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**Training Fast Twitch Muscle Fibers-Summary**

The most optimal method of training has been a highly debated topic across sports and training in general for a long period of time. Many factors are taken into consideration for training such as what your target for improvement is, rest time, how long you should train for, the intensity for how you train and more are thought about when coming up with a training plan, or even a single session/workout.

In a study done by Dr. Tabata to find the best way to improve VO2max, using two groups of athletes, one training endurance in the traditional aerobic way and another group training anaerobically for 6 weeks and the results was summarized to show that the group training anaerobically, not only improved better than the group with aerobic training but also improved their anaerobic capacity. Naturally one would think that anaerobic training is the way to go to improve VO2max, however, in this paper by Maglishco, he looks at multiple studies that are looking for answers in similarly conducted tests, the main focus being how can our muscles increase in their capacities both aerobically and anaerobically. The two major ways those methods are looked at are the growth/involvement of the different muscle fiber types: slow twitch fibers and fast twitch fibers. That is because they are metabolically opposites.

Compared to the fast twitch counterpart, slow twitch muscle fibers have more mitochondria, more capillaries surrounding them and more myoglobin. Those characteristics allow for longer endurance and therefore is associated with aerobic training and endurance in general. The requirements to activate these muscles have nothing to do with speed and instead with intensity, they require the least stimulation from a nerve and are the first of the muscle types to activate so naturally they require the least of amount of effort to be used. When they are trained, the amount of mitochondria, cells such as MCT1(a lactate transporter), aerobic enzymes, and capillaries will be increased, also their ability to metabolize fat will improve as well. Since they are low intensity activated muscles, the way are trained is typically high volume and low intensity, so for example jogging for a mile instead of sprinting a 40-yard dash, more specifically at 50-70% of their VO2max. This prolonged exercise activates a high calcium kinase, and a large increase in calcium such as this allows for growth of mitochondria which is how aerobic endurance is increased.

Fast twitch muscle fibers are actually further categorized into two subcategories (and it is suspected there is even a third but that will not be relevant here), which are fast twitch a and fast twitch x, FTa and FTx for short. Now unlike slow twitch muscles, fast twitch produce greater force, greater in number of fibers per unit, and a variety of anaerobic substances, those of which are necessary due to less access to oxygen in comparison to slow twitch muscles. These characteristics cause these fibers to exhaust quickly. Although, endurance in muscles is more like a spectrum rather than either having it or not, this is where the subcategories of the FT fibers come into play. FTa is more like a combination of slow twitch and FTx, it has more endurance than FTx, produces more force than ST, but going against the spectrum idea FTa have the best ability to remove lactic acid which does contribute to endurance but is not considered aerobic since it is not involving oxygen. FTa fibers activate at higher intensities/effort and FTx fibers activate around maximum intensity/effort. An interesting finding is that when FT fibers are trained at high intensities, instead of FTa becoming more like FTx fibers it is backwards and FTx fibers become more like FTa fibers, unfortunately leading to decrease in the fibers force generating capacity. It has also happened that FT fibers gain enough mitochondria to be typed as ST and the other way around as well.

Now the question to be asked is which method of training or which muscle type is optimal. While the answer would vary for everyone’s situation, since no two bodies are the same, the simple answer is: both. Now that sounds like an answer given by someone who is indecisive but neither type should be neglected, especially if endurance is the focus. All types of muscles are used no matter what so if all are trained then endurance is boosted all around. In the earlier mentioned study by Dr. Tabata, the groups that were experimented with were already previously well trained in low-intensity and endurance focused types of workouts, however, they were exclusively training this way. With no context those results seem to say that the high intensity sprint type training is better for increasing endurance rather than the low intensity long distance training, which would confuse many since the assumption would be the inverse. However, with the inclusion of their previous training it provides a more all around and balanced set of muscles, which makes a lot of sense on every level considering ST contain a lot of lactate transporters despite ST fibers largely depending on oxygen metabolically so the large amount would have to be for something. With all that in consideration the human body had to be designed to use all the types of fibers rather than just solely focusing on one.

Another large factor playing into growth of muscle overall is rest. Whether it is rest after a workout or rest between sets. Within the first 60-90 seconds muscles are solely replenished in creatine phosphate for them to be used at their best ability, which is better for trying to improve your muscles anaerobically and up to 4 minutes is optimal for aerobic training. Of course, each type of rest will change along with however long the set was and its intensity, longer needs more rest and shorter with more intensity needs a certain amount less, 30 seconds being the bare minimum. There is also such this as too much high intensity if you are not providing your body an adequate amount of rest, without the proper amount you would just be torturing yourself and gaining nothing, in fact even deteriorating progress.

There are many factors to take in when training, the best way to go about is to keep your goal in mind and not to leave out any factors. Exclusively training your body one way is never a good idea the human body needs balance and it seems to follow that pattern every step of the way.

**Works Cited**

*Training Fast Twitch Muscle Fibers - Rowperfect*, www.rowperfect.co.uk/wp-content/uploads/2012/01/Training-fast-twitch-fibers.pdf. Accessed 5 Dec. 2023.