Strength Training for the Knee

This handout is to help you rebuild the strength of the muscles surrounding the knee after injury. It is intended as a guideline to help you organize a structured approach to strengthening the knee.

Precautions When Exercising

- Avoid pain at the patellar tendon
- Avoid pain and/or crepitus (grinding) at the patella (kneecap)
- Build up resistance and repetitions gradually
- Perform exercises slowly, avoiding quick direction change and impact loading
- Exercise frequency should be 2 to 3 times a week for strength building
- Be consistent and regular with the exercise schedule

Before Staring Your Workout

- Warm-up prior to exercising by stationary cycling, elliptical machine or treadmill walking uphill
- You are "warmed – up" when you have started sweating
- Gently stretch all muscle groups next (see attachment for recommended stretches)
- Do exercises involving multiple muscle groups first and individual muscle groups last
- Do aerobic workouts ***after*** strength workouts
- Cool-down by stretching after exercise

Progressive Resistance Exercise (PRE) Principle

- To build muscle strength and size, the amount of resistance used must be gradually increased
- The exercises should be specific to the target muscles
- The amount of resistance should be measurable and gradually increased over a longer period of time
- To avoid excess overload and injury, the weight or resistance must be gradually increased in increments of 5 to 10 %
- Resistance can be increased gradually every 10 to 14 days when following a regular and consistent program
- Adequate rest and muscle recovery between workout is necessary to maximize the benefit of the exercise
- If the PRE principle is followed too strictly, the weights potentially will go higher and higher
- At a certain point, the joints and muscles will become overloaded and injury will occur
- This eventuality can be avoided by refraining from using excessive weight during strength training

Basic Knee Strengthening Program

Emphasis is to build muscle strength using BOTH legs. Progress according to the PRE principle

Frequency: 2 to 3 times per week, 3 sets of 10-15 repetitions

Basic Program Exercises (see illustrations at the back of the handout)

- Leg Press
- Hamstring Curl
- Knee Extension Machine
- Wall Slides (hold dumbbells for resistance)
- Roman Chair (hold dumbbells for resistance)
- Chair Squat
- Calf Raises
- Hip Abductor/Adductor machine
- Step Up/Down (see attachment for progression)

If you do not have access to gym equipment, the following exercises can be substituted using ankle weights (see illustrations and instructions attached):

- Straight leg raise
- Short-arc lift
- Side lying abduction
- Standing hamstring curl
- Toe raises

In General, the Basic Knee Strengthening Program is good for most people who are active recreationally, but who do not participate in running and jumping sports. For people who will participate in running and jumping sports, the following Advanced Knee Strengthening Program can be used to develop a higher level of knee strength.

Advanced Knee Strengthening Program

Emphasis is to continue to build muscle strength using both legs and progress to Advanced Exercises using the Single leg. These exercises are integrated with the exercises from the Basic Knee Strengthening Program.

Frequency: 2 to 3 Times per week, 3 sets of 10 repetitions

The following single leg drills are integrated into the workout on a rotating basis:

- Step Up/Down
- Single Leg Wall Slide
- Single Leg Squat (see attachment for progression of single leg drills)

When starting the new single leg drills, start with 3 sets of 5, and add one repetition per set, per workout until you can do 3 sets of 10. When 3 sets of 10 are easy and pain free, then you can hold dumbbells to increase resistance and strength.

So that the Advanced Knee Strengthening Program would be as follows:

- Leg Press
- Hamstring Curl
- Knee Extension Machine
- Wall Slides (hold dumbbells for resistance)
- Roman Chair
- Chair Squat (hold dumbbells for resistance or barbells)
- Calf Raises
- Step up/down
- Alternate workouts with single leg wall slide and single leg squat

Precautions:

Knee extension machine (quadriceps extensions): while providing effective exercise for the quadriceps muscles, this exercise places high levels of stress on the kneecap joint. Please use caution and stop using this machine if you are experiencing any pain, clicking or grinding in the knee.

Roman Chair: to avoid injury, proper technique with good abdominal and low back control is very important with this exercise. Do not perform this exercise if you have a history of low back injury or are experiencing any low back pain.

The following exercises can cause injury and should be performed with caution:

- Stairmaster or stair climber machines
- Lunges
- Squats beyond 90 degrees of knee flexion
- High impact and plyometric exercises

Leg Press

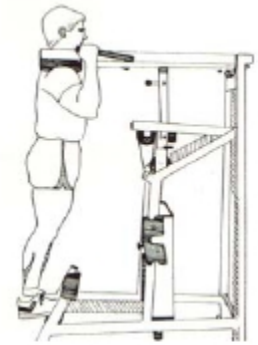
Hamstring Curl

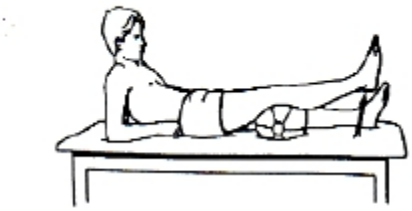
Knee extension

Abductor-Adductor

Calf Raise

Roman chair

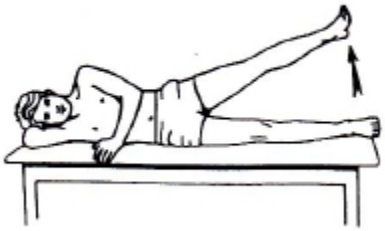




Straight leg lift

short arc lift

standing hamstring curl



Side leg lift

toe raises

calf stretch

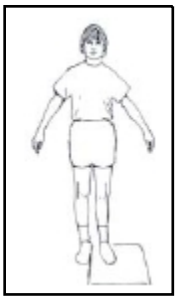
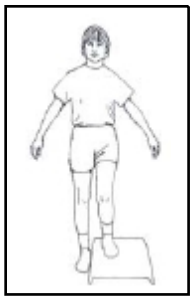
Quadriceps stretch

hamstring stretch

ITB stretch

Instructions for Single Leg Exercises

Step Up-Down Exercise

Place one foot on the step. Maintain balance, if necessary, by holding onto the wall or chair. Standing **sideways** to the step, slowly step up onto the step and slowly straighten the knee using the quadriceps muscles. Slowly lower the opposite foot to touch the floor. Do not land on the floor, just touch gently and repeat the step up.

Start with a step of 2 or 3 inches in height. Start with 3 sets of 5 repetitions. Add one repetition per set, per workout, until you can do 3 sets of 10. If pain free, progress the height of step. Repeat progression at new step height, starting with 3 sets of 5 repetitions

To avoid overstressing the kneecap, limit exercise to step height no greater than the height of a normal stair (8-9inches). At this point, you can begin to add the single leg wall slide exercise. The strength workouts should be practiced 3 times a week (every other day).

Single Leg Wall Slide Exercise

Stand on the single leg with your back and buttocks touching a wall. Place the foot about 6 inches from the wall. Slowly lower your body by bending the knee and slide down the wall until the knee is flexed about 45 degrees (illustration). Pause five seconds and then slowly slide back up to the upright starting position. Keep the hips level and be sure you are using your knee muscles to perform the exercise.

Start with 3 sets of 5 repetitions. Add one repetition per set, per workout, until you can do 3 sets of 10. At this point, you can begin to add the single leg squat exercise.

The strength workouts should continue every other day at the most, with more time between workouts if the knee gets sore after a session. Continue doing the step-up exercise each workout. Alternate the workouts between the single leg wall slide and the single leg squat.

Single Leg Squat Exercise

Stand on one leg and lower your buttocks toward the chair. Slowly return to the standing and starting position. Remember to keep your head over your feet and bend at the waist as you descend. You do not have to squat all the way to the chair, instead, try to stay in a comfortable range of motion where there is no knee pain. As you gain strength, try to do the exercise without holding on to anything.

Start with 3 sets of 5 repetitions. Add one repetition per set, per workout until you can do 3 sets of 10.

After working up to the point where you can do 3 sets of ten of all three drills, you can hold dumbbells to add resistance. Start with 3 pounds in each hand and add 1 to 2 pounds a week until you reach 10 pounds in each hand. When you return to sports or recreational activities, decrease the strength workouts to 2 times a week and do 1 set of 10 of each of the three drills only, as a maintenance workout.

Document originally from:

Massachusetts General Hospital- Department of Orthopaedic Surgery. "Sports Medicine Service Rehabilitation Protocols" .Web. accessed July 20, 2013. <http://www.massgeneral.org/ortho/services/sports/rehab.aspx>.