Notice that the perpendicular distance corresponding to muscle force changes as joint angle changes. This makes calculating torque due to muscle force even more complex.

Knee Extension Torque

\[ \mathbf{F} \times r = \mathbf{T} \]

Solve for the following:

1. Compressive component of the quadriceps force \( (\mathbf{F}_C) \)
2. Rotary component of the quadriceps force \( (\mathbf{F}_R) \)
3. Torque created by the quadriceps force \( (\mathbf{T}_Q) \)
4. Also, how does the patella increase the mechanical capabilities of the quadriceps?
5. How might the knee extension torque be related to ACL injury?

Answers: \( \mathbf{F}_C = 692 \text{ N}; \mathbf{F}_R = 400 \text{ N}; \) and \( \mathbf{T}_Q = 28 \text{ Nm} \)

\[ d = 7 \text{ cm}; \theta = 30^\circ; F_Q = 800 \text{ N} \]

Solve for the following:

1. Compressive component of the quadriceps force \( (\mathbf{F}_C) \)
2. Rotary component of the quadriceps force \( (\mathbf{F}_R) \)
3. Torque created by the quadriceps force \( (\mathbf{T}_Q) \)
4. Also, how does the patella increase the mechanical capabilities of the quadriceps?
5. How might the knee extension torque be related to ACL injury?

Answers: \( \mathbf{F}_C = 692 \text{ N}; \mathbf{F}_R = 400 \text{ N}; \) and \( \mathbf{T}_Q = 28 \text{ Nm} \)

\[ F = 400 \text{ N} \]

\[ d = 7 \text{ cm}; \theta = 30^\circ; \]