

The Theory of Sport Training

Lesson 6

Speed and Strength

Strength

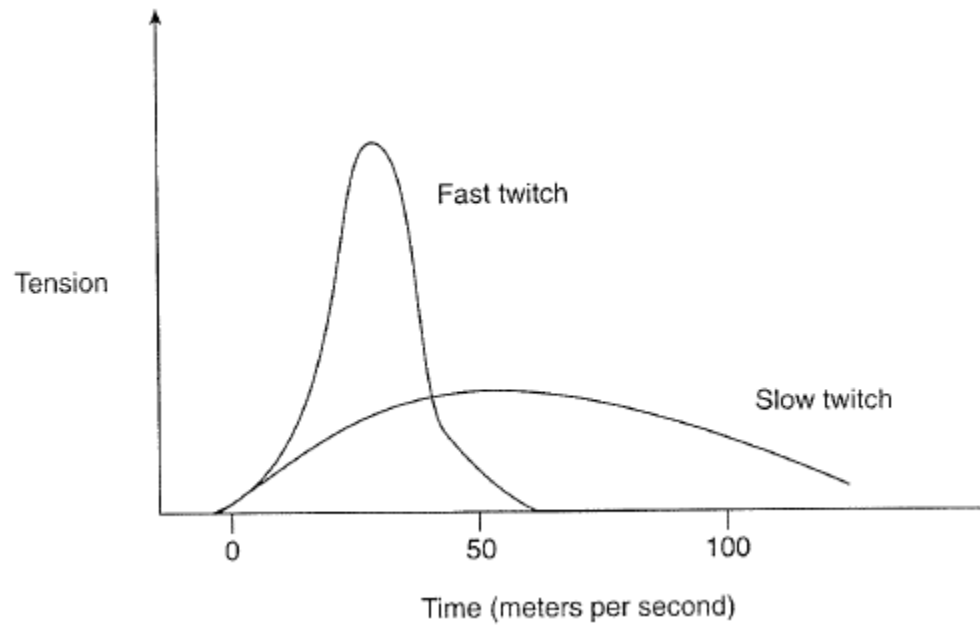
- It is the strength ability ...
- The tasks of strength training:
 - general bodybuilding, stabilize the muscle apparatus for well-being, health, fitness
 - injury prevention and rehabilitation
 - cosmetic training – visage, appearance
 - development of performance for competitive sport

Strength

- Precondition of good strength ability
 - coordination of working muscles
 - coordination of working and opponent muscles
 - size of the muscles cross-sectional area
 - the number of fibres recruited to the work
 - energy system
 - quality of neural system and neuromuscular system

Strength

- Biomechanical preconditions:
 - affectivity of muscular work
 - place of the muscle tendon attachment (fixing) to the bone
 - difference between short and long muscles for resistance activity



Twitch response of fast-twitch and slow-twitch fibers to the same intensity of stimulus.

Type of contraction

- Concentric – shortening of the muscle
- Eccentric – lengthening of the muscle
- Static or isometric – the change of the force without the change of muscle length
- Isokinetic – constant velocity movement, the change of force size

Strength development

- General strength – basic anatomical adaptation, preparation for specific training
- Specific strength – typical for every sport, games, the development of specific muscles groups important for given sport, games , specific dynamic characteristic and time of load

Type of strength

Along the size of weight, speed of motion and time (number of repetition) of physical activity

- Maximal strength
- Dynamic, explosive strength
- Speed strength
- Strength – endurance
- Relative strength

Strength training and muscular adaptation

- Anatomical adaptation
 - increase the oxidative capacity of ST
 - strengthen tendons, ligaments and joints
 - increase the bone mineral content
 - proliferation of connective tissue that surrounds the individual muscle fibres.
- The aim: progressive adaptation of the athlete body for demanding training

Strength training and muscular adaptation

- Hypertrophy
 - increase of cross-sectional area of muscles
 - increase storage capacity for high-energy substrates and enzymes
 - hypertrophy – fast and slow fibres

Strength training and muscular adaptation

- Maximal, submaximal strength:
 - depend on the diameter of cross-sectional area
 - capacity recruit fast twitch fibres
 - ability to synchronize or simultaneously call into action all primarily involved muscles in right moment

Strength training and muscular adaptation

- Conversion (transfer)
 - depend on sport – type of muscular work, level of resistance
 - must include movement pattern, force production, velocity consideration
 - conversion to the power

Principles of strength training

- Train movements, not muscles
- Train core strength before extremity strength
- Build strength from the bottom up
- Incorporate movements, that enhance linkage among the all joints
- Sensibly vary the mode and the load
- The systematic, intensive and regularly strength training can start after maturity

SPEED

- It is the speed ability....
- Very hereditary determined
- Factors which determined speed:
 - genotyp , somatotyp, composition of the muscle, ability to use the energetic source, neuromuscular work,

Speed

- Factor which affects the results of speed during performance:
 - frequency
 - strength
 - technique (coordination)

Biology base of preconditions

- CNS
 - the quality of neural system, primarily – irritation, the velocity of irritation conduction, velocity of information transfer and control of neural-muscular activity
 - intramuscular coordination

Biology base of preconditions

- Muscle system:
- the length of muscle tissue and fascias, number of sarcomas , and the angle of the muscle tissue under which are fasten to the bone
- high rate of FG and the ability of very quickly change of tension and release (70-80%)
- FOG are important for speed endurance
- Optimal rate of flexibility for realization of the technique in full range of demanding movement

Biology base of preconditions

- Energy system
- High store of CP for resynthesis ATP and partly the store of carbohydrates
- Psychological preconditions:
 - Image about right movement – idea about the course of movement
 - High ability of concentration
 - High emotional stability

Characteristics of fast – twitch tissue

- Fast to fatigue
- They are innervated from large nerve cells and can innervate from 300 to more than 500 muscle fibres
- Develops short, forceful contractions
- Recruited only during high – intensity work

Type of speed

- Speed of reaction and speed realization of the movement
- Cyclic or acyclic
- Linear or nonlinear (multidimensional)

Reaction

- Type of reaction
 - simple
 - selective
- 50-60% of hereditary conditioned
- Training can improve reaction time by about 30 %
- The kind of stimuli:
 - visual – reaction time of athletes 0,15 – 0,3 s
 - auditory -0,07 – 0,15 s
 - kinaesthetic – 0,1 – 0,15 s

Linear speed

- Sports?
- Concept of training- from point of speed
 - start - reaction, absol. and explosive strength
 - acceleration – dynamic strength, power
 - max. speed
 - speed maintenance

Multidimensional speed

- Sports?
- Agility, quickness
- Factors – perception, decision, dynamic strength, speed, coordination, ability to change direction and speed- connected with balance
- Concept of training:
 - coordination, technique, reaction,
 - max. speed
 - quick change of direction, change of speed, high variability of movement
 - dynamic strength, max. strength