

Muscle Contraction Scenario: Higher Education

Overview

This is an introductory college anatomy class that meets for 60 minutes and has over 80 students in attendance. In previous classes, students were learning about the muscular system, including understanding the differences between smooth, cardiac, and skeletal muscle. In today's lesson, they will be focusing on skeletal muscle and applying what they learn about the physiology of skeletal muscle contraction to a case example.

This class is an introductory course available to any student on campus, but is required for pre-med, nursing students, and physical and occupational therapists. This year's class is made up primarily of freshman, with a few sophomores and juniors. Being able to understand the physiology of muscular contraction is critical to understanding how to treat a wide range of disorders of the muscular system, including drug and physical therapy applications.

Class Session

In this class session, students will learn the basic physiological process of muscular contraction. Then, they will work in groups to try to problem-solve how to address different clinical case examples that require students to apply their understanding of the muscular physiology.

This is important because it supports the biomedical habit of mind: to use one's understanding of complex physiological processes to make evidence-informed decisions related to case examples. It also helps students understand general skeletal muscle conditions or sports injuries that they may have experienced or heard about, such as strains and contusions.

Goals

- Students will understand the basic physiological process of muscular contraction.
- Students will apply their understanding of physiological process of muscular contraction to analyze two muscular system case examples.

Materials

- Skeletal muscle contraction image
- Muscle Contraction Handout (paper and digital option)
- Step-by-step model example and sentence-starter handout
- Digital resources on the course website and Internet

- Class textbook
- Link to professor's auto-captioned mini-lecture recording

Methods

1. The goal statements from the syllabus will be posted on the whiteboard.
2. Students will see the image of the steps of skeletal muscle contraction projected on the whiteboard and with an image description. This image is also on their [Muscle Contraction Handout](#).
3. The professor will briefly review the key steps and students will be told: "Here are the basic steps involved in skeletal muscle contraction. These steps are important to understand so you can problem-solve disorders of the skeletal muscles."
4. Students will be shown the objective on the board and the professor will restate it: "Your challenge is to use what you know about skeletal muscle contraction and apply it to explain what is happening in two real-life case examples."

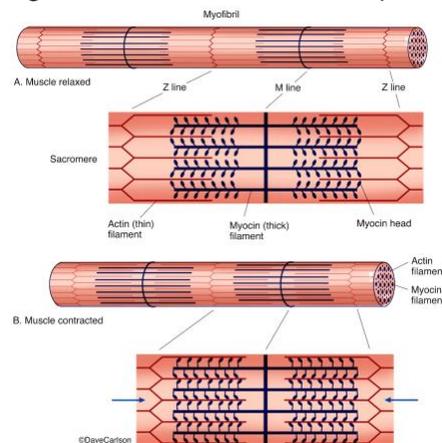


Image showing the key changes in muscular contraction, including the actin and myosin filaments. First the muscle is relaxed, showing the Z and M lines. Then it shows the muscle contracted, including the Z and M lines and myosin heads.

5. The students will pair up to discuss what the goal means and to make a note of what they already know or want to know about skeletal muscle contraction. They will spend a few minutes re-crafting the objectives in their own words using the Muscle Contraction Handout.
6. Also on the Muscle Contraction Handout, students will be prompted to answer: "Use the class textbook, digital resources on our class website (including a pre-recorded, auto-captioned mini-lecture by the professor), and/or your own online research to learn more about the physiology of muscle contraction."
7. There will be three ways students can build their background knowledge and generate diagnosis for the case examples.
 1. Choice 1: Students have a discussion with a partner. They record their key ideas and solutions in the Muscle Contraction Handout.

2. Choice 2: Students can work on their own or with a partner to use sentence starters and a step-by-step model case example to generate solutions to the two clinical case examples. They record key ideas and solutions in the Muscle Contraction Handout.
3. Choice 3: Students can work on their own or with a partner to watch the professor's auto captioned mini-lecture recording and record key ideas and solutions in the Muscle Contraction Handout.
8. Students will review the objective and their preparation before making their choice and will reflect why this choice is the best for them to deepen their learning.
9. As students work through the lesson, they will track their progress for understanding using the prompts:
 1. "How have you developed an understanding of the key steps to skeletal muscle contraction?"
 2. "How have you used that understanding to generate solutions to the clinical case examples?"
 3. "How can you use this background to apply to other kinds of clinical case examples?"
10. When students are finished, they can read or have the text-to-speech read from an article that describes an additional clinical example that requires background understanding of skeletal muscle contraction.
11. At the end of class, the professor will pull the class together for a final summary of key ideas.

Assessments

1. As students work, the professor or teaching assistant will walk around the room and engage students in conversations to get a sense of their progress. If a pair or an individual student encounters barriers, the professor or teaching assistant will offer support (for example, students might be prompted to a specific online resource or part of the professor's recorded mini-lecture).
2. At the end of class, students will record their reflection on their Muscle Contraction Handout:
 - "How well did they meet the goal for today?"
 - "How well did their background understanding of skeletal muscle contraction help them to generate solutions to the clinical case examples?"

They can use drawings, words, and/or numbers to share their reflection. If students use the digital version of the Handout, they could record their answers using speech-to-text options.