Inter- and Intra-observer Agreement of the Motion Palpation Test for Lumbar Vertebral Rotational Asymmetry

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ABSTRACT

Purpose: To investigate inter- and intra-observer agreement in the assessment of lumbar vertebral rotational (VR) asymmetry by a motion palpation test. **Methods:** For this prospective and descriptive test-retest study, 51 asymptomatic participants (40 women, 11 men; mean age 23.3 [SD 5.6] years) were recruited from the community. Each participant was assessed in two sessions by the same three observers, who assessed VR by means of a palpation test for movement asymmetry. This test is performed by applying posteroanterior pressure in an alternating manner to the left and right transverse processes of a vertebra to determine motion asymmetry in the transverse plane and thus the vertebral position. Observers classified the vertebral position as neutral, rotation to the right, and rotation to the left; they were blinded to which participant was being assessed and to any previous results. **Results:** Intra- and inter-observer agreement was verified by the kappa coefficient (κ) and the weighted kappa coefficient (κ_w). Values of κ and κ_w varied from 0.07 (95% CI, -0.10 to 0.245) to 0.37 (95% CI, 0.11–0.63) for intra-observer agreement and from 0.12 (95% CI, -0.06 to 0.29) to 0.30 (95% CI, 0.08–0.52) for inter-observer agreement. **Conclusion:** The motion palpation test used to assess VR asymmetry has low agreement levels; therefore, its clinical significance for measuring vertebral position is questionable.

Key Words: lumbar vertebrae; motion palpation test; reproducibility of results; spine.

RÉSUMÉ

Objet: Analyser la convergence interobservateurs et intra-observateur dans l'évaluation de l'asymétrie de la rotation des vertèbres (RV) lombaires par palpation du mouvement. **Méthodes:** Pour cette étude test-retest prospective et descriptive, on a recruté dans la communauté 51 participants asymptomatiques (40 femmes, 11 hommes; âge moyen de 23,3 [ET de 5,6] ans). Les trois mêmes observateurs ont évalué chaque participant au cours de deux séances et déterminé la RV par palpation afin de déterminer l'asymétrie du mouvement. On pratique ce test en appliquant une pression antérieure en alternance sur les apophyses transverses gauche et droite d'une vertèbre afin de déterminer l'asymétrie du mouvement dans le plan transversal et, par conséquent, la position de la vertèbre. Les observateurs ont classé la position de la vertèbre comme neutre, en rotation vers la droite et en rotation vers la gauche. Ils ne savaient pas quel participant était évalué et ne connaissaient pas les résultats antérieurs. **Résultats:** On a vérifié la convergence interobservateurs et intra-observateur au moyen du coefficient kappa (κ) et du coefficient kappa pondéré (κ_p). Les valeurs de κ et κ_p ont varié de 0,07 (IC à 95% de 0,10 à 0,245) à 0,37 (IC à 95% de 0,11 à 0,63) dans le cas de la convergence intra-observateur et de 0,12 (IC à 95% de -0,06 à 0,29) à 0,30 (IC à 95% de 0,08 à 0,52) dans celui de la convergence interobservateurs. **Conclusion:** La palpation du mouvement utilisée pour évaluer l'asymétrie de la RV produit de faibles niveaux de convergence, et son importance clinique pour la mesure de la position des vertèbres est donc douteuse.

The term *spinal dysfunction* is frequently used as an umbrella term to describe functional changes related to the spine,¹ including hypomobility and hypermobility of the vertebral joints, changes in soft tissues surrounding the vertebrae, and asymmetries in vertebral position. To detect these changes, several assessment techniques involving palpation have been developed;^{2,3} however, because there have been few studies of palpation tests, a gap in our knowledge of spinal palpation procedures still remains.¹

The osteopathic approach to diagnosing spinal dysfunction follows the principles of Fryette's Laws, which assume that, in the presence of a somatic dysfunction, vertebral movement is asymmetric, with freedom of movement on one side of the vertebra and restriction on the opposite side.^{3–5} This assumption also helps to explain the theory that a vertebra tends to be positioned toward the side on which there is more freedom of movement, increasing the asymmetry of the vertebral position.⁴ For

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example, if the L2 vertebra is restricted during movements such as extension, side bending to the right, and rotation to the right, then L2 is said to be flexed, side bent to the left, and rotated to the left on L3. Therefore, the terminology often used implies that the vertebra assumes the position toward the side with more mobility.⁴

Some studies have found that people with low back pain (LBP) have impaired joint movement of the spine.^{6–8} Passias and colleagues,⁶ whose study was aimed at better understanding the mechanical dysfunctions of vertebrae in people with discogenic LBP, reported a decrease in mobility in this population relative to people without LBP symptoms. Palpatory tests are frequently used to assess asymmetrical vertebral position and rotational movement through palpation of the transverse processes and to aid in diagnosis when pain and function are altered.⁹ A study by Snider and colleagues,⁹ whose objective was to investigate incidence and severity of somatic dysfunction of four lumbar vertebral segments (L1–L4) in participants with and without LBP, reported no significant difference between groups in the incidence of static rotational asymmetry but showed that people with LBP had more severe static rotational asymmetry than those in the non-LBP group. Thus, it is possible that changes related to mobility are accompanied by asymmetries in some populations, which would make some palpatory tests a potentially useful diagnostic tool.⁹

Although palpatory tests are in wide clinical use, their reliability has been questioned because evidence of their measurement properties is scarce.¹ Few studies have addressed inter- and intra-observer agreement of palpatory tests to detect rotational vertebra asymmetries, and the results of these few studies are conflicting.^{10,11} Our objective in this study, therefore, was to investigate inter- and intra-observer agreement of a motion palpation test designed to detect rotational asymmetries in lumbar vertebrae.

METHODS

Participants

A convenience sample of 51 healthy adults from the university community agreed to participate. Participant characteristics are presented in Table 1. To be included, participants had to be healthy, have a BMI of less than 25 kg/m², be aged 18–45 years, and have no history of LBP episodes in the previous 2 months. Potential participants were excluded if they presented with a history of lumbar surgery, pregnancy, or known congenital vertebral anomalies; had received manipulative intervention within 1 month before the study; or had tattoos, birthmarks, or scars near the L2 vertebra that could compromise blinding (see Figure 1A). The study was approved by the Human Research Ethics Committee of Santa Catarina State University (registration no. 04939812.8.0000.0118), and all participants provided informed consent.

Table 1 Participant Characteristics

Characteristic	Mean (SD)		
	Male (<i>n</i> = 11)	Female (<i>n</i> = 40)	Total (<i>n</i> = 51)
Age, y	22.4 (1.8)	22.9 (6.3)	22.8 (5.8)
Weight, kg	70.8 (6.3)	58.3 (8.8)	61.0 (9.8)
Height, m	1.8 (0.1)	1.6 (0.1)	1.7 (0.1)
BMI, kg/m ²	23.2 (1.7)	22.0 (2.9)	22.2 (2.7)

Figure 1 Blinding of observers: (A) participant's body covered by dark-coloured sheets, with arrow indicating the small area that exposed L2; (B) position of observer's thumbs for the test.

Observers

Three physiotherapists took part in the study. Observers A and B had 18 and 11 years' clinical experience in manual therapy, respectively; Observer C had 2 years' clinical experience and had recently completed a graduate program in manual therapy. Before carrying out their assessments, all three observers attended an orientation session to standardize procedures.

Vertebral rotation test

The assessment consisted of the motion palpation test used to assess rotational movement asymmetry of the vertebra in the transverse plane.¹⁰ The observer stood at either side of the plinth and palpated the L2 transverse process with the pads of the thumbs. The observer then applied alternating pressure to the left and right transverse processes of vertebra L2 in the posteroanterior direction with both thumbs (see Figure 1B).

If the right transverse process moves anteriorly more easily, the segment is rotating left more freely, and vice versa. In this scenario, the left transverse process may be palpated more prominently (posteriorly).¹² In our study, when the left transverse process was judged to be more prominent than the right, the asymmetry was classified as being to the left; when the right transverse

Table 2 Observer Agreement (κ and κ_w) for the Assessment of Rotational Asymmetry for Vertebra L2

Observer pairs	κ (SE)	95% CI	κ_w (SE)	95% CI	% concordance
Inter-observer					
A–B	0.12 (0.06)	0.00–0.23	0.21 (0.09)	0.04–0.39	35
A–C	0.23 (0.09)	0.05–0.42	0.30 (0.11)	0.08–0.52	57
B–C	0.12 (0.09)	–0.06 to 0.29	0.19 (0.13)	–0.06 to 0.44	39
Intra-observer					
A–A	0.15 (0.15)	–0.14 to 0.44	0.17 (0.16)	–0.15 to 0.48	73
B–B	0.07 (0.09)	–0.10 to 0.245	0.18 (0.12)	–0.06 to 0.41	35
C–C	0.34 (0.11)	0.12–0.55	0.37 (0.13)	0.11–0.63	59

κ_w = weighted kappa coefficient.

process was judged to be more prominent than the left, the asymmetry was classified as being to the right. When neither transverse process was considered more prominent, the vertebral position was classified as neutral.

Procedures

The three observers (A, B, and C) assessed participants in groups of 10, in two sessions. The room in which the assessments took place contained 10 numbered plinths. In the first session, we assigned each participant a letter from A to J, which was later used to randomize the order of assessment for the second session.

Participants were positioned in prone; a researcher who was not involved in the assessment then palpated the lumbar spine to find L2¹³ by identifying the last costal arch, which leads to T12, then counting two inter-spinous spaces below T12 to identify and mark the spinous process of L2. We chose L2 because it can be easily identified and marked.¹³ Participants were then covered with dark sheets and instructed to avoid verbal interaction to ensure blinding of all observers. Only L2 was exposed (see Figure 1). The three observers then entered the room one at a time and individually assessed each of the 10 participants. The observers remained isolated from the participants before the assessments (test and retest) and were blinded to the other observers' results. Participants were given a 30-minute interval between test and retest, during which they were instructed to avoid any strenuous activities. For the second session, participants were placed on different plinths, determined at random. The time interval and the randomization were intended to prevent the observers from memorizing participant characteristics and to ensure that there would be no injury or important rotation to the low backs of participants between test and retest.

Statistical analysis

We used the kappa coefficient (κ), the weighted kappa coefficient (κ_w ; quadratic weight), and the percentage of agreement to analyze intra- and inter-observer agreement. We used κ_w to investigate whether the levels of agreement varied among the three possible answers, using the quadratic weight approach with the following weights:

agreement = 1; disagreement between rotation to the right and neutral position = 0.75; disagreement between rotation to the left and neutral position = 0.75; disagreement between rotation to the left and right = 0.^{14,15}

To determine intra-observer agreement, we analyzed data from the first and second sessions (test–retest) for all three observers; to examine inter-observer agreement, we used data from the first session for all possible pairs of observers (A–B, B–C, A–C). To classify the strength of agreement, we used the following scheme: 0 = poor; 0.01–0.20 = slight; 0.21–0.40 = fair; 0.41–0.60 = moderate; 0.61–0.80 = substantial; and 0.81–1.00 = almost perfect.¹⁶ The sample size was predetermined on the basis of Sim and Wright's¹⁵ study: A minimum sample of 42 participants was needed for an 80% probability of detecting a $\kappa \geq 0.80$, assuming a null hypothesis $\kappa = 0.40$ and a proportion of positive ratings equal to 0.5. We also calculated the standard error and 95% CI for the κ and κ_w coefficients. We used MedCalc Version 12 for Windows (MedCalc Software BVBA, Ostend, Belgium) for all analyses.

RESULTS

Table 2 presents the results of our analyses. Neither intra-observer nor inter-observer agreement reached the level of clinical importance (κ and $\kappa_w < 0.4$). The highest level of agreement (intra-observer agreement for Observer C, $\kappa = 0.34$, $\kappa_w = 0.37$) was classified as fair agreement and was therefore not clinically important.

DISCUSSION

Our findings show that intra- and inter-observer agreement for the detection of rotational asymmetry of the L2 by palpation varied from weak to fair, which suggests that palpation is not a reliable method of detecting such asymmetries.

Systematic reviews have previously addressed the reliability of some palpatory tests;^{17–19} however, the studies within the systematic reviews are difficult to compare because of variations in testing technique and interpretation, as well as in the methodological approaches used. In our study, the values for κ and κ_w showed unsatisfactory agreement, both within and between observers, for the palpatory test investigated. Our findings

are similar to those of Degenhardt and colleagues,¹⁰ who assessed 119 healthy participants using the palpatory test to detect asymmetries in vertebral movement and also found only slight inter-observer agreement ($\kappa = 0.20$). In a second study, Degenhardt²⁰ excluded the rotational motion asymmetry test because of insignificant improvement in reliability seen in their previous study and overall poor reliability during consensus training.

The lack of agreement reported in this study could be explained by the approach to interpreting the test result. Snider and colleagues⁹ study classified asymmetries as *neutral*, *severe*, *moderate*, or *mild*, and their results showed a significant difference between the control group and an LBP group. It seems possible that the lack of agreement seen in our study is due to a simplistic classification of rotations. After data collection, observers informally reported lack of confidence when classifying rotations they considered small, and they reported high confidence when classifying large rotations. Perhaps using a classification that made a distinction between small and large rotations would enhance agreement levels, at least for rotations classified as large.

LIMITATIONS

Our study has several limitations. First, our sample consisted of asymptomatic participants, who may potentially have less rotation asymmetry than people with LBP. Second, the observers were aware that participants were asymptomatic, and bias related to that fact would likely lead to stronger levels of agreement than seen in our results. Finally, the choice of vertebra may represent a limitation: L2 is not usually affected by lumbar spine pathology and was chosen because it is easy to locate reliably.

CONCLUSION

After running a test–retest study with good methodological quality, we showed that evaluation by motion palpation test is not a reliable tool to detect vertebral asymmetry. These findings fit with current clinical recommendations for the assessment of the spine. When treating LBP, clinicians should focus on symptoms reproduced with end-range spinal motions and provocation of the involved lower thoracic, lumbar, or sacroiliac segments. The use of asymmetry tests does not seem to be a reliable tool to guide treatment.

KEY MESSAGES

What is already known on this topic

Even though motion palpatory testing is regularly used in the clinic, the evidence does not favour its use when trying to detect asymmetries of the vertebrae.

What this study adds

Our results show that the motion palpation test used to assess rotational vertebral asymmetry in the trans-

verse plane has low agreement (below clinical importance); we are therefore unable to recommend its clinical use. Clinicians should use other means of assessing rotational vertebral asymmetry, and future studies could evaluate the validity and reliability of this test with more subdivisions in its response, such as very rotated to left, slightly rotated to left, neutral, slightly rotated to right, and very rotated to right.

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