Immediate Effects of Lumbar Spine Manipulation on the Resting and Contraction Thickness of Transversus Abdominis in Asymptomatic Individuals

T here is considerable evidence to support that the transversus abdominis muscle (TrA) has a role to play in spinal control. Laboratory studies using fine-wire electromyography (EMG) have demonstrated that this muscle activates in advance of limb movement and is independent of movement direction in asymptomatic individuals. It has been speculated that this preparatory muscle activity is necessary for spinal control, as it has been observed prior to both anticipated and unexpected spinal perturbations.

**STUDY DESIGN:** Randomized, blinded, controlled crossover trial.

**OBJECTIVE:** To determine if thrust joint manipulation (TJM) to the lumbar spine would result in changes to the resting and contraction thickness of transversus abdominis (TrA) in healthy individuals.

**BACKGROUND:** Recent studies have demonstrated an immediate decrease in resting thickness and an increase in contraction thickness in TrA following lumbar TJM in patients with low back pain (LBP) who met a clinical prediction rule (CPR) for spinal manipulation. This observed phenomenon has not been investigated in healthy individuals.

**METHODS:** Thirty-five healthy participants were randomly assigned to receive a TJM or sham manipulation treatment. All participants received instruction on how to produce an isolated contraction of the TrA that involved visual ultrasound imaging biofeedback. Data were analyzed using ultrasound imaging to measure changes in thickness of the TrA at rest and during contraction, following the administration of each treatment.

**RESULTS:** There were no interactions observed between treatment and time for TrA muscle thickness at rest ($P = .351$) and during the contracted state ($P = .761$).

**CONCLUSION:** Our results indicate that TJM to the lumbar spine does not appear to affect the resting or contraction thickness of TrA in healthy individuals. These findings are in contrast to previous research in which patients with LBP who met a CPR demonstrated an immediate decrease in resting thickness and an increase in contraction thickness in TrA following lumbar TJM. J Orthop Sports Phys Ther 2011;41(1):13-21, Epub 22 October 2010. doi:10.2519/jospt.2011.3311

**KEY WORDS:** low back pain, manual therapy, rehabilitative ultrasound imaging

A similar feedback-mediated response has been observed to counter unexpected perturbations to spinal control. These anticipatory and reactive muscle responses have been shown to be delayed, or absent, in individuals with low back pain (LBP), 17,23,25,27

One proposed approach in lumbar rehabilitation (stabilization) programs is to facilitate an isolated contraction of the TrA. To do this, clinicians have employed the abdominal drawing-in maneuver (ADIM), 40,41,45,46

This approach has been theorized to improve lumbar spine control/stability and has also been found to significantly decrease symptoms and disability associated with LBP. 17,20,40,46

Muscular thickness changes have been observed with ultrasound imaging in patients with LBP immediately following lumbar thrust joint manipulation (TJM). A recent case report 13 documented an increased ability to thicken TrA during the ADIM, immediately following the administration of lumbar TJM. Additionally, a recent case series 44 involving 9 consecutive patients with LBP reported that 6 patients demonstrated an improved ability to increase TrA muscle thickness.
during the ADIM and 5 demonstrated decreased at-rest TrA muscle thickness immediately after lumbar TJM. In their analysis, these authors postulated that the altered TrA muscle thickness following TJM might have been due to descending pain-inhibitory influences afforded by the TJM, which might have allowed for greater relaxation (hence, decreased thickness at rest) and increased thickness during contraction of the ADIM. It is important to note that all patients in these 2 studies had LBP and met a clinical prediction rule (CPR) for spinal manipulation. The authors, while acknowledging the fact that no cause-and-effect conclusions could be made from case studies, postulated that the observed changes in muscle thickness could indicate a possible improvement in neuromuscular control of the TrA after lumbar TJM. To our knowledge, the effect of TJM on resting and contraction thickness of TrA has not been examined in a healthy population. If this same phenomenon (decreased resting thickness and/or increased contraction thickness of TrA following TJM) can be observed in a healthy population, it could suggest that any change in TrA muscle thickness is an observed response to TJM, regardless of the presence of symptoms. Therefore, this study seeks to examine the immediate changes in TrA muscle thickness (at rest and during the ADIM) following lumbar TJM in asymptomatic individuals. We sought to test for 2 hypotheses: that (1) the resting thickness of TrA following TJM would differ from that following a sham procedure and (2) the contracted thickness of TrA following TJM would differ from that following a sham procedure.

METHODS

Subjects

A convenience sample of 35 healthy individuals (females, 19; males, 16; mean ± SD age, 24.8 ± 3.2 years; age range, 21-34 years) was recruited from university faculty and students. Based on data from Koppenhaver et al, this number of participants was thought reasonable to estimate a moderate to large effect size (Cohen $d = 0.30$-$0.40$) for TrA thickness changes at rest and during contraction. Specifically, using a degree of freedom of 1 for the 2-way interaction, an alpha of .05 and power of .80, 26 to 45 individuals were needed for an adequate sample size. Consent ing participants were prescreened for contraindications for lumbar TJM. Participants were excluded if they reported back pain requiring medical or pharmacological treatment within the last 6 months, were pregnant or thought they could be pregnant, or had any history of abdominal or spinal surgery, significant scoliosis, rheumatoid arthritis, osteopenia, or active ankylosing spondylitis. The study was approved by the University of Nevada Las Vegas Biomedical Institutional Review Board. All individuals provided informed consent to their participation.

Procedure

Randomization and ADIM Training

Participants were randomly assigned to 2 groups, a group receiving lumbar TJM (intervention A) at the time of their first visit and a sham manipulation (non-thrust) procedure (intervention B) during the second visit 1 week later. The second group received these interventions in the reverse order. Randomization was achieved through selection of sealed envelopes that contained the order of

FIGURE 1. Flowchart of study design. Abbreviations: ADIM, abdominal drawing-in maneuver; USI, ultrasound imaging.

Study enrollment (n = 35)

ADIM education and training (n = 35)

USI measurement (n = 35)

Manipulation (n = 17)

Sham (n = 18)

USI measurement (n = 17)

USI measurement (n = 18)

1-week interval

USI measurement (n = 17)

USI measurement (n = 18)

ADIM education/ training (n = 35)

USI measurement (n = 17)

USI measurement (n = 18)

Sham (n = 17)

Manipulation (n = 18)

USI measurement (n = 17)

USI measurement (n = 18)
interventions (A-B or B-A) to be implemented. All participants completed both sessions 1 week apart (FIGURE 1).

Ultrasound imaging was used to assess the thickness of the TrA muscle. Recent studies have demonstrated ultrasound imaging to be a reliable method for assessing for thickness changes of the anterolateral abdominal muscles. Ultrasound imaging of the lateral abdominal muscles during the ADIM allows both the clinician and the patient to observe changes in TrA muscle thickness that are considered to be indicators of muscle activation.

One researcher with over 30 years of clinical experience in TJM performed all of the interventions and was blinded to the information on ultrasound imaging and all measurements. Three researchers performed the ultrasound imaging and measurements and were blinded to the order of each participant’s treatment interventions.

Once the participants were assigned to a group, they were taught how to perform the ADIM to ensure that they could produce the desired low-level isometric TrA contraction. The training followed a protocol established in previous studies and also served to mitigate the potential for a learning effect to occur when the measurements were taken.

Participants started their training in a quadruped position and were assisted in determining neutral spine posture. Neutral spine was defined as the midrange sagittal position for each participant’s lumbar spine. To standardize performance of the ADIM, participants were instructed to gently pull the abdominal muscles in toward the spine (lift the umbilicus), without moving their spine from neutral, while breathing normally, and then to maintain this contraction for 10 seconds. Each participant performed the ADIM in this second position 5 times before moving to the final training in the supine hook-lying position with hips and knees bent and feet flat on the table.

During the hook-lying position, participants were given visual biofeedback using the ultrasound imaging and could observe the correct TrA contraction during the ADIM (FIGURE 2). Participants were instructed to perform submaximal contractions of the ADIM another 5 times, with 10-second holds in this final position before being given a 2-minute rest to minimize any fatigue effect after training.

Ultrasound Instrumentation and Measurement Technique Ultrasound images of the lateral abdominal muscles were obtained both pretreatment and posttreatment using a Biosound Esaote MyLab25 Gold unit (Biosound Inc, Indianapolis, IN), with a variable 2.5- to 6.6-MHz, 60-mm curvilinear array (model CA631) in brightness mode (b-mode). The unit was preset to a frequency of 6.6 MHz and a power of 75%, with a maximum depth of 9 cm. The focal length was manually adjusted for each image to maximize visualization of the TrA for each participant.

Participants were positioned in the supine hook-lying position, with a neutral posture for all measurements pretreatment and posttreatment. A transverse image of the anterolateral abdominal wall was obtained along a line midway between the inferior angle of the rib cage and the iliac crest on the participant’s right side. To standardize the position of the ultrasound transducer, it was aligned perpendicular to the anterolateral abdominal muscles, and the anterior fascial insertion of the TrA muscle was positioned approximately 2 cm from the medial edge of the ultrasound image with the participant relaxed. Once this initial image was acquired, a line bisecting the length of the transducer head was drawn on the skin with a marker to standardize the location of the transducer between pretreatment and posttreatment ultrasound imaging. The transducer was placed parallel to the marker drawn and every effort was made to control for clockwise/counterclockwise rotation, and medial/lateral as well as cranial/caudal tilt, as it has been previously shown that transducer motion greater than 9° of clockwise/counterclockwise rotation and greater than 5° of medial/lateral or cranial/caudal tilt introduces error into the measurement of TrA thickness.

The participant was not able to see the ultrasound monitor during the contractions, thus ensuring that visual feedback did not contribute to the participant’s performance. To minimize the effects of breathing on TrA thickness, all ultrasound images were taken immediately after a normal exhalation. Still-frame images of the anterolateral abdominal wall were obtained during the relaxed state and during contraction (ADIM) 3 times each to allow for an averaging of 3 consecutive measures, as this has been found to optimize intraexaminer measurement precision. For the contracted state (ADIM), participants were asked to replicate the same submaximal level of
contraction that they had performed in training and to maintain the contraction during normal breathing. The ultrasound images were taken immediately after a normal exhalation in the breathing cycle.

The researchers performing the ultrasound imaging then left the room, and the researcher providing the treatments entered and provided the randomly ordered treatment intervention. Participants were instructed not to discuss which treatment they had received with the researchers performing the ultrasound measurement upon their return to the room. A posttreatment set of still-frame images was obtained during the relaxed state and during contraction 3 more times.

A total of 12 still images of the right anterolateral abdominal wall were obtained for each participant: 3 pretreatment relaxed, 3 pretreatment contracted, 3 posttreatment relaxed, and 3 posttreatment contracted. Participants returned a week later to undergo the alternative treatment, and a second set of 12 still images was obtained for each participant.

TABLE 1
Occurrence of Cavitations During the Sidelying Manipulation*

<table>
<thead>
<tr>
<th>Position</th>
<th>First Attempt</th>
<th>Second Attempt</th>
<th>Attempts Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right sidelying</td>
<td>30/35 (85.7%)</td>
<td>2/5 (40%)</td>
<td>32/35 (91.4%)</td>
</tr>
<tr>
<td>Left sidelying</td>
<td>31/35 (88.6%)</td>
<td>4/4 (100%)</td>
<td>35/35 (100%)</td>
</tr>
</tbody>
</table>

*Values are number (percent) of participants.

TABLE 2
Descriptive Statistics*

<table>
<thead>
<tr>
<th>Contraction State/Treatment/Time</th>
<th>Results</th>
<th>Change Pretreatment to Posttreatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analysis 1: rest</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sham</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretreatment</td>
<td>0.304 ± 0.093 (0.272, 0.336)</td>
<td>-0.002 ± 0.056 (–0.021, 0.017)</td>
</tr>
<tr>
<td>Posttreatment</td>
<td>0.305 ± 0.098 (0.272, 0.339)</td>
<td></td>
</tr>
<tr>
<td><strong>Manipulation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretreatment</td>
<td>0.307 ± 0.093 (0.275, 0.339)</td>
<td>-0.036 ± 0.048 (–0.032, 0.001)</td>
</tr>
<tr>
<td>Posttreatment</td>
<td>0.322 ± 0.094 (0.290, 0.354)</td>
<td></td>
</tr>
<tr>
<td><strong>Analysis 2: contracted</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sham</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretreatment</td>
<td>0.547 ± 0.167 (0.490, 0.604)</td>
<td>0.04 ± 0.084 (–0.035, 0.043)</td>
</tr>
<tr>
<td>Posttreatment</td>
<td>0.533 ± 0.179 (0.472, 0.595)</td>
<td></td>
</tr>
<tr>
<td><strong>Manipulation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretreatment</td>
<td>0.583 ± 0.201 (0.514, 0.652)</td>
<td>0.007 ± 0.108 (–0.031, 0.044)</td>
</tr>
<tr>
<td>Posttreatment</td>
<td>0.576 ± 0.179 (0.514, 0.638)</td>
<td></td>
</tr>
</tbody>
</table>

*Values are mean ± SD (95% confidence interval).

Treatments Depending on the randomly assigned order, participants received either a spinal TJM or a sham manipulation (nonthrust) in their first session and then the alternative treatment a week later at their second session. The spinal TJM performed was a sidelying lumbar technique, as illustrated in Figure 3 (ONLINE VIDEO) and described in the APPENDIX. It was attempted with the participant lying on the right side first and, if a cavitation was noted, the procedure was repeated with the participant lying on the left side. If the manipulative thrust yielded no cavitation on the first attempt on either side, it was repeated once more so that the researcher performed a maximum of 2 thrust attempts per side. If a cavitation occurred during positioning before the administration of the thrust, it was duly noted but a thrust was still applied. The researcher recorded the presence of cavitations and the number of manipulative thrust attempts per side for each participant (TABLE 1).

The sham manipulation was performed by placing the individual into the sidelying position with both hips and knees flexed to approximately 45°, and performing a Maitland grade I oscillation for lumbar rotation (FIGURE 4, ONLINE VIDEO). The oscillations were performed slowly over very short amplitude for 30 seconds and were repeated with the individuals lying on their other side. No cavitations were noted with any of the participants during sham treatment.

Data Management and Analysis All inferential analyses were undertaken by using SPSS Version 16 (SPSS Inc, Chicago, IL), and all ultrasound imaging images were coded, stored on the ultrasound unit’s hard drive, and later recalled for measurement. Using the unit’s built-in
measurement tool, muscle thickness (to the nearest 0.1 mm) was measured from the inside edges of the fascial bands of the TrA muscle. To consistently measure the same point along the muscle belly, measurements were taken perpendicular to a line through the middle of the muscle belly, 2.5 cm lateral to the rectus sheath muscle-fascia junction (FIGURE 5, ONLINE VIDEO). The ability of each of the researchers to consistently measure TrA thickness directly from the images was confirmed by having each researcher measure muscle thickness on the same images from 10 consecutive participants on different days. These included 3 separate images of the muscle taken at rest and another 3 images taken during contraction prior to the intervention phase of the study. Each researcher was blinded to the previous measurements. Intrarater reliability for the measurement of TrA muscle thickness was excellent for all 3 researchers, each having an intraclass correlation coefficient (ICC3,3) of 0.94, 0.96, and 0.98, respectively. The researcher with the highest intrarater reliability (ICC3,3 = 0.98, SEM = 0.0132) was chosen to measure all of the images for the data analysis.

To assess the relationship of manipulation on TrA muscle thickness, 2-by-2 (treatment [TJM and sham] by time [pretreatment and posttreatment]) analyses of variance (ANOVs) were conducted, 1 for muscle thickness at rest and 1 for muscle thickness during the contacted state.

RESULTS

DESCRIPTIVE STATISTICS FROM THE study are provided in TABLE 2. There was no interaction observed between treatment and time for TrA muscle thickness at rest (F1,26 = .893, P = .351) (FIGURE 6). Likewise, the main effects of treatment (P = .338) and time (P = .072) were not significant (TABLE 3 and 4). In addition, there was no interaction between treatment and time for the TrA muscle thickness during the contracted state (F1,26 = .094, P = .761) (FIGURE 7). The main effect for time was not significant (P = .382). However, the main effect for treatment was significant (P = .014), suggesting that the individuals receiving the TJM condition (combined prescore and postscore) had a thicker TrA than those receiving the sham condition (combined prescore and postscore) (TABLE 4).

DISCUSSION

Despite the recent evidence for the clinical effectiveness of TJM in a select group of patients with LBP10 and neck pain,4 the mechanisms of action for spinal manipulation remain unclear. One of the proposed theoretical mechanisms receiving some attention is a neurophysiological or reflexogenic effect.15,42 It is proposed that the TJM elicits a stretch reflex in either the joint mechanoreceptors or muscle spindles, and this is thought to lead to an inhibition or attenuation of the alpha motor neuron pool, which will thereby cause muscle relaxation and break the “spasm-ischemia-pain-spasm” cycle.38

Our results indicate that there was no difference in thickness seen for TrA at rest or during contraction both prior to and following either TJM or the sham procedure in healthy individuals. These findings are in contrast to those reported by Gill et al12 and Raney et al,44 who found differences in both resting and contracted thickness for TrA following TJM in patients with acute LBP. These authors12,44 postulated that the altered TrA muscle thickness following TJM might have been due to descending pain inhibitory influences afforded by the TJM,1 which
might have allowed for greater relaxation (hence decreased thickness at rest) and increased thickness during contraction of the ADIM. Such a theory would appear to be well supported by many studies investigating the neurophysiological effects of TJM. The patients with LBP who do not meet the clinical prediction rule in comparison to a group of patients with LBP who do not meet the clinical prediction rule in a homogenous group of patients with LBP were a homogeneous group of patients with LBP who do. Furthermore, the authors did not indicate whether the paraspinal EMG levels returned to baseline levels following the initial increase in activity seen with the TJM. In our study, images of the TrA muscle thickness changes were taken at least 2 minutes after each intervention, which might have been well after any transient increase in EMG signal was present from the TJM. If such an increase in EMG signal would translate to a transient increase in thickness of the TrA, it is possible that we were too late with our measurements to detect it.

Ferreira et al. used fine-wire electrodes to obtain EMG measurements of the lateral abdominal muscles (TrA, obliquus externus, and obliquus internus) during trunk perturbations caused by rapid upper extremity movements before and after a rototational mobilization treatment directed to the L4-5 intervertebral segment. They found no change in trunk muscle EMG signal during the postural perturbation after the treatment intervention in their healthy controls. However, in contrast to our study, the authors applied a nonthrust end range rototational lumbar mobilization technique. It would be of interest to repeat their study but apply TJM instead of the nonthrust mobilization and see if the results differ.

Other studies have demonstrated that TJM causes a transient decrease in the motor neuron activity, as assessed by the H-reflex. Dishman et al. used transcranial magnetic stimulation to assess the effects of TJM on the excitability of the motor neuron pool in 24 healthy volunteers. Motor-evoked potentials elicited by the transcranial magnetic stimulation were recorded from the right gastrocnemius muscle. They found that lumbar TJM led to transient facilitation of motor evoked potentials from the gastrocnemius muscle, and their data suggested that there was a postsynaptic facilitation of a motor neurons, cortico-motor neurons, or both that may be specific to the TJM. This suggests motor facilitation or improved muscle activation following TJM and would presumably translate to

### TABLE 3
**Main Effects of Time on Transversus Abdominis Thickness (cm) for Rest and Contracted States**

<table>
<thead>
<tr>
<th>Contraction State</th>
<th>Pretreatment $\overline{\chi}$</th>
<th>Posttreatment $\overline{\chi}$</th>
<th>$P$ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rest</td>
<td>0.306</td>
<td>0.314</td>
<td>.072</td>
</tr>
<tr>
<td>Contracted</td>
<td>0.555</td>
<td>0.555</td>
<td>.382</td>
</tr>
</tbody>
</table>

### TABLE 4
**Main Effects of Treatment on Transversus Abdominis Thickness (cm) for Rest and Contracted States**

<table>
<thead>
<tr>
<th>Contraction State</th>
<th>Manipulation $\overline{\chi}$</th>
<th>Sham $\overline{\chi}$</th>
<th>$P$ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rest</td>
<td>0.315</td>
<td>0.305</td>
<td>.338</td>
</tr>
<tr>
<td>Contracted</td>
<td>0.580</td>
<td>0.540</td>
<td>.014*</td>
</tr>
</tbody>
</table>

*Significant effect ($P<.05$).
increased contraction thickness of the muscle involved. The facilitation effects of the TJM were only found to be significant for a period of 20 to 120 seconds post-TJM; therefore, if motor facilitation can be extrapolated to an increased thickness of contraction in the TrA, it is possible that in our study we were also too late with our measurements to be able to detect it.

Another consideration as to why no change was found in TrA thickness may have been the sensitivity of ultrasound imaging system. The ultrasound transducer used in this study (model CA631) is reported to have an axial resolution of 0.3 mm at 2.5 to 6.6 MHz. Axial resolution refers to the minimum separation between 2 interfaces located in a direction parallel to the ultrasound beam so that they can be imaged as 2 different interfaces. Therefore, if an individual's TrA was only 2 to 3 mm thick (as was the case at rest with 4 out of 35 participants) and changed up to 0.3 mm (10% increase or decrease) with the intervention, then this might not have been detected due to the sensitivity of the measurement tool. It is possible that in those individuals with smaller TrA thicknesses, any change brought about by the intervention might have been close to the limits of detection of the device.

Strengths and Limitations
Our study followed a similar instructional protocol on the use of ultrasound imaging to that reported in recent studies and introduced as much consistency as possible in both the image acquisition and measurement phases. However, we acknowledge that some limitations exist within this study. We opted to assess TrA thickness changes during a voluntary contraction, the ADIM. Performing the ADIM requires some skill acquisition on the part of the participants, and we were not able to determine if the participants were consistently performing the ADIM in the same manner and to the same extent.

We did not measure EMG signal in this study through means of fine-wire or needle electrodes. In a recent systematic review, Koppenhaver et al reported on the validity of ultrasound imaging as a measure of trunk muscle size and activation during both isometric and submaximal contractions. They found 3 studies that had investigated the ability of ultrasound to measure TrA muscle activation when compared with EMG. One study reported a strong linear relationship between EMG signal amplitude and change in TrA muscle thickness (R² = 0.87) during contractions up to 20% of maximal voluntary contraction (MVC). A second study found the relationship between change in TrA muscle thickness and EMG signal amplitude to be curvilinear; however, they did report that an almost linear relationship existed during contractions up to approximately 20% MVC (r = 0.90). The authors suggested that ultrasound measures could not be used as a reliable tool for contractions above 20% of MVC secondary to little change in muscle thickness after 20% MVC. In the third study, patients with recurrent LBP and matched controls were tested for changes in thickness in abdominal muscles while fine-wire EMG signal was measured concurrently during isometric low-load tasks. They found agreement between ultrasound and EMG data for comparison between muscles and between groups. Based on these studies and their extensive review of others, Koppenhaver et al concluded that clinicians could confidently use ultrasound to measure muscle activation during low levels of isometric contraction of TrA, such as during the ADIM performed in this study.

From the reviewed literature, it is possible that we may have been missing some significant albeit transient effects by not acquiring the ultrasound images quickly enough after the interventions. However, to maintain blinding for the study, we had to allow enough time between the intervention and posttreatment imaging for research team members to enter and exit the room. Future studies should utilize a study design that would allow for immediate detection of muscle thickness changes postmanipulation.

We did not examine for contraction thickness changes in the lumbar multifidus following either treatment intervention. It is possible that the immediate effects of TJM may be more readily noted in muscles that are more closely associated with the supposed mechanical effects of the TJM (joint cavitations and stretching).

Our calculations of sample size were based on an estimate of moderate to large effect size; however, our results indicate that the effect size was small. Because the change in TrA thickness that would be considered clinically or functionally significant following an intervention is unknown, it is difficult to have a strong basis for determining sample size for this type of study. But the current data could provide reasonable estimates of expected changes to use to calculate power in future studies.

CONCLUSION
While our results suggest that TJM may not result in any change in resting or contracted thickness of the TrA in individuals without LBP, it is possible that an immediate transient effect occurred as a result of TJM.

KEY POINTS

FINDINGS: Using ultrasound imaging, no change was observed to either the resting or contracted thickness of TrA in healthy individuals following TJM to the lumbar spine.

IMPLICATIONS: These findings suggest that TJM may not facilitate an increase in contraction thickness of the TrA in individuals without LBP. These results also indicate that the proposed neurophysiological mechanisms by which lumbar TJM alters TrA contraction thickness, as previously reported in individuals with LBP who met the criteria for a clinical prediction rule, may be dependent on pain or pathology.
CAUTION: The time delay between TJM and ultrasound imaging measurement may have prevented detection of short-lasting changes. Future studies should examine for potential thickness changes in TrA following TJM in patients with LBP.

REFERENCES

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DESCRIPTION OF THE LUMBAR THRUST JOINT MANIPULATION TECHNIQUE

High-velocity end range rotation thrust to upper lumbar spine on lower lumbar spine, with patient sidelying (sidelying rotation technique or rotation gliding thrust in neutral positioning)

Steps (Left Rotation)

1. Participant was placed in right sidelying.
2. Participant’s right leg and spine were placed in a straight line, to achieve neutral/extension positioning.
3. Participant’s left hip was flexed to approximately 90°.
4. Participant’s left knee was flexed and dorsum of left foot placed just behind the right knee.
5. Researcher introduced left rotation of the participant’s upper body down to the desired level.
6. Researcher was careful to avoid introducing any spine flexion.
7. Researcher took up axillary hold.

Method

1. Researcher stood close to the couch, feet spread and one leg behind the other.
2. Researcher maintained an upright posture facing the participant’s upper body.
3. Researcher placed his right forearm in the region between participant’s gluteus medius and maximus.
4. Researcher rotated the participant’s pelvis and lumbar spine towards his body until motion was palpated at the desired lower lumbar segments (pre-tension).
5. Researcher rotated the participant’s upper body away from his body until he sensed tension at the desired segments.
6. Researcher then rolled the participant about 10° to 15° towards his body.
7. Researcher made any necessary adjustments to achieve prethrust tension.

Thrust

1. Applied by the researcher with the forearm against the pelvis.
2. The direction was down towards the couch by applying exaggerated pelvic rotation towards researcher.
3. The left arm against the participant’s axillary region did not apply a thrust but acted as a stabilizer only.