Petersen *et al*, 2002; Aure *et al,* 2003). In this study 100% of participants who did not exercise suffered from low back pain, as compared to a 71% prevalence of LBP in those that did exercise. From this it can be inferred that an exercise program for emergency medical personnel will be of great benefit in decreasing the incidence and prevalence of low back pain. However, it must be noted that this may not mean causality due to the cross sectional design of the study and the lack of the temporality criteria. The strong association between not exercising and LBP may not mean that lack of exercise causes LBP, but rather the other way around – LBP caused lack of exercising.

Time spent in the field: The majority of participants spent >161 hours in the field per month (36%), i.e. they spent more than 8 hours per working day in the field. Median total time working in emergency services was 4.75 years (range 0.08 years to 34 years). There was a significantly higher exposure time for qualified participants in years working in ambulances, helicopters and in total. These results infer that increased years of exposure to occupational risk factors lead to an increased incidence of low back pain. This can be seen in the fact that there was a significantly higher prevalence of LBP in qualified participants (84%) compared to students (61%). This result supports the hypothesis that the prevalence of low back pain should be directly proportional to the number of years exposed to risk factors in the field.

Equipment used: Many emergency medical personnel (34%) used both self and non-self loading stretcher, while 37% used only a self loading stretcher and 29% only used a non-self loading stretcher. The use of self loading stretchers was not associated with low back pain, with low back pain being almost identical in both groups. This result did not support the theory that the use of the self loading stretcher, which places less strain on the lumbar spine than the non-self loading type, would decrease the incidence of low back of those participants working with them. This may be due to the fact that many participants use both types of stretcher, while those who work exclusively with the self loading stretcher have only recently done so. Emergency medical personnel are also exposed to many other potential occupational risk factors for low back pain such as lifting and carrying of patients and equipment (many times in awkward positions), whole body vibration, motor vehicle accidents, and occupational stress (Volinn, 1997; Teschke *el al*, 1999; Cassidy *et al*, 2003; Davis and Heaney, 2000; Keyserling, 2000; Palmer *et al*, 2000), so the use of a self loading stretcher may not be significant on its own to influence the incidence of low back pain.

Time spent in vehicles: The majority of participants traveled between 200 and 399 kilometers per shift, although there were 6 participants who traveled more than 1000 kilometers per shift. Of the participants 53% were the driver of the vehicle and 47% were not. There was no relationship between the distance traveled per shift and low back pain

However, the driver of the vehicle had a higher risk of LBP than participants who did not drive the vehicles. This may be due to the fact that the driver is exposed to more vibration through constant contact with the steering wheel of the vehicle. Mansfield and Marshall (2001) found that discomfort in the upper arm, wrist, and hand was greater for the drivers than the co-drivers. From this it can be inferred that there is increased vibration coming through the upper limb to the rest of the body. Another reason for drivers having an increased risk for LBP may be the fact that drivers spend more time in a fixed seated position. Co-drivers will spend more time in the back of the ambulance monitoring and treating patients, and are therefore able to move around. Sitting postures, which rotate the pelvis backwards and flatten the lumbar spine, may amplify vibration transmission to the spine, and increase movement of the sacroiliac joint (Teschke *el al*, 1999).

The results also showed that 47% of participants believed that long periods of driving contributed to their current low back pain, while 52% believed it to be a contributing factor to their previous episodes of LBP. Due to the fact that more than half the emergency medical personnel (53%) act as drivers shows that whole body vibration from motor vehicles may act as a significant risk factor for the development or increased incidence of low back pain.

Motor vehicle accidents: Fifty percent of the participants had had a motor vehicle accident while on duty. The majority (21%) had had one accident, and 16% had two accidents. There was one participant who had had 6+ accidents while on duty. There was a higher risk of LBP for those who had had one or more motor vehicle accidents (84%) while on duty compared to those who had not had any (68%), but this association was not statistically significant. Half the participants in this study had had one or more motor vehicle accidents while on duty. From this it can be inferred that motor vehicle accidents are clearly a high occupational risk factor for emergency medical personnel. However, motor vehicle accidents may amplify the presence of existing low back pain, and may not be the initiator. The association between those who had had one or more motor vehicle accidents was not quite statistically significant in this study, but this may be due to the small sample size which may affect the results.

Occupational Stress: The majority of the participants (49%) rated their job as stressful. Of those participants that had occupational stress 70% responded that emotional stress was the likely cause of the occupational stress, while 47% said that it was lack of resources such as necessary equipment, new equipment and facilities at their base of operations. A relatively high percentage (40%) of participants suffered from lethargy, 37% from insomnia and 25% from depression. Three percent were on anti-depressive medication. Participants who rated their job as very stressful had the highest levels of LBP (92%) compared to those who reported little or no stress (62%). In this study insomnia was to be the dominant symptom of depression, with a directly proportional increase in low back pain. Those suffering from depressive states also showed a directly proportional increase in low back pain, thereby supporting the theory that occupational stress or posttraumatic stress in emergency medical personnel may cause an increase in the incidence of low back pain.

Prevalence of LBP: There was a high prevalence of LBP detected in this study (76%), and 74% of cases were probably due to occupational exposure, although a higher percentage was probably aggravated by occupational risk factors. This figure is higher than seen in the average ranges found in previous studies (Masset and Malchaire, 1994; Andersson, 1999; Walker, 2000). This lends credibility to the hypothesis that emergency medical personnel have a higher risk factor than the general population. There was a significantly higher prevalence of LBP in qualified participants (84%) compared to students (61%). This result supports the hypothesis that the prevalence of low back pain should be directly proportional to the number of years exposed to risk factors in the field.

Incidence of LBP: The incidence of episodes of LBP was 21.25% or 2.55 episodes per person per year. There may have been slight bias due to over-reporting of LBP since this condition is very hard to characterize, but this was minimized by defining LBP and withholding the true nature of the study until after the questionnaires had been completed. The 21.25% annual incidence found in this study is significantly higher than is found in literature for the general population (Andersson, 1999; George, 2002). From this it can be inferred that emergency medical personnel have an increased occupational risk for the development of low back pain than the general population.

Absenteeism due to LBP: The majority (62%) did not take leave from work and it was found that 22.4% of participants took one to four day's leave in the past year. In total 36.8% of participants with low back pain took less than 30 days leave in the past year. One participant took more than 30 days leave due to LBP. It was found that 82% had not booked off any days, 15.7% had booked off less than 30 days, while 2.6% had booked off more than 30 days. Although the results of this study show a higher incidence of absenteeism due to LBP than the study done by

Gheldof *et al* (36.8% compared to 27%) it must be noted that the sample size in this study was much smaller which may influence these results. This higher incidence compared to other studies (Gheldof *et al*, 2005; Hagen and Thune, 1998) means that absenteeism will have a significant economic impact on the emergency services industry. This may be the case with this study as the total prevalence of LBP was 76%. This may infer that personnel where reluctant to take off work or that the LBP was mild in nature and therefore did not limit their functional ability, even though they had discomfort.

It is difficult to compare the percentage of participants booked off for light duty such as working in the control room, as most other professions do not have this alternative. In this study 15.7% of participants had booked off less than 30 days, while 2.6% had booked off more than 30 days in the last year. Once again this has a large economic impact on the emergency services industry as another employee is given the task of responding to emergency situations. This means that two people are employed to perform the responsibilities usually allocated to one employee (de Montille, 2004).

Perceived cause of LBP: With respect to the possible cause 86% of participants with LBP thought that their current LBP was caused by their occupation. It was also found that 91% of participants believed that their previous LBP had an occupational cause. Furthermore, it was found that 74% of participants did not suffer from LBP prior to working in emergency services. This means that 74% of the prevalent cases (56.24% of total sample) had LBP that occurred after the onset of working in emergency services, and was likely caused by exposure to working in emergency services. This is significant as it lends credibility once again to the hypothesis that emergency medical personnel have a higher risk for the development of low back pain due to their occupation than the general population.

Thus as a result of the findings of this study the hypotheses of this study are ***accepted*** as read, where :

- Emergency medical personnel should have a higher risk factor for the development of low back pain due to their occupation than the general population.
- An increase in the number of years working in the field (i.e. years of exposure) should lead to an increased incidence and / or prevalence of low back pain.

Nevertheless it is noted that this acceptance is guarded with respect to the ***study limitations***, where there were many factors found to be associated with LBP in this study. However, we cannot infer causality due to the cross sectional design of the study and the lack of the temporality criteria. For instance, the strong association between not exercising and LBP may not mean that lack of exercise causes LBP, but rather the other way around – LBP caused lack of exercising. The small sample size used in this study may have also affected the results. However, this study sheds light on co-existing morbidities and factors related with LBP that could help to prevent its occurrence in this vulnerable occupational group.

Chapter Five

Conclusions and Recommendations

5.1 Conclusions

The results of this study show that there are significant occupational risk factors for low back pain facing those actively working in the emergency medical services. There was a high prevalence of LBP detected in this study (76%), although a higher percentage was probably aggravated by occupational risk factors, as this figure is higher than seen in the average ranges found in previous studies (Masset and Malchaire, 1994; Andersson, 1999; Walker, 2000). The incidence of episodes of LBP was 21.25% or 2.55 episodes per person per year. The 21.25% annual incidence found in this study is significantly higher than is found in literature for the general population (Andersson, 1999; George, 2002).

With respect to the possible cause 86% of LBP; the participants believed that their current LBP was caused by their occupation. It was also found that 91% of participants believed that their previous LBP had an occupational cause. Furthermore, it was found that 74% of participants did not suffer from LBP prior to working in emergency services. This means that 74% of the prevalent cases (56.24% of total sample) had LBP that occurred after the onset of working in emergency services and was likely caused by exposure to working in emergency services.

Due to the above results the ***first hypothesis*** of this study - that emergency medical personnel should have a higher risk factor for the development of low back pain due to their occupation than the general population - is accepted.

It was further hypothesized that an increase in the number of years working in the field (i.e. years of exposure) should lead to an increased incidence and / or prevalence of low back pain. It was shown that there was a significantly higher exposure time for qualified participants in years working in ambulances, helicopters and in total. This infers that there would be an increased exposure time to occupational risk factors for low back pain. This can be seen in the fact that there was a significantly higher prevalence of low back pain in qualified participants (84%) compared to students (61%). The ***second hypothesis*** is therefore also accepted.

5.2 <u>Recommendations</u>

At the outset of this study it was recognized that the sample would at best reflect a pilot investigation with indications for further study. Thus the inferences made could not be definitive in nature but only give rise to suggestion of possible associations / inferences. Therefore, should this or a similar study be repeated, a larger sample size should be utilized in order to increase the validity of the study and power of the statistics.

Emergency medical personnel face a number of occupational risk factors for the development of low back pain. Some of these risk factors such as motor vehicle accidents and whole body vibration are inherent within the profession with very little recourse to counter these risk factors. Other risk factors can be addressed to try minimizing the affect they have on low back pain. These include exercise and occupational stress.

Exercise: Literature has shown that will decrease the incidence of low back pain (Gatterman, 1990; and Richardson *et al*, 2002; Petersen *et al*, 2002; Aure *et al,* 2003). In this study 100% of those participants who did not exercise suffered from low back pain. From this it can be concluded that a mandatory exercise program for emergency medical personnel will significantly help in reducing the risk of developing low back pain.

It is recommended that prospective emergency medical personnel be ***educated*** on the benefits of exercise while still students. This should be included in the educational course structure with emphasis placed on low back strengthening and stretching exercises. This should be done in conjunction with correct lifting techniques already included in the course structure.

Occupational Stress: Emergency medical personnel, who witness repeated traumatic events, are in a high risk category for posttraumatic stress (Merck Manual, 2004: 556). Various studies indicate an association between psychological factors and the occurrence of low back pain (Andersson, 1999; Davis and Heaney, 2000; Devereux *et al*, 1999). In this study nearly half of the participants (49%) rated their job as stressful. Of those participants that had occupational stress 70% responded that emotional stress was the likely cause. Participants who rated their job as very stressful had the highest levels of low back pain (92%) compared to those who reported little or no stress (62%).

At present no occupational psychological support is offered to emergency medical personnel. It is recommended that compulsory monthly debriefings by a psychologist should be implemented within the profession. The majority of emergency medical bases are located within or very near to hospitals who can offer this service, thereby making these debriefings convenient for emergency services personnel. This could greatly reduce the amount of occupational / posttraumatic stress placed on personnel, thereby reducing the psychological risk for the development of low back pain.

References

American Heart Association. 2005. Cigarette Smoking Statistics [online]. Available from http://www.americanheart.org/presenter.jhtml?identifier=4559. [Accessed 23 August 2005].

Andersson, G. 1999. Epidemiological Features of Chronic Low Back Pain. Lancet. 354: 581- 585.

Aure, O. Nilsen, J. Vasseljen, O. 2003. Manual Therapy and Exercise in Patients with Chronic Back Pain. Spine. **28**. 525 – 532.

Beers, M (ed.) 2004. Merck Manual of Medical Information. 2nd Edition. New York: Simon & Schuster

Bernard, R. 2000. Social Research Methods. California:Sage.

Bigos, S. Battie, M. Spengler, D. Fisher, L. Fordyce, W. Hansson, T. Nachemson, A. Wortley, M. 1991. Aprospective Study of Work Perceptions and Psychsocial Factors Affecting the Report of Back Injury. Spine. **16**. 1 – 6.

Boshuizen, H. Verbeek, J. Broersen, J. Weel, A. 1992. Do Smokers Get More Back Pain? Spine. **18**. 35 – 40.

Campion, J. Maricic, M. 2003. Osteoporosis in men. American Family Physician. **67**. 1521-1528

Cassidy, D. Carrol, L. Cote, P. Berglund, A. Nygren, A. 2003. Low Back Pain After Traffic Collisions. A Population Based Cohort Study. Spine. **28**. 1002 – 1009.

Davis, K. Heaney, C. The relationship between psychosocial work characteristics and low back pain: underlying methodological issues. 2000. Clinical Biomechanics. **15**. 389 - 406

Daffue, Y. (YvetteD@hpcsa.co.za) 25 February 2005. *RE: Emergency Medical Personnel Research*. E-mail to J. Vlok (james_vlok@yahoo.com).

De Montille, N. 2004. Personal communication to J. Vlok. 23 August 2004

De Montille, N. 2005. Personal communication to J. Vlok. 17 September 2005.

Devereux, J. Buckle, P. Vlachonikolis, I. 1999. Interactions between physical and psychosocial risk factors at work increase the risk of back disorders: An epidemiological approach. Occupational and Environmental Medicine. **56**. 343 – 353.

Docrat, A. 1999. A Comparison of the Epidemiology of Low Back Pain in Indian and Coloured Communities in South Africa. Masters Degree in Technology: Chiropractic, Durban Institute of Technology

Gatchel, J. Polatin, P. Mayer, T. 1995. The Dominant Role of Psychosocial Risk Factors in the Development of Chronic Low Back Pain Disability. Spine. **20**. 2702-2709.

Gatterman, M.I. 1990. Chiropractic Management of Spine Related Disorders. Baltimore: Williams and Wilkins.

Gheldof, E. Vinck, J. Vlaeyen, J. Hidding, A. Crombez, G. 2005. The differential role of pain-related fear in explaining back pain and sick leave in occupational settings. Pain. **113**. 71 – 81.

George, C. 2002. The Six-Month Incidence of Clinically Significant Low back Pain in the Saskatchewan Adult Population. Spine. **27**. 1778 – 1782.

Greenbauum, T. 2000. Moderating Focus Groups. California. Sage

Hadler, N. 1997. Back Pain in the Workplace. Spine. 22 935 – 940.

Hagen, K. Thune, O. 1998. Work Incapacity from Low Back Pain in the General Population. Spine. **19**. 2091- 2095.

Herniated Disc. 2005. Neurological Medical Information [online]. Available from http://www.lieberson.com/en/neuro_medical_info/major_procedures/cervical_discectomy_files/image004.jpg. [Accessed 20 June 2005].

Kerr, M. Frank, J. Shannon, H. Norman, R. 2001. Biomechanical and psychosocial risk factors for low back pain at work. American Journal of Public Health. **91**. 1069-1075

Keyserling, W. 2000. Workplace risk factors and occupational musculoskeletal disorders, part 1: A review of biomechanical and psychophysical research on risk factors associated with low-back pain. AIHAJ. 61. 39 - 50.

Kirkaldy-Willis, W.H. and Bernard T.N.1999. Managing Low Back Pain. 4th Edition. Philadelphia USA. Churchill Livingstone.

Ligaments of the Lumbar Spine. 2005. Spine Universe [Online]. Available from http://www.spineuniverse.com/displayarticle.php/article107.html. [Accessed 20 June 2005].

Lumbar Spine Blood supply. 2005. Lumbar Spine Anatomy [online]. Available from http://hippocrates.ouhsc.edu/showcase/Gross/Lab3/Fig2-6.jpg. [Accessed 20 June 2005].

Maharaj, P. (maharajp@dohho.kzntl.gov.za) 19 October 2005. *RE: Emergency Medical Personnel Research*. E-mail to J. Vlok (james_vlok@yahoo.com).

Manga, P. Douglas, A. Swan, W. 1993. Effective Management of Low Back Pain: Its Time to Accept the Evidence. Journal of the CCA. **37**. 221 - 229

Mansfield, N. Marshall, J. 2001. Symptoms of musculoskeletal disorders in stage rally drivers and co-drivers. British Journal of Sports Medicine. **35**. 5. 314-320 (7 pp.)

Masset, D. Malchaire, J. 1994. Epidemiologic Aspects and Work-Related Factors in the Steel Industry. Spine. **19**. 143 – 146.

Moore, K.L. 1992. Clinically Orientated Anatomy. 3rd edition. Baltimore USA. Lippincott Williams & Wilkins.

Moore, K.L. and Dalley, A.F. 1999. Clinically Orientated Anatomy. 4th edition. Baltimore USA. Lippincott Williams & Wilkins.

Mouton, J. 2002. Understanding Social Research. Pretoria: Van Schaik.

Muscles of the Lumbar Spine. 2005. The Back Page [Online]. Available from www.thebackpage.net/ anatomy.htm. [Accessed 20 June 2005].

Nahit, E. Hunt, I. Lunt, M. Dunn, G. 2003 Effects of psychosocial and individual psychological factors on the onset of musculoskeletal pain: Common and site-specific effects. Annals of the Rheumatic Diseases. **62**. 755-760

Palmer, K. Griffin, M. Bendall, H. Pannett, B. Coggon, D. 2000. Prevalence and pattern of occupational exposure to whole body vibration in Great Britain: findings from a national survey. Occup Environ Med. **57**. 229-236

Palmer, K. Syddall, H. Cooper, C. Coggon, D. 2003. Smoking and musculoskeletal disorders: Findings from a British national survey. Annals of the Rheumatic Diseases London. **62**. Iss.1. 33 – 36.

Papageorgiou, A. Croft, P. Ferry, S. Jayson, M. Silman, A. 1995. Estimating the Prevalence of Low Back Pain in the general Population. Spine. **20**. 1889 – 1894.

Peterson, T. Kryger, P. Ekdahl, P. Olsen, S. Jacobsen, S. 2002. The Effect of McKenzie Therapy as Compared with that of Intensive Strengthening Training for the Treatment of Patients with Subacute or Chronic Low Back Pain. Spine. **27**. 1702 – 1709.

Richardson, C.A. Snijders, C. Hides. J. Damen, L. Pas, M. Storm, J. 2002. The Relation between the Tranversus Abdominis Muscles, Sacroiliac Joint Mechanics, and Low Back Pain. Spine. **27**. 399 – 405.

Sydsjo, A. Alexanderson, K. Dastserri, M. Sydsjo, G. 2003. Gender Differences in Sick Leave Related to Back Pain Diagnosis. *Spine*. **28**. 385 – 389.

Teschke, K. Nicol, A. Davies, H. Ju, S. 1999. Whole Body Vibration and Back Disorders Among Motor Vehicle Drivers and Heavy Equipment Operators. A Review of the Scientific Evidence. Report to Appeal Commissioner, Workers Compensation Board of British Coloumbia.

Van der Meulen, A. 1997. An Epidemiological investigation of Low Back Pain in a Formal Black South African Township. Masters Degree in Technology: Chiropractic, Durban Institute of Technology.

Volinn, E. 1997. The Epidemiology of Low Back Pain in the Rest of the world. Spine. **22**. 1747-1754

Walker, B. 2000. The Prevalence of Low Back Pain: A Systematic review of the Literature from 1966 to 1998. Journal of Spinal disorders. **13**. 205 – 217.

Walker, B. Muller, R. Grant, W. 2004. Low Back Pain in Australian Adults. Prevalence and Associated Disability. Journal of Manipulative and Physiological Therapeutics. **27**. 238 – 244.

White, A. and Panjabi M.M. 1990. Clinical Biomechanics of the Spine. 2nd Edition. Philadelphia USA. J.B Lippincott Company.

Yeung, S. Genaidy, A. Deddens, J. Alhemood, A. Leung, P. 2002. Prevalence of Musculoskeletal Symptoms in Single and multiple Body Regions and Effects of Perceived Risk of Injury Among Manual handling Workers. Spine. **27**. 2166 – 2172.

List of Appendices

Appendix A: Emergency Medical Personnel Research Questionnaire

Appendix B: Dummy Letter of Information

Appendix C: Informed Consent Form for Dummy Letter of Information

Appendix D: True Letter of Information

Appendix E: Informed Consent Form for True Letter of Information

Appendix F: Voucher for Free Initial Consultation

Appendix G: Number of registered ANA's, ANT's and BAA's in the Durban Metropolitan area from the Health Professionals Council of South Africa

Appendix H: Permission from the Department of Emergency Medical Care and Rescue at the Durban Institute of Technology.

Appendix I: Permission from STAR to conduct research at their base at Virginia Airport

Appendix J: Permission from Netcare 911 to conduct research at their base at St Augustines Hospital

Appendix K: Permission from ER24 to conduct research at their base at Entabeni Hospital

Appendix L: Focus Group Letter of Information

Appendix M: Focus Group Informed Consent

Appendix N: Focus Group Confidentiality Statement

Appendix B

LETTER OF INFORMATION

Dear Participant

Welcome to my study. The title of my research project is '**A Survey of Occupational Risk Factors in Emergency Medical Personnel**'

Name of supervisor:	**Dr C. Korporaal (031 2042611)**
Name of Research Student:	**James Vlok (031-2042205)**
Name of Institution:	**Durban Institute of Technology**

Background to the study:
Emergency medical personnel have a number of risk factors that have been listed in reviewed literature. These include lifting and carrying of equipment and patients, occupational stress, high levels of patient responsibility, smoking, whole body vibration from vehicles, anxiety and depression. From this it can be hypothesized that emergency medical personnel may suffer from a higher prevalence of musculoskeletal disorders than the general population. This could interfere with their ability to carry out their duties, affect their attitude towards patients and colleagues, and result in increased absenteeism.

Objective of the study:
The aim of this study is to identify the prevalence and risk factors specific to the profession, including biomechanical and psychological factors. The results of this study can be used to implement an educational program in the course structure to make occupational risk factors known and what measures can be taken to combat these factors.

Procedure:
Your participation in this study will consist of 5 – 10 minutes of your time to complete a questionnaire. There is no risk and no cost to you except for a small amount of time.

Benefits:
Your participation will help in highlighting the extent of work-related disorders in your field of work. This will ultimately assist your firm in developing new ways of preventing these problems, thus creating a safer and more comfortable environment for you.

Confidentiality:
All the information obtained from the questionnaire is confidential and will be dealt with only by my supervisor and myself in order to produce the relevant results. This information will then be destroyed.

Remuneration:
For your participation in this study you will receive a voucher that entitles you to one free initial consultation at the Chiropractic Day Clinic at the Durban Institute of Technology. Participation in this study will be entirely voluntary. You are free to leave the research at any time with no consequence.

Your participation in this study is much appreciated and you are assured that your input will be confidential and used for research purposes only.

If you have any further questions please feel free to contact either my supervisor or myself.

James Vlok (Chiropractic Intern)

Dr C. Korporaal (Supervisor)

Appendix C

Informed Consent

Date: ____________

Title of research project: The Prevalence and Occupational Risk Factors of Mechanical Low Back Pain in Emergency Medical Personnel

Name of supervisor: Dr. C. Korporaal

Name of Research Student: James Vlok

Name of Institution: Durban Institute of Technology

Please circle the appropriate answer:

1. Have you read the participant information sheet?
   YES/NO
2. Have you had opportunity to ask questions regarding this study?
   YES/NO
3. Have you received satisfactory answers to your questions?
   YES/NO
4. Have you had an opportunity to discuss this study?
   YES/NO
5. Have you received enough information about this study?
   YES/NO
6. To whom have you spoken regarding this study? **James Vlok**
7. Do you understand the implications of your involvement in this study?
   YES/NO
8. Do you understand that you are free to withdraw from this study at any time without having to give a reason, and without affecting your future health care?
   YES/NO
9. Do you agree to voluntarily participate in this study?
   YES/NO

Participant Name: ___________________________ Signature: ______________________

Witness Name: _____________________________ Signature:______________________

Researcher's Name: _________________________ Signature:______________________

Appendix D

LETTER OF INFORMATION

Dear Participant, I would like to welcome you into my study. The title of my research project is: An Investigation into the Prevalence and Occupational Risk Factors of Low Back Pain in Emergency Medical Personnel

Name of supervisor: **Dr C. Korporaal (031 2042611)**
Name of Research Student: **James Vlok (031-2042205)**
Name of Institution: **Durban Institute of Technology**

Background to the study: Many physical and psychological risk factors have been recognized as a cause of acute or chronic low back pain. These include factors such as manual handling and lifting, unfavorable postures, high levels of patient responsibility, smoking, whole body vibration from vehicles, anxiety, stressful responsibility, mental stress at work and depression. Emergency medical personnel have a number of occupational risk factors that are listed in the reviewed literature as risk factors for mechanical low back pain. From this it can be hypothesized that emergency medical personnel would have a higher prevalence of low back pain than the general population. Low back pain could interfere with their ability to carry out their duties, affect their attitude towards patients and colleagues, and result in increased absenteeism

Objective of the study: The aim of this study is to identify the prevalence and risk factors specific to the profession, including selected risk factors. The results of the study can be used to implement an educational program in the course structure to make the occupational risk factors known and what measures can be taken to combat these factors. The data obtained by means of this questionnaire will allow for further assessment of the risk factors for low back pain that emergency medical personnel working in the field face.

Procedure: Your participation in this study will consist of 5 – 10 minutes of your time to complete a questionnaire. There is no risk and no cost to you except for a small amount of time.

Benefits: Your participation will help in highlighting the extent of work-related disorders in your field of work. This will ultimately assist your firm in developing new ways of preventing these problems, thus creating a safer and more comfortable environment for you.

Confidentiality: All the information obtained from the questionnaire is confidential and will be dealt with only by my supervisor and myself in order to produce the relevant results. This information will then be destroyed.

Remuneration: For your participation in this study you will receive a voucher that entitles you to one free initial consultation at the Chiropractic Day Clinic at the Durban Institute of Technology. Participation in this study will be entirely voluntary. You are free to leave the research at any time with no consequence.

Your participation in this study is much appreciated and you are assured that your input will be confidential and used for research purposes only. If you have any further questions please feel free to contact either my supervisor or myself.

James Vlok (Chiropractic Intern)

Dr C. Korporaal (Supervisor)

Appendix E

Informed Consent

Date: ____________

Title of research project: The Prevalence and Occupational Risk Factors of Mechanical Low Back Pain in Emergency Medical Personnel

Name of supervisor: Dr. C. Korporaal

Name of Research Student: James Vlok

Name of Institution: Durban Institute of Technology

Please circle the appropriate answer:

9. Have you read the participant information sheet?
   YES/NO
10. Have you had opportunity to ask questions regarding this study?
   YES/NO
11. Have you received satisfactory answers to your questions?
   YES/NO
12. Have you had an opportunity to discuss this study?
   YES/NO
13. Have you received enough information about this study?
   YES/NO
14. To whom have you spoken regarding this study? **James Vlok**
15. Do you understand the implications of your involvement in this study?
   YES/NO
16. Do you understand that you are free to withdraw from this study at any time without having to give a reason, and without affecting your future health care?
   YES/NO
9. Do you agree to voluntarily participate in this study?
   YES/NO

Participant Name: ___________________________ Signature: ______________________

Witness Name: _____________________________ Signature: ______________________

Researcher's Name: _________________________ Signature: ______________________

Appendix F

This voucher entitles the bearer to **one FREE initial consultation** at the Chiropractic Day Clinic at the Durban Institute of Technology.

This voucher is for participation in the research entitled 'An investigation into the prevalence and occupational risk factors of mechanical low back pain in emergency medical services personnel' **being conducted by James Vlok.**

An initial consultation takes approximately an hour and a half and consists of a Medical History, Physical Examination, Regional Examination, and Treatment.

Initial consultations by appointment only. Please call (031) 204 2205 / 2512

This voucher is only valid for 2 months from the date of issue.

This voucher entitles the bearer to **one FREE initial consultation** at the Chiropractic Day Clinic at the Durban Institute of Technology.

This voucher is for participation in the research entitled 'An investigation into the prevalence and occupational risk factors of mechanical low back pain in emergency medical services personnel' **being conducted by James Vlok.**

An initial consultation takes approximately an hour and a half and consists of a Medical History, Physical Examination, Regional Examination, and Treatment.

Initial consultations by appointment only. Please call (031) 204 2205 / 2512

This voucher is only valid for 2 months from the date of issue.

Appendix G

Total No of Registered Emergency Care Personnel in the Durban Metropolitan Area by Postal Address Area Code as at 24 February 2005

Sum of	RegisterCode			
PostalCode	**ANA**	**ANT**	**BAA**	**Grand Total**
3610	12	10	49	71
3624			1	1
3629			3	3
4000	6	5	40	51
4001	28	23	85	136
4004	5	5	12	22
4037	8	3	38	49
4051	18	6	26	50
4052	22	7	49	78
4068	75	14	60	149
4091	23	5	44	72
4092	88	18	57	163
4093	44	9	31	84
4126	4	6	28	38
4309			1	1
Grand Total	**333**	**111**	**524**	**968**

Appendix H

TO WHOM IT MAY CONCERN

RE: Mr James Vlok – Research Questionairre

The department of Emergency Medical Care and Rescue hereby grants Mr James Vlok permission to administer a research questionnaire to the second and third year learners within the program.

We anticipate the results of his research and hope that his findings will aid us in teaching our learners how to preserve their backs.

Please note that Mr Vlok will be required to contact the department to arrange a suitable time to administer his questionnaire.

Please feel free to contact the department should you have any queries.

R. Naidoo
Head: Department of Emergency Medical Care and rescue
Faculty of health
Durban Institute of Technology
P.O. Box 1334
Durban
4000

Appendix I

Mon, 14 Mar 2005 10:56:48 +0200

Dear James

Sorry this has taken so long to get back to you, STAR hereby grants you permission to conduct research at our monthly morbidity and mortality meetings as well as the helicopter base at Virginia Airport. Please let me know how I may help in making arrangements to assist the smooth running of your data collection. Don't forget, the M&M meetings are on the last Thursday of every month, 17h30 at the Inkosi Albert Luthuli Central Hospital lecture hall on level 4.

Regards
Dave

David Doull
Specialised Trauma Air Rescue
Regional Operations Manager - KwaZulu-Natal
Cell - 083 4006655
Web - www.star.org.za

Appendix J

Wed, 13 Apr 2005 13:32:23 +0200

Hi James

You are welcome to undertake this research project at our base. Our shifts run from 06h45 until 18h45 and then 18h45 until 06h45.

Regards

Vaughan Tocher
Operations Manager - Netcare 911
St Augustines Hospital

Tel (031) 277 4911
Fax (031) 202 7531
e-mail: vaughant@traumalink.co.za

Appendix K

Mon, 18 Apr 2005 12:03:30 +0200

Hi James

It is fine for you to come in to conduct your research at our base at Entabeni Hospital.

Regards
Ben

Ben Johnson
ER24
Regional Operations Manager Kwazulu Natal
Web: er24dbn@ionet.co.za
tel: 084 556 7910

Appendix L

FOCUS GROUP - LETTER OF INFORMATION

Dear Participant,

I would like to welcome you into my study, the title of my research project is:
An Investigation into the Prevalence and Occupational Risk Factors of Low Back Pain in Emergency Medical Personnel

Background to the study:
Many physical risk factors have been recognized as a cause of acute or chronic low back pain, these include factors such as manual handling and lifting, unfavorable postures, and whole body vibration. Various cross-sectional studies indicate an association between psychological factors and the occurrence of low back pain. These factors include anxiety, depression, stressful responsibility and mental stress at work, and job dissatisfaction.

Emergency medical personnel have a number of occupational risk factors that are listed in the reviewed literature as risk factors for mechanical low back pain. From this it can be hypothesized that emergency medical personnel would have a higher prevalence of low back pain than the general population. Low back pain could interfere with their ability to carry out their duties, affect their attitude towards patients and colleagues, and result in increased absenteeism

Objective of the study:
The aim of this study is to identify the prevalence and risk factors specific to the profession, including selected risk factors. The results of the study can be used to implement an educational program in the course structure to make the occupational risk factors known and what measures can be taken to combat these factors. The data obtained by means of this questionnaire will allow for further assessment of the risk factors for low back pain that emergency medical personnel working in the field face.

Your participation in this study is much appreciated and you are assured that your comments and contributions to the discussion will be kept confidential. The results of the study will only be used for research purposes.

If you have any further questions please feel free to contact either my supervisor or myself.

James Vlok

Appendix M

Focus Group

Informed Consent

Date: 11-11-2004

Title of research project: The Prevalence and Occupational Risk Factors of Mechanical Low Back Pain in Paramedics

Name of supervisor: Dr. C. Korporaal

Name of Research Student: James Vlok

Name of Institution: Durban Institute of Technology

Please circle the appropriate answer:

17. Have you read the participant information sheet? YES/NO
18. Have you had opportunity to ask questions regarding this study? YES/NO
19. Have you received satisfactory answers to your questions? YES/NO
20. Have you had an opportunity to discuss this study? YES/NO
21. Have you received enough information about this study? YES/NO
22. To whom have you spoken regarding this study? **James Vlok**
23. Do you understand the implications of your involvement in this study? YES/NO
24. Do you understand that you are free to withdraw from this study at any time without having to give a reason, and without affecting your future health care? YES/NO

9. Do you agree to voluntarily participate in this study? YES/NO

IF YOU HAVE ANSWERED NO TO ANY OF THE ABOVE, PLEASE OBTAIN THE NECESSARY INFORMATION FROM THE RESEARCHER AND / OR SUPERVISOR BEFORE SIGNING. THANK YOU.

RESEARCH STUDENT: Name______________________.
Signature________________.
(block letters)

PLEASE PRINT IN BLOCK LETTERS

Name:	Signature.	Occupation.	Contact no.
1.			
2.			
3.			
4.			
5.			
6.			

Appendix N

CONFIDENTIALITY STATEMENT

This form needs to be completed by every member of the focus group prior to commencement of the focus group meeting.

Declaration

As a member of this committee I agree to abide by the following conditions:

1. All information contained in the research documents and any information discussed during the focus group meeting will be kept private and confidential. This is especially binding to any information that may identify any of the participants in the research process.

2. The patient files have already been coded and will be kept anonymous, no identification of isolated patient cases will be allowed in the focus group.

3. None of the information shall be communicated to any other individual or organization outside the specific focus group as to the decisions of the focus group.

4. The information of this focus group will be made public in terms of a journal publication, which will in no way identify any participants of this research.

Once this form has been read and agreed to, please fill in the appropriated information on the attached sheet and sign to acknowledge agreement.

Code of Conduct

1. All information contained in the research documents and any information discussed during the focus group meeting will be kept private and confidential. This is especially binding to any information that may identify any of the participants in the research process.

2. None of the information shall be communicated to any other individual or organization outside the specific focus group as to the decisions of the focus group.

3. The information of this focus group will be made public in terms of a journal publication, which will in no way identify any participants of this research.

	Member's full name	**Occupation**	**Signature**	**Contact details**
1				
2				
3				
4				
5				
6				

Appendix A

Emergency Medical Personnel Research Questionnaire

Please tick the appropriate *block / blocks*

Section 1: Demographics

1) What is your qualification?

BAA	
ANA	
ANT	
Student	

2) Ethnic group (for research purposes only)

Black	
White	
Indian	
Coloured	

3) Gender

Male	
female	

4) Age

20 - 30	
31 - 40	
41 - 50	
51+	

5) Do you exercise?

Yes	
No	

> If **Yes** to **5**) above: How many times per week?

1 - 2	
3 - 4	
5 - 6	
7 - 8	
8 +	

> How long do you exercise for per session?

30 min	
45 min	
60 min	
90 min	
> 90 min	

6) Do you smoke?

Yes	
No	

> If **Yes** to **6**) above: How many cigarettes per day?

1 - 5	
6 - 10	
11 - 15	
16 - 20	
21 +	

> How many years have you smoked for?

0 - 1 yr	
1 - 2 yrs	

3 - 4 yrs	
5 - 6 yrs	
7 - 8 yrs	
9 + yrs	

7) Do you have a previous history of smoking but have now stopped?

Yes	
No	

> If **Yes** to **7**) above: How many cigarettes did you smoke per day?

1 - 5	
6 - 10	
11 - 15	
16 - 20	
21 +	

> How many years did you smoke for?

1 - 2 yrs	
3 - 4 yrs	
5 - 6 yrs	
7 - 8 yrs	
9 + yrs	

>How many years have you stopped smoking for?

0 to 2 yrs	
3 to 5 yrs	
6 to 8 yrs	

Section 2: Working History

8) How many years/ months have you been working in the emergency medical services?

Ambulance:	Years		Months	
Response unit:	Years		Months	
Helicopter:	Years		Months	
Total	Years		Months	

9) On average how many hours do you work per month in the field?

less than 40	
40 to 80	
81 to 120	
121 to 160	
161 +	

10) What type of stretcher are you working with?

Self loading	
Non self loading	

11) On average how many kilometers do you travel per shift?

0 to 199	
200 to 399	
400 to 599	
600 to 799	
800 to 999	
1000+	

12) Are you the driver of the vehicle?

Yes	
No	

13) How many motor vehicle accidents have you been involved in while on duty?

0	
1	
2	
3	
4	
5	
6+	

14) How would you rate your occupational stress?

Very stressful	
Stressful	
Little Stress	
No stress	

15) If occupational stress is present above, which of the following is the most likely cause?

Lack of resources	
Monetary compensation	
Emotional stress	
Other	

16) Do you suffer from any of the following symptoms: (You may tick more than one)

Panic attacks	
Flashbacks	
Nightmares	
Insomnia	
Lethargy	

17) Do you suffer from depressive states?

Yes	
No	

If **Yes** to **17**) above, are you taking any antidepressant medication?

Yes	
No	

Section 3: Pain History

18) Do you suffer from pain in any of the following areas:

Neck Pain (cervical)	
Mid-back pain (thoracic)	

19) Do you suffer from low back pain? (Defined as pain in the shaded area on the diagram below)

Yes	
No	

Diagram

20) How many days were you absent from work in the last year due to low back pain?

0	
1 to 4	
5 to 9	
10 to 14	
15 to 19	
20 to 24	
25 to 29	
30 or more	

21) How many days were you booked off for light duty (office work, control room etc) in the last year due to low back pain?

0	
1 to 4	
5 to 9	
10 to 14	
15 to 19	
20 to 24	
25 to 29	
30 or more	

> If you have no low back pain and no history of low back pain you do not need to answer any further questions.

> If you are currently suffering from low back pain please answer the following questions.

22) What is the duration of each episode of your low back pain?

1 to 6 days	

7 to 13 days	
14 to 20 days	
21 to 27 days	
28+ days	

23) What best describes the intensity of your low back pain?

No pain at the moment	
Mild	
Moderate	
Severe	
Worst imaginable	

24) Which term best describes the frequency of your back pain?

Infrequent (1 - 2 days per wk)	
Frequent (3 - 5 days per wk)	
Constant (Daily pain)	

25) Do you believe your low back pain is due to your occupation?

Yes	
No	

> If **Yes** to **25**) above, what do you believe was the cause of your back pain?
(you may tick more than one)

Lifting and carrying equipment	
Lifting patients onto a stretcher	
Carrying a stretcher	
Loading patients into an ambulance / helicopter	
Motor Vehicle Accident	
Slips and falls	
Prolonged periods of driving	
Other	

> If you have had previous history of low back pain please answer the following questions

26) How many episodes of low back pain have you suffered in the last year?

1	
2	
3	
4	
5+	

27) What was the average duration of each episode of your low back pain?

1 to 6 days	
7 to 13 days	
14 to 20 days	
21 to 27 days	
28+ days	

28) What best describes the intensity of your previous episodes of low back pain?

Mild	
Moderate	
Severe	
Worst imaginable	

29) Do you believe your low back pain is due to your occupation?

Yes	
No	

> If **Yes** to **29)** above, what do you believe was the cause of your back pain?
(you may tick more than one)

Lifting and carrying equipment	
Lifting patients onto a stretcher	
Carrying a stretcher	
Loading patients into an ambulance / helicopter	
Motor Vehicle Accident	
Slips and falls	
Prolonged periods of driving	
Other	

30) Did you suffer from low back pain before working in the emergency care field?

Yes	
No	