WARD'S™

Muscle Action Demonstration Model

Lab Activity

14 W 8324

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Introduction

The mechanics behind muscle contraction and extension and the relationship between the muscular system and the skeletal system are often difficult to teach in the classroom. The Muscle Action Demonstration Model allows students to visualize the role of muscles as the "biological motors" that control skeletal movement. Students will also be able to examine the interaction between antagonistic muscle pairs.

The Muscle Action Demonstration Model is a representation of a human arm. The understanding gained from this model can then be applied to other movements of the human body, as well as to the muscle movement of other vertebrates.

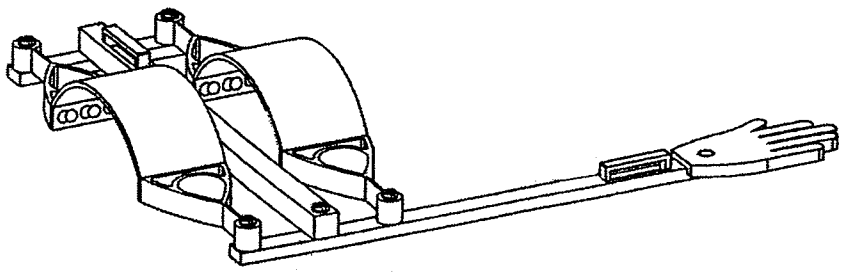
Components of the Model

- 1 rigid plastic extension representing the humerus
- 1 rigid plastic extension representing the combination of the radius and ulna
- 1 flexible/extendable foam "muscle" representing the biceps
- 1 flexible/extendable foam "muscle" representing the triceps
- 4 rigid plastic attachments representing tendons
- 1 foam hand
- 2 self-gripping attachment straps
- 4 plastic connectors (to secure muscles to tendons)

Assembly of the Model

1. Attach the plastic extension representing the upper arm to the plastic extension representing the forearm. Snap the upper arm extension to the center post of the forearm extension.
2. Snap the four plastic tendons to the remaining four posts on the upper arm and forearm. You should have two tendons on the upper arm and two tendons on the forearm.
3. Place each end of the two foam muscles on either opposing end of the tendon pairs. Secure the muscles to the tendons with the four plastic connectors. Do this by placing the connectors on the ends of the tendons and sliding each connector sideways to lock it in place.
4. Slide the attachment straps through the raised slots on both plastic extensions.
5. Attach the foam hand to the end of the plastic extension representing the forearm.

Figure 1



Using the Muscle Action Demonstration Model

Prior to using the Muscle Action Demonstration, introduce students to the following concepts and terminology:

Flexor – a muscle that causes a joint to flex, or close up.

Extendor – a muscle that causes a joint to extend, or straighten.

Tendon – tissue that connects a muscle directly to a bone.

Antagonistic muscle pairs – two sets of muscles, running parallel to a joint, in which opposite actions control movements.

Joint (or articulation) – a point of contact between two different bones.

Place the Muscle Action Demonstration Model on a flat surface with the flexible muscles facing up. With the upper and forearm perpendicular to each other, have students examine both muscles. Engage in flexion by bringing the forearm up towards the shoulder. Again, have students examine both muscles, noting changes undergone by the opposing muscles through the actions of flexing.

Engage the arm in extension by moving the forearm away from the shoulder, extending the arm beyond the perpendicular position. Have students examine the muscles, noting changes that occurred between the act of flexing and extending the arm.

Explain the concept of muscular contraction. Have students form a hypothesis as to which muscles control the act of flexing the arm, which muscles control the act of extending the arm.

Have students place the Muscle Action Demonstration Model on their own arms, securing the model to the upper arm and forearm with the self-gripping attachment straps. Have students engage in flexion and extension and, both physically and through palpation, observe the actions of the their own biceps and triceps muscles.

The concepts taught with the Muscle Action Demonstration Model can be used to stimulate a discussion about the entire musculo-skeletal system and the mechanics of movement. Challenge students to think of other examples of articulations controlled by antagonistic pairs of muscles and their roles in locomotion. Apply the concepts not only to the human skeleton, but to other vertebrates, such as quadrapeds.

Notes:

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