

Targeted exercise program for patients with patellofemoral pain

The exercise session consisted of general and specific warm-up, main part (strengthening exercises) and cool-down (static stretching). The general warm-up consisted of five minutes of light aerobic activities with low impact (walking, jogging, crawling) followed by dynamic stretches for ankle, knee, and hip muscle groups. Participants performed ten slow repetitions through the entire range of motion. Then, kinesthetic-based exercises were used to train lumbar spine position, hip position (avoiding "pelvic drop"), knee position (avoiding knee valgus in front of a mirror or in pairs), and ankle position (avoiding foot pronation and knee valgus) in two sets of ten slow concentric repetitions. In the cool-down part of the session, static stretching (one set of 30-second hold in the passive end range of motion) was performed for lower extremity muscles identified as having flexibility deficits. Individually prepared home-based strengthening, balance and stretching exercises were also discussed. To ensure that exercise performance was mastered, the home exercise program was based on the same selection of strength and balance exercises, intensity, and volume as exercises performed during supervised sessions. The only exception was stretching, which was performed in three 30-second sets.

	Week 1-2	Week 3-4	Week 5-6	Week 7-8	Load
	Front plank (knees and forearms)	Front plank (knees and forearms; elbows pulling down towards knees)	Front plank (toes and forearms)	Front plank (toes and forearms; elbows pulling down towards knees)	
					
Core strengthening exercises	Prone trunk extension	Prone trunk extension (hands behind the head)	Prone superman	Prone trunk extension; hands above the head	3x80% of maximum time isometric hold (i.e. approx. 30s) rest: 60s
					
	Side plank (knee and forearm); left and right side	Side plank (knee and forearm; elbows pulling down towards knees); left and right side	Side plank (foot and forearm); left and right side	Side plank (foot and forearm; elbows pulling down towards knees); left and right side	
					

Deadlift (6-14 kg kettlebell)



Deadlift (two 6-14 kg kettlebells)



Single leg deadlift (6-14 kg kettlebell)



Single leg deadlift (two 6-14 kg kettlebells)



Side lying hip external rotation (miniband around knees)



Banded side walk (miniband around knees)



Side lying hip raise and abduction



Medicine ball (2-3 kg) lunge with trunk rotation to the same side as the lunge leg



Hip, knee and ankle strengthening exercises

Squat (up to 45° of knee flexion)



Goblet squat (up to 45° of knee flexion)



Box step up (up to 45° of knee flexion)



Box step up (6-14 kg kettlebell; up to 45° of knee flexion)



Bilateral heel raises



Bilateral heel raises (6-14 kg kettlebell)



Standing single leg heel raises



Standing single heel raises (6-14 kg kettlebell)



3x80% of maximum number of slow concentric repetitions (i.e. approx. 12) rest: 60s

Lunge (up to 45° of knee flexion)



Lunge with 6-14 kg kettlebell (up to 45° of knee flexion)



Bulgarian squat (up to 45° of knee flexion)



Bulgarian squat with 6-14 kg kettlebell (up to 45° of knee flexion)



Bilateral toe raises, wall support with the free arm



Bilateral toe raises (6-14 kg kettlebell); wall support



Standing single leg toe raises; wall support



Standing single leg toe raises (6-14 kg kettlebell); wall support



Single leg stance on the Airex pad; knee extended



Ball toss in single leg stance on the Airex pad; knee extended



Medicine ball (2-3 kg) trunk rotations in single leg stance on the Airex pad; knee extended



Single leg stance on the Airex pad; knee extended, eyes closed



Ankle, knee and hip targeted balance exercises

3x20s;
rest: standing on the other leg

Single leg stance on the Airex pad; knee flexed up to 45°

Ball toss in single leg stance on the Airex pad; knee flexed up to 45°

Repetitive forward landing on the Airex pad with 3s hold

Repetitive lateral landing on the Airex pad with 3s hold



Single leg kneeling on the Bosu ball; hip flexed up to 20°



Single leg stance on the Bosu ball; knee and hip flexed up to 20°



Ball toss in single leg stance on the Bosu ball; knee and hip flexed up to 20°



Single leg stance on the Bosu ball; knee and hip flexed up to 20°, eyes closed

