
FUNCTIONAL DISORDERS OF THE MUSCLES AND JOINTS OF YOUNG SOCCER PLAYERS AS A RESULT OF IMPROPER TRAINING LOAD

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Keywords:

- disorders of the musculoskeletal system,
- joint flexibility,
- 13-year-old soccer players.

Abstract:

The paper deals with the issue of an insufficient ability of young soccer players to adapt on specific load in the training process. The increase in functional disorders of the musculoskeletal system results in limitation of the range of motion, eventual injuries and lower athletes' performance. The screened sample consisted of 13-year-old soccer players (n=25) from the Centres for talented players of the Slovak Soccer Association. To assess the level of functional disorders of the musculoskeletal system, modified tests according to Neuman (2003) and Bunc et al. (2006) were used. Using diagnostics methods, we found imbalances in lumbar muscles, hip-lumbar, abdominal, gluteal, deep back muscles and muscles of lower limbs – lower crossed syndrome in 68.2 % of young soccer players. Moreover, we identified 54.5 % of participants with lower mobility of the trunk and back side of the lower limbs, deviations from standard flexibility of arm joints, which adversely influence the range of motion, balance in individual game skills and increase the risk of injury. The result was the recommendation of specific compensation of non-physiological movement stereotypes in the training process of young soccer players already in the phase of basic sport preparation.

INTRODUCTION

At present, the ability to adapt on the specific unilateral load of the musculoskeletal system in the training process of young athletes is very individual and dependent on external factors. A training model of young soccer players should adequately reflect age, biological, psychosomatic, psychological–sociological and motor specificities of particular developmental period. Especially in the training process of novice players, selection of size and type of load is problematic as it should not be based on the principle of „copying or reducing” of the senior model (Kampmiller, et. al. 2012).

Inadequate training load of young soccer players in the phase of basic sport preparation can be a reason for adverse changes of the musculoskeletal system (Bursová, Votík Zalabák, 2003). Sports training of young 13 to 14-year-old soccer players is particularly focused on increasing sport performance and drilling soccer skills; on the contrary; less attention is paid to compensation and prevention of the muscle imbalances' occurrence. In sports training, coaches should continually observe a functional state of athletes' musculoskeletal system. Our research was based on previous knowledge on the functional state of the musculoskeletal system and development of muscle imbalance among children and youth of different age groups presented by Buschbacher (2002), Thurzová (2003), Kanášová (2005, 2014), Kampmiller, Vanderka, Lacza, Peráček (2012). Kanášová (2005) mentions that health

problems of sporting children and youths, along with high mental and physical load, adaptation problems, time demands, unreal expectations of parents and fatigue belong to the major causes of early termination of the sports career.

The problem in the training practice is decreasing flexibility of muscles and joints. Especially among young soccer players, these changes manifest as problems with groin muscles, decreased activity of flexors of lumbar joint and leg extensors. Muscle imbalance leads to changes in movement stereotypes followed by overloading of muscles and joints. Repeated regular activation of superficial muscles results in their hyperactivity and, on the contrary, in attenuation of deep muscles and thus imbalance between phasic and tonic muscles appears, which is, thanks to further exercises in this mode, continuously deepening (Kolář - Lewit, 2005). The most common muscle imbalance in soccer is upper and lower crossed syndrome. Concerning the upper crossed syndrome, it is characterised by greater cervical lordosis, elevated shoulder girdle and a forward head posture. Changes of movement stereotypes caused by lower crossed syndrome are manifested as greater lumbar lordosis, changes in the lumbar joint's position and defective stereotype of walking and running (Hošková - Matoušová, 2007). Using regular compensation exercises in the training sessions, it is possible to postpone, or even prevent from the incidence of postural defects, to eliminate decreasing of the game performance and thus to support sport career of young athletes.

AIM

The aim of the study was to diagnose the level of muscle imbalances and assess the level of joint mobility of the chosen joints among young soccer players in the phase of basic sport preparation. We presupposed, similarly to Malátová - Matějková. (2011), a possible incidence of lower crossed syndrome among the participants. The risk of inadequate training load will be identified based on the range of other functional disorders of muscles and joints, with a possibility of their preventive and therapeutic intervention.

THE MATERIAL AND METHODOLOGY

The research groups consisted of selected best young soccer players (n=25) U13 from the Centres for talented players of the Slovak Soccer Association. The research was carried out from May to June 2015. The level of muscle imbalance and joint mobility was diagnosed using standardized tests by Neuman (2003) and Bunc et al. (2006). To assess qualitative and quantitative data on the movement system's functional state, we used basic methods of mathematical statistics; to process the collected data we used percentage and frequency analysis according to Broďáni (2002) using Statistica 10 software. To interpret results of the investigation, methods of logical analysis, induction, deduction and comparison were used.

RESULTS

Within the research, to detect muscle imbalances of the musculoskeletal system, the following standardized tests were used: T1 Jacik test, T2 Zitek test, T3 Test of erector spinae and the back side of the lower limbs according to Bunc et al. (2006), T4 squat with whole feet down and T5 Test of deep back muscles (Neuman, 2003). When assessing symptoms of muscle imbalance, we evaluated reached or unreached performance standard in particular age category (13 years). In the monitored group of soccer players, we took into account volume, intensity and effect of the training load in the basic sport preparation.

Table 1. Symptoms of muscle imbalance in 13-year-old soccer players (Test 1-5)

Muscle imbalance	T1	T2	T3	T4	T5
average	0.81	0.04	0.13	0.68	0.54
standard deviation	0.3947	0.2132	0.3512	0.4767	0.5096
median	1	0	0	1	1
maximum value	1	1	1	1	1
minimum value	0	0	0	0	0

(Source: own processing)

Qualitative indicators of the movement system's functional state confirmed the occurrence of muscle imbalance (Table 1). Its symptoms were recorded in 68.2 % of participants and, as we assumed, lower crossed syndrome was the most common. We also monitored shortened flexors of lumbar joint (m. iliopsoas, m. rectus femoris, m. tensor fasciae latae), weakened abdominal and gluteal muscles, which is documented by results in Test 2 and Test 3. 54.5 % of participants had weakened deep muscles of the back (Test 5). As a result, participants had greater lumbar lordosis, changes in the position of lumbar joint, defective stereotype of walking. Similar findings were also reported by Malátová - Matějková (2011) and it also corresponds with opinions of Volpi et al., (2006) that the reason of disruption of deep stabilizing system of soccer players tend to be inadequate frequency, intensity and repeated type of soccer load accompanied by its insufficient compensation.

The level of joint mobility was assessed using motor tests according to Neuman (2003): T6 Seat and reach, T7 The range of motion in lumbar joint, T8 Supine lying position, legs in forward-middle position, T9 The range of motion in knee joint and T10 Mobility of shoulder joints. Quantitative indicators are listed in Table 2, where in Tests 8, 9 and 10 there are results for both right and left extremities.

Table 2. The level of articular mobility of 13-year-old soccer players (Test 6-10).

Articular mobility	T6	T7	T8R	T8L	T9R	T9L	T10R	T10L
average	6.81	119.31	88.63	89.31	126.59	126.36	6.22	4.401
standard deviation	4.1933	8.9563	5.6772	5.0667	5.3057	5.2617	4.9168	3.9533
median	6.5	120	90	90	127.5	125	7	10
maximum value	15	130	95	100	135	135	18	15
minimum value	0	100	75	80	120	120	0	0

(Source: own processing)

Results of T6 (Figure 1) did not show shortening of lumbar and abdominal muscles in the screened group. Kolář et al. (2009) state that weakened muscles of abdomen play an important role in stabilization of posture, when in their study it was present in 82 %. Hošková - Matoušová (2007) report that lower crossed syndrome is determined by shortened flexors of lumbar joint, which subsequently deteriorates the correct stereotype of walking or running. Bursová, Votík, Zalabák (2003) also describe asymmetry of the range of motion of lumbar joints as a result of unilateral load during kicking and passing among young soccer players.

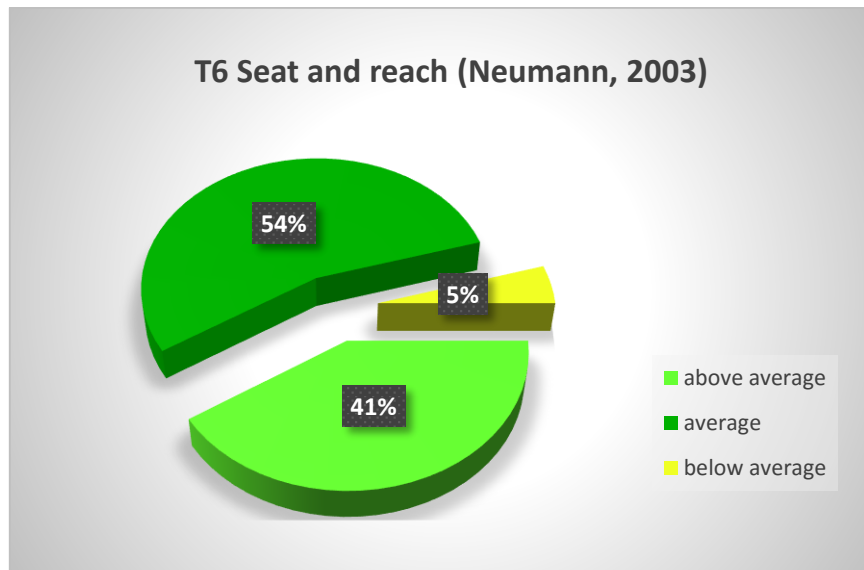


Figure 1. Test 6 Seat and reach - 13-year-old soccer players
(Source: own processing)

Only 23 % of participants (Figure 2) had limited range of motion in lumbar joints. We did not measure any significantly reduced physiological range of motion of lumbar joint in the supine lying position, legs in forward-middle position (Test 8); on the contrary, in 95.4 % of participants, the range of motion of the right and left lumbar joint took place in the average zone of 80-110°. Only in 4.6 % of subjects, these values were above average.

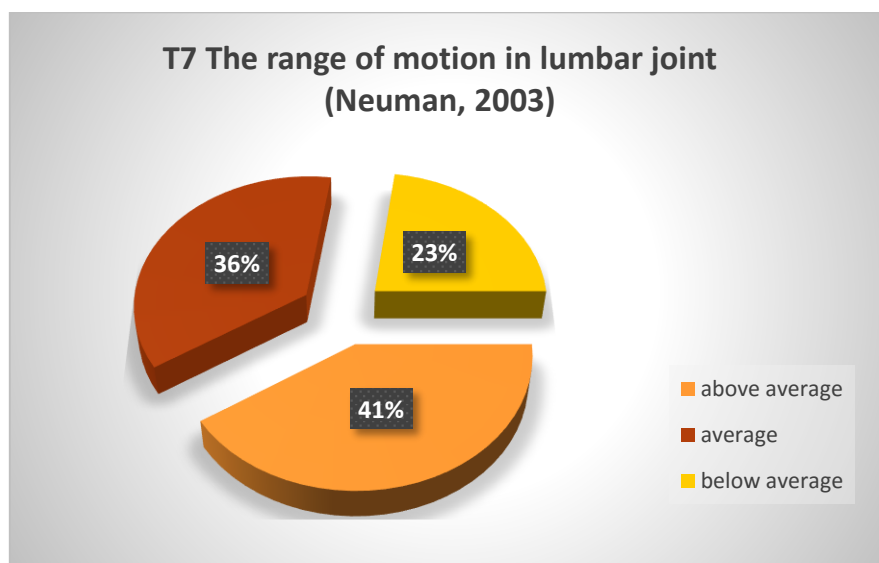


Figure 2. Test 7 The range of motion in lumbar joint – 13-year-old soccer players
(Source: own processing)

The level of knee joint mobility (Test 9) was average (50 %) or even above average (50 %). Overloaded knee flexors that are gradually shortening and limiting the range of the performed movements, as well as shortened muscles of the back side of thigh were diagnosed at the end of basic stage of sport preparation.

In soccer, static overloading of cervical and thoracic spine segments can be often noticed together with changes in movement stereotypes of shoulder girdle (Hošková – Matoušová 2007). Results of Test 10, identifying the level of shoulder joint mobility, pointed out a significant 81.2 % inequality between the right and left upper limb.

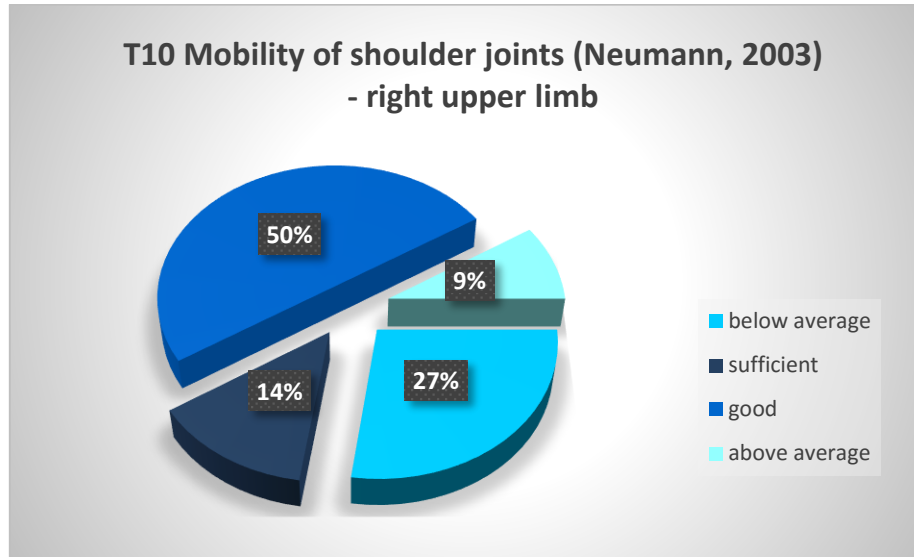


Figure 3. Test 10 Mobility of shoulder joints – right upper limb
(Source: own processing)

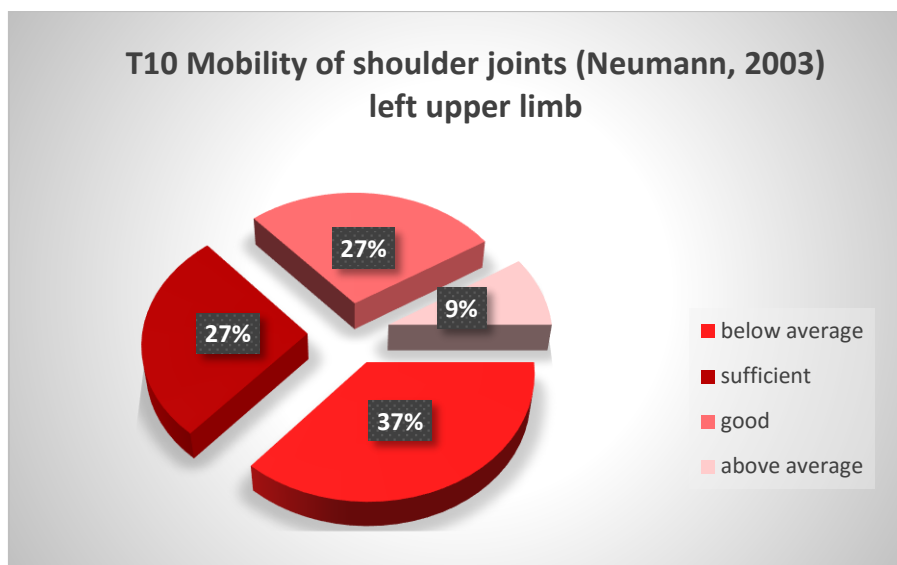


Figure 4. Test 10 Mobility of shoulder joints – left upper limb
(Source: own processing)

In Figure 3 and 4, it is possible to notice differences in mobility of participants' upper limbs. Naturally, mobility of the dominant right arm was better than in the left one but, on the other hand, it also indicated the evolving muscle imbalance in these body segments.

RECOMMENDATIONS

Results of qualitative and quantitative analysis of data from diagnostics of functional disorders of the chosen muscle groups and joints among 13-year-old soccer players during the basic sport preparation indicated that:

- In 68.2 % of participants we diagnosed early symptoms of muscle imbalance, namely lower crossed syndrome: shortened flexors of lumbar joint (m. iliopsoas, m. rectus femoris, m. tensor fasciae latae), weakened abdominal and gluteal muscles,

- up to 54.5 % of participants had weakened deep back muscles; we agree with Volpi, et al., (2006) that the reason of the deformed deep stabilizing system among young soccer players could have been in unilateral and improper soccer load without adequate compensation
- only 23 % of participants had a limited range of motion in lumbar joints; in 95.4 % of subjects, the range of motion of the right and left joint moved in the average zone between 80-110°,
- when assessing the level of shoulder joint mobility, we identified a significant, up to 81.2 %, inequality between the range of motion of the right and left joint
- in the basic stage of sport preparation, the integrated system of systematic assessment of the movement system's functional state among soccer players does not exist; diagnostics of muscle imbalance in this developmental period is rather occasional as we face with it only sporadically in cases of objective health problems or injuries of young soccer players.

Continuous diagnostics, prevention of occurrence or compensation of functional disorders of the movement system should become an inseparable part of work of soccer coaches, fitness coaches and physiotherapists. A professional approach and adequate competences of children and youth's coaches should be a guarantee of a proper training process, taking into account specificities related to young athletes' age and developmental period of the body.

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