DIAGNOSTICS OF MUSCULAR IMBALANCE IN THE SPORTS TRAINING STAGES OF YOUNG SOCCER PLAYERS

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Key words:
- Soccer,
- centers for talented players of the eastern slovakia region,
- postural and phasic muscle groups.

Abstract:

The paper presents survey results and the assessment of the current state of muscle imbalance in stages of soccer training. In relation to the musculoskeletal system, muscle imbalance causes serious problems associated with the functional imbalance between postural and phasic muscle groups. This affects the range of motion, increases the risk of injury and reduces athletic performance (Adamčák, 2000, Thurzová, 2003, Velé, 2006; Kanasová, 2004, 2005, Votík et. al., 2011). The study sample consisted of 502 young athletes from five Centers for talented players of Slovak Football Association within clubs of the eastern Slovakia region. The degree of muscle imbalance was assessed using modified tests according to Neuman (2003) and Bursová (2005). Muscle imbalances were diagnosed in the majority of subjects. Exploratory investigation found muscular imbalance of hip muscles, hip-lumbar muscles, abdominal, gluteal, deep muscles of the back and leg muscles. Weakened abdominal muscles and shortened adducent muscles of inner thigh adversely affect the range of motion of the dominant limb in soccer players, maintaining balance and increase the risk of injuries. One of the main tasks in the stages of youth sports training in soccer is to make use of the compensation system, regeneration and additional tools that will assure that players will sustain physically demanding and specialized training without any difficulties.

ABSTRACT

The paper presents survey results and the assessment of the current state of muscle imbalance in stages of soccer training. In relation to the musculoskeletal system, muscle imbalance causes serious problems associated with the functional imbalance between postural and phasic muscle groups. This affects the range of motion, increases the risk of injury and reduces athletic performance (Adamčák, 2000, Thurzová, 2003, Velé, 2006; Kanasová, 2004, 2005, Votík et. al., 2011). The study sample consisted of 502 young athletes from five Centers for talented players of Slovak Football Association within clubs of the eastern Slovakia region. The degree of muscle imbalance was assessed using modified tests according to Neuman (2003) and Bursová (2005). Muscle imbalances were diagnosed in the majority of subjects. Exploratory investigation found muscular imbalance of hip muscles, hip-lumbar muscles, abdominal, gluteal, deep muscles of the back and leg muscles. Weakened abdominal muscles and shortened adducent muscles of inner thigh adversely affect the range of motion of the dominant limb in soccer players, maintaining balance and increase the risk of injuries. One of the main tasks in the stages of youth sports training in soccer is to make use

of the compensation system, regeneration and additional tools that will assure that players will sustain physically demanding and specialized training without any difficulties.
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INTRODUCTION

At the present time, during the preparation of young sportsmen in training process, we faced with the lack of adaptation`s ability on the specific unilateral physical load of musculoskeletal system which gives rise to breach of relations between postural (tonic) and phasic muscular system and the formation of muscle imbalance. This problem within the research area is analysed by Adamčák (2000), Thurzová (2003), Velé (2006), Kanasová (2004, 2005), Votík et.al. (2011). The content of sport preparation must correspond with age category and the performance level of young sportsmen. It distinguishes qualitatively and quantitatively. The quality of sport preparation consists in overall load to which the players are exposed during a year. We can talk about inadequate, overloading, or insufficient functional demands or the physical load that is qualitatively inadequate from the aspect of long period or imbalanced functioning. According to research of Thurzova (2003) up to 30% of young soccer players and 46% of older players suffer from movement apparatus` pains and they have problems with spine and lower limbs.

The effective sport performance is determined by optimal cooperation of specific muscle groups of motor-hold and motor-move system. The biggest problem in soccer is shortened hip joint flexors that evoke the attenuation of antagonists (gluteal muscles). It is reflected in decreasing of the muscular tension and the lower level of muscle strength. A situation may arise when weakened muscle does not join to motion and let other muscles to supply it; moreover, these muscles have antagonistic relation to motion. The position changes of weakened muscle group in stereotype are basis for painful functional disorders within lumbar area. It can lead to the decreasing of game performance level, eventually to the early end of career (Votík et al., 2011). The typical display of muscular imbalance is defective movement stereotypes as upper (cervicobrachial) and lower (lumboischiadic) crossed syndrome (Bursová, 2005).

The abdomen and gluteal muscles have tendency to get weak. Their shortening causes greater lumbar lordosis. Pressures caused by landings on the feet and rapid changes of motion, which are performed by whole trunk weight, do not distribute on the whole surface of vertebrae. Inadequate conditioning and the game itself overload knee flexors, shortened muscles of back side of thigh cause diminution of motions range that is reflected in shortening of footstep and weak kick strength. The accuracy of shooting and passing, coordination, acceleration and reaction ability get worse. There is frequently preferring of dominant limb during players game skills performing in soccer that causes the formation of lateral preference of dominant leg and asymmetry of lower limbs muscles. The muscle imbalance leads to wrong running technique, it decreases the predispositions for maximum game performance and indirectly causes further overloading of movement apparatus: damaging of tendons, ligaments and joints. The performance increase of young soccer players is frequently limited (Votík et. al, 2011).

According to Perič (2004), the content of sport preparation of youth categories should include controlled compensation of load and regeneration. Compensation exercises focus on balancing of movement system`s fatigue symptoms, compensation of the volume of load in training, balancing of accrued muscular imbalance and the prevention of functional disorders of movement system. Coaches frequently consider compensation exercises in terms of stretching exercises. Considering the physiological effect and focus, there are releasing, stretching and strengthening compensation exercises. The order reveals

in what way should be specific exercises applied. In youth sportsmen is inevitable individual approach when choosing exercises or specification of repetition`s number.

AIM

The aim of our research was to gain and extend the knowledge about functional state of movement system of 9-18 years old football players in Centres for talented players of Slovak Football Association within clubs of the eastern Slovakia region in the phase of preliminary preparation, basic and specialized sports preparation; point to the diagnostic opportunities of the level of muscular imbalance and the targeted compensation of non-physiological movement stereotypes in training process.

METHODOLOGY

We presupposed the escalating symptoms of muscular imbalance in young soccer players, dominantly in the area of lumbar joint flexors, deep muscles of the back and muscles of lower limbs. Research group consisted of young soccer players (n=502) of Centers for talented players of Slovak Football Association within clubs of the eastern Slovakia region: MFK Košice, FK Tatran Prešov, FK Bardejov, MFK Michalovce, FK Spišská nová Ves (preliminary training preparation, U12-13, U14-15, U16-17 and U18-19). The research was carried out from January to April 2013. The level of muscular imbalance was diagnosed by standardised tests of Neuman (2003), Janda (1996) and gained data were processed using computer software Statistica 10.

RESULTS AND DISCUSSION

The analysis of muscle imbalance and qualitative indices of movement system`s functional state confirmed the occurrence of muscular imbalance within experimental group of young football players in the end of preliminary sport preparation and at the beginning of basic sport preparation. Figures 1 and 3 illustrate results of muscular imbalance diagnostics of the riskiest muscles within specific age (or performance) periods.
Results expressively point to increasingly occurred imbalance between abdomen muscles and flexors of lumbar joint (see Fig. 1). We agree with Adamčák (2000) who states that imbalance is caused by typical body posture of soccer players and unilateral load of lower limbs, respectively of dominant leg what is transferred through pelvis on trunk and upper limbs. At the beginning of sport preparation, the cooperation of the muscles is significantly defective, marked by incoordination in period of pubescence` beginning till partial consolidation in the second phase of specialized preparation. These results correspond with findings of Kanásová (2005) who states 30 % occurrence of weakened abdomen muscles in novice volleyball players, up to 70% in hockey players and 57% in group of tennis players.

The most problematic movement stereotype described in literature and research is the extension in lumber joint. The adductors of inner side of thigh, as Pivovarníček et. al. (2011) state, influence body posture in standing position and they participate in outer rotation of lumber joint. By increasing load in training process (see Fig. 2, Fig. 3), shortening of iliopsoas muscle and weakening of buttocks muscles were observed in the researched group of soccer players from the period of the second phase of basic preparation. Muscular imbalance between overloaded thigh muscles and weakened abdomen muscles is the main cause of frequent groin injuries of soccer players.

For evaluation of muscular imbalance symptoms of young soccer players was chosen, as one of criteria, reached or unreached performance standard in particular age period, the influence of load and the time period of its symptoms` occurrence (see Fig. 4, Fig. 5).
The effectiveness of preformed movement task, reaching at least average result, was problematic for the research groups at the end of phase of basic preparation and in the phase

of specialized preparation which is caused by minimally 4-5 year functioning of training load and it is the reflection of insufficient compensation.

RESULTS AND RECOMENDATIONS

In the training process of young football players, we occasionally faced with the evaluation of movement systems` functional state. The integrated system of muscular imbalance` diagnostics does not exist in the stages of sport preparation. After realisation of research applied on 9-18 years old football players of Centres for talented players of Slovak Football Association within clubs of the eastern Slovakia region, results of qualitative and quantitative analysis of data indicate:

- Muscle imbalance already occurred in U12-13 category, dominantly in the area of lumbar joint flexors, deep back muscles and leg muscles that corresponds with the similar measurements of Adamčák (2000), Bursová et al. (2003).

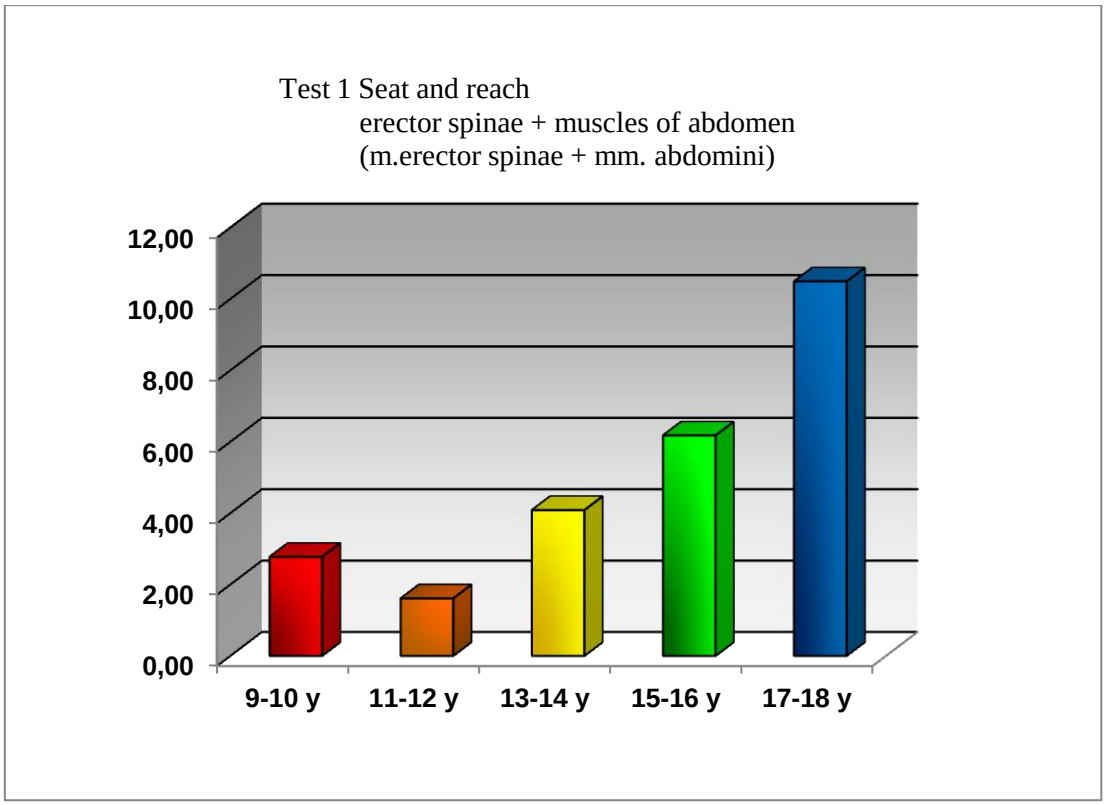

Figure 1. Symptoms of muscular imbalance – Test 1

Figure 2. Symptoms of muscular imbalance – Test 2, Test 3

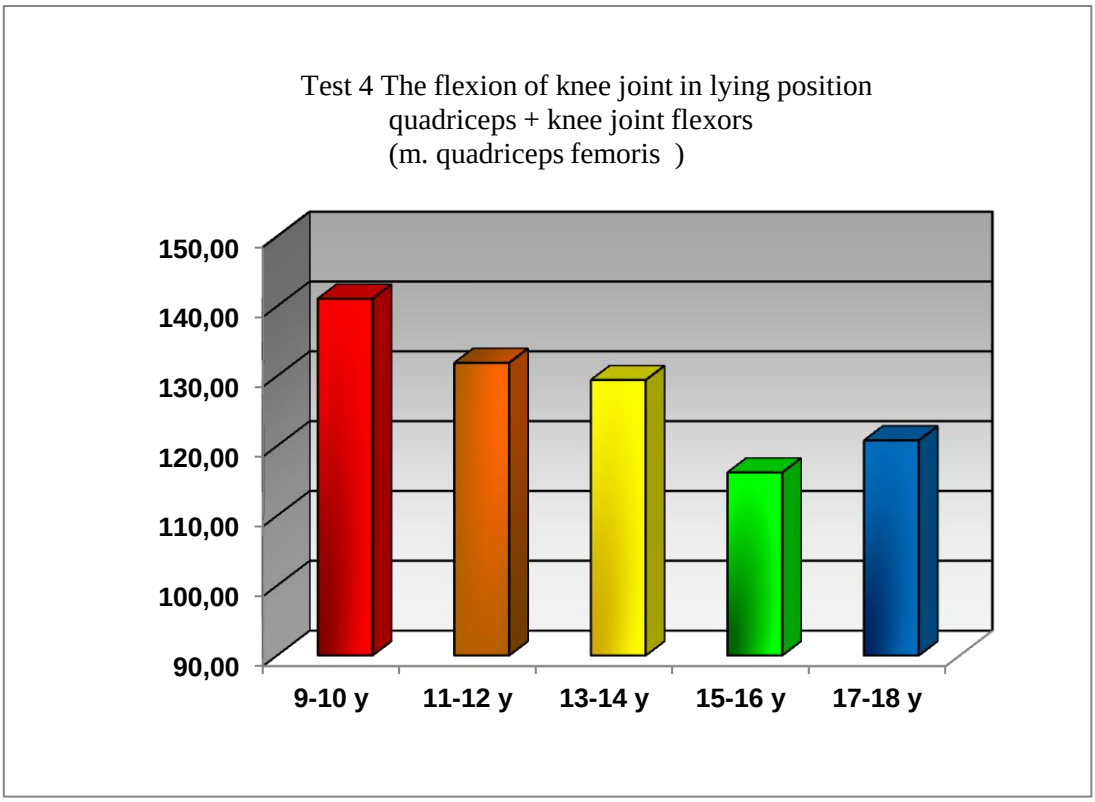

Figure 3. Symptoms of muscular imbalance – Test 4

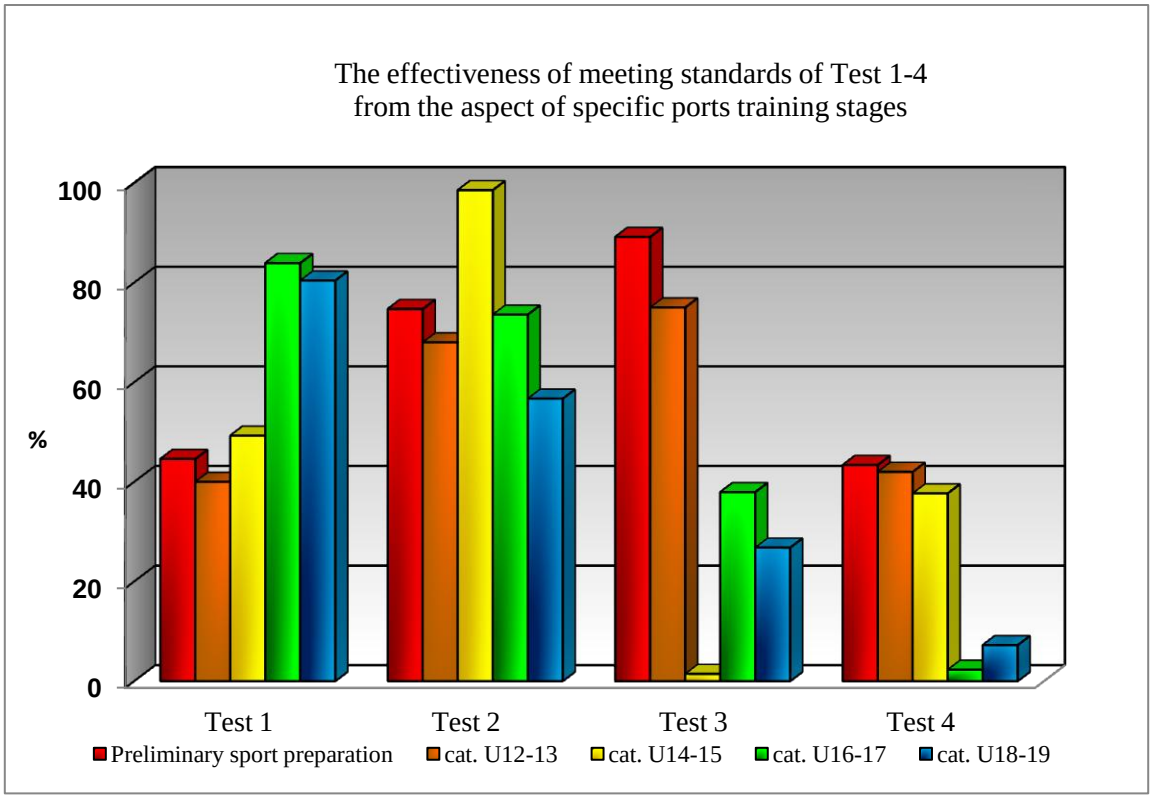

Figure 4. Gained results in Test 1 – 4

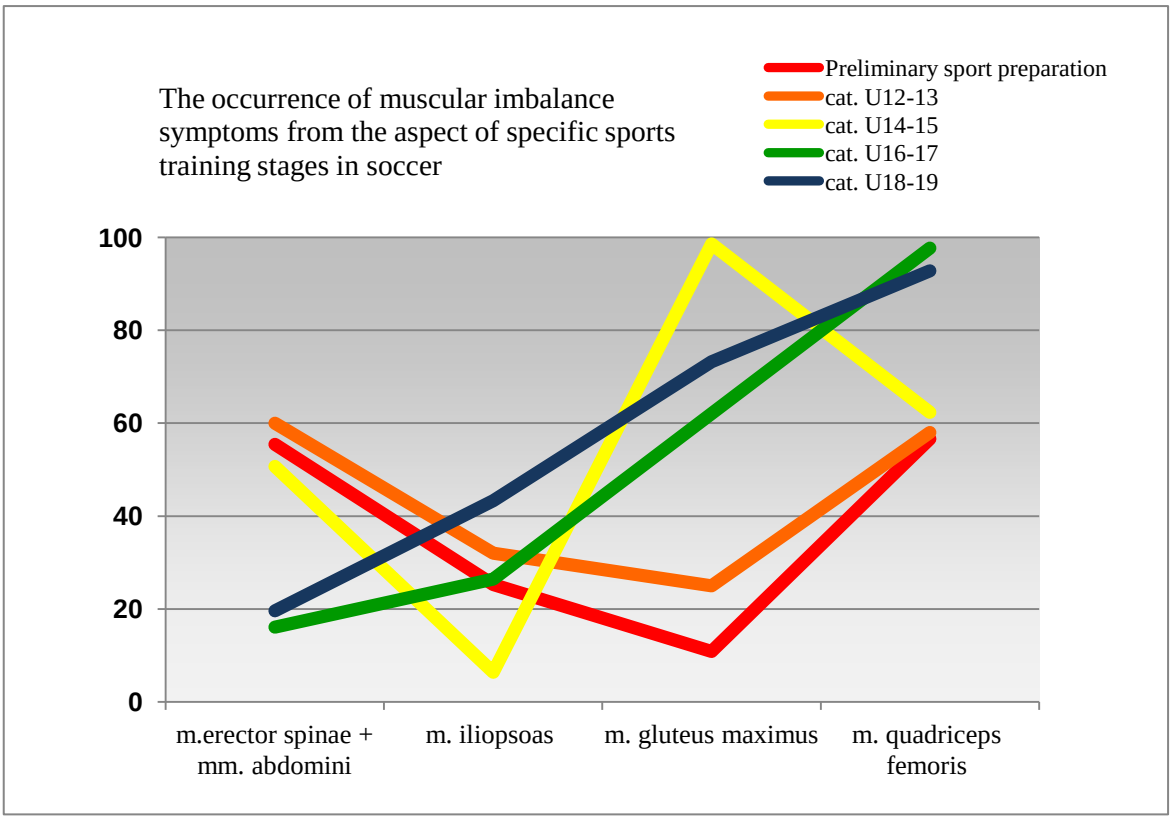

Figure 5. Symptoms of muscular imbalance of young soccer players

- Muscular imbalance and persisting inadequate training load within the phase of basic training preparation causes damaged movement stereotype – lower crossed syndrome

(lumboischiadic), its negative consequence is the higher risk of injuries, inadequate sport performance.

- In the Test 1 Seat and reach, only 44.5% of 9-10 years old and 40% of 11-12 years old soccer players reached average result according to Neumanna (2003). Results of the Test 2 The range of motion in lumbar joint documented that 62.2% of soccer players of all age categories had the range of motion within interval 110-127°. In the Test 3 Supine lying position, legs forward-middle position was recorded disputable result in 13 -14 years old soccer players. In leg forward position of dominant leg was the range of motion in iliopsoas` segment only 81.7°, which means that only 6.4% of young soccer players reached average result according to norm. Gained results in the Test 4 The flexion of knee joint in sitting position in the research groups of U14-15, U16-17 and U17-18 category revealed markedly overloaded knee flexors and shortened adducent muscles of inner thigh that are gradually shortened and limit the range of performed movements.
- From the aspect of muscular imbalance formation`s tendency, the first muscular imbalance symptom in young soccer players of experimental group was noticed in the stage of preliminary sport preparation. In the first phase of basic training stage, the occurrence of muscular imbalance was easy, faintly deformed by unilateral movement activities. In the second phase of basic sport preparation were observed the motion disproportions of muscular imbalance probably caused by pubertal changes in the organism of football players. The rapid increase of muscular imbalances` occurrence in the area of lumbar flexors, deep back muscles and leg muscles was clearly revealed in the first and the second phase of specialized sport preparation.

On the basis of our research, we recommend for all training stages of sports training of children and youth to continually diagnose muscular imbalance, evaluate the functional state of movement system and compensate non-physiological movement stereotypes in training process within Centers for talented players of Slovak Football Association.

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