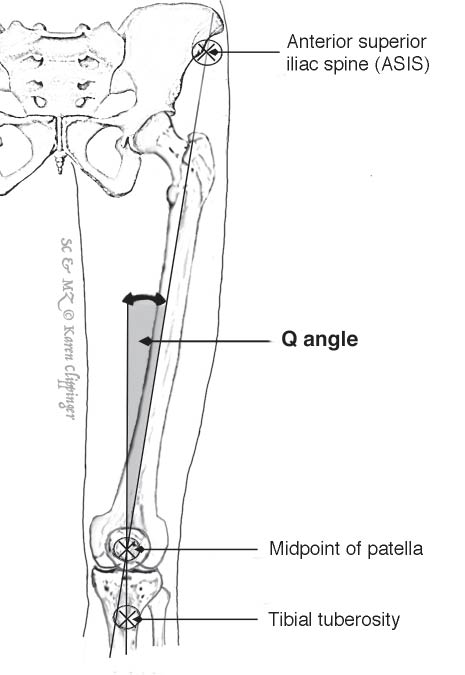
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Alignment and Movement Analysis Lab  
for the Knee Region

# A. The Q Angle (Tests and Measurements 5.2, page 181)

*Working in pairs, have your partner sit with the legs extended to the front while you draw the Q angle and note the movement of the patella, using Tests and Measurements 5.2 for reference. When you have completed steps 1 and 2, reverse roles.*

1. Q angle measurement  
   Draw an X in ink on the tibial tuberosity and another X on the midpoint of the patella of your partner, who is sitting with legs extended to the front. Then, draw one line from the midpoint of the patella upward, in line with the anterior superior iliac spine of the pelvis. Draw a second line starting from the tibial tuberosity, going through the midpoint of the patella and continuing about 3 inches (7.6 cm) past the patella. The angle that is described with its apex at the midpoint of the patella is the Q angle. Estimate this angle in terms of degrees.  
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2. Lateral tracking of the patella  
   With your partner’s legs still extended to the front, instruct your partner to slowly tighten the quadriceps, focusing on pulling the kneecap up toward the waist without letting the knee move backward into hyperextension. While your partner keeps the quadriceps contracted, draw an X on the new midpoint of the patella and note any lateral movement from the original X on the midpoint of the patella (lateral patellar tracking).  
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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1. Variability of Q angles and lateral tracking of the patella  
   Compare the Q angle and lateral tracking of your patella to that of your partner and several other class members. Note the variability and whether the tendency for men to have smaller Q angles than women holds in the students observed.  
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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2. What is the practical significance of these observations to injury risk and preventive measures? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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# B. Knee Alignment (figure 5.11, page 175, and Tests and Measurements 5.1, page 176)

Observe your partner from the front, side, and back and notice whether any of the following knee alignment deviations are present: genu valgum, genu varum, genu recurvatum.

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# C. Locking Mechanism of the Knee (figure 5.13 and Concept Demonstration 5.1, page 178)

Standing in parallel first position, slowly flex and extend your knees (parallel plié), noting the locking mechanism of the knee. In what direction does the femur rotate when the knee extends?

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# D. Improving Knee Hyperextension, or Genu Recurvatum (Concept Demonstration 5.2, page 193)

Working with your partner, employ the following two approaches to improving knee hyperextension:

1. Limit the degree of knee extension with cocontraction of the hamstring muscles.
2. Use the DOR to limit hip internal rotation in the final ranges of knee extension.

Note which tended to work better with your partner. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Provide the rationale from an anatomical perspective of how each approach could prevent knee hyperextension. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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# E. Identify Primary Knee Muscles

List the *primary* muscles that produce the following movements (table 5.2, page 183).

|  |  |
| --- | --- |
| **Knee flexion** | **Knee extension** |
|  |  |
|  |  |

# F. Strength Exercises and Stretches

*Working in groups of three to five, take turns teaching the other members of the group the exercises in tables 5.3 and 5.5, pages 185 and 187, while stating the muscle group challenged by the given exercises. Then review the exercises as a group by marking the exercises while simultaneously stating the muscle group targeted. Finally, write the name of the exercise(s) provided in these tables for the following categories.*

**Knee flexors Knee extensors**

Strength: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Strength: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Stretch: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Stretch: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Compare the strength exercises for the knee extensors provided in table 5.3, page 185, in terms of the type of contraction, the magnitude of patellofemoral compression force, and whether it uses an open or closed kinematic chain. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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# G. Sample Movement Analysis

**1. First-position parallel plié**

|  |  |  |  |
| --- | --- | --- | --- |
| **Movement phase and joint** | **Joint movement** | **Contraction type** | **Functional muscle group: primary muscles** |
| Up phase |  |  |  |
| Hip |  |  |  |
| Knee |  |  |  |
| Down phase |  |  |  |
| Hip |  |  |  |
| Knee |  |  |  |

**2. Standing knee curl**

|  |  |  |  |
| --- | --- | --- | --- |
| **Movement phase and joint** | **Joint movement** | **Contraction type** | **Functional muscle group: primary muscles** |
| Up phase |  |  |  |
| Hip |  |  |  |
| Knee |  |  |  |
| Down phase |  |  |  |
| Hip |  |  |  |
| Knee |  |  |  |