

BTEC

HIGHER NATIONALS

Sport and Exercise Science



Higher National
Certificate Lvl 4

Unit 3: Anatomy & Physiology

Unit code	D/616/0951
Unit type	Core
Unit level	4
Credit value	15

Introduction

The study of the human body is vital in understanding how movement is produced, the systems at work and how they work together to create athletic movement. Anatomy studies the structure of the human body while physiology is concerned with understanding its function.

This unit is designed for students wanting to gain knowledge of the anatomy of the musculoskeletal system and understanding how movement is produced. Students interested in careers such as personal training, physical education teaching, occupational therapy, coaching, exercise prescription and performance analysis would find this a key unit in informing their practice.

This unit will explore the structure and function of the skeleton, osteology and the anatomy of bones and bone growth, types of joint, their structure and their contribution to range of movement. Students will examine the structure of the musculoskeletal system and begin to understand the complexities involved in effective performance.

This unit will explore the structure and function of the cardiovascular and respiratory systems and their role in exercise, the changes that take place and the effect of environmental factors on their effectiveness.

Learning Outcomes

By the end of this unit students will be able to:

1. Identify the key structures of the skeletal system
2. Describe the structure and function of muscles
3. Explore the structure and function of the cardiovascular system
4. Discuss the structure and function of the respiratory system.

Essential content

LO1 Identify the key structures of the skeletal system

Anatomical terminology:

Axial and appendicular skeleton

Positional and directional terminology (e.g. transverse, sagittal)

Major anatomical landmarks

Structure and function of the skeletal system:

Support, protection, movement, minerals, chemical energy storage

Identifying, naming and locating major bones

Knowing types of bone, differing functions of bones in relation to their structure, description of skeletal growth and changes in structure

The function and anatomy of long bones

Joint structure and function:

Structure of synovial joints, e.g. ligaments, cartilage, synovial fluid, etc. How their structures aid their specific functions

Cartilaginous and fibrous joints, location, structure and function

Movement terminology (e.g. flexion, extension, rotation, pronation and supination):

Range of movement dependent upon types of joint

Relate structure to function and lever systems

LO2 Describe the structure and function of muscles

Functions of muscles:

Posture, locomotion, generation of force

Voluntary and involuntary muscles, striated and non-striated

Muscle types:

Skeletal muscle in relation to types, names, origins and insertions, functional anatomy and muscle surface anatomy

Cardiac muscle and smooth muscle

Roles of skeletal muscle, e.g. agonists, antagonists etc.:

The type of contraction (concentric, isometric and concentric) dictated by muscle role

Their types of contraction and the movement produced

Structure of muscles:

Tendons, ligaments, muscle belly and tendons to sarcomere and structural proteins, sliding filament theory, myocytes, myofibrils, actin and myosin and their role in force generation

LO3 Explore the structure and function of the cardiovascular system

Structure of heart and surrounding anatomy:

The cardiovascular system – structure and function

Changes in structure and function with exercise – blood vessels, capillaries, veins, arteries, cardiac impulse, cardiac output, regulation of Heart rate (HR) at rest, regulation of Heart rate (HR) during exercise

SAN and AV node and heart regulation

Sympathetic and parasympathetic nervous system, bundle of His and Purkinje fibres

Adrenaline and noradrenaline

LO4 Discuss the structure and function of the respiratory system

The respiratory system:

Structure and function, the anatomy of the lungs

Gaseous exchange – pulmonary ventilation, the process of breathing or the movement of gases into and out of the lungs

External respiration, the exchange of gases between the alveoli and pulmonary blood

Respiratory gas transport, transport of gases to and from the lungs and cells via the bloodstream, involving the cardiovascular system

Internal respiration, the exchange of gases between the blood and the cells at the capillary level

The effects of environmental factors, e.g. temperature, pressure and saturation on gas volumes, transportation of gases, gas exchange and the concept of partial pressures in response to exercise

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Identify the key structures of the skeletal system		LO1 & LO2 D1 Analyse the role and function of the musculoskeletal system in relation to sporting examples
P1 Show the structure of the skeletal system	M1 Suggest how the structure of synovial joints produces a range of movements	
P2 Identify the structure of common synovial joints		
LO2 Describe the structure and function of muscles		
P3 Identify the major muscles of the human body	M2 Evaluate the major muscles of the human body relating structure to function	LO3 & LO4 D2 Analyse how the cardiovascular and respiratory systems work together in response to an identified sport or exercise example
P4 Illustrate how muscle contractions occur		
LO3 Explore the structure and function of the cardiovascular system		
P5 Demonstrate the structure of the cardiovascular system	M3 Discuss how the cardiovascular system responds to exercise	
P6 Describe the function of the cardiovascular system		
LO4 Discuss the structure and function of the respiratory system		
P7 Demonstrate the structure of the respiratory system	M4 Discuss how the respiratory system responds to exercise	
P8 Describe the function of the respiratory system		

Recommended resources

Textbooks

ROHEN, J.W., YOKOCHI, C. & LUTJEN-DRECOLL, E. (Lippincott) (2015) *Color Atlas of Anatomy: A Photographic Study of the Human Body*. 8th edition. Williams and Wilkins.

McCONNELL, T. H. & HULL, K. L. (Lippincott) (2011) *Human Form Human Function: Essentials of Anatomy and Physiology*. Williams and Wilkins.

WIDMAIER, R. & STRANG, K. T. (2011) *Vander's Human Physiology: The Mechanisms of Body Function*. 12th Edition. McGraw-Hill.

Websites

www.bases.org.uk	British Association of Sport and Exercise Science Physiology General reference
------------------	---

Links

This unit links to the following related units:

Unit 7: Physical Activity, Lifestyle and Health

Unit 9: Biomechanics

Unit 26: Exercise Physiology

Unit 27: Advanced Nutrition