Component I: Core

Module B: Terminology, Anatomy and Physiology

Topic 3: Musculoskeletal System

Statement of Purpose
To prepare the learner with basic knowledge of the musculoskeletal system.

Student Learning Outcomes
Upon completion of this topic, the learner will be able to:

1. Spell and define key terms.
2. List musculoskeletal functions.
3. Name three types of muscle tissue and describe the purpose of each.
4. Describe production and use of energy in muscle.
5. Identify the elements which make up bone tissue.
6. Define the purpose of a muscle group.
7. Identify major muscles and bones.
8. Differentiate between a tendon and a ligament.
9. Identify types of fractures and characteristics of each type.
10. Describe the structure and function of a type of smooth muscle.

Terminology

1. Achilles tendon
2. Adenosine Triphosphate (ATP)
3. Bronchoconstriction
4. Bronchodilation
5. Calcium
6. Cardiac muscle
7. Closed/simple fracture
8. Collagen
9. Comminuted
10. Connective tissue
11. Depressed
12. Displaced
13. Extensor
14. Fixator
15. Flexor
16. Fracture
17. Fracture line
18. Greenstick
19. Impacted
20. Involuntary muscle
21. Joint
22. Ligament
23. Magnesium
24. Nondisplaced
25. Oblique
26. Open/compound
27. Periosteum
28. Peristalsis
29. Phosphorus
30. Prime mover
31. Skeletal muscle
32. Smooth muscle
33. Sphincter
34. Spiral fracture
35. Striated muscle
36. Tendon
37. Transverse fracture
38. Vasoconstriction
39. Vasodilation
40. Voluntary muscle

References

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Websites

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Content Outline/Theory Objectives	Suggested Learning Activities
Objective 1 **Spell and define key terms.** A. Review the terms listed in the terminology section. B. Spell and define the listed terms accurately. C. Pronounce the terms correctly. D. Use the terms in their proper context.	A. Games: word searches, crossword puzzles, Family Feud, Jeopardy, bingo, spelling bee, hangman and concentration. B. Administer vocabulary pre-test and post-test. C. Discuss learning gaps and plan for applying vocabulary.
Objective 2 **List musculoskeletal functions.** A. The functions of the musculoskeletal system 1. Provide framework for the body. 2. Protect the soft body parts such as the brain. 3. Store calcium. 4. Produce blood cells. 5. Movement. 6. Heat production. B. Bone structure and divisions of the skeletal system 1. The structures of bones are comprised two thirds of minerals. 2. One third is organic matter. 3. Two sections of skeleton. a. Axial 1) Spinal column. 2) Skull. 3) Rib cage. b. Appendicular 1) Arms (Upper extremity). 2) Shoulders. 3) Hands. 4) Legs (Lower extremity). 5) Feet. 6) Pelvis. C. Muscle function 1. Unique because it has the ability to contract. 2. Contraction allows muscle to perform various functions. 3. Provides movement. 4. Good posture and stability. 5. Control of body openings and passages. 6. Controls heat production. D. Muscle movement 1. Attached to bones, when they contract, the attached bones move. This allows walking or waving hand. 2. Facial muscles are attached to skin of the face, so when they contract, different facial	A. Lecture/Discussion B. Assigned Readings C. Use anatomical diagrams/ posters/videos/computer assisted learning/ workbook activities.

expressions are produced. 3. Smooth muscle is found in the digestive system, blood vessels, bladder, airways and uterus. 4. The contraction of smooth muscle in these organs produces movements a. Digestive system, peristalsis. b. Blood vessels, vasoconstriction and vasodilation. c. Airways, bronchodilation and bronchoconstriction.	
Objective 3 **Name three types of muscular tissue and describe the purpose of each.** A. Skeletal 1. Voluntary muscle. 2. Striated muscle tissue. 3. Under direct control of the nervous system. 4. Attached to bone by tendon. B. Smooth 1. Involuntary muscle. 2. Provides structures to the body organs. 3. Found in the walls of most tubular organs. 4. Propels or controls the flow of organ content. C. Cardiac 1. Specially adapted involuntary muscle. 2. Own regulatory system. 3. Rich blood supply. 4. Cardiac muscle is placed in a separate category.	A. Lecture/Discussion B. Assigned Readings C. Use anatomical diagrams/ posters/videos/computer assisted learning/ workbook activities.
Objective 4 **Describe production and use of energy in muscle** A. Aerobic and anaerobic are two types of energy systems that are utilized by the body. Each energy system produces Adenosine Triphosphate (ATP), which is used by the muscles to contract. 1. The aerobic system can utilize carbohydrates, proteins or fat to supply an unlimited amount of ATP as long as oxygen is present. The aerobic system provides medium to very long duration energy production with low to moderate power. The by-product of this system is heat, water and carbon dioxide. 2. The anaerobic system can only utilize carbohydrates for ATP production. This system does not use oxygen in the metabolism of the fuel source. The anaerobic system provides short duration and high power. The by-product of the metabolism of glucose (glycolysis) in this system is heat and lactic acid (the cause of	A. Lecture/Discussion B. Assigned Readings C. Use anatomical diagrams/ posters/videos/computer assisted learning/workbook activities.

muscle soreness immediately after exercise).	
Objective 5 **Identify the elements which make up bone tissue.** A. Bones contain various kinds of tissues, including osseous tissue, blood vessels and nerves. B. 20% of bone weight is water. C. 80% is minerals and organic matter. 1. Minerals a. Calcium. b. Phosphorus. c. Magnesium. 2. Organic matter a. Collagen. b. Protein fiber that forms the matrix. D. Periosteum covers bone 1. Tough membrane. 2. Blood vessels and nerves pass through to the bone.	A. Lecture/Discussion B. Assigned Readings C. Use anatomical diagrams/ posters/videos/computer assisted learning/ workbook activities.
Objective 6 **Define the purpose of a muscle group.** A. A muscle group is a pair of skeletal muscles working together. B. The origin is where the muscle begins or is attached to bone; does not move. C. Insertion is where the muscle ends; moveable D. Prime mover is the muscle responsible for movement when a group of muscles is contracting at the same time. E. Fixators are specialized synergists that stabilize the origin (non-moving bone or muscle) of a prime mover.	A. Lecture/Discussion B. Assigned Readings C. Use anatomical diagrams/ posters/videos/computer assisted learning/ workbook activities. D. Demonstrate flexion and extension in class.
Objective 7 **Identify major muscles and bones.** A. Utilize charts and workbooks to identify. B. Relate major muscle groups to bones in the area. C. Correlate with functional aspects. D. Add these major components to vocabulary list.	A. Lecture/Discussion B. Assigned Readings C. Use anatomical diagrams/ posters/videos/computer assisted learning/ workbook activities. D. Labeling an anatomical illustration.
Objective 8 **Differentiate between a tendon and a ligament.** A. Tendon 1. Extended muscular connective tissue which forms strong fibrous structure a. Is attached to rough surfaces on a bone. b. Does not stretch. c. Strongest tendon is the Achilles tendon. B. Ligament 1. Flexible, fibrous tissue	A. Lecture/Discussion B. Assigned Readings C. Use anatomical diagrams/ posters/videos/computer assisted learning/ workbook activities.

a. Connects bone to bone at joints. b. Supports organs. c. Can stretch.	
Objective 9 **Identify types of fractures and characteristics of each type.** A. Closed 1. Complete fracture a. Transverse, straight across the bone. b. Oblique, angular. B. Open bone protrudes through skin is compound. C. Impacted, broken ends are jammed into each other. D. Greenstick is an incomplete fracture in young bone. E. Comminuted 1. More than one fracture line and several bone fragments. 2. Broken and crushed into small pieces. F. Depressed 1. Usually with severe head injuries. 2. Broken piece of bone is driven inward. G. Spiral, when break winds around the bone.	A. Lecture/Discussion B. Assigned Readings C. Use anatomical diagrams/ posters/videos/computer assisted learning/ workbook activities. D. Have students draw types of fractures. E. Create note cards with types of fractures on one side, with definitions on the reverse side. F. In groups of two, create a teaching plan with posters and handouts explaining how to care and prevent muscle strains and sprains.
Objective 10 **Describe the structure and function of a type of smooth muscle.** A. Structure of smooth muscle 1. Involuntary, found throughout internal organs. 2. Informed and innervated by the autonomic nervous system. B. Function 1. Muscle structures that close intermittently to control the flow of food, liquid, or blood. 2. Smooth, donut shaped muscle a. Sphincter is an example of a smooth muscle.	A. Lecture/Discussion B. Assigned Readings C. Use anatomical diagrams/ posters/videos/computer assisted learning/ workbook activities. D. Read the descriptions of various conditions involving muscles. Note pediatric perspective.