

TALKING STRENGTH

MAX FORCE, ENDURANCE, AND FATIGUE FACTORS:

1. Skeletal system - limb length, bone configurations, and muscle origins and insertion.
2. Muscle belly size to tendon ratio.
3. Muscle groups used in exercise performance (single vs. multi-joint).
4. Motor unit (MU) distribution in each acting muscle group.
5. Fiber type quantity in each acting muscle group.
6. Exercise range of motion.
7. Nervous system potential - 30 to 40% neurological ability.
8. Energy systems potential - training status and diet.
9. Mental drive/conscious ability to exert.

FACTORS DETERMINING MUSCLE STRENGTH:

Inside the muscles:

1. Cross-sectional area.
2. Fascicle length.
3. Sarcomere length (longer force).
4. Fiber pennation angle.
5. Moment arm length.
6. Fiber type (Types 1, 2A, and 2X).
7. Ability to transfer force laterally.
8. Myofilament density.

Outside the muscles:

1. Voluntary activation.
2. Antagonist co-activation.
3. Synergist activation.
4. Coordination.



A diagram consisting of two blue lines that originate from the bottom of the 'Inside the muscles' and 'Outside the muscles' lists and converge at the text 'Tendon stiffness'.

Tendon stiffness

INCREASING STRENGTH, IN ORDER:

1. Neuromuscular coordination – first few workouts.
2. Learn how to recruit high-threshold MU's – several weeks.
3. Tendon stiffness - increases quickly, then plateaus.
4. Hypertrophy, myofibril density, and lateral force transmission.

LIGHT LOADS = DECREASE MAXIMUM STRENGTH GAIN POTENTIAL DUE TO:

1. Lesser recruitment & coordination of a maximum number of MUs.
2. Greater CNS fatigue – lessens voluntary activation of high-threshold MUs if working to volitional muscle fatigue (VMF).

3. Lessens tendon adaptations.
4. Lessens lateral force transmission.
5. Type 1 fibers are smaller and have less potential to grow significantly large.
6. Type 1 does contribute to force, but max force is contingent on the stronger 2A and 2X.

MODERATELY HEAVY STRENGTH TRAINING:

1. Using moderately-heavy resistance (e.g., 80% to 90% 1-RM) and reps in the 8 to 15 range can shift Type 2X fiber qualities to type 2A, decreasing MAX strength potential.
2. Type 2A possesses both strength and endurance qualities.
3. Better hypertrophy if one possesses a higher percentage of 2A fibers training to VMF.

HEAVY STRENGTH TRAINING:

1. Increases pure strength – type 2X fiber recruitment using 90%+ 1-RM resistance.
2. Not the best for increasing speed.
3. Use a low volume of work and avoid working to complete VMF.
4. Highly neural dependent - increases coordination & decreases antagonist coactivation.
5. Longer rest times between sets.

ISOMETRIC TRAINING:

1. Increases isometric strength, but not so much maximum dynamic strength.
2. Can stimulate hypertrophy.
3. Increases CNS fatigue.
4. Not good for increasing force at fast speeds.
5. A large increase in tendon stiffness relative to eccentric strength, which can decrease the stretch-shortening cycle.