

MUSCLE FIBERS

EXSC- Std. 9

BELL WORK

- Page 117-118 in small A&P book.
- Define:
- Muscle fatigue
- Muscle tone
- Atrophy
- Hypertrophy

Review 14 must know muscles from previous lesson!!!

MUSCLE TONE MUSCLE ATROPHY

MUSCLE HYPERTROPHY MUSCLE FATIGUE

STANDARD 9

Identify the two types of muscle fibers and their subtypes, slow twitch and fast twitch. Relate the concepts of histochemistry, immunocytochemistry, and physiologic contraction times to the performance of athletes in various sports. Evaluate the role genetics and training play in muscle fiber adaptations. From this research, generate an informational artifact to share with athletes or clients as part of an exercise/training program.

OBJECTIVES

- Compare and contrast the two types of muscle fibers.
- Explain the affect of genetics and training on adaptations of those fibers through the creation of an informational artifact.

MUSCLE FIBERS

- A muscle cell is a “fiber.”
- Fibers are multinucleated and contain myoglobin.
- Myoglobin is an iron/oxygen binding protein.
- Myofibrils contain the contractile fibers.

There are 2 types:

- Type 1 (slow twitch)
- Type 2 (fast twitch)

MYOFIBRIL

- The myofibril is composed of “thick” and “thin” filaments.
- Each of these filaments is made up of strands of protein.

THICK AND THIN FILAMENTS

- The thick filaments, made mostly of myosin, have small “heads” that move.
- The thin filaments, made mostly of actin proteins have points to which the myosin heads temporarily attach.

MUSCLE FIBER ACTION

ALL OR NOTHING

- Fibers are either “on” (contracted) or “off” (relaxed).
- When lifting light weights, only a few fibers may be “on.” For heavy weights, many more may be “on,” and may take turns to prevent fatigue.

MUSCLE CONTRACTION VIDEO

[HTTPS://WWW.YOUTUBE.COM/WA
TCH?V=KTV-CAOT6UQ](https://www.youtube.com/watch?v=KTV-CAOT6UQ)

MUSCLE FIBER TYPES

TYPING METHODS

- “Historically there are two main methods of describing, or typing, a muscle fiber: (a| histochemistry and immunocytochemistry, and (b| physiologic contraction times. However, because differences in physiologic contraction times of the muscle fibers are qualitatively associated with different histochemical stains and immunocytochemical reactions, more generalized terms, such as *slow* and *fast twitch*, *type I* and *type II*, and *oxidative* and *glycolytic fibers* are commonly used.”

~Exercise Physiology by Authors:
Peter B. Raven, David H.
Wasserman, William G. Squires,
Tinker D. Murray

DEFINITIONS

- Histochemistry: the branch of science concerned with the identification and distribution of the chemical constituents of tissues by means of stains, indicators, and microscopy.
- Immunocytochemistry: the range of microscopic techniques used in the study of the immune system.

SLOW TWITCH, FAST TWITCH

- Slow-twitch fibers: lots of myoglobin and mitochondria. What activities would use these fibers?
- Fast-twitch: less myoglobin, but more able to use glycolysis to quickly produce ATP. What activities would use these fibers?
- Different people have different ratios of these two fibers.

FAST-TWITCH FIBERS

- Fast-twitch fibers are for bursts of strength and speed.
- The tradeoff: Fast-twitch fibers fatigue sooner.

SLOW-TWITCH FIBERS

- Slow-twitch fibers are for endurance.
- Trade-off: Slow-twitch fibers cannot supply a lot of power at once.

GROUP ACTIVITY

- Work with a partner to complete the muscle fatigue activity on page 134-135.
- Only do steps 1-8

MUSCLE ADAPTATIONS

GENETICS

- Read the link below to learn more about how genetics plays a role in a person's musculature. Then complete the article review.
- <https://www.scientificamerican.com/article/muscles-genes-cheats-2012-olympics-london/>

ARTICLE REVIEW

▪ After reading the previous article, answer the following questions on your own paper. These can be typed or handwritten responses. You do NOT have to write the questions.

1. What is the title of the article, and who is the author?
2. What question was the author addressing with this piece?
3. What is the role of genetics in athletic performance? Can it be altered?

TRAINING

- Read the link below to learn more about how training/exercise plays a role in a person's musculature. Then complete the article review. (You can write your responses on the same page as the other review.)
- <http://www.livestrong.com/article/273577-how-to-build-lean-muscle-with-cardio/>

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1. What is the title of the article, and who is the author?
2. What topic was the author addressing with this piece?
3. What is the role of training/exercise in athletic performance? Can it cause muscle adaptations?

EXIT TICKET

- 1. Explain the difference between muscle tone and muscle atrophy.
- 2. Which muscle fiber type allows for endurance performance?
- 3. Which muscle fiber type fatigues sooner?
- 4. Which muscle fiber type allows for long distance running?
- 5. What are the two major proteins involved in the sliding filament theory?