

Linear Momentum and Impulse

Principle of Impulse and Momentum

resultant force: $R = \Sigma F = m a$

since $a = dv/dt$: $R = m dv/dt$

multiply by dt : $R dt = m dv$

integrate both sides: $\int R dt = \int m dv = m v_f - m v_i$

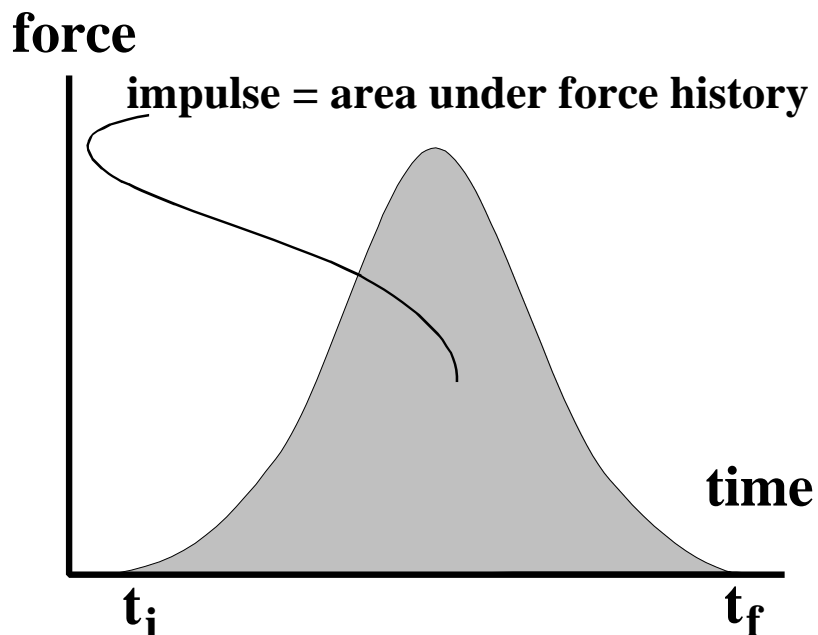
Therefore:

Impulse = change in momentum $= m v_f - m v_i$

Impulse of force $= \int F dt \approx \Sigma F t$ (t = sampling duration)

Linear momentum (quantity of motion) $= m v$

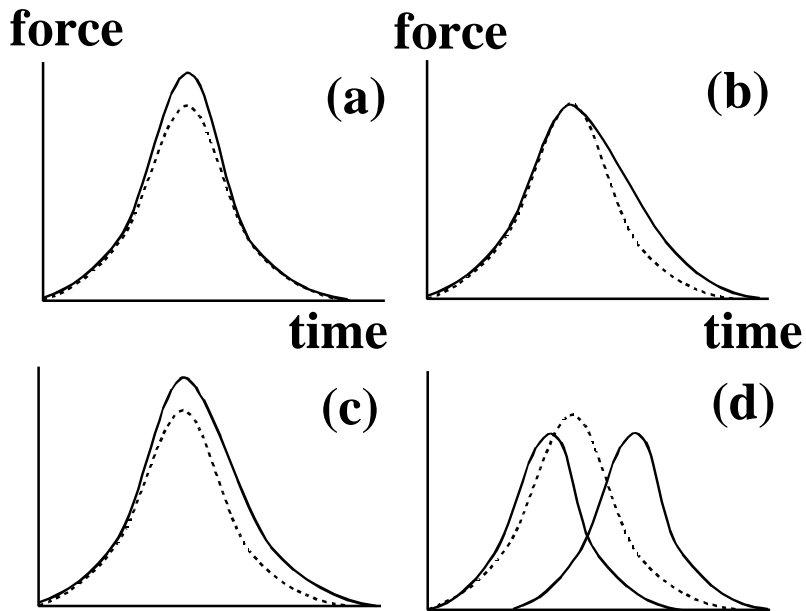
Graphically, impulse is the area under a force history.



Linear Impulse

There are several ways of increasing impulse:

- (a) increase magnitude of force,
- (b) increase duration of force,
- (c) increase both magnitude and force and
- (d) increase number of impulses



-dashed force history is same in all diagrams

Ground Reaction Forces during Running:

