

Energy

Energy: The ability to do work.

Conservation of Energy: Energy cannot be created or destroyed. It may only change from one form to another. $E_1 = E_2$

Energy has to come from somewhere and go somewhere.

- Energy is needed to get an object moving
- Energy is needed to be dissipated to slow an object down.

Types of Energy

- Nuclear
- Heat
- Mechanical
- Chemical
- Light
- Electrical

Mechanical Energy:

- PE: Potential Energy
 - Position: $PE = mgh$
 - Spring: $PE = \frac{1}{2} kx^2$
- KE: Kinetic Energy
- Units: Joule

Work:

- The product of the magnitude of force and the distance through which the force acts.
- Used to describe what is accomplished by a force.
- $W = Fd$ Units: Nm or Joule
- The transfer of energy from one object to another.
- Work-Energy Theorem:
 - The amount of work done is equal to the change in energy.

Power:

- The rate at which work is done.
- The rate at which energy is transferred.
- Unit: Work/time = J/s or Watt

Power vs. Energy

- What a person can do is not limited only by the total energy required but also the rate at which the energy is used.

$$P = W/t = Fd/t = Fv$$

$$\text{Angular parameter: } P = T\omega$$

Since power is a measure of the rate of energy being transferred (maybe to heat or some other non-mechanical form) it is used to calculate 'Energy Absorbed' and 'Energy Generated' parameters.

- Energy Absorbed: T and ω have the opposite directions.
- Energy Generated: T and ω have the same directions.
- Quadriceps eccentric contraction: T is an extensor moment (i.e., negative) ω is flexion (i.e., positive).