



# The effects of the exercises of segmental stabilization in low back pain

## Os efeitos dos exercícios de estabilização segmentar na lombalgia

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### ABSTRACT

**Background:** Low back pain is responsible for a large part of painful disorders in clinical practice, causing limitations in physical activities and professionals. Physical Therapy has directed its techniques in the prevention and relief of symptoms of this disease of the spine, making use of exercises, like the segmental stabilization. **Objective:** To verify the effects of exercises of segmental stabilization in low back pain. **Method:** It was an experimental study of longitudinal quantitative approach with sample of 10 participants with complaint of low back pain. The participants were randomly divided into control and experimental group and after they were assessed through of sheets containing data of identification and the variables (pain, flexibility and balance). The experimental group was treated during six weeks with segmental stabilization and, at the end of the last session, all participants were reassessed. The data were organized in Microsoft Office Excel program, submitted to Student's T test with significance at  $p < 0.05$  for analysis in the statistical program Graph Pad Prism 5.0. **Results:** There was significant improvement in low back pain of the participants after the interventions, but in relation to other variables of the study were obtained only a numerical gain in absolute terms, although not significantly. **Conclusion:** The segmental stabilization provided significant effects on low back pain, indicating that this technique can be used by Physiotherapist in their conducts, however, it is suggested new researches with larger sample in order to obtain better in relation to other variables.

**Keywords:** Low back pain; Exercise therapy; Physical Therapy.

### RESUMO

**Introdução:** A lombalgia é responsável por grande parte dos distúrbios dolorosos na prática clínica, acarretando limitações das atividades físicas e profissionais. A Fisioterapia tem direcionado suas técnicas ao alívio da sintomatologia e prevenção dessa afecção da coluna, se utilizando de exercícios, dentre eles, os de estabilização segmentar. **Objetivo:** Verificar os efeitos dos exercícios de estabilização segmentar na lombalgia. **Método:** Tratou-se de um estudo experimental longitudinal de abordagem quantitativa com amostra de 10 participantes com queixa de dor lombar. Os participantes foram divididos aleatoriamente em grupo controle e experimental, posteriormente foram avaliados por meio de fichas contendo dados da identificação e das variáveis do estudo (dor, flexibilidade e equilíbrio). O grupo experimental foi tratado durante seis semanas por meio da estabilização segmentar e, ao final da última sessão, todos os participantes foram reavaliados. Os dados foram organizados no programa Microsoft Office Excel, submetidos ao teste T de Student com significância em  $p < 0,05$  para posterior análise no programa estatístico Graph Pad Prism 5.0. **Resultados:** Houve melhora significativa na dor lombar dos participantes após as intervenções, já em relação às outras variáveis da pesquisa foram obtidos apenas um ganho numérico nos valores absolutos, embora não tenham sido de forma significante. **Conclusão:** A estabilização segmentar proporcionou efeitos significativos na dor lombar, mostrando que essa técnica pode ser utilizada pelo Fisioterapeuta em suas condutas, no entanto, sugere-se a realização de novas pesquisas com amostra maior a fim de se obter melhores resultados em relação às outras variáveis.

**Palavras-chave:** Lombalgia; Terapia por exercício; Fisioterapia.

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## INTRODUCTION

Low back pain is defined as a painful picture in the lower region of the spine and can only involve the lumbar region, lumbosacral or to the sacroiliac. It is usually related with disorders in the lumbar vertebrae and soft tissue structures such as muscles, ligaments, nerves and intervertebral discs, and common in different age groups of both sexes, affecting them in any part of life, bringing functional damage to them.<sup>(1,2)</sup>

Back pain have multiple etiologies, where the most common are stress, physical overload generated by obesity and impacting activities, poor posture, among others. Usually patients feel discomfort frame and muscle fatigue in the lower region of the spine, and one of the possible causes for the appearance thereof may be lumbar instability, which is through weakness and fatigue of the stabilizing muscles of the spine, namely responsible for upright posture of the individual.<sup>(3-5)</sup>

Physical therapy aims at the development of strategies directed to the low back pain so as to provide relief of symptoms and prevention of new seizures, through their therapeutic resources in order to guarantee well-being of the population and therefore a better quality of life. In most of the time, are able to secure a significant improvement to the patient's painful condition, flexibility and strength of postural muscles, as well as reduced muscle tension, improved balance and promotion of functionality.<sup>(6,7)</sup>

In the last twenty years there has been a substantial growth in the use of exercise to treat low back pain, with a focus on direct them to the stability segment of the spine, which is characterized by isometrics, low intensity and timing of the deep trunk muscles. This method, known as lumbar segmental stabilization, aims to strengthen the deep muscles of the trunk, especially the lumbar multifidus (ML), transversus abdominis (TrA) and transversus of pelvic floor, improving neuromuscular control and thus stabilize the spine, protecting it from excessive wear.<sup>(8,9)</sup>

The popularity of segmental stabilization is associated with its exercise do not suggest a static position the patient, but on the contrary, they have a range of motion in which hypermobility is controlled due to mobility exercises for rigid or low mobility segments, strengthening exercises for the shortened range of motion of the highly mobile segments, postural training to allow movement through a controlled range of motion and patient education.<sup>(10)</sup>

This research aimed to determine the effects of segmental stabilization exercises in low back pain and, more specifically, to measure the intensity of pain, to verify the flexibility of the lumbar spine and to assess the body balance of research participants.

## METHODS

The research was initiated after submission and approval by the Ethics and Research Committee of the Faculdade Integral Diferencial-FACID/DEVRY (protocolo CAAE n°26517313.4.0000.5211, parecer 522.850). Data were

collected after the local declaration of release of the research and by signing the Informed Consent (IC) by research participants.

The study was designed as an experimental, longitudinal nature with quantitative approach. The data collection course was a school clinic of a private higher education institution in the city of Teresina-PI, due to the physical structure be sufficient to carry out the work.

The sample consisted of 10 participants, divided into two groups at random, as follows:

- Control Group (CG): made up of five members;
- Segmental Stabilization Group (SSG): made up of five participants.

Inclusion criteria were female subjects, sedentary and who sought treatment complaining of back pain, aged between 20 and 50 years. Exclusion criteria were the presence of acute low back pain, pain radiating to the lower limbs, vestibular changes, cognitive, previous lumbar surgery, cancer and those who were performing another treatment for low back pain.

Data collection was conducted from February to November 2014. Initially, participants were evaluated through a form developed by the researchers to record the medical history of the participant and the study variables (pain, balance and flexibility). At the end of last call, after six weeks, a reassessment of the same participants took place.

The record of the pain was done by visual analogue scale (VAS) in which the participant rated their pain, from zero to 10, where zero corresponds no pain and 10 excruciating pain.

To assess the flexibility of the spine was requested from the participant realization of the 3rd finger to test soil, where the participant was the anterior trunk flexion is not permitted bending the knees, then it was measured by a tape measure in centimeters the distance from the tip of the 3rd finger (predetermined right hand) to the ground.

Later it was performed Schober test, where the participant was standing, and with your feet together. Then with a pencil dermatographic traced a line between the two posterior superior iliac spines and the other 10 cm above the column. Subsequently, the participant was asked to do the anterior trunk flexion, so it was measured the distance of the points scored, with those participants without mobility changes should increase at least five centimeters, as smaller increases than this amount indicated positive test for alteration of flexibility in the region.

On balance assessment was conducted the examination stabilometry with a Baropodometer S-Plate of Medicapteurs® brand platform with 610 mm wide, 580 mm deep, 4 mm thick, weighing 6.5 kg and area equipped with 1600 piezoelectric sensors pressure (48x48), with 150 frames per second frequency acquisition.

The parameters analyzed were the average amplitude of pressure center (PC) displacement at lateral-lateral plan (AMX)



and anterior-posterior plan (AMY). The examinations were performed in a quiet room where the platform was positioned on the ground, one meter away from the wall. The participant was instructed to stay in standing position for 30 seconds with standardized base opening at 30° in the forefoot region and the heel with four feet away. Each individual stood with head erect, eyes open, arms relaxed at your sides on the platform, bare, his mouth with a relaxed bite with the dental arches supported only, with no contraction.<sup>(11)</sup>

A treatment protocol was performed<sup>(12)</sup> consisted of five progressive stages exercises for six weeks at a frequency of twice a week, where participants carried out the isometric contraction of the transversus abdominis and multifidus, and the contraction of the muscles pelvic floor, following the therapist's guidance, "pull the air - release - and closing the ribs"; "pull your tummy in and hold"; "do as if to hold urine."

Each exercise was performed 12 times, holding the contraction for 10 seconds, and the participants were instructed to report any complaints related to the exercises as well as targeted at achieving the same at home. The following exercises were performed:

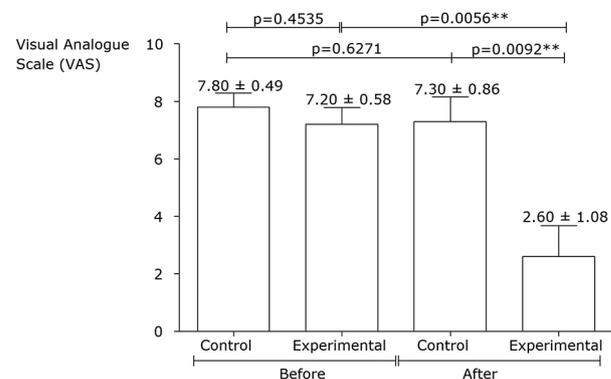
- Step 1 (1 st week): no charge, static, off-balance/disturbance:
  - Supine with knees flexed in adduction, the transverse abdominal muscle activation.
  - In prone, legs straight and arms along the body, activation of the multifidus muscle.
- Step 2 (2nd week): no charge, with movement without balance/disturbance:
  - Supine, knees bent, moves with the lower limb (heel slip).
  - Supine, alternating movements of the limbs, unilateral lifting of the upper limb and lower limb flexion (hip) contralateral (dead bug).
- Step 3 (3rd week): no charge, with movement, with balance/disturbance:
  - Bridge, with your feet flat on the floor and knees bent, lift your pelvis while maintaining the contraction of the deep trunk muscles.
  - Cat position (4 supports) with alternating movements of the upper limb diagonal (flexion) and lower (extension) contralateral.
- Step 4 (4th week): load without movement without balance/disturbance:
  - Sitting, performs pelvic bearing (cram the glutes without the chest) and contraction of the deep trunk muscles.
  - Standing static, performs the contraction of the transversus abdominis and multifidus.

- Step 5 (5th and 6th week): core training - intense workouts activating all the muscles of the spine.
  - Unilateral bridge: Pelvis elevation associated with lifting one leg that is held in extension while maintaining the contraction of the transversus abdominis and multifidus.
  - Side bridge: in the lateral position, performs side elevation of the pelvis to support the feet and elbow, holding the contraction of the transversus abdominis and multifidus.
  - Board: prone, performs elevation of the pelvis to support the feet and elbow, holding the contraction of the transversus abdominis and multifidus.
  - Data were organized in spreadsheets in Microsoft Office Excel 2010 program, submitted to the Student's t test with a 95% confidence interval and significance at  $p < 0.05$  and were subsequently analyzed using the statistical program Graph Pad Prism 5.0.

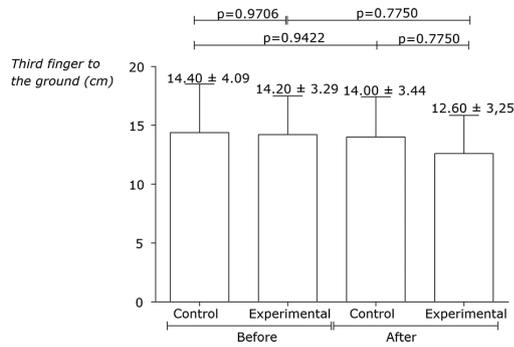
## RESULTS

The data collected and analyzed in this research came from the reviews and revaluations where the sample consisted of 10 participants were female with a mean age of  $27.50 \pm 3.29$  in the control group and  $28.17 \pm 3.90$  in experimental, and a body mass index value (BMI) of  $22.72 \pm 1.29$  in control and  $22.06 \pm 0.96$  in experimental, showing that the groups were homogeneous, with no interference by the age difference and BMI in the study. It is noteworthy that none of the participants reported damage during the search.

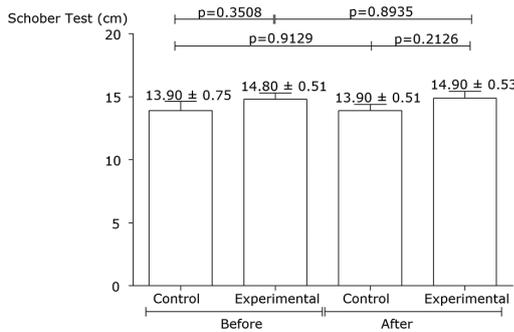
In the pain analysis showed a significant difference ( $p = 0.0056^{**}$ ) before and after the treatment compared to the experimental group, significance seen in the comparison between control and experimental group after six weeks of treatment, where was not observed in control improves, which is due to not having received no intervention, while the experimental pain levels decreased significantly ( $p = 0.0092^{**}$ ), showing that the stabilizing segment was effective in reducing back pain (Figure 1).



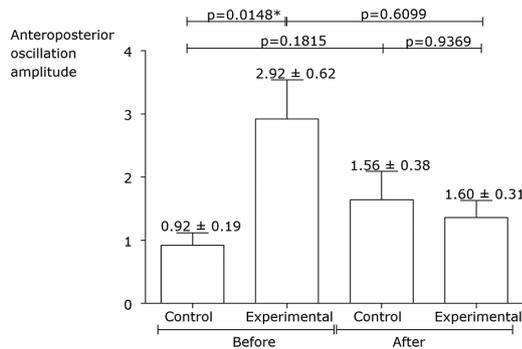
**Figure 1.** Assessment of pain by the visual analogue scale (VAS) before and after treatment. Subtitle: Values expressed as mean  $\pm$  standard deviation;  $^{**}$  significant at  $p < 0.05$ . Source: Original data.



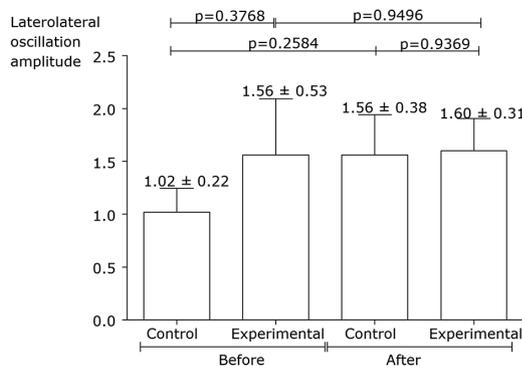
**Figure 2.** Third finger to the ground test (cm) before and after treatment. Subtitle: Values presented as mean ± standard deviation. Source: Original data.



**Figure 3.** Evaluation test Schober, before and after treatment. Subtitle: Values presented as mean ± standard deviation. Source: Original data.



**Figure 4.** Evaluation of the anteroposterior oscillation amplitude before and after treatment. Subtitle: values presented as mean ± standard deviation. Source: Original data.



**Figure 5.** Evaluation of the laterolateral oscillation amplitude, before and after treatment. Subtitle: values presented as mean ± standard deviation. Source: Original data.

For flexibility in the assessment of the third finger to the ground test, the participants did not improve significantly in spite of the absolute numerical gains by comparing the before and after each group, a fact confirmed in the lumbar mobility by Schober test, which even with the improvement obtained with the exercises, did not reach the desired level of significance, showing little effect of this technique in the gain of the lumbar spine flexibility in this study (Figure 2, Figure 3).

In the analysis of body balance of participants by levels of postural sway, both before and after, when comparing the two groups, there was no statistical significance in the anterior-posterior and lateral-lateral direction, showing that the stabilization protocol target for this search. It was not sufficient to improve the stability of participants (Figure 4, Figure 5).

### DISCUSSION

The results showed that after six weeks of segmental stabilization exercises, involving the contraction of the deep trunk muscles, transversus abdominis and multifidus, there was improvement in low back pain in the participants. This occurred even individuals not presenting the initial assessment the maximum level of pain, but it could be observed significant difference between pre and post-intervention.

These results are in agreement with other studies in which it was demonstrated that segmental stabilization exercises compared to no intervention or different to this intervention, have been effective in reducing low back pain of short and long term.<sup>(13,14)</sup>

In a recent study<sup>(12)</sup> were obtained positive results in back pain, where a six-week program was carried out using the segmental stabilization in the frequency of twice weekly in 12 young adult participants of the course of Physical Therapy, Fisioterapia da Universidade Estadual do Centro-Oeste (Unicentro) who had chronic nonspecific low back pain, observing significant improvement of pain, similar to the results of this study, which also achieved statistical significance in reducing the pain of the participants, using similar protocol.

In another study<sup>(15)</sup> was carried out stabilization exercise program segment for six weeks through three stages in 59 participants of both genders with chronic back pain were divided into control and experimental group, where we observed significant differences in reduction in pain ( $p = 0.0071$ ), when comparing the experimental group before and after the intervention, proven through pain questionnaires before and after treatment, similar to the findings of this study, with five progressive stages of exercises in a group more homogeneous, addressing only women, was obtained even better significance ( $p = 0.0056$ ).

It was reported in another study<sup>(16)</sup> an improvement in pain and functional performance, proven by a pain questionnaire before and after treatment with 12 sessions on the basis of



a lumbar-pelvic stabilization exercise program in 29 patients with chronic nonspecific low back pain divided into control and experimental group. These results show, as in this study, it is possible to reduce lower back pain in patients with chronic low back frame in a relatively short period of intervention.

At one study<sup>(17)</sup> evaluated the effects of stretching exercises and strengthening of the anterior and posterior chain muscles for three months at a frequency of twice a week, on the flexibility of the posterior chain (at the 3rd finger to the ground) and lumbar mobility (by Schober test) in 19 participants of both genders with chronic low back pain for 3 months and at the end of the study demonstrated a significant improvement in flexibility of the posterior muscle chain and lumbar mobility, unlike the findings of this research, that can be explained to the treatment of this study have not been fully geared to flexibility gain, but still there were absolute numerical gains comparing the pre and post intervention.

Another study<sup>(18)</sup> involving 70 participants, divided into control and experimental group, aimed to evaluate the effectiveness of the "Back School", a postural training method used for prevention and treatment of low back pain patients, consisting of theoretical information educational, containing practice of therapeutic exercises for the spine. After 16 weeks of intervention, the experimental group had significant improvement ( $p < 0.05$ ) of the lumbar mobility proven by Schober test, different from the results of this study, after six weeks of segmental stabilization exercises was not able to increase lumbar mobility, using the same test, but it is noteworthy that treatment protocols were different.

In a recent study<sup>(19)</sup> verified the efficiency of segmental stabilization of the oscillation of the body center of gravity by 25 participants from both genders with low back pain, using a protocol of just one day exercises, with 3 repetitions for each exercise, for then the participants were reassessed. At the end, it was concluded that this technique is not effective for promoting change of body sway of the center of gravity in anteroposterior and lateral axes significantly, which was similar to the findings of this study, that even with a longer intervention also did not achieve significance as the body oscillations.

The authors of another study<sup>(20)</sup> evaluated through the body oscillations of a force platform in three participants with lumbar dysfunction before and after a stabilization target protocol associated with muscular isometry techniques and postural held for 5 weeks in frequency of 2 times a week, totaling 10 sessions. At the end of the study was achieved statistical significance ( $p < 0.05$ ) in body sway in the anterior-posterior direction, a fact that distinguishes the present study due to the use of more techniques in the participants, different from this study, that only with the technique stabilizing segment has not been able to achieve statistical significance in any of the examined directions.

## CONCLUSION

The results presented in this study showed positive effects of segmental stabilization in low back pain, where statistical significance, showing that this technique can be used as another way to help the physiotherapist in their behavior to lessen the pain of their patients.

It is noteworthy that not all results were statistically significant, even with the improvement in absolute values in the other study variables. Therefore, it is suggested to conduct further research with larger numbers of sample and techniques in order to obtain better results compared to other variables.

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## AUTHORS CONTRIBUTION

LPFB carried out the study of the effects of segmental stabilization in the participants, was responsible for the implementation of the research methodology, participated in the statistical analysis and drafted the manuscript. LFBPS attended the orientation and implementation of stabilization techniques segment, took part in the study design, assisted in the statistical analysis and assisted in drafting the manuscript. RCS participated in drafting the study, participated in the design of the study and helped draft the manuscript. LKBLM carried out the study of the effects of segmental stabilization in the participants, participated in the study design, coordinated and prepared the same and helped draft the manuscript. AFMC participated in the study design and helped in the development and coordination of research.

## COMPETING INTERESTS

The authors declare no conflicts of interest.

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