Unit 1: Principles of Anatomy and Physiology in Sport

Unit code: D/502/4888

QCF Level 3: BTEC National

Credit value: 5

Guided learning hours: 30

Aim and purpose

The aim of this unit is to explore the structure and function of the skeletal, muscular, cardiovascular and respiratory systems and also to learn the fundamentals of the energy systems.

Unit introduction

The human body is made up of many different systems that work together and allow us to take part in a huge variety of sport and exercise activities. An athlete can go from rest to all-out sprinting in a matter of seconds, whereas an endurance athlete can continue exercising for many hours at a time.

The skeletal and muscular systems work together to allow our bodies to perform a vast range of different movements. Our cardiovascular and respiratory systems act as a delivery service, working together to supply oxygen and nutrients to the body which in turn is used to produce energy for muscular contraction.

In order to appreciate how each of these systems function, learners will study the structure of the skeletal, muscular, cardiovascular and respiratory systems. The human anatomy of these systems is very different but in terms of operation, each system is implicitly linked. Having an understanding of these body systems is imperative in the sport and active leisure industries in order to begin to appreciate how the body functions and how it copes with the many different stresses of exercise.

The unit starts by exploring the structure and function of the skeletal system which includes the different bones of the skeleton and the different types of joints. The muscular system is then studied, including the major muscles of the body, muscle movement, the different types of muscle and muscle fibre types.

The structure of the heart and blood vessels is covered, together with the function of the cardiovascular system. The unit goes on to explore the structure of the respiratory system and the function, including the mechanics of breathing. The final part of the unit explores the three different energy systems and the sports in which they are predominantly used.

Learning outcomes

On completion of this unit a learner should:

1 Know the structure and function of the skeletal system

2 Know the structure and function of the muscular system

3 Know the structure and function of the cardiovascular system

4 Know the structure and function of the respiratory system

5 Know the different types of energy systems.

Unit content

1 Know the structure and function of the skeletal system

Structure of skeletal system: axial skeleton; appendicular skeleton; types of bone (long bones, short bones, flat bones, irregular bones, sesamoid bones); location of major bones (cranium, clavicle, ribs, sternum, humerus, radius, ulna, scapula, ilium, pubis, ischium, carpals, metacarpals, phalanges, femur, patella, tibia, fibula, tarsals, metatarsals, vertebral column – cervical, thoracic, and lumbar vertebrae, sacrum, coccyx)

Function of skeletal system: support; protection; attachment for skeletal muscle; source of blood cell production; store of minerals

Joints: fixed; slightly moveable; synovial/freely moveable (types, structures, movement at each joint)

2 Know the structure and function of the muscular system

Muscular system: major muscles (biceps, triceps, deltoids, pectoralis major, rectus abdominis, rectus femoris, vastus lateralis, vastus medialis, vastus intermedius, semimembranosus, semitendinosus, biceps femoris, gastrocnemius, soleus, tibialis anterior, erector spinae, teres major, trapezius, latissimus dorsi, obliques, gluteus maximus); function; location; types of muscle (cardiac, skeletal, smooth)

Function of the muscular system: movement – antagonistic pairs (agonist, antagonist); fixator; synergist; types of contraction (isometric, concentric, eccentric, isokinetic)

Fibre types: Type 1; Type 2a; Type 2b; characteristics; types of sports each are associated with

3 Know the structure and function of the cardiovascular system

Structure of the cardiovascular system: heart (atria, ventricles, bicuspid valve, tricuspid valve, aortic valve, pulmonary valve, aorta, vena cava – superior and inferior, pulmonary vein, pulmonary artery); blood vessels (arteries, arterioles, capillaries, veins, venuoles)

Function of the cardiovascular system: delivery of oxygen and nutrients; removal of waste products; thermoregulation (vasodilation and vasoconstriction of vessels); function of blood (oxygen transport, clotting, fighting infection)

4 Know the structure and function of the respiratory system

Structure of the respiratory system: nasal cavity; epiglottis; pharynx; larynx; trachea; bronchus; bronchioles; lungs (lobes, pleural membrane, thoracic cavity, visceral pleura, pleural fluid, alveoli); diaphragm; intercostal muscles (external and internal)

Function: gaseous exchange; mechanisms of breathing (inspiration and expiration); lung volumes, eg tidal volume, vital capacity, residual volume; control of breathing (neural and chemical)

5 Know the different types of energy systems

Energy systems: phosphocreatine; lactic acid system; aerobic energy system; amount of ATP produced by each system; sports that use these systems to provide energy; recovery time

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P1 describe the structure and function of the skeletal system		
P2 describe the different classifications of joints		
P3 identify the location of the major muscles in the human body		
P4 describe the function of the muscular system and the different fibre types	**M1** explain the function of the muscular system and the different fibre types	**D1** analyse the function of the muscular system and the different fibre types
P5 describe the structure and function of the cardiovascular system	**M2** explain the function of the cardiovascular system	
P6 describe the structure and function of the respiratory system	**M3** explain the function of the respiratory system	
P7 describe the three different energy systems and their use in sport and exercise activities. [IE3]	**M4** explain the three different energy systems and their use in sport and exercise activities.	**D2** analyse the three different energy systems and their use in sport and exercise activities.

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators