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THE EFFECT OF 8 WEEKS PILATES TRAINING ON THE TREATMENT OF PATELLOFEMORAL PAIN SYNDROME

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ABSTRACT

The purpose of this research was to determine the effect of 8 weeks Pilates training on the treatment of Patellofemoral Pain syndrome (PFPS). This study is single grouped experimental pre-post test design. Subjects were 20 male with bilateral PFPS, (25.7 ±5. 5 years old). Subjects accomplished Pilates training program for 8 weeks, 3 days a week. Paired sample T-test was used to analyze the data of the study by use of SPSS software. The result showed that 8 weeks Pilates training significantly improved PFPS, therefore knee function and knee pain has improved and decreased respectively following the treatment. It is concluded that 8 weeks Pilates training could improve PFPS. Therefore, the Pilates method behaved as a useful therapeutic tool in the increase of subject's knee function. It is hence an important alternative in the prevention as well as recovery of patellofemoral pain syndrome and related injuries triggered by the decrease of the muscular length, abnormal lower limb biomechanics, soft-tissue tightness, muscle weakness, neuromuscular imbalance between muscles and excessive exercise.

Key words: Knee, Treatment, Patella femoral pain syndrome and Pilates.

INTRODUCTION:

Patellofemoral pain syndrome (PFPS), which is one of the most common disorders of the knee, accounts for 25% of all knee injuries treated in sports medicine clinics, [2,13] Clinical assessment and treatment of this condition are extremely challenging because of the multiple forces affecting the patellofemoral joint. Wilk et al, [33] have stated that PFPS remains one of the "most vexatious clinical challenges in rehabilitative medicine." A combination of factors, such as abnormal lower limb biomechanics, soft-tissue tightness, muscle weakness, and excessive exercise, may result in increased cartilage and subchondral bone stress, subsequent PFPS, and subtle patellar malalignment or more overt patellar maltracking.

Some theories for the source of the non-traumatic, gradual onset of PFPS leading to patellar malalignment are: increased Q angle; tension on the lateral retinaculum, the hamstrings, the iliotibial band, and the gastrocnemius; excessive pronation of the subtalar joint,[26] increase in lumbar lordosis; history of ankle dislocation; and increase in medial hip rotation, which causes joint torsion,[14] However, the most acceptable hypothesis for this malalignment is the abnormal lateral tracking of the patella,[23] which happens due to a neuromuscular imbalance between the vastus medialis obliquus (VMO) and vastus lateralis (VL) muscles and leads to a decrease in the activation of the VMO muscle,[9]

Patellofemoral pain syndrome presents as diffuse anterior or retropatellar knee pain in the absence of other pathology exacerbated by activities such as stair climbing, prolonged sitting, squatting, and kneeling. It is a common complaint in the sport and general populations, especially where repetitive lower limb loading is involved.[12,15]

Despite the prevalence of PFPS, its etiology is not well understood. The most commonly accepted hypothesis is the abnormal lateral tracking of the patella, [22,34] Patellar tracking is the outcome of an interaction between passive structures, muscle, and the neuromotor control systems. Commonly, treatment aims to restore the equilibrium of the patellar tracking system, [25,34]

The flexibility of the hamstrings, quadriceps, and gastroc/soleus complex has been associated with PFPS, [21,32,35] Researchers have suggested that PFPS is related to muscular weakness in the hip, causing lateral patellar tracking caused by poor eccentric strength and control of Hip abductors and external rotators,[20,29]

Different conservative treatment approaches have been reported; however, exercise therapy is widely accepted and routinely applied as the main treatment method,[1,5,28] There are different hypotheses of the biomechanic and neurophysiology contributing mechanisms of the beneficial effect of exercise therapy,[6,8,17,22,27,28] Good clinical results have been shown with quadriceps strengthening, with both open and closed kinetic chain exercises,[5,6,22,31]

It is believed that Pilates-based physical therapy is gaining momentum in the rehabilitation community as an effective treatment approach for diagnoses related to postural dysfunction, poor

movement patterns, joint instability, and muscular imbalance. Pilates-based therapeutic exercises and principles are used in conjunction with traditional physical therapy methods to increase proprioception, coordination, balance, control, strength, flexibility, stability, and mobility. These exercises are very versatile and adaptive and can be used to effectively treat patients regardless of age, ability, or fitness level. The techniques have been successful in rehabilitating patients with the following diagnoses: scoliosis, glenohumeral instability, impingement, rotator cuff tendonitis, thoracic outlet syndrome, chronic sprain/strains, herniated cervical and lumbar discs, spondylolisthesis, incontinence and pelvic floor dysfunction, patellar tracking problems, fibromyalgia, and musculoskeletal problems related to pregnancy, and many others.

The Pilates training intends to improve the general flexibility and aims at health through the 'strength center' of posture and breathing coordination with the performed movements. The method is based on six principles with the purpose to consciously move with no fatigue or pain. These principles are: breathing, control, concentration, articulatory organization, movement flow and accuracy, [24] It is a method which works with muscular exercises of low contraction impact, intensely strengthening the muscles,[16] However, even with its benefits, little is published on this therapeutic modality, especially in athletes.

Thus, the aim of the present study was to determine the effects of 8 weeks, Pilates training on the treatment of Patellofemoral Pain syndrome in male between 20-30 years old.

It was hypothesized which 8 weeks Pilates training will significantly improves Patellofemoral Pain syndrome.

SAMPLE:

Twenty male (25.7 ±5.5 years old) with bilateral PFPS were participate in this research (n=20). Each participant read and completed an informed consent form and completed the American Heart Association and American College of Sports Medicine Pre Participation Screening Questionnaire prior to the onset of the study. To subjects were given an oral and written overview of the study.

METHODOLOGY:

50 participants were referred by outside orthopedic surgeons, and 20 fulfilled the eligibility criteria. Inclusion criteria were bilateral anterior knee pain for 6 to 12 months and at least 3 of the 4 following clinical criteria: pain associated with prolonged sitting with bended knees, descending stairs, kneeling and squatting, or sports activities.

Exclusion criteria were clinical evidence of patellar dislocation or subluxation, periarticular bursitis or tendonitis, ligamentous instability, or intra-articular pathology. Before beginning therapy, all patients were thoroughly clinically examined.

Those who did not reveal any obvious reason for a systemic disorder like patellar or lower-extremity alignment problems or benign joint hypermobility syndrome were not excluded. To rule out osteoarthritic changes or hypoplastic femoral trochlea, radiographs were performed.

Additional exclusion criteria were: a history of knee surgery, or oral or intra-articular administration of drugs within the last 3 months.

The study was approved by the local ethics committee. All subjects provided written informed consent.

Prior to testing, the subjects were weighed and their height measured using an electronic body scale tool made in Satrap co –Iran.

Outcome Measures-

The assessments were performed before treatment with follow- ups after 8 weeks of training.

Assessment of pain-

Patellofemoral pain was assessed with a VAS comprising a 10-cm line, with 0 representing no pain and 10 representing worst pain. The reliability of VAS scoring in patients with PFPS is established through a number of studies, showing intraclass correlation coefficient (ICCs) of .60 to .79 for usual pain and .88 for worst pain,[7,10] A weaker ICC of .66 was reported for activity dependent VAS,[10] In this study, we used VAS scores for 2 different conditions: VAS 1, average pain with activities of daily living (descending stairs, prolonged sitting, kneeling, or squatting), and VAS 2, pain during sports activities (walking, jogging, jumping). The VAS scores were performed 3 day before treatment and after 8 weeks of treatment.

Assessment of function-

The Kujala patellofemoral score (KPS), which is a valid and reliable tool in scoring patellofemoral disorders, [18] was used to assess knee pain and function. This KPS scoring system is valid in the evaluation of patients with PFPS, with an intraclass reliability correlation coefficient range of .90 to .98, [3,10]

Training Protocol-

Pilates training program was made following the six Main principles:

1. Centering is the foundation of all movements, requiring core muscle stabilization prior to initiating arm or leg movements.
2. Control refers to the ability to monitor the movements, while performing them with the correct mindful intent, from the appropriate muscle groups.
3. Precision relates to the focus on completing an exercise using the proper form and execution.
4. Concentration places form and the mental fortitude to perform an exercise as the focal point.
5. Breath refers to maintaining proper breathing techniques crucial to performing these exercises (Inhalation is used to prepare for the movement and exhalation is used to execute the movement, activate core muscle support, and intensify the movement).
6. Flow is the connection of one movement to the next and is developed over time as the patient becomes familiar with the exercises, [30]

Subjects did lower extremity Pilates exercises for three days a week during 8 weeks. All Pilates sessions were given and supervised by the same experienced physiotherapist. The Pilates exercise program was developed by the researchers of the study, based on Levine et. al.'s Pilates training, [19] Each session lasted one hour. The class consisted of 20 minutes warm up and cool down (10 minutes before and 10 minutes after the exercises) and 40 minutes (increased gradually from 20 minutes) of Pilates exercises. The repetitions of Pilates exercises were increased gradually from 5 repetitions. In the second week the participants did 6 repetitions, in the third week 7 repetitions and in the fifth week 8 repetitions were done. Between the sixth and eighth weeks, the participants performed 10 repetitions. Pilates exercise program is illustrated in Table 1. Subjects were told not to change their lifestyle and not to participate a regular exercise

program or a sport, during the study. Additionally they've been checked periodically by researches.

Table 1. Pilates training protocol

	Exercises
Week 1	Hundreds 1/2/3
Week 2	Week 1 + One leg stretch 1, Double leg stretch 1/2, Clam
Week 3	Week 2 + One leg stretch 2, Shoulder bridge 1
Week 4	Week 3 + Shoulder bridge 2, Hip twist
Week 5	Week 4 + Scissors 1, One leg kick
Week 6	Week 5 + Scissors 2, Side kick 1
Week 7	Week 6 + Side kick 2, One leg circle ½
Week 8	Week 7

Analysis of data: Descriptive statistics were obtained on all measures. Inferential statistics with paired sample t-test assessed differences due to the effect of 8 weeks Pilates training on the

treatment of Patellofemoral Pain syndrome. SPSS 18 was used for all analyses with α=0.05 used as the level of significance.

FINDING AND CONCLUSION:

Analyzing the results of the data showed that there is significant deference in the VAS max and KPS in the post-test as compared to the pre-test in response to Pilates training.

Table 2: Demographic Data of Patients	
Age (y)	25.7 ±5.5
Height (cm)	169.8 ±4.9
Weight (kg)	67.5 ±8.2

Table 3: Change in Measures Maximum Values of VAS and KPS (Mean ±SD)

	Before Treatment	After Treatment	T	Sig
VAS max	5.63 ±1.6	1.40 ±0.7	19.06	*0.00
KPS	82.45 ±5	89.20 ±3	-7.3	*0.00

The results of this study show that there is significant difference in VAS max and KPS was observed in post-test as compared to pre-test in response to Pilates practice, hence H0 is rejected, and therefore Pilates training can reduce of pain and improvement of function during 8 weeks in patients with PFPS.

Results of the study support findings of Thomeé (1997),[27] Crossley(2002),[11] Boling(2006),[5] and Bily et al.(2008)[4]

It was not possible to have a control group with sham treatment because of the methodological limitation of our treatment protocol to be applied as sham therapy. Furthermore, it was also not possible to have a control group without therapy because patients were referred from outpatient

orthopedic programs for treatment; therefore, it was not acceptable to withhold them from therapy.

It is concluded with the present study that the training protocol in the Pilates method applied by the researchers was able to improve knee function and decreased patellofemoral pain of subjects. Such program presented acute effects, represented by the statistically increase of knee function (KPS) and reduction of knee pain (VAS) due to strengthening of knee extensors, hip abductor and lateral rotator muscles , improve flexibility of thigh muscles and patella alignment.

Therefore, the Pilates method behaved as a useful therapeutic tool in the increase of subject's knee function, it is hence an important alternative in the prevention as well as recovery of patellofemoral pain syndrome and related injuries triggered by the decrease of the muscular length, abnormal lower limb biomechanics, soft-tissue tightness, muscle weakness, neuromuscular imbalance between muscles and excessive exercise.

Further studies should be conducted with the Pilates method in order to elucidate all the possibilities of application of this therapeutic modality.

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