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Comparative analysis of different physical therapy programs in the treatment of people with knee osteoarthritis

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ABSTRACT

Introduction: Knee osteoarthritis (OA) develops gradually and causes pain, a decrease in range of motion, muscle mass, and strength and leads to a decrease in physical activity and a poor quality of life for the patient. The aim of this study was to investigate the effects of different physiotherapy programs on pain intensity, range of motion, and quality of life in people with knee OA.

Methods: The study was designed as a prospective, experimental, and randomized trial. Sixty subjects of both sexes and all ages with OA of the knee were enrolled in the study. In the studied Group I (n = 30), in addition to the standard protocol, high induction electromagnetic stimulation was applied using a Salus Talent device with a strength of 3 T and a frequency of up to 50 Hz for 10 min. In the test Group II (n = 30), in addition to the standard protocol, high-intensity laser therapy (HILT) with a power of 5 J was applied with the help of the Ilux Yag 1064 device for 7 min. The therapy protocol for both test groups lasted 8 weeks, with subjects treated once a week.

Results: Analysis of the mean scores on the VAS scale shows that in both groups, the lowest mean scores were recorded in the III measurement (4.35) and the highest in the I measurement (7.96). In all three measurements, there was a difference in the extent of mobility of internal rotation in the form of a higher average range of motion in the test group II, in which HILT was applied. Analysis of the mean scores on the knee injury and osteoarthritis outcome score quality of life scale showed that in both groups, the lowest mean scores were recorded at the first measurement (14.84), with the mean score increasing at the second (32.95) and third measurements (41.08).

Conclusion: Both methods showed significant results in reducing pain intensity, improving knee mobility, activities of daily living, and quality of life in people with knee OA. The obtained data do not give preference to any method but indicate them as adequate physiotherapy protocols to improve the function and quality of life of people with knee OA.

Keywords: Osteoarthritis; knee joint; high induction electromagnetic stimulation; high intensity laser therapy

INTRODUCTION

Osteoarthritis of the knee (OA) is a chronic, inevitably progressive, and irreversible process, also known as degenerative joint disease. It develops gradually and causes pain, a decrease in range of motion, muscle mass, and strength. It leads to a reduction in physical activity and poor quality of life for the patient and has become a significant public health problem and the leading cause of disability in the United States and the world (1-3).

OA is associated with articular cartilage damage, bone osteophyte formation, and subchondral bone sclerosis, and in advanced cases, subchondral cyst formation may also be pathologically demonstrated (4).

The prevalence of OA of the knee increases with age and is more common in women than in men (5,6). Symptomatic osteoarthritis accounts for 10–15% of the population worldwide, including 8.5 million in the United Kingdom. In the United States, it affects

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the largest number of adults (7,8), with a prevalence of 33.6% (12.4 million).

It is the result of a complex interaction of numerous factors, including joint integrity, genetic predisposition, local inflammation, mechanical forces, and cellular and biochemical processes (9,10). Symptoms are often associated with physical inactivity (11), while the association between obesity and knee OA has been consistently supported by numerous studies (12).

The pathology of knee OA is manifested by inflammation of the synovium, cartilage damage, bone remodeling, and osteophyte formation (13). The most common symptom is pain and stiffness of the knee joint, usually in the morning, lasting no longer than 30 min. The pain may be dull or sharp, continuous, or intermittent, and range in intensity from mild to intolerably disabling. Symptoms are accompanied by a decrease in range of motion in the knee joint, crepitations, and weakness of the surrounding muscles. In the advanced stage of OA of the knee, there is swelling, complete loss of mobility, and instability of the joint. The above symptoms lead to limitation of activities of daily living, which negatively affects the psyche and decreases the quality of life (4,14).

The initial diagnosis of knee OA includes a review of medical history and medical history with emphasis on chronic health conditions, known injury or trauma, previous surgery, medications taken, occupation, and symptoms such as intensity and location of pain and morning joint stiffness. After taking a history, a focused physical examination should be performed. Each patient should be evaluated for the presence of swelling around the knee joint, loss of range of motion, and loss of smooth mechanical movement and properties of the surrounding muscles (tone, trophicity, stretch, and strength). In addition, the examination should describe the extent of passive and active motion of the affected joint (4).

For more than 40 years, the radiological classification of knee OA according to Kellgren and Lawrence (15,16) has been recognized as the "gold standard" in rheumatology. Their radiological classification of OA based on the presence of osteophytes, narrowing of the joint space, sclerosis of the subchondral bone, formation of cystic formations, and alteration of bone parts is still generally accepted today despite certain shortcomings. According to Kellgren and Lawrence, there are the following grades: Grade 0 – normal/no signs of OA, Grade 1 – suspicious/minimal, insignificant osteophytes, Grade 2 – minimal/present osteophytes, joint space preserved, Grade 3 – marked/moderate narrowing of joint space, and Grade 4 – marked/significantly narrowed joint space with sclerosis of subchondral bone (17).

Treatment of knee OA should aim to relieve pain, improve function, and limit disability. Nonsurgical treatments for knee OA are often beneficial in patients with Kellgren and Lawrence Grades 0–3, whereas surgical treatment is required to cure or improve advanced stages of knee OA in patients with Grade 4 (18,19).

Current clinical practice guidelines recommend patient education, kinesiotherapeutic procedures, and weight loss (20-22). Treatment must include lifestyle modification and, depending on symptoms, the use of physical agents such as thermotherapy, electrotherapy, hydrotherapy, and phototherapy; pharmaceutical treatment with NSAID injections of hyaluronic acid, corticosteroids, and glucosamine; kinesiotherapeutic procedures; orthopedic devices; and osteopathic treatment (23).

Laser belongs to phototherapy methods and we define it as a source of monochromatic, coherent, intense, and focused light. It can be applied directly to the damaged area. It relieves pain, accelerates collagen synthesis and granulation tissue formation, which is why it is often used for soft tissue, tendon, and ligament injuries (24).

In the 90s of the 20th century, the use of high intensity lasers (high intensity laser therapy [HILT]) began in physical and rehabilitation medicine. HILT is based on a short-term high peak of laser light that is minimally absorbed by chromophores and has a biological effect on superficial and deep tissues. The above mentioned biological effect is achieved by analgesic, photochemical, photothermal, and photomechanical effects. The analgesic effect is explained by different mechanisms, but it is thought to act, among other things, on the stimulation of the descending antinociception pathway by stimulating the production of endogenous morphine (25,26).

Highly induced magnetic stimulation (HIMS) is increasingly used in the conservative treatment of degenerative musculoskeletal disorders. Because of the rapid and precisely defined temporal change of the high-intensity magnetic field, the discharge of the induced electric voltage and the consequent induced electric current is generated in the treated tissues. For this reason, this type of stimulation is used in cases where it is necessary to induce the necessary current in the target tissue to achieve a more effective effect (27).

Surgical intervention should be considered when all options for conservative treatment have been exhausted, that is, when the quality of life is significantly impaired. Surgical options vary depending on the degree of OA, concomitant diseases, and risk factors and include several techniques: Arthroscopy, cartilage repair, osteotomies, and knee arthroplasty or partial and total knee arthroplasty (28,29).

The aim of this study was to evaluate the effects of different physiotherapy programs on pain intensity, range of motion of the affected joint, and quality of life in people with OA of the knee.

METHODS

The study included 60 subjects of both sexes and all ages with OA of the knee who were referred for physical treatment to the Clinic for Treatment, Health Care, and Rehabilitation Master Fizikal, Istočno Sarajevo. Patients were divided into two groups according to the method of stratified randomization, study Group I (n = 30) and study Group II (n = 30).

The criteria for inclusion in the study were subjects of both sexes of all ages with symptoms of knee OA, who volunteered and gave written informed consent to participate in the study, and were referred for physical treatment. The exclusion criteria for the study were subjects with OA of the knee who did not give written consent to participate in the

study and for whom the therapeutic program was not fully implemented.

The study was designed as a prospective, experimental, and randomized trial using a descriptive method of analysis.

In both studied groups, a standard protocol was applied, which included shock wave therapy, TENS, massage, and a kinesiotherapy program that included active and actively assisted exercises, muscle strengthening exercises, and exercises with weights for the upper leg muscles for 15 min.

In the studied Group I, in addition to the standard protocol, HIMS was performed using a Salus Talent device with a strength of 3 T and a frequency of up to 50 Hz for 10 min.

In the tested Group II, in addition to the standard protocol, HILT with a power of 5 J was applied with the help of the Ilux Yag 1064 device for 7 min.

The therapy protocol for both tested groups lasted 8 weeks, during which the subjects received therapy once a week. Both groups of subjects were tested with research instruments at the beginning, middle (4 weeks), and end of treatment.

The instruments used in the study are:

"Knee injury and osteoarthritis outcome score (KOOS)" questionnaire was designed for subjects with knee pain. The questionnaire was adapted only for the problem of knee pain, and the questions aimed to obtain as much information as possible about the activities of daily living of people in the third age. The questionnaire consisted of several parts with predetermined answers. Respondents were interviewed at baseline, midpoint, and post-treatment (30).

Analog Pain Scale (Likert scale) – a one-dimensional pain assessment scale used to measure subjective pain intensity (31).

The protractor is used to measure joint range of motion, which was measured at baseline, during treatment, and at the end of treatment to monitor treatment outcomes (32).

The study was approved by the Ethics Committee of the University of Sarajevo – Faculty of Health Studies under the number 04-7-53/21(02-3-614/11).

Data entry, integrity checking, and recalculation of each subscale were performed in Microsoft Excel 2013. The statistical analysis itself was performed using the statistical package IBM Statistics SPSS v 20.0.

Data were presented in tabular and graphical form by absolute number of cases, percentage, arithmetic mean with standard deviation, and range of values according to the type of data.

Comparison of values between observed groups was performed using Student's t-test for independent samples, Chi-square test, and Fisher's exact test. Comparison of differences between measurements was performed by one-way analysis of variance with *post hoc* tests using Student's t test.

The results of all analyzes were considered statistically significant at the 95% confidence level or at values of $p < 0.05$.

RESULTS

The study included 60 subjects divided into two groups: The studied Group I ($n = 30$) and the studied Group II ($n = 30$).

The analysis of the gender structure of the respondents in the sample shows that both in the total sample and in the individual groups, female respondents were more represented, with 33 people or 55.0% in the total sample, 16 or 53.3% in the studied Group II, and 17 or 56.7% in the studied Group I. Statistical analysis shows that there is no significant difference between the studied groups in terms of gender ($p > 0.05$) (Table 1).

Analysis of the average age of respondents in the total sample shows that respondents had an average age of 59.2 ± 9.74 years, with the youngest respondent being 41 years old and the oldest 77 years old. The comparison between the groups shows that the respondents of the studied Group I with an average age of 59.23 ± 9.03 years (range 44–77 years) were slightly older than the respondents of the studied Group II with an average age of 59.17 ± 10.55 years (range 41–76 years) and there was no statistically significant difference between the studied groups ($p > 0.05$) (Table 2).

The analysis of the average values of body weight, height, and body mass index (BMI) shows that there are small deviations between the studied groups and in relation to the average of the total sample. The comparison between the studied groups shows that there is no statistically significant difference between the studied groups ($p > 0.05$) according to body weight, body height, and BMI (Table 3).

The analysis of the average scores on the VAS scale shows that both in the total sample and in the individual groups

TABLE 1. Gender structures of respondents

Gender	Group		Total, *n* (%)
	Group I, *n* (%)	Group II, *n* (%)	
Male	13 (43.3)	14 (46.7)	27 (45.0)
Female	17 (56.7)	16 (53.3)	33 (55.0)
Total	30 (50.0)	30 (50.0)	60 (100.0)

χ^2=0.067; df=1; p=0.500

TABLE 2. Analysis of the average age of respondents

Groups	n	AS	SD	Minimum	Maximum
Group I	30	59.23	9.03	44.00	77.00
Group II	30	59.17	10.55	41.00	76.00
Total	60	59.20	9.74	41.00	77.00

t=−0.026, df=58, p=0.979. SD: Standard deviation, AS: Average score

TABLE 3. Analysis of body weight, body height and body mass index of the respondents

Antropometric measurements	*n*	AS	SD	Minimum	Maximum
Body weight (kg) (t=−0.039; p=0.845)					
Group I	30	85.53	16.90	55.00	140.00
Group II	30	84.70	15.93	60.00	130.00
Total	60	85.12	16.29	55.00	140.00
Height (cm) (t=−0.239; p=0.627)					
Group I	30	175.03	9.15	160.00	190.00
Group II	30	176.23	9.86	160.00	192.00
Total	60	175.63	9.45	160.00	192.00
BMI (t=−0.319; p=0.574)					
Group I	30	27.69	3.47	21.48	40.91
Group II	30	27.16	3.79	21.26	36.01
Total	60	27.43	3.61	21.26	40.91

BMI: Body mass index, SD: Standard deviation, AS: Average score

studied, the lowest average scores were recorded on the III measure (4.35) and the highest on the I measure (7.96), with no statistically significant differences between the groups studied ($p > 0.05$) (Table 4).

The analysis of the average values of knee extension shows that both in the total sample and in the individual groups studied, the lowest average values were recorded in the measurement III (0.17) and the highest in the measurement I (0.42), with no statistically significant difference between the groups studied ($p > 0.05$) (Table 5).

TABLE 4. Analysis of average values of the visual analogue scale according to the measurements

VAS measurements	*n*	AS	SD	Minimum	Maximum
VAS-I measurement (t=−2.821; p=0.098)					
Group I	30	7.80	0.84	6.00	9.00
Group II	30	8.13	0.68	7.00	9.00
Total	60	7.96	0.78	6.00	9.00
VAS-II measurement (t=−3.810; p=0.056)					
Group I	30	5.66	0.80	4.00	7.00
Group II	30	6.06	0.78	5.00	8.00
Total	60	5.86	0.81	4.00	8.00
VAS-III measurement (t=−0.754; p=0.389)					
Group I	30	4.23	0.85	3.00	6.00
Group II	30	4.46	1.19	3.00	7.00
Total	60	4.35	1.03	3.00	7.00

VAS: Visual analogue scale, SD: Standard deviation, AS: Average score

TABLE 5. Analysis of average knee extension values according to the measurements

Extension measurements	*n*	AS	SD	Minimum	Maximum
Extension-I measurement (t=−3.919; p=0.052)					
Group I	30	0.00	0.00	0.00	0.00
Group II	30	0.83	2.31	0.00	10.00
Total	60	0.42	1.67	0.00	10.00
Extension-II measurement (t=−2.829; p=0.098)					
Group I	30	0.00	0.00	0.00	0.00
Group II	30	0.67	2.17	0.00	10.00
Total	60	0.33	1.56	0.00	10.00
Extension-III measurement (t=−2.071; p=0.155)					
Group I	30	0.00	0.00	0.00	0.00
Group II	30	0.33	1.27	0.00	5.00
Total	60	0.17	0.91	0.00	5.00

SD: Standard deviation, AS: Average score

TABLE 6. Analysis of average knee flexion values according to the measurements

Flexion measurements	*n*	AS	SD	Minimum	Maximum
Flexion-measurement (t=−0.764; p=0.386)					
Group I	30	103.00	15.23	80.00	130.00
Group II	30	106.00	11.01	90.00	130.00
Total	60	104.50	13.26	80.00	130.00
Flexion-II measurement (t=−0.277; p=0.601)					
Group I	30	113.16	12.14	90.00	130.00
Group II	30	114.66	9.82	100.00	130.00
Total	60	113.91	10.97	90.00	130.00
Flexion-III measurement (t=−0.044; p=0.834)					
Group I	30	119.33	9.63	105.00	130.00
Group II	30	118.83	8.77	100.00	130.00
Total	60	119.08	9.13	100.00	130.00

SD: Standard deviation, AS: Average score

The analysis of the average values of knee flexion shows that both in the total sample and in the individual groups studied, the lowest average degree of flexion was recorded in the first measurement (104.50) and the highest in the third measurement (119.08), with no statistically significant difference between the groups studied ($p > 0.05$) (Table 6).

The analysis of the average values of external rotation in the knee shows that both in the total sample and in the individual groups studied, the lowest average values were recorded in the first measurement (27.91) and the highest in the third measurement (33.41), with no statistically significant difference between the groups studied ($p > 0.05$) (Table 7).

The analysis of the average values of internal rotation in the knee shows that both in the total sample and in the individual groups studied, the lowest average values were recorded in the I measurement (11.92) and the highest in the III measurement (16.08), with a statistically significant difference in the II measurements in the form of a higher average value in the group studied II, in which HILT was applied ($p < 0.05$) (Table 8).

The average score of the KOOS symptom scale tells us the extent to which knee OA symptoms interfere with activities of daily living. The lower the score, the more limited the activities of daily living and vice versa.

TABLE 7. Analysis of average external rotation values in the knee according to measurements

External rotation measurements	*n*	AS	SD	Minimum	Maximum
External rotation-I measurement (t=−3.7501; p=0.701)					
Group I	30	27.66	4.49	20.00	35.00
Group II	30	28.16	5.49	15.00	40.00
Total	60	27.91	4.98	15.00	40.00
External rotation-II measurement (t=−1.256; p=0.267)					
Group I	30	32.33	5.37	25.00	40.00
Group II	30	30.66	6.12	15.00	40.00
Total	60	31.50	5.77	15.00	40.00
External rotation-III measurement (t=−3.574; p=0.064)					
Group I	30	34.83	4.82	25.00	40.00
Group II	30	32.00	6.64	15.00	40.00
Total	60	33.41	5.92	15.00	40.00

SD: Standard deviation, AS: Average score

TABLE 8. Analysis of internal rotation average values in the knee according to measurements

Internal rotation measurements	*n*	AS	SD	Minimum	Maximum
Internal rotation-I measurement (t=−0.391; p=0.534)					
Group I	30	11.50	5.11	5.00	20.00
Group II	30	12.33	5.21	5.00	20.00
Total	60	11.92	5.13	5.00	20.00
Internal rotation-II measurement (t=−4.462; p=0.039)					
Group I	30	13.50	4.57	5.00	20.00
Group II	30	15.83	3.95	10.00	25.00
Total	60	14.66	4.40	5.00	25.00
Internal rotation-III measurement (t=−4.619; p=0.036)					
Group I	30	15.00	3.93	10.00	20.00
Group II	30	17.16	3.86	10.00	25.00
Total	60	16.08	4.02	10.00	25.00

SD: Standard deviation, AS: Average score

The analysis of the average scores of the KOOS symptom scale shows that both in the total sample and in the individual studied groups, the lowest average scores were recorded in the first measurement (32.02), with an increase in the average scores in the measurements II (48.63) and III (56.13), and with a statistically significant difference in the measurement II in the form of a higher average score in the studied group I, that is, in the group in which HIMS was applied ($p < 0.05$) (Table 9).

The average score on the KOOS pain scale indicates the impact of pain on activities of daily living; the lower the score, the more limited the activities of daily living.

The analysis of the average scores on the KOOS – pain scale shows that both in the total sample and in the individual groups studied, the lowest average scores were recorded at the first measurement (34.07), with an increase in average scores at the second (55.23) and third (70.42) measurements, without statistically significant differences between the groups observed, ($p > 0.05$). This means that pain had a significantly greater influence on activities of daily living at the first measurement than at the second and third measurements, where the influence of pain on activities of daily living was significantly lower in both groups studied, but without a significant difference (Table 10).

TABLE 9. Analysis of knee injury and osteoarthritis outcome score-symptom scale average values

KOOS symptoms measurements	*n*	AS	SD	Minimum	Maximum
KOOS symptoms-I measurement (t=−0.057; p=0.813)					
Group I	30	31.79	7.58	17.86	57.14
Group II	30	32.26	7.93	21.43	50.00
Total	60	32.02	7.70	17.86	57.14
KOOS symptoms-II measurement (t=−4.296; p=0.043)					
Group I	30	50.24	5.93	39.29	67.86
Group II	30	47.02	6.08	25.00	57.14
Total	60	48.63	6.17	25.00	67.86
KOOS symptoms-III measurement (t=−3.246; p=0.077)					
Group I	30	54.29	6.85	39.29	64.29
Group II	30	57.98	8.88	39.29	75.00
Total	60	56.13	8.08	39.29	75.00

KOOS: Knee Injury and Osteoarthritis Outcome Score, SD: Standard deviation, AS: Average score

TABLE 10. Analysis of knee injury and osteoarthritis outcome score-pain scale average values

KOOS pain measurements	*n*	AS	SD	Minimum	Maximum
KOOS pain-I measurement (t=−0.000; p=1.000)					
Group I	30	34.07	8.96	19.44	61.11
Group II	30	34.07	6.44	25.00	41.67
Total	60	34.07	7.74	19.44	61.11
KOOS pain-II measurement (t=−0.783; p=0.380)					
Group I	30	54.07	7.92	41.67	77.78
Group II	30	56.39	11.95	25.00	77.78
Total	60	55.23	10.11	25.00	77.78
KOOS pain-III measurement (t=−0.188; p=0.666)					
Group I	30	71.20	12.02	50.00	83.33
Group II	30	69.63	15.85	44.44	97.22
Total	60	70.42	13.97	44.44	97.22

KOOS: Knee injury and osteoarthritis outcome score, SD: Standard deviation, AS: Average score

The analysis of the average scores on the KOOS – scale of activities of daily living shows that both in the total sample and in the individual studied groups, the lowest average scores were recorded during the first measurement (41.25), with an increase in the average score during the second (60.04) and III measurement (75.15) and with a statistically significant difference during the II measurement in terms of a higher average score in the studied group II ($p < 0.05$). This means that in the test Group II, in which the HILT was applied, in comparison with the test Group I, in which the high-induction electromagnetic stimulation was applied, a statistically significant improvement in the scale of activities of daily living was achieved during the second measurement (Table 11).

The analysis of the average scores on the KOOS – Sport/Recreational Activities Scale shows that both in the total sample and in the individual groups studied, the lowest average scores were recorded during the first measurement (16.60), with an increase in the average score during the second (36.88). and III (46.04) measurements and with a statistically significant difference during the II and III measurements in terms of a higher average value in the studied Group II, in which HILT was applied ($p < 0.05$), and this

TABLE 11. Analysis of average values of knee injury and osteoarthritis outcome score-scale of daily activities

KOOS activities measurements	*n*	AS	SD	Minimum	Maximum
KOOS activities-I measurement (t=−0.335; p=0.565)					
Group I	30	40.75	7.26	27.38	53.57
Group II	30	41.75	5.96	29.76	52.38
Total	60	41.25	6.60	27.38	53.57
KOOS activities-II measurement (t=−4.068; p=0.048)					
Group I	30	57.42	5.89	46.43	78.57
Group II	30	62.66	12.95	40.48	85.71
Total	60	60.04	10.32	40.48	85.71
KOOS activities-III measurement (t=−0.005; p=0.944)					
Group I	30	75.28	13.11	55.95	90.48
Group II	30	75.01	15.54	44.05	96.43
Total	60	75.15	14.26	44.05	96.43

KOOS: Knee injury and osteoarthritis outcome score, SD: Standard deviation, AS: Average score

TABLE 12. Analysis of average values knee injury and osteoarthritis outcome score -scale of sports/recreational activities

KOOS sport/recreation measurements	*n*	AS	SD	Minimum	Maximum
KOOS sport/recreation-I measurement (t=−2.855; p=0.096)					
Group I	30	14.72	8.53	0.00	25.00
Group II	30	18.47	8.66	4.17	41.67
Total	60	16.60	8.73	0.00	41.67
KOOS sport/recreation-II measurement (t=−7.420; p=0.0001)					
Group I	30	29.86	3.80	16.67	37.50
Group II	30	43.89	14.17	8.33	66.67
Total	60	36.88	12.48	8.33	66.67
KOOS sport/recreation-III measurement (t=−10.503; p=0.0001)					
Group I	30	38.19	7.51	20.83	50.00
Group II	30	53.89	17.44	20.83	87.50
Total	60	46.04	15.48	20.83	87.50

KOOS: Knee injury and osteoarthritis outcome score, SD: Standard deviation, AS: Average score

table shows a statistically significant better effect of HILT in comparison with the application of HIMS in people who practice sports/recreational activities, and the practice of sports/recreational activities is statistically significantly easier already after the second measurement (Table 12).

The analysis of the average scores on the KOOS quality of life scale shows that both in the total sample and in the individual groups studied, the lowest average scores were recorded at the first measurement (14.84), with an increase in the average score at the second (32.95) and third (41.08) measurements, and with a statistically significant difference at the II measurement in the form of a higher average score in the group studied II ($p < 0.05$) (Table 13).

DISCUSSION

The analysis of the average age of the respondents in the total sample showed that the respondents had an average age of 59.2 ± 9.74 years. The comparison between the groups shows that the respondents of the studied Group I were slightly older (59.23 ± 9.03 years) than the respondents of the studied Group II (59.17 ± 10.55). The analysis of gender structure of respondents in the sample shows that female respondents were more represented both in the total sample and in each studied group.

The analysis of the average values of body weight, height, and BMI showed that there was no statistically significant difference between the studied groups. All this indicates that the sample is homogeneous in terms of gender, age, and basic physical parameters.

The average scores on the VAS scale, both in the total sample and in the individual groups, were lowest in the III measurement and highest in the I measurement, with no statistically significant difference between the studied groups.

In 2011, Štiglić-Rogoznica et al. conducted a study on the effect of high-intensity lasers in patients with knee OA. The study was performed on a group of 96 patients, 75 women and 21 men, aged 56–66 years, with an average age of 59.2 years. Pain intensity before HILT, expressed by the VAS scale, ranged from 45 to 70 mm, mean 57 mm. After HILT, pain intensity was lower, its value ranging from 10 to 30 mm, mean 22 mm ($p < 0.001$). Patients treated with HILT showed excellent and statistically significant pain reduction. Therefore, HILT showed a very good and rapid analgesic effect in patients with knee OA. This study is in correlation with our study (33).

TABLE 13. Analysis of knee injury and osteoarthritis outcome score-quality of life average values scale according to the measurements

KOOS quality of life measurements	*n*	AS	SD	Minimum	Maximum
KOOS quality of life-I measurement (t=−0.020; p=0.889)					
Group I	30	14.72	8.53	0.00	25.00
Group II	30	15.00	6.69	6.25	25.00
Total	60	14.86	7.60	0.00	25.00
KOOS quality of life-II measurement (t=−5.893; p=0.021)					
Group I	30	29.86	3.80	16.67	37.50
Group II	30	36.04	13.80	12.50	56.25
Total	60	32.95	10.51	12.50	56.25
KOOS quality of life-III measurement (t=−3.759; p=0.057)					
Group I	30	38.19	7.51	20.83	50.00
Group II	30	43.96	14.45	18.75	68.75
Total	60	41.08	11.78	18.75	68.75

KOOS: Knee injury and osteoarthritis outcome score, SD: Standard deviation, AS: Average score

Wyszyńska and Bal-Bocheńska in their review, which included six studies, investigated the success of using HILT as a newer therapeutic modality in the rehabilitation of musculoskeletal disorders and injuries. The purpose of this study was to evaluate the efficacy of HILT in patients with knee OA, its rapid effect, rapid pain relief, and reduction in recovery time. The primary outcome analyzed in this systematic review was the reduction in pain intensity in patients with knee OA. Five studies from this review used the VAS pain scale. The research results showed that HILT was effective in reducing pain in patients with knee OA. The results of the review showed that HILT is superior to other forms of rehabilitation in reducing pain intensity and improving the functional status of patients with OA. The results of this study are consistent with the results of our work, in which we demonstrated a significant reduction in pain intensity after the second and third measurements (34).

In all three measurements, there was an improvement in the range of motion of flexion, extension, external rotation, and internal rotation with no statistically significant differences in either group studied. There was a difference in the range of motion of internal rotation in terms of higher average range of motion in the studied Group II, in which HILT was applied in 2018, Ciplak et al. conducted a study on patients who presented to the outpatient clinic of the University of Inon, Faculty of Medicine, Department of Physical Medicine and Rehabilitation due to knee pain and were diagnosed with knee OA. A total of 48 patients (33 women and 15 men, aged between 25 and 65 years, mean age 54.25 years) participated in this study. The respondents were divided into two groups of 24 participants each. The mean age of the groups was determined to be 56.91 ± 7.86 years for the first group (thermotherapy + TENS + US) and 51.62 ± 10.3 years for Group 2 (HILT + thermotherapy). A total of 10 thermotherapies, TENS, and ultrasound were applied for 2 weeks for the first group. For the second group, a total of 10 HILT therapies and thermotherapies were performed. Stretching of the quadriceps and hamstring muscles and isometric exercises were performed in both groups. The use of HILT in patients with knee OA was statistically significantly better in terms of pain and function scales compared with combined treatment withTENS and ultrasound, even when combined with exercises, can produce better results in patients with OA (35).

Analysis of mean scores on the KOOS symptom scale shows that both in the total sample and in the individual groups, the lowest mean scores were recorded at the first measurement, with an increase in the mean score at the second and third measurements, and with a statistically significant difference at the second measurement in the form of a higher mean score in the studied Group I, that is, in the group in which highly induced electromagnetic stimulation was applied ($p < 0.05$).

Pain intensity on the KOOS – pain scale decreased during

the measurements II and III, without statistically significant differences between the studied groups ($p > 0.05$).

The scores on the KOOS – scale of activities of daily living show that a statistically significant improvement was achieved in the studied Group II in comparison with the studied Group I.

Kheshie et al. conducted a study at the Department of Physical Therapy, Umm Al-Qura University in Saudi Arabia. Subjects were enrolled in the study from the outpatient department of physiotherapy and rehabilitation at AL -Noor Hospital. A total of 53 male patients with a mean age (SD) of 54.6 years participated in this study. Patients were randomly assigned to three groups and treated with HILT and exercise (HILT +EX), LLLT and exercise (LLLT+EX), and placebo laser plus exercise (PL +EX). Patients in all treatment groups received an exercise program that included active exercises, muscle stretching, and flexibility exercises. All three groups had 12 treatments, two treatments per week for 6 weeks. The aim of this randomized controlled trial was to compare the effects of LLLT and HILT on pain relief and functional improvement in patients with knee OA. It was concluded that HILT combined with exercise was more effective than LLLT combined with exercise, and both treatments were better than exercise alone in treating patients with knee OA. In this study, the results of HILT were superior to those of LLLT in pain relief and functional improvement (36).

In 2019, Song et al. reviewed the literature on the effectiveness of HILT. Six articles were included in this meta-analysis, and the average age of the studied population ranged from 54 to 65 years. Two studies included only men and one included only women. The primary endpoint of the study was pain, and secondary endpoints were knee stiffness and function. It was concluded that HILT was effective in relieving pain and improving function in osteoarthritis of the knee (37).

Comparison of mean scores on the KOOS sports/leisure activity scale in studied Groups I and II showed statistically significant improvement during the study period.

The quality of life of respondents with osteoarthritis on the KOOS quality of life scale shows an increase in the average score during the measurements II and III with a statistically significant difference during the measurement II in the form of a higher average score in the studied Group II ($p < 0.05$).

Jasenicka studied the use of SALUS TALENT especially in degenerative diseases of the musculoskeletal system. The studied sample included all patients with musculoskeletal pain and consisted of 89 patients – 28 men aged 25–71 years, average 51.5 years, and 61 women aged 32–73 years, average 55.6 years. Their work examined the effects of Salus Talent on reducing pain, edema, improving mobility and quality of life, and found that improvement often occurred after just one use. The study is consistent with our research, which found significant improvement after the second measurement following the use of Salus Talent (38).

CONCLUSION

Considering the progressiveness and irreversibility of OA of the knee, we can conclude that both methods show significant results in reducing pain intensity and symptoms of OA of the knee, improving knee joint mobility, activities of daily living, and quality of life of people with OA of the knee. The data obtained from both groups studied do not support one method, but make them appropriate physical therapy protocols for improving function and quality of life in people with knee OA.

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DECLARATION OF INTEREST

Authors declare no conflict of interest.

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