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Inter-examiner agreement of musculoskeletal and visceral tests to assess the pelvic region in women with stress urinary incontinence

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ORIGINAL ARTICLE

ABSTRACT

An accurate assessment of the pelvic region is necessary to provide reproducibility in research and clinical practice. The aim of this study, which is part of a randomized controlled trial, was to test the level of inter-examiner agreement of musculoskeletal and visceral tests to assess the pelvic region in women with stress urinary incontinence. A cross-sectional study was conducted with 20 women between 30 and 60 years old. Nine musculoskeletal tests were performed (standing and sitting flexion tests, Gillet test, iliac, sacral, and bladder position and mobility tests, psoas test, and abdomen assessment) and one pain provocation test for the sacroiliac joint (Patrick Faber test). Descriptive statistics were used, and the inter-examiner agreement was assessed using the Kappa coefficient (κ). Significant agreement was found for the Patrick-Faber test and abdomen type ($\kappa = 0.649$, $p < 0.0001$ and $\kappa = 0.342$, $p < 0.342$, respectively). No significant agreement was observed in the remaining tests. In general, the tests' reproducibility in this study among evaluators to assess women's pelvic region with stress urinary incontinence is very weak.

Keywords: sacroiliac joint, reproducibility of tests, urinary incontinence, reliability

INTRODUCTION

Pelvic floor disorders may present as urinary incontinence (stress, urge, or mixed), urinary retention, fecal and flatus incontinence, intestinal constipation, pelvic organ prolapse, neurological changes, painful syndromes, and sexual dysfunction (Alves et al., 2017). They can be caused by several factors, such as age, hormonal imbalance, physical inactivity, a trauma in the region, obesity, intestinal constipation, chronic diseases (including diabetes and neurological diseases), family history, drugs that act on the lower urinary tract, caffeine consumption, smoking, pelvic surgery, diseases that affect collagen, heredity, in addition to rigorous exercise and/or impact (Thomaz et al., 2018).

Biomechanical or hormonal conditions particular to the pregnancy-puerperal cycle can also affect the structures (fascia, ligaments, and muscles) that support the pelvic organs. The risk ratios can vary from the patient's ethnicity, high body mass index (BMI) and high weight gain during pregnancy. Surgical vaginal births are also at risk and have been reported when the second stage of delivery (expulsive period) and/or high-weight newborns are advanced, as they occur with a higher incidence of episiotomy and spontaneous lacerations in this region (Dasikan et al., 2020). Several studies have already pointed out that episiotomy cannot be considered a protective measure for the pelvic floor, as it attributes some damage and impairment to functionality (Pires & Onofre, 2018).

In addition, changes in lumbopelvic joint biomechanics, fascial adhesions, and muscle imbalance (hypotonia of some muscles and hypertonia in others) are potentially generators of functional imbalances visceral elements, given

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the anatomical connections and articular relations. The impairment of mobility and visceral motility ends up having a negative impact on surrounding tissues because it compromises the physiological effects of pressure variation, which restricts the free flow of fluids (artery-venous, lymphatic, and interstitial) (Araújo et al., 2017).

Hebgen (2011), Lopez (2017), and Guillaud et al., (2018) mention that the dysfunctions of osteoarticular mobility can cause changes in the bladder function since the urinary bladder and the pubic symphysis are connected by the pubovesical ligament and by the endopelvic fascia. In addition, myofascial tensions in the urogenital diaphragm region can compromise the functionality of the genitourinary tract by affecting myocontractable capacities and generating pain, dystonia and causing infections and inflammations.

The diagnosis of these biomechanical dysfunctions is carried out through palpatory examinations, identification of asymmetries (absence of position or kinetic symmetry), alteration of texture (edema, flaccidity), restriction of mobility (a resistance or kinetic incapacity), and provocation tests of sacroiliac joint pain (Basile et al., 2017; Consorti et al., 2018; Laslett, 2008; Robinson et al., 2007; Soleimanifar et al., 2017).

Studies report that reliability is low for the palpation and provocation tests (Basile et al., 2017), although a combination of three or more provocative sacroiliac joint tests has reasonable sensitivity and specificity in diagnosing an SIJ injury (Laslett, 2008; Lima et al., 2019).

A diagnostic test must be reproducible on the same individual by two or more examiners or by the same evaluator on two separate occasions. Two independent evaluators must be able to agree for a finding to be clinically significant. If a diagnostic test does not meet this basic requirement, it is considered unreliable. In the last decade, evaluators' reliability has gained attention in the literature because of evidence-based practice (Consorti et al., 2018; Lucas et al., 2010).

According to Robinson et al. (2007), reliability can be influenced by three factors: participants, therapists, and clinical tests. Lucas and Bogduk (2011) state that examiners' interpretation of a test may disagree, which may influence the results (*i.e.*, the examiners may agree that a condition is present but mislabel it in their reports), and this is prone to significant inter-examiner bias and variability.

Previous studies have also evaluated the inter-examiner reliability of sacroiliac joint tests in individuals with nonspecific low back pain, spondylitis, pelvic pain, and asymptomatic (Castro et al., 2018; Cohen et al., 2013; Cooperstein et al., 2015; Dryfuss et al., 1994; Lima et al., 2019; Meijne et al., 1999; Robinson et al., 2007; Soleimanifar et al., 2017; Vincent-Smith & Gibbons, 1999). But no studies have yet been found that evaluated the tests in women with stress urinary incontinence.

Nevertheless, to the best of our knowledge, there are no studies evaluating test reliability in women with stress urinary incontinence. Therefore, this study aimed to test the inter-examiner reliability of musculoskeletal and visceral tests to assess the pelvic region in women with stress urinary incontinence. The hypothesis is that experienced examiners will present moderate to good reliability.

METHODS

A cross-sectional study was conducted from May to September 2019 at a private physiotherapy clinic in Fortaleza, Ceará, Brazil.

The study was approved by the Ethics Committee of Institute of Health and Hospital Management (3.315.046). All participants signed a written consent form, and all procedures were performed in accordance with the Declaration of Helsinki.

Our study protocol followed the *Guidelines for Reporting Reliability and Agreement Studies* (GRASS) (Kottner et al., 2011).

Selection and Description of Subjects

The study used a convenience sample of women aged 30 to 60 years with urine loss symptoms for at least the last six months,

recruited from hospitals, urogynecology clinics, social networking invitations, gyms clubs, and sports advice.

Exclusion criteria were urinary or mixed urinary incontinence, overactive bladder, neurological disorders, urinary or anal infection, urogenital atrophy, grade 3 or 4 pelvic organ prolapse, spinal fracture, and hip arthrosis.

Instruments and Procedures

Two physiotherapists with a diploma in osteopathy and more than 10 years of clinical experience evaluated all participants. Each was blinded to the evaluation of the other. Before the study, there were training sessions to align the tests between the evaluators and achieve consensus on executing and interpreting the measurements. Nine palpation and pelvic movement verification tests were performed (standing and sitting flexion tests, Gillet test, iliac, sacral and bladder mobility test, activity evaluation of the psoas muscle, and the type of abdomen) and a pain provocation test for the sacroiliac joint (Patrick Faber). Each evaluator performed the tests only once, unaware of any clinical information regarding the evaluated woman. There was no time interval between measurements, which were performed independently. The evaluation interval between the examiners averaged 5 minutes, and a random drawing determined the evaluation order. A third investigator was assigned to record all measurements.

a) *Standing flexion test:* Volunteer standing, the evaluator was positioned behind a sitting volunteer, with the thumbs placed firmly and lightly on the UPIS, and asked the volunteer to flex the trunk. The evaluator watched the ascendancy of the thumbs, especially in the last degrees of movement. In conditions of functional balance, the two thumbs must rise simultaneously and symmetrically. Conversely, decreased movement, or a sacroiliac joint's positional failure results in the ipsilateral UPIS moving more cephalically than the other due to altered lumbopelvic rhythm (Egan et al., 1996). Therefore, the evaluators should report whether the test showed right, left, or no change.
b) *Seated flexion test:* Seated volunteer, evaluator was positioned behind a sitting volunteer, with the thumbs placed firmly and lightly on the UPIS, and asked the volunteer to flex the trunk. The evaluator watched the ascendancy of the thumbs, especially in the last degrees of movement. In conditions of functional balance, the two thumbs must rise simultaneously and symmetrically. If the thumb moved at a greater anterior-superior distance during flexion, it would indicate that the sacrum was fixed to the ilium on that side. (Egan, Cole & Twomey, 1996). Similar to the standing flexion test, the evaluators should report whether the test showed right, left, or no change. According to Mitchell, Moran, and Pruzzo (1979), a positive result in the standing and sitting flexion tests are indicative of iliac and sacral dysfunction, respectively.
c) *Gillet test:* This test determines whether anatomical factors in the sacrum and ilium move during hip flexion in a standing position. The volunteer was standing, and the therapist was positioned with one thumb on the UPIS and the other on the ipsilateral sacral base at the same height. Hip and knee flexion at 90° were required, standing on one leg. The dysfunction response is non-rotation of the ilium and, therefore, no thumb drop (Cooperstein et al., 2015; Magee, 2002). Evaluators should report whether the test showed right, left, or no change.
d) *Patrick Fabere:* Orthopedic pain provocation test for sacroiliac joint and to assess the mobility of femuroacetabular complex structures. With the volunteer in a supine position, the knee on the tested side is bent at 90°, and the foot is supported on the opposite leg's knee. The evaluator holds the pelvis firmly against the examination table, and the tested knee is pushed toward the table, exploring the abduction range and external rotation of the ipsilateral femoral acetabular. If there is pain only in the sacroiliac joint, the test is considered positive (Soleimanifar et al., 2017). The evaluators should describe

whether the test was positive for left or right sacroiliac pain in the report.

e) *Iliac mobility tests:* With the contact of both hands on the Antero-Superior Iliac Spines, the therapist applied efforts of posterior and anterior rotation (alternately) in each of the iliacs, qualifying the freedom of movement. The anterior or posterior rotational mobility restriction was indicative of dysfunction: anterior or posterior rotation of the right or left iliac or without any restriction (Chila, 2012).

f) *Sacral mobility testing:* Evaluation of sacrum is important due to the correlation between sacral mobility and the functionality of neuronal elements (roots S2, S3 and S4, pudendal nerve and autonomic ganglia) responsible for the autonomic balance and functional performance of the pelvic floor (Lopez, 2017). The assessment of sacral mobility was carried out with the patient in a prone position, therapist contacting the sacrum with an open hand, qualifying the rebound (rebound) of the hemibases and the inferolateral angles, taking as a reference the sacroiliac joint mobility arms and the possibilities of movement in nutation, counter-nutation (uni or bilateral), anterior or posterior torsion. The dysfunctional possibilities considered were: anterior or posterior right/left torsion, right/left unilateral nutation or counter-nutation, bilateral nutation, bilateral or unrestricted counter-nutation (DiGiovanna et al., 2005).

g) *Psoas muscle test by measuring the length of the upper limbs:* As psoas muscle tension can influence sacroiliac and spinal dysfunction, it was evaluated by subjectively measuring the length of the arms above the head and extended, with the individual in the supine position. The shorter arm indicates the tonic hyperactivity side of the psoas (Almeida, 2006).

h) *Assessment of bladder fascial mobility:* A palpation and induction of bladder movement were performed, exploring parameters of right/left, upper/lower translation, right/left, upper/lower oblique, and right/left rotation. The volunteer should have previously emptied her bladder (Stone, 2007).

i) *Abdomen type:* Upon palpation, the abdominal musculature was subjectively classified as hypertonic, hypotonic, or normotonic and the abdominal mass as hypertensive, hypotensive, or normotensive. Such conditions affect the balance of intra and extra-cavitary pressures on the urogynecological system. Whereas a hypotonic abdomen may indicate hypotonia of the pelvic floor's synergistic muscle, the transversus abdominis, while a hypertensive, globose abdomen suggests an increase in internal pressures. Abrams et al., (2017) reported that overweight women (body mass index 25-30 kg/m^2) and obese women (> 30 kg/m^2) are at high risk for developing pelvic dysfunction.

Statistical Analysis

Participant characteristics were analyzed using descriptive statistics (measures of central tendency and dispersion). Inter-examiner reliability was assessed with the Kappa coefficient and a confidence interval of 95%, where significance was rated as <0 (insignificant); >0<0.2 (weak); >0.21<0.4 (reasonable); >0.41<0.6 (moderate); >0.61<0.8 (strong); and >0.81<1 (almost perfect) (Choen, 1998). Data were analyzed in SPSS with a significance level of $\alpha = 0.05$.

RESULTS

The sample consisted of 20 women with complaints of stress urinary incontinence in the last six months, mean age of 41.20 ±9.27 years, and a body mass index (BMI) of 25.95 ±3.50 kg/m^2. Only 35% reported lower back pain or other musculoskeletal symptoms. The values of the two evaluators' frequency and percentage of agreement in the different variables analyzed are shown in Table 1.

It is observed that there is significant reliability in the Patrick Fabere test and the type of abdomen. This agreement was strong for Patrick Fabere and reasonable for the type of abdomen ($p = 0.649$ and 0.342), respectively.

The tests of visceral mobility (p> 0.2 <0.3), sacral mobility (0.207) and hypertonia of the psoas by measuring the length of the upper limbs (p = 0.207) performed by the examiners showed reasonable statistical reliability.

Standing flexion tests (p = 0.570), sitting flexion (p = 0.891), Gillet (p = 0.834), tests for iliac mobility (p = 0.571) had insignificant levels of weak reproducibility.

Table 1
Frequency and percentage of agreement of the two evaluators on the different variables analyzed.

Variables	AF (times) n=20	PA (%) n=20	Kappa	p
Standing trunk flexion test	5	25	-0.079	0.570
Sitting trunk flexion test	6	30	-0.014	0.891
Gillet test	8	40	-0.021	0,834
Patrick Fabere test	19	95	0.649	<0.0001*
Iliac mobility	5	25	0.060	0.571
Sacral mobility	4	20	-0.139	0.207
Psoas test	11	55	-0.139	0.207
Bladder mobility (translation)	9	45	0.214	0.098
Bladder mobility (oblique)	9	45	0.200	0.131
Bladder mobility (rotation)	12	60	0.269	0.169
Type of abdomen	12	60	0.342	0.027*

Note: AF= agreement frequency; PA= percentage of agreement; *p<0.05.

DISCUSSION

This study aimed to assess the agreement of musculoskeletal and visceral osteopathic tests in the pelvic region in women with urinary incontinence. Although some studies have assessed the agreement of some of these tests in individuals with some spinal dysfunction (Consorti, 2018; Egan et al., 1996; Lima et al., 2019; Meijine et al., 1999; Robinson et al., 2007). The present study is the first to evaluate these tests in women with urinary incontinence and to assess whether there is agreement among trained examiners. We understand that the practice and repetition of these physical exams can be useful for an accurate diagnosis, which leads to therapeutic success.

The Patrick Fabere provocation test, which is provocative of the structures that make up the femur-acetabular and sacroiliac joint, was the only one among the tests carried out in this study that had a strong agreement level (p <0.0001). As it is an arthrocinmatic mobility test, in which extrinsic efforts tension the joint structure, it is consistent to expect it to be positive when there is any affection of these structures. The sphincteric dysfunctions capable of causing urinary incontinence do not seem to have a strong relationship with the structural condition of the joint tissues evaluated in this test, which corroborates with the statistical data showing that 92.5% of the women had the test said negative, that is, without symptoms of stress in these joints.

Robinson et al. (2007) observed that the evaluators had a higher level of disagreement in the Patrick Fabere test compared to other provocative tests, such as the compression and distraction, thigh thrust, bilateral and unilateral internal rotation test, drop test in people with ankylosing spondylitis, postpartum pain and asymptomatic. However, Castro et al (2019) evaluated the Patrick Fabere test to diagnose inflammation of the sacroiliac joint in spondyloarthritis patients comparing it to other tests for the pelvic region (Gaenslen, thigh thrust and compression). They noted that the Patrick Fabere test was the best performing procedure among examiners (sensitivity 71%, specificity 75%) and, when these tests were combined, demonstrated the strongest predictive value (sensitivity 86%, specificity 62%).

The evaluation of the type of abdomen had a higher level of agreement, being assessed by the Kappa coefficient as reasonable (p = 0.027), probably due to the biotype of women who had a

higher body mass index, which promoted a greater consensus among the examiners.

The visceral mobility tests (p> 0.2 <0.3), sacral (0.207), and the psoas muscle tests by measuring the length of the upper limbs (p = 0.207) have reasonable statistical reliability.

The low reproducibility of these tests can interfere with three-dimensional biomechanical movements, promoting more options of the results, mainly to qualify the viscera mobility (right/left, upper/lower, oblique right/left, upper/lower, right/left rotation) or sacrum mobility (anterior or posterior right/left torsion, unilateral right/left nutation or counter-nutation, bilateral nutation, bilateral counter-nutation or without restriction).

Regarding the assessment of psoas through the length of the upper limbs showing reasonable reproducibility, suggested emphasizing the importance of other tension relationships that interfere in the mobility of the upper limb and, consequently, in the diagnostic reliability, such as scapulohumeral mobility disorders, costal, visceral, among others. This endorses the idea of this test's low reliability for detecting functional psoas imbalances.

Guillaud et al. (2018) found no evidence for the reliability of diagnostic techniques used in visceral osteopathy in their systematic review. Most studies have a high risk of polarization and do not show reliability for the evaluated results.

For Soleimanifar et al. (2017), the mobility assessment can be biased; because of the degree of slack, the sensation of sliding or shearing felt by the trained operator can be perceived as a subtle change in the quality of movement instead of sudden changes in mobility ranges, which will influence the results.

Standing flexion tests (p = 0.570), sitting flexion (p = 0.891), Gillet (p = 0.834), tests for iliac mobility (p = 0.571) had insignificant levels of weak reproducibility. These results are in line with other studies.

Egan et al. (1996) support that standing or sitting trunk flexion tests are not accurate indicators of a sacroiliac dysfunction or pathology and that other factors may be involved in a positive result. In their clinical trial, nearly one-third of the subjects had positive results even though they were asymptomatic, suggesting that these tests may produce false positives and the need to investigate more carefully the association between structural and functional asymmetry.

Vincent-Smith and Gibbons (1999) observed that the standing flexion test has negligible reliability between examiners and moderate intra-examiner reliability when performed on asymptomatic individuals, suggesting its reliability as an indicator of sacroiliac joint dysfunction still questionable.

Laslett (2008) reported that the Gillet and standing flexion tests' sensitivity and specificity have long been observed to be weak. Dreyfuss et al. (1994) found the incidence of false positives in the Gillet and standing and sitting flexion tests of 16%, 13%, and 8%, respectively, in asymptomatic individuals.

Klerx et al.(2019) reviewed the reliability of eight sacroiliac mobility tests in the literature, including the standing and seated flexion and Gillet tests, for their clinical usability recommendations. They recommend that tests evaluating sacroiliac joint mobility should not be used in clinical practice. Reliability values were higher for the cluster (mobility and pain-provoking) tests than individual tests, but diagnostic accuracy remains uncertain due to the studies' methodological quality. They report that the joint movement is very small (0.2 degrees posterior rotation, 0.6 degrees rotation around the helical axis, and 0.3 mm translation), and measuring sacroiliac mobility using manual palpation can therefore be impossible.

Lucas and Bogduk (2011) hypothesize that perhaps the standing and seated flexion tests measure soft tissue movement over the joint and not necessarily the joint. Report that if the test cannot correctly identify whether a person has a dysfunction, this inaccuracy may compromise randomized clinical trial results even before it begins. This is relevant for not only clinical studies but safe and effective practice in physiotherapy offices. Variability in test results reduces the confidence that the clinician can place in test-based predictions, limits the ability to administer a better treatment, and results in an

incorrect diagnosis and adverse psychological effects that may contribute to the sensation of indisposition.

For Laslett (2008), the only acceptable standard reference developed to verify the sacroiliac joint's mobility so far is radiographic analysis during flexion / extension with metal markers imbued in the sacrum and iliac.

Lima et al. (2019) report that the gold standard for diagnosing dysfunction in the sacroiliac joint is an invasive technique of infiltration with anesthetics, and when there is a loss of symptoms after the infiltration, it indicates an injury. However, this procedure requires expensive and technical procedures that are not common in clinical practice. In addition, the mobility of the sacroiliac joint is not assessed with this procedure; therefore, it may not be useful for measuring joint function. They state that a clinically useful and reliable tool for clear interdisciplinary communication is needed to obtain accurate results and allow different examiners to obtain similar results.

Soleimanifar et al. (2017) investigated the correlation of mobility verification and provocation tests for the sacroiliac joint, and the results showed that neither single nor grouped tests have a significant correlation with each other. In other words, positive or negative single or cluster test results from each group did not correlate with positive or negative results from other groups. Therefore, they conclude that these tests cannot assume a mobility dysfunction

The systematic review by Basile et al. (2017) found that intra-examiner reliability is higher than inter-examiner reliability, suggesting that there is greater consensus among examiners regarding the degrees of pressure and palpatory accuracy and that examiners' experience may also interfere with diagnostic accuracy.

McIntyre et al. (2018) reported that the lack of reliability in osteopathic evaluation judgments is due to the complexity of cognitive perception and the evaluator's relationship with their knowledge and beliefs. They suggest incorporating hypothetical-deductive reasoning and multisensory perception during clinical reasoning.

This study reinforces that certain orthopedic and functional evaluation measures should be applied with more care due to subjective and challenging reproducibility. A critical assessment is needed on what these results mean and how they can be applied to patients. It is observed that, in the clinical environment, the kinetic-functional evaluation has evolved to an increasingly global approach, so that the tests used to quantify and qualify the mobility parameters and the view of linear cause and effect relationship have been losing importance since it differs from the primary concept of tensegrity relationships currently spread in the midst of manual therapy. What should matter is the presence or absence of movement restriction, since, in the tonic imbalance, the musculoskeletal and visceral structure has its mobility restricted and, consequently, dysfunctional. Perhaps the tests mentioned in this study are still used for a pedagogical approach in educational institutions to help construct clinical reasoning, but it is noticed that they are not very unfounded in the scientific literature.

Study limitations

Because there is no gold standard non-invasive tool to assess musculoskeletal and visceral dysfunctions in the pelvic region, in this study, we selected tests used in the clinical practice of physiotherapy offices, but with not as acceptable levels of validity, as reported in the reviews of related articles. However, the researchers' consensus, based on the professional evaluators' experience, was to gather a more significant number of related tests, which could change this statement and help in the choice of more appropriate manipulative techniques for women with stress urinary incontinence. The fact that there are various choice options in the reports may have resulted in less reproducibility of the results among the examiners.

CONCLUSION

This study's results support that the level of interrater agreement of musculoskeletal and visceral tests for the pelvic region in women with stress urinary incontinence was strong for the

Patrick Fabere test and reasonable in the evaluation of the type of abdomen.

Reproducibility was reasonable for the visceral and sacral mobility tests, and the psoas dystonia test by measuring the length of the upper limbs was negligible for the standing and seated flexion and Gillet and iliac mobility tests.

The present study does not support the clinical utility of these tests used alone or in combination. Thus, tests that allow more significant agreement and/or define criteria with less subjectivity and higher reproducibility must be developed.

Clinical relevance

- Standing and sitting trunk flexion tests, Gillet test, psoas test by measuring the length of the upper limbs, iliac and sacrum mobility tests, and bladder mobility assessment were used to evaluate the pelvic region in women with stress urinary incontinence.
- This study found that the inter-examiner reproducibility of these tests is negligible.
- Clinicians and researchers should consider using these procedures in their work routines.

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REFERENCES

Abrams, P., Cardozo, L., Wagg, A., & Wein, A. (Eds) (2017). Incontinence (6th Edition). Bristol UK: ICI-ICS, International Continence Society.

Almeida, L.C. (2006). *Reeducação postural e sensoperceptiva: fundamentos teóricos e práticos*. Rio Janeiro: Medbook.

Alves, J. O., Luz, S. T. da, Brandão, S., Luz, C. M. da, Jorge, R. N., & Roza, T. D. (2017). Urinary incontinence in physically active young women: prevalence and related factors. *International Journal of Sports Medicine, 38*(12), 937-941.

Araújo, M. P. de, Sartori, M. G. F., & Girão, M. J. B. C. (2017). Athletic Incontinence: Proposal of a New Term for a New Woman. *Revista Brasileira de Ginecologia e Obstetrícia, 39*, 441–442.

Basile, F., Petracca, M., & Scionti, R. (2017). Diagnostic reliability of osteopathic tests: a systematic review. *International Journal of Osteopathic Medicine, 25*, 21-29.

Castro, M. P., Stebbings, S. M., Milosavljevic, S., Pedersen, S. J., & Bussey, M. D. (2019). Assessing the construct validity of clinical tests to identify sacroiliac joint inflammation in patients with non-radiographic axial spondyloarthritis. *International Journal of Rheumatic Diseases, 22*, 1521-1528.

Chila, A.G. (2012). *Foundations of osteopathic medicine* (3rd ed.). FAAO.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum Associates.

Cohen, S. P., Chen, Y., & Neufeld, N. J. (2013) Sacroiliac joint pain: a comprehensive review of epidemiology, diagnosis and treatment *Expert Review of Neurotherapeutics, 13*(1), 99-116.

Consorti, G., Basile F., Pugliese, L., & Petracca, M. (2018). Interrater reliability of osteopathic sacral palpatory diagnostic tests among osteopathy students. *The Journal of the American Osteopathic Association, 118*(10), 637-644.

Cooperstein, R., Blum, C., & Cooperstein, E. C. (2015) Assessment of consistency between the arm-fossa test and Gillet test: a pilot study. *Journal of Chiropractic Medicine, 14*, 24–31.

Dasikan, Z., Ozturk, R., & Ozturk, A. (2020). Pelvic floor dysfunction symptoms and risk factors at the first year of postpartum women: a cross-sectional study. *Contemp Nurse, 27*, 1-24.

DiGiovanna, E. L., Schiowitz, S., & Dowling, D. J. (2005). *An osteopathic approach to diagnosis and treatment* (3rd ed). Lippincott Williams Wilkins.

Dreyfuss, P., Dreyer, S., Griffin, J., Hoffman, J., & Walsh, N. (1994). Positive sacroiliac screening tests in asymptomatic adults. *Spine, 19*(10), 1138-1143.

Egan, D., Cole, J., & Twomey, L. (1996). The standing forward flexion test: an inaccurate determinant of sacroiliac joint dysfunction. *Physiotherapy, 82*(4), 236-242.

Guillaud, A., Darbois, N., Monvoisin, R., & Pinsault, N. (2018). Reliability of diagnosis and clinical efficacy of visceral osteopathy: a systematic review. *BMC Complementary and Alternative Medicine, 18*(65), 2-12.

Hebgen, E. U. (2011). *Visceral Manipulation in Osteopathy*. Thieme.

Klerx, S. P., Pool, J. J. M., Coppieters, M. W., Mollema, E. J., & Pool-Goudzwaard, A. L. (2019). Clinimetric properties of sacroiliac joint mobility tests: a systematic review. *Musculoskeletal science*

and practice, (in press). https://doi.org/10.1016/j.msksp.2019.102090.

Kottner, J., Audig, L., Brorson, S., Donner, A., Gajewski, B. J., Hróbjartsson, A. R., Shoukri C. M., & Streiner D. L. (2011). Guidelines for reporting reliability and agreement studies (GRRAS) were proposed. *Journal of Clinical Epidemiology, 64*, 96-106.

Laslett, M. (2008). Evidence-based diagnosis and treatment of the painful sacroiliac joint. *Journal of Manual & Manipulative Therapy*, *16*(3), 142–152.

Lima, P.O.P., Melo, W. P.X., Bezerra, M. A., Almeida, G. P.L., Nunes, A. C. L., & Oliveira R. R. (2019). Intraexaminer and interexaminer reproducibility of the Downing test for sacroiliac joint evaluation of symptomatic and asymptomatic individuals. *Journal of Chiropractic Medicine*, (in press). https://doi.org/10.1016/j.jcm.2018.11.007

Lopez, D. (2017). Osteopathy for urologic and pelvic health. In Chughtai, B., Stein, A., & Espinosa, G. (Eds.). *Healing in Urology: clinical guidebook to herbal and alternative therapies (pp.* 209-221). New Jersey: World Scientific.

Lucas, N.P., Macaskill P., Irwig, L., & Bogduk N. (2010). The development of a quality appraisal tool for studies of diagnostic reliability (QAREL). *Journal of Clinical Epidemiology, 63*, 854-861.

Lucas, N., & Bogduk N. (2011). Diagnostic reliability in osteopathic medicine. *International Journal of Osteopathic Medicine, 14*, 43-47.

Magee, D. (2002). *Orthopedic Physical Assesment*. (6th ed). London: Elsevier.

McIntyre, C., Lathlean, J., & Esteves, J. (2018). Osteopathic clinical reasoning: An ethnographic study of perceptual diagnostic judgments, and metacognition. *International Journal of Osteopathic Medicine, 28*, 30-41.

Meijne, W., Neerbos, K. v., Aufdemkampe G., & Wurff, P. van der (1999). Intraexaminer and interexaminer reliability of the Gillet test. *Journal of Manipulative and Physiological Therapeutics, 22*(1), 4-9.

Mitchell, F. L., Moran, P. S., & Pruzzo, N. A. (1979). *An evaluation and treatment manual of osteopathic muscle energy procedures.* Valley Park, Missouri.

Pires, J. L. V. R., & Onofre, N. S. C. (2018). Fisioterapia no Puerpério remoto. In Baracho, E. (Ed.) *Fisioterapia aplicada à saúde da mulher* (pp.199-220). (6a ed). Rio de Janeiro: Guanabara Koogan.

Robinson, H. S., Brox, J. I., Robinson, R., Bjelland, E., Solem, S., & Telje, T. The reliability of selected motion- and pain provocation tests for the sacroiliac joint. *Manual Therapy, 12*(2007), 72–79.

Soleimanifar, M., Karimi, & Massoud, A. (2017). Association between composites of selected motion palpation and pain provocation tests for sacroiliac joint disorders. *Journal of Bodywork and Movement Therapies, 21*(2), 240-245.

Stone, C. A. (2007). *Visceral and Obstetric Osteopathy*. Elsevier.

Thomaz, R. P., Colla, C., Darski C., & Paiva, L. L. (2018). Influence of pelvic floor muscle fatigue on stress urinary incontinence: a systematic review. *International Urogynecology Journal, 29*(2), 197–204.

Vincent-Smith B. & Gibbons P. (1999). Inter-examiner and intra-examiner reliability of the standing flexion test. *Manual Therapy, 4*(2), 87-93.