

## Impact of Three-week Educational Program on Low Back Flexibility and Pain in College Students

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### Abstract

**Purpose:** The purpose of this study was to document the effectiveness of a three-week educational program on low back flexibility and pain reduction in college students between the ages of 18 and 30 who are at risk for low back pain. **Methods:** Fifty college students were assigned to either an experimental group that participated in a three-week educational program or a control group. Subjects were assessed pre- and post-intervention using the following outcome measures: Oswestry® Low Back Pain Disability questionnaire, the Fitnessgram® Back Saver Sit and Reach test, and pre- and post-low back pain survey. **Results:** The majority of students decreased in low back pain and felt that the educational program was beneficial in preventing and delaying low back pain. A repeated measures ANOVA revealed that there was no significant interaction between groups over time in low back flexibility and pain intensity,  $p > 0.5$ . **Conclusion:** An educational program for college students that increases low back flexibility and decreases pain will prevent or delay low back pain among college students.

## INTRODUCTION

Low back pain (LBP) is the second most common ailment in the United States affecting sixty to eighty percent of the American population any given year.<sup>2</sup> Previous studies have indicated the first episode of LBP occurs between the ages of 25 and 55.<sup>4</sup> LBP takes place in the lumbar vertebrae where the vertebrae carry the majority of the body's weight and endure a high amount of stress.<sup>2</sup> Typically, episodes of LBP are acute and non-specific. LBP duration can be categorized as acute (<6 weeks) and chronic (>12 weeks), and it is defined as specific (i.e. fracture, tumor, infection, or bulging disc) or non-specific, which implies there is not a clear, specific cause.<sup>5,6</sup> The majority of LBP experiences can be prevented or delayed with improvements in posture, exercise, and other lifestyle habits.<sup>7</sup> With these types of improvements in mind, we have striven to create an educational program that will provide students with information to prevent or delay subsequent episodes of LBP.

Risk factors for low back pain are aging, lack of physical fitness, weakness of back and abdominal muscles, smoking, obesity, low educational level, high levels of pain and disability, stress, and anxiety.<sup>6</sup> Occupational risk factors that account for most low pain experiences are manual handling, bending, twisting, whole body vibration, monotonous tasks, poor work relationships, and heavy lifting.<sup>6</sup> Effective, conservative treatments for low back pain intervention are light to moderate activity, non-steroidal anti-inflammatory drugs (NSAIDs), muscle relaxants, analgesics, exercise therapy, behavior therapy, spine manipulation, and multidisciplinary programs.<sup>6</sup> In hopes of decreasing risk factors for students and increase the effectiveness of treatment students seek preventive methods that are conservative and effective such as an educational program.

As described in *Prevention and Treatment of Acute Low Back Pain: Physical Therapy and Other Non-surgical Methods*, we found that Middle Tennessee State University students were experiencing LBP as early as 18 years old and preferred conservative treatment. Although there is evidence that low back education and conservative treatment are effective,<sup>4</sup> this study seeks to measure the effectiveness of a three-week LBP education program. The program consists of lectures describing posture management, exercises, and activities. Assessment of the program, including students between the ages of 18 and 30 that are at risk for LBP, is through the analysis of pre- and post-program surveys. We will also use a secondary measurement to evaluate the effects of the program on hamstring flexibility with the Fitnessgram<sup>®</sup> Back Saver Sit and Reach test and level of back pain with the Oswestry<sup>®</sup> Low Back Pain Disability questionnaire.

## METHODS

### *Subjects*

Fifty-two students participated in the study which received approval from Institutional Review Board of Middle Tennessee State University. Volunteers were recruited from Dr. J. Angela Hart-Murdock's classes. Subjects were separated into a control group and an experimental group. Students were excluded from the study if they were not between the ages of 18 and 30 or had an Oswestry<sup>®</sup> Disability Index score of >40%.

### ***Eligibility Screening***

#### ***Oswestry© Low Back Pain Disability Questionnaire***

For 25 years, the Oswestry© Low Back Pain Disability questionnaire has been considered the “gold standard” for measuring low back pain functionality.<sup>8</sup> Students completed the questionnaire assessing their pain intensity in nine modalities: while standing, conducting personal care, performing sexual acts, sleeping, lifting, walking, sitting, traveling, and socializing. Subjects were included in the study if their pain score was  $\leq 40\%$ , implying that the students were categorized as having minimal or moderate disability. Under these criteria subjects experience low back pain, but daily living is not affected.

### ***Procedures***

#### ***Fitnessgram© Back Saver Sit and Reach***

The Fitnessgram© Back Saver Sit and Reach has been shown to accurately measure hamstring flexibility but cannot be used to measure low back flexibility. The objective of the test is to measure the ability of subjects to reach a specified distance on the right and left sides of the body. The student’s highest measured distance was recorded to the nearest fourth an inch. Six students (three men and three women) chosen randomly from each group completed the sit and reach test.

### ***Low Back Pain Surveys***

Prior to the lectures, both the control and experimental group completed the LBP survey (Figure 1) providing information on age, experiences of LBP, posture while sitting, sleeping, standing, and lifting, and exercise history. After the experimental group completed the educational program, both groups completed another survey (Figure 2) to conclude if LBP experiences changed after completing the educational program.

### ***Low Back Prevention Worksheet***

After completing the educational program, the experimental group was provided a LBP prevention worksheet (Figure 3) that served as an overview of the lectures. The worksheet included proper posture and body mechanics, stretching and strengthening exercises, and moderate to low risk physical activities. The worksheet was given to all students for those who may have missed a lecture or did not comprehend the material during the lectures.

## **INTERVENTION**

Fifty-two students were separated into the control and experimental group. The control group consisted of 23 students, and the experimental group consisted of 29 students. The control and experimental groups completed the LBP survey and Fitnessgram© Back Saver Sit and Reach test. The experimental group completed a three-week LBP educational program. Subjects in the control group were informed about the study, but were not given instructions on how to prevent or delay LBP. Both groups were reassessed and retested with

the low back pain LBP questionnaire and the back saver sit and reach at the conclusion of the study.

The experimental group received a 10 -20 minute lecture once a week for three weeks. The objective of the lectures was to provide students with the knowledge to prevent or delay LBP. The lectures included information regarding LBP prevalence, forms of conservative treatment for LBP, proper posture management while sitting, driving, lifting, and sleeping, strengthening and stretching exercises that targeted low back muscles, abdominal muscles, back extensors, hip extensors, and leg muscles, and physical activities. The lectures also included videos that demonstrated the how to sit while driving and how to properly pick up an object and included pictures on proper postures and exercises. After completing the LBP educational program, students were given a LBP prevention worksheet to help retain the information from the lectures.

### ***Data Analysis***

Descriptive statistics were calculated on all students to determine personal characteristics (Tables 1 and 2). Chi-square tests were performed to determine whether relationships existed on the basis of experiencing LBP while sitting, sleeping, standing, and lifting with the number of hours of sitting during the day, knowledge about proper postures for sitting, sleeping standing, and lifting, and improvement of postures for sitting, sleeping, standing, and lifting after completing the three-week educational program using a level of significance accepted at  $\alpha=.05$  (Table 3). The Fitnessgram® Back Saver Sit and Reach flexibility scores and Oswestry® Low Back Pain Disability questionnaire pain scores from the control and experimental groups were compared with an Analysis of Variance (ANOVA) with two repeated measures using a level of significance accepted as  $\alpha=.05$ .

## **RESULTS**

### ***Descriptive Analysis***

Fifty-two college students participated in this study. Ten of the 52 students did not complete the post-LBP survey. The majority of the students were male that completed the study, and forty-one of the forty-two students that completed the study experienced low back pain (Table 2). After the three-week educational program, 63.34% of the students indicated LBP decreased compared to 42.11% decreased in LBP in the control group (Table 2). Using chi-square analysis, we could not reject the null hypothesis of independence of the following factors: experience of LBP when sitting and knowledge of proper sitting posture, experience of LBP when standing and knowledge of proper standing posture, experience of LBP when lifting and knowledge of proper lifting posture, experience of LBP when sitting and improvement of sitting posture, experience of LBP when sleeping and improvement of sleeping posture, experience of LBP when standing and improvement of standing posture, and experience of LBP when lifting and improvement of lifting posture (Table 3). However, we conclude experience of LBP is not independent of the number of

hours a person is seated per day and experience of LBP when sleeping is not independent of knowledge of the proper standing posture (Table 3).

#### *Fitnessgram® Back Saver Sit and Reach*

A repeated measures ANOVA was conducted to determine differences between the experimental and control groups in flexibility scores. As shown in Figure 4, there was no statistically significant interaction ( $p>0.5$ ) between group and time relative to flexibility score. There was no significant effects for group or time with respect to flexibility score (Figure 4).

#### *Oswestry® Low Back Pain Disability Questionnaire*

A repeated measures ANOVA was conducted to determine differences between the groups in low back pain scores. As shown in Figure 5, there was no statistically significant interaction ( $p>0.5$ ) between group and time relative to pain score. There was no significant effects for group or time with respect to pain score (Figure 5).

## **DISCUSSION**

The three-week educational program used in this study appears to be effective in decreasing number of experiences of LBP among college students between the ages of 18 and 30. The educational program's purpose was to inform students of LBP prevalence, forms of conservative treatment for LBP, proper posture management while sitting, driving, lifting, and sleeping, strengthening and stretching exercises that targeted low back muscles, abdominal muscles, back extensors, hip extensors, and leg muscles, and physical activities. The students attended one 10-20 minute lecture every week for three weeks.

Prior to the intervention, the majority of the students experienced LBP in the control and experimental groups (Table 1). After completing the three-week educational program, a majority of the experimental group decreased in LBP and felt that the three-week educational program was beneficial in preventing LBP (Table 2). The majority of the control group did not decrease in LBP (Table 2). Although when using chi-square analysis we could not reject the null hypothesis for a majority of the relationships, we could conclude that experience of LBP is not independent of the number of hours a person is seated per day, and experience of LBP when sleeping is not independent of knowledge of the proper standing posture (Table 3).

Although the repeated measures ANOVA performed on the Fitnessgram® Back Saver Sit and Reach flexibility scores and Oswestry® Low Back Pain Disability questionnaire pain scores showed no statistically significant change within or between groups, there was a trend for improvement in flexibility and LBP between pre- and post-testing for the control group. The experimental group did not improve flexibility scores or LBP scores. This trend implied that the three-week educational program did not increase low back flexibility nor decrease level of pain for college students. Although speculative, the lack of

effectiveness may be due to the short duration of the study and to the small sample size used for statistical analysis (ANOVA).

## **CONCLUSION**

Interventions that help delay and prevent LBP among college students are essential, and educational programs may be an effective option. Future studies should increase the sample size of the experimental and control groups, increase the length of the education program, and require active participation during the education program by having students perform exercises and practice proper postures. Although students reported when they experienced LBP by completing the pre-program LBP survey, students should record their experiences of LBP in a journal during future educational programs.

A three-week educational program did not appear to have an impact on low back flexibility and pain intensity, however the majority of students from the experimental group believed the program was beneficial in preventing low back pain. An education program for college students that increases low back flexibility and decreases pain could prevent or delay low back pain among college students.

## **ACKNOWLEDGEMENTS**

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**REFERENCES**

- <sup>1</sup> Hertling, D., Kessler, R. (2006). In Lippincott, Williams, and Wilkins, *Management of common musculoskeletal disorders: physical therapy principles and methods*. 4<sup>th</sup> ed. Philadelphia, PA. 2006:843-890.
- <sup>2</sup> Nieman, David C. *The Exercise-Health Connection*. Champaign, IL: Human Kinetics; 1997.
- <sup>3</sup> Trevathan, W., Smith E., McKenna, J. (Eds.). *Evolutionary medicine*. New York: Oxford University Press; 1999.
- <sup>4</sup> Braggins, Sheila. Treatment and prevention of low back pain. *Back Care: A Clinical Approach*. London: Harcourt Publishers Limited;2000:137-138.
- <sup>5</sup> Lippincott, Williams, and Wilkins. Exercise and activity for individuals with nonspecific back pain. In Wolters Kluwer, *ACSM's Resources for Clinical Exercise Physiology: Musculoskeletal, Neuromuscular, Neoplastic, Immunologic, and Hematologic Conditions*. 2<sup>nd</sup> ed. Baltimore, MD: American College of Sports Medicine; 2009:148-161.
- <sup>6</sup> Koes BW, van Tulder MW, and Thomas S. Diagnosis and treatment of low back pain. *bmj.com*;2006;332: 1430-1434.
- <sup>7</sup> *The Fit Back: Prevention and Recovery*. Time Life Education;1988;1:7-69.
- <sup>8</sup> FairbankJCT,CouperJ,DaviesJB.The oswestrylowbackpain questionnaire.*Physiotherapy*;1980;66:271-273.

## APPENDIX

Figure 1. Low Back Pain Pre-Survey

### Low Back Education Survey 1

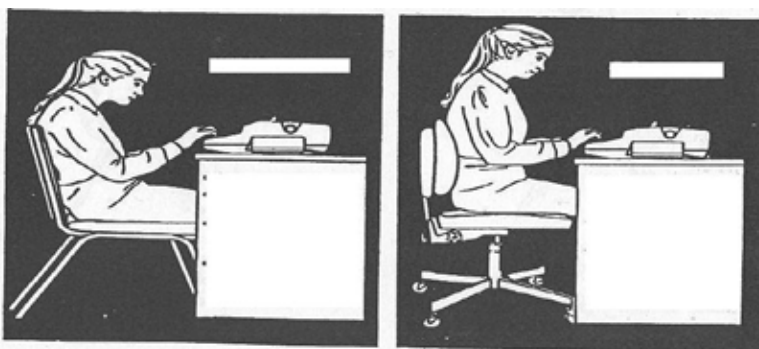
The purpose of this study is to survey students between the ages of eighteen and sixty years old to determine the education levels of students about low back prevention methods.

For additional information about giving consent or your rights as a participant in this study.

#### Directions

Please answer all questions. Please ask me any questions if you have any problems.

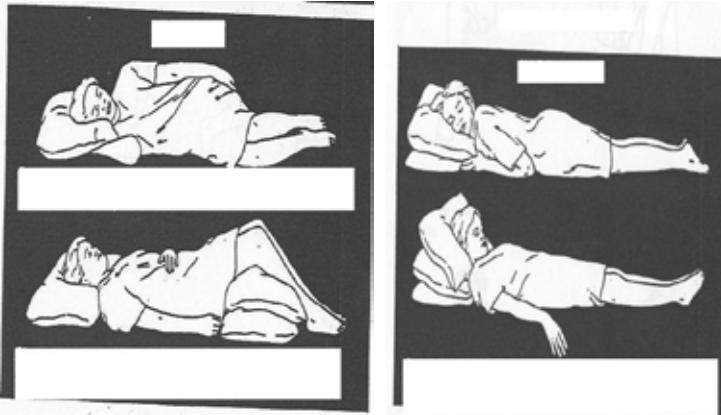
1. Age \_\_\_\_\_
2. Sex     Male     Female
3. Race     American Indian or Alaskan Native     White     Hispanic/ Latino  
 Asian, Pacific Islander, or Hawaiian native     African American or Black     Other
4. Have you ever experienced back pain?     Yes     No
5. How often do you experience low back pain?     Daily     Weekly     Monthly
6. Do you experience low back pain when sitting?     Yes     No
7. How long do you sit during the day? (i.e. during class, while driving, etc.)  
 1-2 hours     3-4 hours     5-6 hours     7 or more hours
8. Circle the correct sitting posture and box the sitting posture that you find yourself in the most.



9. Do you experience low back pain when sleeping?     Yes     No

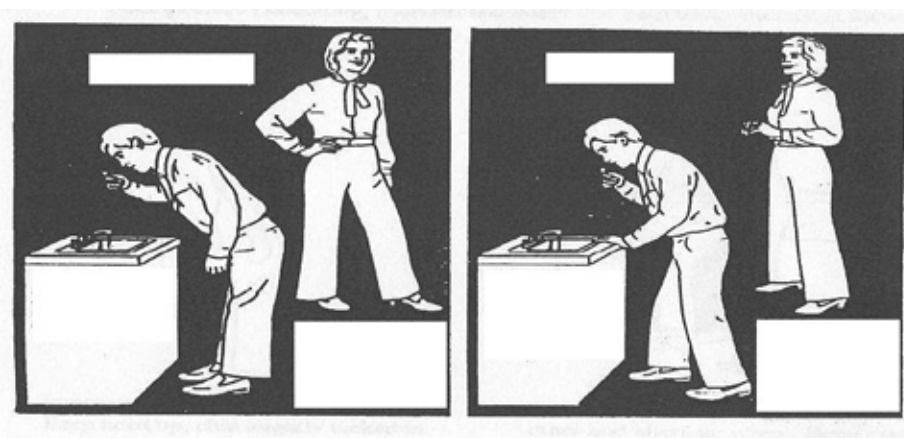


10. Circle the correct sleeping posture and box the sleeping position that you find yourself in the most.



11. Do you experience low back pain while standing? Yes No

12. Circle the correct standing posture and box the standing position that you find yourself in the most.



13. Do you experience low back pain while lifting? Yes No

14. Circle all of the correct lifting postures.



15. You experience low back pain more when  Sitting  Sleeping  Standing  Lifting

16. How often do you exercise within a week?  
 0-1 days  2-3 days  4-5 days  6-7 days

17. Does your exercise program include exercises that strengthen or stretch your abdominal exercises?  Yes  No

18. Do you feel behavioral changes will prevent or delay low back pain?  Yes  No

**Figure 2. Low Back Pain Post-Survey****Low Back Pain Education Survey 2**

The purpose of this study is to survey students between the ages of eighteen and sixty years old to determine if the low back pain education lecture delayed or prevented experiences of low back pain for students.

For additional information about giving consent or your rights as a participant in this study.

**Directions**

Please answer all questions. Please ask me any questions if you have any problems.

1. Age \_\_\_\_\_
2. Sex     Male    Female
3. Race     American Indian or Alaskan Native     White     Hispanic/ Latino  
 Asian, Pacific Islander, or Hawaiian native     African American or Black     Other
4. Did you improve your posture when sitting?     Yes     No
5. Did you improve your posture when sleeping?     Yes     No
6. Did you improve your posture when standing?     Yes     No
7. Did you improve your posture when lifting?     Yes     No
8. Have your experiences of low back pain lessened?     Yes     No
9. Do you feel improving posture lessened your experiences of low back pain?  
 Yes     No
10. Have you increased how many times you exercise within a week?     Yes     No
11. Do you include exercises that strengthen or stretch your abdominals?     Yes     No
12. Do you feel that the lecture was beneficial to you in preventing low back pain?  
 Yes     No

Figure 3. Prevention of Low Back Pain Worksheet

## Prevention of Low Back Pain

During a given year, 60-80% of Americans will experience an episode of low back pain. The first episode low back pain occurs between the ages of 25 and 60 years old. With the proper posture mechanics and stretching and strengthening exercises, you can prevent or delay low back pain.

### Proper Posture Mechanics

#### Standing or Walking

- Stand with lower back erect and flat
- Avoid standing for long periods of time
- Do not stand with hands supporting weight

#### Driving

- Lower back erect
- Knees are higher than your hips
- Never sit for a long time

#### Sitting

- Sit with back flat
- Knees should be higher than hips
- Stop every 30-60 minutes to walk or stretch


#### Lifting

- Let legs do most of the work
- Hold object close to the body
- Never lift with legs straight


#### Sleeping

- Sleep on flat, firm mattress
- Sleep on side with both arms in front and knees slightly drawn up toward chin
- When lying on back, place pillows under knees


### Stretching and Strengthening Exercises





Pelvic Tilt-Stretches Abdominal Muscles




Double Knees to Chest-Stretches Hip, Buttock. And Lower Back




Trunk Flex- Stretches Back, Leg, and Abdominal Muscles

Single Leg Extension-Stretches Abdominal Muscles and Strengthens Hip and Buttock Muscles



Partial Sit Up-Strengthens Low Back and Abdominal Muscles



Standing McKenzie Exercise- Stretches Abdominal Muscles Strengthens Back Extensors

### Moderate to Minimal Risk Activities

- \*Hiking
- \*Swimming
- \*Walking
- \*Water Aerobics
- \*Yoga

- \*Pilates
- Jogging
- Horseback Riding
- Backpacking
- Baseball

- Basketball
- Bowling
- Golf
- Ice-Skating
- Softball

\*Minimal Risk Activities

### Stretching Dos and Don'ts

**Do-**

- ✓Stretch at least 3 days a week
- ✓Hold stretch for 10 to 30 seconds
- ✓Repeat each stretch 10 times

**Don't-**

- ✓Stretch without warming up( light walk or run)
- ✓Bounce
- ✓Hold painful positions
- ✓Hold your breath

Table 1. Pre-Program Personal Characteristics for Participants

Pre-Personal Characteristics	Control (n)	Experimental (n)	Control (%)	Experimental (%)
<b>Sex</b>				
Male	11	10	52.17	65.52
Female	12	19	47.83	34.48
<b>Race</b>				
White/Caucasian	18	18	78.26	55.17
Black/African-American	4	7	17.39	31.03
Hispanic/Latino	0	3	0	10.35
Asian/Pacific Islander/ Hawaiian native	0	1	0	3.45
Other	1	0	4.34	0
<b>Experience LBP</b>				
Yes	22	27	95.65	93.10
No	1	2	4.35	6.90
<b>Frequency of LBP</b>				
Daily	4	5	19.05	18.51
Weekly	1	8	4.76	29.63
Monthly	16	14	76.19	51.85
<b>Frequency of Exercise</b>				
0-1 day	4	9	18.18	31.03
2-3 days	11	12	50.00	41.38
4-5 days	4	7	18.18	24.14
6-7 days	3	1	13.64	3.45

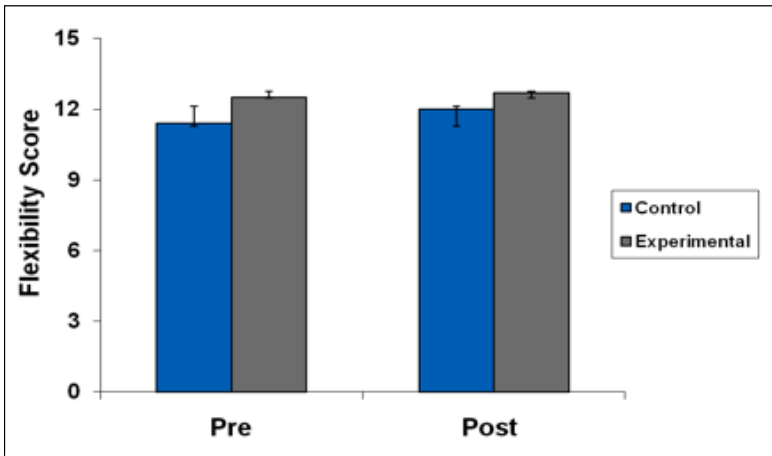
*Table 2. Post-Program Personal Characteristics for Participants*

<b>Post-Personal Characteristics</b>	<b>Control (n)</b>	<b>Experimental (n)</b>	<b>Control (%)</b>	<b>Experimental (%)</b>
Sex				
Male	9	7	47.37	30.43
Female	10	16	52.63	69.57
<b>Race</b>				
White/Caucasian	14	17	73.69	73.91
Black/African-American	4	4	21.05	17.39
Hispanic/Latino	0	1	0.00	4.35
Asian/Pacific Islander/ Hawaiian native	0	1	0.00	4.35
Other	1	0	5.26	0.00
<b>Experience LBP</b>				
Yes	19	22	100.00	95.65
No	0	1	0.00	4.35
<b>LBP Decreased</b>				
Yes	8	14	42.11	63.64
No	11	8	57.89	36.36
<b>Exercise Increased</b>				
Yes	7	11	36.84	50.00
No	12	11	63.16	50.00
<b>Lecture Beneficial</b>				
Yes	N/A	21	N/A	95.45
No	N/A	1	N/A	4.55

*Table 3. Results of Chi-Square Testing for Independence in Experimental Group*

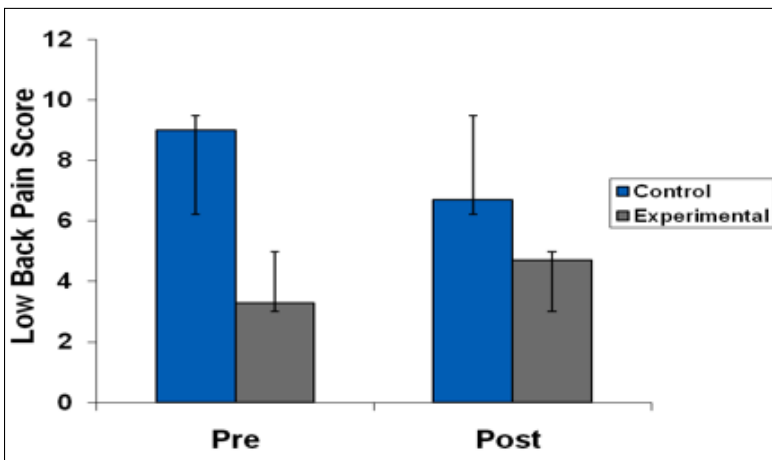
<b>Factors</b>	<b>Chi-Squared Value (<math>\chi^2</math>)</b>	<b>Degrees of Freedom (df)</b>	<b>Cut Off Value (<math>\alpha=.05</math>)</b>
Experience of LBP and Amount of Sitting per Day	6.365	2	5.911
Experience of LBP Sitting and Sitting Posture	0.089	1	3.841
Experience of LBP Sleeping and Sleeping Posture	6.390	1	3.841
Experience of LBP Standing and Standing Posture	0.244	1	3.841
Experience of LBP Lifting and Lifting Posture	0.024	1	3.841
Experience LBP Sitting and Improved Sitting Posture	1.317	1	3.841
Experience LBP Sleeping and Improved Sleeping Posture	1.498	1	3.841
Experience LBP Standing and Improved Standing Posture	0.176	1	3.841
Experience LBP Lifting and Improved Lifting Posture	1.011	1	3.841

Figure 4. Fitnessgram Back Saver Sit and Reach Flexibility Scores



\*Significant interaction of flexibility intervention by time,  $p>0.5$

Figure 5. Oswestry Low Back Pain Disability questionnaire Pain Scores



\*Significant interaction of flexibility intervention by time,  $p>0.5$