



EduTrend Contents

W4C · INDIVIDUAL SPORTS · HIGH SCHOOL

Biomechanics of Technique

Use levers, forces and projectiles to improve performance

Ages 15–18

Level: Advanced

75 minutes

Groups of 3–4

Activity 05

Inside: activity at a glance · step-by-step session plan · facilitator notes · 3 student worksheets · assessment checklist

ACTIVITY 05 · AT A GLANCE

Biomechanics of Technique

Students study how forces, levers and projectile motion shape technique. They film a jump or throw, measure angles and phases with free analysis apps, compare with an expert model, and write a biomechanical analysis with coaching recommendations.

Learning outcomes

By the end of the session students can:

- apply Newton's laws to sporting movements;
- classify levers in the body;
- explain factors affecting projectile distance;
- analyse technique from video and recommend changes.

KEY WORDS

biomechanics · force · Newton's laws · lever · fulcrum · projectile · angle of release · centre of mass · video analysis

CURRICULUM LINKS

PE and sports science: biomechanics. Physics: forces and motion. Maths: angles and trigonometry.

1

WARM UP

Raise, mobilise, prepare

2

LEARN

Technique focus

3

PRACTISE

Drills and repetition

4

MEASURE

Time, distance, score

5

REFLECT

What improved?

6

COOL DOWN

Recover and review

Equipment (per group)

- Tablets or phones for slow-motion video (with consent)
- Free video analysis app with angle tools
- Tape measures, cones
- Soft throwing implements or a jump area
- Worksheets 1, 2 and 3

Before the session

- Obtain consent for filming.
- Set up a safe jump or throw area.
- Prepare an expert model image or clip.
- Test the analysis app.

SAFETY

Warm up fully; use safe landing areas and throwing sectors. Film from a safe position. Share video only within the group.

ACTIVITY 05 · SESSION PLAN

Step by step

Insist on filming side-on at right angles to the movement: poor camera position ruins angle measurements.

Time	What happens	Say or ask
0–10 min Hook	Show a slow-motion jump.	<i>“What determines how far they go?”</i>
10–25 min Theory	Newton’s laws, lever classes and projectile factors.	<i>“Which lever is the elbow in a biceps curl?”</i>
25–45 min Film	Groups film three attempts of a jump or throw side-on.	<i>“Is the camera level and square?”</i>
45–65 min Analyse	Measure release or take-off angle and phases; compare with an expert.	<i>“What is the biggest difference?”</i>
65–75 min Recommend	Groups present one evidence-based technique change.	<i>“What evidence supports your change?”</i>

CHALLENGE CARD (print or copy onto the board)

Film and analyse a jump or throw, measure a key angle, compare it with an expert model, and recommend one technique change supported by biomechanical principles.

ACTIVITY 05 · FACILITATOR NOTES

The sport science in brief

Newton's laws explain movement: forces cause acceleration, and every action has an equal and opposite reaction. Most joints in the body act as third-class levers, where the effort lies between the fulcrum and the load, which favours speed and range of movement over force.

The distance of a projectile depends on release speed, release angle and release height. In theory 45 degrees gives the greatest range when release and landing heights are equal, but real techniques differ: long jumpers typically take off at much lower angles, around 20 degrees, because they cannot keep their run-up speed at steeper angles. Release speed usually matters most.

Common ideas to listen for

- "45 degrees is always best." Release height and speed change the optimum.
- "Stronger always means further." Technique and timing turn strength into speed.
- "Video shows everything accurately." Camera angle and position affect measurements.

Adapting the activity

Support

Use a guided analysis sheet with one angle to measure.

Stretch

Calculate horizontal and vertical velocity components from video and explain their effect.

WORKSHEET 1

Biomechanics concepts

Name: _____

Class: _____ Date: _____

Apply the concepts.

Concepts

Concept	Explanation	Sporting example
Newton's 3rd law		
Third-class lever		
Angle of release		
Centre of mass		

WORKSHEET 2

Video analysis

Record measurements.

Measurements

Attempt	Key angle	Distance	Notes
1			
2			
3			
Expert model			

WORKSHEET 3

Technique recommendation

Justify a change.

Main difference from the expert

Recommended change and biomechanical reason

FOR THE TEACHER

Assessment checklist

Use during the session. One sheet covers up to eight students; copy as needed.

Student	Applies principles	Measures from video	Justifies recommendations

Suggested codes: W = working towards · E = expected · G = greater depth

ABOUT THIS ACTIVITY

Biomechanics of Technique is a sample activity from the EduTrend Contents W4C Individual Sports programme (high school, level: advanced). Every activity in the programme follows the same format: a practical challenge, a clear session plan, facilitator notes and ready-to-print worksheets, so that teachers, club leaders and parents can run it without extra preparation.

Full 15-, 20- and 32-week programmes are available from EduStore at edutrend.org.

© 2026 EduTrend Contents. This activity may be printed and copied for use with students in your own school, club or home. It may not be resold or published elsewhere. Photos: Peter Zhan / Unsplash.