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EFFECTS OF IMPLEMENTING A THERAPEUTIC PHYSICAL CULTURE PROGRAM FOR OSTEOCHONDROSIS OF THE LUMBAR SPINE IN A FITNESS CENTER

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Abstract. The article presents the effects of implementing the program of therapeutic physical training for osteochondrosis of the lumbar spine in a fitness center. The 6-month study took place in a fitness center and included 30 men and women aged 35-45 years with osteochondrosis of the lumbar spine, confirmed with ray diagnosis data (X-ray, computed tomography or magnetic resonance imaging) and a doctor's medical report. The studied parameters changed reliably ($p<0.05$): the range of active movements in the lumbar spine improved by 40.6-64.1% according to goniometry, the intensity of pain syndrome according to visual analogue scale decreased by 65.1-68.1%, the functional test results improved in the range of 61.5-85.3%, the degree of disability according to the Osvestry questionnaire decreased by 58.6%. The results obtained after implementing the program of therapeutic physical training in a fitness center reflect its effectiveness in osteochondrosis of the lumbar spine.
Keywords: therapeutic physical training, osteochondrosis of the lumbar spine, fitness center.

Introduction. Osteochondrosis of the lumbar spine is one of the most common pathologies of the musculoskeletal system, affecting up to 90% of the population over 30 years of age. These diseases are characterized by degenerative-dystrophic changes in the intervertebral discs, ligamentous apparatus and muscles of the trunk, which leads to severe pain syndrome, limited mobility and a decrease in the quality of patient's life [1-3].

The highest incidence of osteochondrosis of the lumbar spine is observed among people of working age (35-45 years), which causes significant economic losses to society due to temporary and permanent loss of ability to work. Modern sedentary lifestyle, excessive static and dynamic loads on spine and excessive body weight are the main risk factors for the development of this pathology [4].

Despite the wide range of conservative and surgical methods of treating osteochondrosis, the leading role in restoring the functional state of patients is played by health-improving motor programs [1, 2, 5]. However, existing rehabilitation programs don't always take into account the individual characteristics of the signs of the disease, the level of physical fitness and motivation of patients, as well as the conditions for carrying out health improving measures.

The problem of the study is the insufficient effectiveness of standard approaches to therapeutic physical training of people aged 35-45 with osteochondrosis of the lumbar spine in fitness centers. There is a need to develop a program of therapeutic measures based on the combined use of various means and forms of motor therapy, taking into account the specifics of the disease and the capabilities of the fitness industry.

Aim of the study: to determine the effectiveness of the implementation of a program of therapeutic physical training for osteochondrosis of the lumbar spine in a fitness center.

Methods and organization. The study was conducted at the World Class Kashirskij fitness center during 6 months, with the inclusion of 30 fitness center clients aged 35-45 years with a diagnosis of "osteochondrosis of the lumbar spine", confirmed by radiation diagnostic data (X-ray, computed tomography or magnetic resonance imaging (MRI)) and a doctor's medical report.

Criteria for inclusion of participants in the study: gender – men and women; age – 35-45 years; diagnosis – osteochondrosis of the lum-

bar spine, stage II according to Osna-Popelyansky; period of the disease – chronic relapsing course outside of exacerbation; intensity of pain syndrome according to the visual analogue scale (VAS) – no higher than 40 mm; absence of contraindications to physical rehabilitation and hydro-kinesiotherapy; informed voluntary consent to participate in the study.

Exclusion criteria: presence of concomitant diseases in the acute or decompensated stage (arterial hypertension, ischemic heart disease, diabetes mellitus, etc.); history of injuries and surgeries on the spine; signs of spinal stenosis and sequestered intervertebral disc herniation according to MRI data; severe radicular and pain syndrome requiring drug correction; presence of contraindications to physiotherapy, therapeutic physical culture, massage; regular classes in other therapeutic physical culture routines or swimming at the time of the research.

The research methods included: assessment of pain intensity according to VAS (mm); goniometry to determine the mobility of the lumbar spine (degrees); functional tests (Schober test, fingertip-to-floor test, back (s) and abdominal (s) muscle endurance test); assessment of life activity disorders according to the Oswestry questionnaire (points). Statistical methods were used for mathematical processing of the data, the following indicators were calculated: arithmetic mean (M), standard deviation (σ). The data were checked for normality of distribution with the Kolmogorov-Smirnov test. The reliability of differences between groups and within groups was assessed using Student's T-test for dependent and independent samples, differences were considered statistically significant at $p<0.05$. Calculations were performed using the Microsoft Excel 2019.

Participants were divided into two equal groups: the main group (MG, n=15) and the control group (CG, n=15). Distribution into groups was carried out by simple randomization using a random number generator. Classes in both groups were held 3 times a week for 60 minutes for 24 weeks. Participants in the CG were engaged in a standard health program of the fitness center. The program was designed for 8 weeks and included general health classes in the gym and the pool.

The participants of the MG were trained according to the developed program of therapeutic physical culture (TPC) for osteochondrosis of the lumbar spine, consisting of 3 periods, including therapeutic gymnastics, health-improving means of physical culture (hydro-kinesiotherapy, training on exercise machines), massage and myofascial release. The preparatory period (2 weeks) included group classes in aqua aerobics (2 times a week for 45 minutes) and Pilates (1 time a week, 60 minutes). Aqua aerobics classes were held in a deep-water pool using support equipment (noodles, aqua belts) aimed at increasing overall endurance and strengthening the main muscle groups. Pilates classes included stretching, breathing exercises, and relaxation elements performed from the starting positions of standing, sitting, and lying on a mat. In the main period (4 weeks), the program was supplemented with strength training in the gym (2 times a week for 60 minutes), including basic exercises on exercise machines for the main muscle groups (leg press, bench press, upper block pull, leg extension while sitting) in 2-3 sets of 10-15 repetitions with moderate weights. Aqua aerobics (1 time per week) and Pilates (1 time per week) classes continued. In the final period (2 weeks), strength training in the gym was reduced to once a week, aqua aerobics and Pilates classes were held with the same frequency, and basic elements of aqua stretching were additionally mastered (1 class per week, 45 minutes), aimed at improving flexibility and joints mobility.

Results and discussion. The effects of TPC are presented in the dynamics of the studied indicators (table 1-4).

Results of goniometry of the lumbar spine in the main (MG) and control (CG) groups before and after the course of therapeutic physical culture are shown in table 1.

Table 1

Dynamics of the range of motion in the lumbar spine according to goniometry data before and after the use of TPC (M±σ), °

Spinal movements	Group	Before	After	P<
Flexion	MG	34.8±8.2	52.2±6.4	0.05
	CG	35.2±8.6	43.1±7.3	0.05
Extension	MG	13.1±4.5	21.5±3.8	0.05
	CG	13.4±4.8	16.8±4.2	0.05
Side bend to the right	MG	13.8±3.7	19.4±2.9	0.05
	CG	14.1±4.0	16.3±3.5	-
Side bend to the left	MG	14.3±3.9	20.1±3.1	0.05
	CG	14.6±4.2	17.0±3.7	-

Note: TPC – therapeutic physical culture; MG – main group; CG – control group

The initial values of the lumbar spine flexion amplitude were 34.8±8.2° in the MG and 35.2±8.6° in the CG, indicating a significant limitation of mobility. The extension amplitude was significantly reduced and was 13.1±4.5° in the MG and 13.4±4.8° in the CG. The amplitude of side bend to the right was 13.8±3.7° in the MG and 14.1±4.0° in the CG, to the left – 14.3±3.9° in the MG and 14.6±4.2° in the CG, indicating significant disruption of the lateroflexion of the spine.

After TPC the flexion volume significantly ($p<0.05$) increased by 49.9% in the MG and by 22.4% in the CG, reaching 52.2±6.4° and 43.1±7.3°, extension significantly ($p<0.05$) increased by 64.1% in the MG and by 25.4% in the CG, reaching 21.5±3.8° and 16.8±4.2°, respectively. The volume of lateral bending to the right significantly ($p<0.05$) increased by 40.6% in the MG, reaching 19.4±2.9°. In the CG, the increase was 15.6% and was statistically insignificant. The amplitude of lateroflexion to the left increased by 40.6% ($p<0.05$) in the MG and by 16.4% in the CG, reaching values of 20.1±3.1° and 17.0±3.7°.

The VAS was used to study the dynamics of pain syndrome in the MG and CG during the implementation of TPC (table 2). Pain intensity was assessed before the course, in the middle (after 3 weeks) and after its completion. The subjects noted the average level of pain in the lumbar region at rest and during movement over the past three days.

Table 2

Dynamics of pain intensity according to VAS in patients of the MG and CG before, in the middle and after the application of TPC (M±σ), mm

Indicator	Group	Before	Middle	After	P<
Pain at rest	MG	38.5±10.2	25.4±8.6	12.3±6.4	0.001
	CG	37.9±9.8	31.2±9.1	23.7±7.5	0.01
Pain when moving	MG	62.7±12.4	41.8±10.5	21.9±7.8	0.001
	CG	61.5±11.9	52.6±10.8	39.2±9.4	0.01

Note: TPC – therapeutic physical culture; VAS – visual analogue scale; MG – main group; CG – control group

Before the start of TPC, the pain intensity at rest was 38.5±10.2 mm in the MG and 37.9±9.8 mm in the CG, which corresponds to moderate pain syndrome. In the middle of the course, the pain index significantly ($p<0.05$) decreased by 34.0% in the MG and by 17.7% in the CG, reaching values of 25.4±8.6 mm and 31.2±9.1 mm, respectively. After completion of the TPC program, pain at rest decreased by 68.1% ($p<0.001$) in the MG and by 37.5% ($p<0.01$) in the CG, reaching the level of mild pain – 12.3±6.4 mm and 23.7±7.5 mm.

The initial values of pain intensity during movement were 62.7±12.4 mm in the MG and 61.5±11.9 mm in the CG, indicating severe pain syndrome. In the middle of the TPC course, the indicator significantly ($p<0.05$) decreased by 33.3% in the MG and by 14.5% in the CG, reaching 41.8±10.5 mm and 52.6±10.8 mm, respectively. After completing the program, pain during movement decreased by 65.1% ($p<0.001$) in the MG and by 36.3% ($p<0.01$) in the CG, reaching the level of mild and moderate pain – 21.9±7.8 mm and 39.2±9.4 mm.

The results of functional testing of patients in the MG and CG before and after the course of TPC are presented in table 3.

The initial values of the Schober test were 2.6±0.8 cm in the MG and 2.7±0.9 cm in the CG, indicating a significant limitation of the mobility of the lumbar spine. After the TPC course, the indicator significantly ($p<0.001$) increased by 61.5% in the MG and by 25.9% ($p<0.05$) in the CG, reaching values of 4.2±0.6 cm and 3.4±0.7 cm, respectively. The initial distance in the "fingertip-to-floor" test increased significantly – in the MG 18.4±6.3 cm and in the CG 17.9±5.8 cm, indicating a pronounced impairment of the flexibility of the spine and hamstring muscles. After TPC, the indicator significantly ($p<0.001$) decreased by 66.3% in the MG and by 35.8% ($p<0.01$) in the CG, reaching 6.2±4.1 cm and 11.5±4.6 cm, reflecting an increase in spine flexibility.

Table 3

Dynamics of functional test indicators in patients of the MG and CG before and after the use of TPC (M±σ)

Test	Group	Before	After	P<
Schober test, cm	MG	2.6±0.8	4.2±0.6	0.001
	CG	2.7±0.9	3.4±0.7	0.05
Fingertip-to-floor test, cm	MG	18.4±6.3	6.2±4.1	0.001
	CG	17.9±5.8	11.5±4.6	0.01
Back muscle endurance test, s	MG	28.5±12.4	52.8±14.6	0.001
	CG	29.2±11.7	38.6±12.9	0.05
Abdominal muscle endurance test, s	MG	32.7±11.8	58.3±12.2	0.001
	CG	33.4±12.3	44.9±11.5	0.05

Note: TPC – therapeutic physical culture; MG – main group; CG – control group

The initial body holding time in the back muscle endurance test in the MG was 28.5±12.4 s, in the CG 29.2±11.7 s, reflecting the weakness of the muscular corset. After TPC, the indicator significantly ($p<0.001$) increased by 85.3% in the MG and by 32.2% ($p<0.05$) in the CG, amounting to 52.8±14.6 s and 38.6±12.9 s. The body holding time in the abdominal muscle endurance test before TPC was 32.7±11.8 s in the MG and 33.4±12.3 s in the CG. After completion of TPC, the indicator significantly ($p<0.001$) increased by 78.3% in the MG and by 34.4% ($p<0.05$) in the CG, reaching values of 58.3±12.2 s and 44.9± 11.5 s.

The exploration of the dynamics of functional limitations and life activity disorders in the CG and MG was conducted using the Oswestry questionnaire (table 4).

Before the start of TPC, both groups of subjects had a high level of disability associated with lower back pain. The total score on the Oswestry questionnaire was 26.3±8.2 points in the MG and 25.3±7.6 points in the CG, which corresponds to significant limitations. Patients experienced the greatest difficulties when lifting, standing, walking, and sitting. Pain syndrome significantly reduced the quality of sleep, limited sexual activity, and the ability to participate in social life. After the

course of exercise therapy, both groups showed a statistically significant ($p<0.05$) reduction in life activity disorders in most sections of the Oswestry questionnaire, with the exception of sex life in the CG.

Table 4

Dynamics of the Oswestry questionnaire indicators in the MG and CG before and after the use of TPC (M±σ), points

Phase	Group	Before	After	P<
Pain intensity	MG	2.8±0.9	1.2±0.6	0.001
	CG	2.7±0.8	1.9±0.7	0.01
Personal care	MG	2.1±0.8	0.8±0.5	0.001
	CG	2.0±0.7	1.4±0.6	0.05
Lifting	MG	3.2±1.1	1.4±0.7	0.001
	CG	3.1±1.0	2.2±0.8	0.05
Walking	MG	2.5±0.9	0.9±0.6	0.001
	CG	2.4±0.8	1.6±0.7	0.01
Sitting	MG	2.7±1.0	1.1±0.7	0.001
	CG	2.6±0.9	1.8±0.8	0.05
Standing	MG	3.0±1.2	1.3±0.8	0.001
	CG	2.9±1.1	2.1±0.9	0.05
Sleeping	MG	2.4±0.9	1.0±0.6	0.001
	CG	2.3±0.8	1.6±0.7	0.05
Sex life	MG	2.2±1.1	0.9±0.7	0.001
	CG	2.1±1.0	1.5±0.8	-
Social life	MG	2.6±1.0	1.1±0.8	0.001
	CG	2.5±0.9	1.8±0.8	0.05
Travelling	MG	2.8±1.2	1.2±0.9	0.001
	CG	2.7±1.1	1.9±1.0	0.05
Total	MG	26.3±8.2	10.9±5.4	0.001
	CG	25.3±7.6	17.8±6.3	0.01

Note: TPC – therapeutic physical culture; MG – main group; CG – control group

However, the degree of improvement in the functional state was significantly higher in patients in the MG compared to the CG. Thus, the total score on the questionnaire decreased in the MG by 58.6% (from 26.3±8.2 points to 10.9±5.4 points), in the CG – by 29.6% (from 25.3±7.6 points to 17.8±6.3 points). The most pronounced positive dynamics in the MG were noted in relation to pain intensity (decrease by 57.1%), walking (improvement by 64.0%) and personal care (improvement by 61.9%). In the CG, these indicators improved by 29.6%, 33.3% and 30.0%.

Conclusion. The effectiveness of the TPC program in the MG showed that its use in individuals aged 35-45 years with osteochondrosis of the lumbar spine led to a statistically significant ($p<0.05$) improvement in all the studied parameters. The range of active movements in the lumbar spine according to goniometry data improved by 40.6-64.1%, the intensity of pain syndrome according to VAS decreased by 65.1-68.1%, the indicators of functional tests improved in the range of 61.5-85.3%, the degree of impairment of life activity according to the Oswestry questionnaire decreased by 58.6%.

Conflict of interest. The authors declare no conflict of interest.

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