

## Strength and power training in soccer

### Semester 2

#### Learning outcomes

Upon successful completion of this course the student will be able to:

1. Understand the importance of force training in football
2. Identify central and peripheral adaptations after force training in football players of any level (training session, long-term adaptations, etc)
3. Understand of the specificities of different ages (childhood, football academies, professional)
4. Use the methods to assess the function of the neuromuscular system
5. Design appropriate protocols and to apply these methods, record, process and present the evaluation of the human performance
6. Present methods and research findings

#### Content

1. Purpose: Basic knowledge of muscular mechanics

Content: Types of muscle contraction in football. The concept of plyometrics. Stretch-shortening cycle, storage and reuse of elastic energy. Force velocity and force-length relationship principles. The concept of power.

2. Assessment of external and internal load and training guidance.

Purpose: Game Analysis

Contents: The determining factors of physical fitness according to the needs of the player.

3. Neuromuscular adaptations in football

Purpose: Learning about afferent pathways and reflexes and their consequences on muscle activation. Understanding the agonist and antagonist motoneuron function during maximal and submaximal contractions.

Contents: Explosive strength training and spinal reflexes. The role of Golgi tendon organs and muscle spindle in controlling muscle integrity and joint protection. Stability and tremor.

4. Improving explosive power and speed in football

Purpose: The importance of speed and how to improve it.

Contents: The concept of Rate of Force Development (RFD). The change in stiffness of myotendinous complex after training.

5. Various exercises – Combined training

Purpose: The repeatability of explosive movements and the improvement of performance.

Contents: Stiffness evaluation. Specific exercises. Analytical exercises. Sprint technical performance. Horizontal jumps. Vertical jumps. Resistance training.

6. Strength training protocols

Purpose: Familiarity with different types of training.

Contents: Maximum strength training. The knee extensors. The plantar flexors. The concept of specific force. The concept of intermittent force.

7. Training planning

Purpose: Building a coaching philosophy and learn planning skills

Contents: Tactical periodization. New trends. Horizontal alternation of specification. Undulating periodization. Block training. Competition form

8. Specific training for important muscle groups in football

Purpose: Strength training for football-specific muscle groups.

Contents: Eccentric hamstring training. Explosive glute training. Plyometric training of plantar flexors. Strength training for the peronei muscles.

9. Fatigue in football and its consequences on technique and accuracy

Purpose: Indicators' analysis and understanding of the central and peripheral fatigue phenomenon.

Contents: Central and peripheral fatigue. Defining and evaluating indicators. Electromyogram (EMG) changes during fatigue. Neuromuscular transmitters. Overtraining with symptoms of sympathotonia and parasympathotonia.

10. The effect of strength on a player's balance, stability, and accuracy

Purpose: The role of strength in an athlete's static and dynamic balance.

Contents: Balance strategies. The role of kinesthetic, proprioceptive, and visual feedback. Sensory training.

11. Warm-up and stretching

Purpose: Understanding the consequences of temperature increase.

Contents: The contrast between central and peripheral temperature. The half-time problem. The consequences of passive stretching.

12. Complementary means of strength training (neuromuscular electrical stimulation (NMES), vibration, roller, etc.)

Purpose: Evoked muscle contraction due to electrical stimulation. The effects of whole-body tendon and focal vibration. Fascial release.

Contents: The reversal recruitment order of Motor Units. Strength training programs with neuromuscular electrical stimulation (NMES). The improvement of sensory feedback with external stimuli.

### **Assessment**

Written essay based on scientific articles (50%)

Oral presentation (50%)

### **Bibliography/journals**

1. La preparation physique en football, Cometti Gilles 2005
2. Μύες, νεύρα και κίνηση, B. TYLDESLEY

### **Journals**

1. Biology of Sport
2. Journal of Applied Physiology
3. European Journal of Applied Physiology
4. Journal of Neurophysiology
5. Journal of Electromyography and Kinesiology
6. Journal of Biomechanics.