Cardiovascular Physiology Activities

Purpose: Explore how the heart rate responds to sitting and standing.

Materials: watch with second hand; space to lay down; and chair to sit on.

Activities:

Lay quietly, then count heart rate at rest for 15 seconds. Multiply this number by 4 to get the number of beats per minute (bpm). Write your answer here.	
Sit quietly in a chair, then count heart rate at rest for 15 seconds. Multiply this number by 4 to get the number of beats per minute (bpm). Write your answer here.	
Wait one minute, measure your heart rate again and write your answer here.	
Stand up quickly, then count heart rate at rest for 15 seconds. Multiply this number by 4 to get the number of beats per minute (bpm). Write your answer here.	
Wait one minute, measure your heart rate again and write your answer here.	

Outcome: You should notice an increase in heart rate upon sitting and upon standing. After waiting a minute at each new position, the heart rate should return to the resting rate.

Background and Significance: Standing up results in pooling of the blood in the lower extremities. This decreases the return of blood to the heart, which then tries to pump faster to maintain cardiac output (that is, the amount of blood pumped by the heart each minute) and oxygen delivery to the body. As the cardiovascular system adapts to the change in position, the heart rate is restored to its resting rate. The cardiovascular system adapts, in part, by constricting the veins in the extremities to decrease the pooling of blood there.

Questions for Group Discussion:
Is the effect greater for tall or short individuals? Why do you think this is so?
Why can people faint when standing at attention without moving? How does exercise help?
Why are astronauts maintained in a horizontal position during take off?
Would the same effect (of moving to an upright position) occur during space flight?

* 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.