

Summary

Topic 4.3 Fundamentals of Biomechanics

Subject	Year	Start date	Duration
Sports, exercise and health science	IB1	Week 2, January	4 weeks 8 hours

Course Part

Topic 4: Movement Analysis

Description

Biomechanics can be defined as the “applications of mechanics to the human body and sporting implements, and studies the forces on (and caused by) the human body and the subsequent result of those forces” (Coleman1999). This means that biomechanics examines the forces caused by the human body (for example, by the muscles) and forces on the body from outside (such as gravity or other players) and the effects they have on the body’s motion. Furthermore, “biomechanics is the science underlying techniques” (Hay 1994). This means that if a coach or physical education teacher wishes to understand technique in order to improve performance or reduce injuries, he or she must have a good knowledge of biomechanics. Biomechanics is divided into two areas: kinematics (dealing with the motion of bodies and objects) and kinetics (dealing with forces).

Inquiry & Purpose

Inquiry / Higher Order Questions

Type

Inquiry Questions

Concept-based

How does the way the body is made and move impact performance?

Curriculum

Aims

Appreciate scientific study and creativity within a global context through stimulating and challenging opportunities

Acquire a body of knowledge, methods and techniques that characterize science and technology

Apply and use a body of knowledge, methods and techniques that characterize science and technology

Develop an ability to analyse, evaluate and synthesize scientific information

Develop experimental and investigative scientific skills including the use of current technologies

Develop and apply 21st-century information and communication skills in the study of science

Develop an understanding of the relationships between scientific disciplines and their influence on other areas of knowledge

◇ Objectives

Demonstrate knowledge and understanding of

- facts, concepts and terminology
- methodologies and techniques
- communicating scientific information

Apply

- facts, concepts and terminology
- methodologies and techniques

Formulate, analyse and evaluate

- scientific explanations

📖 Syllabus Content

Core

Topic 4: Movement analysis

4.3 Fundamentals of biomechanics

- 4.3.1 Define the terms force, speed, velocity, displacement, acceleration, momentum and impulse.
- 4.3.2 Analyse velocity–time, distance–time and force– time graphs of sporting actions.
- 4.3.3 Define the term centre of mass.
- 4.3.4 Explain that a change in body position during sporting activities can change the position of the centre of mass.
- 4.3.5 Distinguish between first, second and third class levers.
- 4.3.6 Label anatomical representations of levers.
- 4.3.7 Define Newton’s three laws of motion.
- 4.3.8 Explain how Newton’s three laws of motion apply to sporting activities.
- 4.3.9 State the relationship between angular momentum, moment of inertia and angular velocity.
- 4.3.10 Explain the concept of angular momentum in relation to sporting activities.
- 4.3.11 Explain the factors that affect projectile motion at take-off or release.
- 4.3.12 Outline the Bernoulli principle with respect to projectile motion in sporting activities.

📊 ATL Skills

📖 Approaches to Learning

⚙️ Thinking

IB DP Sports Exercise and Health Science (IB1)



Self-management



Developing IB Learners

☆ Learner Profile



Inquirers



Knowledgeable



Thinkers



Communicators



Risk-takers (Courageous)



Balanced



Reflective