Unit 8: Physiology of Human Body Systems

Level: 3
Unit type: Internal
Guided learning hours: 60

Unit in brief

Learners will focus on the physiological make up of three human body systems (musculoskeletal, lymphatic and digestive), how the systems function and what occurs during dysfunction.

Unit introduction

The human body is a complex mix of organs and organ systems. Knowledge of how they function to maintain human life is an essential part of the study of human physiology. In this unit, you will focus on three body systems: musculoskeletal, lymphatic and digestive. You will examine each of the systems as a functioning unit, identifying their structure and function. By exploring the anatomy of these systems, through experimentation and use of simulations, you will develop your knowledge and understanding of their role in the human body.

You will also give attention to understanding the implications of what happens when the systems fail to work properly and the available treatments. The unit will be of particular interest if you are interested in sport, body-building and maintaining a healthy body.

An understanding of the fundamental systems that make up the human body is a key requirement if you wish to progress to study health and care-related programmes or biomedical sciences in further education and at university. It is an essential requirement for a career in sport- and health-related disciplines, for example physiotherapist, sport trainer and exercise physiologist.

Learning aims

In this unit you will:

A Understand the impact of disorders of the musculoskeletal system and their associated corrective treatments
B Understand the impact of disorders on the physiology of the lymphatic system and the associated corrective treatments
C Explore the physiology of the digestive system and the use of corrective treatments for dietary-related diseases.
### Summary of unit

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<tr>
<th>Learning aim</th>
<th>Key content areas</th>
<th>Recommended assessment approach</th>
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| **A** Understand the impact of disorders of the musculoskeletal system and their associated corrective treatments | **A1** Structure of the musculoskeletal system  
**A2** Function of the musculoskeletal system  
**A3** Health matters and treatments related to the musculoskeletal system | Learners would use information gained from research, visits, dissections/videos, models and simulations to produce an illustrated report explaining and analysing the structure and function of the musculoskeletal system. An evaluation of a related disorder/dysfunction of the system and associated treatments must be included. |
| **B** Understand the impact of disorders on the physiology of the lymphatic system and the associated corrective treatments | **B1** Structure of the lymphatic system  
**B2** Function of the lymphatic system  
**B3** Health matters and treatments related to the lymphatic system | Research work using the internet and TV documentaries to help learners to create a presentation that describes and explains the structure and function of the lymphatic system in promoting a healthy body. An evaluative case study of the effect of a disorder/dysfunction of the system and possible treatments must be included. |
| **C** Explore the physiology of the digestive system and the use of corrective treatments for dietary-related diseases | **C1** Structure of the digestive system  
**C2** Function of the digestive system  
**C3** Health matters and treatments related to the digestive system | A lab book/record of investigations modelling the functioning of the various parts of the digestive system. Photographs and information from the investigations will be used to create an information leaflet that explains the role and location of organs and evaluates dietary disorder in the system and possible treatments. Observation records of practical work undertaken to assess the nutrient content of food will be required. Evidence and conclusions from the investigations will be incorporated into the information leaflet. |
Content

Learning aim A: Understand the impact of disorders of the musculoskeletal system and their associated corrective treatments

A1 Structure of the musculoskeletal system

Structure and identification of major bones, muscles, joints and supporting apparatus by visual examination of diagrams or models and manipulative means in living subjects as appropriate.

- Axial skeleton, to include:
  - cranium, mandible and maxilla
  - vertebral column (cervical, thoracic and lumbar vertebrae, sacrum and coccyx, intervertebral discs)
  - ribs and sternum.
- Appendicular skeleton, to include:
  - limb bones (humerus, radius, ulna; femur, patella, tibia, fibula)
  - wrist, hand and digit bones (carpals, metacarpals, phalanges)
  - ankle, foot and digit bones (tarsals, metatarsals, phalanges, calcaneus)
  - shoulder girdle (scapula, clavicle)
  - pelvic girdle (ilium, pubis, ischium).
- Bone types: long bones, short bones, flat bones, irregular bones, sesamoid bones.
- Bone composition: periosteum, spongy/compact bone, bone marrow, mineral use.
- Identification of the major joint types and where they exist in the human body – gliding, condyloid, saddle, socket, ball and socket, pivot, hinge.
- Classification of joints: fibrous, cartilaginous, synovial.
- Composition and location of ligaments and tendons.
- Major muscle groups.
- Structure of muscle fibres.

A2 Function of the musculoskeletal system

Functions of each part of the musculoskeletal system and how each contributes to the effective functioning of the whole system.

- Skeletal functions: support, protection, attachment for skeletal muscle, storing minerals, producing blood cells, maintaining mineral homeostasis.
- Muscle: the role of ligaments, tendons, skeletal muscle, smooth muscle, process of muscle contraction, fast- and slow-twitch fibres.
- Movement due to interaction of muscles, bones, joints and attachment apparatus: flexion/extension, adduction/abduction, internal/external, rotation, circumduction.

A3 Health matters and treatments related to the musculoskeletal system

The causes, symptoms and common treatments involved in common disorders or dysfunction in the musculoskeletal system.

- Disorders to include: forms of arthritis; hip dysplasia; hypermobility; bone fracture and dislocation; repetitive strain injury (RSI); muscle, ligament and tendon trauma.
- Treatments for musculoskeletal disorders (including physiological reasoning behind the treatment), to include: physiotherapy; arthroscopy; joint replacement therapy; rest, ice, compression, elevation (RICE); splinting and casting.
Learning aim B: Understand the impact of disorders on the physiology of the lymphatic system and the associated corrective treatments

B1 Structure of the lymphatic system
Composition and location of component parts:
• spleen, thymus gland, tonsils, lymph glands, lymph vessels
• major lymph nodes – axillary, abdominal, inguinal, popliteal, supratrochlear
• presence of valves.

B2 Function of the lymphatic system
Location, processes, structures involved and importance of each function:
• formation and transport of lymphocytes and lymph
• removal of interstitial fluid from tissues
• maintenance of hydrostatic pressure
• absorption of fats from the digestive system.

B3 Health matters and treatments related to the lymphatic system
Symptoms, treatment and physiological reasoning behind treatment for disruption or dysfunction of the lymphatic system, to include:
• lymphadenitis
• lymphedema
• Hodgkin’s lymphoma.

Learning aim C: Explore the physiology of the digestive system and the use of corrective treatments for dietary-related diseases

C1 Structure of the digestive system
Location and structural features of the following parts of the digestive system and associated organs:
• mouth, pharynx, oesophagus, stomach, small intestine (duodenum, jejunum, ileum), large intestine, rectum, anus
• associated organs: pancreas, liver, gall bladder.

C2 Function of the digestive system
• Processes involved in digestion, absorption and assimilation of nutrients:
  o mechanical and chemical digestion
  o action of enzymes (protease, amylase, lipase, hydrolysis and assimilation)
  o sites of nutrient absorption, active transport, diffusion.
• Chemical tests for the presence of macro-nutrients found in foods: starch, proteins, lipids, reducing and non-reducing sugars, vitamin C content.

C3 Health matters and treatments related to the digestive system
• Dietary sources and importance of macronutrients and micronutrients including symptoms of deficiencies – fibre, lipids, protein, water, carbohydrates, vitamins (A, B, C, D) and minerals (iron, magnesium and iodine).
• Digestive system diseases and physiological reasoning behind treatments, e.g. coeliac disease, irritable bowel syndrome, colitis.
## Assessment criteria

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<tr>
<th>Pass</th>
<th>Merit</th>
<th>Distinction</th>
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<tbody>
<tr>
<td><strong>Learning aim A: Understand the impact of disorders of the musculoskeletal system and their associated corrective treatments</strong></td>
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<tr>
<td>A.P1</td>
<td>Explain the functional role of the musculoskeletal system in the human body.</td>
<td>A.M1</td>
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<td>A.P2</td>
<td>Describe the effect of disorder of muscles and joints and possible corrective treatment(s).</td>
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<td><strong>Learning aim B: Understand the impact of disorders on the physiology of the lymphatic system and the associated corrective treatments</strong></td>
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<td>B.P3</td>
<td>Describe the gross anatomy and function of the organs of the lymphatic system.</td>
<td>B.M2</td>
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<td>B.P4</td>
<td>Describe the effect of a disorder on the lymphatic system and possible corrective treatment(s).</td>
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<td><strong>Learning aim C: Explore the physiology of the digestive system and the use of corrective treatments for dietary related diseases</strong></td>
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<tr>
<td>C.P5</td>
<td>Explain the role and location of organs involved in digestion.</td>
<td>C.M3</td>
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<td>C.P6</td>
<td>Correctly carry out investigations to establish sources and importance of key nutrients for a balanced diet.</td>
<td>C.M4</td>
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<td>C.P7</td>
<td>Describe the symptoms of nutrient deficiency as a result of dietary-related disease.</td>
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**Essential information for assignments**

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of three summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.D1)

Learning aim: B (B.P3, B.P4, B.M2, B.D2)

Learning aim: C (C.P5, C.P6, C.P7, C.M3, C.M4, C.D3)
Further information for teachers and assessors

Resource requirements
For this unit, learners must have access to:
- a well-equipped laboratory
- IT resources, which could be used as a reference point.

Essential information for assessment decisions
It is expected that where possible, investigative work will be carried out in this unit. Health and safety considerations are paramount, and teachers must ensure that the necessary risk assessments are carried out and communicated to their learners. Refer to CLEAPSS and/or your centre’s health and safety regulations if in doubt about any of the investigative work that has been suggested.

It is understood that specific groups of learners or teachers for ethical, religious or other reasons may feel that they are not able to undertake dissection work as part of the unit. If practical dissection is not carried out, it is expected that suitable alternatives will be available. This is to enable learners to fully understand the anatomy and physiology of the body systems studied in the unit content. Alternatives to dissection could be documentaries of dissections/operations, computer-generated simulations and model making.
Learning aim A

For distinction standard, learners will research disorders/dysfunctions of the musculoskeletal system. Learners will reach conclusions based on referenced evidence they have produced from research on the impact on health of one named disorder/dysfunction and its corrective treatment(s). A visit from or to a physiotherapist would aid understanding and help create a vocational context.

Learners will provide a detailed evaluation demonstrating in-depth, scientific knowledge of the anatomy and physiology of the effects of the condition, including major bones, muscle (groups), joints and movement at the joints. Learners will then establish how the disorder impacts the normal functioning/movement in the human body.

Learners will evaluate how the work of the medical professional uses corrective mechanisms and treatments in order to improve the functioning of the skeleton and its physical, physiological and social impact on human health. Learners will also explain the limitation of the corrective treatment(s) used.

For merit standard, learners must provide a detailed comparison of three disorders affecting different aspects of the musculoskeletal system and how normal movement is affected. Learners must use the correct scientific and technical terms to clearly outline the type of joint, muscle movement at the joint, muscle attachment and the groups of muscles that are involved in bringing about normal movement. They must also explain the importance of the movement to the normal functioning of the human body and how each disorder differs in terms of its effect on normal function. When comparing corrective treatments for each disorder, learners must consider scientific rationale for using that particular treatment over others.

Access to dissection of a small mammal, chicken bones/joints, or models of skeletons and joints and use of simulations would develop and aid learners’ understanding. The use of referenced diagrams or photographs to help learners to produce an analytical report on muscles, joints and associated movement should be encouraged. Correct use of scientific terms must be included in the report.

For pass standard, learners will explain how the structure of the human skeleton, muscles and joints form an essential system in the functioning of the human body by providing support, protection, movement and storage/production of minerals and blood cells. Learners will identify and name six major joints in the human musculoskeletal system and fully explain the importance of their structure and role in the human body in terms of normal movement. Learners will name one disorder of musculoskeletal system and outline how it impacts normal function of the human body. Learners will reference specific muscles or muscle groups and joints affected by the disorder and give an overview of the corrective treatment(s) associated with it.

Learning aim B

For distinction standard, learners must base their evaluation on one named disorder. They will analyse the effect of the disease on the lymphatic system, the normal functioning of which will be explicitly explained. The implications of the disease on the health status of an individual suffering from the disorder will be addressed within the context of a patient case study. Learners will evaluate the physiological basis of any treatment and discuss the impact of this on the restoration of normal lymphatic function. This will include benefits and problems faced by medical professionals when using corrective treatments. They will use correct scientific terminology throughout.

For merit standard, learners will demonstrate detailed understanding of the anatomy and function of the lymphatic system, using correct scientific terminology to explain the rationale for use of corrective treatment for the effects of a named disorder of the lymphatic system. Learners will give detailed explanations of the disorder affecting the normal functioning of the lymphatic system and the associated corrective treatment.
For pass standard, learners must describe the gross anatomy of the organs and associated structures that form the lymphatic system. Learners must label (for themselves) each structure of the lymphatic system and describe, in brief, the role it plays in the system. Learners will describe how lymph is formed and its role in the health of the body.

Learners will also briefly describe a named disorder and its effect on the normal function of the lymphatic system, including the symptoms present in the human body and give an overview of the corrective treatment(s) associated with the disorder.

Learning aim C

For distinction standard, learners will research dietary-related disorders of the digestive system. Learners must choose a named digestive system-related disease that affects the normal functioning of the body. They must explain how the named disease affects the system using correct biological terminology. Learners must also consider the effects on the person that is suffering from the disease and how medical intervention seeks to treat the effects of disease. Evaluations must also cover the implications to the health status of the individual and compare this with the healthy functioning of the digestive system.

For merit standard, learners must analyse the mode of action of digestive enzymes as applied to each of the macronutrients listed in the unit content. This will include named enzymes, the location of enzyme secretion, the location of enzyme action (if different), substrates and products of each nutrient broken down with enzymatic assistance. This will be linked to the analysis of nutrients in foods.

Learners will need to consider how nutrient deficiency can be tackled in terms of corrective treatments. They must explain the corrective treatment for the deficiency of two nutrients and how they may relieve the symptoms described.

For pass standard, learners must perform analytical tests to identify the nutrients present in dietary sources of macronutrients as listed in the unit content, they must also give detailed descriptions of nutrient-deficiency symptoms. Learners must describe the gross anatomy of the different areas of the digestive system as listed in the unit content. Learners should label each of the areas of the digestive system and describe, in brief, the role of the component labelled. Learners could use photographs from the dissection to label or complete a dissection. This would help provide the context necessary to help generate the understanding required.

Links to other units

This unit links to:
- Unit 1: Principles and Applications of Science I
- Unit 5: Principles and Applications of Science II
- Unit 9: Human Regulation and Reproduction
- Unit 10: Biological Molecules and Metabolic Pathways
- Unit 11: Genetics and Genetic Engineering
- Unit 12: Diseases and Infections.

Employer involvement

University sports science departments may be able to provide support and guidance and access to models of joints and a skeleton. Physiotherapy departments may be able to offer information and access to examples of replacement joints and exercises that will assist in treatment and recovery from musculoskeletal dysfunction.

GP Surgeries may have specialist nurses who might be available to visit and provide information about management of digestive system disorders, such as coeliac disease, irritable bowel syndrome and colitis.