**Article Full Title**

Scapular Kinematics Pre- and Post–Thoracic Thrust Manipulation in Individuals with and Without Shoulder Impingement Symptoms: A Randomized Controlled Study

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**Paper Abstract**

Study design: Randomized controlled trial with immediate follow-up. Objectives: To evaluate the immediate effects of a low-amplitude, high-velocity thrust thoracic spine manipulation (TSM) on pain and scapular kinematics during elevation and lowering of the arm in individuals with shoulder impingement syndrome (SIS). The secondary objective was to evaluate the immediate effects of TSM on scapular kinematics during elevation and lowering of the arm in individuals without symptoms. Background: Considering the regional interdependence among the shoulder and the thoracic and cervical spines, TSM may improve pain and function in individuals with SIS. Comparing individuals with SIS to those without shoulder pathology may provide information on the effects of TSM specifically in those with SIS. Methods: Fifty subjects (mean ± SD age, 31.8 ± 10.9 years) with SIS and 47 subjects (age, 25.8 ± 5.0 years) asymptomatic for shoulder dysfunction were randomly assigned to 1 of 2 interventions: TSM or a sham intervention. Scapular kinematics were analyzed during elevation and lowering of the arm in the sagittal plane, and a numeric pain rating scale was used to assess shoulder pain during arm movement at preintervention and postintervention. Results: For those in the SIS group, shoulder pain was reduced immediately after TSM and the sham intervention (mean ± SD preintervention, 2.9 ± 2.5; postintervention, 2.3 ± 2.5; P&lt;.01; moderate effect size [Cohen d = 0.2]). Scapular internal rotation increased 0.5° ± 0.02° (P = .04; small effect size [Cohen d&lt;0.1]) during elevation of the arm after TSM and sham intervention in the SIS group only. Subjects with and without SIS who received TSM and asymptomatic subjects who received the sham intervention had a significant increase (1.6° ± 2.7°) in scapular upward rotation postintervention (P&lt;.05; small effect size [Cohen d&lt;0.2]), which was not considered clinically significant. Scapular anterior tilt increased 1.0° ± 4.8° during elevation and lowering of the arm postmanipulation (P&lt;.05; small effect size [Cohen d&lt;0.2]) in the asymptomatic subjects who received TSM. Conclusion: Shoulder pain in individuals with SIS immediately decreased after a TSM. The observed changes in scapular kinematics following TSM were not considered clinically important. Keywords: manipulation; manual therapy; rehabilitation; spine.

**NIH Risk of Bias Tool**

Quality Assessment of Controlled Intervention Studies

1. **Was the study described as randomized, a randomized trial, a randomized clinical trial, or an RCT**

Yes

1. **Was the method of randomization adequate (i.e., use of randomly generated assignment)?**

Yes

1. **Was the treatment allocation concealed (so that assignments could not be predicted)?**

Yes

1. **Were study participants and providers blinded to treatment group assignment?**

No

1. **Were the people assessing the outcomes blinded to the participants' group assignments?**

Yes

1. **Were the groups similar at baseline on important characteristics that could affect outcomes (e.g., demographics, risk factors, co-morbid conditions)?**

Yes

1. **Was the overall drop-out rate from the study at endpoint 20% or lower of the number allocated to treatment?**

Yes

1. **Was the differential drop-out rate (between treatment groups) at endpoint 15 percentage points or lower?**

Cannot Determine, Not Reported, or Not Applicable

1. **Was there high adherence to the intervention protocols for each treatment group?**

Yes

1. **Were other interventions avoided or similar in the groups (e.g., similar background treatments)?**

Cannot Determine, Not Reported, or Not Applicable

1. **Were outcomes assessed using valid and reliable measures, implemented consistently across all study participants?**

Yes

1. **Did the authors report that the sample size was sufficiently large to be able to detect a difference in the main outcome between groups with at least 80% power?**

Cannot Determine, Not Reported, or Not Applicable

1. **Were outcomes reported or subgroups analyzed prespecified (i.e., identified before analyses were conducted)?**

Yes

1. **Were all randomized participants analyzed in the group to which they were originally assigned, i.e., did they use an intention-to-treat analysis?**

Yes

**Key Finding #1**

In subjects with shoulder impingement syndrome (SIS), shoulder pain was reduced immediately following thoracic manipulation and a sham treatment which mimicked the set-up of thoracic manipulation but did not provide the HVLA thrust.

**Key Finding #2**

SIS groups experienced a significant decrease in pain of 0.6 points on the NPRS, however, this does not meet the MCID of 2 points proposed by Farrar et al., 2001.

**Key Finding #3**

The mean change in NPRS for the manipulation and sham groups were 25.5% and 10.3%, respectively. These changes represent the MCID for patients with chronic pain as suggested by Dworkin et al., 2009.

**Key Finding #4**

There were significant, yet clinically non-relevant changes in scapular kinematics in the SIS thoracic manipulation and sham groups.

**Please provide your summary of the paper**

This study was an RCT that investigated the effects of thoracic spine manipulation on shoulder pain and scapular kinematics in subjects with shoulder impingement syndrome (SIS). They hypothesized that thoracic spine manipulation (TSM) would reduce pain in subjects with SIS, and alter scapular kinematics in both asymptomatic subjects, and those with SIS. They randomly assigned 97 subjects into four groups; SIS+TM, SIS+Sham, Asymptomatic+TSM, and Asymptomatic+Sham. Electromagnetic sensors were placed on specific bony landmarks of the spine, scapula, and humerus in order to accurately assess kinematics before and after. Sensors were not removed or adjusted between trials, and the manipulation/sham was completed in a way that did not disturb the sensors. Both SIS groups saw a statistically significant decrease in pain of 0.6 points on the NPRS following either TSM or sham treatment. These changes, however, do not meet the MCID of 2 points. When assessing who reported decreased pain following intervention, 60% reported changes following TSM whereas 36% reported changes following sham treatment. Statistically significant changes in scapular kinematics were also found, however, they were not clinically relevant.

**Please provide your clinical interpretation of this paper. Include how this study may impact clinical practice and how the results can be implemented.**

This paper shows that thoracic manipulation may significantly alter pain in subjects with shoulder impingement syndrome. However, they also found that a sham manipulation (no actual HVLA thrust) also significantly decreases pain following application. When looking at point change on the NPRS, the changes were not clinically relevant, however when looking at mean % change, they were above the MCID for chronic pain. Another consideration is that group means may potentially hide some subjects that responded in a statistically AND clinically significant way to TSM for SIS. Any changes that were seen in scapular kinematics did not appear to be clinically meaningful. These findings suggest that TSM is potentially beneficial for transient pain relief in those with shoulder impingement syndrome. However, they also point to the fact that whether an HVLA thrust manipulation is performed or not may not be important, and changes in pain result independently of a thrust. As always, patient values/expectations are very important to consider. If a patient is hesitant to receive a HVLA thrust, then they may reap the same benefits from the grade III/IV mobilization that occurs before a thrust. Counter to that, if a patient believes that manipulations will be beneficial, then transient pain relief may be amplified. It is important to note that this study did not follow-up over time, so conclusions cannot be drawn regarding how long this pain relief was experienced.