The Effects of Myofascial Release and Muscle Energy Techniques on a Patient with Adult Idiopathic Structural Scoliosis: A Case Study

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Abstract

**Objective:** The purpose of this case study is to determine if Myofascial Release (MFR) and Muscle Energy Techniques (MET) will increase spinal range of motion, improve chest expansion, decrease muscle tone imbalances, improve posture, and decrease pain symptoms associated with structural scoliosis in a 21-year-old female case subject.

**Background:** Studies have shown that manual therapy can improve spinal range of motion (ROM) and pulmonary function, correct postural imbalances, and decrease pain symptoms in subjects with scoliosis. The aim of this study is to treat the postural dysfunctions and symptoms associated with scoliosis by targeting the shortened hypertonic musculature and correcting axial spine restrictions.

**Methods:** A 21-year-old female participated in 10 treatments for 60 minutes consisting of 1 session a week over a period of 10 weeks. MFR was used to address muscle imbalances and treat shortened musculature typical of a right thoracic, left lumbar S scoliosis curve. MET was used to correct any imbalances in the spine, ribs, pelvis, and sacrum. Assessments performed included postural observation with photos, thoracic range of motion measurements with a tape measure and goniometer, costovertebral expansion, special tests, Quadruple Visual Analog Scale (QVAS), Symptom Diagram, and Oswestry Low Back Questionnaire.

**Results:** Thoracic spine flexion, right thoracic rotation, and rib expansion increased significantly for the subject. Before and after photos show postural changes, which are most noticeable in shoulder levels and the scapular region. The Quadruple Visual Analog Scale (QVAS) reported pain levels went from a 4/10 to 1/10. The Symptom diagram initially showed 14 areas of pain which was reduced to 3 areas. The participant experienced a gradual decrease in headaches, going from daily headaches prior to treatment to no headaches in the final week.
Conclusion: MFR and MET were effective at increasing spinal range of motion and chest expansion, improving posture, and decreasing pain symptoms exhibited by a female subject with structural scoliosis. However, further investigation is needed with a larger sample size, longer time frames, and the use of pre and post x-rays.

Keywords: Scoliosis, Massage Therapy, Myofascial Release, Muscle Energy Techniques, MET, Neuromuscular Technique, Thoracic Range of Motion, Chest Expansion, Costovertebral Expansion
Introduction

Scoliosis

Scoliosis is a disorder of the spine characterized by a lateral deviation of the spinal column beyond 10 degrees and by rotation of the vertebrae. Spinal curvatures have been found in medical literature as far back as ancient Greece where Hippocrates developed treatment protocols to correct spinal deformities (15). Scoliosis can be classified in many ways including the age of onset, whether it is structural or functional, the location of the curve, and the etiology (1,2). Idiopathic scoliosis is diagnosed when there are no clear clinical findings for the cause.

Idiopathic scoliosis is the most common form of structural scoliosis occurring in 2-3% of the population, and idiopathic scoliosis accounts for 75% to 85% of all cases (1,3). Idiopathic scoliosis is divided into 3 groups: infantile, juvenile, and adolescent depending on when the curve is diagnosed. Adult scoliosis can either be a further progression of adolescent scoliosis, or a result of degenerative changes or trauma (4,1). The etiology of idiopathic scoliosis is not clear, but it is thought to have a genetic link. Some other possible causes are neuropathy, myopathy, degenerative changes, and trauma (1,3). Girls are 6 times more likely to have scoliosis than boys. If the spinal curve is greater than 30 degrees, the ratio rises to 10 girls to 1 boy (4).

Symptoms and other health related conditions are widely dependent on the age of the patient, the location of the curve, and the severity. Some common symptoms are pain, nerve root and joint irritation, decreased or altered range of motion, and a decrease in the patient’s quality of life (3,4,5). Patients often present with a humped rib cage and cosmetic deformities which can lead to poor self-esteem and psychosocial problems (4). Advanced rotational deformities can impair chest expansion resulting in abnormal respiratory function and cardiopulmonary problems.
There is a higher risk of complications for people who have been diagnosed before puberty with moderate to severe scoliosis because of the curve progression (1).

Scoliosis treatment depends on the degree of the curve and the age of the patient. A curve that is less than 20 degrees is usually monitored and treated with physiotherapy. Bracing is usually recommended for curves between 30 and 45 degrees in adolescent idiopathic scoliosis. Surgical correction or the insertion of Harrington rods is often recommended when the curve exceeds 45 degrees (4,6). Physical therapy and exercise are highly recommended for those with scoliosis, but there is a lack of research and evidence on how effective it is at preventing progression (6,7).

Myofascial Release and Muscle Energy Techniques

The first known use of Myofascial Release was in the 1940s, but it wasn’t until 1981 an Osteopathic Physician labeled the term myofascial release (10). Myofascial Release is a manual massage therapy technique that uses gentle sustained pressure to release fascial adhesions (8). These fascial adhesions impact muscle function, create decreased ROM, and distorted neuromuscular input (19). Fascial restrictions can develop from many things such as trauma, surgery, lack of blood flow, injury, structural dysfunction, overuse, and poor posture. These soft tissue restrictions put stress on the body resulting in dysfunction, pain, and decreased mobility (9,10). According to a Systemic Review on Myofascial Release as a Treatment for Orthopedic Conditions in 2013, “Fascia is believed to be 1 continuous piece of tissue working in connected “chains” to create tensegrity in the body. Therefore, when fascia in one area is stretched, it can cause tightness, restriction, and pain in another part of the body (10).” MFR works by increasing blood flow and activating the stretch reflex in muscles (8,9).
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Muscle Energy Technique is an osteopathic technique developed in 1988 that uses the energy of a contracting muscle to help restore normal function to the muscles and spinal joints (8). Restricted joints can cause muscle imbalances, spasms, pain, and reduced or dysfunctional range of motion (11,12). Neuromuscular techniques produce a stretch on the tendon that stimulate the Golgi tendon organs which inhibit muscle tension (12). Although there is very limited research regarding the effectiveness of MET, studies have reported decreased pain, reduced muscle tension and spasm, increased range of motion, and improved strength with MET (11,13,14).

Scoliosis causes soft tissue and bony dysfunctions which can create muscle imbalances, fascial restrictions, spinal deformity, joint restrictions, impaired range of motion, decreased pulmonary function, and pain (4). The muscles surrounding the spine greatly affect its shape and movement (19). The use of MFR can reduce myofascial restrictions which helps to decrease muscle tone imbalance, increase spinal range of motion, and increase chest expansion (8,9,10). MET can be used to normalize dysfunctional joints of the spine to decrease muscular asymmetries, improve posture and spinal range of motion, and decrease pain caused by scoliosis (11,12,13,14). This case study will focus on the use of these techniques on a female subject with adult idiopathic structural scoliosis. The expected outcomes for this case study was to increase spinal range of motion, improve chest expansion, decrease muscle tone imbalances, improve posture, and decrease pain symptoms.

Methods

Patient Profile

The patient is a 21-year-old female that is currently a full-time student and a part-time waitress. As a student, the subject sits for long periods of time studying which she contributes
pain symptoms. She works as a server 2 days a week, and she notices pain in her mid-back when she holds serving trays. She describes her physical level as moderately active because she plays soccer 4 times a week. During soccer the subject doesn’t feel pain symptoms, but after she feels pain in her left shoulder. She sprained her right ankle in soccer 5 days prior to the first treatment and had mild swelling and bruising, but she can fully weight bare on it. The patient has played competitive soccer since she was five years old and reports that she has sprained both ankles multiple times. Furthermore, the patient experiences stress from school, which she says can affect her sleep by keeping her up all night.

The patient discovered she had scoliosis about a year ago during a massage which was confirmed by x-rays in February 2018 (Appendix 11). She was diagnosed with adult idiopathic structural scoliosis with a right thoracic curve of 28 degrees and a left lumbar curve of 19 degrees. The patient is young and active, and she says she does not have any physical limitations. The structural asymmetries of the rib humping and elevated right shoulder bother her and make her self-conscious. The patient complains of a dull aching pain on her right side in her chest, ribs, erectors, rhomboids, left quadratus lumborum and bilateral shoulder pain. She says she usually experiences mild daily headaches when she is studying for extended periods of time. The pain has been infrequent for over a year but has been gradually getting worse. The subject is not seeing any other practitioners and has not had any treatment for her scoliosis. She claims that using heat and stretching helps with the pain.

The tools of assessment used were a health intake, postural exam, joint exams, and special tests. Photos were taken before the initial treatment and after the last treatment. Costovertebral expansion and thoracic range of motion measurements with a tape measure and goniometer were taken on the first, fifth, and tenth visits. Each visit the patient filled out a QVAS
and a Symptom Diagram (Appendix 1,2). The Oswestry Low Back Questionnaire was done the first and last treatment (Appendix 4).

**Physical Examination**

Baseline measurements and photos were taken by a postural exam with four positions: anterior, posterior, and two lateral views (3). Postural faults were noted using landmarks to make the observations more consistent. The patient's left shoulder was significantly lower than her right shoulder and her right iliac crest was lower than her left. Typically with a right S curve of the spine the left shoulder and left hip appear lower than the right, so there is a slight deviation from the standard basis (8). The right shoulder appeared to be more anterior and the left shoulder was rotated more internally. The right thoracic and left lumbar curve were apparent with noticeable scapular and rib abnormalities.

Palpation revealed that the right anterior superior iliac spine was more inferior than the left, and the right posterior superior iliac spine was more superior than the left. This indicates possible anterior rotation of the right ilium. Hypertoned and tender muscles palpated were the right trapezius, levator scapula, scalene, sternocleidomastoid, pectoral muscles, quadratus lumborum and lumbar erectors. On the left half of the body hypertonicity of the latissimus dorsi, mid-trapezius, thoracic erector spinae, intercostals, and quadratus lumborum were noted. These findings were consistent with the presentation of a scoliotic S curve (8).

Joint exams were performed for the glenohumeral (GH) joint and thoracic spine. ROM appeared normal for the GH joint with pain on internal rotation. Thoracic range of motion was limited in rotation to the right, and the subject experienced pain in flexion and extension. Thoracic spine rotation measurements were taken with a goniometer following a 2012 study on the Reliability of Thoracic Spine Rotation Range of Motion Measurements in Healthy Adults.
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(18). Thoracic spine flexion was taken with a measuring tape starting at the spinous process of C7 to T12 while standing. The patient flexes forward and the distance is measured between the same spinous processes (3). Costovertebral expansion measurements were taken at three different levels to determine chest expansion (3).

The Skyline test was used to check for functional or structural scoliosis and was positive for structural scoliosis (3). The asymmetries found in the ilium and scapular areas warranted further special tests to determine other contributing factors to the scoliosis dysfunction, which are shown in Table 8. Apley’s Scratch test was performed and noted with a measuring tape (3).

Summary of Treatments

This case study included a total of 10 treatments once a week for 10 weeks, which all followed the same protocol. Each treatment was 60 minutes with 35 minutes in prone, 20 minutes in supine, and 5 minutes side lying. The patient exhibited muscle imbalances that are common with a right S thoracic curve. With an S thoracic scoliotic curve the convex thoracic right side is typically stretched and weak, while the left thoracic concave side musculature is typically hypertoned (9). The muscle imbalance over time can create bony deformities because the bone will remodel itself along lines of stress and tension (16).

The treatment started in prone with MFR consisting of a sustained compression that was held for 2-3 minutes into the myofascial restriction, while taking up tissue slack, until a release was felt (9). A pain scale of 1-5 was used to stay within the patient’s pain tolerance (Appendix 3). Working superficially to deep releasing the left middle and lower trapezius, rhomboids, latissimus dorsi, serratus anterior, thoracic erector spinae, intercostals, and quadratus lumborum. The right trapezius, levator scapula, quadratus lumborum and lumbar erectors were also treated in prone. MET was performed to the sacrum for left central sacral torsion (Appendix 9) and to
the ribs 4 to 10 on the right convex side (Appendix 10). In supine the right sternocleidomastoid, scalenes, pectoralis major and minor were treated with MFR. MET was performed to the right first and second rib (Appendix 10). The right anterior rotation of the ASIS was corrected with MET as well as distraction of the sacroiliac joint (Appendix 7,8). In the side lying position MET was done bilaterally on the QL with more focus on the left side (Appendix 6). The decreased right thoracic rotation was addressed seated at the end of the treatment using a rotational MET technique (Appendix 5).

Results

Table 1 shows chest expansion which is measured at the axilla, xiphoid, and 10th rib all improved in expansion. The 1st Tx measurement for the 10th rib was 0 cm.

<table>
<thead>
<tr>
<th>Treatment Session #</th>
<th>Costovertebral Expansion (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axilla</td>
<td>2</td>
</tr>
<tr>
<td>5th Tx</td>
<td>3.75</td>
</tr>
<tr>
<td>10th Tx</td>
<td>4</td>
</tr>
<tr>
<td>Xiphoid</td>
<td>2.1</td>
</tr>
<tr>
<td>5th Tx</td>
<td>2.8</td>
</tr>
<tr>
<td>10th Tx</td>
<td>5</td>
</tr>
<tr>
<td>10th Rib</td>
<td>0.03</td>
</tr>
<tr>
<td>5th Tx</td>
<td>2</td>
</tr>
<tr>
<td>10th Tx</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Table 1. Costovertebral Expansion measured in centimeters.
Table 2 shows thoracic spine rotation, which improves on the right side throughout the treatments ending with almost equal left and right rotation.

Table 2. Thoracic spine rotation measured in degrees.

<table>
<thead>
<tr>
<th>Treatment Session #</th>
<th>1st Tx</th>
<th>5th Tx</th>
<th>10th Tx</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Tx</td>
<td>49</td>
<td>50</td>
<td>52</td>
</tr>
<tr>
<td>Right</td>
<td>36</td>
<td>43</td>
<td>50</td>
</tr>
</tbody>
</table>

Table 2. Thoracic spine rotation measured in degrees.

Thoracic spine flexion is shown in table 3.

Table 3. Thoracic spine flexion measured in centimeters.

<table>
<thead>
<tr>
<th>Treatment Session #</th>
<th>1st Tx</th>
<th>5th Tx</th>
<th>10th Tx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thoracic Spine Flexion</td>
<td>0.1</td>
<td>1</td>
<td>3.2</td>
</tr>
</tbody>
</table>
Table 4 shows the results of Apley’s Scratch test.

![Apley’s Scratch Test Graph]

Table 4. Apley’s Scratch test measured in centimeters from the middle fingers.

Table 5 shows the QVAS which was taken before each treatment. There was a decrease in overall back pain, the patient’s typical average pain, and their pain at its worst.

![Quadruple Visual Analogue Scale- Back Pain Graph]

Table 5. Quadruple Visual Analogue Scale
Table 6 shows the Symptom diagram which was taken before each treatment.

### Table 6. Symptom Diagram

<table>
<thead>
<tr>
<th>Areas of Pain</th>
<th>Tx 1</th>
<th>Tx 2</th>
<th>Tx 3</th>
<th>Tx 4</th>
<th>Tx 5</th>
<th>Tx 6</th>
<th>Tx 7</th>
<th>Tx 8</th>
<th>Tx 9</th>
<th>Tx 10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14</td>
<td>11</td>
<td>12</td>
<td>9</td>
<td>11</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

Starting the treatments, the patient experienced headaches every day and at the last 2 treatments the subject reported having no headaches as seen in table 7.

### Table 7. Number of headaches per week.

<table>
<thead>
<tr>
<th># of Headaches per week</th>
<th>Tx 1</th>
<th>Tx 2</th>
<th>Tx 3</th>
<th>Tx 4</th>
<th>Tx 5</th>
<th>Tx 6</th>
<th>Tx 7</th>
<th>Tx 8</th>
<th>Tx 9</th>
<th>Tx 10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
The patient completed the Oswestry Low Back Disability Questionnaire (OLBDQ) for back pain on the first and final visit. On the initial visit the results were a 12% disability and the final visit showed a 4% disability.

Table 8 shows the results and indications of each of the special tests performed. Special tests can be found in Orthopedic Physical Assessment (3).

<table>
<thead>
<tr>
<th>Special Test</th>
<th>Initial Assessment Results</th>
<th>Final Assessment Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skyline</td>
<td>+ Structural scoliosis</td>
<td>+ Structural scoliosis</td>
</tr>
<tr>
<td>Gillet’s</td>
<td>+ Right hypomobile SI joint</td>
<td>Negative</td>
</tr>
<tr>
<td>Rectus Femoris Contracture</td>
<td>+ Bilateral- Minimal</td>
<td>+ Bilateral- Minimal</td>
</tr>
<tr>
<td>Seated Flexion</td>
<td>+ Right= left central torsion of sacrum</td>
<td>+Right= left central torsion of sacrum- minimal difference</td>
</tr>
<tr>
<td>Pectoralis Major Length</td>
<td>+ Right hypertoned pectoralis major</td>
<td>Negative</td>
</tr>
<tr>
<td>Supine to Sit</td>
<td>Inconclusive as to an anterior or posterior pelvic rotation</td>
<td>Negative</td>
</tr>
<tr>
<td>True Leg Length</td>
<td>Negative- No indication of leg length discrepancy</td>
<td>N/A</td>
</tr>
<tr>
<td>Thomas</td>
<td>Negative- No indication of hip flexor contraction</td>
<td>N/A</td>
</tr>
<tr>
<td>90/90 Straight Leg Raising</td>
<td>Negative- No indication of hypertoned hamstrings</td>
<td>N/A</td>
</tr>
<tr>
<td>Faber</td>
<td>Negative- No indication of hip joint involvement or iliopsoas spasm</td>
<td>N/A</td>
</tr>
<tr>
<td>Ober’s</td>
<td>Negative- No indication of iliotibial band contracture</td>
<td>N/A</td>
</tr>
<tr>
<td>H&amp;I Stability</td>
<td>Negative- No indication of muscle spasm or instability in the lumbar spine</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 8: Special Tests
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The before and after photo in figure 1 shows a significant improvement in the shoulder levels. The left shoulder and arm appear more symmetrical to the right side.

Figure 1.
In figure 2 there is a dramatic improvement in the scapular region. Before photos show the left shoulder is lower than the right and the left hip is higher than the right hip. The after photos show the improvement in posture and muscle balance.

Figure 2.
EFFECTS OF MYOFASCIAL RELEASE AND MUSCLE ENERGY TECHNIQUES ON A PATIENT WITH IDIOPATHIC SCOLIOSIS

Before and after photos of Apley’s Scratch test show improved GH and scapular mobility in figure 3.

Figure 3.

Figure 4 shows the before and after photos of rotation to the right.

Figure 4.
Marks were placed on the subject’s spinous processes at C7, T3, T6, T9, and T12 in figure 5. There is a visible change in scapular and thoracic region.

Figure 5.
EFFECTS OF MYOFASCIAL RELEASE AND MUSCLE ENERGY TECHNIQUES ON A PATIENT WITH IDIOPATHIC SCOLIOSIS

Discussion/Conclusion

As hypothesized MFR and MET were able to increase spinal range of motion, improve chest expansion, decrease muscle tone imbalances, improve posture, and decrease pain symptoms associated with idiopathic structural scoliosis in a 21-year-old female case subject. Chest expansion increased gradually throughout the treatments indicating greater rib mobility and reduced restrictions. These findings also correlate with a 2015 study where thoracic region self-mobilization was found to increase chest expansion and breathing (17). There was no movement in the thoracic spine during flexion initially. The patient’s flexion was coming from her pelvis. On completion of the final visit, flexion in the thoracic spine was within normal range according to the thoracic measurement test (3). Thoracic spine rotation increased significantly on the right convex side which could be a result of resetting neuromuscular feedback from MET and MFR (7,11,19); moreover, reducing the fascial restrictions on the patients left side would also aid in easier rotation to the right (9,19).

During the GH joint exam there was no noticeable restrictions. The Apley’s Scratch test assesses combined GH ROM which could be related to scapular restrictions. There was a noticeable increase from start to finish in ROM as seen in figure 3, which I would attribute to decreased periscapular and pectoral myofascial adhesions. The Pectoralis Major length test on the right went from positive to negative indicating reduced hypertonicity and improved mobility. A systemic review done by C. Mauntel et al. in 2014 concluded: “The findings of this study indicate that myofascial release therapies are effective in restoring and increasing ROM, without having a detrimental effect on muscular activity or performance (19).”

The Gillet’s test was initially positive on the right indicating a hypomobile SI joint. The use of MET on the right to reduce an anterior rotation of the innominate bone at the SI joint and
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the distraction of the SI joints (Appendix 7,8) helped mobilize the stuck SI joint improving mobility and helping reduce the anterior rotation. The left central sacral torsion, when the sacrum is rotated towards the left on a central axis making the sacrum more posterior on the left, was treated with MET (Appendix 9). There was only a slight left torsion on the final assessment.

The decrease in muscle tone imbalance and improved posture is shown in the before and after photos in figures 1, 2, and 5. The before photos show asymmetries in the shoulders, arms, scapular region, and hips. Post treatment the body appears more symmetrical and balanced. The combination of MFR and MET helped decrease areas of hypertonicity and reset the neurofeedback of the muscular tissue helping restore normal function (19). There is a noticeable improvement in scapular and GH function shown in figure 4. This illustrates how myofascial restrictions can limit ROM and joint mobility (19). The marks placed on the spinous processes in figure 5 appear to show a small decrease in the curve, but that would need to be confirmed with x-rays. Figure 5 also shows a significant difference in the inferior angles of the scapula. I cannot say if the scoliotic curve decreased as there are no post x-rays, but there is some evidence that cobb angles can be decreased through manual therapy according to a study done in 2009 and 2016 (21,22).

The QVAS revealed a decrease in pain symptoms with some fluctuations throughout the treatment. Some of the increased pain was attributed to her menstrual cycle and increased stress with school. The symptom picture diagram showed a decrease in the number of areas of pain but what was most interesting about it was how the areas changed. The shifting locations of pain could indicate the body rebalancing and adapting to the release of restrictions. Prior to the treatment, the patient reported having daily headaches, and by the 9th visit she said they were gone. Decreasing the hypertoned muscles and myofascial adhesions in her upper trapezius,
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levator scapula, and SCM most likely helped to decrease the number of headaches the patient experienced. A study done in 2011 found that there was evidence that MFR is effective at reducing headache frequency (20).

The patient exhibited only 12% disability initially on the OLBDQ, and there was a decrease on her final treatment to 4%. Because the patient is young and active her scoliosis has yet to interfere too much with her daily activities. The couple areas of improvement reported from the OLBDQ were that her pain fluctuates but is overall improving, she can now stand as long as she wants without extra pain, and she can lift heavy objects without extra pain. The physical appearance of the subjects back and shoulders did make her self-conscious. She was very happy with the final results and felt much better about her appearance. After her final treatment she said that her back and hips felt good and that she doesn’t have pain anymore after exercising. She also stated that she hadn’t noticed pain anymore while serving tables.

This study does provide some valuable evidence towards MFR and MET as an effective treatment for idiopathic scoliosis, however it does have several limitations. First, the therapist’s inexperience with using a goniometer and performing the special tests could have skewed the results and measurements. Second, the treatments were limited to the use of only MFR and MET. While it is good to use limiting techniques to assess their effectiveness, using other modalities and homecare could have been beneficial. Third, the ten-week protocol of the study. I think a long term study would be very interesting to follow the changes and see if the results are maintained. Lastly, the patient had recently sprained her right ankle before the treatment began which could have altered her stance and affected her posture. She also had variable degrees of stress with school which could have affected her mood and pain levels.
In conclusion, there is some evidence that the use of MFR and MET can help treat the dysfunctions that accompany idiopathic scoliosis. However, further studies are needed involving a larger sample size, the use pre and post x-rays, and uniform protocol and assessment methods. Idiopathic scoliosis is a complex disorder with many contributing factors and can affect each individual differently over time. More long-term research needs to be done on the management and progression of individuals with idiopathic scoliosis.

**Conflict of Interest**

It must be stated that there was a pre-existing relationship between the therapist and patient prior to the commencement of this study. A therapeutic relationship was established at the onset, avoiding possible biased and conflict of interest.

**Acknowledgements**

I would like to extend my sincerest gratitude to all of my instructors and classmates at CDI College. Your encouragement throughout this program is much appreciated and you have all contributed greatly to my education. I would also like to thank the participant for her time and commitment throughout the case study.
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Appendix

QUADRUPLE VISUAL ANALOGUE SCALE

Name_________________________ Number_________ Date__________

INSTRUCTIONS: Please circle the number that best describes the question being asked.

Note: If you have more than one complaint, please answer each question for each individual complaint and indicate which score is for which complaint.

EXAMPLE:

HEADACHE

NICK

LOW BACK

0 1 2 3 4 5 6 7 8 9 10

1. What is your pain RIGHT NOW?

0 1 2 3 4 5 6 7 8 9 10

2. What is your TYPICAL or AVERAGE pain?

0 1 2 3 4 5 6 7 8 9 10

3. What is your pain AT ITS BEST (How close to “0” does your pain get at its best)?

0 1 2 3 4 5 6 7 8 9 10

What percentage of your awake hours is your pain at its best? __________%

4. What is your pain AT ITS WORST (How close to “10” does your pain get at its worst)?

0 1 2 3 4 5 6 7 8 9 10

What percentage of your awake hours is your pain at its worst? __________% 


Pain Scale- Appendix 3.

1. Light touch

2. A little more pressure

3. Therapeutic pressure

4. Considerable amount of pressure, may have to breath through it.

5. Too much pressure and pain, stop
LOW BACK DISABILITY QUESTIONNAIRE (REVISED OSWESTRY)

This questionnaire has been designed to give the doctor information as to how your back pain has affected your ability to manage in everyday life. Please answer every section and mark in each section only ONE box which applies to you. We realize you may consider that two of the statements in any one section relate to you, but please just mark the box which MOST CLOSELY describes your problem.

Section 1 - Pain Intensity
☐ I can tolerate the pain without having to use painkillers.
☐ The pain is bad but I can manage without taking painkillers.
☐ Painkillers give complete relief from pain.
☐ Painkillers give moderate relief from pain.
☐ Painkillers give very little relief from pain.
☐ Painkillers have no effect on the pain and I do not use them.

Section 2 -- Personal Care (Washing, Dressing, etc.)
☐ I can look after myself normally without causing extra pain.
☐ I can look after myself normally but it causes extra pain.
☐ It is painful to look after myself and I am slow and careful.
☐ I need some help but manage most of my personal care.
☐ I need help every day in most aspects of self-care.
☐ I do not get dressed, wash with difficulty and stay in bed.

Section 3 – Lifting
☐ I can lift heavy weights without extra pain.
☐ I can lift heavy weights but it gives extra pain.
☒ Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned, for example on a table.
☐ Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are conveniently positioned.
☐ I can lift very light weights.
☐ I cannot lift or carry anything at all.

Section 4 – Walking
☐ Pain does not prevent me from walking any distance.
☐ Pain prevents me from walking more than one mile.
☐ Pain prevents me from walking more than one-half mile.
☐ Pain prevents me from walking more than one-quarter mile.
☐ I can only walk using a stick or crutches.
☐ I am in bed most of the time and have to crawl to the toilet.

Section 5 -- Sitting
☐ I can sit in any chair as long as I like.
☐ I can only sit in my favorite chair as long as I like.
☐ Pain prevents me from sitting more than one hour.
☐ Pain prevents me from sitting more than 30 minutes.
☐ Pain prevents me from sitting almost all the time.

Scoring: Questions are scored on a vertical scale of 0-5. Total scores and multiply by 2. Divide by number of sections answered multiplied by 10. A score of 22% or more is considered significant activities of daily living disability.

Score: (Score x 2) / [(Sections x 10) = % ADL]

Appendix 4.
Appendix 5. Thoracic spine rotation

Appendix 6. Quadratus Lumborum Release
Appendix 7. Distraction of SI Joints

Appendix 8. Posterior Rotation of the Innominate Bone
Appendix 9. Central Torsion Manipulation

MET for Ribs- Appendix 10

1. Locate ribs you want to treat.
2. During exhalation follow the ribs until the patient can’t exhale anymore.
3. The patient then inhales while the practitioner resists inhalation.
4. Repeat 3-5 times.
Appendix 11. X-rays taken February 2018