

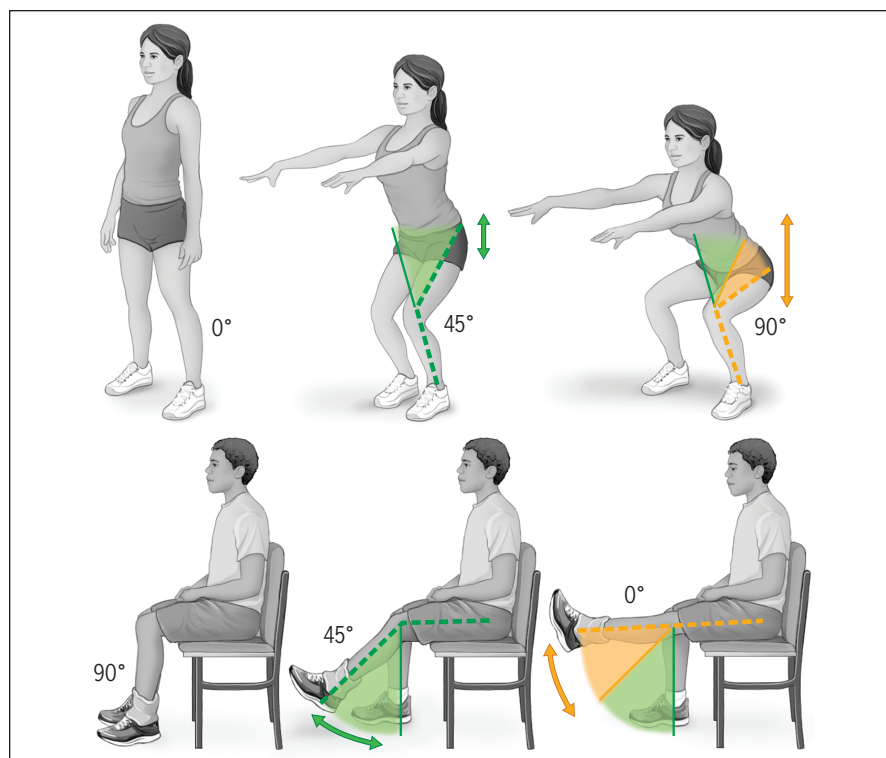
Knee Pain

Safely Strengthening Your Thigh Muscles

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Quadriceps are the muscles on the front of your thigh that help you straighten your knee. When these muscles are not strong, you may feel pain under your kneecap. Quadriceps can be strengthened by performing squats and leg extensions. However, when you do not perform these exercises properly, you may also feel knee pain. Understanding the load and stress under the

kneecap when you execute squats and leg extensions can help you perform these exercises better and with less pain while you strengthen your quadriceps. A study published in the May 2014 issue of *JOSPT* provides information intended to help physical therapists and their patients use these exercises to strengthen thigh muscles while minimizing the load under the kneecap.



EXERCISES TO TREAT KNEE PAIN. Squat: Stand with your feet shoulder width apart and toes pointing forward. To minimize load under the kneecap, only squat halfway between the standing and sitting positions (0°-45°), then stand back up. **Leg extension:** Sit with good posture. To minimize load under the kneecap, straighten the leg halfway (90°-45°), and then lower the leg back down to the floor. **Repetitions and sets:** Perform exercises based on the guidance provided by your physical therapist. **Progression:** As you strengthen the quadriceps muscle in your thigh, your knee will become less painful and you will be able to squat safely from 0° to 90° and extend your leg from 90° to 0°.

This Perspectives article was written by a team of *JOSPT*'s editorial board and staff, with Deydre S. Teyhen, PT, PhD, Editor, and Jeanne Robertson, Illustrator.

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NEW INSIGHTS

In this study, 10 healthy individuals performed both exercises. When doing the squat exercise, each participant began in a standing position with knees straight (0° of knee flexion), feet shoulder width apart, and toes facing forward. The individual then squatted until the knee joint was bent to 90°. This angle is similar to the angle of the knee when a person sits in a chair. The study participant then performed the leg extension exercise, sitting with good posture so that the knee and hip joints were both at 90°. The individual brought the leg up until it was parallel to the floor and the knee was straight (0° of knee flexion). The researchers used mathematical models to determine load and stress under the kneecap. They found that squatting halfway down (0°-45°) in the squat exercise and straightening the knee from 90° to 45° in the leg extension exercise produced the least amount of load under the kneecap.

PRACTICAL ADVICE

Limiting knee motion during strengthening exercises can help decrease the load under the kneecap. When starting a new exercise program for knee pain, your physical therapist may tell you to begin with "quarter squats" (0°-45°). Performing a quarter squat requires that you move just halfway between the standing and sitting positions. When doing leg extensions to strengthen your quadriceps, your therapist may tell you to start in the seated position and only straighten your leg halfway (90°-45°). Restricting motion in these exercises can help minimize the pain while doing them. As your quadriceps become stronger and you feel less pain under your kneecap, your therapist will increase the amount of motion that you can safely perform. Eventually, you should be able to do these exercises fully without pain. Your physical therapist can determine how you can safely strengthen your quadriceps to help treat your knee pain.

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