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Research Article

The Influence of Hamstring Extensibility on a Clinical Test for Lumbar Spine Mobility (Schober)

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Abstract

Introduction: Low back pain is usually the result of dysfunctions and/or alterations in lumbar biomechanics. It is represented as a set of painful manifestations that can affect the lumbar, lumbosacral, and/or sacroiliac region, with the quadrant of discomfort being the region from the costal margin to the inferior gluteal fold, with or without complaints for the lower limb.

Objective: To determine if the hamstrings muscles can affect the interpretation of the analysis of two tests involving lumbar mobility (Schober and 3rd finger to the ground).

Methodology: A pilot study was conducted with 42 volunteer students studying at the Lusíada University Center where BMI, abdominal circumference, 90-90º flexometer, Schober test and 3rd finger to ground test were evaluated.

Results: 42 participants, when the variables were analyzed and correlated, all showed a weak inverse correlation or weak correlation, not being possible to confirm the proposal of the study.

Conclusion: Retraction of the hamstrings probably affects lumbar mobility, but the relations found were weak to corroborate such a statement, possibly because the population studied was young and healthy.

Keywords: Hamstring Muscles; Articular Range of Motion; Low-Back Pain; Physical Therapy Modalities

Introduction

Low back pain is usually the result of dysfunction and/or alterations in lumbar biomechanics. It is represented as a set of painful manifestations that can affect the lumbar, lumbosacral and/or sacroiliac region, with the quadrant of discomfort being the region from the costal margin to the inferior gluteal fold and may or may not have complaints for the lower limbs [1-4]. When the lower limbs are involved, the term sciatica is used, which can have a radicular origin, exemplified by the compression of nerve roots by disc protrusions or myofascial referred pain [5,6].

Low back pain can be classified based on the time of onset of symptoms as well as the cause. When time is taken into consideration, low back pain is acute if it has a sudden onset and lasts less than six weeks, subacute if it lasts six to twelve weeks, or chronic if it lasts longer than twelve weeks. The causes may be called specifics or nonspecific, the specific are due to the result of herniated discs, spondylolisthesis, vertebral fractures, tumors, infections or inflammatory diseases of the lumbar spine, while the nonspecific are those whose reason, anatomical or neurophysiological cause is not identifiable [7,8].

Currently, low back pain is a considerable public health problem, since it affects a large part of the population, generating leaves from their jobs and premature retirement due to disability. From this, it is estimated that approximately 80% of the population suffers from this type of pain and it is observed that acute pain occupies the lives of adults in about 15% - 30% of cases, but epidemiological studies show a prevalence of low back pain in children and adolescents reaching around 30%, which is probably linked to postural changes, muscle shortening, excessive load on the school bag and inadequate ergonomics to remain hours studying [8].

Low back pain can be correlated with muscle extensibility, considering that retraction may be the result of adaptation. Thus,

musculoskeletal adaptations can be considered one of the possible causes of low back pain [9,10]. The measurement of range of motion (ROM) is important for physiotherapeutic evaluation because it assesses joint limitations and allows monitoring of therapeutic interventions in the rehabilitation process. For the evaluation to be effective, reliable instruments should be used, preferably non-invasive and with high reliability for an effective evaluation [11].

Aim of the Study

This study aimed to determine if the hamstring muscles can affect the interpretation of the analysis of two tests involving lumbar mobility (Schober and 3rd finger to the ground).

Materials and Methods

The study was conducted with 42 volunteer students at the Lusíada University Center, evaluating the effectiveness of the application of the Schober test and the 3rd finger to the ground test in relation to hamstring extensibility. The research was submitted and approved by the Ethics Committee of the Lusíada University Center under the CAAE number: 89756218.5.0000.5436 (Appendix A). Soon after, the participants were explained the objective and proposal of the study and given the free and informed consent form.

Initially some anthropometric information was collected to determine whether they influenced the values of the tests applied, and firstly weight and height values were obtained and, consequently, the BMI was calculated. The average obtained in this study was 25.02 kg/m^2, characterizing a pattern of overweight people.

Subsequently, abdominal circumference measurements were collected to determine its influence on the tests. To perform the measurement, the anterosuperior iliac spines were initially looked for, then it was measured two fingers above them, obtaining the measure close to the umbilical scar, then, with a measuring tape, the abdominal circumference was measured, determining its total value. It was considered normal values for men from 94 to 102 cm and for women from 80 to 88 cm. In the study the average found was 84.18 cm, concluding that the research population was within normal parameters.

After the anthropometric values were measured, the range of motion of the knee was measured to determine the hamstring extensibility with a flexometer. The subject remained in dorsal decubitus position on a stretcher, with the knee and hip flexed at 90°, the flexometer was positioned on the lateral malleolus of the lower limb being analyzed and asked to perform the movement of knee extension, thus assessing the range and it was considered a normal person who reached values equal to or greater than 140° (Figure 1).

Figure 1: Assessment of ischiotibial extensibility using a flexometer with knee range of motion analysis.

After this, the Schober test was performed, which consists of extending the tape measure along the spine between the lumbosacral joint (L5-S1 transition), and directing it 10 cm above this location, i.e. ascending the lumbar region. Then the patient performed maximum trunk flexion, directing his hands to the ground. The examiner measured again the distance between the two initial points (L5-S1 to the point that had been marked 10 cm); if this variation value was less than 5 cm, that is, less than 15 cm in total, the test was considered positive for lumbar hypomobility (Figure 2). If the value exceeded 15 cm, it was characterized as normal site motion. Although questioned in the literature, this test has a high reliability [12].

Figure 2: Demonstration of the evaluation was performed by the Schober test, with markings and tape measure positioning.

Finally, the 3rd finger to the ground test was performed to quantify the distance from the ground. The patient was asked to flex the trunk trying to reach the ground without bending the knees as much as possible. Using a tape measure, the evaluator measured

the distance left for the 3rd finger to reach the ground, considering a normal measurement, the distance less than or equal to 10 cm and an altered distance those greater than 10 cm (Figure 3).

Figure 3: Representation of the 3rd finger reach test.

The data were presented as mean and standard deviation, and Pearson's Correlation analysis was performed, always with a 5% significance level.

Results and Discussion

The present study was conducted with 42 students from a university in Santos, SP, Brazil, none of the participants had a history of any musculoskeletal impairment and all signed the free and informed consent form. The research was composed of 33 (78.57%) females and 9 (21.43%) males (Table 1).

	Mean ± Standard deviation
Age (years)	21,26 ± 2,51
Mass (Kg)	68,31 ± 15,32
Heigh (cm)	164,52 ± 9,38
BMI	25,02 ± 4,87
Abdominal Circumference	84,18 ± 10,93

Table 1: Sample characterization.

The Schober and Fleximeter variables, within the normality standard, it was possible to see an inversely weak correlation (r = -0.2843), showing that the higher the Schober value, the lower the value seen in the flexometer (Figure 4a), concluding that a compensation occurred in the lumbar spine, due to retraction of the hamstrings. Next, the relationship between the altered Schober and Fleximeter variables was analyzed. When related, a weak inverse correlation was found (r = -0.0923), telling us that the higher the Schober value the lower the Fleximeter value (Figure 4b), again concluding that a compensation of the lumbar spine occurred due to the influence of the restriction of the hamstring muscles.

Figure 4: Relationship between fleximeter and Schober test data for individuals within both the normal (A) and altered (B) ranges. Reference Standard of Normality: Schober test = ≥ 15 cm Normal/< 15 cm altered; Fleximeter = ≥ 140 cm Normal/< 140 cm Altered.

When correlating the variables Abdominal Circumference and Schober (Figure 5), a weak relationship was found (r = 0.1183), showing that the abdominal circumference, in this case, did not influence the schober test. That is, they did not have considerable abdominal protrusion in this case.

Figure 5: Relationship between Schober's test and abdominal circumference.

Later, the variables, distance from the 3rd finger to the ground (total) and fleximeter (Figure 6) were analyzed. When correlated, it was possible to see a moderate inverse relationship (r = - 0.5921), determining that the greater the distance of the 3rd finger to the ground, the lower the value of the flexometer, i.e. the lower the flexibility of the hamstrings, the farther the participants were from the ground.

Then the variables of Distance of the 3rd finger from the ground (total) and Schober were analyzed, when compared, they showed a weak inverse relationship (r = -0.3716), finding that the greater the

Figure 6: Relationship between flexometer and 3rd finger distance.

distance from the ground, the lower the Schober value, that is, the lower the lumbar mobility, the farther the participants were from the ground (Figure 7).

Figure 7: Relationship between Schober's test and the distance of the 3rd finger.

Finally, the variables abdominal circumference and distance from the 3rd toe were checked, and a weak relationship (r = 0.1567) was found between the variables, showing that the greater the abdominal circumference, the greater the distance from the 3rd toe to the ground (Figure 8).

Based on the origin, insertion, and influence of the hamstrings on the pelvis and consequently on the lumbar spine, hypothetically, the decrease in extensibility of such muscles would also affect lumbar mobility. However, either because of compensations or because the changes found were not drastic, the relationships analyzed were weak to determine that this muscle group compromises lumbar mobility, at least when considering the individuals evaluated. The posterior muscle chain, more specifically the hamstrings, tends to shorten due to a sedentary lifestyle and to postures maintained for long periods, such as sitting. Changes in flexibility interfere with joint ROM, affecting load distribution (gravitational and ground reaction loads), culminating in myalgia and degenerative conditions [13].

Figure 8: Relationship between the 3rd finger distance test and abdominal circumference.

In the present research, one of the variables analyzed was whether the abdominal circumference influenced the distance reached from the 3rd finger to the ground, demonstrating a weak relationship when correlated, information that corroborates the study of Ferreira., *et al*. [14] who, when verifying whether the abdominal circumference altered the flexibility of adolescents aged 14 to 18 years, also found a weak correlation between the variables, as in the present study. The relationship between these two measures does not seem to be influenced by each other in the age group analyzed. However, it should be noted that the participants in both surveys did not have high abdominal circumference on average.

When analyzing the abdominal circumference and Schober test variables, a weak relationship was found when correlated, reinforcing the findings in the study by Zambon., *et al*. [15] who, when performing a comparative analysis of the flexibility of active and nonactive elderly women, comparing the flexibility of those who practiced hydrogymnastics and combined exercises with the elderly who did not practice any physical activity, concluded that waist circumference does not influence the analysis of the Schober test.

As for the variables of 3rd finger to the ground and flexometer, in the present study, a moderate inverse relationship was found; however, in the study by Santos, Pires, Vieira [16] when conducting a research and evaluating the posterior chain flexibility of young university students through the 3rd finger to the ground test and the use of the flexometer, saw that 40% of the participants had shortening of the posterior chain when the two tests were performed, just like the present study, because when the 3rd finger to the ground test was performed, they saw that the farther the finger was from the ground, the lower the value on the flexometer was, demonstrating muscle shortening.

When correlating the flexometer and Schober test variables, both altered and normal values, a weak inverse correlation was found, as in the study of Sassi [17] that when analyzing which method was better for lumbar mobility gain between pilates or isostreching stretching, also did not find a significance of mobility gain when using the same methods for evaluation of the present study.

Analyzing the variables distance from the 3rd finger to the ground (total) and Schober's test, in the present study there was a weak inverse relationship, demonstrating that the lower the lumbar mobility, the farther the participants were from the ground, unlike the study by Mello [18] who, when performing a comparative analysis of spinal flexibility in physical therapy and physical education students through Schober's test, 3rd finger to the ground, and the stibor index, found no significant difference in mobility among the students. The present study also differs from the findings of Jorge and collaborators, 2008, who, when checking whether acupuncture would influence pain improvement and functional gains in patients with ankylosing spondylitis, also found no significant difference in the improvement of the Schober test and 3rd finger to the ground.

The considerations made refer to a population of young adults, without pain, with good hamstring flexibility and lumbar mobility in the majority. Affecting the expansion of these findings to patients who seek physical therapy; however, the methodology of this study could be explored in other groups. Despite this limitation of the individuals analyzed and the weak relationships found, this is considered a pilot for future proposals. Therefore, it is indicated that further studies should be conducted with participants at older ages and with a less healthy lifestyle.

Conclusion

The shortening of the hamstrings probably affects lumbar mobility, but the relationships found in this study were weak to corroborate such a statement, possibly because the population studied was young and healthy.

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Conflict of Interest

None.

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