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How Should We Teach Lumbar Manipulation? A Consensus Study

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How Should We Teach Lumbar Manipulation? A Consensus Study

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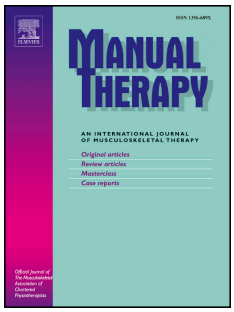

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HOW SHOULD WE TEACH LUMBAR MANIPULATION? A CONSENSUS STUDY

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HOW SHOULD WE TEACH LUMBAR MANIPULATION? A CONSENSUS STUDY

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ABSTRACT

Background

Spinal manipulation is an effective intervention for low back pain, yet there is little consistency in how this skill is taught.

Objectives

The purpose of this study was to identify what educators and clinicians believe are important characteristics of the patient and operator position prior to side-lying lumbar manipulation and the patient position and operator motion during the manipulative thrust.

Design

A multi-disciplinary correspondence-based Delphi method

Methods

Three rounds of questionnaires were sent to physical therapists, osteopaths and chiropractors. Consensus was established in Round 3 if at least 75 % of respondents identified a characteristic as very important/extremely important on a 5-point Likert scale.

Results

265 educators and clinicians completed the three rounds of questioning. There was consensus that localization to target segment, patient comfort, table height, and log rolling the patient towards the operator are important characteristics of patient position during the preparatory phase. During the manipulation phase, respondents agreed that it is important to maintain localization to the segment and rotate the patient's pelvis and lumbar spine. For the operator characteristics, consensus was reached for the following

items; moving up and over the patient, maintaining contact using forearms, and close contact between the operator and patient (preparatory phase); generating force through the body and legs, dropping the body downwards, maintaining localization, and providing a high-velocity and low-amplitude thrust (manipulation phase).

Conclusions

This Delphi study successfully identified key characteristics of patient position and operator position and motion for effective delivery of side-lying lumbar spine manipulations.

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Keywords:

Spinal manipulative therapy, lumbar spine, manual therapy, Delphi, education

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INTRODUCTION

Low back pain is a major healthcare problem in Western societies, with enormous costs in terms of healthcare expenditures and productivity as well individual pain and suffering. There are very few interventions that have demonstrated significant effectiveness beyond the natural resolution of symptoms that can be attributed to the passing of time.[1] However, research suggests that spinal manipulative therapy (SMT) reduces pain and disability in individuals with back pain. [2-4] Manipulation is performed by clinicians in several disciplines, including physical therapists, osteopaths and chiropractors. Spinal manipulation can be defined as "the application of rapid movement to vertebral segments producing joint surface separation, transient sensory afferent input and reduction in perception of pain. Joint surface separation will commonly result in intra-articular cavitation that, in turn, is commonly accompanied with an audible pop".[5] Lumbar manipulation is often performed with the patient in side-lying (**Figure 1).** The rotatory side-lying lumbar manipulation is a complex motor skill that requires substantial training and practice by the novice clinician to deliver proficiently and effectively.

Much of the current research investigating SMT focuses on what is happening at the patient-operator interface, without consideration of the operator's mechanics.[6,7-13] Existing research has also quantified the differences in magnitude, duration and direction of force at the patient-operator interface between novice and expert clinicians performing SMT.[7,8,13,14] Additionally, studies focusing on skill acquisition have provided novice operators with different methods of instruction to determine which method results in the best learning of the skill.[9-11] However, much of the existing information that

considers how the operator should perform manipulative techniques is based on individual expert opinion. There are multiple texts that describe how to perform SMT.[15-21] These texts elaborate on the specifics of patient positioning, how to achieve an adequate pre-manipulative barrier or "pre-load", and the hand and body position of the practitioner. In short, they capture static positioning but do not describe how practitioners then move their body to generate the appropriate force at the patient-operator interface. Similarly, Sizer et al., (2007)[22] conducted a Delphi study of physical therapy educators to determine the critical skill-sets required for competency in manual therapy. From the Delphi survey and factor analysis the authors distilled eight essential skill-sets. Only one of the eight skills addressed the issue of force generation and no specific description was provided of how the practitioners should position themselves, shift their weight or develop their body's momentum in order to generate the forces needed to produce an effective manipulation**.**

As a result of the substantial evidence for the effectiveness of manipulation for spinal conditions, the use of manipulation for lumbar spine conditions is recommended internationally in a number of clinical practice guidelines.[23-25] Additionally, instruction in manipulation has been included in entry level physical therapy curricula in the United States since 2009[26] and is now required for program accreditation in North America.[27,28]Therefore it is important that practitioners are taught how to perform these techniques proficiently, and that educators understand how best to teach them. A first step towards this goal is to determine the essential components of patient positioning and operator positioning during rotatory side-lying lumbar manipulation. Therefore, the

purpose of this study was to identify what educators and clinicians believe to be the important characteristics of the patient and operator position prior to the rotary side-lying lumbar manipulation and the patient position and operator motion during the manipulative thrust.

METHODS

The classic Delphi method was chosen for this study because it is an established process for using informed opinion or expertise to develop a consensus where there is limited existing information. In this study design, three rounds of questioning or survey iterations are designed to develop a consensus of opinion concerning a specific topic. The first round is qualitative and designed to gather as wide a variety of opinions as possible whereas the second two rounds are quantitative.[29] This approach has advantages over other survey methods. Specifically, participants remain anonymous and cannot be influenced by group pressure or more dominant individuals.[30] Additionally, multiple rounds of questioning allow respondents to add additional insights and more thoroughly clarify the information developed by previous iterations.[31]

Round 1 of the survey included questions regarding the demographic information of the respondents. Additionally, there were four open-ended questions that asked the practitioners to identify the characteristics they believe to be important for teaching side-lying lumbar manipulation. They were: (1) patient position in the preparatory phase, (2) patient position in the manipulation phase, (2) operator position in the preparatory phase and (4) operator motion in the manipulation phase (see **Appendix 1**). This

survey was sent via email to members of the American Academy of Orthopaedic Manual Physical Therapists (AAOMPT) and to individuals who were identified as teaching manual therapy or manipulative skills in entry-level DPT programs, chiropractic and osteopathy programs in the United States. The Institutional Review Body of XXXX approved the study.

Reponses from the open-ended questions in round 1 were manually compiled. A working group of three study investigators identified and codified themes from the qualitative responses. All three investigators have advanced training in manual therapy and are certified as Orthopaedic Clinical Specialists (OCS) by the American Board of Physical Therapy Specialties. The working group met on multiple occasions to review individual responses for each question. Initially, qualitative responses for each question containing similar word groupings or concepts were identified and the group defined an umbrella category for this concept (for example, individual responses regarding patient positioning such as “locked down to the proper level” or “positioning to isolated segment of interest” would be codified to the category “localization to target segment”). Each individual response was then codified to a category (or categories). The most highly represented categories in each question were then developed into descriptor statements that were further investigated in rounds 2 and 3.

Round 2 of the survey used Likert scales. The survey asked participants to quantify the relative importance of characteristics of patient position and operator position and motion that were identified in round one. Each characteristic was graded on a 5-point

Likert scale anchored by the statements “Not at all important”, “Very unimportant”, “Neither important nor unimportant”, “Very important”, and “Extremely important”.[32]

Round 3 of the survey used exactly the same Likert items as round 2. In addition, for each item, participants were shown bar graphs of data demonstrating the results for the same item from round 2. Therefore, round 3 provided participants with the opportunity to consider their response in the context of peer responses.

All rounds of the survey were implemented utilizing Qualtrics Research Suite software (Qualtrics, Provo, UT). Participants received an individual link to each survey via e-mail. If participants did not respond within two weeks of receiving the survey, they were sent a reminder e-mail. Results from rounds 2 and 3 of the survey were automatically collated by the Qualtrics software and then exported to Excel for additional analysis (Microsoft Excel 2010, Microsoft Corporation, Redmond, WA). For each item, the number of responses for “Not at all important” and “Very unimportant” were collated and categorized as “Unimportant”, and the number of responses for “Very important” and “Extremely important” were collated and categorized as “Important”. Consensus was established for each item if greater than 75% of participants identify the item as “Unimportant” or “Important”. [22,33]

RESULTS

Respondents

Round 1

Our database of potential participants acquired manually from available institutional and organization webpages, consisted of 61 osteopathy faculty, 197 chiropractic faculty, 443 physical therapy faculty and 1867 members of the American Academy of Orthopaedic Manual Physical Therapists (AAOMPT). After removal of duplicates and invalid e-mail addresses, 2427 invitations to participate in the survey were e-mailed. Six hundred and twelve individuals completed round 1 of the survey (25% response rate). This initial sample included 571 physical therapists, 10 osteopaths and 31 chiropractors. On the whole, respondents were highly experienced clinicians, with the modal experience in the group being 15 years or more. Of the respondents to round 1, 81% were currently teaching manipulation, either in a clinical or academic setting, or both.

Rounds 2 & 3

Three hundred and sixty-five respondents completed round 2 of the survey, representing a 60% retention rate from round 1. The round 3 survey was completed by 258 respondents (71% retention rate from round 2; 11% overall response rate). The overall non-response rate from rounds 1 to 3 was similar across the three professions (physical therapists 42%; osteopaths 40%, chiropractors 39%). Demographic data were missing for eleven individuals in this sample and were only partially completed by 40 others. Of the round 3 respondents, 193 reported holding a Doctor of Physical Therapy (DPT) or Master of Physical Therapy (MPT) degree, four were doctors of osteopathic medicine and 12 were doctors of chiropractic. Forty-nine individuals reported other or additional credentials, with 21 holding a Bachelor's degree in physical therapy, five holding a Master's degree other than MPT, eleven holding a Doctor of Science or

Doctor of Health Science degree, and six holding a PhD. All but 14 of the respondents to round 3 had completed, or were completing, formal post-graduate training or certification. This post-graduate training primarily consisted of orthopedic residencies and fellowships, Orthopaedic Clinical Specialist certification, and certification or fellowship from AAOMPT and the North American Institute of Orthopaedic Manual Therapy. Additional characteristics of the round 3 respondents are presented in **Table 1.**

Consensus results

The responses to the round 3 survey are presented in **Figures 2** and **3**. Items that achieved a consensus during round 3 and were determined to be “Important” to the successful performance of the side lying lumbar manipulation are shown in **Table 2**. All of these items also achieved a consensus during round 2. One additional item achieved a consensus during round 2 but not during round 3 (importance of localization to the target segment with lumbar flexion/extension). There was no consensus on items that were “Unimportant” for the success of side lying lumbar manipulation. For those items that did not achieve consensus, the average (standard deviation) percentage of respondents identifying them as important was 44.5 (0.11) %.

DISCUSSION

This investigation developed a consensus amongst educators and clinicians regarding the important aspects of teaching side-lying lumbar manipulation. Responses were obtained from a diverse cohort of respondents, many of whom had residency and/or

fellowship training. We studied respondents' opinions regarding patient and operator position immediately prior to the manipulation, and the patient position and the operator motion during the manipulative thrust. A comparison between items in rounds 2 and 3 of the survey and recommendations in popular manual therapy texts is presented in **Table 3.**

For patient positioning both prior to and during the manipulation, respondents felt that localization to the chosen segment was important. During round 1 of the survey (open responses) participants did not specify whether the particular functional spinal unit (2 adjacent vertebrae, hereon termed "segment") was selected because it was symptomatic or had some form of motion limitation on clinical testing. However, these are the criteria commonly used to select a segment for manipulation.[16,34-37] Despite this consensus that localization to a particular segment was important, respondents did not agree that the affected side should be uppermost, nor did they agree that one of the segment vertebrae should be aligned perpendicular to the table. Consensus was achieved in both the second and third rounds of the survey that rotation and side bending of the lumbar spine should be used to achieve localization. Several manual therapy authors describe the importance of localization.[36 34,38] (Table 3) In this context, the term *localization* refers to the process of using combined movement (movement in three planes) so that application of a thrust can be focused on an isolated segment, in order to produce cavitation at that segment. This localization allows for optimal zygapophyseal joint pre-positioning, so that the manipulation can be achieved with a low amplitude motion. According to McCarthy (2001)[34] a high-velocity, low-amplitude

thrust is applied in a position where the joint has reached the limit of movement in that particular combination of planar movements but is not at the end of available range for each of the movements if they were to be applied in isolation. In order to produce an end-of-combined-range position amenable to manipulative therapy, the combinations of movement used are often complex and appear to contradict the coupled movements of the spine. The use of these `irregular' or non-coupled movements is thought to produce the 'lock' position in the adjacent joints commonly referred to in osteopathic literature.[16] [36] Flexion[39,40] and extension[41] have been shown to influence the coupling of spinal segments. In the second round of the survey participants agreed that flexion or extension should also be used to achieve localization. Fewer respondents in the third round felt flexion and extension were important for localization and this did not achieve our *a-priori* threshold for consensus (71.8%). Had we used a less stringent threshold criterion, this item would have achieved consensus. As localization using flexion/extension appears to be commonly advocated when teaching manipulation[16,36,42] (**Table 3**) it is possible that the respondents felt that this aspect of localization was less important than rotation/side-bending, despite the biomechanical evidence. Additional studies will be needed to clarify how combinations of movement in all three planes may influence joint localization.

Although respondents felt that localization to a segment is important, some research shows manipulation may produce cavitation at segments other than the targeted segment.[43-45] Additionally other authors report that the manipulation may be effective regardless of the side of manipulation.[46] Further research will be needed to clarify to

what extent localization to a specific segment and side of the spine is necessary for clinically effective manipulation. In particular, the distribution of some of the previously demonstrated neurophysiological effects of manipulation, such as hypoalgesia and muscle facilitation, may be regional rather than localized to the targeted segment.[47] Interestingly, in spite of the agreement that localization to the segment is important, the respondents did not feel that it was essential for the operator to use their hands to palpate the desired segment. Therefore, localization must be achieved through a mechanism other than direct palpation. It is possible that operators can sense the localization by feeling the barrier (resistance to motion) using their forearms placed on the patient's trunk and pelvis.

Patient comfort was identified as being important in both the preparation and manipulation phase. This factor received a very high level of agreement. In the first round of our survey, in which participants responded to open-ended questions, many respondents felt that patient comfort was important yet very few respondents described what this entailed. Some respondents said the patient should be relaxed. Gibbons and Tehan (2001)[36] state that patient comfort is critical for achieving a successful SMT. Similarly, Maitland recommends oscillating the patient, without changing spinal position, in order to promote patient relaxation and comfort.[18] It is clear that non-verbal posture, body motion and prosody are also powerful means of communication.[48] While not previously investigated in relation to manual therapy, we propose that patient comfort may also be influenced by the patient sensing the therapist's competence and confidence in performing the manipulative technique.

Respondents agreed that optimal table height is important. In the first round some respondents described a specific metric for this position: the table height should be such that the operator's anterior superior iliac spine (ASIS) meets the patient's uppermost ASIS. This is taught by some manual therapy educators.[16,36] However, it is interesting to note that in rounds 2 and 3 when respondents were asked specifically if the operator's pelvis should be at the same height as the patient's, consensus was not established. We can conclude that manual therapy educators and clinicians are in agreement that the treatment table should be at the optimal height, but that they do not all use anatomical landmarks on the operator and patient as a means of determining the proper height. This may reflect the limitation of using a Delphi method, in that there is an inability to further clarify or elaborate on responses in the second and third rounds of questioning.

Respondents noted that it is important to "logroll" the patient toward the operator prior to administering the manipulation. The general purpose of log-rolling is to maintain alignment of the whole spine while turning and moving a patient.[49] Several manual therapy authors use the term *logrolling* when discussing SMT but do not define what they mean.[17,21] Gibbons and Tehan (2001)[15] do not use the term logrolling but describe the "final minor adjustment" in which the patient is rolled 10-15°toward the operator while maintaining the buildup of leverages (or localization) previously attained. Respondents concurred that during the manipulation phase, the operator should generate force by using their legs or body and by dropping their body downwards.

Additionally, they also agreed that during the manipulation phase it is important to achieve rotation of the patient's pelvis and lumbar spine. Interestingly, there was no consensus that it was important for the operator to have their feet aligned in a particular direction or that it was important for the operator to maintain their trunk in vertical alignment. Presumably then, logrolling the patient allows the operator to achieve the rotation of the patient's pelvis or lumbar spine by dropping down once the patient is properly positioned.

Cook et al., (2013)[50] suggest that the clinical effects of forces imparted to joints during manipulation or mobilization may be independent of the velocity with which the force is applied. However, certain clinical characteristics may identify patient populations that respond more favorably to high-velocity manipulation than to low-velocity mobilization.[51] Additionally laboratory studies investigating both the mechanical consequences of manipulation at the intra-articular surface[45] and in the form of neurophysiological changes[47,52] have described effects that only occur with a high-velocity thrust. The respondents in this study concluded that it was important that the force applied during the thrust is both high-velocity and low-amplitude (HVLA). While it may be implied that manipulation is a high-velocity and low-amplitude technique, some experts use the term manipulation in a more generic sense to encompass all types of manual therapy, including joint mobilization, soft tissue mobilization and thrust manipulation.[53] In the United States since 1998, the American Physical Therapy Association (APTA) *Guide to Physical Therapist Practice* has defined mobilization/manipulation as "a manual therapy technique comprised of a continuum of skilled passive movements that are applied at

varying speeds and amplitudes, including a small amplitude/high velocity therapeutic movement."[23] To achieve a common language for describing this area of the physical therapist's scope of practice, the terms "thrust" and "non-thrust" manipulation were established to replace the previous terms "manipulation" and "mobilization," respectively. The APTA *Manipulation Education Manual for Physical Therapist Professional Degree Programs* further defines *thrust manipulation* as a "high velocity, low amplitude therapeutic movement within or at the end range of motion" and *non-thrust* as manipulations that do not involve thrust.[54] Thus, due in part to scope-of-practice issues, several terms have been developed to describe the same type of procedure. Thrust manipulation, impulse, HVLA, spinal manipulative therapy (SMT) and grade V mobilization are all terms that have been used to describe the same type of manual procedures. Despite the ambiguity in the usage of the term *manipulation*, the respondents of this study concluded that high-velocity and low-amplitude forces were important characteristics of manipulation.

A Delphi approach was chosen for this study because it facilitates attaining a consensus when empirical evidence is lacking and when there are areas of uncertainty.[55,56] This method is a time-effective means of obtaining a large number of opinions from a diverse sample of respondents without the potential problems of face-to-face committees or focus groups. During face-to-face consensus building, individuals may be inhibited from expressing opinions by more dominant or senior members of a group, and may be inordinately influenced by the group opinion.[56,57] The Delphi method avoids these limitations by providing anonymity for respondents while still allowing them to consider

their responses in the context of other expert opinion. However, the success of the Delphi process is entirely dependent upon having an appropriately sized and well-qualified panel of experts.[55,56] One of the strengths of this study was the large sample size. The number of respondents in this study was significantly greater than that of similar Delphi surveys investigating physical therapy practice. 612 manual therapy educators and clinicians participated in the first round of our study and 258 remained by the final round. In contrast, the majority of previous studies have utilized expert panels with fewer than 100 individuals[22,33,58,59,60] The overall response rate in the present study was also similar to or greater than comparable studies[33,61,62] This study also benefited from a diverse and well-qualified panel of respondents. Manual therapy educators and clinicians from the fields of physical therapy, osteopathy and chiropractic participated. Although the number of osteopaths and chiropractors who participated in the study was smaller than that of physical therapists, the relative representation of each profession remained stable across the three rounds of the survey. This diversity of participants strengthens our results by including multiple professionals who routinely perform manipulation, ensuring a range of different perspectives. Having input from a multidisciplinary group of professionals delineates the common aspects of the technique that are considered, regardless of professional background. However, it should be noted that not all of the participants reported regularly using side-lying lumbar manipulation in their clinical practice.

There are some limitations inherent in using the Delphi approach. As in all Delphi studies, the round 1 survey, which frames the research question for the later rounds,

was developed based on the investigators' experience and review of the literature. Additionally, the development of the second and third round of the survey was based upon the investigators' interpretation of the open, qualitative responses during round 1. Although the investigators identified the primary categories of responses that encapsulated the vast majority of the open answers, in order to keep the round 2 and 3 surveys at a manageable length not all of the concepts in the open responses could be collated into Likert scales. Further, participants were unable to elaborate more on their responses during rounds 2 and 3, resulting in some potential loss of information or additional viewpoints. Because the Delphi method requires individuals to respond to a series of questionnaires the retention rate of respondents across all rounds of the study is often low and this may impact generalizability of the results. However, the advantages of the Delphi method were that it facilitated investigating the opinions of a very large and diverse group of expert respondents from across the United States, with minimal expense.

Conclusions

This investigation is the first to develop a consensus amongst manual therapy educators and clinicians as to which characteristics are considered to be most important when teaching a side-lying lumbar spine manipulation. It is important that practitioners are taught how to perform these techniques competently. A first step towards this is to determine the essential components of patient positioning and operator application of this technique. These conclusions should be validated through biomechanical research as well as in studies contrasting expert and novice manual therapy practitioners.

TABLES

Table 1. Characteristics of the round 3 respondents[1] (SLM – side-lying lumbar manipulation)

CHARACTERISTICS	NUMBER OF RESPONDENTS
Years in clinical practice	
0 - 5	25
5 – 10	48
10 – 15	43
15 – 20	43
> 20	88
Source of manipulation training[2]	
Didactic content in primary degree	104
Practical content in primary degree	104
Residency/fellowship	150
Continuing education	169
Practice setting[3]	
Outpatient/ambulatory care	203
Hospital based facility	21
Inpatient acute care	2
Inpatient rehab care	1
Home health	1
Frequency of performing SLM[4]	
Never/occasionally	30
< 1 x per week	53
1 – 3 x per week	57
4 – 6x per week	30
6 – 9 x per week	17
> 10 x per week	31
Setting of current SLM teaching	
Academic	41
Clinical	71
Both academic and clinical	94
Not currently teaching SLM	41

[1]n = 247
[2]note that these categories are not mutually exclusive
[3]n = 228
[4]n = 218

Table 2. Items achieving a consensus of being important to a successful side lying lumbar manipulation. For full text of each item please see Appendix 1.

ITEM	CONSENSUS (%)[1]
Patient position – preparatory phase	
Localization to target segment with rotation/side bend	83.5
Patient comfort	96.2
Table height	92.1
Log rolling patient towards operator	83.5
Patient position – manipulation phase	
Maintain localization achieved during preparatory phase	89.4
Rotation of patient's pelvis and lumbar spine	88.6
Operator position – preparatory phase	
Body up and over patient	93.1
Use of forearms to maintain contact/generate force	83.1
Close contact between operator and patient	98.5
Operator motion – manipulation phase	
Generation of force through body and legs	92.3
Dropping downwards to generate force	82.2
Maintain localization while generating force	89.2
Thrust is high-velocity	96.9
Thrust is low-amplitude	87.2

[1] Percentage of participants identifying the item as Very Important or Extremely Important

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Table 3. Comparison between items in rounds 2 and 3 of the survey and recommendations in popular manual therapy texts

Items in the Survey	Manual therapy texts
Targeted segment uppermost (-)	• No indication as to which side should be uppermost[15] • Use algorithm to decide targeted side (supine technique used) [(1) positive side of standing flexion test. (2) side of tenderness to sacral sulcus. (3) patient-reported most symptomatic side][46] • Uppermost side shall be the symptomatic side[63]
Targeted segment perpendicular to table (-)	• During the localization procedure the operator shall ensure that the transverse processes of one the segment vertebra remain perpendicular to the table[20]
Flex and extend to localize targeted segment (-)	• The rationale for using neutral, extended or flexed position should be based on patient comfort[15] • Use the pelvis to flex and extend the lumbar spine targeted segment to find the midpoint (for a neutral alignment) [18] • Use extension/flexion of the legs to achieve further extension or flexion in the lumbar spine • Flex/extend the trunk to the point that the upper segment begins to move then flex/extend lower extremities until the lower segment moves[20]
Logroll (+)	• Technique used to achieve maximal relaxation of the patient and to take up any remaining slack[18] • Performed prior to inducing the thrust as a means of creating momentum as the technique is better applied in a dynamic position[16] • Last movement performed prior to applying the thrust[54]

Feet aligned in particular direction (-)	• Both feet are pointing towards the head of the table[16]
Feel targeted segment (-)	• Use finger tips between spinous processes to assess for motion while rotating the lumbar spine to the target segment[15,54] • Operator's hand monitors the target segment as rotation is introduced[20]
High velocity (+)/low amplitude (+)	• Must be rapid but not excessively forceful[15]
Localization to targeted segment with rotation/side bend (+)	• Use rotation from above if operator desires to perform procedure in further rotation[18] • A small amount of trunk rotation is induced (not specific to the target segment)[16]

+ Delphi consensus was achieved
- Delphi consensus was not achieved

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FIGURE LEGENDS

Figure 1. Patient and operator position for the side-lying lumbar manipulation

Figure 2a. Items relating to patient position during the preparatory phase of a side-lying lumbar manipulation. **Figure 2b** Items relating to patient position during the manipulation phase of a side-lying lumbar manipulation.

Figure 3a. Items relating to operator position during the preparatory phase of the side-lying lumbar manipulation. **Figure 3b.** Items relating to operator motion during the manipulation phase of the side-lying lumbar manipulation.

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FIGURES

Figure 1.

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Figure 2

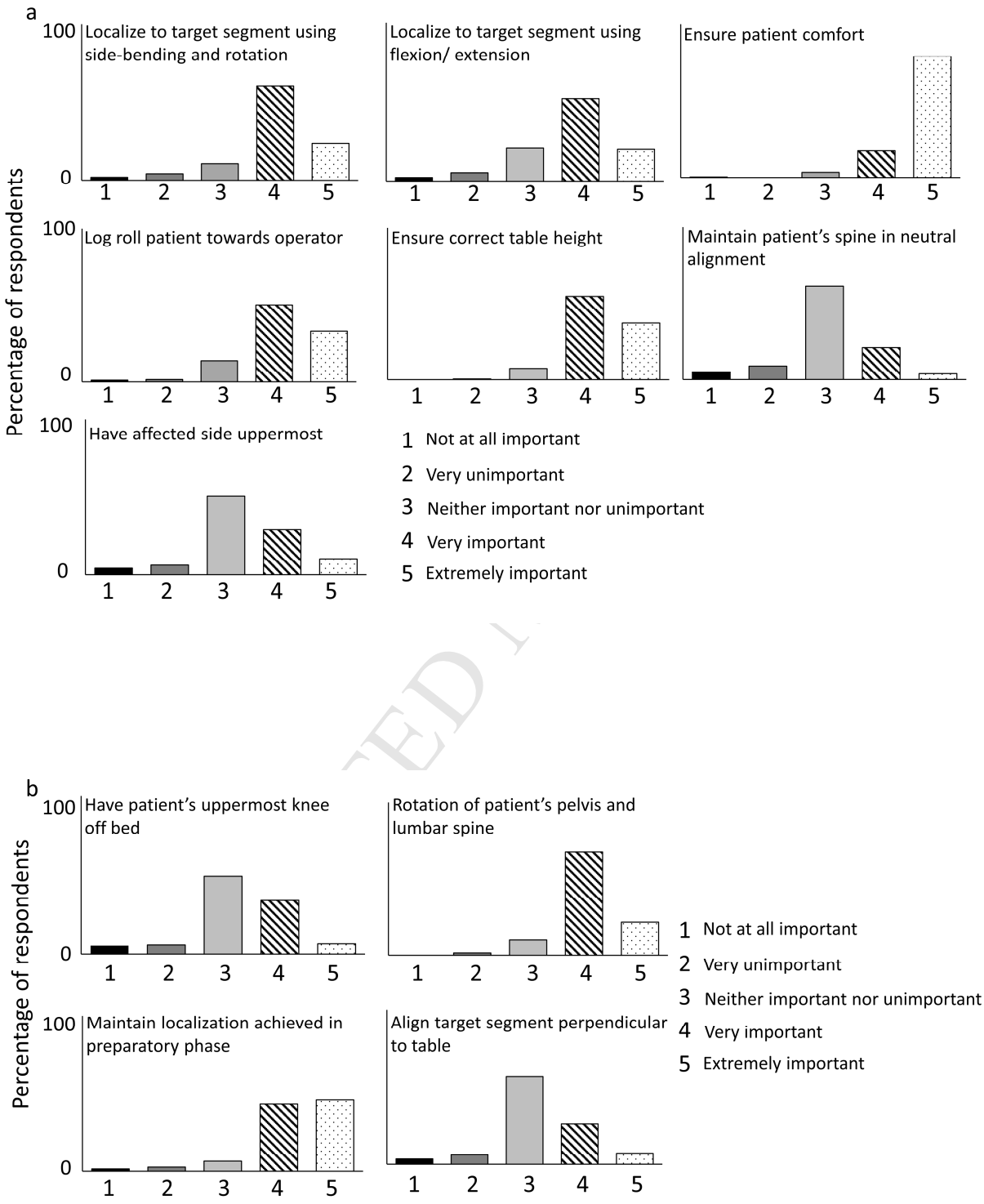
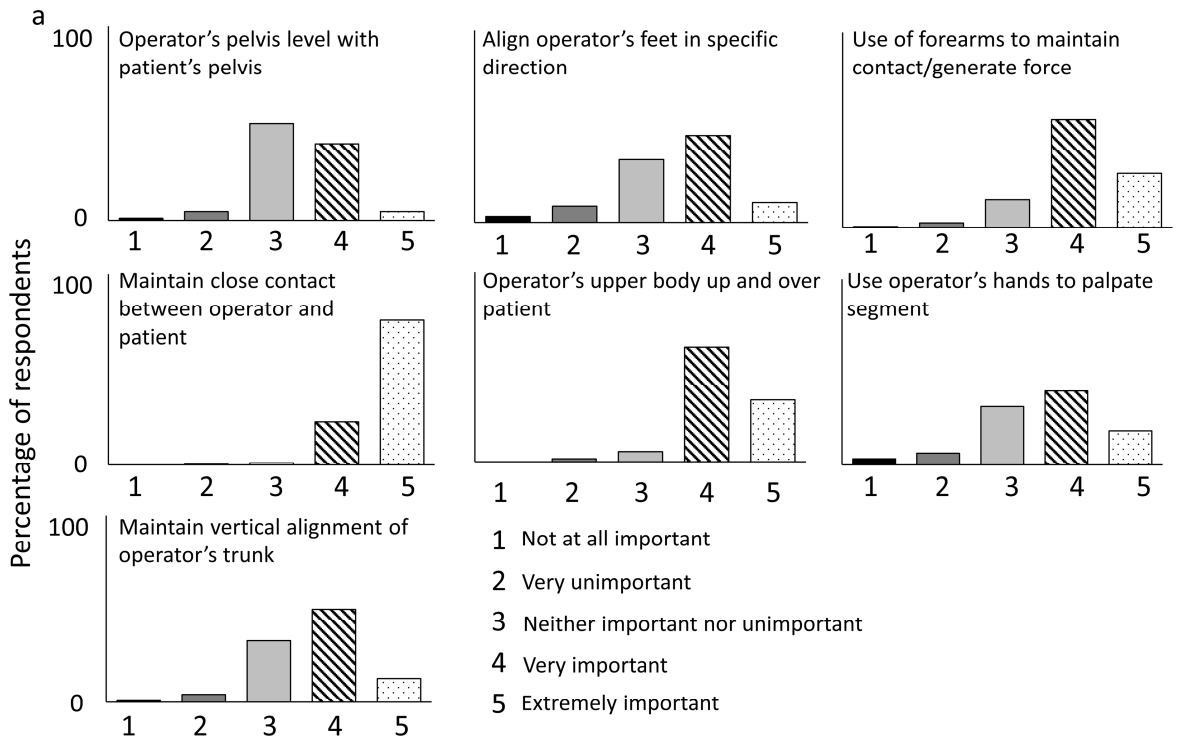

a
Percentage of respondents
100
0
Localize to target segment using side-bending and rotation
Localize to target segment using flexion/ extension
Ensure patient comfort
Log roll patient towards operator
Ensure correct table height
Maintain patient's spine in neutral alignment
Have affected side uppermost
1 2 3 4 5
1 Not at all important
2 Very unimportant
3 Neither important nor unimportant
4 Very important
5 Extremely important
b
Have patient's uppermost knee off bed
Rotation of patient's pelvis and lumbar spine
Maintain localization achieved in preparatory phase
Align target segment perpendicular to table

Figure 3.



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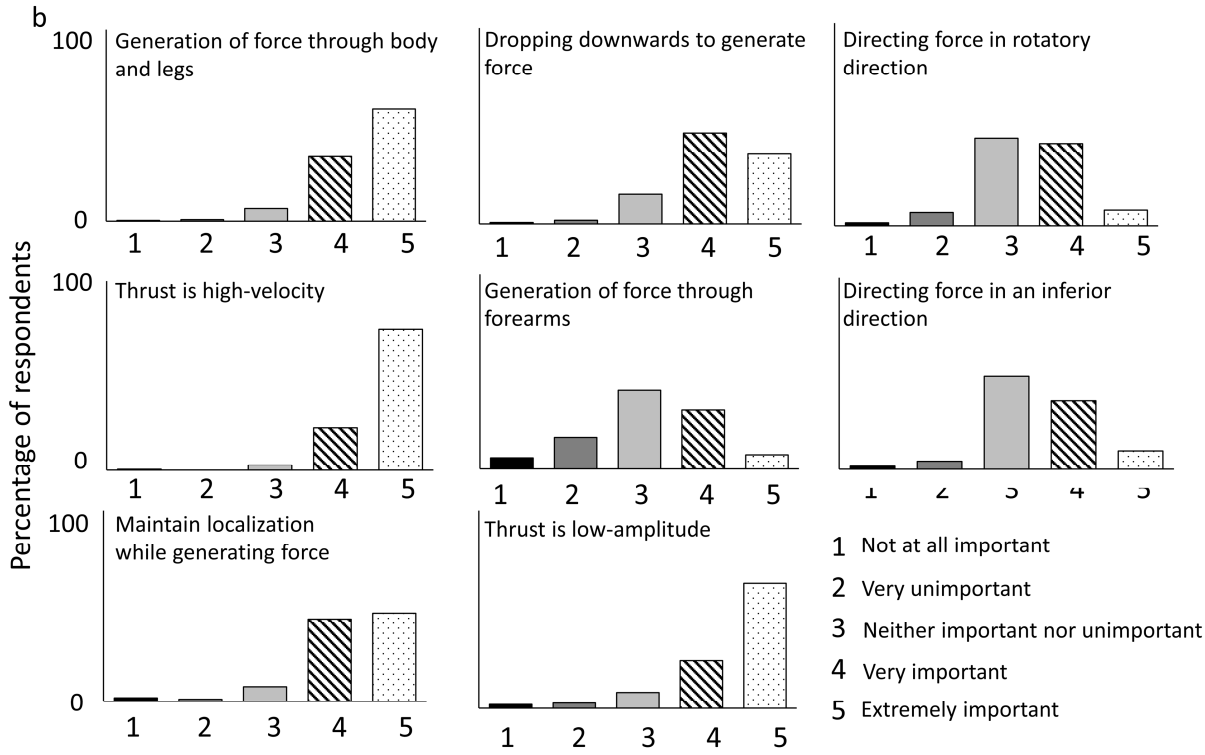

APPENDIX 1

Round 1 open questions

Q1 – When teaching manual skills, what do you consider to be most important in the position of the patient during the preparatory phase of a side-lying lumbar manipulation?
Q2 – When teaching manual skills, what do you consider to be most important in the position of the patient during the manipulation phase of a side-lying lumbar manipulation?
Q3 – When teaching manual skills, what do you consider to be most important in the position of the operator during the preparatory phase of a side-lying lumbar manipulation?
Q4 – When teaching manual skills, what do you consider to be most important in the motion of the operator during the manipulation phase of a side-lying lumbar manipulation?

Rounds 2 and 3 Likert items

In terms of **patient position** during the **preparatory phase** of a side-lying lumbar manipulation, how important is it to:

	Not at all Important	Very Unimportant	Neither Important nor Unimportant	Very Important	Extremely Important
1) Achieve appropriate locking/localization to the target segment using combinations of side-bending and rotation?	☐	☐	☐	☐	☐
2) Achieve appropriate locking/localization to the target segment using flexion/extension of the lumbar spine?	☐	☐	☐	☐	☐
3) Ensure patient comfort?	☐	☐	☐	☐	☐
4) Ensure correct table height?	☐	☐	☐	☐	☐
5) Log roll the patient towards the operator?	☐	☐	☐	☐	☐
6) Maintain the patient's spine in neutral alignment?	☐	☐	☐	☐	☐
7) Have the patient's affected side uppermost?	☐	☐	☐	☐	☐

In terms of **patient position** during the **manipulation phase** of a side-lying lumbar manipulation, how important is it to:

	Not at all Important	Very Unimportant	Neither Important nor Unimportant	Very Important	Extremely Important
1) Have the patient's uppermost knee off the table?	☐	☐	☐	☐	☐
2) Maintain the locking/localization to the segment that was achieved during the preparatory phase?	☐	☐	☐	☐	☐
3) Achieve rotation of the patient's pelvis and lower lumbar spine?	☐	☐	☐	☐	☐
4) Align the target segment perpendicular to the table?	☐	☐	☐	☐	☐

In terms of **operator position** during the **preparatory phase** of a side-lying lumbar manipulation, how important is it to:

	Not at all Important	Very Unimportant	Neither Important nor Unimportant	Very Important	Extremely Important
1) Have the operator's pelvis level with the patient's pelvis?	☐	☐	☐	☐	☐
2) Have the operator's upper body up and over the patient?	☐	☐	☐	☐	☐
3) Align the operator's feet in a specific direction relative to the patient?	☐	☐	☐	☐	☐
4) Use the operator's hands to palpate the segment?	☐	☐	☐	☐	☐
5) Use the operator's forearms to maintain contact and generate forces?	☐	☐	☐	☐	☐
6) Maintain vertical alignment of the operator's trunk?	☐	☐	☐	☐	☐
7) Maintain close contact between the operator and the patient?	☐	☐	☐	☐	☐

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In terms of **operator motion** during the **manipulation phase** of a side-lying lumbar manipulation, how important is it to:

	Not at all important	Very Unimportant	Neither Important nor Unimportant	Very Important	Extremely Important
1) Use the operator's legs or body to generate the manipulation force?	☐	☐	☐	☐	☐
2) Use the operator's forearms to generate the manipulation force?	☐	☐	☐	☐	☐
3) Drop down to generate the manipulation force?	☐	☐	☐	☐	☐
4) Direct the operator's force in an inferior direction?	☐	☐	☐	☐	☐
5) Direct the operator's force in a rotatory direction?	☐	☐	☐	☐	☐
6) Maintain the locking/localization of the segment while generating the manipulation force?	☐	☐	☐	☐	☐
7) Use a high velocity thrust when generating the manipulation force?	☐	☐	☐	☐	☐
8) Use a low amplitude thrust when generating the manipulation force?	☐	☐	☐	☐	☐

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Highlights

- Delphi study identifying key aspects of performing side-lying lumbar manipulation.
- Expert manual therapy practitioners and educators completed three-round survey.
- Identified important components of patient position before and during manipulation.
- Determined essentials of practitioner position and mechanics during manipulation.
- Consensus will help manual therapy educators better teach this technique.

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