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Physiology

Muscles Adapting to Resistance Training

With the human body being constantly evolved over time, it experiences a lot of changes as someone gets older or they just get things removed over time in some sort of way. The human body has seen wisdom teeth become a part of evolution as some people don’t have any, while some have up to all 4 and it is reportedly being evolved out but isn’t the only thing being evolved out of humans. One more example would be the Palmaris Longus as it in recent years and studies has been deemed as “useless” and some people are born without it and simply don’t need it. The palmaris longus is a muscle that isn’t really needed anymore, but all the other muscles in the human body are being used, some more than others and when being targeted in training, they cause to adapt to different training methods and intensities.

This article shows how muscles adapt to long term resistance exercise. It is stated how one of the most studied muscle components are peripheral muscle components of the training response is muscle hypertrophy. Muscle hypertrophy is basically an increase in muscle mass and weightlifting is an example of hypertrophy. While there has been hypertrophy in long term resistance training, short term muscle resistance training has also been reported to induce altercations in muscle fibers architecture, fiber type distribution, myosin heavy chain, and isoform composition. The study was performed on chemically single muscle fiber segments which was obtained from young adult male subjects from before and after a 3-month period of progressive resistance exercise training. Some early results include that functional adaptations of both slow and fast skeletal muscle cells to short term resistance training includes the likes of greater fiber force and peak power, but however it did not include changes to the intrinsic contractile properties of the cell.

The Study also shows subjects who have participated in resistance training programs spanning 4,15,16,27 years normally show greater hypertrophy compared to people who have trained only 3-6 months and also 3,17,20, and 23 years. 6 subjects were used who attend Oregon State University and most subjects started training while competing in high school sports and continued training as they grew older and played rec sports, those subjects never played collegiate sports and would not be considered an elite “powerlifter” or “body builder”. They were engaged in progressive resistance exercise programs that mostly targeted all major upper and lower muscle groups. Training intensity, frequency, and volume were regularly checked and were put on 4 day a week programs at 60-100% intensity with also including a 1 rep max as well. On larger muscle groups like the pectoralis, quadriceps, etc… sets of 8-12 reps were performed while smaller muscle groups like the biceps, triceps, calves, etc... sets of 6-8 reps were performed, each set was performed, and the person was lifting until failure. Very little cardio and endurance training was done during this test, it was mainly muscle resistance training.

The patients also reportedly did not use any steroids and medication during the test, but half of the patients did use creatine monohydrate during the first half of the year. Percutaneous needle biopsies were taken in the mid left vastus lateralis after 5 days of hitting legs and was reported that there was no reported symptoms of muscle swelling or soreness. It was also reported that after 14 days of muscle detraining, aka not working out, it shows that it has a 6% decline of type II muscle fibers, but it has no effect on type I muscle fibers. Which overall shows that taking a good 5 days off won’t hurt your muscle growth and will have no effect on your muscles until about you decide to take an extended vacation from the gym and choose not to go for a good 2 weeks. The study showed that slow and fast vastus lateralis muscle fibers were found stronger in the first group than in the 2nd group that was being tested on. The first group showed a 37-54 percent greater peak ca2+ activated force in compared to the 2nd group and an increase in 35-40% peak power in compared to the 2nd group as well. In the 3 month study from earlier, it showed that aspects of absolute force and power, increased in direct proportion to muscle hypertrophy. Force fiber CSA, shortening length and velocity, power and fiber volume did not respond well to the short-term resistance program.

The 3 month training test was expanded to several years and was later concluded that years of training showed that a resistance exercise program was effective in increasing absolute peak ca2+ activated force and that the power of skeletal muscle cells do not alter the ability of fibers of MHC to shorten, produce force, or power. In a 3-6 month span, it was also concluded that slow and fast fibers from the first group are relatively larger in comparison to the 2nd group who also di 3-6 months. The bigger fibers from the first group are still relatively smaller than someone who is considered an “elite” and competitive power lifter and body builder. Some things could almost of jeopardized the whole tests as later in the study, people’s genetics and nutrition were being taken into effect and what kind of supplements the person was taken. The study shows that creatine has no real effect on performance gain as it makes your muscles look bigger, but has no real impact on your ability to lift weights. It is said that continuous resistance training and taking creatine helps your improvement, but just being consistent helps with your strength training as well, not just creatine which the body already produces. In the uses that took creatine, there was only a 0.005 percent difference in the people who took creatine and who didn’t, making it pretty useless. The study later went into runners and how they have a 19% increase in gastrocnemius type I fibers in comparison to regular people basically and how pro longed endurance training also is related to training induced shift in myosin chain light isoform content. Some groups which have different ca2+ activated force and peak power were attributed to differences in fiber CSA. Normalized and contractile properties were similar in between the groups. Changes in ca2+ force and fiber CSA shortening velocity/fiber volume are not obligatory in slow or fast twitch muscle fibers that have been in a substantial amount of hypertrophy over the years of resistance training. While some test show the differences in muscle fibers from different sets of groups, genetics will also take a huge factor on the strength and the will of the people doing the training.