

INTEGRATING BIOLOGY**● Muscles and Work**

When you try to lift a heavy object, electrical impulses from your brain cause your muscles to contract and a force is exerted on the object. If the force is not strong enough to overcome the downward force due to gravity, the object does not move. But work is still being done on your muscles.

Resistance Exercise

If you regularly returned to the object and tried to lift it, the size and strength of your muscles would begin to increase. You would be engaging in a form of exercise called resistance exercise. In resistance exercise, force is exerted against a relatively heavy object. Lifting weights is an example of a resistance exercise. Besides resistance, there are two other kinds of exercise: anaerobic and aerobic.

Anaerobic Exercise

In anaerobic exercise, energy-rich oxygen cannot be supplied fast enough by the heart and lungs. Instead, the muscles rely on swift chemical reactions to supply them with the needed energy. Because these chemical reactions can only continue for a limited period of time, anaerobic exercise requires brief (but intense) physical exertion. Some examples of this form of exercise are pole vaulting and sprinting.

Aerobic Exercise

Aerobic exercise lasts longer and is less intense than anaerobic exercise. During aerobic exercise, your muscles have a continuous supply of oxygen from the heart and lungs. Some forms of aerobic exercise are swimming and jogging.

Your Turn to Think

1. Which type of exercise consists of shorter, more intense activity?
2. Which type of exercise is probably best for the heart and lungs? Why?
3. Label each of the following exercises *aerobic*, *anaerobic*, or *resistance*:
 - a. doing a running long jump
 - b. running the 100 m dash
 - c. running a marathon
 - d. doing push-ups