

ORIGINAL PAPER

THERAPY AREA: OTHER

Physical therapist attitude and opinion about cervical spine examination: A national Spanish survey

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Abstract

Objective: A correct examination is essential during a differential diagnosis of neck pain patients. Therefore, the objective of this study was to provide an update on the properties considered most important by physical therapists (PTs) when conducting accessory and physiological movement tests during the cervical spine physical examination.

Methods: A total of 84 private physiotherapy centres participated in this online cross-sectional survey including 415 active physiotherapists and members of one autonomous Spanish Physiotherapists School. This survey included information about the characteristics of the respondents (eg, weekly patient care, highest qualification and specific training in osteopathy and manual therapy), their opinion about the accuracy and reliability of accessory and physiological movement tests, the frequency and importance of mobility and pain responses, and the most commonly reference used to make a judgement.

Results: Pain responses are most frequently used by physiotherapists at a rate of 79.8% and also rated as important by 42.65% respondents mobility aspects such as quality of end-feel (17.3%), quantity of translation (16.4%) and quality of resistance (13.3%) during passive accessory intervertebral movement tests. During passive and active physiological movement tests, the most frequent properties assessed were the quality of motion path (80.5% and 84.3%, respectively) and quantity of angle bending (81.7% and 77.6%, respectively). Pain responses are used as reference by 54.7% to make a clinical judgement during passive accessory intervertebral movement tests.

Conclusion: Physical therapists face validity in relation to passive accessory intervertebral movement test for assessing spinal segmental motion aspects has been decreasing with more attention devoted to pain responses. The current scepticism regarding the motion properties assessed with these tests is associated with utility aspects such as validity, sensitivity, accuracy and specificity.

1 | INTRODUCTION

A correct examination is essential during the evaluation of patients with neck pain with mobility deficits, headaches, movement coordination impairments or radiating pain impairments to match the patient's clinical presentation with the most effective treatment

choice.^{1,2} In addition to imaging studies and validated self-reports of disability questionnaires,^{3,4} clinicians use a variety of physical examination tests to monitor the patient's status.^{5,6}

The most frequently used procedures performed by physical therapists (PTs) for the physical examination of the cervical spine are passive accessory intervertebral movements (PAIVM) tests; passive

physiological movements (PPM) active physiological movements (APM), cranio-cervical flexion test, joint position error (JPE) and the neck muscles endurance test.⁷ However, different outcomes could be considered during those tests' performance related to mobility (quality of motion path, end-feel or resistance; quantity of physiological and accessory movements, vertebrae position) and pain.^{7,8} The literature contains a large diagnostic accuracy and reliability indices for these clinical examination items.

PAIVM tests showed poor reliability when used to assess accessory movement capacity, vertebrae position or end-feel resistance,⁹ suggesting they should not be used clinically.¹⁰ When these techniques are used to determine the pain responses, there is strong evidence of high levels of reliability.

The low reproducibility of PAIVM could be explained by tactile perception which is affected by palpation (palm or finger), trust of the somatosensory impression of the movement stimulus analysed by palpation, use of touch or pressure sensors, analysis of the motion event (focus on palpating the initial motion elicited instead of concentrating solely on the amount of motion), clinician tactile receptors degradation because of the age and finger conformation to the spatial details of the palpation surface.¹¹ Additionally, these assessments can be impacted by other factors such as number of repetitions, number of measurements, force applied at the end of the movement range, movement directions, time intervals between movements and even the effects of mobilisations on the tissues mechanosensitivity. Furthermore, when specifically assessing the lumbar spine, which shown to have greater reliability of PAIVM tests than in the cervical spine, there was no agreement with dynamic magnetic resonance results.¹²

Assessing cervical flexion, extension, rotation and side bending range of motion using an inclinometer or a cervical device exhibits acceptable reliability and there is moderate evidence for the use of these procedures during the screening of non-specific neck pain patients.^{1,2} Although a large cohort study recommended to not consider cervical range of movement (CROM) as indicator to measure the progress of chronic neck pain¹³ a systematic review reported reduced active CROM in people with neck pain compared with healthy subjects.¹⁴ Also, PAM tests such as cranio-cervical flexion test, neck muscles endurance tests and JPE tests have moderate evidence for use in patients with non-specific neck pain^{1,2} and have been shown to exhibit acceptable reliability and validity during the clinical examination.⁸

A previous survey study conducted over 10 years ago¹⁵ assessed clinician attitudes while performing the manual assessment of spinal motion and their opinion about the reliability of different tests classified in PAIVM, APM and PPM. Since then, the number of published studies evaluating measurement properties of cervical spine physical examination has increased, a new survey evaluating the current PTs attitudes is warranted. The aims of this study were: (a) to provide an update in the most important properties considered by PTs when conducting accessory and physiological movement tests during the cervical spine physical examination and (b) to assess the reasoning evolution if any compared with the Abbott et al¹⁵ study after 10 years of new scientific evidence.

What's known

- Ten years ago, physical therapists considered mobility aspects as the most frequent and important properties assessed during the manual spine examination.
- Since then, evidence suggest these tests should not be used clinically to determine mobility aspects.

What's new

- Physical therapists face validity to using passive accessory intervertebral movement test for assessing spinal segmental motion has been decreasing with more importance being placed on pain responses during the tests performance in the clinical practice.

Message for the clinician

- A highly reliable test is not enough to make treatment decisions. Physical therapists are considering utility aspects such as validity, sensitivity, accuracy and specificity.

2 | MATERIALS AND METHODS

This was an online, cross-sectional, descriptive survey and CHERRIES checklist for reporting results of Internet E-Surveys has been followed.¹⁶ The target population for this study was PT members of one of the autonomous Spanish Physiotherapists Schools. We included all individuals who reached at least the PT degree. This protocol was reviewed and approved by the University Alfonso X el Sabio Ethics Committee. An informed consent was written and included with the length of time of the survey (around 15 minutes), where data were stored, who were the researchers and the purpose of the study. Participants were informed that their autonomous Spanish Physiotherapists School collegiate number was required and collected as personal information to avoid duplicated participation and only the principal researcher had the password of the survey data to protect unauthorised access. The use of the participant and survey data was assumed if PTs submitted their survey after reading and checking the informed consent in the first survey step.

Development of the survey instrument was approached in two phases. The principal investigator (JAVC) developed a Spanish translated version 1 as part of earlier research,¹⁵ which was further developed after fixing problems with comprehension. We then designed a final version 2 open survey using Google Forms (<https://docs.google.com/forms/>) based on feedback from the previous survey. A trial ($n = 32$) of this final version was preformed to check the usability and technical functionality before starting this research.

Sample size was calculated by $n = \frac{t^2 * p * q}{d^2}$, where t is the value for selected alpha level of 0.025 in each tail (1.96) and $p \times q$ was estimate of variance (0.25). Therefore, for the physiotherapists population

in Spain in 2018 (N = 54 258) a minimum of 382 surveys were required.¹⁷

Participants were contacted via email with a list of 84 private physiotherapy centres located in Spain with 546 PTs linked to a private university located in Madrid. Participants were sent the link to participate between January 2020 and April 2020. This survey was voluntary to participate, and no incentives were offered.

This survey was based on four questions (one per page). In the first question, participants were asked how many years of experience they had, their highest academic degree, weekly time treating patients and if they received osteopathy or manual therapy training. In the second question, participants were asked to choose (on a Likert scale) how accurate and reliable they believe PAIVM are for estimating the quantity of movement present at a cervical segment. The third question was related to PAIVM, PPM and APM tests and the outcomes assessed while performing the techniques. A multi-response item was created with following options: "Position of vertebra"; "Quantity of angle"; "Quantity of translation"; "Quality of resistance"; "Quality of end-feel"; "Quality of motion path," "Pain response"; "None" and "Others" (free text). We assessed the most commonly rated outcome and the first and second outcome rated as most important in PAIVM tests. In the fourth question, participants were asked to answer what they are comparing while performing PAIVM with these options: "The mobility you expect for that segmental level, taking into account the patient's age and body type"; "The mobility you expect for that segmental level, compared to your experience of assessing the same segmental level in other patients with the same medical conditions and healthy subjects"; "The mobility you expect for that segmental level, compared to other segments above and below"; "A patient's familiar pain response during the procedure"; "None" and "Others" (free text). All the questions were highlighted as mandatory items to send and a Back Button to change their responses was available.

Data from Google Forms were transferred to the SPSS package, Version 21 Software for Mac OS. Descriptive statistics (number and percent for categorical data and mean and standard deviation for continuous data setting a 95% CI) were used to summarise the data. For ranked responses, we counted the frequency of each response rated as most important and second most important. Free-text responses were assessed qualitatively.

3 | RESULTS

Four hundred and fifteen (79.12%) of 546 PTs completed surveys. Only completed surveys were analysed (100% were completed properly and included in the analyses). Characteristics of the participants are described in Table 1.

The majority of respondents believe that PAIVM tests are "somewhat inaccurate" (42.9%; 95% confidence interval 37.8%, 47.5%), "somewhat intra-examiner unreliable" (46.3%; 95% confidence

TABLE 1 Characteristics of respondents

| | |
|--|-----------------------------|
| Participation ratio | 415/546 (79.12%) |
| Age (y) ^a | 29.51 ± 6.8 |
| Professional experience (y) ^a | 9.18 ± 6.29 |
| Direct patient care | |
| >30 h/wk | 275 (66.3%) |
| 20-30 h/wk | 95 (22.9%) |
| <20 h/wk | 45 (10.8%) |
| Highest qualification | |
| Physiotherapy degree/diploma | 190 (45.8%) |
| Postgraduate title | 50 (12%) |
| Master's degree | 144 (34.7%) |
| PhD | 31 (7.5%) |
| Osteopathy training | |
| Yes | 130 (31.3%) |
| No | 285 (68.7%) |
| Manual therapy training | |
| Yes | 339 (81.7%) |
| No | 76 (18.3%) |

^aValues are means ± standard deviation (SD).

interval 41.4%, 51.1%) and "somewhat inter-examiner unreliable" (41.7%; 95% confidence interval 36.9%, 46.5%) (Table 2).

When asked participants to consider what they were intending to assess when performing PAIVM tests. The greatest proportion of respondents rated the patient's pain response as most considered (79.8%; 95% confidence interval 75.4%, 83.4%) and also as most important (42.7%; 95% confidence interval 38.3%, 47.7%). Quality of end-feel was the next most rated (45.3%; 95% confidence interval 40.5%, 50.6%), but quantity of translation was ranked the second most important (9.9%; 95% confidence interval 7.0%, 12.5%). Further results are shown in Figure 1.

During PPM, the properties most frequently assessed were the quantity of angle (81.7%; 95% confidence interval 77.8%, 85.5%) followed by quality of motion path (80.5%; 95% confidence interval 76.4%, 84.3%) and during APM the quality of motion path followed (84.3%; 95% confidence interval 80.7%, 88.0%) by quantity of angle (77.6%; 95% confidence interval 73.5%, 81.4%). All the responses are shown in Figure 2.

How respondents judge spinal mobility during PAIVM tests is presented in Figure 3. The majority base their judgement on familiar pain responses during the test procedure (54.7%; 95% confidence interval 49.6%, 59.3%). Although open text answers were available to contribute with any other non-proposed PAIVM, APM, PPM property or any other PAIVM judge, any respondent used this tool to propose any new option (n = 0).

4 | DISCUSSION

Our data indicate that a minority (6%) of Spanish PTs believe PAIVM can be used to detect quantity of spinal segmental motion. There

| | n (%) | 95% CI (%) |
|---|------------|------------|
| Accuracy^a | | |
| Not at all accurate | 53 (12.8) | 9.6-15.9 |
| Somewhat inaccurate | 178 (42.9) | 37.8-47.5 |
| Somewhat accurate | 159 (38.3) | 33.5-42.9 |
| Very accurate | 25 (6.0) | 3.9-8.7 |
| Intra-examiner reliability^b | | |
| Not at all reliable | 35 (8.4) | 5.8-11.3 |
| Somewhat unreliable | 192 (46.3) | 41.4-51.1 |
| Somewhat reliable | 151 (36.4) | 31.8-41.0 |
| Very reliable | 37 (8.9) | 6.3-11.6 |
| Inter-examiner reliability^c | | |
| Not at all reliable | 98 (23.6) | 19.8-27.7 |
| Somewhat unreliable | 173 (41.7) | 36.9-46.5 |
| Somewhat reliable | 133 (32.0) | 27.7-36.1 |
| Very reliable | 11 (2.7) | 1.2-4.3 |

^aResponses to the question "Indicate how accurate you believe passive accessory intervertebral movements tests are for estimating the quantity of accessory movement present at two spine segments (for example identifying restricted, normal or excessive movement)".

^bResponses to the question "Indicate how reliable you believe passive accessory intervertebral movements tests are for the same examiner".

^cResponses to the question "Indicate how reliable you believe passive accessory intervertebral movements tests are for two different examiners".

TABLE 2 Accuracy and reliability of passive accessory intervertebral movement tests

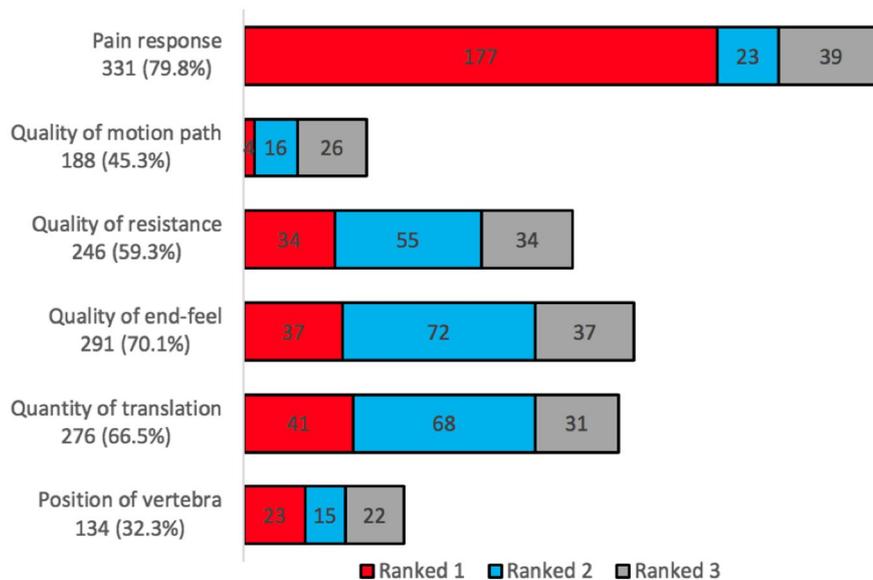


FIGURE 1 Responses to the question "Which of these items do you assess during Passive Accessory Inter-Vertebral Movement tests? Rank these in order of importance". Data represent the number of PTs who ranked each response as the greatest importance (red bars), second greatest importance (blue bars) and third greatest importance (grey bars). About 23.9% ranked did not highlighted any item as most important, 76.1% ranked the most important item, 62.7% ranked the two most important items and 45.5% ranked the three most important items

has been a decrease in the confidence in PAIVM accuracy over the past 10 years when comparing results with Abbott et al.¹⁵ This sceptical reasoning is also applicable to their PAIVM reliability beliefs. However, no data about PTs beliefs related to PAIVM reliability was found.

Our findings are consistent with previous research indicating that segmental motion tests are recommended during the examination of patients with neck pain but the accuracy to determine movement quantity is lower when determining accessory mobility^{1,2}; (b) the accuracy of these test are higher when the aim is reproducing

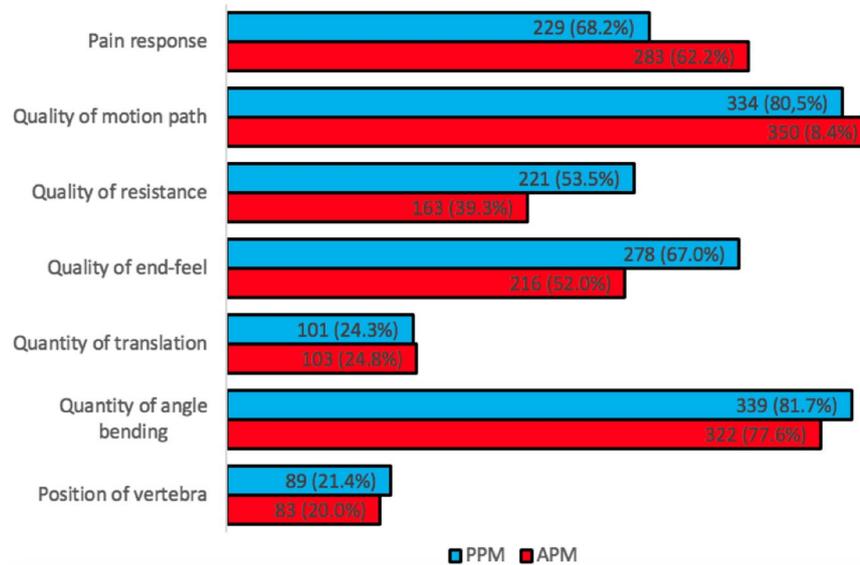
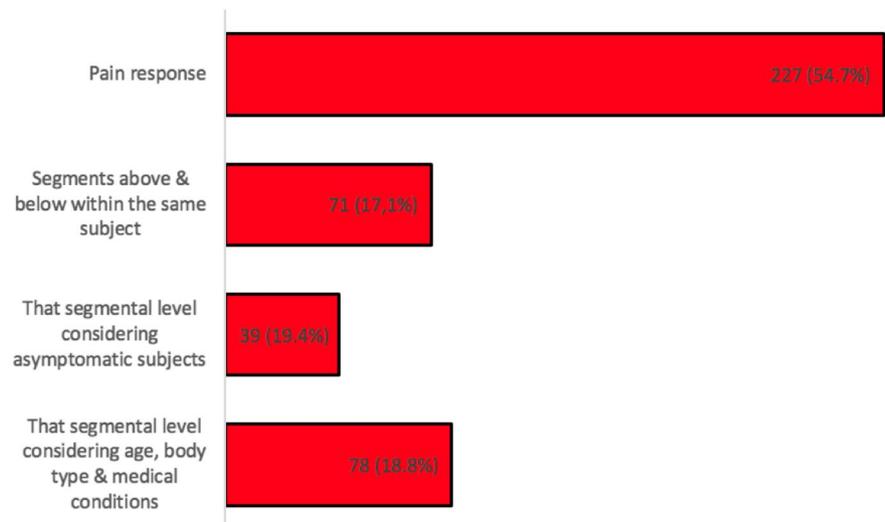


FIGURE 2 Responses to the questions "Which of these aspects do you assess during Passive (eg passive flexion/rotation/side bending/extension cervical range of movement) and Active (eg Cranio-cervical flexion test/Joint Position Sense Error/Flexor neck muscles endurance/Active Cervical Range of Movement) Physiological Movement tests?". Blue bars show responses to the question "Which of these aspects do you assess during Passive Physiological Movement test (eg passive flexion/rotation/side bending/extension cervical range of movement)?". Red bars show responses to the question "Which of these items do you assess during Active Physiological Movement tests (eg Cranio-cervical flexion test/Joint Position Sense Error/Flexor neck muscles endurance/Active Cervical Range of Movement)?". Data represent the number (n) and percentage (%) of PTs who selected each response

FIGURE 3 Responses to the question "Do you base your judgement during Passive Accessory Inter-Vertebral Movement tests?". Red bars represent the number (n) and the percentage (%) of PTs who selected each response as the most important



pain (79% specificity and 82% sensitivity¹⁸ and (c) cervical spine PAIVM reliability has shown greater confidence when assessing pain responses or a joint dysfunction in the upper three cervical spine segments (up to 85% specificity and 65% sensitivity),⁵ but not in lower segments. We therefore conclude that acceptance of the face validity of manual segmental mobility assessment has decreased among PTs.

Our data indicate that, overall, pain responses to the procedure and quality of end-feel (eg, capsule, disc, muscle, ligament, bony or cartilage) were the dominant items assessed during PAIVM tests. Here, a clinical reasoning change after 10 years is shown, where the most rated items were quantity of motion and quality of the

resistance (force applied to produce a translation during the range). However, the most important property considered during the exam is still the pain response, with a 21% increase of responses over the past 10 years.¹⁵ Few new studies have examined the assessment of spinal accessory movement tests over the past 10 years. However, a systematic review of the whole spine including only high-quality methodological studies determined that PAIVM should not be used for assessing quantify mobility aspects, planning a treatment or to assess the patients progress as they are invalid and non-reproducible methods¹⁸ except for determining the presence or absence of joint dysfunction in upper three cervical spine segments and it is only recommended to focus on related pain responses.^{1,2} Our results also

agree those considerations, showing a reasoning focus change from mobility-related aspects to pain responses compared with Abbott et al.¹⁵

During PPM tests (eg, passive CROM), most of respondents assess the quantity of angle of spinal bending and quality of motion path. Ten years ago, those were the most important properties but in reverse order. Quantity of angle seems decreased in neck pain patients¹⁴ compared with healthy subjects and is recommended as a physical examination measure related to clinical prognosis. However, there is a weak correlation between quantity of angle and disability.¹⁹ The assessment of the spine motion path quality is important for clinicians to identify possible movement risk factors in individuals with neck pain that may be targeted with treatment because of altered kinematics observed in individuals with neck pain.²⁰ Surveyed data indicated that PTs are focusing on clinically relevant parameters when performing PPM tests.

The quality of the motion path perceived by the assessor during APM tests was the most commonly rated by respondents followed by quantity of angle of spinal bending. Our results cannot be compared with Abbott's study¹⁵ because those tests were not included. APM tests have a moderate evidence use for non-specific neck pain^{1,2} to make treatment decisions. Cranio-cervical flexion test, neck muscle endurance test and active CROM seems reliable and has shown satisfactory construct validity. However, JPE did not exhibit correlation with any self-reported outcome measures⁸ or enough accuracy studies support² and should not be used to make a treatment decisions.

There is little evidence assessing each test groups (PAIVM, PPM and APM) for each property exposed here and most of the studies are assessing intra-examiner, inter-examiner and test-retest reliability. High reliable tests may not preclude diagnostic or prognosis utility²¹ and further research is required to adequately support this.

Therefore, utility is more important than reliability and although those studies are harder to design, further validity research is needed to clarify which properties should be considered while performing each test.

This study has several limitations that should be taken into account. The data represents a large sample of clinically active PTs but may not be internationally generalisable. The use of prepared responses may have led to bias, however, this is mitigated by the fact that respondents did not provide any free-text responses. Also, each APM test should be studied separately to be able to rank properties of different tests.

5 | CONCLUSIONS

Physical therapists face validity to use passive accessory intervertebral movement test for assessing spinal segmental motion aspects has been decreasing with more importance being placed on pain responses. The current scepticism regarding the motion properties assessed with these tests is associated with a perception of low accuracy and reliability. Further research is necessary to assess utility

aspects such as validity, sensitivity and accuracy of these tests to each property. We recommend using these tests to assess those properties which are methodologically consistent and scientifically valid.

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DISCLOSURES

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author (JA Valera-Calero), upon reasonable request.

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