# Immediate Effects of Thoracic Spine Thrust Manipulation on Neurodynamic Mobility

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## Abstract

**Objective:** The purpose of this study was to investigate the immediate effects of thoracic spine thrust manipulation (TSM) on the upper limb provocation test (ULPT) and seated slump test (SST) in individuals with identified neurodynamic mobility impairments. A secondary aim was to determine if correlation existed between the perception of effect and improvements in neurodynamic mobility following a thrust manipulation compared with mobilization.
**Methods:** A pretest-posttest experimental design randomized 48 adults into 2 groups: TSM or mobilization. Participants with identified neurodynamic mobility impairment as assessed with the ULPT or SST received a pre-assigned intervention (TSM, n = 64 limbs; mobilization, n = 66 limbs). Perception of effect was assessed to determine its influence on outcome. Repeated-measures analysis of variance was used to examine the effects of intervention, and Fisher's exact test and independent *t* tests were used to determine the influence of perception.
**Results:** Both the ULPT ($P < .001$) and SST ($P < .001$) revealed improvements at posttest regardless of intervention. The ULPT effect sizes for TSM ($d = 0.70$) and mobilization ($d = 0.69$) groups were medium. For the SST, the effect size for the TSM group ($d = 0.53$) was medium, whereas that for the mobilization group ($d = 0.26$) was small. Participants in the mobilization group with positive perception had significantly greater ($P < .05$) mean neurodynamic mobility changes than those with a negative perception.
**Conclusions:** Neurodynamic mobility impairment improved regardless of intervention. The magnitude of change was greater in the ULPT than SST. Although both interventions appeared to yield similar outcomes, individuals who received mobilization and expressed a positive perception of effect exhibited significantly greater changes in neurodynamic mobility than those without a positive perception. (J Manipulative Physiol Ther 2018;xx:1-10)
**Key Indexing Terms:** *Manipulation, Spinal; Spine; Thoracic Vertebrae*

## Introduction

The benefits of manual therapy intervention for a variety of musculoskeletal conditions have been widely reported in the literature.[1-8] Despite the high level of current evidence supporting its use, the specific mechanisms of action remain elusive.[9] The model proposed by Bialosky et al suggests that the interplay between biomechanical and neurophysiological effects of manual therapy may be responsible for changes seen clinically.[10] Additionally, in recent years, the literature has suggested that influences such as patient-therapist alliance and patient expectation may have an impact on the efficacy of manual therapy interventions.[11-17]

Traditionally, both thrust joint manipulation and mobilization are considered manual therapy treatment techniques. However, although both are commonly used to reduce pain, eliminate impairment, and improve function, their relative efficacy is not entirely clear.[6,8,18] Thrust joint manipulation has been reported to be equally effective as mobilization in decreasing pain and improving function for mechanical low back pain.[19] Similarly, Izquierdo Pérez et al[20] reported no significant difference between cervical spine thrust manipulation and mobilization for chronic neck pain. Other authors, however, report superior outcomes when comparing thrust joint manipulation to mobilization procedures for mechanical neck pain,[21] cervicogenic headaches,[22] and low back pain.[23]

Variability in the evidence comparing thrust joint manipulation to mobilization is also noted for techniques directed at the thoracic spine. Thoracic spine thrust joint manipulation has been found to be more effective than mobilization for mechanical neck pain,[24] disability,[25,26] and lower trapezius muscle activation.[27] However, other authors have failed to establish a significant benefit of thoracic spine thrust joint manipulation over mobilization. When comparing thrust manipulation to mobilization, Sillevis et al noted no difference in autonomic nervous

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**Table 1.** *Demographic Profile of Study Participants*

| Group | Height (m) | Weight (kg) | Age (y) | BMI (kg/m$^2$) | Female (%) |
|---|---|---|---|---|---|
| TSM | 1.70 (0.08) | 70.86 (12.50) | 25.73 (9.02) | 24.27 (3.40) | 63.64 |
| Mobilization | 1.69 (0.09) | 67.16 (13.96) | 23.33 (3.47) | 23.35 (3.75) | 76.19 |
| *P* value | .62 | .37 | .26 | .40 | |

Data are expressed as the mean (standard deviation), except where noted.
*BMI,* body mass index; *TSM*, thoracic spine thrust manipulation.

system activity in participants with chronic cervical spine pain.[28] Suvarnnato et al reported similar levels of improvement for participants who received thrust joint manipulation or mobilization for chronic neck pain.[29] Salom-Moreno et al reported similar improvements in pain-pressure threshold following thrust joint manipulation or mobilization in participants with mechanical neck pain.[24]

To determine why some individuals respond more favorably to thrust joint manipulation or mobilization, Lopez-Lopez et al considered psychological factors for participants with chronic neck pain who were exposed to different manual therapy techniques.[30] These authors noted that although thrust joint manipulation and mobilization both improved cervical spine pain, individuals with high anxiety responded more favorably to mobilization, whereas individuals with lower levels of anxiety were more likely to respond to thrust joint manipulation. Although evidence suggests that both mechanical and neurophysiological effects occur with manual therapy,[5,10,31,32] these findings indicate that psychological factors may also influence outcomes depending on the treatment received.

In addition to psychological factors, Bialosky et al's proposed model of the mechanisms of manual therapy suggests that nonspecific features such as patient expectation can affect the delivery of manual therapy treatment and the patient experience.[10] Patient expectation is strongly correlated with outcomes in individuals experiencing neck pain, and matching expectation with treatment appears to dramatically increase efficacy of care.[12,13] Patient expectation can also be positively or negatively influenced by the instructions given by the practitioner.[14] Additionally, positive psychological reinforcement appears to improve patient outcomes.[15]

Although many studies have investigated thrust joint manipulation and/or mobilization for mechanical cervical spine or lumbar spine pain, range of motion (ROM), perceived disability, and pain-pressure threshold, few have investigated the effects of manual therapy on peripheral nervous system tissue and mechanosensitivity to testing with procedures such as neurodynamic tests. Szlezak et al[33] inferred a relationship between abnormal neurodynamic mobility and persistent peripheral dysfunctions such as hamstring strains. These authors also reported improved neurodynamic mobility via the straight leg raise test following unilateral lumbar spine mobilization.[33] A recent meta-analysis of peripheral responses to cervical or thoracic spinal manual therapy reported improvements in upper limb neurodynamic testing, thereby supporting the therapeutic effect of spinal manual therapy.[34] However, of the articles reviewed, only 4 used upper limb neurodynamic testing as an outcome measure, and all participants were treated with a cervical lateral glide mobilization.[5,35-37] Because of the anatomical relationship of the thoracic spine and the sympathetic chain ganglion, it appears plausible that intervention in this area may affect peripheral sympathetic outflow to both the upper and lower quarters.

Although previous studies have investigated the response of upper quarter neurodynamic mobility to cervical spine lateral glide mobilization,[5,35-37] no studies have investigated the effects of thoracic spine thrust manipulation (TSM) or mobilization on upper and lower quarter neurodynamic mobility. Additionally, no study has attempted to correlate perception of benefit from mobilization or thrust joint manipulation with improvement in neurodynamic mobility impairments. The purpose of this study was to investigate the immediate effects of TSM on the upper limb provocation test (ULPT) and seated slump test (SST) in participants with identified neurodynamic mobility impairments. An additional purpose was to determine if a difference in treatment effect was present between participants with positive and those with negative perceptions of effect.

## Methods

### Design

A randomized pretest-posttest experimental design was used to investigate the immediate effects of TSM on neurodynamic mobility. Shenandoah University's institutional review board, which approved this study for the Protection of Human Subjects, granted ethical approval. Prior to testing, examination procedures were explained and all participants provided informed consent. This trial was registered with ClinicalTrials.gov and made public via ID No. NCT02842918.

### Participants

Based on a power analysis, to achieve a power of 0.80 and an effect size 0.5, a sample size of 126 limbs was recommended a priori. Forty-eight asymptomatic adults,