
STRENGTHENING THE PELVIC FLOOR FOR EASING AND PREVENTING LOW BACK PAIN. 30 MINUTE HOME EXERCISE PROGRAM

Inna M. Ivanova

Faculty of public health, Medical university - Sofia, Bulgaria, inna_mincheva@abv.bg

Vanina Mihailova - Alakidi

Faculty of public health, Medical university - Sofia, Bulgaria, vanina_delfi@abv.bg

Faculty of public health, Medical university – Plovdiv, Plovdiv

Abstract: The lifetime prevalence of nonspecific low back pain in developed countries is 60%-70%. Low back pain, also called lumbago, radiculitis, is one of the most common musculoskeletal complaints causing musculoskeletal dysfunction. Globally, about 40% of people suffer from persistent low back pain at some point in their lives. Women have been shown to suffer from such changes more often than men. According to a study carried out by Global Burden of Disease (2019), low-back syndrome falls in the top ten diseases leading to temporary disability. The purpose of the study was to follow the effect of an adapted "30 minute home exercise program" - with kinesitherapy techniques on pathologies in the lumbar region and especially on the main symptom, namely pain. Improving the stability of the pelvic ring, as well as the good condition of the muscles in the small pelvis and those responsible for movements in the hip joints determine the condition of the mobile segments and contractile structures in the lower spine, the pelvic ring and the pendular apparatus. Methodology. Twenty-nine people were studied, of whom 27 completed the full program – 5 men and 22 women. Four control treatments were conducted, at equal intervals, over a two-week (14 days) period. On the remaining 10 days, the patients were instructed to perform the gymnastics at home. We used two tests to monitor the effectiveness of the program: the "Visual Analogue Scale" and the "10 Step Time Test" (measured in seconds, adapted by us). The measurements were performed at the beginning and at the end of the treatment period. The program contains 17 exercises divided into 4 groups in a specific sequence. Results: At the end of the two-week period, each participant reported improvement in the general condition, reduction of the pain, mobility and reduced fatigue. The overall results of the two tests showed a reduction in the values of the "Visual Analogue Scale" - by one unit and a reduction in the performance time in the "10-step test" - adapted by us. Conclusion: The therapeutic program consisting of 17 exercises is sufficient to relieve pain in the lumbar region. The values from both tests demonstrate also an ease in ambulation, which would respectively improve the quality of life and the performance of daily activities in patients. The average duration of the program was about 30 minutes. The preventive effects, including psychological effects, of rehabilitation on life styles to form behavioral stereotypes and optimal benefits for socialization are discussed. Essential criteria for the leading role of physical activity are outlined. As a result of data and research from leading institutions, traditional and contemporary views are discussed, as well as specific implemented models for its maintenance, dosed according to age and health status; the promoting effects against various diseases are indicated. Attention is given to activities equivalent to sporting elements, including effects on quality of life. Recommendations: A longer study of the test group and a repeat study to verify the effectiveness of the program are required to validate its effectiveness.

Keywords: lumbar pain, pelvic floor, analytical gymnastics/kinesitherapy, home program/kinesitherapy

1. INTRODUCTION

Daily movement patterns and habits provoke pain in the spine and torso. The spinal changes found are due to prolonged maintenance of an abnormal/unusual postural position (Yankov, T., & Panayotova-Ovcharova, L., 2020; Shivachev, Y., 2021). It is not uncommon for low back pain to be the cause of more frequent falls in the fairer sex, who account for a higher percentage of patients with such complaints (Ge, L. et al, 2022). The genesis of the pain is associated with dysfunctions in the sacroiliac joints, facet joints, intervertebral discs, radiculopathies etc. (Tanwar, P, 2022). Kinesitherapy finds a definite place to address the lifetime symptomatology in these patients (Todorov, K. et al, 2017).

Low back pain has been analyzed as a complex symptom (Lunkes, L. C., et al 2023; Katz J. & R. Melzack, 1999). Its occurrence has been examined as a dynamic process by J. Katz & R. Melzack (1999). Lumbar pain can also be provoked by changes in the sacroiliac joints or changes in the hip joints (Sembrano, J. N., & Polly Jr, D. W., 2009), spinal trauma (Ivanova, V. et al 2022), structural and functional changes - as a consequence of scoliotic changes (Mihaylova, N. et al., 2012), etc. Gerenova, Z. (2020) discusses hip joint and gait changes, making a link to dysfunction in the flexor musculature in the area. Smith, J.A. (2022), (quoting Nüesch, C. et al 2023) inferred in his study that greater muscle activation in the lumbar region was present in patients with low back pain. The spasticity of the musculature in the pelvic floor region may be the source of atypical lumbar and pelvic pain mentioned by a

number of authors - the pathology is explained by incorrect or harmful habits related to activities of daily living of each respondent (Faubion, S. S. et al 2012). Physical activity and targeted physiotherapy could alleviate both conditions - spasticity and the pain provoked by it.

Active kinesitherapy should be aimed at overcoming muscle imbalances and building a strong muscular corset (Todorov, T. et al 2014), and it is essential to tailor the stage to the prescribed therapy to achieve maximum results (Krasteva-Ruseva, M., 2016). Kinesitherapy has an important role in overcoming pain symptomatology (Todorov, K. et al, 2017), also expressed through retraining in correct posture to reduce disability (Nenova, G. et al, 2016), motor control and balance to address the risk of falling in women (Ge, L. et al, 2022), etc. To overcome the main symptom - pain, an active lifestyle is recommended, as well as building healthy habits (Lunkes, L. C. et al 2023). For these reasons, the activity of physiotherapists requires flexibility and combinativeness in the choice of methods used in the therapy itself and to the therapist-patient relationship (Dillon. M. et al 2023), as well as an individual approach to the choice of physiotherapy equipment and its parameters, tailored to the personal characteristics of each individual (Papathanasiou, J. et al 2015).

For pelvic floor stabilization, Marques A. (2010) frames a group of recommendations derived from the "Center for Disease Control and Prevention (CDC) and the American College of Sports Medicine", some of which state the need for "moderate-intensity aerobic exercise - 30 minutes, 5 times per week or high-intensity aerobic exercise for 20 minutes, 3 times per week, for healthy adults aged 18-65". They also mention weight/resistance training as well as endurance exercises. Kraydjikova, L., et al (2015) highlight the need to maintain good torso conditioning in athletes with low back pain by performing stretch exercises after each workout. Static stretching of the ischiocrural musculature helps to reduce non-specific low back pain, studied in 30 patients aged between 20-55 years (Riaz, S. A., & Usman, M., 2023). K. Kuiya et al (2023) found that the application of MET (muscle energy techniques) in iliopsoas effectively reduced low back pain (LBP) and hyperlordotic curvature. Therapies including classical therapeutic massage, post-isometric relaxation, analytical exercises, exercises from the daily activities, different types of gaits, exercise equipment, and automobilization have a good effect on the emotional state, increase motivation, self-esteem, and the sense of safety in patients with pain syndromes (Kraydjikova L. et al 2016). Some of the preventive guidelines for influencing LBP include: smooth movements, strengthening the musculature directly involved in trunk and spine movements, and regular prophylaxis (Nenova, G. et al. 2016).

The combination of non-traditional methods such as: acupuncture, reflexotherapy in the foot, hand and back area has a beneficial effect on pain, movement volumes and muscle weakness (Shivachev, Y., et al 2017; Shivachev, Y., et al 2017).

The individual approach to patients and the involvement of a multidisciplinary team is essential (Nenova, G. et al. 2016). 'Multidisciplinary functional programs' have been shown to be more effective in the short and long term, helping to improve patients' ability to work and return to their working environment, with the aim of retaining the outcomes achieved (Roren, A., et al 2023). This approach, in spinal injuries, has been noted to be most effective in terms of pain, mobility and biomechanical movement performance (Sinaki, M. et al 2002).

A number of authors have noted that the combination of physical activity and working with a psychologist has a number of benefits as well as achieving better and more consistent outcomes (Ho, E. K. Y. et al. 2022). The psychoemotional approach is important to reach the confidence levels of patients in order to conduct a kinesitherapy program (Todorova, G., 2015).

With the development of telemedicine during Covid - 19, Krkoska, P. et al (2023) followed 27 patients assigned to a home rehabilitation program, finding high effectiveness and satisfaction on the part of patients who were under regular monitoring. This study opens up the possibility for outcome-based home rehabilitation programs, given remote monitoring in established program and control testing. Griffin Lee et al 2023, analyzed 292 foreign studies of home rehabilitation. In concluding their study, the authors conclude that these types of "remote" programs are difficult to track, control, and evaluate.

2. MATERIALS AND METHODS

The study was conducted in the city of Sofia – Diagnostic and Consulting Center 22, for the period 1.10.2022 - 23.12.2022. 29 people were studied, 27 successfully completed the entire course of treatment: 22 women and 5 men. Average age of the group - 48,96 years. Six of the tested persons were in acute, 20 in subacute and only one in chronic period. Factors included: pain in the lumbar region and sacrum, duration of complaints for more than a month, kinesitherapy treatments assigned, no electrotherapy. The mean duration of complaints of the group in months was 35.12 /approximately 3 years/. The data are presented in Table 1.

Table 1. Test group data

Sex /N=27/		Years	Stage of the disease			Average duration of the complaints /in months/
Men	Women		Acute	Subacute	Chronic	
5	22	48.96	6	20	1	35.12

None of the patients used mobility aids.

We used the "Visual Analogue Pain Scale", as this was the chief complaint of each of our study subjects; a 10-step time test measured in seconds, adapted by us. The results were recorded as baseline - during the first session and at the end of the treatment period.

Verbal, numbered, and visual scales are most commonly used to assess pain based on the subjective perception of the symptom (Katz, J., & Melzack, R., 1999). Such type of instruments are applicable to neuropathic pain (Nikolova, P., & Despotova-Toleva, L., 2019), upper extremity pain syndromes (Belomazheva-Dimitrova, S., 2016), all spine segments (Stoyanov, G. et al, 2020), etc. We used the numbered VAS, which is a 10 cm, dashed line (with numbers from 1 to 10). The digit "1" equals to "no pain" and the digit "10" indicates the strongest possible pain intensity (Koleva, G., & Georgieva, D., 2016). Koleva, G. (2016) stated in her article that this is the more preferred option by the elderly patients.

We measured the time it took each patient to complete 10 steps. The aim was to check if there was a relationship between lumbar pain and moving in space on a flat surface with normal steps for each person. The test was adapted from the '10 meter walk test', which is a recording of maximum speed during walking in which the patient is instructed to walk in such a way that they feel as comfortable as possible (Sakaguchi, T. et al 2022).

The duration of the program took 14 days /two weeks/ for each patient. During this period, each participant received 4 control treatments at regular intervals for validation, control and testing.

The purpose of the study was to determine the effectiveness of the program on pain symptoms, the effect of the added isometric component in each exercise, and whether it affected pain. In addition, we looked at whether it would affect movement time, one axis per ten individual steps.

From the short but thorough study, different types of programs prove physical activity to be significant in terms of pain symptom. The emphasis of the program fell on the isometric and indirect activation of the muscles located around the hip joints that make up the pelvic floor and, respectively, the larger ones - the motors of the lower limbs.

Tools used and program structure:

The program is made up of exercises engaging the pelvic floor with an additional isometric component. Different starting positions are used, with gradation. It starts with a set of movement patterns in a supine position, sitting on a large therapy ball and standing and gymnastic wall exercises.

I. First group of exercises - supine position. Each exercise is repeated 20 times:

1. Starting position supine, legs flexed and supported on the couch. A small therapy ball is placed between the knees and should be pressed between both legs during the exercises in this series. In the first exercise, 20 squeezes of the ball (adduction at the hip joints) are performed, holding for 3 seconds for each.
2. Taking the knees to the left and right. Squeeze the small therapy ball between the knees.
3. From the same starting position, with the ball between the knees - lift the pelvis, hold for 3 seconds and return to the starting position.
4. The hands are placed under the pelvis to fix the movement of the pelvis. Lifting the feet at about ten centimeters from the couch is performed. The purpose of the exercise is to activate the abdominal wall and m. iliopsoas.
5. Perform torso lifts - up to the level of the lower edge of the shoulder blades, with a hold at the end of the movement of about 3 seconds. The movement resembles an "upper" abdominal press.
6. Diagonal lifting of the torso in an "upper" abdominal press, with the command to touch the opposite knee to the moving hand, for the convenience of patients.
7. The starting position of the body is the same, the hands are placed, relaxed, above the head (they can grip their elbows). Perform 3 deep breaths with the abdominal wall (diaphragmatic breathing) and 3 with the chest cage (medium breathing).

II. Second group of exercises - starting position - on a large therapy ball. A gymnastic wall or a higher stable object can be used to be able to grip the patient. Repetitions of the elements of this group are 10 in number:

1. Sitting on a large therapy ball - the back should be straight and the ball should be selected so that the 90° rule is observed at the ankles, knee joints and hip joints. The hip joints are abducted about 40-45°, chosen according to the height and comfort of the patient. Triple flexion is performed in the lower limbs, keeping the spine erect.

2. The starting position is similar to the previous exercise, with side lunges. The purpose of the exercise is to establish balance of the spine relative to the pelvis, engaging it not only in an anterior-posterior direction, but also in two spiral-diagonal patterns.

3. Lifting and sitting on the ball, necessarily with a straight spine. Standing is not done in full, but to the extent that the ball is felt with the pelvis.

4. From sitting on the ball perform circular movements in the lumbar, pelvic and hip joints. The knees and ankles follow the movements so that correct and smooth circles are performed with a straight back.

III. Third group of exercises - performed from a standing starting position, the feet are two fists apart. The back is straight throughout the exercises and follows the movements from the adjacent joints of the pendular apparatus. Perform 10 repetitions per side in each movement pattern.

1. Starting position - standing, hands gripped just above shoulder level on the gymnastic wall or other surface so that during squats a slight pulling of the muscles on the back surface is felt. Half squats are performed - no more than 90 degrees should be passed at the hip joints.

2. Similar to the previous exercise, but with each squat one of the legs is brought backwards without establishing support on it. This is done alternately with both legs - 10 movements for each leg.

3. Starting position standing hands are placed at shoulder level on the wall in front of us - bringing the arm horizontally on the floor in the backward direction, the eyes follow every movement and the arms return to the starting position. 10 repetitions per arm.

4. The performance is similar to the previous exercise, but this time the gaze is fixed on the wall - an imaginary point in the middle between the two palms.

IV. Fourth group of exercises - breathing exercises. Depending on the fatigue, the starting position is chosen - supine or sitting.

1. Diaphragmatic breathing - to make it easier for patients, a command is given to place one hand on the abdomen and, breathing, try to push the hand forward. Perform 5 smooth inhalations and exhalations, counting to 6 on the inhalation and exhalation.

2. Breathing with the chest cage - 4 breaths are performed, during the inspiration the arms are raised forward and up, and during the expiration the breath is noisy and fast.

Important: Before standing up, the patient is allowed to sit/lie for a while to allow the vital signs - pulse, respiratory rate, and blood pressure - to return to normal (if necessary, you can wait a little longer). If the pace is tailored to each individual, there should be no need for more rest time after the procedure. Average program duration: 30 minutes.

In data analysis, we used IMB SPSS Statistics to determine the significance of the results.

3. RESULTS

After the end of the therapeutic period, the studied indicators showed an improvement in terms of both indicators - reduction of subjective pain sensation and reduction of the time for which 10 steps are performed, in most patients. To prove significance, we examined the data through the IMB SPSS Statistics program used for statistical analyses (Table 2).

We divided the tests into two groups, which we tentatively called "Group 1" the VAS pain test, and "Group 2" the results for the "10-step test."

Table 2. Data from the t-test

Group of parameters	Std. Deviation	St. error mean	95% Conf. Interval of the difference		T	P
			Lower	Upper		
Group 1	0.877	0.169	0.653	1.347	5.925	P<0.01
Group 2	0.46798	0.09006	0.10376	0.47401	3.208	P<0.05

The results of "Group 1" and "Group 2" had high statistical significance, P<0.01 and P<0.05, respectively. From this it should be concluded that the complex thus constructed has a positive impact on the indicators studied - through the reduction of the values for each of them.

Each individual subject can serve as a control with respect to their personal performance. In each patient, the data obtained after the end of the procedural period were better than the baseline values - at the first examination.

4. DISCUSSION

The therapy thus presented and conducted demonstrated success with respect to the indicators tested. No association was found between the two tests and the results obtained. Probably, the latter is due to the duration and the method of execution for the task. Longer training and adjustment in the motor patterns performed by each individual is

necessary. Griffin Lee et al 2023 support this view in the article where they point out the need for longer follow-up and monitoring of patients. The main issues that need to be addressed and investigated in depth are: the physiological development of each individual, standardization of test groups for more homogeneous results - by age, physical activity, gender, co-morbidities of the musculoskeletal system (such as the presence of flatfoot, knee joint changes, spinal changes, etc.), other diseases overlapping the symptom of lumbar and sacral pain, different habitual habits, nature of occupation in terms of movement patterns, etc.

5. CONCLUSIONS

Specific physical activity is a key factor in maintaining the vitality, intellectual and emotional freshness of individuals. The contribution of physical activity and rehabilitation as protective factors for non-communicable diseases is associated with good mental health, improved quality of life and well-being. In this sense, while modern medicine adds years to life, physical activity and mainly rehabilitation is an essential factor to add meaningful life to years.

Despite the individual and societal benefits, rehabilitation is not a priority in most countries and is under-resourced. Rehabilitation in our country does not stand out as a dominant factor in the recovery of the individual with lumbar syndrome. The development is a prerequisite for the implementation of models to overcome the negative consequences of Low-back syndrome.

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