

# Generating movement in the body · supported focus

International Baccalaureate · IB Diploma · Sports, Exercise and Health Science · HL

## Scope and prerequisites

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Supported HL focus. First assessment 2026; current SL/HL brief acquired. Remaining guide, assessment and practical requirements retain their recorded holds.

Prerequisites: read the stated quantities and units, use arithmetic and the model conditions below. Each lesson develops its own method before independent transfer.

These are original or explicitly fictional teaching examples, not actual measurements or completed assessed learner investigations.

## Biomechanics: movement and impulse

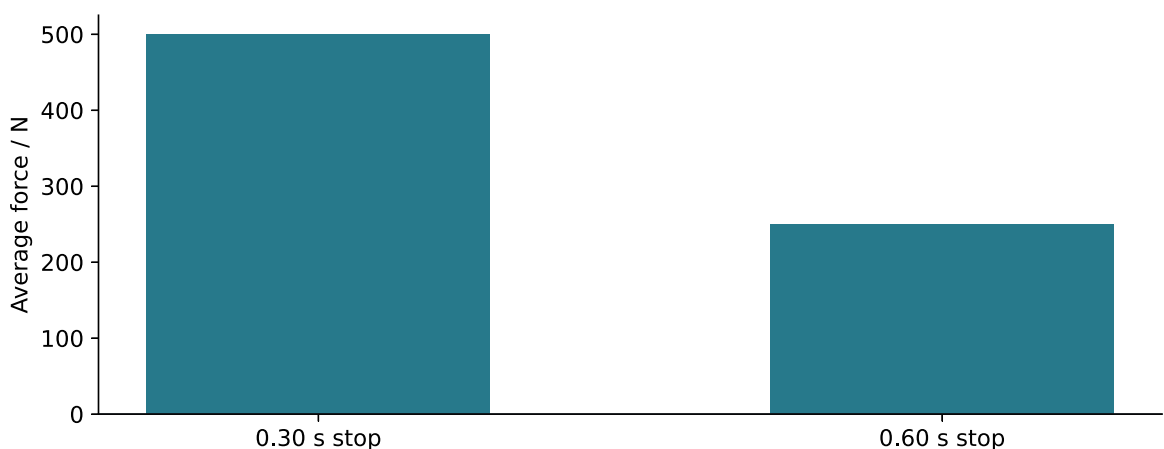
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### ■ What would explain this observation?

- Landing with bent knees increases the time over which momentum changes. The movement can reduce average impact force for the same momentum change.
  - Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.
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### ■ Build the model

- Joint movement results from muscle forces acting through lever systems. The centre of mass and **base of support** affect stability. **Impulse** connects force-time evidence to momentum change.
- impulse: Force integrated over time, equal to momentum change; base of support: The area supporting a body.



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### ■ Choose evidence that can test it

- A biomechanical analysis must define the segment, direction and phase of movement. Net force and a single muscle force are not interchangeable. A longer lever arm can change torque without changing applied force.
  - Use teacher-approved video of a safe movement with consent. Calibrate distance and time, identify frames consistently, and avoid making medical claims from a two-dimensional recording. Camera perspective can bias apparent joint angles.
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### ■ Work from known quantities

- State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution.
- Known: momentum changes by 150 kg metres per second. Average force magnitude = momentum change/stopping time. For 0.30 s, force =  $150/0.30 = 500$  N. For 0.60 s, force =  $150/0.60 = 250$  N. This idealized average excludes the detail of a changing force curve.

#### Example:

Momentum change is 120 kg metres per second over 0.40 s. Find average force magnitude. Use the same sequence: known quantities → model → relation → substitution → unit and interpretation.

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### ■ Check the conclusion and its limits

- The largest force is not the same as average force. A school movement study should not deliberately create high-impact landings to test a prediction.
- Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

#### Warn:

A video from one angle proves the cause of a sports injury. This claim is false: The largest force is not the same as average force. A school movement study should not deliberately create high-impact landings to test a prediction.

#### Key:

Biomechanics: movement and impulse: A biomechanical analysis must define the segment, direction and phase of movement. Net force and a single muscle force are not interchangeable. A longer lever arm can change torque without changing applied force.