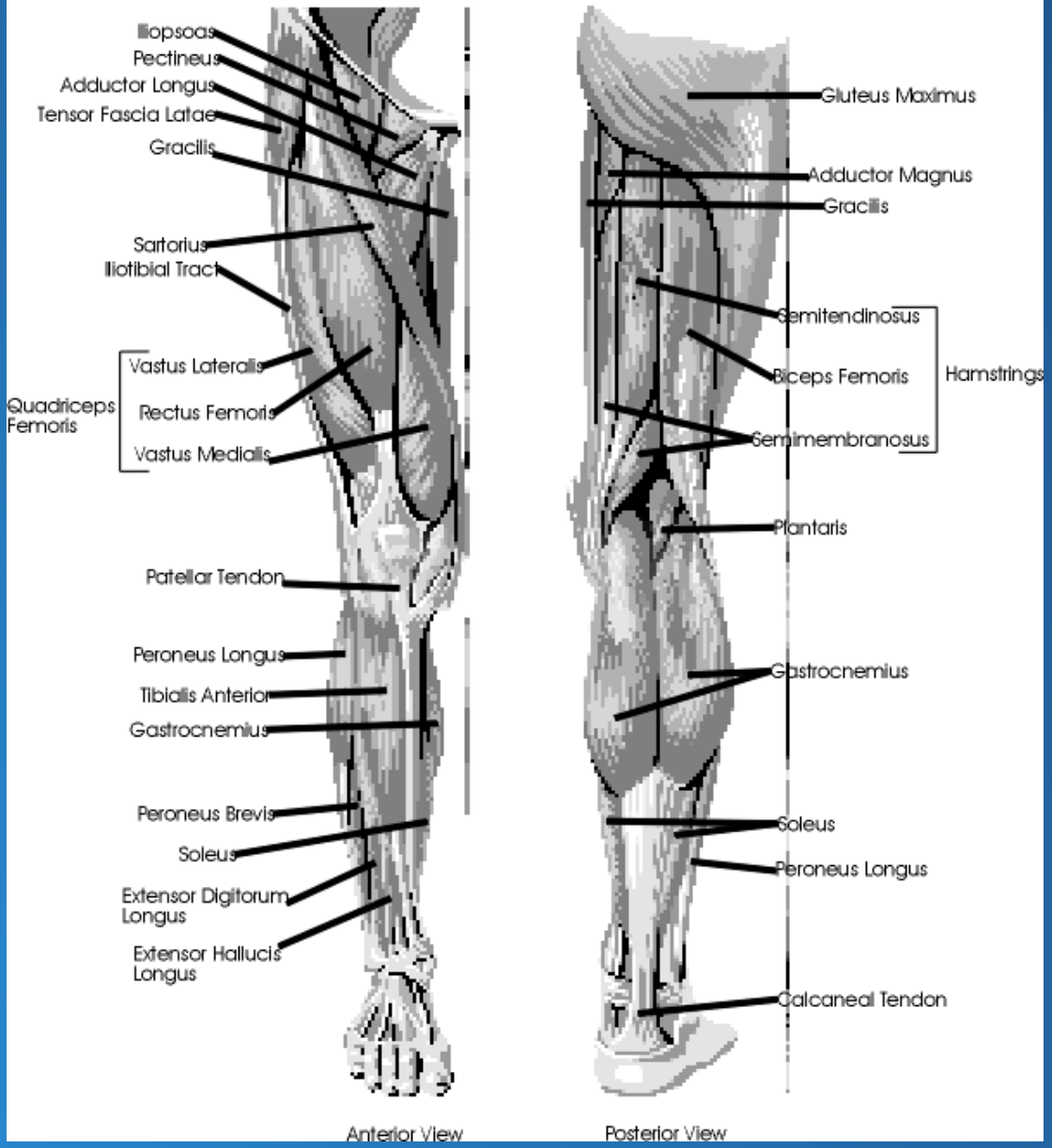
Biomechanics of Cycling

Muscles of the Lower Limb



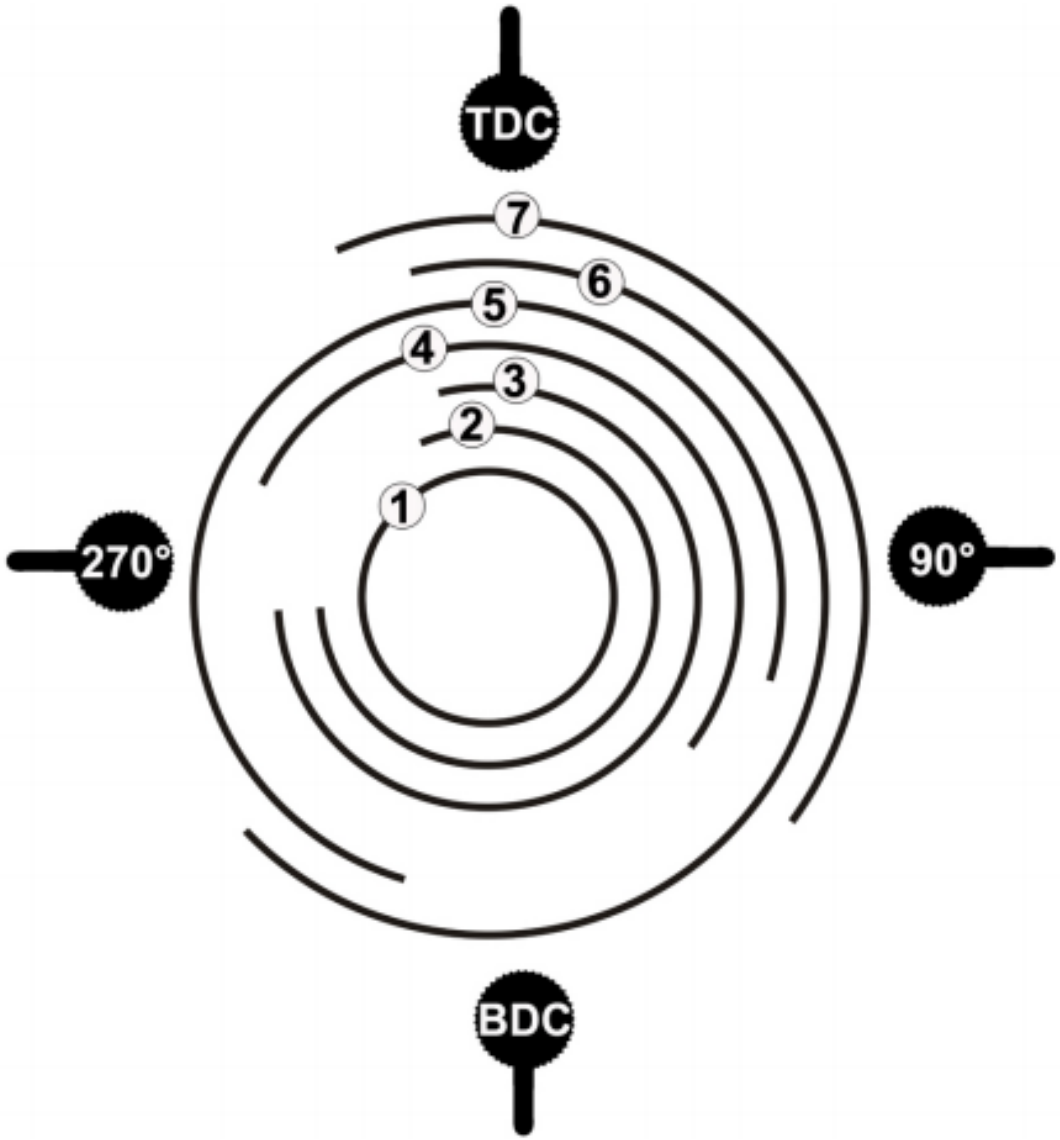


Fig. 3. Overview of muscle activity timing in lower extremities during cycling in relation to the crank angle (1=TA, 2=SOL, 3=GM, 4=VL&VM, 5=RF, 6=BF and 7=GMax). Based on the results of Ryan & Gregor, (1992)

Muscle Grouping

Single joint

- Gluteus maximus and medius
- Vastus lateralis and medialis
- Tibialis anterior
- Soleus
- Iliopsoas

Two joint

- Rectus Femoras
- Semimembranosus
- Semitendinosus
- Bicep femoris
- Gastrocnemius lateralis and medialis

Muscle Grouping

- extensor/flexor group generate energy for pedalling
- RF/TA group and the Hamstring group improve the efficiency of energy transfer among the muscles
  - the RF/TA group is active during the transition from one revolution to the next
  - the hamstring group is active near the middle of the revolution

Efficiency

- Key factor is the propulsive torque
- The optimum efficiency occurs when the centrifugal force equals zero
- Most often only the downstroke phase is mechanically efficient

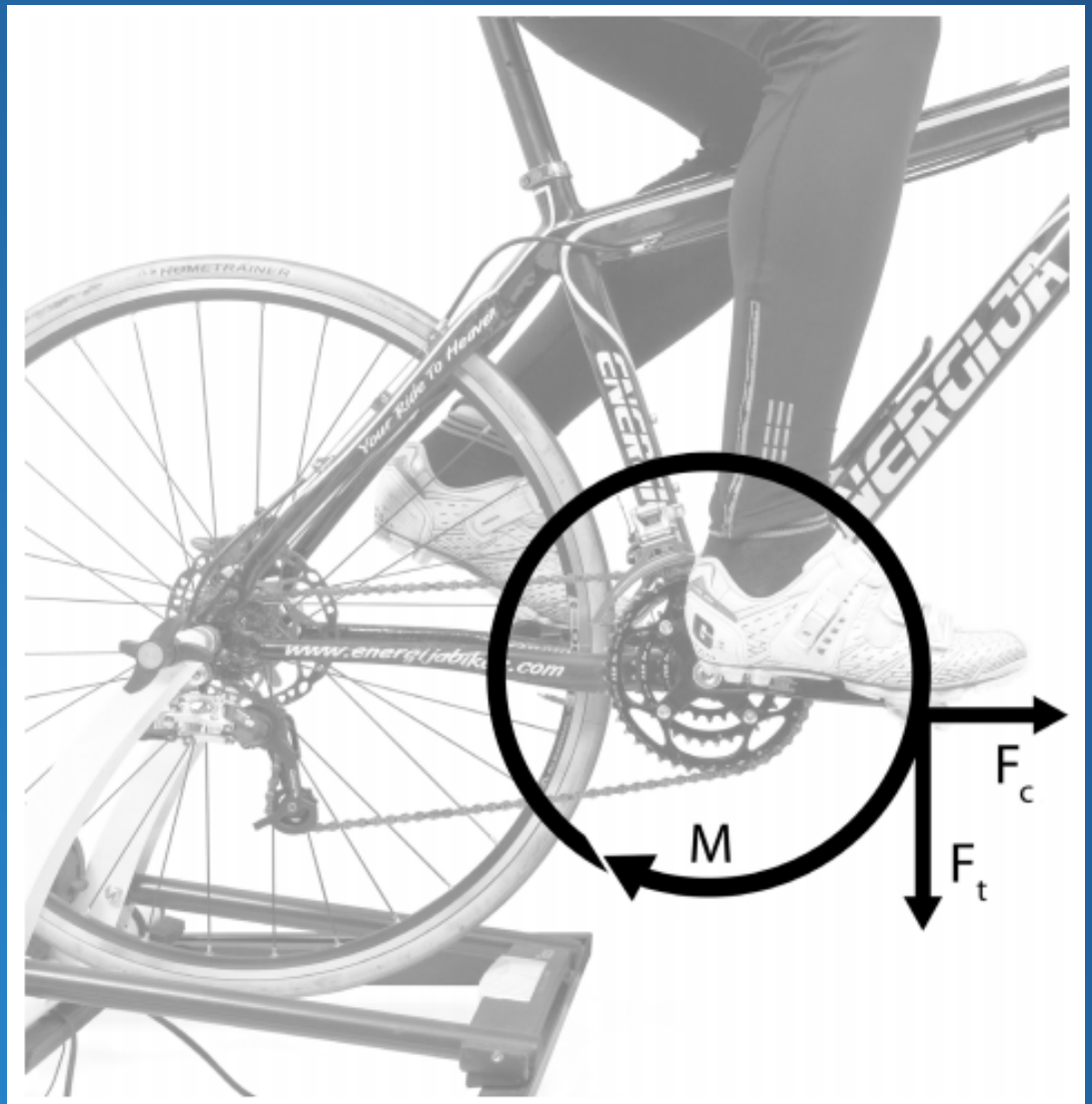


Fig. 2. Overview of all major forces directed at the pedal in the downstroke phase at 90°.(M=propulsive torque, F_c=centrifugal force, F_t=tangential force)

Forces

- When the centrifugal force is zero the sum of the forces is tangential in the direction of the pedals movement
  - if points slight forward in the downstroke and slightly back in the upstroke
  - it is negative from 195º to 360º
- Centrifugal force is highest from 120° to 195° and lowest when the pedal is horizontal from 90° to 285°