



5-2015

Effects of Chiropractic Adjustment on Malalignment of Posture and Lumbosacral Complex Pain

Annie W. S. Chen

Follow this and additional works at: <http://vc.bridgew.edu/theses>



Part of the [Sports Sciences Commons](#)

Recommended Citation

Chen, Annie W. S.. (2015). Effects of Chiropractic Adjustment on Malalignment of Posture and Lumbosacral Complex Pain. In *BSU Master's Theses and Projects*. Item 24.

Available at <http://vc.bridgew.edu/theses/24>

Copyright © 2015 Annie W. S. Chen

EFFECTS OF CHIROPRACTIC ADJUSTMENT ON MALALIGNMENT OF
POSTURE AND LUMBOSACRAL COMPLEX PAIN

A Thesis Presented

by

Annie W.S. Chen

Submitted to the Graduate School of Bridgewater State University in partial fulfillment of
the requirements for the degree of

MASTER OF SCIENCE IN ATHLETIC TRAINING

May 2015

EFFECTS OF CHIROPRACTIC ADJUSTMENT ON MALALIGNMENT OF
POSTURE AND LUMBOSACRAL COMPLEX PAIN

A Thesis Presented

By

Annie W.S. Chen

Approved as to style and content by:

(Chairperson of Thesis Committee) Date

(Member) Date

(Member) Date

Abstract

Title of Thesis: EFFECTS OF CHIROPRACTIC ADJUSTMENT ON
MALALIGNMENT OF POSTURE AND LUMBOSACRAL
COMPLEX PAIN

Annie Wing Si Chen, Master of Science, 2015

Thesis directed by: Dr. Pamela J. Russell
Professor
Movement Arts, Health Promotion and Leisure Studies
Department

The purpose of this study was to investigate the effects of chiropractic adjustments on malalignment of the posture and lumbosacral complex pain. About fifty billion dollars a year was spent on treatment of lower back pain in about 80% of the population.¹ Athletes at Bridgewater State University were used as participant in the study during a chiropractic clinic at the Tinsley athletic training room. The method used to collect data was using Coach My Video and Dartfish apps on the iPad to capture footage to analyze the pre and post effects of chiropractic adjustments. The Dartfish app was used to create angles of measurements to analyze the position of the glenohumeral joint against the baseline on the wall behind the participant. A survey was used to assist in evaluation of participants knowledge of chiropractic medicine and lumbosacral complex pain. The results show that there was no change seen in posture. There was a statistically significant reduction in pain between pre and post chiropractic adjustments.

Acknowledgements

I dedicate this to my family and especially to my grandfather, Tang Chen, who passed just shy of a month to the start of my Masters program at Bridgewater State University. His wish was to see me graduate from college and go on to get my Masters. Today, I have accomplished this goal he had for me. He was my hero and my biggest cheerleader. Thank you for being my father figure and teaching me to be a kind hearted, hardworking, and open-minded individual.

I dedicate this to Cailey A. Bilodeau. Cailey was a fellow classmate whom unfortunately passed away during our two-year Masters program. She was a loving and caring individual who always knew how to put a smile on our faces with her humor during class. She was also in the process of writing her thesis and today, I complete my own in honor of her. Although we only knew her for 8 months, she brought our cohort together and turned it into a family. Rest in the sweetest peace Cailey.

Thank you to Dr. Pamela Russell for guiding me through this research process for the past four semesters at Bridgewater State University. Dr. Russell gave life to my thesis and expanded my curiosity for research in the sports medicine realm. Thanks for always giving me positive reinforcement and encouraging me to keep on pushing forward when I thought I was ready to give up.

I would like to also thank my committee members, Dr. Suanne Mauer-Starks, my professor and advisor, and Dr. Kathleen Laquale, my sports nutrition professor. Thank you Dr. Mauer-Starks and Dr. Laquale for taking time from your busy schedules to review and provide feedback to my thesis.

Table of Contents

<u>Section</u>	<u>Page</u>
Introduction.....	1
Literature Review.....	3
Anatomy of Spine.....	3
Anatomy of Sacrum and Sacral Iliac Joint.....	6
Biomechanics of SI joint.....	7
SI Joint Dysfunctions.....	7
Use of Chiropractic Medicine to Cure Ailments.....	10
Chiropractic Treatment and Posture.....	12
Summary.....	14
Methods.....	16
Participants.....	16
Instruments.....	16
Procedures.....	19
Data Analysis.....	20
Results.....	22
Discussion.....	25
Conclusion.....	27
References.....	28
Appendix A.....	30
Appendix B.....	35
Appendix C.....	38

Table of Figures

<u>Section</u>	<u>Page</u>
Figure 1. Anatomy of the lumbar vertebrae.....	4
Figure 2. Anatomy of the spine.....	5
Figure 3. Lumbo-sacro complex.....	6
Figure 4. Arabesque.....	8
Figure 5. Elite Rower.....	8
Figure 6. Baseline and iPad tripod set-up.	17
Figure 7. Visual Analogue Scale.....	18
Figure 8. Pain Map.....	18
Figure 9. Pre and Post Adjustments of Glenohumeral Joints from Dartfish App.....	21

List of Tables

<u>Section</u>	<u>Page</u>
Table 1. Subject Demographics.....	22
Table 2. Pre/Post and Returning Pre/Post Visual Analogue Scale Ratings.....	23
Table 3. Region of Pain Pre and Post Adjustment.....	24
Table 4. Posture Changes.....	24

In the United States population, many individuals¹ suffer from excruciating lower back pain. About fifty billion dollars a year is spent on treatment of lower back pain in about 80% of the population.¹ The many solutions to help with this problem involve large doses of medication and surgical interventions. However, many people prefer the use of chiropractic medicine instead of the commonly used medical methods. Chiropractic adjustments have been viewed as an alternative way of healing all aspects of the body. This alternative medicine gives rise to a holistic mechanism of healing through the triggering of dermatomes and myotomes of the body. Dermatomes are unilateral areas of the skin that sensory nerves from the spinal cord innervate.⁶ Myotomes are the unilateral muscle area that is innervated by a single spinal nerve.⁶ An individual may feel sensations of numbness and tingling if there is spinal nerve damage or impingement. Adjustments of the spine also play a major role by realigning the body and taking pressure off areas of the spine that may cause pain and discomfort.

Studies done on lower back pain have shown that the use of coupling agents with chiropractic adjustment is effective.¹ The concentration of this study was on the integrity of the lumbosacral complex of the body of Division III collegiate sport athlete. The purpose of this study was to examine the effects of chiropractic adjustments on pain and posture in collegiate athletes. The hypothesis was that chiropractic adjustments would decrease pain in the lumbosacral complex and positively affect the posture of someone who presents with lumbosacral pain. The dependent variables were pain in the lumbosacral complex and posture and the independent variable was chiropractic adjustment to the spine.

The operational definitions of this study can be identified as chiropractic adjustments, lower back pain (LBP), lumbosacral, posture, sacroiliac joint (SI joint), and SI joint dysfunction. Chiropractic adjustments are defined as the technique used to manipulate the vertebrae to realign the spine to correct posture and SI joint malalignment. Lumbosacral is defined as the area of the spine associated with the lumbar vertebrae and sacrum. Lower back pain (LBP) is defined as uncomfortable sensations such as soreness, aching, and shooting pain radiating from the SI joint up the lumbar spine and the surrounding musculoskeletal region. Posture is defined as the position of the spine when standing or seated. The SI joint is the region where the sacrum and the iliac meet. SI joint dysfunction is defined as the imbalance of the sacroiliac joint.

Assumptions of the study were that malalignment of posture affected low back pain in Division III collegiate athletes. Malalignment of posture will then affect the lumbosacral region causing pain. This study will be delimited to Division III collegiate athletes at Bridgewater State University. Another delimitation to this study is chiropractic adjustments will only be performed bi-weekly by Dr. Elfman at Bridgewater State University.

The importance of this study is to show that chiropractic adjustments can be used more frequently when treating an athlete for lower back pain. By realigning the posture of the athlete, he or she may get more relief of pain. Supplemental sports medicine care is provided in traditional athletic training rooms today. The value of this study is the cost of treatment may become less using holistic treatment and may help a larger population of athletes suffering from lower back pain.

Review of Literature

Although chiropractic medicine has been around since the Greeks ruled the Roman Empire, Chatman-Smith explains that chiropractic medicine was first widely developed and used in Iowa in 1895 by a man by the name of David Palmer.⁶ Not until the 1970s was chiropractic medicine fully recognized as a true health care route for those whom seek holistic medicine. Chiropractic medicine is the use of spinal manipulation that may alter one's health. The subtopics that will be discussed in the review of literature will be the anatomy of the spine, anatomy of the lumbosacral joint, use of chiropractic medicine to cure ailments, lumbosacral complex dysfunction, chiropractic treatment options and posture for lumbosacral complex dysfunction using chiropractic medicine.

Anatomy of the Spine

The spine is constructed of thirty-three vertebrae in charge of postural control and support of the skull. It is broken up into four sections: cervical spine, thoracic spine, lumbar spine, and sacral spine. The cervical, thoracic, and lumbar spines create the curvature of the spine and depending on the individual can produce too much curvature on a specific location. The spine is made up of vertebrae that vary between the cervical, thoracic, and lumbar regions. The different regions of the spine are made up of different surface areas, sizes, and shapes. Starting from the cervical region of the spine, the vertebrae become larger as the spine transitions to the thoracic, lumbar and sacral regions. Each vertebra consists of the vertebral body, spinous process, vertebral foramen, transverse process, superior articular process, superior articular facet, costovertebral facet, transverse foramen, and inferior articular facet. Figure 1 shows the lumbar spine and the anatomy of the vertebrae.

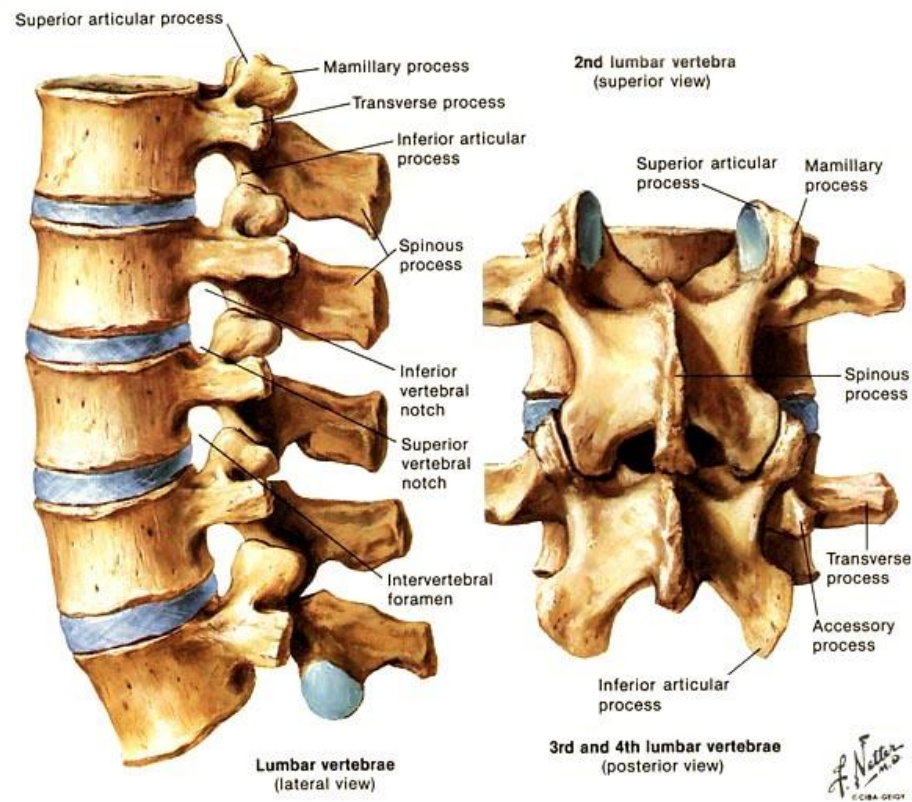


Figure 1. Anatomy of the Lumbar Vertebrae.

Retrieved from: <http://perfectgolfswingreview.net/pivot.htm>

Each section of the spine comprises intervertebral discs that serve as shock absorption and increase range of motion of the spine. Intervertebral discs are made of the annulus fibrosus surrounding the nucleus pulposus. The annulus fibers are formed into an X pattern. Annulus fibers secure both the superior and inferior vertebrae together in the spine. The nucleus pulposus is made up of 60-70% water allowing for compression and deformation. For the purpose of this study, we will examine the lumbar spine down to the sacral spinal region of the body¹². Lumbar spine can be viewed in Figure 2.

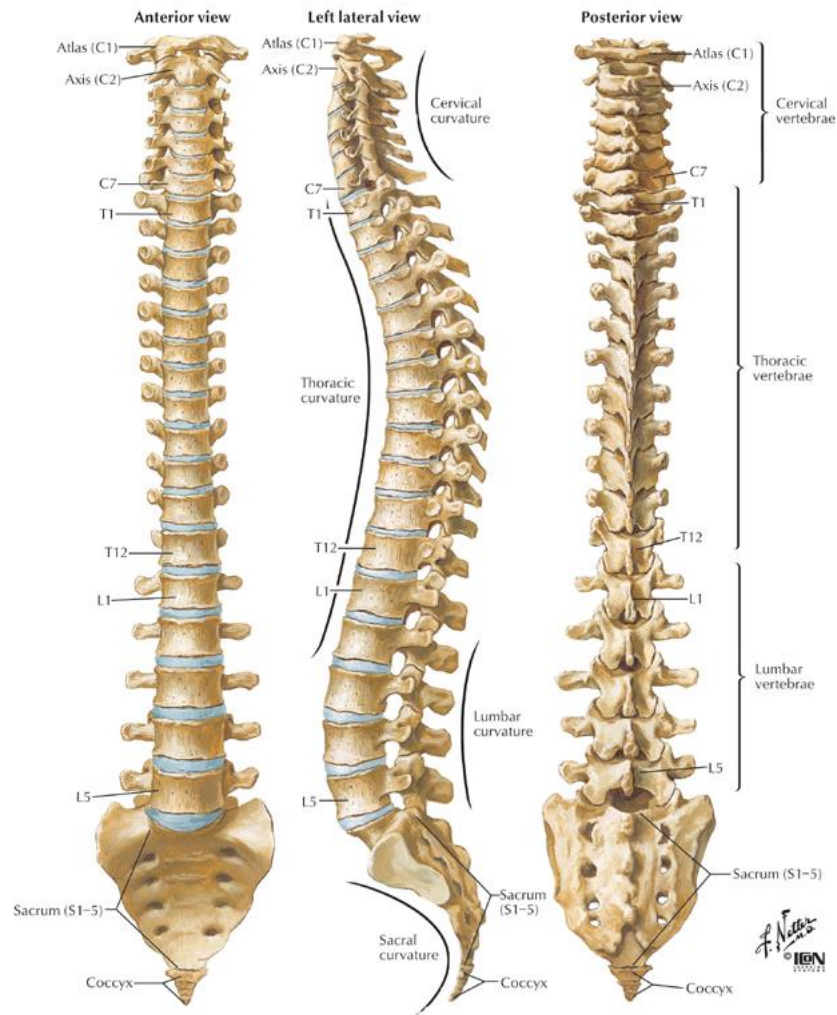


Figure 2. Anatomy of the Spine.

Retrieved from: <http://ittcs.wordpress.com/2010/05/05/anatomy-and-physiology-the-spinal-column/>

The muscles innervating the spine control the posture and stabilization of the spine. Muscles that are involved are divided into two categories extrinsic and intrinsic.. In this study concentrated on the intrinsic muscles of the body involved in the integrity of the lumbosacral region. The intrinsic muscles of the spine are iliocostalis lumborum,

iliocostalis thoracis, longissimus thoracis, spinalis thoracis, spinalis thoracis, semispinalis thoracis, multifidus, and rotatores of the lumbosacral region¹².

Anatomy of the Sacrum and Sacroiliac Joint

Continuing down the spine is the midpoint or center of gravity where the upper extremity and the lower extremity of the body meet; thus known as the pelvic region or the sacroiliac joint. For the purpose of this research, we will be using the term sacroiliac joint (SI joint). In Starkey's findings¹², the SI joint region of the body is immobile compared to the spine, however, the movement of the hip is greatly dependent on this region when standing, walking, running and all other physical activities. Though the SI joints are immobile there is some rotational movement and translational movement of the ilium and if the area is stressed to a certain extent this may cause SI joint dysfunction. The SI joint is comprised of the sacrum and two iliac bones fused together by the pubic symphysis. Figure 3 shows the anatomy of the SI joint along with the lumbar spine.

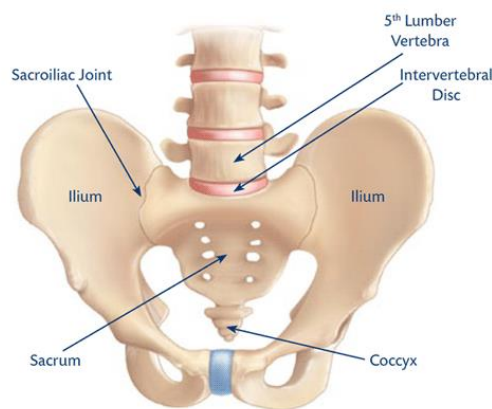


Figure 3. Lumbo-sacro Complex.

Retrieved from: <http://si-lok.globusmedical.com/anatomy-of-the-si-joint/>

Although muscles directly affect the movement of the SI joint, Starkey¹² states that there are two causes of SI joint dysfunction. The first cause is that muscles that are involved with the hip joint may cause problems due the origin of the muscle on the sacrum. Secondly, the SI joint may be affected by the musculature of the pelvis, which can cause rotational issues¹².

Biomechanics of the SI joint

The function of the SI joint is to weight bear and absorb energy that is placed on the body. The SI joint helps the body evenly distribute weight to the upper and lower extremities of the body. Small sagittal rotational movements are made in the posterior portion of the sacroiliac vertebrae, S2, of the spine. Many nerves innervate from the SI joint region giving the spine sensation of pain when the nerves or vessels branching from the SI region are compromised.⁵ In conclusion, motions such as spinal flexion or extension and rotational movements may cause radiating SI joint pain and discomfort, especially if an individual has improper biomechanics.

SI Joint Dysfunctions

The outcome of SI joint dysfunction causes the major issue of LBP¹² LBP is frequently seen in the general population, athletes and specifically in dancers.⁵ About 12% of dancers complain of LBP. The SI joint of dancers plays a role in dance since there are many movements involved in the rotation, extension and flexion of the lower extremities of the body. Although problems can arise in the SI joint, researchers argue that most commonly seen LBP is due to surrounding muscular structures around the SI joint.⁵ See Figure 4 for example of ballet movement.



Figure 4. Arabesque.

Retrieved from <http://www.dancer.com/artistDetail.php?id=25>.

Timm⁶ studied SI joint dysfunction in elite rowers. Many elite rowers are prone to SI joint dysfunction but this issue has barely been studied. Timm⁶ explained that during rowing strokes, there are about 3330 N of compressive force placed on the SI joint in women and about 3919 N in men. This is due to the spinal extension in the catch and drive stroke of rowing. With the large forces applied to the SI joint lumbosacral pain results. Figure 5 shows elite rower in motion.



Figure 5. Elite Rower.

Retrieved from <http://www.carlosdinares.com/page/2/>

In a study by Arab et al¹ the researchers argued there was no significant change in hamstring length and gluteal muscle strength. This study was performed without chiropractic adjustments. The purpose of this study was to look at the relationship between hamstring length and gluteal muscle strength in individuals with sacroiliac joint dysfunction. The study showed about 159 subjects had LBP between the ages of 20 to 65 years of age. Testing procedures for SI joint dysfunction called for thigh thrusts or posterior shear test, compression test, distraction test, sacral thrust test, and measuring the hamstring muscle strength and gluteus maximus muscle strength.¹ About 66% of the sample had SI joint dysfunction with gluteal weakness while 34% had LBP without SI joint dysfunction. This study showed that SI joint dysfunction was prevalent in elite rowers and perhaps chiropractic procedures can help. However, musculoskeletal activity may cause the initial pain.

The importance of the SI joint is significant in all aspects of upper and lower movement of the body. In the study done by Timm⁶ the researcher explained SI joint dysfunction as the change in mobility of the SI joint's range of motion. The change in the SI joint's range of motion creates an imbalance in structures such as the sacrum and ilium; thus causing LBP.⁶ DeMann explained that during gait of dancers, the SI joint protects the lumbar discs by decreasing the torsional stress during pelvic rotation.⁵ On the contrary, Lindsay et al⁷ found that 47% of elite skiers had asymmetrical SI joints and 73% had lumbosacral dysfunction. Although the researchers⁷ findings show a high percentage in asymmetry of the SI joints, lumbar complications were not always associated with SI joint dysfunction as previously thought.⁷ Chiropractic adjustments were recommended by primary care physicians as part of rehabilitation although not

much information was given on the effectiveness of the manual manipulation of the spine in both studies.

Use of Chiropractic Medicine to Cure Ailments

The use of chiropractic medicine alone can be effective to cure a variety of body ailments. However, many studies examined the effectiveness of chiropractic adjustments and the coupling effect of topical creams and the comparison of muscle relaxants to the adjustments. In a study done by Zhang et al⁸ researchers determined that Biofreeze enhanced the effectiveness of pain relief when coupled with chiropractic adjustments. About 40 individuals participated in this study over a 4-week period. They were broken up evenly into an experimental and control group. The experimental group of the study received both chiropractic adjustments and Biofreeze application after adjustments and an at-home treatment of Biofreeze while the control group only had chiropractic adjustments. Measurements in this study were recorded by five different methods: visual analog scale, Roland Morris disability questionnaire, low back muscle EMG, and heart rate variability. The results showed the use of Biofreeze in conjunction to chiropractic adjustments significantly reduced lower back pain in the experimental group. The control group did not show the same results as compared to the experimental group and saw no significant reduction in pain.⁸ This study did not show the specific effect on the SI joint however, the coupling method of Biofreeze and chiropractic adjustments alleviated general LBP faster. Although topical application of coupling methods prove to be effective, today medications are often used in place of chiropractic medicine or in conjunction with medication in pill-form.

The use of traditional medicine has become quite popular to treat LBP. In a study done by Hoiriis et al⁹ the purpose was to compare chiropractic adjustments to muscle relaxants and a placebo/sham treatment to see if there was a reduction in lower back pain. This study called for volunteers from ages 21 to 59 years with uncomplicated LBP of 2 to 6 weeks duration. There were three groups in the study, one received chiropractic adjustments and a medical placebo, the second group received only muscle relaxants and sham adjustments, and the third group received a medical placebo and sham adjustments for 2 weeks. The visual analog scale for pain, Oswestry Disability Index, Modified Zung, and Schober's test were used to measure the results. The results, from the medical placebo along with chiropractic adjustments, showed that there were improvements in LBP after 2 weeks and more after a 4-week follow up. However, chiropractic adjustments on the participants with only chiropractic adjustments were shown to be more effective than the placebo and muscle relaxants used.⁹ After reviewing these articles, the use of Biofreeze and chiropractic adjustments and chiropractic adjustments alone were more effective than coupled with a muscle relaxant or medical placebo. The debate over the use of chiropractic adjustments alone between the elderly population is geared more towards the holistic healing and the younger population is fully immersed in the technological world of health sciences.

In today's society, chiropractors work in conjunction with other healthcare physicians. Many individuals that seek chiropractic health care vary from the elderly to the younger and more active populations. Newborn children are being adjusted immediately after they leave the womb of their mother. The elderly population is also firm believers in chiropractic healing. This elderly population believes that chiropractic

medicine fixes ailments causing lower back and hip pain.⁸ In the past several decades, studies have shown that the elderly populations are living longer and make up about 16.7% of the United States.⁶ Many elderly are prescribed prescription medications to alleviate pain. However, the contraindications of the prescription drugs are causing negative side effects in the health of the older generation. The elderly population uses chiropractic adjustments as a holistic outlet of pain relief instead of traditional medicine.⁶ Although chiropractic medicine is mainly utilized by the older blue-collar generation⁶ today many college students and athletes have made chiropractic medicine part of their healthcare regimen during their active seasons of their sports. Collegiate athletes and students, compared to the older generation, are more active due to the health conscious society and the increased popularity of sports. However, researchers must focus more into the actual problem causing LBP because today, LBP does not only affect the sedentary, but also the younger and more active individuals as well.

Chiropractic Treatment and Posture

Many people today, especially children and young adults, have all constantly developed postures that would be considered improper by the older generation. Posture is derived from the musculoskeletal effects that result in a variety of postural deficiencies. Normal posture is called orthoposition, when posture deviates from normal it is described as mild defined as about 25% from normal deviation, moderate about 50% deviation, and severe at 75% deviation.¹² Posture can contribute to indirect and direct overuse injuries.¹² Postural deviations or malalignments may cause pain to radiate down to the lumbosacral hip complex. To help alleviate the individual's pain, many individuals are referred to the chiropractor for adjustments. In a study done by Nigg et al¹⁰ a force plate was used to

test gait. Chiropractic manipulation was used to address lower back pain then an improvement of gait was recorded on a force plate. The changes were recorded from individuals with asymmetric gaits before the treatments and then became symmetric after the treatment.¹⁰

As part of LBP rehabilitation, most individuals are sent to physical therapy seeking pain relief in their SI joints. However, chiropractic adjustment treatment is another option to alleviate pain in the lumbosacral region. Chiropractic adjustments are also known as spinal manipulations. The technique used in spinal manipulations or chiropractic adjustments is to increase joint mobility in hypomobile joints in the spine. To increase joint mobility the chiropractor applies a direct force to the hypomobile joint.¹¹ Chiropractic medicine is believed to heal neuromusculoskeletal issues of an individual without the use of traditional medicine.¹¹ It is also believed that chiropractic medicine affects factors that influence motor behaviors of the body.¹¹

Not only do chiropractic adjustments improve joint mobility but also running performance as seen in a study done by Smith et al.¹² The study that was performed was to observe the outcome of chiropractic adjustments on running posture and a 5 year old child with xeroderma pigmentosum. Xeroderma pigmentosum (XP) is a rare genodermatosis transmitted as a recessive trait.¹¹ Those with XP generally are highly photosensitive and develop skin tumors and locomotor patterns that cause falling when running due to a trunk forward lean posture. Trunk forward lean was defined as the angle between a line connecting the hip joint and the shoulder joint and a horizontal line passing through the hip joint.¹¹ The goals of the treatment were to improve walking and sitting. The subject completed 6 running trials before chiropractic adjustments and then

another 6 running trials after chiropractic adjustments. The results of the study showed an immediate improvement in her running pattern. Her trunk forward lean angle decreased to 4.68 degrees and her step length increased.¹¹ The importance of this was that after chiropractic adjustments, her posture improved while her trunk forward lean and step length increased with positive feedback.

Summary

People seeking chiropractic medicine are those who have constant neck, spine and back pathologies that hinder their everyday lifestyle.⁶ Musculoskeletal issues arise in most adults and children in the United States.⁶ The anatomy of the SI joint is important for the clinician to know because of the many different nerves that branch out from the lumbo-sacral region of the spine. Pain may be caused by the improper biomechanics due to deviated posture and malalignment of the SI joint that may compromise and put pressure on the nerves causing pain in the lumbosacral complex. The use of alternative chiropractic medicine to alleviate LBP is a non-traditional way to avoid major side effects from prescription drugs or surgical procedures. However, clinicians must look at specific areas causing LBP such as SI joint dysfunction. SI joint dysfunction may not be the issue as seen on opposing studies performed.^{1,11} The research that has been done has limited sample sizes and not enough trials to fully demonstrate the effectiveness of chiropractic adjustments on the SI joint. Many elite athletes have been studied however not much research has been done on athletes in the collegiate setting. More research needs to be performed on the future on chiropractic medicine to see the true affects on the lumbosacral hip complex in collegiate athletes. The importance of the study is to show holistic medicine such as chiropractic adjustments to treat pain in the lumbosacral

complex of athletes. The use of holistic medicine may decrease the cost of medical bills and limit the used of medication that may only hide the true origin of the individuals pain. The importance of this study is to show that chiropractic adjustments can be used as an alternate method of treatment for those who suffer from lumbosacral complex pain. Healthcare providers should also realize that pain may be suffered in the lumbosacral complex but the posture should also be evaluated because there may be a correlation to pain due to malalignment of posture.

Methods

Participants

Bridgewater State University collegiate athletes volunteered to participate in this study. They signed a consent form and a video consent form approved by the BSU IRB (Appendix A.) before the first adjustment made by the chiropractor. The inclusion criteria for our subjects were athletes at the ideal age of the eighteen to twenty-five showing signs of lumbosacral complex pain. The exclusion criteria for subjects were athletes with no pain or who had prior surgery on the lower back. Both female and males who played a spring or fall sport at Bridgewater State University were asked to volunteer.

Instruments

The instruments that were used in this study are the iPad, tripod, leveler, tape measure, painter's tape, Visual Analog Scale, pain map, and surveys. Painter's tape was used as a baseline for measurements and comparisons regarding posture before and after the chiropractic adjustments. To measure the base line, our lines were marked on the wall where the participant stood in front of for research using blue painters tape. The horizontal lines were measured about 8 ½ inches from the ground up and 8 ½ inches apart. A leveler was used to place the tape horizontally on the wall to eliminate errors. A vertical line bisected the three horizontal lines made by the painters tape measuring about 7 feet. A leveler again was used for a more accurate alignment of the tape. A blue tape maker was placed on the ground so that participants could reference to where they needed to stand in front of the tape on the wall. The three horizontal lines were used as baseline reference points for the glenohumeral joint, knee joint, and the ankle joint (Figure 6.) Participants were asked to stand in front of the lines, located inside of the Tinsley athletic

training room and a picture was taken of the frontal and sagittal plane of the body. The application used on the iPad was the camera application or the Coach My Video application and data were analyzed using Dartfish Express. The iPad was placed on a tripod to eliminate any errors that may occur during video data collection and analysis. The app was used to calculate the shoulder angle in the frontal view and to assist in evaluation of posture.

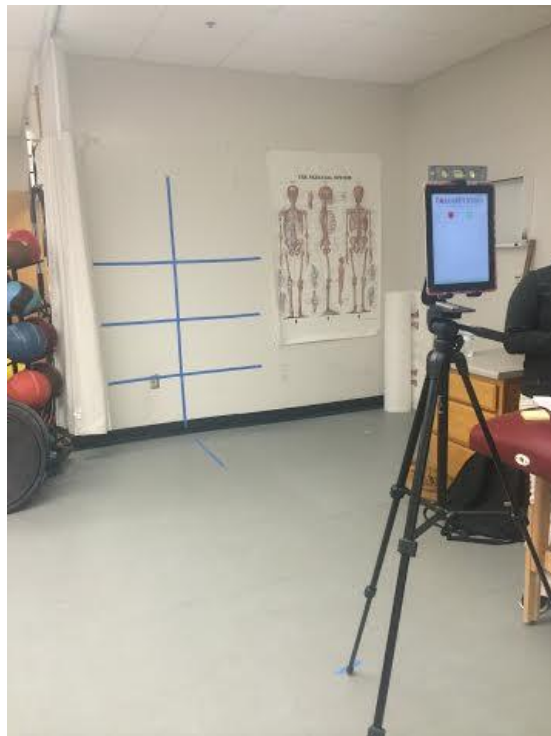


Figure 6. Baseline and iPad Tripod Set-Up.

The visual analog scale (Figure 7) proves to be a reliable source of measuring LBP.^{6,12} The visual analog scale measured the dependent variable, which was pain of the lumbosacral complex pain.

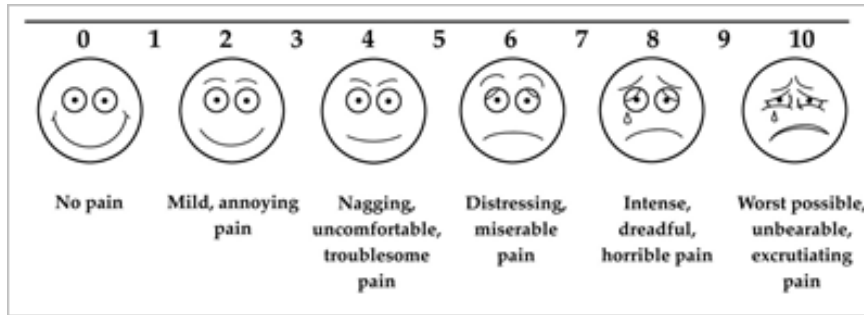


Figure 7. Visual Analog Scale.

Retrieved from <http://www.ericlinmd.com/neck-vas-form.php>

A pain map (Figure 8) was also given to the athletes to fill out before and after the chiropractic adjustments. This pain map assisted in evaluation of the localization of lumbosacral pain the athlete was experiencing. The pain map can be seen in Appendix B.

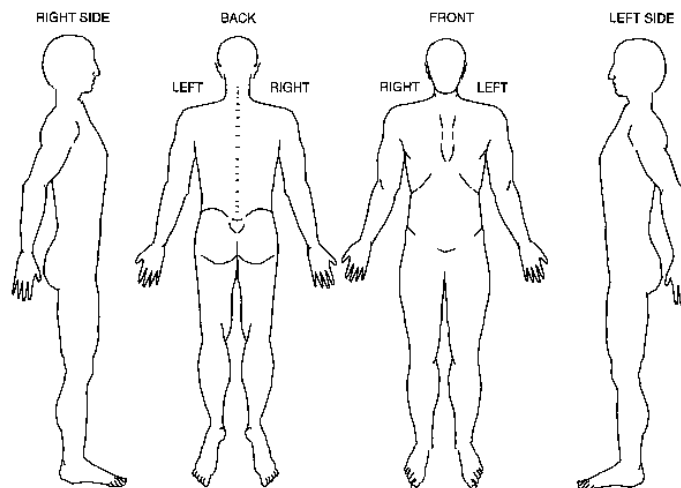


Figure 8. Pain Map

Retrieved from <http://imgarcade.com/1/body-pain-chart/>

A survey was used to measure the varying levels of pain, what sport the athlete played, their knowledge of chiropractic medicine, previous injury to the spine and other questions relating to the malady of each individual. One question asked the athlete whether or not they thought their pain was acute, chronic, or recurrent. Athletes were

asked if they wore orthotics and how many orthotics. Another question asked how aware they are about their posture and how useful they think chiropractic adjustments are on a scale of 0 to 5, 0 being doesn't work and 5 being very well (Appendix C.)

Procedures

This study was performed throughout a semester period. The clinic for chiropractic adjustments was held during the regular Bridgewater State University spring semester. The clinic was a bi-weekly clinic and on Wednesdays from 12:30 PM – 1:00 PM. Participants were only needed in the clinic for about fifteen to twenty minutes for each visit with the chiropractor. Dr. Elfman, a licensed and certified chiropractor, was the main chiropractor that provided chiropractic adjustments throughout the study to maintain consistency and continuity of care.

To gather subjects for the research, the BSU athletes were approached one on one in the athletic training room and asked verbally if they would like to participate in the study. No form of compensation was given to the athletes and they gladly offered to be a part of the study. It was quite simple getting the athletes to participate because I was already familiar with the athletes and had great rapport with them. Many of the athletes that usually visited Dr. Elfman showed signs of interest when others were asked to volunteer to become a participant and also gladly became participants as well.

After signing an informed consent document, collegiate athletes with lumbosacral complex pain after evaluation by a certified athletic trainer filled out a questionnaire or survey regarding pain. The study began following the first chiropractic clinic held at BSU Tinsley Athletic Training Room. The athletes' with LBP were measured by the using the Visual Analog Scale. Surveys were filled out regarding pain and athletes' knowledge of

chiropractic medicine before the adjustments. Then the next step of this process was the assessment of posture by using the iPad and lines marked on the wall using painter's tape. Chiropractic adjustments were then applied on athletes and following the adjustments athletes were asked to stand in front of the baseline for the researcher to take pictures of the frontal and sagittal views of their body. They were then asked to fill out a Visual Analog Scale and pain map once more. Athletes were free to leave once all documents are collected.

Data Analysis

The data collected from each athlete were compared to look for similarities and differences of the participants' posture and lumbosacral complex pain. Posture was analyzed and classified using the sagittal views of the body as having change or no change as seen in the upper extremity shoulder complex of the body. The videos taken by Coach My Video were transferred over to the Dartfish Express application on the iPad. Using the Dartfish application of the iPad, we analyzed the differences between the right and left angles of the glenohumeral joint before and after adjustments by drawing an angle of where the glenohumeral joint bisects the focal line on the wall (Figure 9.) We used a paired samples t-test to compare the differences between the right and left glenohumeral joints before and after the adjustments with the expectation that the shoulders would be more level or like each other after adjustment. Visual Analog Scale scores and pain maps of before and after chiropractic adjustments were compared. A paired samples t-test was used to compare the pre and post adjustment VAS scores.



Figure 9. Pre and Post Adjustments of Glenohumeral Joints from Dartfish Application

Results

Participants

The participants that were included in this study were 13 Bridgewater State University Students. Table 1. There were 7 individuals whom claimed their pain was a recurring pain, 3 said their pain was chronic, and 3 said their pain was acute. Eleven individuals said that chiropractic medicine worked well to very well for them and 2 people had not experience chiropractic adjustments. Five of the 13 participants claimed they had recurring pain and visited the chiropractor twice.

Table 1. Subject Demographics

Participants	Basketball	Football	Wrestling	Track	Softball	Swimming
Females	3	0	0	0	1	1
Males	0	5	1	2	0	0

Pain

Participants reported whether their pain was acute, chronic or recurrent. About 7 of the participants reported their pain to be recurrent, 3 reported the pain as being chronic, and 3 reported pain to be acute. The individuals reporting the pain being chronic were a track and field athlete, a basketball player and a football player. Those that reported their pain being acute were a softball player and a wrestler. The rest that reported their pain being recurrent were 3 football players, 2 basketball players, 1 swimmer and 1 track and fielder. The participants also filled out a pre and post Visual Analog Scale regarding their level of pain. The VAS scale was out of 10-points. Returning participants filled out another VAS before and after their second chiropractic

adjustments. Paired samples t-test comparisons showed statistically significant reduction in pain for patients on both their first and second visits.

Table 2. Pre/Post Visual Analogue Scale Ratings.

Patient Group	Pre VAS Score	Post VAS Score	Significance
Single Visit (n = 13)	3.46 ± 1.21	1.38 ± 1.21	p = .0001
Second Visit (n = 5)	4.2 ± 1.10	2.4 ± 1.01	p = .036

Pain Location

Pain location was indicated by the pain map given to the participants before and after their adjustments. The pain that was described by the participant was located in either the upper left quadrant (UL), upper right quadrant (UR), lower left (LL), or lower right (LR). Most of the pain was felt in the posterior aspect of the body, however, some did indicate pain in the anterior aspect alone or in conjunction with the posterior pain. Some participants also complained of pain radiating to the lower leg and some of pain was in the neck. Participants experienced a decrease in pain in 2 regions of the body post chiropractic adjustment. Seven participants saw a reduction of pain after chiropractic adjustments in 1 to 2 regions of their body (Table 3).

Table 3. Region of Pain Pre and Post Adjustment

Sport	Pre Region of Pain	Post Region of Pain	Region of Pain Change
Track and Field	Post. LL LR	None	- 2 Regions
Swim	Post. LL LR	None	- 2 Regions
Basketball	Post. UL LL LR	Post. UL LL	- 1 Region
Basketball	Ant. LL LR	Post. LL LR	Change Anterior to Posterior
Football	Post. LL	None	- 1 Region
Basketball	Ant. LL LR	Ant. LL LR	No Change
Softball	Post. LR	Post. LR	No Change
Football	Post LL LR	None	- 2 Regions
Football	Post LL LR	Post LL LR	No Change
Football	Post UL UR LL LR	Post UL LL	- 2 Regions
Wrestling	Post. LL LR	Post. LL LR	No Change
Track and Field	Post UL UR	Post UL UR	No Change
Football	Post LR	None	- 1 Region

Posture

Many of the glenohumeral joint angles varied from the right to the left side by about 2 to 3 degree difference during pre and post adjustments. There was no significant difference between right and left glenohumeral joint angles after chiropractic adjustments (Table 4). The sagittal view of each participant was compared using the vertical and horizontal baselines behind the participant. There were not many participants with changes in posture. Many of the participants showed forward head posture and a kyphotic curve to their spine pre adjustments. Only slight changes were observed. No obvious changes could be analyzed.

Table 4. Posture Table

	Pre Adjustment	Post Adjustment	Significance
Subjects (n=13)	3.04 ± 1.87	2.28 ± 3.07	p = .44

Discussion

The purpose of this study was to examine the effects of chiropractic adjustments on pain and posture in collegiate athletes. The hypothesis was that chiropractic adjustments would decrease pain in the lumbosacral complex and positively affect the posture of someone who presents with lumbosacral pain. The importance of this study is to show that chiropractic adjustments can be used more frequently when treating an athlete for lower back pain. By realigning the posture of the athlete, he or she may get more relief of pain. This supplemental sports medicine care is provided in traditional athletic training rooms today. The value of this study is the cost of treatment may become less using holistic treatment and may help a larger population of athletes suffering from lower back pain.

Pain

Pain had a significant decrease as indicated by VAS Scores and as seen in Table 2. The pain diminished by at least 2 or 3 points depending on the athlete and with some, all pain decreased immediately post adjustment. The pain in the athletes may have decreased due to the lack of pressure after chiropractic adjustments caused by the facet joint impingement along the lumbosacral complex. This pressure may have caused pain along the spinal nerves. Decrease in pain was also found in a study done by Zhang et al.⁸ They used Biofreeze and chiropractic adjustments for acute low back pain. In comparison to our study, chiropractic adjustments alone that were applied to the BSU athletes were temporary treatments to relieve pain. Only a few returned for second treatments of chiropractic adjustments alone. Hoiriis et al⁹ measured the use of muscle relaxants and pain versus chiropractic adjustments alone. They found that chiropractic adjustments was

more effective than the use of muscle relaxants thus providing our research with support for the positive effects of chiropractic adjustments.

Posture

We did not see much change in posture from the sagittal or frontal views from the pictures taken pre and post adjustments of the athletes. However, in the previous study performed by the American Chiropractic Association¹¹ they found that posture improved after the chiropractic adjustment was applied and increased step length during running.⁹ In our study our measurements of posture may not have been precise due to excessive clothing to detect meaningful changes.

Pain Location

The location of pain varied for each participant. Many showed pain in the lumbosacral complex but some also circled on the pain map anterior aspects and upper body quadrants causing ailments. Seven participants saw a reduction of pain after chiropractic adjustments in 1 to 2 regions of their body. Some claimed to have no pain after the adjustment. Those who returned for a second chiropractic adjustment found the treatments to be a temporary cure for their lumbosacral complex pain. Many of the athletes who volunteered in our research did not return for a second visit suggesting that chiropractic medicine may have caused a positive change.

Limitations of Research

The major limitation experienced in this research was some participants wore baggy shirts and pants that covered joints that were needed for the measurements. Since most of the athletes had baggy clothing on, we had to estimate where the exact glenohumeral joint was located to take angle measurements to determine postural

changes. Possible limitations of this study were the participant honesty on the survey or pain map and in response to chiropractic treatment. Some athletes may have a higher pain tolerance than others so that this could cause issues regarding different perception of pain compared when compared different athletes. Athletes were prime subjects of this study due to the demanding physical activity of the athletes' sport. However, most athletes complaining of LBP also had malalignment at the SI joint.

Summary and Conclusion

The research conducted has shown that pain can be decreased with chiropractic adjustments. However, we cannot conclude that chiropractic adjustments change posture. The data showed a significant decrease in pain as evaluated by the VAS however; chiropractic adjustments influence on posture could not be accurately evaluated. In conclusion, this research has shown that chiropractic adjustments decrease lumbosacral complex pain. Futures studies should be performed to evaluate posture and lumbosacral complex pain with a better postural assessment. These future studies should also include musculoskeletal system and measurement of true leg-length discrepancy that could cause excessive pressure or pull to the lumbosacral complex with an important focus on the sacroiliac joint resulting in pain.

References

1. Arab, A., Mohammadifar, A., Nourbakhsh, M. The relationship between hamstring length and gluteal muscle strength in individuals with sacroiliac joint dysfunction. *Journal of Manual and Manipulative Therapy*. 2011;19(1): 5-10.
2. Moore, K., Dalley, A., Agur, A. *Clinically Oriented Anatomy*. 6th ed. Lippincott Williams and Wilkins. Baltimore, MD. 2010.
3. Rondberg, T. Chiropractic First: The fastest growing healthcare choice... before drugs or surgery. *The Chiropractic Journal*. 1998.
4. Starkey, C., Brown, S., Ryan, J. *Examination of Orthopedic and Athletic Injuries*. 3rd ed. Philadelphia, Pennsylvania: F.A. Davis Company; 2010: 457-512.
5. Demann, L.E. Sacroiliac dysfunction in dancers with lower back pain. *Manual Therapy*. 1997; 2(1): 2-10.
6. Timm, K. Sacroiliac joint dysfunction in elite rowers. *Journal of Orthopedic and Sports Physical Therapy*. 1999; 29(5): 288-293
7. Lindsay, D., Meeuvisse, W., Mooney, M., Summersides, J. Lumbosacral dysfunctions in elite cross-country skiers. *Journal of Orthopedic & Sports Physical Therapy*. 1993; 18 (5): 580-585.
8. Zhang, J., Enix, D., Snyder, B., Giggey, K., Tepe, R. Effects of Biofreeze and chiropractic adjustments on acute low back pain: a pilot study. *Journal of Chiropractic Medicine*. 2008; 7: 59-65.
9. Hoiriis, K. Pflieger, B., McDuffie, F. A randomized clinical trial comparing chiropractic adjustments to muscle relaxants for subacute low back pain. *Journal of Manipulative and Physiological Therapeutics*. 2004; 26(6): 388-398.

10. Nigg, B., Robinson, R., Herzog, W. Use of Force Platform Variables to Quantify the Effects of Chiropractic Manipulation on Gait Symmetry. *Journal of Manipulative and Physiological Therapeutics*. 1997; 10(4):172-176.
11. American Chiropractic Association. What is chiropractic? *American Chiropractic Association*. Published 2013. Retrieved from http://www.acatoday.org/level2_css.cfm?T1ID=13&T2ID=61.
12. Smith, D., Smith, J., Walsh, M. Running posture and step length changes immediately after chiropractic treatment in a patient with xeroderma pigmentosum. *Journal of Manipulative and Physiological Therapeutics*. 2009; 32(1): 93-98.

APPENDIX A

Bridgewater State University Informed Consent Document

Title of Research: Effects of Chiropractic Adjustment on Lumbosacral Complex Pain and Posture

Researcher: Annie Chen ATS, Department of Movement Arts, Health Promotion and Leisure Studies, Bridgewater State University, 617-571-0631

You are being asked to participate in a project conducted through Bridgewater State University Tinsley Athletic Training Room. The University requires that you give your signed agreement to participate in this project.

The investigator will explain to you in detail the purpose of the project, the procedures to be used, and the potential benefits and possible risks of participation. You may ask him/her any questions you have to help you understand the project. A basic explanation of the project is written below. Please read this explanation and discuss with the researcher any questions you may have.

If you then decide to participate in the project, please sign on the last page of this form in the presence of the person who explained the project to you. You should be given a copy of this form to keep.

1. Nature and purpose of the Project

This study is being done because we want to research the effects of chiropractic adjustment on lumbosacral complex pain and posture. Most athletes that have pain within their lumbosacral complex often have a malaligned spine. Chiropractic adjustments can help to realign the spine and hopefully correct posture while also taking stress off of the lumbosacral complex and relieving lower back pain.

2. Explanation of the Procedures

If you have agreed to chiropractic care after being referred by a certified BSU athletic trainer, you will be asked to sign a consent form to participate in the study. You will be asked to fill out a survey, Visual Analog Scale, and a Pain Map. Then pictures of your full body at a frontal and sagittal view will be taken for analysis. You will then be adjusted by the chiropractor and again be asked to fill out the Visual Analog scale and Pain map after adjustment to your spine. After this process, another picture will be taken of the same frontal and sagittal views for analysis. You should not participate in this study if you are pregnant, have a herniated disk, or have had a previous fracture or surgery to your spine. Your participation in the study will add approximately 20-30 minutes to one of your chiropractic sessions.

3. Discomfort and Risks

Risks or discomforts that you might experience are lower back soreness after the adjustment, stiffness, swelling, and redness to the area after the adjustments. It is extremely rare that chiropractic adjustments result in injury. These are all normal risks associated with chiropractic care.

4. Benefits:

This study is important to science/society because many athletes suffer from lower back pain and immediately jump to the conclusion that surgeries and medicine can solve all of their lower back problems. Chiropractic medicine is a holistic treatment that is non-invasive and may be just as effective as surgery and even cost less. By correcting postural alignment and lumbosacral complex pain there may be no need for medication use or surgery. Individually, you may benefit personally by participating in this study.

5. Confidentiality:

Your information will be kept confidential by keeping your files locked within the researchers iPad with a passcode that only she knows. Other private information will be collected in a folder labeled with your name, secured, and locked away in Dr. Russell's office until the end of the study. Your name will not be used in the reporting of results. Photos or videos will only be used with your consent as indicated on the next form.

Additionally, while every effort will be made to keep your study-related information confidential, there may be circumstances where this information must be shared with:

- * Federal agencies, for example the Office of Human Research Protections, whose responsibility is to protect human subjects in research;
- * Representatives of Bridgewater State University, including the Institutional Review Board, a committee that oversees the research at BSU;

Refusal/Withdrawal:

Refusal to participate in this study will have no effect on any future services you may be entitled to from the University. Anyone who agrees to participate in this study is free to withdraw from the study at any time without penalty.

By signing below I am indicating that I understand that it is not possible to identify all potential risks in an experimental procedure, and I believe that reasonable safeguards have been taken to minimize both the known and potential but unknown risks. ***[If applicable -I agree that all known risk to me have been explained to my satisfaction. I understand that Bridgewater State University has no policy or plan to pay for any injuries I might receive as a result of participating in this research protocol.]***

Participant Signature

Date

Witness Signature

Date

Any questions regarding the conduct of the project, questions pertaining to your rights as a research subject, or research related to injury, should be brought to the attention of the IRB Administrator at (508) 531-1242.

Any questions about the conduct of this research project should be brought to the attention of the principal investigator: Annie Chen, 617-571-0631

Video Photo Release

I hereby indicate, as specified below, my consent to use any photos, videotape, or audiotape material taken of myself during this research project. I understand that I may withdraw permission for photographic, video or audio material to be used in this research project at any time.

PLEASE CHECK TWO BOXES AND SIGN BELOW

I agree to have my audio or visual material available for the research project and educational use in classroom and laboratory settings.

I do not agree to make audio or visual material available for the research project and educational use in classroom and laboratory settings.

I agree to have my audio or visual material available on the internet as part of a webpage.

Do not make my audio or visual material available on the internet as part of a webpage.

Participant's Signature Date

Witness Signature Date

APPENDIX B

Name: _____

Date: _____

Male: _____ Female: _____

Lower Back Pain Survey

Please circle the letter that applies to you in each question. If necessary, please fill out spaces that are blank.

1. What sport do you play?
 - A. Basketball
 - B. Wrestling
 - C. Swimming and Diving
 - D. Soccer
 - E. Other : _____

2. What position do you play? Please write answer below.

3. Have you ever had back injury?
 - A. Yes
 - B. No

4. Acute/ chronic/ recurring pain to the lower back?
 - A. Acute – pain suddenly felt, direct hit
 - B. Chronic – pain has been occurring longer than 3 months and up
 - C. Recurring – pain every now and then, not constant pain

5. How aware are you of your posture when you are sitting or standing?

A. Always aware

B. Aware

C. I don't ever think about my posture unless someone mentions it

D. Never aware

6. Do you wear orthotics in your shoes? If yes, one or two feet?

A. Yes, I wear (Write down one or two feet) _____

B. No

7. How has chiropractic care worked for you? Circle number that applies.

1	2	3	4	5	N/A
Doesn't Work	Not Well	Average	Well	Very Well	

APPENDIX C

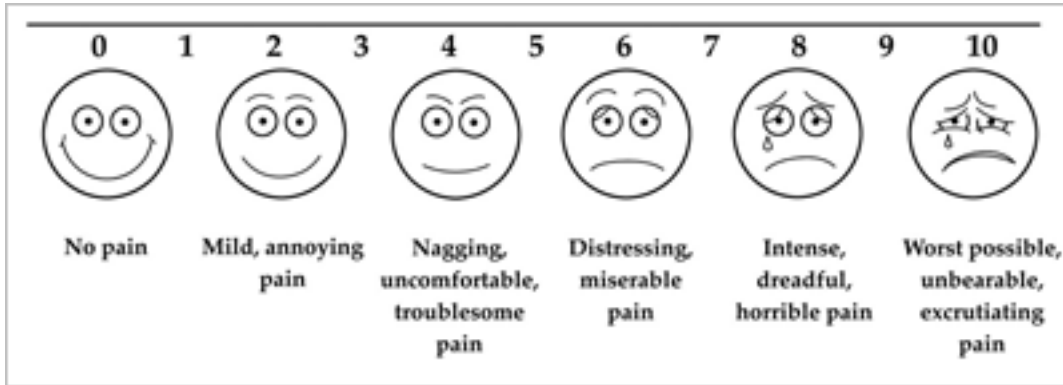
Name: _____

Date: _____

Pain Assessment Tools

Visual Analog Scale

Please circle the degree of pain regarding your lower back pain at the moment.



Pain Map

Circle all areas where you feel pain.

Signature: _____ Date: / /

SHOW US WHERE IT HURTS

Please mark **area(s)** of injury or discomfort as shown in the example below. Mark all areas with the appropriate symbols and indicate the degree of pain using a scale from 1 (discomfort) to 10 (extreme pain).

Description → Numbness NNNN Pins & Needles PPPP Burning BBBB Aching AAAA Stabbing SSSS

Symbol → ○ Circle any area of pain not represented by a symbol.

Example

Right Front Back Left