9.6: Types of Skeletal Muscle Fibers

Slow-twitch and fast-twitch skeletal muscle fibers can be characterized by their metabolic processes and corresponding physiological traits.

LEARNING OBJECTIVE

By the end of this section, you will be able to:

• Differentiate between the types of skeletal muscle fibers

Key Takeaways

Key Points

• Oxidative fibers rely on aerobic respiration to fuel muscle contractions, and include slow-twitch fibers, which are characterized as muscles with long contraction duration, associated with endurance.
• Glycolytic fibers rely on glycolysis to fuel muscle contractions and include fast-twitch fibers, which are characterized by fast muscle contractions of short duration.
• The proportion of fast-twitch vs. slow-twitch muscles of an individual is partly genetic in nature. However, concentrated exercise that prioritizes one type of muscle fiber use over the other can improve an individual’s ability to perform related physical activities.
Glossary

**fast-twitch**: Type II fibers which are characterized by fast muscle contractions of short duration.

**slow-twitch**: Type I fibers characterized as muscles with long contraction duration, associated with endurance.

**glycolytic**: Of, pertaining to or producing glycolysis, which is the metabolic pathway that converts glucose into pyruvate.

Skeletal muscle fibers can be characterized by their metabolic processes and corresponding physiological traits.

![Signaling Pathways that Regulate Skeletal Muscle Fiber-type Phenotype](https://med.libretexts.org/Bookshelves/Health_and_Fitness/Book%3A_Lifetime_Fitness_and_Wellness_(Lumen)/03%3A_Unit…)

**Signaling Pathways that Regulate Skeletal Muscle Fiber-type Phenotype**

Exercise-induced signaling pathways in skeletal muscle that determine specialized characteristics of slow-twitch and fast-twitch muscle fibers.

Oxidative fibers rely on aerobic respiration to fuel muscle contractions, and consist of slow-twitch (Type I) fibers, which are characterized as muscles with long contraction duration, associated with endurance. Slow-twitch fibers are used to maintain posture. They are usually found in red muscles, indicative of the large concentration of myoglobin providing a steady supply of oxygen to them. The red muscles use oxidative phosphorylation to obtain ATP. Oxidative phosphorylation occurs in the red muscles as the process requires a lot of oxygen, and the red muscles contain high amounts of myoglobin. The process is slower than glycolysis, but much more efficient, which is why slow-twitch muscles do not tire easily. Also, slow-twitch fibers contain less sarcoplasmic reticulum, facilitating a slower release of calcium, regulating muscle contraction at slower rates.

Glycolytic fibers rely on glycolysis to fuel muscle contractions and consist of fast-twitch (Type II) fibers, which are characterized by fast muscle contractions of short duration. Fast-twitch fibers are constituents of white muscles and have less myoglobin due to their primary reliance on glycolysis (anaerobic respiration) to fuel muscle contractions. Although glycolysis is very quick, it is also inefficient at producing ATP. Glycolysis produces lactic acid as a byproduct, which leads to fatigue. The use of the glycogen cycle is the reason why fast-twitch muscles tire out quickly.

There is some evidence that the proportion of fast-twitch versus slow-twitch muscles of an individual is partly genetic in nature. That is, we are born with a unique proportion of such muscles that suit us to particular types of physical activity. This is not without debate, however. Regardless, concentrated exercise that prioritizes one type of muscle fiber use over the other, can lead to muscle hypertrophy (increase in size), improving an individual's ability to perform related physical activities.

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