AN INVESTIGATION INTO THE ASSOCIATION BETWEEN THE CUMULATIVE EFFECT OF STUDYING AND PRACTISING MANUAL THERAPEUTIC TECHNIQUES AND LOW BACK PAIN IN CHIROPRACTIC STUDENTS.

Mini-dissertation in partial compliance with the requirements for the Masters Degree in Technology: Chiropractic, in the Department of Chiropractic at the Durban Institute of Technology.

by

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I, Charmaine Chantel Fyfe, declare that this dissertation represents my own work, both in conception and execution.

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This dissertation is dedicated to my loving parents, Mordecai and Daphne, with all my love and appreciation.
Your support and unconditional love is what got me through all the toughest times.
I love you both with all my heart and soul.

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ABSTRACT

INTRODUCTION

The purpose of this study is to determine whether the cumulative effect of studying, and practising manual therapeutic techniques (including receiving manipulation), is associated with chiropractic students experiencing low back pain (LBP).

According to Smith (2005), students currently registered in the Durban Institute of Technology Health faculty were found to have the highest proportion of LBP when compared to students in other faculties. Thirty seven percent of the students with LBP were chiropractic students.

In a study performed by Macanuel et al. (2005) on undergraduate chiropractic training, it was concluded that chiropractic students experience side effects during chiropractic technique class.

There is epidemiological evidence that chiropractors are a high-risk group of health professionals who experience low back disorders (Tim 1996, Lorme and Naqv 2003, Rupert and Ebete 2004). Rupert and Ebete (2004) suggest that the majority of chiropractors have suffered an occupational injury primarily related to administering manual procedures.

METHOD

All chiropractic students that were present on the day(s) of data collection, and registered at the Durban Institute of Technology, were requested to participate in this study. Each student was presented with a letter of information, a letter of consent and a low back pain questionnaire. The students were requested to answer the questionnaire presented to them.

The questionnaire comprised 53 questions in five sections, covering demographics, study environment, lifestyle factors, low back pain and

chiropractic practice. However, the final questionnaire that was administered, did not have demarcated sections. This helped to avoid bias. The questions were also scrambled to ensure that each question was being answered as a separate entity. This ensured accurate data collection.

The SPSS statistical package was used to analyze the data.

RESULTS AND DISCUSSION

Ninety two point five percent of participants had experienced low back pain at some time in their lives (n=111). Of these, 47.3% (n=52) were currently experiencing low back pain. Those who had had LBP in the past had mainly had it recently (0-6 months previously) but there were three participants who had had the condition for six to ten years. Between first and third year, there was an increase in the prevalence of LBP from 35% to 50%. In fourth years and masters (1) students, there was a decrease in the prevalence. In the second masters year, the prevalence was at its highest (61%).

The time spent practising chiropractic techniques was significantly related to low back pain overall. As the number of hours increased, so did the prevalence of low back pain, but when stratified by year of study, it was apparent that this association was only in the masters students, as the other lower years did not practice for as many hours as the masters students.

CONCLUSION

LBP is prevalent amongst chiropractic students. The year of study does not affect the prevalence; rather the hours spent practicing chiropractic techniques was a significant risk factor, with those practising for more than 21 hours a week having a 22 times higher risk for low back pain than those not practising the techniques. The other factors which were significantly associated could have been as a result of having low back pain and not a causal factor for it. There were no demographic factors associated with low back pain after adjustment for confounders, thus this condition is not limited to certain profiles.

TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 THE PROBLEM AND ITS SETTING

According to the literature, back pain and related conditions rank second only to the common cold as a cause of work absenteeism. Cakmak et al (2004) highlighted the fact that low back pain (LBP) is the most common problem that causes injuries in the younger population. Eighty eight percent of these individuals have pain in their later years. This study indicated that identifying and preventing the associated factors is essential for the solution of this great problem.

Nyland and Grimmer (2003) suggest that physiotherapy students should be alerted to the likelihood of their experiencing LBP and its potential cause during training, so that they enter the workforce with a decreased risk of developing back pain. They recommend that the potential for other undergraduate students to suffer LBP should also be considered.

There is epidemiological evidence that chiropractors are a high-risk group of health professionals who experience low back disorders (Tim 1996, Lorme and Naqv 2003, Rupert and Ebete 2004). Rupert and Ebete (2004) suggest that the majority of chiropractors have suffered an occupational injury, primarily related to administering manual procedures.

In a study by Macanuel et al. (2005) on undergraduate chiropractic training, it was concluded that chiropractic students experience side effects during chiropractic technique class.

A Swiss study performed by Jeannin et al. (2005) concluded that the onset of acute low back pain is often the result of mechanical damage due to excessive and prolonged poor posture and mechanics. Seemingly trivial stress, such as bending over, twisting and lifting can also result in minor irritation that can lead to chronic low back pain (Kirkaldy-Willis et al. 1993).

1.2 RESEARCH QUESTION

Is the cumulative effect of studying, and practising chiropractic technique (including receiving manipulation), associated with chiropractic students experiencing low back pain?

1.3 OBJECTIVES OF THE STUDY

1. Develop and pilot an appropriate questionnaire for chiropractic students.
2. Define and establish a demographic profile.
3. Define or establish the risk factors that exist in each chiropractic student sub-group.
4. Compare the different risk factor profiles between each group.

This research aims to determine whether the cumulative effect of studying, and practising chiropractic technique (including receiving manipulation), is associated with chiropractic students experiencing LBP.

All available chiropractic students at the Durban Institute of Technology were presented with a letter of information and informed consent and were requested to complete a questionnaire regarding LBP.

The SPSS statistical package was used to analyze the data.

1.4 BENEFITS OF THE STUDY

This study aims to identify the number of chiropractic students at the Durban Institute of Technology who have suffered or are suffering with LBP.

This study aims to alert chiropractic students at the Durban Institute of Technology to the likelihood of LBP and its potential cause during training.

It will highlight the importance of chiropractic educators, practitioners and professional organizations recognizing these risk factors and seriously addressing the prevention of these injuries through both training programmes and additional research.

CHAPTER 2

REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

According to the literature, back pain and related conditions rank second only to the common cold as a cause of work absenteeism, and are the most common cause of disability in people under 45 years of age (Manga et al. 1993).

Low back pain is one of the most common and incapacitating disorders in modern society. Eighty to eighty eight percent of people experience incapacitating LBP during their adult lives (Giles 1989). Britain experienced an economic loss of thirty million pounds in 1989 due to this common complaint (Giles 1989).

2.2 AGE

Skovron (1992) suggests that the prevalence of LBP is relatively high among people who are in their twenties and thirties.

Two South African studies, performed on blacks and Indians respectively, (van der Meulen, 1997 and Docrat, 1999) suggest that the prevalence rate of LBP in the 18 to 25 year old age group was higher than the population mean.

Cakmak et al. (2004) highlight the fact that LBP is the most common social problem that causes injuries in the younger population. Eighty eight percent of these individuals have pain in their later years. This study indicates that

identifying and preventing the associated factors is essential for the solution of this problem.

According to Waddell and Burton (2000), the most consistent and strongest predictor of future LBP is the individual's previous history of LBP.

2.3 PHYSICAL EXERCISE

In a study performed by Salminen (1993), it was concluded that inactive subjects are 27% more likely to suffer from LBP than those subjects who exercise once a week. According to several other authors, physical exercise **-** especially core stability exercises, has a positive effect on LBP (Svensson et al. 1983, Kiirkaldy-Willis and Burton 1993, Travell and Simons 1997, Smith 2005).

2.4 ERGONOMICS

Lorme and Navk (2003) performed a study to investigate whether chiropractor's workstation table height and the tasks they perform make them more susceptible to low back strain. They found that the lowest table height was the most straining for all tasks and concluded that workstation table height had a significant effect on low back load.

2.5 MEDICAL CONDITIONS

According to the literature, subjects currently experiencing urinary tract infections (UTI) and depression have a higher prevalence of LBP (Kumar et al. 1997, Haslett et al. 1999, Korporaal 2002, Smith 2005). According to Korporaal (2002), urinary tract infections are a cause of LBP, and LBP, is frequently reported by people who suffer from emotional or psychological disorders (Kirkaldy-Willis and Burton 1993).

2.6 LOW BACK PAIN IN STUDENTS

According to Smith (2005), students currently registered in the Durban Institute of Technology Health Faculty were found to have the highest proportion of LBP when compared to other faculties. Thirty seven percent of the students suffering with back pain were chiropractic students. It was also found that students who had to sit for long periods or work in uncomfortable positions during the course of their studies were more likely to experience LBP.

In a study performed in 2002 investigating sixteen to twenty year old students, it was established that back pain was one of the common self-reported health care needs (Jeannin et al. 2005).

In another study performed in Kuwait investigating ten to eighteen year olds, it was established that LBP is associated with the following factors: an increase in age, being female, strenuous physical activity and the time spent watching television (Shehab and Al-Jarallah, 2005).

2.7 LOW BACK PAIN IN HEALTH CARE STUDENTS

According to Smith and Leggat (2004) in their study among rural Australian nursing students, it was found that LBP was the most common condition reported. In another study investigating nursing students in Japan, the prevalence of LBP was much higher than pain in other areas of the body (Smith et al. 2003).

In a study investigating undergraduate physiotherapy students in Austria in 2001, a high prevalence of low back pain was reported (Nyland and Grimmer, 2003). The results of this study showed that the risk of LBP increased significantly for the students once they completed their first year of study. Spending more than twenty hours per month, sitting looking down, was significantly associated with a

one month LBP prevalence. Treating patients for more than twenty hours per month was associated with a one week LBP prevalence. According to the authors, physiotherapy students should be alerted to the likelihood of LBP and its potential cause during training, so that they enter the workforce with a decreased risk of developing low back pain. They recommend that the potential for other undergraduate students to suffer LBP should also be considered.

Regulies and Krause (2005) suggest that work related musculo-skeletal disorders (of which LBP is the most prevalent) account for the largest single category of lost time in occupational injury and disease episodes in industrialised countries. They also suggest that low back pain represents a serious health risk, and is therefore a real health care problem.

2.8 LOW BACK PAIN IN CHIROPRACTORS

There is epidemiological evidence that chiropractors are a high risk group for low back disorders (Tim 1996, Lorme and Naqv 2003). In a study performed by Rupert and Ebete (2004), it was suggested that the majority of chiropractors have suffered an occupational injury primarily related to administering manual procedures. This study highlighted the importance of chiropractic educators, practitioners and professional organisations recognizing these risk factors and seriously addressing the prevention of these injuries through both training programmes and additional research. Byfield and Maher's study (2003) concluded that chiropractors suffer from a higher incidence of neck and shoulder pain when compared with any other healthcare workers.

In a Swiss study performed by Jeannin et al. (2005), it was concluded that the onset of acute LBP is often the result of mechanical damage due to excessive and prolonged poor posture and mechanics. Seemingly trivial stress, such as bending over, twisting and lifting can also result in minor irritation that can lead to chronic LBP (Kirkaldy-Willis et al. 1993).

Nyland and Grimmer 2003 point out that physical factors like heavy physical work, lifting, bending, twisting and static postures make the subjects of the study more prone to experiencing LBP.

2.9 CHIROPRACTIC MANIPULATION AND ITS EFFECTS

The specific indications for adjustment are joint dysfunction or loss of movement in the range of joint play. According to McMennell (1960), 'no more than one joint should be manipulated at one time, no more than one movement in one joint should be attempted and no forceful movements should be used' (McMennell, 1960. page 113). During chiropractic practical classes, students may manipulate more than one segment and segments that are not fixated, which may leave chiropractic students with more back pain than others due to excessive manipulation. Schneider et al. (1988) concur with this.

Macanuel et al. (2005) conducted a study investigating the side effects sustained by chiropractic students during their undergraduate training in chiropractic technique class. The study concluded that chiropractic students experience side effects (similar to those experienced by patients under clinical care), during chiropractic technique class and that chiropractic students might be more prone to lumbo-pelvic injuries, especially during side-posture manipulation techniques. These injuries were however most frequently described as mild and self-limiting. Most injuries were reported in students' second year of study in Canada, which corresponds to the fourth year of study in South Africa (if this study was conducted in Canada or the USA, then their second year corresponds to our fourth year because they do two years of pre-med). Macanuel et al. (2005) suggests that the following strategies should be adopted to minimize the occurrence and frequency of injuries sustained by chiropractic students:- "reduce the number of consecutive attempts at achieving joint cavitation; minimize the amount of time a student is placed in a rotated pre-tension position prior to the

attempt; and devote more time in selecting an appropriate clinical target", (page 53).

2.10 CONCLUSION

To date, no research has been conducted to investigate whether the cumulative effect of studying, and practising chiropractic technique (including receiving manipulation), is associated with chiropractic students experiencing LBP.

Therefore, this research aims to determine whether the cumulative effect of studying, and practising chiropractic technique (including receiving manipulation), is associated with chiropractic students experiencing LBP.

CHAPTER 3

MATERIALS AND METHODS

3.1 STUDY DESIGN

This was a descriptive study, mainly quantitative in nature, and it made use of a structured questionnaire to collect the data.

3.1.1 SAMPLE

All chiropractic students that were present on the day(s) of data collection, and registered at the Durban Institute of Technology, were requested to participate in this study. Each student was presented with a letter of information, a letter of consent and a LBP questionnaire.

The students were requested to answer the questionnaire presented to them.

3.1.2 SELECTION PROCEDURE

All chiropractic students that were present and registered at the Durban Institute of Technology were requested to participate in this study.

The students were instructed not to write their names, student numbers or any form of identification on the questionnaire presented to them. This was to maintain the anonymous nature of the questionnaire and the confidentiality of the subject. The questionnaires were to be stored at the Chiropractic Day Clinic for five years following the study. Thereafter, they would be shredded.

A minimum of eighty percent of the class population or twenty students in each student sub-group was required to answer the questionnaire for the results to be valid. This catered for students who were sick or not available for other reasons, to answer the questionnaire.

1ST YEAR	**2ND YEAR**	**3RD YEAR**	**4TH YEAR**	**MASTERS First Registration**	**MASTERS Successive Registration**
Study	Study	Study	Study	study	
		Receive manipulation	Receive manipulation	Receive manipulation	Receive manipulation
Perform motion palpation	Perform motion palpation	Perform motion palpation and manipulation	Perform motion palpation and manipulation	Perform motion palpation and manipulation	Perform motion palpation and manipulation
				Treat patients	Treat patients

The data collection took place over approximately three days.

3.1.3 INCLUSION AND EXCLUSION CRITERIA

INCLUSION CRITERIA

In order to be accepted for participation in this study, students had to comply with the following criterion.

- All students needed to be registered chiropractic students of the Durban Institute of Technology.

EXCLUSION CRITERIA

Participants were excluded from this study if they:

- Did not comply with the above inclusion criteria,
- Had systemic or pathological disorders affecting the lumbar spine, including arthritides, infections or malignancies,
- Had any contraindications to manipulation of the lumbar spine,
- Did not complete the questionnaire adequately,
- Did not sign the letter of informed consent,

3.2 STUDY MATERIALS

3.2.1 QUESTIONNAIRE BACKGROUND

The questionnaire used was adapted from two questionnaires:

a) A questionnaire formulated by Tim (1996) regarding the prevalence of LBP in practicing chiropractors,

b) A questionnaire formulated by Smith (2005) regarding LBP in students at a tertiary institution.

This questionnaire was validated by the use of two focus groups. The first focus group consisted of representative students of the groups under investigation. Before commencing the focus group, each participant was required to read and sign a letter of information (Appendix D), a letter of informed consent (Appendix E) and confidentiality statement (Appendix F). Each participant was then given a low back pain questionnaire. Each question was critically discussed and amended where appropriate. A video of the focus group was made and is available for observation of the content of the discussion.

The second focus group consisted of qualified chiropractors in the chiropractic department At the Durban Institute of Technology. During this focus group, the entire study was discussed. Comments were made on how the study and questionnaire could be modified in order to accurately assess and answer the research question. Suggestions for change were analyzed by the group and the changes were effected.

The questionnaire was refined, considering the comments made by both groups.

The questionnaire was piloted to pre-test and confirm the validity of the questionnaire.

The questionnaire comprised 53 questions in five sections, covering demographics, study environment, lifestyle factors, LBP and chiropractic practice. However, the final questionnaire that was administered, did not have demarcated sections. This helped to avoid bias. The questions were also scrambled to ensure that each question was being answered as a separate entity. This ensured accurate data collection.

The questions were predominantly closed, however a qualitative element was included in a small number of questions.

3.3 STATISTICAL METHODS

3.3.1 STATISTICAL METHODOLOGY

SPSS version 11.5 was used for data analysis (SPSS Inc, Chicago, Ill, USA). Descriptive statistics were achieved using frequency tabulations and charts for categorical variables, and summary statistics such as mean, standard deviation and range for quantitative variables. Risk factors for current LBP were examined using Pearson's chi square tests/Fisher's exact tests, and Students t-tests where appropriate, stratified for year of study. For variables where sample size was small due to non response, for example, Time spent doing aerobic activity weekly, non-parametric Mann-Whitney tests were used. Time spent doing certain exercise activities weekly was calculated by multiplying the number of sessions by the duration of each session. Multivariate logistic regression analysis was used to assess the independent effects of various risk factors on current LBP whilst controlling for year of study. A p value of <0.05 was considered as statistically significant.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 INTRODUCTION

In this chapter the results of the statistical analysis of the data are presented. A discussion of the results is also presented in this chapter.

4.2 DATA

4.2.1. Primary Data

The primary data used in this study were obtained from a questionnaire. The questionnaire consisted of three main sections: demographics, lifestyle factors and LBP. Two qualitative questions were asked in this questionnaire, regarding perceived causes of LBP and recommendations to decrease the students' exposure to LBP.

4.2.2 Secondary Data

The secondary data that were used was obtained from various sources, namely, the internet, journal articles and books.

4.3 DEMOGRAPHIC DATA AND RESULTS

4.3.1 Age

There were one hundred and twenty chiropractic students that participated in the study. Their ages ranged from 18 to 37 years, with a mean age of 22.7 years and a standard deviation of 3.5 years.

4.3.2 Gender

There were similar proportions of males and females in the sample: 56 males and 64 females. The gender distribution is shown in Figure 1.

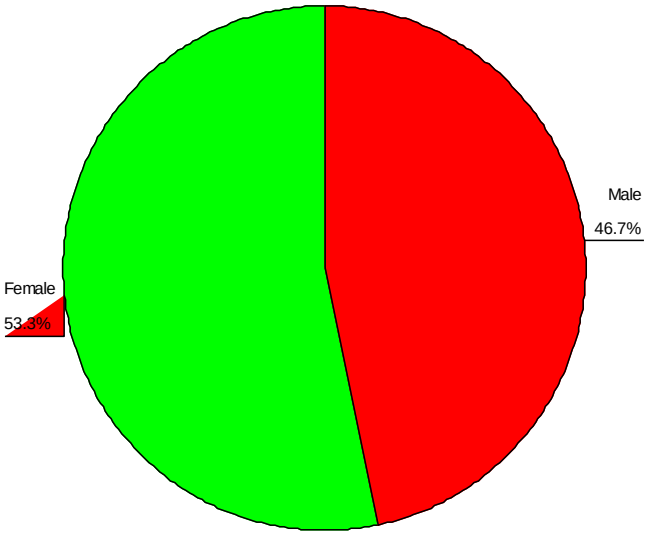

Figure 1: Gender distribution of the sample (n=120)

The gender distribution in this study was almost equal.

4.3.3 Race

The majority of participants were White (n=79, 66.4%) followed by Indian (n=32, 26.9%). The race distribution is shown in Table 1. There was one missing value. This could be due to a student not answering the question.

Table 1: Racial distribution of the sample (n=119)

	Frequency	Percent
Black	6	5.0
White	79	66.4
Coloured	1	.8
Indian	32	26.9
Israeli	1	.8
Total	119	100.0

4.3.4 Years of study

Table 2 shows that there were approximately equal proportions of participants in all the years of study, except for fourth year students, who constituted only 8.3% of the sample.

Table 2: Year of study of sample participants (n=120)

	Frequency	Percent
First	23	19.2
Second	20	16.7
Third	24	20.0
Fourth	10	8.3
Masters (1)	20	16.7
Masters (2)	23	19.2
Total	120	100.0

The reason there was an 8.3% response in the fourth year class was that many of the students were not present at lectures on the day the questionnaire was distributed. Three of the fourth year students participated in the focus group, and therefore could not participate in the study.

There were approximately 210 students registered for chiropractic for the year 2005 at the Durban Institute of Technology. There was a response of more than fifty percent (half the population), even though the response from the fourth year class was poor.

4.3.5 Health status

Asthma and other diseases were the most prevalent conditions reported (see Figure 2). These were followed by low back injury and depression. The majority of participants were healthy and reported no disease conditions (n=88, 73.3%).

14.2% (n=17) of the participants reported experiencing recent urinary tract infections. 53% of these reported experiencing low back pain during the urinary tract infection. 64.1% of the females (n=41) reported low back pain when menstruating.

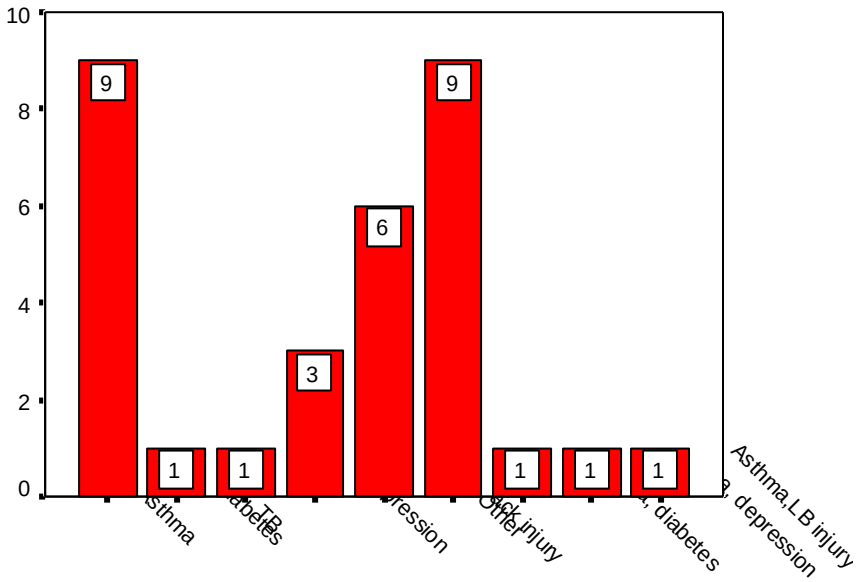

Figure 2: Conditions reported by study participants (n=32)

The question regarding low back injury was not answered as desired. Some students assumed that their low back pain was a low back injury, so they indicated they had a low back injury when in fact they had low back pain. This question was referring to any accidents which had occurred, injuring the lower back.

Other conditions that were reported were headaches, neck pain and sinusitis. There were a significant number of students experiencing other conditions.

According to the literature, subjects currently experiencing urinary tract infections and depression have a higher prevalence of low back pain (Kumar et al. 1997, Hope et al. 1998, Haslett et al. 1999, Korporaal 2002, Smith 2005). According to Korporaal (2002), urinary tract infections are a cause of LBP, and LBP is frequently reported by people who suffer from emotional or psychological

disorders (Kirkaldy-Willis and Burton 1993).

According to this study's findings the association between urinary tract infections as risk factors for present low back pain, was not significant. These findings are not consistent with the literature mentioned in this study.

In this study, there is a high prevalence of asthma in chiropractic students. These findings are consistent with the study performed by Smith (2005), where he found that asthma was also very prevalent in the student population.

4.3.6 Low Back Pain

Ninety two point five percent of participants had experienced LBP at some time in their lives (n=111). Of these, 47.3% (n=52) were currently experiencing LBP.

Most of those who had had LBP in the past had had it recently (within the previous six months) but there were three participants who had had the condition for six to ten years. This is shown in Table 3. There was one missing value. This could be due to a student's not answering the question or answering it incorrectly.

The results of this study show that there are a significant number of chiropractic students that experience LBP. These findings support the study performed by Smith (2005). He found students currently registered in the Durban Institute of Technology Health Faculty had the highest proportion of LBP when compared to other faculties. Thirty seven percent of the students with LBP were chiropractic students. It was also found that students who had to sit for long periods or work in uncomfortable positions during the course of their studies were more likely to experience LBP. Chiropractic students sit for long periods while they study and work in uncomfortable positions, during chiropractic practical classes.

Table 3: How long ago did you have Low back pain?

	Frequency	Valid Percent
0-6 months	79	71.8
6-12 months	16	14.5
2-5 yrs	12	10.9
6-10 yrs	3	2.7
Total	110	100.0

One hundred and eleven students had experienced low back pain at some time in their lives. This table shows that a total of 95 (79+16) students had experienced LBP in the past year. All the students in the study had been studying chiropractic for at least six months, since the questionnaire was administered in October. It is clear from these results that a large number of students experience low back pain.

This table also shows that the number of students experiencing LBP decreases as the years of study increase. This suggests that students could be adapting to the pain as they continue with their studies, or perhaps they ignore it more than the younger students.

In Table 4, the respondents reported the intensity of their LBP. The previous LBP was more severe on the whole than the present LBP.

Table 4: Intensity of previous and present Low back pain

Intensity	Previous LBP		Present LBP	
	Frequency	Percent	Frequency	Percent
Mild	41	38.3	33	54.1
Moderate	49	45.8	25	41.0
Severe	17	15.9	3	4.9
Total	107	100.0	61	100.0

The number of students who answered yes to the direct question regarding present low back pain was 52. This value will be regarded as correct, since it was a direct question. The value above, 61, is incorrect. This question may not have been worded clearly. An explanation for this discrepancy could be that the question was ambiguous.

The results show that the frequency of subjects experiencing mild to moderate pain was greater than that of those experiencing severe pain.

Table 5 shows that previous LBP tended to be more frequent than current LBP, but that current LBP was more constant.

Table 5: Frequency of previous and present Low back pain

Frequency	Previous LBP		Present LBP	
	Frequency	Percent	Frequency	Percent
Infrequent	68	64.8	38	61.3
Frequent	32	30.5	16	25.8
Constant	5	4.8	8	12.9
Total	105	100.0	62	100.0

This number 62 can also be regarded as incorrect, since the correct value is 52 (as explained above). An explanation for this discrepancy could be that some students answered the question regarding the frequency or infrequency of episodes of pain, while others answered regarding the frequency of pain within the episode.

There was not much difference in the length of time that participants had had previous and current LBP. Both were mainly for within one year. Few participants had LBP for more than ten years. This is shown in Table 6.

Table 6: Duration of previous and present Low back pain

Duration	Previous LBP		Present LBP	
	Frequency	Percent	Frequency	Percent
0-1 yr	45	48.4	26	51.0
2-3 yrs	26	28.0	13	25.5
4-5 yrs	14	15.1	7	13.7
6-9 yrs	6	6.5	4	7.8
10-14 yrs	2	2.2	1	2.0
Total	93	100.0	51	100.0

Only seven students (5.8%) reported having to stay away from work due to low back pain. None had had surgery on the lower back.

4.3.7 Treatment of low back pain

Seventy one (59.2%) participants had had treatment for LBP at some time and twelve (10%) students were currently being treated. The vast majority had been treated by a chiropractor (n=83, 69.2%), three were treated by a physiotherapist

and two by a masseur. GPs, pharmacists and homeopaths were only used by one participant each. This is shown in Figure 3.

Only one participant was not satisfied with the quality of treatment received. This was someone who was treated by both a chiropractor and a physiotherapist. Only four participants were dissatisfied with the outcome of treatment and all four had been treated by chiropractors.

In future studies, students should be further interviewed regarding their dissatisfaction with chiropractic care in order to better understand this problem.

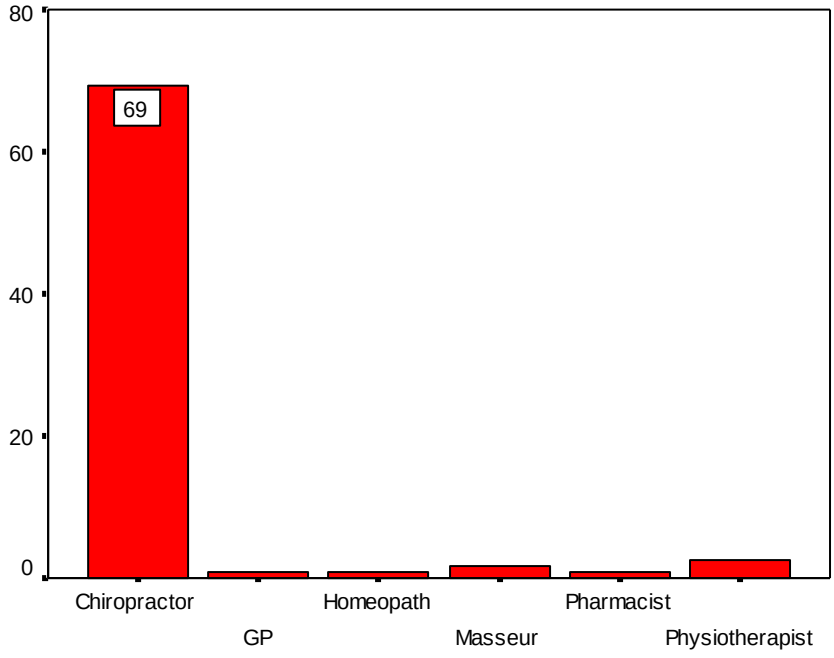

Figure 3: Percentage of participants receiving treatment by type of practitioner

The results in this section show that many students had been treated by a chiropractor. This is because all the students have access to chiropractic interns at the Chiropractic Day Clinic, situated at the Durban Institute of Technology.

4.3.8 Back pain and daily activities

Tables 7 to 13 show the responses to the questions on daily activities and low back pain. They are also shown graphically in Figure 4. The activities that caused the most LBP were poor posture and sitting at a desk.

Table 7: Responses to "sitting at my desk causes LBP"

	Frequency	Percent
Never	22	18.3
Infrequent	49	40.8
Frequent	40	33.3
Constant	8	6.7
N/A	1	.8
Total	120	100.0

Table 8: Responses to "performing normal daily activities causes LBP"

	Frequency	Percent
Never	51	42.5
Infrequent	54	45.0
Frequent	10	8.3
Constant	1	.8
N/A	4	3.3
Total	120	100.0

Table 9: Responses to "sitting and leaning forward causes LBP"

	Frequency	Percent
Never	31	25.8
Infrequent	55	45.8
Frequent	26	21.7
Constant	6	5.0
N/A	2	1.7
Total	120	100.0

Table 10: Responses to "standing and leaning forward causes LBP"

	Frequency	Percent
Never	40	33.3
Infrequent	42	35.0
Frequent	28	23.3
Constant	7	5.8
N/A	3	2.5
Total	120	100.0

Table 11: Responses to "Frequent bending and twisting causes LBP"

	Frequency	Percent
Never	26	21.7
Infrequent	54	45.0
Frequent	31	25.8
Constant	5	4.2
N/A	4	3.3
Total	120	100.0

Tables 8 to 11 (performing daily activities, sitting and leaning forward, standing and leaning forward, and frequent bending and twisting) will be discussed as a whole, since the movements are similar. In each group, a large number of students frequently experience pain during the movements. These findings are in keeping with the findings of Jeannin et al. (2005) and Nyland and Gimmer (2003). These studies concluded that physical factors like heavy physical work, lifting, bending, twisting and static postures make the subjects of the study more prone to experiencing LBP. Seemingly trivial stress, such as bending over, twisting and lifting can also result in minor irritation that can lead to chronic LBP (Kirkaldy-Willis et al. 1993).

Table 12: Responses to "use of incorrect furniture causes LBP"

	Frequency	Valid Percent
Never	17	14.3
Infrequent	50	42.0
Frequent	45	37.8
Constant	5	4.2
N/A	2	1.7
Total	119	100.0

A total number of 100 students infrequently, frequently, or constantly experienced low back pain due to the use of incorrect furniture. This is a significant number of students and highlights the fact that this is a common problem. In the study performed by Lorme and Navk (2003), they concluded that workstation table height had a significant effect on low back load.

Table 13: Responses to "incorrect posture causes LBP"

	Frequency	Percent
Never	14	11.7
Infrequent	51	42.5
Frequent	49	40.8
Constant	6	5.0
Total	120	100.0

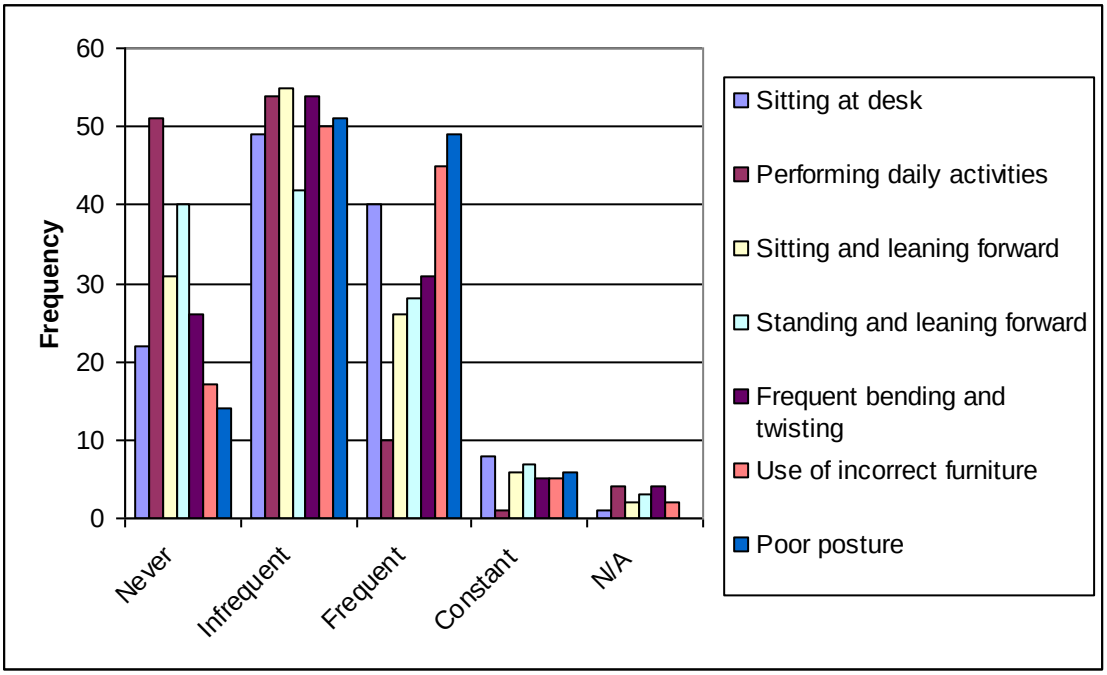

Figure 4: Number of participants who responded in each category for the activities shown

Thirty two point eight percent, (n=39), participants reported that performing a specific movement causes or aggravates their low back pain. This response is shown in Table 14.

Table 14: Performing a specific movement and Low back pain

	Frequency	Percent
Yes	39	32.8
No	68	57.1
N/A	12	10.1
Total	119	100.0

The specific movements recorded to cause LBP were, flexion, extension and lateral flexion. Students also revealed that lying prone and standing and sitting for prolonged periods aggravated their LBP.

4.3.9 Risk factors for current LBP by the group

There was no statistically significant association between year of study and current experience of LBP (p=0.460, Table 15). However, between first and third year, there was an increase in the prevalence of LBP from 35% to 50%. In fourth year and masters (1), there was a decrease in the prevalence. In second masters year, the prevalence was at its highest (61%).

The prevalence of LBP increases when students first start studying chiropractic, (first year to third year). Perhaps this is because when they start studying, they have to study for very long hours. In fourth year, the students start to adapt to the pain and the different lifestyle. The reason that the prevalence of LBP increases in the masters students could be because masters students are highly stressed due to working on their research, internship and working in the clinic.

Table 15: Cross-tabulation between year of study and current LBP

			Do you currently experience LBP		Total
			Yes	No	
YEAR	First	Count	8	15	23
		Row %	34.8%	65.2%	100.0%
	Second	Count	8	12	20
		Row %	40.0%	60.0%	100.0%
	Third	Count	12	12	24
		Row %	50.0%	50.0%	100.0%
	Fourth	Count	4	6	10
		Row %	40.0%	60.0%	100.0%
	Masters (1)	Count	7	13	20
		Row %	35.0%	65.0%	100.0%
	Masters (2)	Count	14	9	23
		Row %	60.9%	39.1%	100.0%
Total		Count	53	67	120
		Row %	44.2%	55.8%	100.0%

P=0.460

Initially, risk factor analysis was crude (without taking account of year of study, ie. overall), then stratified by year of study to assess intra-group risk factors in Table 16. However, due to decreased power in the stratified analysis, Type II errors may have been made, i.e., a significant difference might not be found even when one exists, due to the small sample size. In addition, Fisher's exact tests were used to increase validity in small sample sizes, but this was only possible for two by two tables. Where the levels of risk factors exceeded two, Pearson's chi square had to be used, and the validity of the chi square statistic may be questionable where numbers in cells were less than five.

Gender was associated with LBP at the crude level (p=0.017) but not after stratification for year of study. A higher percentage of females had LBP on the crude analysis.

Age was not associated with LBP overall, except at the masters (1) year (p=0.032) where the mean age of those who did not have current LBP was older than those who did.

For statistical purposes, race was reclassified into White, Indian and other to avoid an invalid chi square test due to small sample sizes in some groups.

Hours spent practising chiropractic techniques was significantly related to LBP overall (as the number of hours increased so did the prevalence of LBP), but when stratified by year of study, it was apparent that this association was only in the masters students as the other lower years did not practice for as many hours as did the masters students.

Similarly, interrupted sleep was only a significant risk factor in the masters (2) year.

Lack of exercise was a significant risk factor in the third year group only. In a study performed by Salminen (1993), it was concluded that inactive subjects are 27% more likely to suffer from LBP than those subjects who exercise once a week. According to many other authors, physical exercise, especially core stability exercises have a positive effect on (Svensson et al .1990, Kiirkaldy-Willis and Burton 1993, Travell and Simons 1997, Smith 2005).

Table 16: Associations between risk factors and present LBP

Factor	Crude p value	Stratified p value by year of study					
		First	Second	Third	Fourth	Masters (1)	Masters (2)
Gender	0.017*	0.400	0.197	0.100	1.000	0.651	0.383
Age	0.242	0.875	0.090	0.188	0.244	0.032*	0.245
Race	0.448	0.894	0.175	1.000	0.732	0.374	0.160
Urinary tract infection	0.201	0.269	#	0.640	#	0.613	0.253
LBP when had UTI	0.233	0.667	0.158	0.165	1.000	0.896	0.207
LBP when menstruating	0.165	0.660	0.281	0.085	0.240	0.199	0.412
Hours seated	0.118	0.420	0.475	0.126	0.841	0.080	0.529
Hours practicing chiropractic technique	0.006*	0.657	0.650	0.721	#	0.043*	0.015*
Hours practicing motion palpation	0.029*	0.567	0.584	0.591	0.400	0.022*	0.164
Enjoy studying	0.780	0.758	0.267	0.496	0.392	0.249	0.086
Hours slept	0.133	0.685	0.197	0.214	0.190	0.368	0.308
Interrupted sleep	0.045*	1.000	1.000	0.193	1.000	0.356	0.040*
How do you sleep	0.247	0.273	0.210	0.475	0.108	0.386	0.678
Smoking	0.081	0.379	0.242	1.000	0.335	0.550	0.068
Exercise	0.072	1.000	1.000	0.037	0.400	1.000	1.000
How many hours exercise per week	0.847	0.411	0.153	0.825	0.306	0.469	0.235
Part time job	0.089	0.657	1.000	0.214	1.000	0.122	1.000
Hours worked per week	0.214	0.259	0.391	0.216	0.132	0.312	0.552
How many months have you had the job	0.243	0.207	0.307	0.164	0.462	0.975	0.757
Self adjust	0.358	1.000	0.373	1.000	0.500	0.356	0.400
Receive adjustment	0.044*	0.193	1.000	1.000	#	1.000	#

* statistically significant at 0.05 level

not able to calculate as no cases in that stratum

Time spent doing various activities did not influence prevalence of LBP. This is shown in Table 17.

Table 17: Associations between time spent in activities and present LBP

Time spent in activity	P value – crude
Time spent doing aerobics weekly (n=14)	0.945
Time spent cycling weekly (n=13)	0.214
Time spent golfing weekly (n=11)	0.516
Time spent playing hockey weekly (n=5)	0.264
Time spent paddling weekly (n=8)	0.377
Time spent playing rugby (n=7)	0.417
Time spent running (n=34)	0.238
Time spent playing racquet sports (n=19)	0.964
Time spent swimming (n=15)	0.548
Time spent walking (n=20)	0.267
Time spent playing water polo (n=4)	0.655
Time spent weight training (n=32)	0.285

* statistically significant at 0.05 level

not able to calculate as no cases in that stratum

This table shows that sport does not affect the results.

4.3.10 Adjusted risk factors for current LBP

A backwards stepwise logistic regression model based on likelihood ratios was specified with entry and exit probabilities set at 0.05 and 0.1 respectively. The model was completed in 10 steps. Variables entered on step 1 were: age, gender, race, year of study, UTI, UTI pain, hours spent seated, hours spent practicing chiropractic techniques, hours spent practicing motion palpation, smoking, exercise, part time job, self adjustment and received adjustment.

Table 18 shows the results of the final model. Hours spent seated, exercise, receiving adjustment, and hours spent practising chiropractic were independent risk factors for LBP. Spending 21 to 30 hours seated compared with 1-10 hours was a five times higher risk for developing LBP (95% CI 1.4 to 18.4). Spending 31 hours or more seated was a 5.1 times higher risk for LBP than spending 1-10 hours seated. However, this factor may have been as a result of the LBP rather than a causal factor for it (reverse causality). Interrupted sleep was not statistically significant (p=0.092) but those who had interrupted sleep were two times more likely to have LBP than those who did not have interrupted sleep, but this could have also been an example of reverse causality. Doing no exercise created almost four times increased risk **-** again this could be as a result of the LBP and not a causal factor for it. Not receiving adjustments was significantly associated with low back pain. Those who did not receive adjustments were 84% protected from low back pain, which again might be due to reverse causality i.e: that if students do not have LBP, they will not receive treatment for it, and therefore will not receive manipulation. As hours spent practising chiropractic increased, so did the risk of LBP, with those who practised more than 21 hours a week being at a 22 times increased risk than those who practised for 0 hours. This is the only factor which is not affected by reverse causality. The year of study was not significant and was eliminated from the model on step 6.

Table 18: Logistic regression analysis of risk factors for current LBP

Variables	p value	OR	95.0% C.I. for OR	
			Lower	Upper
Hours spent seated (baseline 1-10)	.055			
Hours spent seated (11 to 20)	.221	2.362	.596	9.357
Hours spent seated (21 to 30)	.013	5.086	1.405	18.416
Hours spent seated (31+)	.018	5.144	1.327	19.933
Sleep Interrupted (yes)	.092	2.183	0.880	5.416
Exercise (no)	.023	3.691	1.194	11.411
Received adjustment (no)	.021	.159	.033	.763
Hours spent practicing chiropractic (baseline 0)	.024			
Hours spent practicing chiropractic (1 to 10)	.482	.688	.242	1.951
Hours spent practicing chiropractic (11 to 20)	.823	1.176	.286	4.838
Hours spent practicing chiropractic (21+)	.010	21.940	2.077	231.808
Constant	.196	.382		

4.4 CAUSES OF LOW BACK PAIN

Listed below are the causes of low back pain, as found in this study.

1. Studying and sitting for prolonged periods
2. Treating patients (at the chiropractic clinic, sports events and community service)
3. Non-weight bearing sports
4. Weight bearing sports
5. Muscle strain (including myofascial trigger points)
6. Bad posture
7. Incorrect ergonomics
8. Stress
9. Chiropractic practical classes (receiving multiple manipulations, excessive self manipulation, poorly practiced manipulations)
10. Menstruation

4.5 RECOMMENDATIONS TO DECREASE STUDENTS' EXPOSURE TO LOW BACK PAIN

Listed below are recommendations to decrease students' exposure to low back pain, as found in this study.

1. Ergonomics (increase height of chiropractic tables and massage beds, correct height of the desks and chairs, mobile stools in treatment rooms)
2. Correct posture (especially while treating patients)
3. Receive chiropractic treatment
4. Perform core stability exercises and low back stretches everyday (also swimming, home exercise programs)
5. Physical education classes as part of syllabus (warm up and cool down of back muscles before and after chiropractic practical classes)
6. Techniques to decrease low back pain (back pain education from 1st year)
7. Manipulate only affected areas
8. Do not over manipulate the same segment

4.6 SUMMARY AND CONCLUSION

LBP is prevalent amongst chiropractic students. The year of practice does not affect the prevalence, rather the hours spent practising chiropractic techniques was a significant risk factor, with those practising for more than 21 hours a week having a 22 times higher risk for LBP than those not practising the techniques. The other factors that were significantly associated, could have been as a result of having LBP and not a causal factor for it. There were no demographic factors associated with LBP after adjustment for confounders, thus this condition is not limited to certain profiles.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The aim of this research was to determine whether the cumulative effect of studying, and practising chiropractic technique (including receiving manipulation), is associated with chiropractic students experiencing LBP.

The results of this study suggest that LBP is prevalent amongst chiropractic students. The hours spent practising chiropractic techniques, (more than 21 hours per week), was a significant independent risk factor for LBP. This was the only factor, which is not affected by reverse causality. Those who did not receive adjustments were 84% protected from LBP, which again might be due to reverse causality i.e.: that if students do not have LBP, they will not receive treatment for it, and therefore will not receive manipulation. The other factors, which were significantly associated, could have been as a result of having LBP and not a causal factor for it. There were no demographic factors associated with LBP after adjustment for confounders, thus this condition is not limited to certain profiles. Doing no exercise created almost four times increased risk - again this could be as a result of the LBP, and not a causal factor for it.

This study provides evidence that the cumulative effect of studying, and practising chiropractic technique, is associated with chiropractic students experiencing LBP. Further studies should be performed regarding LBP in chiropractors and chiropractic students. Studies investigating why the time spent practising chiropractic techniques, is a significant risk factor for LBP, will be very beneficial for chiropractic students and the chiropractic profession.

5.2 Recommendations

- Question 22 – level of play should have been explained in the questionnaire (social, club or professional).
- Question 29 – 31 – these questions regarding previous and present intensity, frequency and duration of LBP should have been more clearly worded. Some of the subjects did not answer these questions correctly. There were some discrepancies in the statistical analysis of these questions.
- Specific questions should have been asked regarding how many times the subjects were adjusted by a fellow student, fifth year student, sixth year student and a qualified chiropractor.
- This questionnaire was administered at the end of the year. In further studies, it should be administered at the beginning of the year, when most students are attending all their lectures.
- Questionnaires should be developed specifically for master's students – perhaps specific questions should be asked regarding receiving manipulation, administering manipulation and administering soft tissue therapy.
- This was a baseline study to determine whether chiropractic students experience LBP. Further more in-depth studies should be performed to investigate exactly why chiropractic students experience LBP. Perhaps an interview type study will be beneficial.
- Each participant should have received a full physical and regional exam to acquire objective results as well.

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