Fast and Slow Twitch Muscle Fibers

Does muscle type determine sports ability?

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Are you a better sprinter or distance runner? Many people believe that having more fast and slow twitch muscle fibers may determine what sports athletes excel at and how they respond to training.

Skeletal muscle is made up of bundles of individual muscle fibers called myocytes. Each myocyte contains many myofibrils, which are strands of proteins (actin and myosin) that can grab on to each other and pull. This shortens the muscle and causes muscle contraction.

It is generally accepted that muscle fiber types can be broken down into two main types: **slow twitch (Type I)** muscle fibers and **fast twitch (Type II)** muscle fibers. Fast twitch fibers can be further categorized into **Type IIa** and **Type IIb** fibers.

These distinctions seem to influence how muscles respond to training and physical activity, and each fiber type is unique in its ability to contract in a certain way. Human muscles contain a genetically determined mixture of both slow and fast fiber types. On average, we have about 50 percent slow twitch and 50 percent fast twitch fibers in most of the muscles used for movement.

Slow Twitch (Type I) The slow muscles are more efficient at using oxygen to generate more fuel (known as ATP) for continuous, extended muscle contractions over a long time. They fire more slowly than fast twitch fibers and can go for a long time before they fatigue. Therefore, slow twitch fibers are great at helping athletes run marathons and bicycle for hours.

Fast Twitch (Type II) Because fast twitch fibers use anaerobic metabolism to create fuel, they are much better at generating short bursts of strength or speed than slow muscles. However, they fatigue more quickly. Fast twitch fibers generally produce the

same amount of force per contraction as slow muscles, but they get their name because they are able to fire more rapidly. Having more fast twitch fibers can be an asset to a sprinter since she needs to quickly generate a lot of force.

Type IIa Fibers These fast twitch muscle fibers are also known as intermediate fast-twitch fibers. They can use both aerobic and anaerobic metabolism almost equally to create energy. In this way, they are a combination of Type I and Type II muscle fibers.

Type IIb Fibers These fast twitch fibers use anaerobic metabolism to create energy and are the "classic" fast twitch muscle fibers that excel at producing quick, powerful bursts of speed. This muscle fiber has the highest rate of contraction (rapid firing) of all the muscle fiber types, but it also has a much faster rate of fatigue and can't last as long before it needs rest.

Fiber Type and Performance Our muscle fiber type may influence what sports we are naturally good at or whether we are fast or strong. Olympic athletes tend to fall into sports that match their genetic makeup. Olympic sprinters have been shown to possess about 80 percent fast twitch fibers, while those who excel in marathons tend to have 80 percent slow twitch fibers.

Can Training Change Fiber Type?This is not entirely understood, and research is still looking at that question. There is some evidence showing that human skeletal muscle may switch fiber types from "fast" to "slow" due to training.

What can I do to improve my performance?

Keep in mind that genetic differences may be dramatic at the elite levels of athletic competition. But following the principles of conditioning can dramatically improve personal performance of a typical athlete.

With consistent endurance training, muscle fibers can develop more and improve their ability to cope with and adapt to the stress of exercise.

Is fiber type the number one factor that makes an elite athlete elite?

Fiber type is part of a great athlete's success, but it alone is a poor predictor of

performance. There are many other factors that go into determining athleticism, including mental preparedness, proper nutrition and hydration, getting enough rest, and having appropriate equipment and conditioning.

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