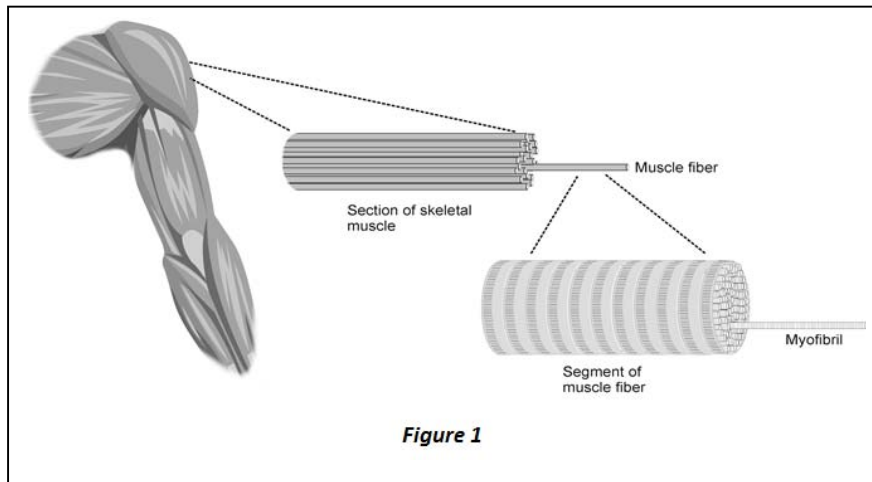


Analysis

Background

Skeletal muscle is composed of bundles of individual muscle fibers (see Figure 1) and has unique properties which allow it to respond to stimuli by contracting. Individual muscle fibers respond to an action potential with an all or none response, meaning the muscle fiber contracts to its maximum potential or not at all. Once a muscle has contracted, relaxation must occur before it can contract again. There are two basic types of muscle fibers: *slow-twitch fibers* and *fast-twitch fibers*. Fast-twitch fibers contract quickly creating short explosive movements and a high force of contraction. Because anaerobic metabolism provides the energy to fast-twitch fibers, fast-twitch fibers fatigue quickly. On the other hand, slow-twitch fibers contract slowly creating contractions that last longer over time and generate a low force of contraction. Because aerobic metabolism provides the energy to fast-twitch fibers and because the fibers are efficient at using oxygen to produce ATP, slow-twitch fibers fatigue slowly. The force of contraction of a muscle can be increased by increasing the frequency of stimulation to the muscle fibers (summation) or increasing the number of muscle fibers contracting by stimulating more motor units (recruitment).



Muscle fatigue occurs with prolonged or repetitive use of a muscle group. With fatigue, there is a sense of weakness and even discomfort, which eventually leads one to discontinue the activity that is causing it. The mechanism of fatigue is multifactorial and not fully understood, but is felt to involve the central nervous system, peripheral nervous system, muscle units and individual muscle fibers. At the level of the muscle fiber, depletion of ATP plays a role in fatigue.

Regular exercise improves muscular function and delays the onset of fatigue, thus increasing the amount and duration of work that can be performed. Exercise is important for optimal athletic performance, prevention of injury in athletes and non-athletes, and the maintenance of good general health.

Questions

1. What 2 ways can increase the force of a muscle contraction?

2. Examine your graph and the data in Table 1. Overall, **what is happening to the number of muscle fibers during the continuous grip activity?** Create a claim. Next, provide evidence by circling the part of your graph that supports your claim. Finally, provide the reason that links your evidence to your claim from the given background text.

Claim:

Evidence: (Insert copy of graph with circled evidence below)

Reason: (Copy the highlighted reason and insert below)

3. Examine your graph and/or data in Table 1. **Which type of muscle fibers are contracting in the first 10 second interval?** Create a claim. Next, provide 2 pieces of evidence 1) by circling the part of your graph that supports your claim and 2) by writing the evidence from your data table. Finally, provide the reason that links your evidence to your claim from the given background text.

Claim:

Evidence #1: (Insert copy of graph with circled evidence below)

Evidence #2: (Insert from Data Table)

Reason: (Copy the highlighted reason and insert below)

4. Examine your graph and/or data in Table 1. **Which type of muscle fibers are contracting during the 50-70 second interval?** Create a claim. Next, provide 2 pieces of evidence 1) by circling the part of your graph that supports your claim and 2) by writing the evidence from your data table. Finally, provide the reason that links your evidence to your claim from the given background text.

Claim:

Evidence #1: (Insert copy of graph with circled evidence below)

Evidence #2: (Insert from Data Table)

Reason: (Copy the highlighted reason and insert below)

5. Examine your graph and the data in Table 2. **Which type of muscle fibers are contracting during the repetitive grip exercise of this lab?** Create a claim. Next, provide evidence by circling the part or area of your graph that supports your claim. Finally, provide the reason that links your evidence to your claim from the given background text.

Claim:

Evidence: (Insert copy of graph with circled evidence below)

Reason: (Copy the highlighted reason and insert below)

6. The slopes in Table 3 should both have negative slopes. What does a negative slope represent?
7. Compare the 2 slopes from Table 3. What difference do you notice between the slopes? Explain why there is a difference between the slopes.
8. Based on your graphs, explain what happened when the subject was “encouraged” to grip even harder? In your explanation, be sure to include what happened to the number of muscle fibers contracting and what was the cause.