HOW TO INCREASE SPEED OF MUSCLE CONTRACTION?
Netreba Alexey, Bravyy Yan, Popov Daniil, Vinogradova Olga
(SSC RF Institute for biomedical problems RAS, Russia)

According to the principle of training specificity, maximal improvement of muscle performance can be attested with the test exercise identical to training. It is also a well-known fact, that gain in strength is always accompanied by growth of the muscular contraction velocity. Therefore, we looked into benefits from two essentially different strength training protocols: highly resistive and, consequently, restraining the contraction velocity and low resistive permitting, on the contrary, high contraction velocity for the development of maximal contraction velocity. The experiment involved two groups of subjects (n=10 in each) who trained leg extensors 3 times a week for 9 weeks on a pneumatic apparatus in sitting posture. Advantage of the pneumatic apparatus is that it is devoid of the significant inertia characteristic of the free-weight training machines. Group-1 exercised at 90% of MVC and group-2, at 20-25% of MVC. The week cycle for each group consisted of 3 training sessions. All subjects were motivated to exercise at a maximum speed. In group-1, each set continued till exhaustion (after 6-10 movements). In group-2, the criterion for set termination was reduction by half of the leg extension speed (after 35-50 movements). Mechanical work per a training session was equal in the groups. The all-important result of the experiment was disproof of specificity of training performed at different contraction velocities. Trained at high contraction velocity, group-2 demonstrated a much lower gain in velocity of the leg extension comparing with group-1 which could not do fast movements because of high external resistance. This fact suggests that training at high contraction velocity was unfavorable for gain in velocity. The single-joint MVC testing (knee extension) in the broad range of angular velocity showed considerable strength's gain in both groups. However, no difference was found between the groups. These findings can be explained by the specific features of biomechanics of fast and slow training movements. Contribution of the knee extensors to fast flexion is a little bigger that to slow movement which is demanding mainly for hip extensors. The EMG-amplitude rise following 9 weeks in both groups but in the group-1 the increments were higher. It may be connect with a bigger training load which is use in this group. Our results could be expected considering numerous publications advocating for the integrated EMG amplitude as an indicator of intensity of the descending nervous drive to muscles. Thus the results of our experiment evidence that the theory of training specificity postulating the dependence of maximal gain in muscle strength and velocity on training (test) protocols may have exclusions.

Keywords: Strength Training, Velocity, Exercise