Muscle Physiology Activities

Purpose: Explore the muscles' response to intermittent contractions and sustained contractions.

Materials: squeeze ball (or tennis ball) and a watch with second hand.

Activities:

Sitting quietly, grasp squeeze ball. At the start signal, squeeze and release, once per second until you are unable to continue. Time how long this takes. Write the amount of time here.	
Rest one minute and repeat with the other hand. Write the amount of time here.	
Return ball to the original hand. At the start signal, squeeze the ball and hold the squeeze continuously until you are unable to continue. Time how long this takes. Write the amount of time here.	
Rest one minute and repeat with the other hand. Write the amount of time here.	

Outcome: You should notice discomfort and fatigue as you perform the intermittent contractions (the first experiment); this should occur faster in your non-dominant hand. You should find that fatigue occurs faster during the sustained contraction. You may not find a difference between your dominant hand and non-dominant hand.

Background and Significance: Discomfort and progressive loss of strength occur with repeated contractions due to muscle fatigue. The effect is greater during sustained contractions as blood flow is impeded because of muscles compressing blood vessels. Rhythmic contractions actually promote blood flow by alternately compressing and relaxing against the vessels (see the cardiovascular activities on the previous page). With leg exercises (such as knee bends), larger muscles are involved, which stimulates the cardiovascular system, respiratory system, and cooling system. Fatigue can 'protect' a muscle from injury.

Questions for Group Discussion:

- Why do muscles fatigue?
- Why does it hurt when your muscles get tired?
- Why can you do more exercise when it is performed rhythmically compared to continuously?
- Why does leg exercise stimulate more systems than arm exercise?

* Activity presented by Steven S. Segal, Ph.D., Yale University School of Medicine, at the Experimental Biology '99 workshop for teachers and students, Washington, DC.