



## The Effect of Pilates Exercise on Improvement of Functional Performance Tests in Young Male with Patello-Femoral Pain Syndrome

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### Abstract

**Aim:** The study of the effect of Pilates exercise on improvement of functional Performance tests in young male with PFPS was the main purpose the present study.

**Material and Methods:** The 11-young male (age: 26.41±1.04yr, height: 177.37±3.21cm, and weight: 177.37±3.21kg) with PFPS, as exercise groups, performed the Pilates exercises for ten weeks, three sessions per week and one hour per session. Functional performance tests (Step-down, left and right and Single-leg press) was assessed. All data were analysed using SPSS and the statistical significance level was set at  $p<0.05$  and  $p<0.001$ .

**Results:** The result of analysis indicated that significant difference found between pre- and post-test in exercise group in Step-down test ( $t=9.79$ ,  $p<0.001$ ) and Single-Leg Press ( $t=8.86$ ,  $p<0.001$ ) test.

**Conclusion:** According to the results of the present research, it could be concluded that for improvement of daily activities and functional performance in young male with PFPS, Pilates exercise method is recommended.

### Keywords

Pilates Exercise,  
Young Male,  
PFPS,  
Step-Down,  
Single-Leg Press

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## INTRODUCTION

Anterolateral ligament of the knee pain associated with excessive compression between the patella and the lateral femoral condyle is known as patellofemoral-pain syndrome (PFPS) (Loudon and et al., 2004). PFPS is a common problem among adolescents and young adults, characterized by retro patellar pain (behind the kneecap) or peripatellar pain (around the kneecap) when ascending or descending stairs, squatting or sitting with flexed knees (Witvrouw and et al., 2005). Quadriceps muscle forces play a crucial role in determining the medial-lateral force balance, contact force, and pressure distribution of the patellofemoral joint (Elias and et al., 2006). The weakness in the hip musculature could lead to increased femoral adduction and medial rotation during dynamic weight-bearing activities, which would increase the lateral patellofemoral joint vector, leading to patellar facet overload (Frye and et al., 2012).

Physical therapy plays an important role in the conservative management of PFPS, with treatment frequently advocated for pain control and muscle strengthening (Harrison and et al., 1995). Exercise therapy has consistently been found to be effective in reducing pain in patients with PFPS, with programs traditionally focusing on improving quadriceps strength and vastus medialis obliquus function (Peters and Tyson, 2013). Suggested additional hip-strengthening exercises to patients with PFPS in order to decrease pain and increase functional status (Şahin and et al., 2016). The addition of kinesio taping to the conventional exercise program does not improve the results in patients with PFPS, other than a faster improvement in hamstring muscle flexibility (Akbaş and et al., 2011).

Pilates is an exercise approach developed that is based on body-mind spirit interaction combined with biomechanics, motor learning, and core stability (Latey, 2002). During a Pilates exercise session, mental effort focuses on activating specific muscles in a functional sequence at controlled speeds, emphasizing quality, precision, and control of movement with specific attention to breathing and proprioception (Kloubec, 2010) and it is a term used to describe any of the exercises that were developed by Joseph Pilates, and appears to be popular across a range of age groups (Kaesler and et al., 2007). The Pilates method is designed to stretch and strengthen muscles and improve coordination (Pilates and Miller, 2003). The Pilates method focuses on building motions and activities that helps to

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strengthen minor muscles, which, in turn, helps to strengthen major muscles (Mohammadi and et al., 2015). Hence, the purpose of this study is to examine the effect of Pilates exercise on improvement of functional Performance tests in young male with PFPS.

## METHOD

**Participants:** The 11-young male with PFPS participating in this study. Each participant was questioned about their past medical history and present health status. The participants received a stipend to cover their travel expenses and time. Prior to the study, procedures and guidelines were presented orally and in written form. Participants agreeing to participate signed an institutionally approved consent form.

**Step-Down Test:** The step-down is a unilateral test performed from a platform 6 inches (15.24cm) high. Participants step forward and down toward the floor. The down limb only brushes the floor with the heel and then returns to full knee extension. This counts as one repetition. Each repetition must be completed such that the step limb is not used to accelerate back onto the step. The number of repetitions the participants performs in 30 seconds is recorded. Both limbs are tested (Loudon and et al., 2002).

**Single-Leg Press Test:** Participants are positioned at level 7, which is considered to be 50% of the participant's body weight. Participants begin with the test knee in full extension. One repetition consists of a complete cycle of full knee extension to 90° of knee flexion and return to full knee extension. The number of unilateral squats completed in 30 seconds is recorded. Both limbs are tested (Loudon and et al., 2002).

**Experimental Design:** Measuring of variables was performed before (pre-test) and after (post-test) the protocol. The experimental group participated in Pilates exercise program for ten weeks, three sessions per week and one hour per session, during the study. Each exercise session consisted of 20 minutes of warm up (10 minutes) and cool down (10 minutes) and 40 minutes of Pilates exercises. The Pilates method exercises were taught and performed on exercise mats and tables in the research area. In Pilates exercise, there are different equipment's to use for different aims (Mohammadi and et al., 2015). We used thera-band or elastic bands, and Pilates or exercise ball. Modified Pilates based exercises were divided three parts, in first part (4 week), mat exercises (Pilates and Miller, 2003), in the second part (3 week), thera-band exercises and in the third part (3 week), Pilates ball exercises were performed (Irez and et al., 2011). Pilates exercise was performed by the participants on an informal schedule and were not under the supervision of a coach or athletic trainer. Functional performance tests (Step-down, left and right and Single-leg press) was assessed. Prior to the testing, a standardized 5 min warm-up was completed. Functional performance tests specific to PFPS should include weight bearing stress with various knee flexion angles because these are common aggravating positions and require dynamic muscular control. The step-down mimics the function of stair descent, a common aggravating factor. A single-leg press test was chosen to stress the patellofemoral joint in a partial weight-bearing mode (Loudon and et al., 2002).

**Analysis of Data:** All data were analysed using SPSS version 19. Descriptive statistics were presented as mean and standard deviation. The data were tested for normal distribution with the Shapiro-Wilk test. The Independent t-test and paired sample t-test was used to compare the differences between the pre- and post-test in both groups. The statistical significance level was set at  $p < 0.001$ .

## RESULTS

The age, height and weight for experimental groups of participants are presented in Table 1.

**Table 1.** Descriptive statistics of Experimental groups (Mean  $\pm$  SD).

Experimental Group (n=11)	
$\bar{X} \pm SD$	
Age (yr.)	26.41 $\pm$ 1.04
Height (cm)	177.37 $\pm$ 3.21
Weight (kg)	75.84 $\pm$ 1.39

Table 2 presents compares of pre- and post-test for Step-Down and Single-Leg Press test variable in both groups. The result of analysis indicated that there was significant difference in pre- and post-test in Step-Down test. It means the mean of Step-Down test was significantly ( $p < 0.001$ ) higher in post-test than pre-test ( $p < 0.001$ ).

**Table 2.** T-test for comparing Step-Down and Single-Leg Press Test data of participants in the pre- and post-test in two groups.

Tests	Pre-Test $\bar{X} \pm SD$	Post-Test $\bar{X} \pm SD$	D.F.	t	p
Step-Down	15.79±1.29	19.72±1.63	10	9.79	0.000*
Single-Leg Press	14.71±1.28	18.16±0.63	10	8.86	0.000*

\*Significance level set to:  $p < 0.001$

The result of analysis also indicated that significant difference found between pre- and post-test in experimental group in Single-Leg Press test variable ( $p < 0.001$ ). Single-Leg Press was significantly lower in pre-test than post-test (Table 2).

## DISCUSSION

Conservative treatment of PFPS has focused on numerous techniques including vastus medialis oblique (VMO) training, taping, knee bracing, biofeedback, nonsteroidal anti-inflammatory medication (NSAIDs), and muscle balance (Latey, 2002). Functional performance tests that are specific for PFPS should be chosen based on clinical evidence and the case of replication among clinics and facilities (Loudon and et al, 2002).

The ultimate goal of rehabilitation for patients with PFPS is return to the highest functional level in the most efficient manner (Loudon and et al., 2002). The objective of the study was to assess the effects of Pilates exercise which target at reducing knee pain and improving knee function for young male with PFPS. The results of the present research are consistent with previous findings indicating an improvement of motor functions in elderly adults after conducting a Pilates exercises period (Mohammadi and et al., 2015).

In the scientific literature for Pilates exercise, there is no valid data regarding the length of Pilates exercise program (Mohammadi and et al., 2015). We carried out 10-weeks program and found a significant difference in improvement of daily activities and functional performance in young male with PFPS. Therefore, we may suggest that this length of the training program could be sufficient to gain improvements for functional tests in young male with PFPS. In this study, we used resistance bands and found a positive effect on muscle strength within the exercise group. In contrast to their study, we also added exercise ball or the Pilates ball exercises to the Pilates exercise program. For this study, medial knee taping was used in participants who noticed a decline in pain symptoms with a step-down test.

Functional testing is an attempt to evaluate the knee joint under conditions that mimic realistic functional demands. The tests should be time efficient and simple to perform with minimal instruction; they should require minimal staff training and be conducted within a clinical setting. Functional performance tests that are specific for PFPS should be chosen based on clinical evidence and the case of replication among clinics and facilities (Loudon and et al., 2002).

Exercise therapy is frequently used in the treatment of patellofemoral pain syndrome and is believed to be an effective means in reducing pain and restoring function of patients. The review provides evidence that exercise therapy is beneficial for patients with patellofemoral pain syndrome when compared to no treatment (Latey, 2002).

Activities of daily living are composed of static and dynamic conditions such as sitting or walking (Mohammadi and et al., 2015). Our study reports a significant increase in functional Performance tests after the Pilates exercise in young male with PFPS. These findings supported previous findings in relevant literature. One goal of the present study was the effect of the Pilates exercises on functional tests in young male with PFPS, the results of this study revealed that a significant increase in Step-down, left and right and Single-leg press after the Pilates exercise in young

male with PFPS, which supported previous findings (Loudon and et al., 2004; Loudon and et al., 2002) in the relevant literature.

The main aim of the study was to investigate whether individuals improved because of the Pilates exercises, which the results of the present research indicated, was an improvement in functional Performance tests in experimental group.

## CONCLUSION

According to the results of the present research, it could be concluded that for improvement of daily activities and functional performance in young male with PFPS, Pilates exercise method is recommended.

## PRACTICAL APPLICATIONS

Therefore, we can recommend Pilates exercises to be included in designing training programs for young male with PFPS.

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