Thrust Joint Manipulation Utilization by Us Physical Therapists

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THRUST JOINT MANIPULATION UTILIZATION

BY US PHYSICAL THERAPISTS

By

Sean Reilly
Rebecca Slaughter
Erwin Ventura

A doctoral project submitted in partial fulfillment of the requirements for the

Doctor of Physical Therapy

Department of Physical Therapy
College of Allied Health Sciences
Division of Health Sciences
The Graduate College

University of Nevada, Las Vegas
May 2016
This doctoral project prepared by

Sean Reilly

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entitled

Thrust Joint Manipulation Utilization by Us Physical Therapists

is approved in partial fulfillment of the requirements for the degree of

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ABSTRACT

Study Design: Online survey study.

Objective: To determine physical therapists’ utilization of thrust joint manipulation (TJM) and their comfort level in using TJM between the cervical, thoracic, and lumbar regions of the spine. We hypothesized that physical therapists who use TJM would report regular use and comfort providing it to the thoracic and lumbar spines, but not so much for the cervical spine.

Background: Recent surveys of first professional physical therapy degree programs have found that TJM to the cervical spine is not taught to the same degree as to the thoracic and lumbar spines.

Methods: We developed a survey to capture the required information and had a Delphi panel of 15 expert orthopedic physical therapists reviewed it and provide constructive feedback. A revised version of the survey was sent to the same Delphi panel and consensus was obtained on the final survey instrument. The revised survey was made available to any licensed physical therapists in the USA using an online survey system, from October 2014 through June 2015.

Results: Of 1014 responses collected, 1000 completed surveys were included for analysis. There were 478 (48%) males; the mean age of respondents was 39.7 ± 10.81 years (range 24 – 92); and mean years of clinical experience was 13.6 ± 10.62. A majority of respondents felt that TJM was safe and effective when applied to lumbar (90.5%) and thoracic (91.1%) spines; however, a smaller percentage (68.9%) felt that about the cervical spine. More therapists reported they would perform additional screening prior to providing TJM to the cervical spine than they would for the lumbar and
thoracic spine. Therapists agreed they were less likely to provide and feel comfortable with TJM in the cervical spine compared to the thoracic and lumbar spine. Finally, therapists who are male; practice in orthopedic spine setting; are aware of manipulation clinical prediction rules; and have manual therapy certification, are more likely to use TJM and be comfortable with it in all 3 regions.

**Conclusion:** Results indicate that respondents do not believe TJM for the cervical spine to be as safe and efficacious as that for the lumbar and thoracic spines. Further, they are more likely to perform additional screening, abstain from and do not feel comfortable performing TJM for the cervical spine.

**Clinical Relevance:** Our research reveals there is a discrepancy between utilization of TJM at different spinal levels. This research provides an opportunity to address variability in clinical practice among physical therapists utilizing TJM.

Key Words: *Thrust joint manipulation, Manipulation, Manual therapy, Mobilization, Survey.*
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**Introduction**

Thrust joint manipulation (TJM) is defined as a high-velocity low-amplitude thrust technique which can be distinguished from other joint mobilization techniques that do not utilize a final thrust maneuver.\(^1\),\(^2\) The intent is to achieve an audible cavitation, although cavitation may not be necessary to achieve the desired clinical effects.\(^3\) TJM is used in clinical practice by physical therapists to treat musculoskeletal pain and dysfunction. The *Manipulation Education Manual* published by the American Physical Therapy Association (APTA)\(^4\) indicates that training in TJM should begin in first professional physical therapy programs. Furthermore, competent performance of manual therapy techniques (including mobilization/manipulation thrust and non-thrust techniques) is listed as a standard and required element (7D27-f) for the accreditation of physical therapist education programs by the Commission on Accreditation in Physical Therapy Education (CAPTE).\(^5\)

A recent survey of physical therapist professional degree programs in the United States found that all but one, of the 147 responding programs, were currently teaching TJM in their curriculum.\(^6\) While the average time programs devoted to instruction in TJM was 50 hours, they found a large amount of variation, with 58 programs reporting between 1 and 30 hours of teaching time and 17 programs reporting over 100 hours.\(^6\) An interesting finding was that of the spinal regions, the cervical spine received the least amount of emphasis, with 52 out of 147 (35%) responding programs not teaching TJM to the cervical spine.\(^6\) This is in contrast to TJM in the lumbar and thoracic regions, which was taught in virtually all responding programs (99% and 97% respectively).\(^6\) Although this is an increase from the 47% of responding programs that excluded cervical
techniques found in an earlier study, it is evident that cervical spine TJM continues to be taught at a lower rate than TJM for other spinal regions. If physical therapists are not being taught cervical spine TJM in their first professional degree programs, it is reasonable to conclude that those wishing to learn and safely practice this intervention must be looking to post-professional programs such as manual therapy certification, orthopedic residencies and/or fellowships.

There is conflicting evidence on the utilization of cervical spine TJM by physical therapists for patients with neck pain. Hurley et al conducted a postal survey of 150 randomly selected physical therapists in Ontario, Canada, who regularly performed spinal manipulation. Of the 118 respondents, only 41 (34.7%) indicated that they would perform cervical spine TJM where it was indicated (based upon 6 indications from the Clinical Practice Guideline the authors developed).

In an earlier postal survey of UK manual therapists, Adams and Sim sent questionnaires to 300 UK manipulative physical therapists and achieved a 48% response rate. Of the 143 responders, 129 (90.2%) identified themselves as ‘users’ of TJM, and anxiety about possible complications was the prominent reason given by ‘non-users’ and ‘partial users’ for their avoidance of manipulative procedures. All ‘non-users’ were female, none of which listed private practice as their primary work area. In the survey, the thoracic spine was the region most often manipulated (97%), followed by the lumbar spine (92%). TJM to the cervical spine was employed by a varying percentage of responders based on the level within the cervical spine. Interestingly, 80% of the responders indicated they would regularly manipulate the lower cervical spine, 66% the middle cervical spine and 22–24% the upper cervical spine.
The rates of utilization of TJM in the cervical spine reported by Adams and Sims\(^9\) (66% for the middle cervical spine and 80% for the lower cervical spine) are significantly higher than those found by Hurley et al\(^8\) (only 34.7% for the cervical spine) and another study by Jull et al\(^10\) (20.2% for the cervical spine). In an Australian, multi-center RCT of physical therapy management of cervicogenic headache, Jull et al\(^10\) reviewed the treatment records of 100 subjects who received only manual therapy, or manual therapy with exercise. Their results indicated that TJM to the cervical spine was used in only 20.2% of the 1090 treatments provided to the 100 subjects.

In a recent international study, all health care professional groups identified as having a major role in the management of neck pain were surveyed to determine their use of physical medicine, complementary and alternative medicine.\(^{11}\) Of the 360 respondents, 138 (38%) were physical therapists, and of those 138, 12% were from the United States.\(^{11}\) The majority of all 360 respondents commonly used manual therapy, with mobilization (90%) being more frequently used than TJM (56%).\(^{11}\) While utilization rates by healthcare profession were not provided, the authors did report physical therapists performed TJM significantly less often than chiropractors.\(^{11}\)

The fact that TJM to the cervical spine is not being taught to the same degree as other regions of the spine within first professional physical therapy programs, and that physical therapists tend to use it less frequently in clinical practice, leads us to wonder how TJM to the spine is viewed by physical therapists currently practicing in the United States (US). Therefore, the purpose of this study was to survey physical therapists to determine their utilization of TJM within the three spinal regions; their thoughts about
safety and efficacy of TJM to the spinal regions; and to discover any perceived barriers to utilization of TJM.

Methods

We developed, piloted, and delivered an electronic survey to US physical therapists. It was based upon previous paper surveys. Reporting of methods and results followed the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). Sample size (800) was determined using the following sample-size calculation formula:

\[ N_s = \frac{(N_p)(p)(1-p)}{(N_p-1)(B/C)^2 + (p)(1-p)} \]

Where:
\( N_s \) = completed sample size for desired level of precision
\( N_p \) = size of population
\( p \) = proportion of population expected to choose one of the two response categories
\( B \) = acceptable amount of sampling error; .03 = ± 3% of the true population value
\( C \) = Z statistic associated with the confidence level

For the current study, the population (\( N_p \)) was drawn from data from the United States Department of Labor, Bureau of Labor Statistics as of May 2014. \( N_p \) was calculated at 200,670 physical therapists. The proportion of the population (\( p \)) expected to choose one of the two response categories (to participate or not) was designed as a 50/50 split or 0.50. The acceptable amount of sampling error (\( B \)) was set to 0.03, while the confidence level (\( C \)) was established at 90%, with a corresponding Z statistic of 1.645. The resulting \( N_s \) or completed sample size was 748, which was rounded up to a sample size of 800. A confidence level of 10% was selected because it was subjectively considered the best balance of Type I and Type II error by the researchers of the current study.
Survey Development

The primary objectives were to: 1) determine the level of use of TJM within the 3 spinal regions amongst physical therapists in the USA; 2) compare/contrast use of TJM within the 3 spinal regions; 3) determine therapists’ level of comfort performing TJM within the 3 spinal regions; 4) determine therapists’ beliefs about safety and efficacy of TJM for each of the spinal regions; and 5) discover parameters that might influence use/non-use of TJM within the 3 regions. A preliminary survey was distributed in June 2014 to a Delphi panel consisting of 15 licensed physical therapists who were experts in performing, teaching, and researching TJM. Feedback from the Delphi panel was incorporated and a revised survey instrument was sent back to 10 of the members of the Delphi panel in July 2014 for further comments/feedback. Once consensus (minimum 70% agreement) was achieved from the 10 members, the final survey was adopted.

The final survey was then field tested in August 2014 on a random sample of 20 licensed physical therapists to determine test-retest reliability. The survey was completed on 2 separate occasions, 2 weeks apart, by the same 20 physical therapists and comparisons demonstrated the survey to be reliable with 19 of the 20 PTs responding identically on both occasions for all survey questions. All questions are listed in Appendix 1, as they appeared in the final version of the survey.

The first page of the survey provided a description of the study and its objectives, and then asked for informed consent before continuing to the rest of the questions. Respondents were informed that the survey had IRB approval, that participation was voluntary and the name and contact number of the Principal Investigator was provided.
Survey questions first asked for demographic information, years and nature of clinical experience, manual therapy certifications (if any), practice settings, and whether or not the respondent was aware of any clinical prediction rules (CPR’s) for provision of TJM. Within the survey, TJM was defined for participants as “a high velocity low amplitude thrust technique given with the intention of achieving joint cavitation.” The next four questions examined respondents’ beliefs about: a) safety and effectiveness of TJM for each of the 3 spinal regions; b) whether they would routinely perform additional medical history screening prior to TJM for each of the 3 spinal regions; c) whether they regularly provided TJM for each of the 3 spinal regions; and d) their level of comfort performing TJM for each of the 3 spinal regions. The final question asked about perceived barriers to the use of TJM in the spine by physical therapists.

Adaptive questioning was not used, and all respondents had the opportunity to answer each of the 15 questions. Questions were presented in the same order for every respondent, and it was not mandatory to respond to every question that was displayed. The survey could be completed on any computer or electronic device with an internet browser and internet access. Respondents were able to review and change their responses if necessary by scrolling up or down. Depending upon the device used, the maximum number of questions visible per screen was three.

The link to the finalized survey was then distributed via social media and word of mouth to target a convenience sample of any practicing physical therapists within the United States. Social media (e.g. Facebook, Twitter, and LinkedIn) notifications were also posted, with permission, to the notice boards and associations representing physical therapists within the United States. Leaflets and business cards with the webpage link to
the survey were distributed at the 2014 Annual Conference of the American Academy of Orthopedic Manual Physical Therapists (AAOMPT) in October; at the 2015 Combined Sections Meeting (CSM) of the American Physical Therapy Association (APTA) in February; and the 2015 NEXT conference and exhibition of the APTA in June.

Completion of the survey was entirely voluntary, and any practicing physical therapist in the US was eligible to participate. No incentives were offered for completed surveys. The online platform could not restrict access to one response per computer IP address so we had to check responses from identical IP addresses and eliminate duplicates. Finally, email addresses were neither collected nor tracked, so that all data were anonymous.

Data Processing and Statistical Analysis

Individual responses were exported to Microsoft Excel (2013), and data were erased for cases where respondents had refused consent by exiting the survey without answering any questions. Small manual alterations were made to tidy the data, e.g. if respondents had entered their highest earned degree into the ‘other’ box instead of selecting it from the available options, the selection was entered in place of ‘other’. Data was then exported into statistical analysis software (SPSS Version 21; SPSS Inc, Chicago, IL).

Descriptive statistics were calculated for each of the variables to determine the demographics of the survey respondents, and their awareness of CPR’s for spinal manipulation. Because the data was ordinal, we analyzed levels of agreement with the 4 questions that examined beliefs regarding TJM using a non-parametric Freidman’s ANOVA for each question. If statistically significant differences were found, post hoc
comparisons were conducted (Wilcoxon signed rank test) with a Bonferroni corrected \( \alpha = .0167 \). Frequency counts for the survey-provided choices for perceived barriers to providing TJM to the spine were obtained, and qualitative analysis of the manually entered responses to the choice of “Other” was undertaken to look for specific themes.

To better understand therapist attributes associated with their beliefs about TJM, ordinal logistic regression was performed for 3 of the 4 questions that examined respondents’ beliefs. Modeled questions were: 1) safety and effectiveness of TJM for each of the 3 spinal regions; 2) whether they regularly provided TJM for each of the 3 spinal regions; and 3) level of comfort performing TJM for each of the 3 spinal regions. The responses to these questions for the 3 spinal areas (cervical, thoracic, lumbar) were the dependent variables in the models. Prior to modeling, all questions (independent variables) from the survey were tested for collinearity with each other. Entry level degree and highest earned degree, awareness of CPR’s and with which CPR’s respondents were familiar, as well as age and years of practice were collinear and so only one (highest degree, awareness of CPR’s, and years of practice) from each pair was used in the modeling. For modeling, practice setting and special certifications were dichotomized so that respondents either practiced in ‘Outpatient Orthopedics (Spine)’ or not, and either had a ‘special certification’ or not. For all models, predictor variables included: years of practice, percentage of patients seen with the particular spine region related to the question (e.g., lumbar patients for the questions about lumbar spine; lumbar and SI were combined), gender, highest earned degree, practice setting, awareness of CPR’s, and special certification.
Results

The survey was opened on October 12, 2014 and remained open until June 12, 2015. It was accessed 1018 times, and there were 4 respondents who did not consent to participate/answer any questions. Of the 1014 respondents who had given consent, 1000 (98.6%) completed the survey by providing answers to the 4 questions about TJM in the 3 regions of the spine and results from these respondents were analyzed. Data from the remaining 1.4% of respondents, who did not complete our a priori determined minimum number of questions, were excluded. Mean duration for the survey (time to complete) was 7 minutes.

Demographics

Of the 1000 valid responses, 519 were female (51.9%), 478 were male (47.8%) and 3 declined to indicate. Mean age for the sample was 39.8 ± 10.67 (range 23 - 85). (Table 1) Respondents lived, based on computer IP addresses used to complete the survey, in all but 3 states in the US, with most respondents located in the Midwest (Kansas, Missouri, Iowa, Wisconsin and Illinois) as well as Texas and the West coast (California, Nevada, Oregon and Washington). (Figure 1)
Details of first professional degree and highest earned degree for the survey respondents are provided in Table 1. When compared by gender, males tended to have higher first professional degrees than females (p = .003), and higher ‘highest earned degrees’ than females (p = .000). Of the 480 respondents that reported having completed some form of manual therapy or clinical specialty certification, 277 (57.7%) were male and this was a statistically significant higher proportion than females (p = .000). Of the various manual therapy/clinical specialty certifications listed, males were proportionally more represented for all (ps < .05) except certified orthopedic manual therapist (COMT) (p = .177). (Table 1)
Table 1. Demographics of the survey responders

<table>
<thead>
<tr>
<th></th>
<th>Group (n=1000)</th>
<th>Males (n=478)</th>
<th>Females (n=519)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean ± SD) (992 responded)</td>
<td>39.8 ± 10.67</td>
<td>39.5 ± 10.07</td>
<td>39.9 ± 11.17</td>
<td>.583†</td>
</tr>
<tr>
<td>Years of practice (992 responded)</td>
<td>13.5 ± 10.61</td>
<td>13.0 ± 9.81</td>
<td>14.1 ± 11.24</td>
<td>.097†</td>
</tr>
<tr>
<td>Entry-level Degree (993 responded)</td>
<td></td>
<td></td>
<td></td>
<td>.003*</td>
</tr>
<tr>
<td>- DPT</td>
<td>426 (42.9%)</td>
<td>204 (47.9%)</td>
<td>222 (52.1%)</td>
<td></td>
</tr>
<tr>
<td>- MPT/ MSPT</td>
<td>310 (31.2%)</td>
<td>173 (55.8%)</td>
<td>137 (44.2%)</td>
<td></td>
</tr>
<tr>
<td>- BPT/ BSPT</td>
<td>228 (23.0%)</td>
<td>89 (39.0%)</td>
<td>139 (61.0%)</td>
<td></td>
</tr>
<tr>
<td>- Certificate/ Other</td>
<td>29 (2.9%)</td>
<td>11 (37.9%)</td>
<td>18 (62.1%)</td>
<td></td>
</tr>
<tr>
<td>Highest Degree (992 responded)</td>
<td></td>
<td></td>
<td></td>
<td>.000*</td>
</tr>
<tr>
<td>- PhD/ DSc/ EdD</td>
<td>41 (4.1%)</td>
<td>29 (70.7%)</td>
<td>12 (29.3%)</td>
<td></td>
</tr>
<tr>
<td>- DPT</td>
<td>592 (59.7%)</td>
<td>299 (50.5%)</td>
<td>293 (49.5%)</td>
<td></td>
</tr>
<tr>
<td>- MPT/ MSPT</td>
<td>197 (19.9%)</td>
<td>96 (48.7%)</td>
<td>101 (51.3%)</td>
<td></td>
</tr>
<tr>
<td>- BPT/ BSPT</td>
<td>116 (11.7%)</td>
<td>36 (31.0%)</td>
<td>80 (69.0%)</td>
<td></td>
</tr>
<tr>
<td>- Certificate/ Other</td>
<td>46 (4.6%)</td>
<td>16 (34.8%)</td>
<td>30 (65.2%)</td>
<td></td>
</tr>
<tr>
<td>Manual Therapy/ Clinical Speciality Certification (y/n)</td>
<td>480 (48%)</td>
<td>277 (57.7%)</td>
<td>203 (42.3%)</td>
<td>.000*</td>
</tr>
<tr>
<td>- OCS</td>
<td>231 (23.1%)</td>
<td>153 (66.2%)</td>
<td>78 (33.8%)</td>
<td>.000*</td>
</tr>
<tr>
<td>- FAAOMPT</td>
<td>95 (9.5%)</td>
<td>79 (83.2%)</td>
<td>16 (16.8%)</td>
<td>.000*</td>
</tr>
<tr>
<td>- MTC</td>
<td>41 (4.1%)</td>
<td>31 (75.6%)</td>
<td>10 (24.4%)</td>
<td>.000*</td>
</tr>
<tr>
<td>- CertMDT</td>
<td>34 (3.4%)</td>
<td>26 (76.5%)</td>
<td>8 (23.5%)</td>
<td>.001*</td>
</tr>
<tr>
<td>- COMT</td>
<td>45 (4.5%)</td>
<td>26 (57.8%)</td>
<td>19 (42.2%)</td>
<td>.177*</td>
</tr>
<tr>
<td>- Other certification</td>
<td>247 (24.7%)</td>
<td>133 (53.8%)</td>
<td>114 (46.2%)</td>
<td>.032*</td>
</tr>
</tbody>
</table>

* Pearson Chi-Square analysis  
† Independent samples t-test

DPT = Doctor of Physical Therapy; MPT = Master of Physical Therapy; MSPT = Master of Science in Physical Therapy; BPT = Bachelor of Physical Therapy; BSPT = Bachelor of Science in Physical Therapy; OCS - Orthopedic Certified Specialist; FAAOMPT = Fellow of the American Academy of Orthopaedic Manual Physical Therapists; MTC = Manual Therapy Certified; CertMDT = Certificate in Mechanical Diagnosis Therapy; COMT = Certified Orthopedic Manual Therapy

Mean years of clinical practice for the survey sample was 13.5 ± 10.61 years (range 1 – 50), with no difference between males and females. Respondents were able to
check multiple practice settings if applicable and 81% reported their practice setting as
‘orthopedic spine’; 78% as ‘orthopedic extremities’; 16% as ‘acute/ inpatient care’; 6% as
‘pediatrics’; 7% as ‘skilled nursing’; 8% as ‘home health’; and 14% as ‘other’.

Awareness of Manipulation Clinical Prediction Rules

In response to the question “are you aware of any clinical prediction rules
(guides) for patients with neck or back pain who are more likely to benefit from spinal
manipulation?”, 83.7% responded ‘yes’. Of those that responded in the affirmative,
78.3% knew about the lumbar TJM for low back pain; 61.4% knew about the thoracic
TJM for neck pain; and finally, 52.8% knew about the cervical TJM for neck pain CPR’s.

Safety and efficacy of TJM by spinal region

For levels of agreement with the statement “Thrust Joint Manipulation in the XXX
spine is safe and effective for patients in which it is indicated”, non-parametric
Friedman’s ANOVA revealed a statistically significant difference among the means
$\chi^2(2)=704.291, p=.000$. Post hoc comparisons (Wilcoxon signed rank test) with a
Bonferroni corrected $\alpha = .0167 (.05 / 3$ comparisons) revealed a significant difference
between the lumbar and thoracic spinal regions ($p=.001$); between lumbar and cervical
spinal regions ($p=.000$); and between thoracic and cervical spinal regions ($p=.000$).
Therapists believed that TJM was more effective and safe in the thoracic spine than in the
lumbar and cervical spines, and more effective and safe in the lumbar than in the cervical
spine. (Figure 2)
**Figure 2:** Levels of agreement with the statement “Thrust Joint Manipulation in the XXX spine is safe and effective for patients in which it is indicated.”

Wilcoxon Signed Ranks Test revealed significant differences between thoracic and lumbar spines ($p=.001$); between thoracic and cervical spines ($p=.000$); and between lumbar and cervical spines ($p=.000$).

*Additional screening prior to performing TJM by spinal region*

For levels of agreement with the statement “*Prior to performing Thrust Joint Manipulation to the XXX spine, I would routinely perform additional medical history screening*”, a statistically significant difference was found among the means $\chi^2(2)=212.297$, $p=.000$. Post hoc comparisons revealed a significant difference between each of the spinal regions ($ps=.000$). Therapists reported they would conduct additional screening prior to performing TJM in the cervical spine more than they would for the lumbar and thoracic spines, and more in the lumbar spine than they would for the thoracic spine. (Figure 3)
**Figure 3:** Levels of agreement with the statement “Prior to performing Thrust Joint Manipulation to the XXX spine, I would routinely perform additional medical history screening.”

Wilcoxon Signed Ranks Test revealed significant differences between each region of the spine (ps=.000).

**Regularly providing TJM by spinal region**

For levels of agreement with the statement “I regularly provide Thrust Joint Manipulation to the XXX spine where it is indicated”, a statistically significant difference was found among the means $\chi^2(2)=742.855$, p=.000. Post hoc comparisons revealed a significant difference between each of the spinal regions (ps=.000). Therapists agreed that they regularly provided TJM in the thoracic spine more than they would for the lumbar and cervical spines, and more in the lumbar spine than they would for the cervical spine. (Figure 4)
Figure 4: Levels of agreement with the statement “I regularly provide Thrust Joint Manipulation to the XXX spine where it is indicated.”

Wilcoxon Signed Ranks Test revealed significant differences between each region of the spine (ps=.000).

Comfort providing TJM by spinal region

For levels of agreement with the statement “I am comfortable performing Thrust Joint Manipulation to the XXX spine in patients that require it”, a statistically significant difference was found among the means $\chi^2(2)=790.956$, $p=.000$. Post hoc comparisons revealed a significant difference between each of the spinal regions (ps=.000). Therapists agreed they were comfortable performing TJM in the thoracic spine more than they would be for the lumbar and cervical spines, and more in the lumbar spine than they would be for the cervical spine. (Figure 5)
Figure 5: Levels of agreement with the statement “I am comfortable performing Thrust Joint Manipulation to the XXX spine in patients that require it.”

Wilcoxon Signed Ranks Test revealed significant differences between each region of the spine (ps=.000).

Barriers to the use of TJM by Physical Therapists

Lack of adequate mentoring and entry-level training were chosen the most by respondents (64.9% and 63.8% respectively) as a barrier to the use of TJM. Concerns about safety and lack of post-graduate training were chosen 56.7% and 54.5% respectively, and legislative efforts by other professions to preclude physical therapists from using TJM was chosen by 33% as barriers. Only 9.5% chose lack of evidence for its effectiveness as a barrier to the use of TJM in the spine.

One hundred and twenty-one therapists (12.1%) chose “other” as a barrier to providing TJM and were then able to enter free text. The comments provided by these responding therapists were qualitatively analyzed and grouped into specific themes. (Table 2)
Table 2. Comments provided by respondents when choosing “other” for perceived barriers to the use of TJM by physical therapists - 121 respondents provided 125 examples of 7 specific themes.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Frequency</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear/ Confidence</td>
<td>32</td>
<td>• Lack of confidence in my skill</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fear and stigma</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fear of injuring the patient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Size barriers - comfort level</td>
</tr>
<tr>
<td>Lack of education</td>
<td>26</td>
<td>• Lack of entry-level training for cervical spine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lack of opportunity to practice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Need more education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Not having a clinical mentor</td>
</tr>
<tr>
<td>Safety/ Efficacy</td>
<td>23</td>
<td>• Same results with non-thrust mobilizations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Potential for exacerbating injury/ pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Risk/ benefit ratio doesn’t favor TJM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lack of evidence for long term benefits</td>
</tr>
<tr>
<td>Practice Setting</td>
<td>17</td>
<td>• Lack of appropriate patient population to practice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type of patients I treat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Relevance to my area of practice</td>
</tr>
<tr>
<td>Legality issues</td>
<td>7</td>
<td>• Fear of litigation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fear of repercussions from aggressive chiropractic lobby</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Liability if it goes wrong</td>
</tr>
<tr>
<td>Patient issues</td>
<td>7</td>
<td>• Patient apprehension towards joints ‘cracking’</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Patient relaxation to get effective results and safety</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Patient comfort and consent</td>
</tr>
<tr>
<td>No interest in TJM</td>
<td>6</td>
<td>• Personal bias not to use it</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• It doesn’t belong in PT scope of practice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Not interested/ willing to perform the techiques</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>• Viewed as ‘chiropractic only’ treatment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Many people already see a chiropractor either before or concurrently with physical therapy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Negativity from other physical therapists</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lack of physician acceptance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lack of ‘true’ direct access</td>
</tr>
</tbody>
</table>
Modeling

For all 3 modeled questions, individual models were generated for each of the spinal regions about which participants were asked to respond (cervical, thoracic, and lumbar), such that 9 total models were created (Tables 3 – 5). All models were adjusted for gender, years of practice, proportion of patients seen with spine pathology, education level, awareness of CPR’s, manual therapy certification, and practice setting. In all 3 models for the question about therapist comfort performing TJM (I am comfortable performing thrust joint manipulation to the XXX spine in patients that require it), 4 of the predictor variables were significant: gender, outpatient orthopedic practice, awareness of CPR’s, and manual therapy certification (Table 3).

Table 3. Ordinal Logistic Regression Model Results For the Question, “I am comfortable performing thrust joint manipulation to the XXX spine in patients that require it.”

<table>
<thead>
<tr>
<th></th>
<th>Cervical OR (95% CI)</th>
<th>Thoracic OR (95% CI)</th>
<th>Lumbar OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2.78 (2.17-3.55)</td>
<td>3.06 (2.22-4.22)</td>
<td>3.23 (2.43-4.26)</td>
</tr>
<tr>
<td>Female</td>
<td>ref</td>
<td>ref</td>
<td>ref</td>
</tr>
<tr>
<td>Ortho spine practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>ref</td>
<td>ref</td>
<td>ref</td>
</tr>
<tr>
<td>No</td>
<td>0.69 (0.50-0.96)</td>
<td>0.30 (0.20-0.44)</td>
<td>0.48 (0.33-0.69)</td>
</tr>
<tr>
<td>CPR Aware</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2.82 (1.88-4.22)</td>
<td>10.75 (6.26-18.48)</td>
<td>6.61 (4.13-10.56)</td>
</tr>
<tr>
<td>No</td>
<td>ref</td>
<td>ref</td>
<td>ref</td>
</tr>
<tr>
<td>Manual Therapy certification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>ref</td>
<td>ref</td>
<td>ref</td>
</tr>
<tr>
<td>No</td>
<td>0.43 (0.34-0.55)</td>
<td>0.50 (0.37-0.68)</td>
<td>0.47 (0.35-0.61)</td>
</tr>
</tbody>
</table>

Bold OR’s indicate significant results. CPR=clinical prediction rule
Models adjusted by: years of therapist experience, the proportion of patients that they treat with the modeled spine region, and highest earned degree.
These results indicate that, depending on spine region, the odds of male therapists being more comfortable with TJM were 2.78 to 3.23 times greater than that of females. The odds of therapists that do not practice in an outpatient orthopedic setting on patients with spinal pathology being comfortable with TJM were 31% to 70% less than the odds for therapists who do such practice. The odds of therapists who are aware of spine CPR’s being comfortable with TJM were 2.82 to 10.75 times greater that of therapists unaware of the CPR’s. Finally, the odds of those without manual therapy certification being comfortable with TJM were 50% to 57% less than that of therapists with manual therapy certification.

In the 3 models for the question about regularly providing TJM (I regularly provide thrust joint manipulation to the XXX spine where it is clinically indicated), the same 4 predictor variables from the previous question were significant (Table 4). The direction and magnitude of the effect was likewise similar to the previous question on comfort. The odds of male therapists regularly performing TJM were 2.25 to 2.94 (depending on spine region) times greater than that of females. The odds of therapists that do not practice in an outpatient orthopedic setting on patients with spinal pathology regularly performing TJM were 36% to 74% less than the odds for those who do such practice. The odds of therapists who are aware of spine CPR’s regularly performing TJM were 2.83 to 6.57 times greater that of therapists unaware of the CPR’s. Finally, the odds of therapists without manual therapy certification regularly performing TJM were 51% to 56% less than that of those with manual therapy certification.
Table 4. Ordinal Logistic Regression Model Results For the Question, “I regularly provide thrust joint manipulation to the XXX spine where it is clinically indicated.”

<table>
<thead>
<tr>
<th></th>
<th>Cervical OR (95% CI)</th>
<th>Thoracic OR (95% CI)</th>
<th>Lumbar OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td><strong>2.69 (2.10-3.44)</strong></td>
<td><strong>2.25 (1.73-2.92)</strong></td>
<td><strong>2.94 (2.24-3.85)</strong></td>
</tr>
<tr>
<td>Female</td>
<td>ref</td>
<td>ref</td>
<td>ref</td>
</tr>
<tr>
<td><strong>Ortho spine practice</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td><strong>0.64 (0.46-0.90)</strong></td>
<td>ref</td>
<td>ref</td>
</tr>
<tr>
<td><strong>CPR Aware</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td><strong>2.83 (1.84-4.36)</strong></td>
<td><strong>6.57 (4.10-10.53)</strong></td>
<td><strong>5.28 (3.33-8.37)</strong></td>
</tr>
<tr>
<td>No</td>
<td>ref</td>
<td>ref</td>
<td>ref</td>
</tr>
<tr>
<td><strong>Manual Therapy certification</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td><strong>0.44 (0.34-0.56)</strong></td>
<td><strong>0.48 (0.36-0.62)</strong></td>
<td><strong>0.49 (0.38-0.63)</strong></td>
</tr>
</tbody>
</table>

Bold OR’s indicate significant results. CPR=clinical prediction rule
Models adjusted by: years of therapist experience, the proportion of patients that they treat with the modeled spine region, and highest earned degree

In the 3 models for the final question about TJM being safe and effective (Thrust joint manipulation in the XXX spine is safe and effective for patients in which it is indicated), only 2 variables were significant for all 3 spine regions: gender and awareness of CPR’s (Table 5). The direction and magnitude of the effect was again similar to the previous questions. The odds of male therapists feeling TJM is safe and effective were 1.69 to 2.35 (depending on spine region) times greater than that of female therapists. The odds of therapists who are aware of spine CPR’s feeling TJM is safe and effective were 2.84 to 12.30 times greater than that of those unaware of the CPR’s.
Table 5. Ordinal Logistic Regression Model Results For the Question, “Thrust joint manipulation in the XXX spine is safe and effective for patients in which it is indicated.”

<table>
<thead>
<tr>
<th></th>
<th>Cervical OR (95% CI)</th>
<th>Thoracic OR (95% CI)</th>
<th>Lumbar OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1.69 (1.34-2.14)</td>
<td>2.31 (1.36-3.94)</td>
<td>2.35 (1.49-3.72)</td>
</tr>
<tr>
<td>Female</td>
<td>ref</td>
<td>ref</td>
<td>ref</td>
</tr>
<tr>
<td><strong>Ortho spine practice</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>ref</td>
<td>ref</td>
<td>ref</td>
</tr>
<tr>
<td>No</td>
<td>0.76 (0.55-1.06)</td>
<td>0.29 (0.18-0.49)</td>
<td>0.50 (0.32-0.79)</td>
</tr>
<tr>
<td><strong>CPR Aware</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2.84 (1.93-4.18)</td>
<td>9.55 (5.23-17.42)</td>
<td>12.30 (5.98-25.29)</td>
</tr>
<tr>
<td>No</td>
<td>ref</td>
<td>ref</td>
<td>ref</td>
</tr>
<tr>
<td><strong>Manual Therapy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>certification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>ref</td>
<td>ref</td>
<td>ref</td>
</tr>
<tr>
<td>No</td>
<td>0.68 (0.53-0.86)</td>
<td>0.82 (0.49-1.36)</td>
<td>0.65 (0.43-0.98)</td>
</tr>
</tbody>
</table>

Bold OR’s indicate significant results. CPR=clinical prediction rule
Models adjusted by: years of therapist experience, the proportion of patients that they treat with the modeled spine region, and highest earned degree

**Discussion**

This study aimed to determine whether or not practicing physical therapists in the US were utilizing, and felt comfortable providing, TJM to each of the three spinal regions. The results demonstrate that 66.5% agreed (completely or somewhat) that they regularly use TJM in the thoracic spine where it is indicated (Figure 4) and 75.9% were comfortable doing so (Figure 5). Significantly lower proportions were found for utilization and comfort providing TJM in lumbar spine, 52.9% and 66.5% respectively. These utilization rates are much lower than the 97% for the lumbar spine and 92% for the thoracic spine reported by Adams and Sim⁹; however, this may be explained by the fact
that they limited their survey to manipulative physical therapists in the UK whereas our study was open to any practicing physical therapist regardless of practice setting. Our results show that only 33% of physical therapists regularly provide, and 39.1% are comfortable performing, TJM in the cervical spine. Although this utilization is somewhat comparable to the 34.7% of Canadian physical therapists, who regularly perform spinal manipulation, it is much lower than the rates reported by Adams and Sim. They found rates of 80% for the lower cervical, 66% for the middle cervical and 22 - 24% for the upper cervical spine.

There may be many reasons why TJM is not being utilized as often in the cervical spine as it is in the other areas of the spine. There is conflicting evidence on whether TJM is better than other forms of manual therapy or exercise, and this may well explain the lower utilization rate. Another reason is that it receives the least emphasis in teaching within physical therapist professional degree programs. The latest survey of US programs found that 35% do not teach TJM to the cervical spine, whereas almost all do teach it for the lumbar (99%) and thoracic regions (97%). This may also explain why our study found that respondents were least comfortable performing TJM to the cervical spine in patients where it is appropriate and indicated.

The findings from the ordinal logistic regression modeling provide some interesting thoughts about therapists’ attributes associated with their beliefs about TJM. We found that male therapists were 2.78 to 3.23 times more likely (depending on spinal region) to be comfortable, and 2.25 to 2.94 times more likely to regularly provide TJM than female therapists. This finding cannot be explained by the fact that more male therapists tended to have manual therapy and/or clinical specialty certifications as the
modeling adjusted for specialty certification. The modeling also found that after adjusting for gender, respondents without specialty certification were 51% to 56% less likely to use, and 50% to 57% less likely to report being comfortable providing, TJM to any region of the spine. Results show that male therapists tended to represent a greater proportion of the higher entry-level and earned professional degrees, and while this might suggest greater awareness of CPR’s, this was also adjusted for in the modeling and cannot explain why males therapists were more likely to be comfortable and regularly provide TJM. There may be other factors (such as size, strength, confidence, and interest in TJM) which we did not ask about in the survey, which might help explain this difference between the genders.

With respect to the safety and efficacy of TJM, results demonstrate that a majority of the respondents agreed that TJM was safe and effective in all of the spinal regions (Figure 2). The cervical spine had the least number of therapists believing that TJM was safe and effective (68.9%) when compared to the thoracic and lumbar spines (91.1% and 90.5% respectively). This is likely reflective of the evidence suggesting that there are greater risks associated with performing TJM in the cervical spine, that there is less evidence to support its effectiveness, and that it is taught less in first professional degree programs. However, it is interesting to note that therapists also believed that TJM was more effective and safe in the thoracic spine compared to the lumbar spine. This finding may be more reflective of recent research into the regional interdependence approach, which highlights the value of TJM to the thoracic spine in patients with neck pain when combined with therapeutic exercise. However, it should be noted that in a sub-group of patients with low back pain, there is high level evidence to support
the use of TJM in the lumbar spine.\textsuperscript{15,28} It is also possible that therapists may not be as aware of adverse events associated with TJM to the thoracic spine, and a recent systematic review has highlighted the need for therapists to monitor the forces they use in this area of the spine and reconsider the risks.\textsuperscript{29}

The modeling found that responding therapists were more likely to believe that TJM was safe and effective (for all 3 spinal regions) if they were male and aware of CPR’s. Similar to the questions about comfort and regularly providing TJM, this finding might well be attributable to factors not raised in the survey. It also showed that therapists that do not practice in an outpatient orthopedic setting on patients with spinal pathology were less likely to believe TJM was safe and effective for the thoracic and lumbar spines, than therapists who do such practice. This was not so for the cervical spine, as regardless of their practice setting, therapists did not differ significantly in their beliefs about safety and effectiveness of TJM for this region.

When asked to consider any barriers to the use of TJM by physical therapists, a majority of respondents felt that inadequate training (entry-level and post-graduate), insufficient mentoring and safety were of greatest concerns. While all professional physical therapy programs teach TJM in their curriculum,\textsuperscript{6} there is a large amount of variation in the amount of training provided by programs, and so it is not surprising that 63.8% of respondents chose this as a barrier. Lack of adequate mentoring was chosen by 64.9% and this may be reflective of inadequate clinical opportunities to practice TJM to the spine. Boissonnault et al\textsuperscript{1} found that although TJM was being taught in entry-level programs, students were not given opportunities to practice the skill on patients by their clinical instructors. If such practice opportunities are not available during entry-level
training, it makes sense that therapists wishing to develop skills in TJM would seek post-graduate training and lack of such training was seen as a barrier by 54.5% of respondents. Interestingly, this study found that therapists who had undergone such training via manual therapy or specialty certification were more likely to provide TJM and more comfortable when doing so. Finally, concerns about safety were chosen as a barrier to the use of TJM by 56.7% of therapists.

Although only 12.1% of respondents provided comments for “other” barriers to the use of TJM, qualitative analysis found similar and recurring themes, such as ‘lack of education’, ‘fear/confidence’, and ‘safety/efficacy’, all of which could be addressed by improving educational and mentoring opportunities. Steps should be taken to correct for the large variance in teaching of TJM within professional degree programs and to provide more clinical instructors who can provide clinical opportunities and mentoring for students in these programs. Also, graduates who are interested in pursuing further education and practice with TJM should be made aware of the post-graduate training opportunities available through orthopedic residency and fellowship programs accredited by the American Board of Physical Therapy Residency and Fellowship Education (ABPTRFE). Additionally, there are opportunities through continuing education seminars which offer certification in spinal TJM.

A third of respondents believed that legislative efforts by other professions to preclude therapists from using TJM was a barrier, and this was also represented in the comments associated with the themes ‘legality issues’ (e.g. fear of repercussions from aggressive chiropractic lobby) and ‘other’ (e.g. viewed as ‘chiropractic only’ treatment). Historically, TJM has been a part of physical therapy practice since the profession’s
inception, and physical therapists are conducting much of the latest research, which is providing evidence for its efficacy and safety. Although a majority of therapists are supportive of the use of TJM in their clinical practice, there were some who expressed comments such as ‘it doesn’t belong in PT scope of practice’ and ‘personal bias not to use it’ which were classified into the theme ‘no interest in TJM’. (Table 2)

Limitations

All web-based and online surveys have some form of bias, such as under-representation of non-internet/social media users. This survey was distributed by social media and word of mouth, and calculation of response rates (returned surveys/distributed surveys) cannot be made as in traditional survey studies. Following the CHERRIES checklist, our survey had excellent participation (99.6%) and completion (98.6%) rates; however, we could not calculate the view rate as the online platform did not provide a count of unique visitors to the website.

The online survey platform was not able to restrict access to one response per device, so it is possible that single participants may have completed the survey more than once. When collected from the same IP address, we analyzed demographic data to see if there were multiple responses from participants with identical responses for all the following: age; gender; entry-level degree; highest earned degree; years of clinical practice; practice setting. We were not able to find any, supporting the assumption of unique respondents.

Selection bias is also a possibility as much of the publicity was generated by professional organizations with a focus on TJM, such as orthopedic residency and
fellowship programs, the Orthopedic Section of the APTA and the AAOMPT. Although we did have therapists who indicated that they practice in a setting other than orthopedics (15% acute/ inpatient care; 6% pediatrics; 7% skilled nursing; 8% home health; and 14% as other), the majority of respondents practice setting included orthopedic spine (81%) and orthopedic extremities (78%) with respondents able to check multiple settings if applicable. Finally, this study’s inclusion of only US physical therapists does not allow for generalization to physical therapists practicing TJM in other countries.

**Conclusion**

Physical Therapists who responded to the survey agreed that TJM was a) effective and safe; b) regularly provided; and c) comfortably performed in the thoracic spine, followed by the lumbar spine, and least so in the cervical spine. They also agreed that they would conduct additional screening prior to performing TJM in the cervical spine more than they would for the lumbar and thoracic spines. The odds of being more comfortable and more regularly providing TJM were higher if therapists were male, practicing in an outpatient orthopedic setting on patients with spinal pathology, aware of spine CPR’s, and had manual therapy certification. Finally, the odds that therapists agreed that TJM was safe and effective were higher in males and in those who were aware of spine CPR’s.
Appendix 1

Finished Survey

The survey you are about to participate in: "Utilization of Spinal Manipulation", was developed to investigate your background and perspective in the use of thrust joint spinal manipulation in terms of how your knowledge base was created and how your performance of techniques was obtained. Specifically, this study will look at the level at which you feel comfortable performing spinal manipulation. For the purpose of our study we are defining joint spinal manipulation as a high velocity low amplitude thrust technique given with the intention of achieving joint cavitation.

This survey should take approximately 5-10 minutes to complete. By participating in the survey you will assist us in gathering information about the utilization of spinal manipulation by physical therapists. Your participation in this study is voluntary and you may refuse to participate in this study or in any part of this study without prejudice to your relations with the university. You are encouraged to answer all questions honestly and to the best of your ability.

If you have any questions or concerns about the study, you may contact Dr. Puenteedura at (702) 895-1621. For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact the UNLV Office for Research Integrity - Human Subjects at 702-895-2794.

On behalf of the DPT program at the University of Nevada, Las Vegas we would like to thank you for taking the time to complete our survey and contribute to the knowledge base of our profession.

What is your gender?

- Male
- Female

What is your age (in years)?

[Input field]
What was your entry-level degree?

- Bachelor of Physical Therapy (BPT)
- Masters in Physical Therapy (MPT) MSPT
- Doctor of Physical Therapy (DPT)
- Other

What is your highest earned degree?

- Bachelor of Physical Therapy (BPT)
- Masters in Physical Therapy (MPT) MSPT
- Doctor of Physical Therapy (DPT) DPT
- Doctor of Philosophy (PhD)
- Other

Please list any special certifications you may have. (Check all that apply)

- OCS
- FAAOMPT
- NTC
- Cert MDT
- CDOMT
- Other

How many years have you been practicing as a licensed physical therapist?

Which physical therapy setting(s) do you currently practice in? (Check all that apply)
Please estimate what percentage of your patients present with:

- Lumbar Spine Dysfunction
- Thoracic Spine Dysfunction
- Cervical Spine Dysfunction
- SI Region Dysfunction

Are you aware of any Clinical Prediction Rules (guides) for patients with neck or back pain who are more likely to benefit from spinal manipulation?
- Yes
- No

Which of these Clinical Prediction Rules are you familiar with? (Check all that apply)

- Back pain that responds to lumbopelvic spine manipulation
- Neck pain that responds to thoracic spine manipulation
- Neck pain that responds to cervical spine manipulation

Please rate your level of agreement with the following statements.
<table>
<thead>
<tr>
<th>1/18/2015</th>
<th>Quatrox Survey Software</th>
</tr>
</thead>
</table>
| **Thrust joint manipulation in the LUMBAR spine is safe and effective for patients in which it is indicated** | ![Selection](https://example.com)
| **Thrust joint manipulation in the THORACIC spine is safe and effective for patients in which it is indicated** | ![Selection](https://example.com)
| **Thrust joint manipulation in the CERVICAL spine is safe and effective for patients in which it is indicated** | ![Selection](https://example.com)

Please rate your level of agreement with the following statements.

<table>
<thead>
<tr>
<th></th>
<th>Completely disagree</th>
<th>Somewhat disagree</th>
<th>Neutral</th>
<th>Somewhat agree</th>
<th>Completely agree</th>
</tr>
</thead>
</table>
| Prior to performing thrust joint manipulation to the LUMBAR spine I would routinely perform additional medical history screening | ![Selection](https://example.com)
| Prior to performing thrust joint manipulation to the THORACIC spine I would routinely perform additional medical history screening | ![Selection](https://example.com)
| Prior to performing thrust joint manipulation to the CERVICAL spine I would routinely perform additional medical history screening | ![Selection](https://example.com)

Please rate your level of agreement with the following statements.

<table>
<thead>
<tr>
<th></th>
<th>Completely disagree</th>
<th>Somewhat disagree</th>
<th>Neutral</th>
<th>Somewhat agree</th>
<th>Completely agree</th>
</tr>
</thead>
</table>
| I regularly provide thrust joint manipulation to the LUMBAR spine where it is clinically indicated | ![Selection](https://example.com)
| I regularly provide thrust joint manipulation to the THORACIC spine where it is clinically indicated | ![Selection](https://example.com)
| I regularly provide thrust joint manipulation to the CERVICAL spine where it is clinically indicated | ![Selection](https://example.com)
Please rate your level of agreement with the following statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Completely disagree</th>
<th>Somewhat disagree</th>
<th>Neutral</th>
<th>Somewhat agree</th>
<th>Completely agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am comfortable performing thrust joint manipulation to the LUMBAR spine in patients that require it</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am comfortable performing thrust joint manipulation to the THORACIC spine in patients that require it</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am comfortable performing thrust joint manipulation to the CERVICAL spine in patients that require it</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What do you see as barriers to the use of thrust joint manipulation in the spine by Physical Therapists? (Check all that apply)

- [ ] Lack of entry level training
- [ ] Lack of post-graduate training
- [ ] Concerns about its safety
- [ ] Lack of evidence for its effectiveness
- [ ] Lack of adequate mentoring
- [ ] Legislative efforts by other professions to preclude us from using it
- [ ] Other

**Appendix 2**

**Checklist for Reporting Results of Internet E-Surveys (CHERRIES)**

<table>
<thead>
<tr>
<th>Checklist Item</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe survey design</td>
<td>Describe target population, sample frame. Is the sample a convenience sample? (In “open” surveys this is most likely.)</td>
</tr>
<tr>
<td>IRB approval</td>
<td>Mention whether the study has been approved by an IRB.</td>
</tr>
<tr>
<td>Informed consent</td>
<td>Describe the informed consent process. Where were the participants told the length of time of the survey, which data were stored and where and for how long, who the investigator was, and the purpose of the study?</td>
</tr>
<tr>
<td>Data protection</td>
<td>If any personal information was collected or stored, describe what mechanisms were used to protect unauthorized access.</td>
</tr>
<tr>
<td>Development and testing</td>
<td>State how the survey was developed, including whether the usability and technical functionality of the electronic questionnaire had been tested before fielding the questionnaire.</td>
</tr>
<tr>
<td>Open survey versus closed survey</td>
<td>An “open survey” is a survey open for each visitor of a site, while a closed survey is only open to a sample which the investigator knows (password-protected survey).</td>
</tr>
<tr>
<td>Contact mode</td>
<td>Indicate whether or not the initial contact with the potential participants was made on the Internet. (Investigators may also send out questionnaires by mail and allow for Web-based data entry.)</td>
</tr>
<tr>
<td>Advertising the survey</td>
<td>How/where was the survey announced or advertised? Some examples are offline media (newspapers), or online (mailing lists – If yes, which ones?) or banner ads (Where were these banner ads posted and what did they look like?). It is important to know the wording of the announcement as it will heavily influence who chooses to participate. Ideally the survey announcement should be published as an appendix.</td>
</tr>
<tr>
<td>Web/E-mail</td>
<td>State the type of e-survey (eg, one posted on a Web site, or one sent out through e-mail). If it is an e-mail survey, were</td>
</tr>
</tbody>
</table>
the responses entered manually into a database, or was there an automatic method for capturing responses?

<table>
<thead>
<tr>
<th>Context</th>
<th>Describe the Web site (for mailing list/newsgroup) in which the survey was posted. What is the Web site about, who is visiting it, what are visitors normally looking for? Discuss to what degree the content of the Web site could pre-select the sample or influence the results. For example, a survey about vaccination on an anti-immunization Web site will have different results from a Web survey conducted on a government Web site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory/voluntary</td>
<td>Was it a mandatory survey to be filled in by every visitor who wanted to enter the Web site, or was it a voluntary survey?</td>
</tr>
<tr>
<td>Incentives</td>
<td>Were any incentives offered (eg, monetary, prizes, or non-monetary incentives such as an offer to provide the survey results)?</td>
</tr>
<tr>
<td>Time/Date</td>
<td>In what timeframe were the data collected?</td>
</tr>
<tr>
<td>Randomization of items or questionnaires</td>
<td>To prevent biases items can be randomized or alternated.</td>
</tr>
<tr>
<td>Adaptive questioning</td>
<td>Use adaptive questioning (certain items, or only conditionally displayed based on responses to other items) to reduce number and complexity of the questions.</td>
</tr>
<tr>
<td>Number of Items</td>
<td>What was the number of questionnaire items per page? The number of items is an important factor for the completion rate.</td>
</tr>
<tr>
<td>Number of screens (pages)</td>
<td>Over how many pages was the questionnaire distributed? The number of items is an important factor for the completion rate.</td>
</tr>
<tr>
<td>Completeness check</td>
<td>It is technically possible to do consistency or completeness checks before the questionnaire is submitted. Was this done, and if “yes”, how (usually JAVAScript)? An alternative is to check for completeness after the questionnaire has been submitted (and highlight mandatory items). If this has been done, it should be reported. All items should provide a non-</td>
</tr>
</tbody>
</table>
response option such as “not applicable” or “rather not say”, and selection of one response option should be enforced.

<p>| <strong>Review step</strong> | State whether respondents were able to review and change their answers (e.g., through a Back button or a Review step which displays a summary of the responses and asks the respondents if they are correct). |
| <strong>Unique site visitor</strong> | If you provide view rates or participation rates, you need to define how you determined a unique visitor. There are different techniques available, based on IP addresses or cookies or both. |
| <strong>View rate (Ratio of unique survey visitors/unique site visitors)</strong> | Requires counting unique visitors to the first page of the survey, divided by the number of unique site visitors (not page views!). It is not unusual to have view rates of less than 0.1% if the survey is voluntary. |
| <strong>Participation rate (Ratio of unique visitors who agreed to participate/unique first survey page visitors)</strong> | Count the unique number of people who filled in the first survey page (or agreed to participate, for example by checking a checkbox), divided by visitors who visit the first page of the survey (or the informed consents page, if present). This can also be called “recruitment” rate. |
| <strong>Completion rate (Ratio of users who finished the survey/users who agreed to participate)</strong> | The number of people submitting the last questionnaire page, divided by the number of people who agreed to participate (or submitted the first survey page). This is only relevant if there is a separate “informed consent” page or if the survey goes over several pages. This is a measure for attrition. Note that “completion” can involve leaving questionnaire items blank. This is not a measure for how completely questionnaires were filled in. (If you need a measure for this, use the word “completeness rate”.) |
| <strong>Cookies used</strong> | Indicate whether cookies were used to assign a unique user identifier to each client computer. If so, mention the page on which the cookie was set and read, and how long the cookie was valid. Were duplicate entries avoided by preventing users access to the survey twice; or were duplicate database entries having the same user ID eliminated before analysis? In the latter case, which entries were kept for analysis (e.g., the first... |</p>
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP check</td>
<td>Indicate whether the IP address of the client computer was used to identify potential duplicate entries from the same user. If so, mention the period of time for which no two entries from the same IP address were allowed (eg, 24 hours). Were duplicate entries avoided by preventing users with the same IP address access to the survey twice; or were duplicate database entries having the same IP address within a given period of time eliminated before analysis? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?</td>
</tr>
<tr>
<td>Log file analysis</td>
<td>Indicate whether other techniques to analyze the log file for identification of multiple entries were used. If so, please describe.</td>
</tr>
<tr>
<td>Registration</td>
<td>In “closed” (non-open) surveys, users need to login first and it is easier to prevent duplicate entries from the same user. Describe how this was done. For example, was the survey never displayed a second time once the user had filled it in, or was the username stored together with the survey results and later eliminated? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?</td>
</tr>
<tr>
<td>Handling of incomplete questionnaires</td>
<td>Were only completed questionnaires analyzed? Were questionnaires which terminated early (where, for example, users did not go through all questionnaire pages) also analyzed?</td>
</tr>
<tr>
<td>Questionnaires submitted with an atypical timestamp</td>
<td>Some investigators may measure the time people needed to fill in a questionnaire and exclude questionnaires that were submitted too soon. Specify the timeframe that was used as a cut-off point, and describe how this point was determined.</td>
</tr>
<tr>
<td>Statistical correction</td>
<td>Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for the non-representative sample; if so, please describe the methods.</td>
</tr>
</tbody>
</table>
References


27. Cleland JA, Mintken PE, Carpenter K, Fritz JM, Glynn P, Whitman J, Childs JD. Examination of a clinical prediction rule to identify patients with neck pain likely to benefit from thoracic spine thrust manipulation and a general cervical range of


Curriculum Vitae

Sean P. Reilly
2818 Mill Point Drive, Henderson NV 89074
702-630-8948 sreilly91@icloud.com

EDUCATION

✦ University of Nevada, Las Vegas - Las Vegas, NV
  ○ Bachelor of Science: Kinesiology ~ Graduated: May 2013 ~ GPA: 3.6
✦ University of Nevada, Las Vegas - Las Vegas, NV
  ○ Doctor of Physical Therapy ~ Expected Graduation: May 2016 ~ GPA: 3.7

PROFESSIONAL EXPERIENCE

FYZICAL Therapy and Balance Center - Las Vegas, NV January 2016 - Present

✦ Clinical Internship
  ○ Evaluated and provided clinical diagnosis for numerous balance and vestibular related pathologies, as well as pre and post surgical orthopedic cases
  ○ Developed individualized plan of care for each patient and progressed when appropriate
  ○ Performed and interpreted a multitude of functional outcome measures and posturography tests
  ○ Collaborated with physical therapy assistants, office managers, and billing department regularly to ensure proper patient care
  ○ Provided oversight and direction to physical therapy assistants to ensure proper plan of care implementation

Centennial Hills Hospital - Las Vegas, NV October 2015 - December 2015

✦ Clinical Internship
  ○ Conducted numerous physical therapy evaluations of patients in the acute setting and developed appropriate plan of care
  ○ Experienced patient care in a multitude of settings including but not limited to: post-op joint replacement, general medicine, intensive care unit, step down unit, and emergency department
  ○ Evaluated and treated a multitude of wounds including surgical sites, pressure ulcers, diabetic ulcers, skin tears, burns, and traumatic injuries
  ○ Trained under supervision of clinical instructor in the application of wound VAC, progressing to independent application with simple and complex wound sites
  ○ Collaborated with occupational therapy, speech therapy, nursing, and physical therapy assistants for co-treatments
North Las Vegas VA Medical Center - North Las Vegas, NV July 2015 - September 2015

✚ Clinical Internship
  ○ Performed numerous examinations, evaluations, and consultations of patients in the acute rehabilitation setting
  ○ Developed plans of care for a multitude of pathologies including CVA, chronic spinal cord injury, amputees, joint replacement, and traumatic injuries
  ○ Performed family and caregiver training personalized to each patient’s specific impairments and functional limitations prior to discharge home
  ○ Evaluated patient need and fit patients for assistive devices including wheelchairs, ambulatory aids, and orthotic devices
  ○ Collaborated with medical team consisting of physiatrist, occupational therapy, speech therapy, case manager, social worker, and nutritionist to develop a universal plan of care prior to each patient’s discharge

University of Nevada, Las Vegas - Las Vegas, NV August 2014 - June 2015

✚ Graduate Assistant
  ○ Assist mentor professor in research including literature reviews, data collection and data analysis
  ○ Provide mentorship and tutoring services to first year physical therapy students
  ○ Provide campus and department tours to prospective students and assist in recruitment of prospective physical therapy students
  ○ Responsible for preservation and cleanliness of cadavers used for dissection as well as cleanliness of the cadaver laboratory

Dr. James E. Deacon - Las Vegas, NV May 2013 - February 2015

✚ Physical Therapist/Care Provider
  ○ Provide care for man diagnosed with incomplete tetraplegia
  ○ Develop and design individualized plan of care and exercise program
  ○ Perform therapeutic exercise through strength, range of motion, and aquatic therapies
  ○ Provide screening and regular care for integumentary and musculoskeletal systems

Select Physical Therapy - Las Vegas, NV June 2014 - August 2014
Clinical Internship
- Performed numerous examinations and evaluations on patients with musculoskeletal, neurological and integumentary disorders
- Developed individualized plan of care for each of my patients and progressed when appropriate
- Provided manual therapy using clinical reasoning and judgement
- Developed individualized exercise programs for patients to carry out while in a home setting
- Collaborated with several other healthcare professionals including orthopedic surgeons and occupational therapists
- Demonstrated strong and effective communication skills with patients and their caregivers

Tim Soder Physical Therapy - Las Vegas, NV July 2010 - November 2012

Volunteer/Physical Therapy Technician
- Assisted physical therapists in patient interventions
- Instructed patients in therapeutic exercise and activity
- Provided care through use of therapeutic modalities

RESEARCH EXPERIENCE

Mentored Group Research Project

Student Investigator
- Utilization of Spinal Manipulation: A Survey Study
  - Currently under review for publication at the Journal of Manual & Manipulative Therapy.
  - Presented at APTA’s Combined Sections Meeting, 2016

PROFESSIONAL MEMBERSHIPS/CERTIFICATIONS

American Physical Therapy Association Core Ambassador, Nevada
- June 2014 - Present

Nevada Physical Therapy Association Student Special Interest Group Co-Chair
- June 2014 - October 2015

American Physical Therapy Association Member
- June 2013 - Present

Nevada Physical Therapy Association Student Special Interest Group SSIG Secretary
- June 2013 - June 2014

Healthcare Provider CPR and AED Certification
- American Heart Association
- Expires April 11, 2016
REFERENCES

* Furnished upon request

_Rebecca Slaughter, SPT_
7933 Dover Shores Avenue, Las Vegas, NV 89128
(702) 324-1981, slaugh22@unlv.nevada.edu
************************************************************************
EDUCATION
University of Nevada Las Vegas – Doctor of Physical Therapy
*Expected graduation: **May 2016**

2013: University of Nevada Las Vegas – Bachelor of Science: Kinesiology, with Spanish Minor
***summa cum laude

PROFESSIONAL EXPERIENCE
January – March 2016: Children’s Therapy Center – Las Vegas

*Clinical internship

- Examination and evaluation of patients in the outpatient pediatrics setting
- Developed plan of care and provided treatment for conditions including developmental delay, torticollis, post-op orthopedic surgery, cancer, coordination disorders, cerebral palsy
- Assisted with evaluation and fit for assistive devices including wheelchairs, walkers, standing frames, gait trainers, and orthoses
- Collaborated with other health care professionals including occupational therapists and speech therapists

October – December 2015: Health South - Desert Canyon – Las Vegas

*Clinical internship

- Examination and evaluation of adults in the inpatient rehabilitation setting
- Developed plan of care and provided treatment for conditions including post-op joint replacement, post-op cardiac surgery, CVA, TBI, traumatic injuries
- Performed home evaluations for patients preparing for discharge
- Collaborated with other health care professionals including physicians, occupational therapists, speech therapists, nurses, and case workers as part of a medical team to prepare patients for discharge
- Provided patient and caregiver education prior to patient’s discharge home

July-September 2015: Summerlin Hospital – Las Vegas

*Clinical internship

- Examination and evaluation of patients in the acute setting
- Developed plan of care and provided treatment for patients in a variety of settings, including post-op orthopedic surgery, post-op cardiac surgery, general medicine, and intensive care unit
- Evaluation and treatment of wounds including surgical sites, pressure ulcers, diabetic ulcers, venous ulcers, skin tears, insect bites, and traumatic injuries
- Trained in use and application of wound VAC
- Collaborated with other health care professionals including occupational therapists and nurses

**August 2014 – May 2015:** Graduate Assistant – UNLV Department of Physical Therapy

- Tutoring for first-year physical therapy students
- Assisted mentor professor with research - literature reviews, data collection
- Assisted with data management and lab equipment for research
- Assisted with setting up student labs for various classes
- Provided campus and department tours to prospective students

**June – August 2014:** Kelly Hawkins Physical Therapy – Las Vegas

*Clinical internship*

- Examination and evaluation of patients in the outpatient orthopedic setting
- Developed plan of care and provided treatment for a variety of musculoskeletal and neuromuscular disorders and post-op orthopedic surgeries
- Provided manual therapy as warranted on an individual basis
- Developed and educated patients on individualized home exercise programs
- Trained in the use and application of various modalities including electrical stimulation, ultrasound, and traction

**Nov. 2013 – Jan. 2014:** Admissions Assistant – UNLV Department of Physical Therapy

- Processed applications for UNLVPT admissions
- Communicated with prospective students regarding the application process
- Assisted with organizing student interviews

**CURRENT RESEARCH ACTIVITY**
Mentored Group Research Project: *in progress*


- Student investigator
- Currently under review for publication in the *Journal of Manual and Manipulative Therapy*

**PEER REVIEWED PROFESSIONAL PRESENTATIONS**

**PROFESSIONAL MEMBERSHIPS AND CERTIFICATIONS**
- APTA member since 2013

- American Heart Association - Healthcare Provider CPR/AED Certification through April 2016
  *Will be recertified in May 2016*

**REFERENCES**
- Provided upon request

Erwin Ventura, PT, DPT
10365 Station Creek Cir.
Las Vegas, NV 89178
(702) 281-0075
Education

- **University of Nevada, Las Vegas (UNLV) – Las Vegas, NV**
  - Doctor of Physical Therapy, May 2016
- **University of Nevada, Las Vegas (UNLV) – Las Vegas, NV**
  - Bachelor of Science – Kinesiological Sciences (Cum Laude), May 2012
- **Continuing Education**
  - Combined Sections Meeting, Anaheim, CA – February 2016
  - Interprofessional Education Day – Spring 2015
  - UNLV PT Distinguished Lecture Series featuring Dr. Timothy Flynn, PT, DPT, OCS, FAAOMPT – November 2014
  - NPTA Southern District Meeting featuring Dr. Le Hua, MD – November 2014
  - Combined Sections Meeting, Las Vegas, NV – January 2014
  - UNLV PT Distinguished Lecture Series featuring Dr. Christopher Powers, PT, Ph.D., FACSM, FAPTA – November 2013
  - UNLV PT Distinguished Lecture Series featuring Dr. Gail Jensen, PT, Ph.D., FAPTA – June 2013

Professional Experience

- **Select Physical Therapy** Las Vegas, NV Jan 2016 – Apr 2016
  - Student Physical Therapist
    - Clinical Rotation – Outpatient Orthopedic
    - Examined and evaluated multiple patient cases including children, young adults, multi-level athletes, geriatric, pre/post op orthopedic surgery
    - Cooperated with physical therapy assistants to promote a collaborative approach to patient care
- **Sunrise Hospital and Medical Center** Las Vegas, NV Oct 2015 – Dec 2015
  - Student Physical Therapist
    - Clinical Rotation – Rehabilitation Hospital
    - Provided patient care services including body-weight supported treadmill training, family training, therapeutic exercise and manual therapy
    - Directed physical therapy plan of care and team meetings
- **St. Rose Dominican Hospital – San Martin** Las Vegas, NV Jul 2015 – Sep 2015
  - Student Physical Therapist
    - Clinical Rotation – Acute Care
    - Provided therapy at various levels of care including joint replacement, med-surgery and intermediate care (IMC) with an emphasis on intensive care patients (ICU)
• Assisted in facilitating wound care

• **Kelly Hawkins Physical Therapy** *Las Vegas, NV Jun 2014 – Aug 2014*
  o Student Physical Therapist
    • Clinical Rotation – Outpatient Orthopedic (Rural)
    • Demonstrated effective communication skills with patient care
    • Presented an in-service on the current classification approach to treating patients with low back pain

**Volunteer Experience**

• **Heart Walk** *Las Vegas, NV Nov 2013*
  o Volunteer

• **Opportunity Village** *Las Vegas, NV Oct 2013*
  o Volunteer

• **Achieve Physical Therapy** *Las Vegas, NV Jul 2012 – Aug 2012*
  o Volunteer Physical Therapist Aide
    • Supervised patients during therapeutic exercises in outpatient orthopedic setting
    • Assisted physical therapist with interventions for patients

• **Good Shepherd Rehabilitation Center** *Las Vegas, NV May 2012 – June 2012*
  o Volunteer Physical Therapist Aide
    • Gained interpersonal experience
    • Evaluated rehabilitation therapy services

• **Optimum Health Care** *Las Vegas, NV May 2011 – Aug 2011*
  o Volunteer Physical Therapist Aide
    • Observed home health care treatment
    • Participated in aiding the physical therapist with patient care

**Research Experience**

• **Mentored Group Research Project**
  o Student Investigator
  o Research Advisor – Dr. Emilio Puentedura, PT, DPT, Ph.D., OCS, FAAOMPT
  o *Utilization of Spinal Manipulation – A Survey Study*
  o Accepted for platform presentation at the Combined Sections Meeting, 2016
  o Under review for publication at the Journal of Manual & Manipulative Therapy

**Professional Memberships/Certifications**

• **APTA**
  o Member since 2013
• Healthcare Provider CPR and AED Certification
  o American Heart Association
  o Expires April 2016

References

• Furnished upon request