iUSP160 – Anatomy and physiology for sports massage

URN – A/617/5649

Guided Learning Hours: 70

Learning outcome	Assessment criteria	Taught content to include
LO1 Understand the structural organisation of the human body	1.1. Outline the structural organisation of the human body	• Atoms • Molecules • Cells • Tissues • Organs • Systems • Organism
	1.2. Describe the structure of the human cell	• Cell membrane • Nuclear membrane • Nucleus • Nucleolus • Cytoplasm (cytosol) • Centrosome • Golgi apparatus • Mitochondria • Lysosome • Endoplasmic reticulum • Ribosome • Centrosome • Centromere • Vacuoles (more relevant to plants) • Centrioles • Chromatids (part of nucleus) • Cytoskeleton
	1.3. Describe the functions of the human cell	• Cell membrane

		- Regulates passage of substances in and out of cell • Cytosol - Medium for metabolic reactions • Cytoskeleton - Directs movement within cell • Nucleus/nucleolus - Genetic material; controls cellular activity • Ribosome - Protein synthesis in association with rough endoplasmic reticulum • Smooth endoplasmic reticulum - Inactivation of toxic chemicals • Golgi apparatus - Sorts, packages proteins and lipids • Lysosomes - Breaks down molecules in cell • Mitochondria - Generation of ATP • Centrosome/centrioles - Formation of flagella and cilia
	1.4. Describe the different types of human tissue	• Epithelial tissue - Simple ▪ Squamous ▪ Cuboidal ▪ Ciliated ▪ Columnar - Compound ▪ Transitional ▪ Stratified • Nervous tissue • Muscular tissue - Skeletal - Smooth - Cardiac • Connective tissue - Areolar - Adipose - Cartilage (white fibrous, yellow elastic, hyaline)

		- Bone - Blood - Lymph • Membranes - Serous - Mucous - Synovial
	1.5. Explain the functions of the different types of human tissue	• Epithelial tissue - Covering and lining ▪ Forms outer skin layer ▪ Lines internal organs - Glandular epithelium ▪ Secretion - Contributes to special sense organs ▪ Smell ▪ Hearing ▪ Vision ▪ Touch • Nervous tissue - Neurons ▪ Conducts nerve impulses - Neuroglia ▪ Supports and protects neurons • Muscular tissue - Motion - Movement of substances in the body - Maintains posture and stabilising body positions - Regulates organ volume - Thermogenesis • Connective tissue - Binds - Supports - Compartmentalises - Transport of substances - Energy storage • Membranes - Serous ▪ Lines body cavities and covers organs

		- Synovial
		  ▪ Lubricates synovial joints
		- Mucous
		  ▪ Secretes mucus
		  ▪ Barrier to microbes and other pathogens

LO2 Understand the structure and functions of the skin	2.1. Describe the structure of the skin	• Epidermis - Stratum corneum - Stratum lucidum - Stratum granulosum - Stratum spinosum/malphigian layer - Stratum germinativum/basal layer - Melanocytes - Keratinocytes - Langerhans cells - Merkel cells • Dermis - Blood (vessels) supply arteries, veins, capillaries - Lymphatic (vessels) supply - Hair follicle - Hair - Sebaceous gland - Sweat glands: Eccrine and apocrine - Sensory nerve endings and receptors - Dermal papilla (papillae) - Collagen - Elastin - Histeocytes (histiocytes or macrophages) - Mast cells - Fibroblasts - Erector (arrector) pili muscles • Subcutaneous layer - Adipose tissue - Areolar connective tissue - Nerve endings and receptors
	2.2. Describe the functions of the skin	• Secretion • Heat regulation • Absorption

		• Protection • Elimination • Sensation • Vitamin D formation (7-dehydro-cholesterol) • Keratinisation • Melanin formation • Immunity • Blood reservoir

LO3 Understand the structure and functions of the skeletal system	3.1. Describe the structure of the skeletal system	**Axial skeleton** • Cranium - Parietal - Frontal - Ethmoid - Sphenoid - Occipital - Temporal • Facial - Nasal - Zygomatic - Maxilla - Lacrimal - Turbinator (turbinate) - Palatine - Mandible - Vomer • Auditory ossicles - Malleus - Incus - Stapes • Vertebrae - Cervical - Thoracic - Lumbar - Sacrum - Coccyx - Hyoid - Ribs

- Sternum

Appendicular skeleton

- Upper extremity
  - Shoulder girdle
    - Scapula
    - Clavicle
  - Arm, wrist and hand
    - Humerus
    - Ulna
    - Radius
    - Carpals
      - Scaphoid
      - Lunate
      - Triquetral
      - Pisiform
      - Trapezium
      - Trapezoid
      - Capitate
      - Hamate
    - Metacarpals
    - Phalanges
- Lower extremity
  - Pelvic girdle
    - Innominate bones: Ischium, ilium, pubis
  - Leg and foot
    - Femur
    - Tibia
    - Fibula
    - Patella
    - Tarsals
      - Talus
      - Calcaneus
      - Navicular
      - Medial cuneiform
      - Intermediate cuneiform
      - Lateral cuneiform
      - Cuboid
    - Metatarsals

		▪ Phalanges
	3.2. Describe the functions of the skeletal system	• Support • Protection • Leverage for movement • Provides attachment for skeletal muscles • Mineral homeostasis • Red blood cell production • Energy storage
	3.3. Explain the classification of bones	• Based on type - Compact - Cancellous • Based on shape - Long - Short - Flat - Irregular - Sesamoid - Sutural • Give examples of where in the body they would be found
	3.4. Explain the stages of bone growth and repair	• Ossification - Intramembranous - Endochondral • Bone growth - Growth in length - Growth in thickness • Hormonal regulation of bone growth • Bone homeostasis • Repair of bone and fracture - Fracture haematoma - Fibrocartilaginous callus formation - Bony callus formation; remodelling - Cells involved (osteoblasts, osteoclasts, osteocytes)

LO4 Understand the structure and functions of joints	4.1. Describe the different joint categories	• Structural classification - Fibrous - Cartilaginous - Synovial • Functional classification - Immovable (synarthroses) ▪ Sutures - Slightly moveable (amphiarthroses) ▪ Intervertebral discs ▪ Symphysis pubis - Freely moveable (diarthroses, synovial) ▪ Hinge ▪ Condyloid ▪ Ball and socket ▪ Gliding ▪ Pivot ▪ Saddle
	4.2. Explain the structure of synovial joints	• Articulating bones • Articular cartilage • Articular capsule • Synovial membrane • Synovial fluid • Intracapsular and extracapsular ligaments • Menisci • Bursa • Periosteum
	4.3. Describe joint actions at the major joints	• Angular movements - Flexion - Extension - Hyperextension - Abduction - Adduction - Lateral flexion - Horizontal flexion - Horizontal extension • Rotational movements - Medial rotation - Lateral rotation

		- Left and right rotation • Circumduction movements • Special movements - Inversion - Eversion - Protraction - Retraction - Elevation - Depression - Supination - Pronation - Plantar flexion - Dorsiflexion
	4.4. Explain the characteristics of ligaments	• Structure - Collagen - Fibres-bundles arranged in multiple directions • Properties - Resist forces in several directions • Functions - Attaches bone to bone - Stabilises joints - Directs joint motion
	4.5. Explain the characteristics of tendons	• Structure - Epimysium - Perimysium - Endomysium - Collagen - Aponeurosis - Tendon sheaths • Properties - High tensile strength - Parallel alignment of collagen fibres • Function - Attachment of muscle to bone

LO5 Understand the structure and functions of the muscular system	5.1. Describe the characteristics of the types of muscle tissue	• General characteristics - Excitability - Conductivity - Contractility - Extensibility - Elasticity • Skeletal - Striated - Voluntary - Innervated by somatic nervous system • Cardiac - Striated - Involuntary - Co-ordinated by conduction system - Innervated by autonomic nervous system • Smooth - Non-striated - Involuntary - Innervated by autonomic nervous system
	5.2. Locate the major anterior and posterior skeletal muscles	• Muscles of the back and neck - Erector spinae - Scalenes - Sternocleidomastoid - Splenius capitis • Primary muscles of respiration - Diaphragm - Intercostals • Muscles of the shoulder joint - Pectoralis major - Deltoid - Latissimus dorsi - Teres major - Supraspinatus - Infraspinatus - Teres minor - Subscapularis - Coracobrachialis • Muscles of the shoulder girdle

		- Trapezius - Levator scapulae - Rhomboids major and minor - Serratus anterior • Muscles of the upper arm and elbow - Biceps brachii - Brachialis - Triceps brachii • Muscles of the forearm - Flexors ▪ Pronator teres ▪ Flexor carpi radialis ▪ Flexor carpi ulnaris ▪ Palmaris longus ▪ Flexor digitorum superficialis ▪ Flexor digitorum profundus - Extensors ▪ Extensor carpi radialis brevis ▪ Extensor carpi ulnaris ▪ Anconeus ▪ Supinator ▪ Extensor carpi radialis longus ▪ Brachioradialis • Anterior and posterior abdominal walls - Rectus abdominis - Internal obliques - External obliques - Transversus abdominis - Quadratus lumborum • Muscles of the hip joint - Iliacus - Psoas major - Tensor fasciae latae and iliotibial tract - Gluteus medius - Gluteus minimus - Piriformis - Pectineus • Muscles of the knee joint and thigh - Quadriceps

		▪ Rectus femoris ▪ Vastus lateralis ▪ Vastus intermedius ▪ Vastus medialis - Adductors ▪ Brevis ▪ Longus ▪ Magnus - Hamstrings ▪ Biceps femoris ▪ Semitendinosis ▪ Semimembranosis ▪ Sartorius ▪ Gracilis • Muscles of the lower leg and ankle - Anterior compartment ▪ Tibialis anterior ▪ Extensor digitorum longus - Lateral compartment ▪ Peroneus longus ▪ Peroneus brevis - Posterior deep compartment ▪ Tibialis posterior ▪ Flexor digitorum longus ▪ Popliteus - Posterior superficial compartment ▪ Gastrocnemius ▪ Soleus ▪ Achilles tendon
	5.3. Identify and locate the muscle attachment sites for the major muscles of the body	• Position • Origin • Insertion
	5.4. Describe the action of the major anterior and posterior skeletal muscles	• Muscles of the back and neck - Erector spinae - Scalenes - Sternocleidomastoid - Splenius capitis • Primary muscles of respiration

		- Diaphragm - Intercostals • Muscles of the shoulder joint - Pectoralis major - Deltoid - Latissimus dorsi - Teres major - Supraspinatus - Infraspinatus - Teres minor - Subscapularis - Coracobrachialis • Muscles of the shoulder girdle - Trapezius - Levator scapulae - Rhomboids major and minor - Serratus anterior • Muscles of the upper arm and elbow - Biceps brachii - Brachialis - Triceps brachii • Muscles of the forearm - Flexors ▪ Pronator teres ▪ Flexor carpi radialis ▪ Flexor carpi ulnaris ▪ Palmaris longus ▪ Flexor digitorum superficialis ▪ Flexor digitorum profundus - Extensors ▪ Extensor carpi radialis brevis ▪ Extensor carpi ulnaris ▪ Anconeus ▪ Supinator ▪ Extensor carpi radialis longus ▪ Brachioradialis • Anterior and posterior abdominal walls - Rectus abdominis - Internal obliques

		- External obliques - Transversus abdominis - Quadratus lumborum • Muscles of the hip joint - Iliacus - Psoas major - Tensor fasciae latae and iliotibial tract - Gluteus medius - Gluteus minimus - Piriformis - Pectineus • Muscles of the knee joint and thigh - Quadriceps ▪ Rectus femoris ▪ Vastus lateralis ▪ Vastus intermedius ▪ Vastus medialis - Adductors ▪ Brevis ▪ Longus ▪ Magnus - Hamstrings ▪ Biceps femoris ▪ Semitendinosis ▪ Semimembranosis - Sartorius - Gracilis • Muscles of the lower leg and ankle - Anterior compartment ▪ Tibialis anterior ▪ Extensor digitorum longus - Lateral compartment ▪ Peroneus longus ▪ Peroneus brevis - Posterior deep compartment ▪ Tibialis posterior ▪ Flexor digitorum longus ▪ Popliteus - Posterior superficial compartment

		▪ Gastrocnemius ▪ Soleus ▪ Achilles tendon
	5.5. Describe the roles of muscles during movement	• Agonist • Antagonist • Fixator • Synergist
	5.6. Explain the different types of muscle contraction	• Isotonic – concentric and eccentric • Isometric (static) • Isokinetic
	5.7. Explain the principles of muscle contraction	• Sliding filament theory - Sarcomeres - Sarcolemma - Myofibrils - actin and myosin filaments - Troponin - Crossbridges - Tropomyosin - Calcium - Sarcoplasmic reticulum - ATP - ADP • Neurotransmitters, resting potential • Synapse • All or none law

LO6 Know the structure and functions of the nervous system	6.1. Describe the structure of the nervous system	• Central nervous system - Brain and spinal cord • Peripheral nervous system - 12 pairs cranial nerves - 31 pairs spinal nerves • Sensory neurons • Association neurons • Motor neurons • Somatic nervous system • Autonomic nervous system

	6.2. Outline the functions of each subdivision of the nervous system	• Central nervous system - Brain ▪ Brain stem (medulla oblongata, pons, midbrain) ▪ Diencephalon (thalamus & hypothalamus) ▪ Cerebellum ▪ Cerebrum (lobes, cortex, gyri) ▪ Meninges (dura, arachnoid & pia mater) ▪ Cerebrospinal fluid - Spinal cord ▪ Cervical and lumbar enlargements ▪ Nerve plexuses ▪ Meninges (dura, arachnoid & pia mater) ▪ Cerebrospinal fluid ▪ Spinal nerves (dorsal and ventral roots) ▪ Cauda equina ▪ Filum terminale ▪ Dorsal and ventral grey horns ▪ Ascending and descending tracts - Peripheral nervous system ▪ 12 pairs of cranial nerves (sensory, motor & mixed) ▪ 31 pairs of spinal nerves (cervical, thoracic, lumbar, sacral & coccygeal) - Autonomic nervous system ▪ Sympathetic ▪ Parasympathetic - Somatic nervous system
	6.3. Explain the characteristics of the different types of nerves	• Cell body • Axon • Dendrites • Axon terminals • Synaptic end bulb • Schwann cells (neurolemmocytes) • Myelin sheath • Nodes of Ranvier • Sensory neurons • Association neurons • Motor neurons

		• Synapse • Neurotransmitters • Reflex arc

LO7 Understand the structure and functions of the endocrine system	7.1. Describe the structure of the endocrine system	• Hypothalamus • Pituitary - Posterior lobe - Anterior lobe • Thyroid gland • Parathyroids • Thymus • Pineal • Islets of Langerhans • Adrenal medulla • Adrenal cortex • Ovaries • Testes
	7.2. Explain the role of hormones	• Regulation of: - Chemical composition of the internal environment - Metabolism - Contraction of smooth muscle, cardiac muscle and glandular secretion - Activities of the immune system • Plays a role in: - Smooth, sequential integration of growth and development - Reproduction and fertilization - Oocyte and sperm production - Nourishment of the embryo and fetus - Delivery and nourishment of the newborn
	7.3. Name key hormones and their actions	• Pituitary - Human growth hormone - Thyroid stimulating hormone - Follicle stimulating hormone - Luteinizing hormone - Prolactin - Adrenocorticotropic hormone - Melanocyte stimulating hormone

		- Oxytocin - Anti-diuretic hormone (vasopressin) • Pineal - Melatonin • Thyroid - Thyroxine (T4) - Triiodothyronine (T3) - Calcitonin • Parathyroids - Parathyroid hormone • Thymus - Thymosin • Islets of Langerhans - Insulin - Glucagon - Somatostatin - Pancreatic polypeptide • Adrenals - Aldosterone - Cortisol - Androgens - Epinephrine - Norepinephrine • Ovaries - Oestrogens - Progesterone - Relaxin - Inhibin • Testes - Testosterone - Inhibin

LO8 Understand the structure and functions of the cardiovascular system	8.1. Describe the structure of the cardiovascular system	• Heart - Size and location - Upper chambers ▪ Left atrium ▪ Right atrium - Lower chambers

		▪ Left ventricle ▪ Right ventricle - Atrioventricular valves ▪ Mitral (bicuspid) ▪ Tricuspid - Semilunar valves ▪ Aortic ▪ Pulmonary - Septum - Heart wall (endocardium, myocardium, pericardium) - Coronary circulation - Conduction system - Papillary muscles - Chordae tendineae • Blood - Plasma - Formed elements - Red cells - White cells - Platelets • Blood vessels - Arteries ▪ Aorta ▪ Elastic (conducting) arteries • Brachiocephalic • Common carotid • Subclavian • Vertebral • Pulmonary • Common iliac ▪ Muscular (distributing) arteries • Axillary • Brachial • Radial • Intercostal • Femoral • Popliteal • Tibial

		▪ Arterioles - Capillaries ▪ Venules ▪ Veins • Inferior vena cava • Superior vena cava • Venous sinuses
	8.2. Describe the functions of the cardiovascular system	• Transportation of: - Oxygen - Nutrients - Carbon dioxide - Waste products - Hormones - Heat • Regulation of: - pH - Body temperature - Water content of cells • Protection against: - Blood loss (clotting) - Foreign microbes and toxins
	8.3. Describe the flow of blood around the circulatory system	• Divisions of circulation: - Pulmonary - Systemic • Hepatic portal • Coronary • Oxygenated blood • Deoxygenated blood • Arteries • Capillaries • Veins • Venous sinuses • Pumping mechanisms for venous system: - Skeletal muscle pump - Respiratory pump - Valves
	8.4. Describe the composition of blood	• Plasma

		- Water 91.5% - Plasma proteins 7% ▪ Albumins ▪ Globins ▪ Fibrinogen ▪ Other proteins • Formed elements - Red cells (erythrocytes) - White cells (leucocytes) - Platelets (thrombocytes) • Solutes - 1.5%: Inorganic ions; nutrients; waste; gases; hormones
	8.5. Describe blood pressure	• Define blood pressure • Cardiac output • Diastole • Systole • Stroke volume • Pulse and pulse rate • Measurement of blood pressure • Auto regulation of blood pressure
	8.6. Describe factors that may affect blood pressure	• Exercise • Obesity • Diet • Sodium intake • Alcohol • Stress • Smoking • Caffeine

LO9 Understand the structure and functions of the respiratory system	9.1. Describe the structure of the respiratory system	• Nose • Nasal cavity • Larynx • Pharynx • Trachea • Bronchi • Bronchioles • Alveoli

		• Lungs • Pleura (visceral, parietal, pleural cavity)
	9.2. Describe the functions of the respiratory system	• Supply oxygen to blood and tissues • Eliminate carbon dioxide
	9.3. Identify the main muscles involved in breathing	• Muscles of inspiration - Primary ▪ Diaphragm ▪ External intercostals - Accessory ▪ Sternocleidomastoid ▪ Scalenes ▪ Pectoralis minor • Muscles of expiration - Internal intercostals - Rectus abdominis - External oblique - Internal oblique - Transversus abdominis
	9.4. Describe the passage of air through the cardio-respiratory systems including gaseous exchange	• Pulmonary ventilation - Inspiration and expiration - Diaphragm and intercostals • External (pulmonary) respiration - Gaseous exchange within lungs • Internal (tissue) respiration - Gaseous exchange within tissues

LO10 Understand the structure and functions of the lymphatic system	10.1. Outline the structure of the lymphatic system	• Primary lymphatic organs - Red bone marrow - Thymus gland • Secondary lymphatic organs - Lymph nodes - Spleen - Lymphatic nodules - Mucosa associated lymphoid tissue (MALT) • Lymphatic vessels - Lymphatic capillaries - Afferent lymphatic vessels

		- Efferent lymphatic vessels - Lymphatic trunks - Lymphatic ducts
	10.2. Describe the functions of the lymphatic system	• Drains interstitial fluid • Transports dietary lipids • Immune responses
	10.3. Describe the structure of a lymph node	• Capsule • Trabeculae • Hilus • Cortex - Follicle - Cortical sinus - Germinal centre - Reticular fibre • Medulla - Medullary cord - Medullary sinus - Reticular fibre
	10.4. Explain the functions of a lymph node	• Filtering • Phagocytosis
	10.5. State the location of the major lymph nodes	• Occipital • Auricular • Parotid • Buccal • Superficial and deep cervical • Submandibular • Axillary • Supratrochlear • Thoracic • Abdominal • Inguinal • Popliteal

LO11 Know the structure and functions of the digestive system	11.1. Outline the structure of the digestive system	• Gastrointestinal tract - Mouth - Pharynx - Oesophagus - Stomach - Small intestine - Large intestine - Rectum - Anus • Accessory structures - Teeth - Tongue - Salivary glands - Liver - Gall bladder - Pancreas
	11.2. Outline the functions of the digestive system	• Processes - Ingestion - Secretion - Mixing and propulsion - Digestion - Absorption - Defecation • Explain the process by which food stuffs are broken down as they pass through the alimentary canal during the digestive process - Action of rennin, hydrochloric acid and pepsin in the stomach - Action of pancreatic juice, i.e. trypsin and trypsinogen, lipase, amylase on peptones, fats and polysaccharides - Action of bile on fat - Action of intestinal juice – maltase, sucrase, lactase on disaccharides • Carbohydrate digestion and absorption - Mouth ▪ Salivary amylase • Polysaccharides into disaccharides - Small intestine ▪ Pancreatic amylase • Polysaccharides into disaccharides

		• Disaccharides to monosaccharides ▪ Absorbed into blood capillaries of villi • Protein digestion and absorption - Stomach ▪ Pepsinogen into pepsin ▪ Proteins into polypeptides - Small intestine ▪ Chymotrypsin and trypsin • Polypeptides into tripeptides and dipeptides ▪ Peptidases • Tripeptides and dipeptides into amino acids ▪ Absorbed into blood capillaries of villi • Lipid digestion and absorption - Small intestine ▪ Bile salts emulsify fats ▪ Pancreatic lipase • Fats into fatty acids and glycerol ▪ Lipases • Fats into fatty acids and glycerol ▪ Absorbed into the lacteals of villi • Water absorption - Stomach ▪ Small amount absorbed - Small intestine ▪ Majority absorbed - Large intestine ▪ Remaining absorbed • Explain the function and where in the digestive system you would find the following: - Enzyme - Proteins - Peptones - Polypeptides - Amino acids - Carbohydrates - Disaccharides - Monosaccharides

		- Fats - Fatty acids

LO12 Know the structure and functions of the urinary system	12.1. Outline the structure of the urinary system	• Kidney (cortex and medulla) • Renal pelvis • Ureter • Bladder • Urethra
	12.2. Outline the functions of the urinary system	• Kidneys - Regulates blood volume composition and blood pressure - Stimulates production of red blood cells - Synthesis of vitamin D • Ureters - Transport of urine from kidney to bladder • Urinary bladder - Stores urine • Urethra - Discharges urine from body • Glomerular filtration - Glomerulus and glomerular capillaries - Renal tubule • Tubular reabsorption - Peritubular capillaries and vasa recta • Renal tubule • Tubular secretion - Blood capillaries - Renal tubule • Explain the composition of urine - 2% urea - 96% water - 2% other substances, e.g., ammonia, sodium, potassium, phosphates, chlorides, sulphates, and excess vitamins - Colour is formed from bilirubin (bile pigment)

LO13 Understand the effects of sports massage on the body systems	13.1. Explain the physical effects of sports massage	• Stretches and releases myofascial tissues • Increases muscle flexibility and range of motion • Breaks down scar tissue • Reduces swelling
	13.2. Explain the physiological and neurological effects of sports massage	• Increases blood and lymph flow • Increases supply of oxygen and nutrients and removes waste • Stimulates nervous activity • Relieves pain • Golgi tendon organs • Stretch reflex
	13.3. Explain the psychological effects of sports massage	• Relieves tension and anxiety • Supresses perception of pain • Stimulates physical activity

Assessment	
MCQ	

Guide to taught content
The content contained within the unit specification is not prescriptive or exhaustive but is intended to provide helpful guidance to teachers and learners with the key areas that will be covered within the unit, and, relating to the kinds of evidence that should be provided for each assessment objective specific to the unit learning outcomes.

Document History

Version	Issue Date	Changes	Role
v1	13/08/2019	First published	Qualifications and Regulation Co-ordinator