



Effects of strength training program in the treatment of chronic non-specific low back pain

Efeitos do programa do treinamento de força no tratamento da lombalgia crônica inespecífica

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ABSTRACT

Low back pain is defined as any pain that occurs between the last costal arch and the lower gluteal fold, and may contain different intensities and durations, being considered chronic if it lasts for more than 12 weeks, becoming nonspecific if its cause is not identified, compromising the quality of life of affected individuals. Currently, Strength Training (RT) has been included in the treatment of chronic non-specific low back pain to improve the condition of people suffering from this condition. Thus, the objective of this research was to verify the impact of SSD in the treatment of low back pain, pointing out the main aspects from the inclusion of this practice in daily life, showing the benefits arising from this method. For the present study, a review of scientific articles was carried out using the *PubMed*, *Scielo* and *Google Scholar* databases to complement the information on low back pain and SSD. Several evidences were found that contribute positively to the improvement of low back pain with the use of SSD in pain conditions, increase in functional capacity, improvement in activities of daily living (ADL), gain in muscular endurance, strength and hypertrophy, in addition to individuals being more active. It is concluded that SSD has been shown to be effective in the treatment of chronic nonspecific low back pain, improving its symptoms such as pain, disabilities, however, if applied by an unqualified professional and in an erroneous way, it can be harmful to health.

Keywords: Strength training, Low back pain, Treatment, Quality of life.

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INTRODUCTION

Low back pain is characterized as all pain that is originally found in the region starting in the last costal arch to the lower gluteal fold (BARROS and SILVA, 2019). According to Pennone (2017), this is a worldwide condition that affects about 80% of adults, with a high chance of leading them to leave work. According to Barros *et al.* (2022), low back pain is the second most common reason for medical consultations, thus increasing the number of surgeries performed in the lumbar region, and it is worth noting that about 15% to 40% of patients who underwent spinal arthrodesis will not have a good improvement in functional capacity.

According to Almeida and Kraychete (2017), the most common causes of low back pain are divided into five main groups, being mechanical, neurogenic, non-mechanical, visceral pain, and others. Cordeiro *et al.* (2020) points out that some structures when affected tend to trigger low back pain, such as stabilizing muscles, intervertebral discs, sacroiliac joints, fascia, facet joints, vertebrae, meninges and nerves, and dysfunctions such as herniated discs, myofascial syndrome, osteoarthritis, rheumatoid arthritis, tumors, ankylosing spondylitis and infections.

In the last decade, physical exercise has been shown to be one of the most effective and most used alternatives for the treatment of low back pain (SILVA *et al.*, 2022). This practice has shown an improvement in the fight against several diseases such as diabetes, hypertension, obesity and others, thus, strength exercises, such as deadlifts, have shown significant improvement in relation to low back pain in men and women (RABELO and SOUZA, 2021).

A study by Silva *et al.*, (2021) showed that physical exercises improve the treatment of low back pain, in addition to helping prevent it, improving the individual's functional status, which is the main non-pharmacological treatment tool for low back pain, favoring people's quality of life.

Physical exercises for low back pain can be performed individually or by a group of people under the care of a Physical Education professional, especially exercises aimed at muscle strengthening, especially the transversus abdominis, multifidus, abdomen and trunk muscles, varying in intensity, volume, frequency and duration (RAMOS *et al.*, 2017).

Therefore, a popular method of exercise, the TF is intended to improve the physical capacity for the conditioning of athletes. It is defined by the performance of movement through the body muscles against some opposing force, which can be performed through equipment, free weights, elastic straps, body weight, plyometrics and running on slopes (FLECK and KRAEMER, 2017). Together with TF or resistance training, in which the practitioner tries to



move or moves against external resistance seeking to increase strength, it is directly related to muscle strengthening, size, and endurance aimed at improving health (UNSER, 2022).

According to Silva *et al.* (2021) the practice of ET has shown an improvement in low back pain, due to the abdominal strengthening that protects the lumbar region, with a decrease in pain providing a good functional status. Andrade and Gardenghi (2017) add that ET has been shown to be an alternative for patients with non-surgical cases of herniated discs, where the pathology is mild to moderate, thus also being a great option for injury prevention.

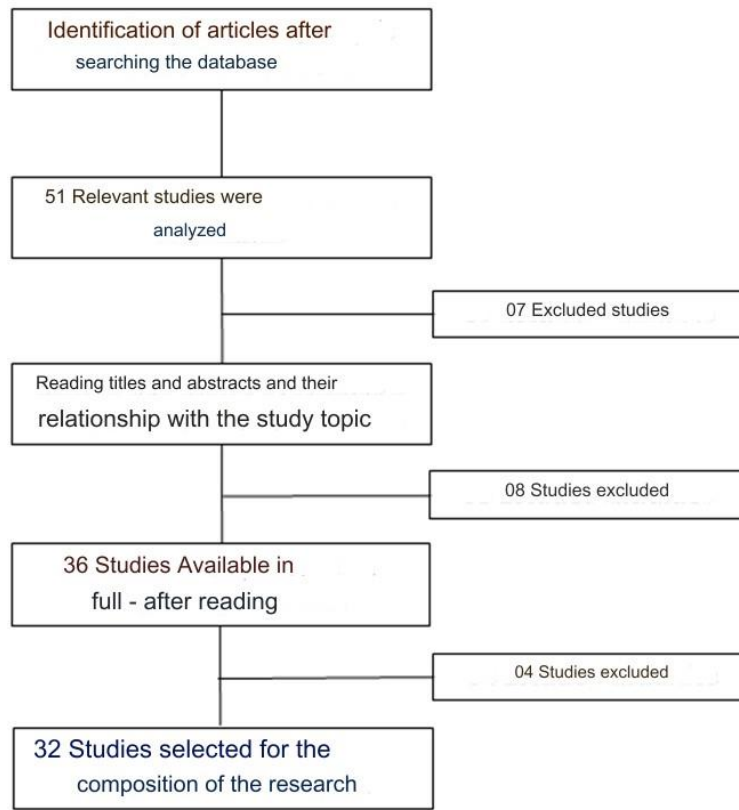
Thus, the objective of this study was to verify the effectiveness of SSD in the non-pharmacological treatment of individuals with chronic nonspecific low back pain, conceptualizing and addressing chronic nonspecific low back pain, which can contribute as an efficient and safe alternative in the intervention of this pathology.

METHODOLOGICAL PROCEDURES

For the composition of this review, a bibliographic survey was carried out in the databases Scielo, PubMed and specialized scientific journals indexed in Google Scholar with the selection of scientific articles published between 2011 and 2023, using as descriptors alone or in combination: Strength training, Low back pain, Treatment, Quality of life.

Three stages were used to select the material. The first was characterized by the research of the material, which comprised between the months of February and October 2023, with the selection of 51 works. The second included the reading of the titles and abstracts of the papers, aiming at a greater approximation and knowledge, excluding those that had no relation and relevance to the theme. After this selection, we searched for the texts that were available in full, totaling 32 studies, which were included in the review Figure 1.

Figure 1. Flowchart related to the selection stages of the articles used in the research



The articles selected and included in the research consisted of original articles, reviews and systematic reviews of the literature. As eligibility and inclusion criteria for the selected articles, we analyzed the origin of the journal and indexing, studies that presented data related to strength training and nonspecific chronic low back pain. In the reading and evaluation, the articles that met the eligibility criteria were selected and included in the research by consensus.

RESULTS

CHRONIC NONSPECIFIC LOW BACK PAIN

Low back pain is characterized by all pain that is originally found in the region starting in the last costal arch up to the lower gluteal fold, and may or may not be identified with the structure that causes it, and there may be different durations and intensities (OLIVEIRA, KANAS and WAJCHENBERG, 2021). According to Ribeiro, Martins, and Perez (2019), this pain can be defined as acute, subacute, and chronic. It is acute if it lasts for up to 6 weeks, subacute with a duration of 6 to 12 weeks, and chronic from 12 weeks (MARQUES, 2022).

According to Passos and Junior (2021), low back pain in which its anatomical or neurophysiological cause is not identified is called nonspecific, and this group represents 90% to 95% of cases (CARGNIN *et al.*, 2019). According to Almeida and Kraychete (2017), although there are no defined causes, the most common diagnoses are related to the musculoskeletal system, such as weakness of the abdominal muscles, asymmetry of lumbar joint facets, wear and tear, and excessive lordosis.

According to Cordeiro *et al.* (2020), low back pain is related to the intense practice of daily activities, pathological conditions, loss of range and coordination of movements, lack of trunk stability, and genetic cause. And according to Ferreira, Barbosa and Kerppers (2018), the cause of low back pain can vary between age, the work function that the individual performs, psychological, biological, cognitive and mechanical factors. The main causes of low back pain are divided into 5 groups, as detailed in Table 1.

Table 1: Main causes of low back pain

Mechanics (80-90%)	<ul style="list-style-type: none"> • Unknown cause – Muscle strain or ligament injury (65-70%) • Disc degeneration or joint disease • Congenital deformity (postural dysfunctions) • Spondylosis • Instability
Neurogenic (5-15%)	<ul style="list-style-type: none"> • Disc Hardware • Osteophytic nerve root injury • Annular fissure with chemical irritation of the nerve root • Syndrome due to surgical failure of the spine (e.g. recurrent hernia)
Non-mechanical conditions (1-2%)	<ul style="list-style-type: none"> • Neoplasm • Infections • Inflammatory arthritis • Paget's Disease • Other (Scheuermann's disease)
Referred visceral pain (1-2%)	<ul style="list-style-type: none"> • Gastrointestinal disease (intestinal inflammations, pancreatitis) • Kidney diseases • Abdominal aortic aneurysm
Other (2-4%)	<ul style="list-style-type: none"> • Fibromyalgia • Somatoform disorder

Source: Almeida and Kraychete, (2017)

Low back pain is a more common dysfunction in adults and about 80% of this population will suffer from some episode of low back pain in their lives (ALMEIDA and KRAYCHETE, 2017). According to Silva, Guilherme and Oliveira (2020), at the moment we associate it with work, the occurrence of low back pain varies between 30% and 60%, significantly affecting the quality of life and well-being of employees, since they spend a lot of time sitting with inadequate postures, make a lot of repetitive movements and especially when they lift a lot of weight exceeding the load supported.



Silva *et al.*, (2022) state that low back pain has a great economic impact, since it contributes to the early retirement of workers, ahead of heart disease, diabetes, hypertension, and respiratory diseases.

According to Foizer *et al.* (2021), low back pain is one of the main reasons for complaints in medical consultations. Corroborating, Tomazini and Magalhães (2022) report that low back pain has a major impact on the world's population health, becoming the largest cause of disability worldwide. People who suffer from this pain are more likely to be sedentary and consequently reduce their day-to-day activities.

STRENGTH TRAINING

The term strength training (RT), also identified as resistance training, is used to characterize an exercise that requires a movement of the body muscles against an opposing force (FLECK and KRAEMER, 2017). TF is a highly adaptable and well-rounded form of exercise, which has been gaining popularity in recent years. This practice is sought by people of different ages, aiming to improve quality of life (BRITO *et al.*, 2021).

According to Murer, Braz, and Lopes (2019), ET can be performed with different types of objectives, such as prophylactic, recreational, aesthetic, therapeutic, stabilization, or sports performance. Aoyama *et al.*, (2019) add that in recent years ET has shown excellent results, and has been very well accepted by the population. It is increasingly recommended by doctors and health professionals for their patients of all ages and groups.

ET is characterized by exercises in which participants use a muscle or muscle group to overcome external resistance, with the objective of gaining strength, hypertrophy, power, and motor performance, through free weights, apparatus, body weight, among others (DOMINSKI *et al.*, 2020). According to Garcia *et al.*, (2020) they can be named as monoarticular, with those that are performed through only one joint and multiarticular being those that require more than one joint in their execution. Fleck and Kraemer (2017) provide some basic definitions of TF, which is usually used in training programs, such as number of repetitions, sets, and types of muscle contractions. For Magalhães *et al.*, (2023), an important aspect related to ST is the three types of force: isometric force, eccentric force, and concentric force, which can lead to different types of force stimuli during exercises.

In the search for more expressive results, a planning is carried out within the ET, known as prescription, enabling the use and alteration of some variables, namely the exercises and their order, number of repetitions and sets, intensity, frequency, volume, and density (GARCIA *et al.*,



2020). Adding to the prescription, according to Jackson, Shepherd and Kell (2011), a separation of periods in the year is carried out, in each period the main focus of training can be changed, according to the specificity of the individual, this method has been performed for a long time by athletes, being used in a therapeutic way, for individuals with musculoskeletal injuries, such as low back pain.

According to Souza *et al.*, (2023) in the literature, SSD has been presented as an effective method in increasing strength, improving functionality in daily tasks, controlling blood pressure, and improving the psychological aspect. Corroborating, Kuster *et al.*, (2021) state that in relation to the benefits of SSD, there is also an improvement in balance, coordination, power, strength, endurance, increased bone mineral density, having a positive impact on quality of life at any age.

One explanation for the increase in strength caused by SSD is the increase in the cross-section of musculoskeletal tissue, also known as muscle hypertrophy, characterized by the development of these fibers (MURER, BRAZ and LOPES, 2019).

IMPACT OF STRENGTH TRAINING ON LOW BACK PAIN

Although there is no specific rule for the type of exercise, it is recommended that individuals who have low back pain avoid rest and be physically active, as long as it is accompanied by a trained professional aiming at improving the injured region, with exceptions in cases of acute pain. (SILVA *et al.*, 2021). Brambilla and Pulzatto (2020) corroborate, highlighting that exercises that aim to strengthen the *core* region are important because this muscle group can protect the lumbar region, balancing the dorsal and abdominal muscles, avoiding overloading the vertebral discs. For Santos, Gosser and Vespasiano (2019), the *core* muscles are an integrated unit of muscles encompassing 29 pairs of muscles, among which the main ones are: pelvic girdle muscles, abdominals, glutes, obliques, lumbar multifidus, among others, responsible for maintaining the strength and posture of the lower and upper limbs.

Pennone (2017) adds that high-intensity, high-volume or low-intensity, low-volume ET can improve the perception of chronic pain, modulate inflammatory biomarkers, and increase the cross-section of lumbar multifidus.

Although its practice brings many health benefits, if prescribed and performed in the wrong way, lacking monitoring by a qualified professional, the practice can result in tendon, ligament and muscle injuries such as low back pain itself (BARROS and SILVA, 2019). A literature review by Baraldo *et al.*, (2023), showed a significant prevalence rate of low back pain

in elite athletes of weightlifting modalities, possibly caused by poor execution of the sports gesture and exacerbated loads, which can cause herniated discs and muscle strains.

For Fischer, Calley, and Hollman (2021), training programs that include deadlifts can be beneficial for people who have low back pain of mechanical origin, improving pain and functionality in the region. With the same reasoning, for Pennone (2017), the multi-joint exercises commonly used in strength training such as squats and deadlifts have a strong activation of the muscles of the abdominal and lumbar region to keep the curvature of the spine aligned throughout the range of motion. In addition to the above authors, Berglund *et al.* (2015), suggest that deadlifts can be used for patients with low back pain, as long as the intensity of pain and disability are assessed and taken into account before training is prescribed.

Thus, for Andrade and Gardenghi (2017), sessions with up to 30 minutes of ET can present good results if well performed in the stagnation of herniated discs, mobility and pain relief caused by this disease, in addition to being a non-pharmacological treatment method that can also act in a preventive way in its early stages.

Below it is possible to analyze the use of exercises used in the ET protocols as a method of intervention for low back pain, as shown in Table 2.

Table 2 – List of exercises used in low back pain interventions.

Authors	Sample	Exercises used	Duration
UNSER. 2022	13 Individuals of both sexes who report having chronic low back pain	Isometric Plank, Pulley Sit-Ups, Step Climb, Reverse Nordic Push-Up, Supinated High Pull, Unilateral Front Thrust, Unilateral Front Pull, Push Up, Dynamic Abduction Bridge, Roller Squat, Front Thrust, Closed Front Pull, Pelvic Raise, Lunge and Bulgarian Squat.	8 Weeks
CALATAYUD <i>et al.</i> 2020	85 Individuals between 18 and 75 years of age of both sexes who had chronic nonspecific low back pain	Squats with elastic band, Torso twist with elastic, Deadlift with elastic, Isometric unilateral glute bridge, Isometric side plank, Isometric front plank, Supra adapted abdominal, Super-man 4 supports.	8 Weeks
JACKSON, SHEPHERD e KELL. 2011	45 Individuals who were middle-aged or elderly, active, moderately trained, engaged in ice hockey and other recreational activities that did not include SSD and had low back pain.	Leg press, Leg press, Chair flexor, Bench press, Incline bench press, Back puller, Low row on cable, Dumbbell press, Barbell curl, Triceps on cable, Abdominal supra, Abdominal Swiss ball, Super-man 4 supports	16 Weeks
AGBONLAHOR e SUBULADE. 2020	53 individuals of both sexes with chronic nonspecific low back pain who still had mild or moderate symptoms or with functional disability and who were diagnosed by the physician	Free weight and bodyweight exercises for Erector Spinae, Rectus Abdominis, External Oblique, Internal Oblique, Transversus Abdominis, Gluteus Maximus, Iliopsoas and Quadriceps Femoris	10 Weeks

KIM and YIM. 2020	66 Subjects of both sexes with symptoms of chronic nonspecific low back pain and core muscle imbalance and received exercise therapy by an orthopedist	Abdominal Emptying, Lateral Bridge, Unilateral Floor Hip Raise Extending Knees, Unilateral Hip Extension Solo Prone Prone Position, Super-man 4 Supports Contralateral, Solo Hip Extension, Hip Extension Four Supports with Knee Flexed, Hip Abduction on the Ground in Lateral Decubitus.	6 Weeks
KANG and OH. 2021	27 Women with chronic low back pain or a history of chronic low back pain in the past year	Sling hip bridge exercise, Sling hip abduction.	4 Weeks

Source: Prepared by the authors.

According to Unser (2022), an eight-week ET protocol in individuals with chronic low back pain proved to be a viable option for the adult population, reducing pain scores. According to Calatayud *et al.*, (2020), progressive group ET, lasting eight weeks, was a viable option for reducing the intensity and disability of individuals with low back pain. A 16-week periodized ET protocol for middle-aged and recreationally active older men with low back pain has been shown to be effective in improving strength, disability, pain, and quality of life (Jackson, Shepherd, and KELL, 2011).

A study by Agbonlahor and Subulade (2020) analyzed the TF for the core muscles over 10 weeks for patients with chronic low back pain, where there was an improvement in pain intensity and improvement in muscle endurance. Abdullah *et al.*, (2022) suggest that the SSD for the core has a positive impact on the increase in daily physical activities and can be used as a treatment tool to reduce pain.

A protocol of ET and stretches directed to the hip together with the ET for core stabilization showed a reduction in pain and instability scores over 6 weeks, and an increase in the quality of life score (KIM and YIM, 2020). In addition, according to Kang and Oh (2021), the ET performed with elastic slings for gluteus medius and maximus, in addition to improving pain, also helps with lumbopelvic and gait strength and stability in individuals with chronic low back pain.

DISCUSSION

Regarding the studies presented on this subject, it can be seen that low back pain does not have a specific cause, and can be acquired through daily tasks, pathologies, weaknesses, genetic causes and muscle imbalances (CORDEIRO *et al.*, 2020), which can vary from 6 to 12 weeks, and from 12 weeks onwards it is considered chronic. Although there are several causes for low back pain, most of the time it is directly linked to mechanical causes of 80 to 90%, of which 65



to 70% are muscle or ligament tensions, among other causes such as disc degeneration or joint diseases (ALMEIDA and KRAYCHETE, 2017). Low back pain directly interferes with the world's population health, becoming the largest cause of disability worldwide.

The ET is characterized as an exercise that requests the movement of the body muscles against an opposite force and can be performed with different overloads, namely, free weights, apparatus, elastic bands and body weight, seeking different objectives such as strength gain, power, motor performance, coordination, aesthetic, prophylactic and stabilization. It has been shown to be efficient in improving functionality in daily tasks, controlling blood pressure, increasing bone mineral density and improving the psychological aspect, providing an improvement in quality of life regardless of age.

The use of SSD in the treatment of chronic nonspecific low back pain has been shown to be effective and safe when prescribed correctly and by a qualified professional, since the results of the studies show improvements in pain, functional disabilities, gait pattern, improvement in daily physical activities, hypertrophy, muscle strength and endurance.

Although the results are mostly efficient, the professional should evaluate case by case and verify whether the use of ET is appropriate and what type of ET protocol should be followed to improve the condition of chronic nonspecific low back pain, because the misapplication of ET can cause treatment failure, such as in the case of acute pain.

FINAL THOUGHTS

In the present study, we investigated what is and what are the main causes of chronic nonspecific low back pain, seeking to understand SSD, and to analyze its effects on the non-pharmacological treatment of chronic nonspecific low back pain. Chronic nonspecific low back pain is clearly a public health problem that can significantly interfere with the quality of life of its patients, since it causes discomfort, pain and incapacity in the performance of activities of daily living. ET has been used more and more in people's daily lives due to its numerous benefits, such as endurance, strength and muscle hypertrophy, which in turn also acts directly on the quality of life of people who practice it.

In this review, significant improvements in the symptoms of the disease were verified, such as pain in the lumbar region, improvement in activities of daily living, functional disability, muscular endurance, hypertrophy and also improvement in gait and balance, making it a viable and safe option for the treatment of chronic nonspecific low back pain.



We emphasize that although most of the results are positive, the misuse of ET can result in treatment failure, either due to exacerbated loads in the execution of the exercises, or due to exercises performed incorrectly, or due to the lack of follow-up by a qualified and qualified professional to prescribe the modality. Even if the work contributes to the topic in question, it is recommended to carry out additional research that deepens and explores this topic in more detail.



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