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Original article

EVALUATION OF THE FUNCTIONAL SOMATIC PARAMETERS IN 8 – 10- YEAR OLD FOOTBALL PLAYERS

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Abstract

Aim. The aim of this study is to investigate the changes of the functional somatic indicators in the football players aged 8-10 years in order to adjust the physical effort parameters.

Methods. The study involved 63 children aged 8 to10 from the Concordia Chiajna Sports Club. This study refers to an ascertaining experiment that considers the changes of the cardiovascular indicators in the football players of this age. The medical evaluation of the athletes was performed at the Chiajna Medical Center clinic in July 2020. The somatic indicators were: height, weight and body mass index (BMI); the functional somatic pathologic indicators were expressed by the diagnosis of the medical evaluation.

Results. The results of the evaluation highlight an average age of the children of 8.75 years (n=63; 47.6% of 8 years, 30.2% of 9 years and 22.2% of 10 years); body weight of 32.36 kg and height – 138.77 cm; the BMI is within the normal limits of 16.64 units and a percentage value of 55.67% (excepting 9.52% with values <5th and 4.76% - >95th). The metabolic rate shows an increase by 66.4 kcal at 9 years and by 84.4 kcal at 10 years. Normal body mass is between 25.6 – 34.8 kg at 8 years, between 28.5 – 39.5 kg at 9 years and between 34.7 – 38.17 kg at 10 years. The diagnostic analysis of the functional somatic changes in the 8-10-year-old football players reveals 14 indicators with 32 pathologic cases (50.8%), out of which 30.2% are somatic ones (sloped shoulders, pectoral asymmetry, postural kyphosis, pectus excavatum and scoliosis) and 20.6% - functional (bradycardia, LVH, arrhythmia, sinus tachycardia, ventricular allure).

Conclusions. Sports medical evaluation of 8-10-year old football players pointed out the changes in the functional somatic indicators, which draws attention both to the need to adjust the physical effort parameters during training and to comply with the medical recommendations.

Key words: indicators, pathologic changes, diagnosis, medical recommendations, training.

Introduction

Football is one of the most practiced sports in the world. As a performance sport, football is complex and depends on a number of factors, such as: physical condition, psychological factors, technique of the player and tactics of the team. Injuries and sequelae from previous injuries can affect the ability of the players to perform (Arnason et al., 2004; Turbeville et al., 2003).

It is important to know the anthropometric indicators and body composition indicators from an early age, in different sports, especially football. There are a numerous concerns of the researchers regarding the separate approach of these parameters (indicators), but the relationship between these ones is not sufficiently analyzed (Slimani & Nikolaidis, 2017).

The body mass index (BMI) and its limitations must be well understood, particularly in children and adolescents. Certain conditions can influence the interpretation of BMI, such as the fact that athletes may have a high BMI due to the increase of muscle mass. The changing of the relationship between height and weight with age has complicated the situation (Cole et al., 2005; Chung, 2015; Şimşek et al. 2014). Recent investigations have shown that the aerobic and musculoskeletal intensity is high in children during a variety of team sports (football, basketball and unihockey) (Larsen et al., 2018). In order to assess the effect of physical activity on body composition, it will be necessary to measure not only the body mass index but also the body fat. Football can be proposed as a physical activity aiming at the prevention or treatment of the obesity and the comorbidities of this one (Maffeis et al., 1996; Moreno et al., 2004).

Throughout the last decades, the interest in the physiological demands of football playing and training has increased. Several studies have highlighted the association between clustering of cardiovascular disease risk factors and physical inactivity as well as poor physical condition in 9–16-year-old schoolchildren (Randers et al., 2010). A cardiovascular assessment is rarely done among athletes although fatal events are more and more frequently reported. Most of these accidents are cardiovascular ones (Sangare et al., 2019). Severe sinus

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bradycardia and the extended ventricular pauses in Holter monitoring are situations that generate doubts in the way to approach an asymptomatic athlete (Peidro & Pelliccia, 2017). Systematic sports training may lead to increased left ventricular wall thickness (LVWT); thus uncertainty is created in terms of diagnosis of athlete's heart differentiated from hypertrophic cardiomyopathy (HCM).

Echocardiographic data specific to athlete's heart syndrome are limited largely to adults, with little information regarding adolescent athletes (14 to 18 years old), for whom the risk of sudden death from HCM is the highest (Sharma et al., 2002). Sinus tachycardia accompanies always heat stroke. Heart rates higher than 160 beats per minute(BPM) occur in severe cases and may be accompanied by hypotension (Hart et al., 1980). The high-intensity interval training (HIIT) is used with priority in young football players. So, in their case, it is important to measure the systolic function and left ventricular (LV) volumes (Tolfrey & Smallcombe, 2017).

The *aim of this study* is to investigate the changes of the functional somatic indicators in the football players of 8-10 years old in order to adjust the physical effort parameters.

Methods

A number of 63 children of 8-10 years old from the Concordia Chiajna Sports Club participated in this study. It is an ascertaining experiment that takes into account the modifications of the cardiovascular indices in the football players aged 8-10 years. The sports medical evaluation of the athletes was carried out in July 2020, in Chiajna Medical Center. There were used the following somatic indicators: height, weight and body mass index (BMI). The functional somatic and pathologic indices were expressed through the diagnosis of the medical evaluation.

Research indicators studied: anthropometric indicators (current and ideal weight - kg, height –cm); body composition (muscle mass (kg and %), body mass index – BMI); automatically calculated metabolic rate (kcal); ideal normal body mass (kg) (https://calculator-imt.com/ro-md/imc-copii/). Body composition was assessed using the TANITA DC- 360 analyzer.

The statistical analysis was performed with the help of KyPlot program, using the conventional statistical indicators: mean ± SD (mean and standard deviation) and CV% (variability coefficient).

Results

The results of the sports-medical evaluation of the 8 - 10 - year-old football players are listed in table no. 1 and figure 1. Football players with an average age of 8.75 years (n=63; 47.6% of 8 years; 30.2% of 9 years and 22.2% of 10 years old) participated in this study.

Table no. 1. Results of the evaluation of the functional somatic indicators in the football players aged 8-10 years (n = 63)

Variables		8 years (n = 30)		9 years (n = 19)		10 years (n = 14)	
Height (cm)		135.07 ± 6.56	4.86%	141.1 ± 4.75	3.36%	144.6 ± 6.98	4.82%
Weight (kg)		29.85 ± 7.07	23.7%	32.8 ± 4.34	13.22%	38.17 ± 5.62	14.7%
BMI (kg/m^2)		16.28 ± 2.65	16.29%	16.56 ± 1.55	9.36%	18.2 ± 1.82	9.98%
BMI (%)		44.33 ± 24.6	54.4%	47.9 ± 9.18	19.16%	46.8 ± 18.1	38.8%
Metabolic rate (kcal)		1098.4 ± 125.4	11.42%	1164.8 ± 76.5	6.56%	1249.2 ± 100.2	10.07%
Normal body mass (range)	min	25.6 ± 2.53	9.85%	28.5 ± 2365	6.96%	34.7 ± 4.23	9.77%
	max	34.8 ± 3.46	9.95%	39.5 ± 2.65	6.71%	38.17 ± 5.62	14.7%

The values are presented as M ± SD și CV%.

BMI, body mass index; M, mean; SD, standard deviation; CV, variability coefficient; n, number of subjects.

The analysis of the somatic indicators shows an average body weight of 33.6 kg; height – 140.3 cm; BMI is within the normal limits of 17.01 kg/m^2 with a percent value of 46.3% (excepting 9.52% with values of <5th and 4.76% - >95th). The metabolic rate highlights an increase by 66.4 kcal at 9 years and by 84.4 kcal at 10 years.

The normal mass at 8 years old ranges from 25.6 to 34.8 kg; at 9 years from 28.5 to 39.5 kg; at 10 years between 34.7 – 38.17 kg.

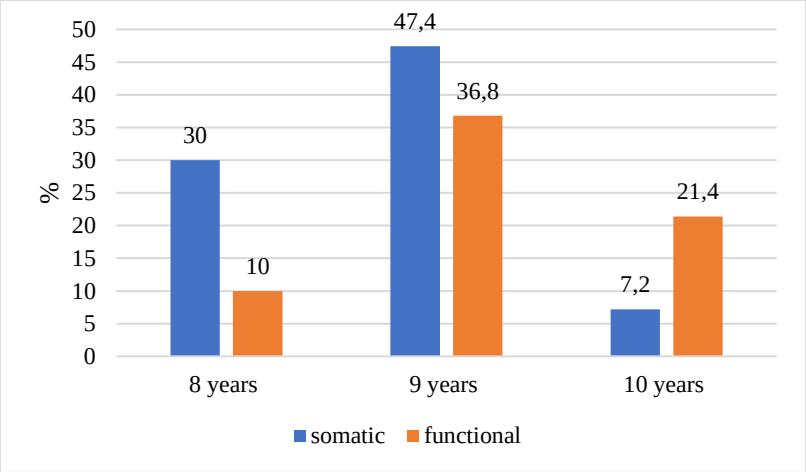

Fig. 1. Share of the functional somatic pathologic changes in football players of 8-10 years old

The diagnostic analysis of the functional somatic changes in football players aged 8-10 years highlights 14 indicators with 32 pathologic cases (50.8%), of which 30.2% somatic ones (sloped shoulders, pectoral asymmetry, postural kyphosis, pectus excavatum and scoliosis) and 20.6% - functional ones (bradycardia, LVH, arrhythmia, sinus tachycardia, ventricular allure).

Discussions

The medical evaluation results are based on the investigation of the changes of the functional somatic indicators in the football players aged 8-10 years. This investigation is necessary for adjusting the physical effort parameters.

The analysis of the somatic indicators reveals the increase of the values in relation to weight, height and body mass index. To examine the activity profile and the physiological requirements of the small-sized football games, it was demonstrated that this type of games explained the high heart rate for all groups of players, regardless of age, gender and social background. It also explained a large number of intense actions for all players, men and women alike (Randers et al., 2010). An analysis was made to determine whether the musculoskeletal fitness of the schoolchildren aged from 8 to 10 years was affected by the frequent intense sessions of physical education (3×40 min/week) (Larsen et al., 2017). It was also showed that 8–10-year-old children engaged in sports club activity, especially ball games, have better physical fitness and a healthier body composition than other children. The young athletes have a superior aerobic and musculoskeletal fitness, better sprint performance, improved postural balance and coordination abilities, as well as a lower fat mass index (Larsen et al., 2018). The body balance, podiatric parameters and body composition of young footballers were evaluated in the context of football training control. The average values of body composition parameters reflect the changes in the ontogenetic development, the basic somatic parameters (body weight and height) and the training experience. The correct intensity and volume of training does not interfere with the proper development of the body in terms of tissue and biochemical composition (Bukowska et al., 2021).

The metabolic rate increases by 5.3% kcal at 9 years and by 6.8% kcal at 10 years, while the normal mass increases by 1.8 kg at 9 years and by 3.47 kg at 10 years. The non postabsorptive metabolic rate (namely the sum of thermogenesis and energy expenditure for activity) was notably greater in the obese children (Maffeis et al., 1996). The experts of the World Health Organization (WHO) have addressed the interpretation of the cut-off points recommended for BMI in order to determine the overweight and obesity in Asian populations (World Health Organization, 2004).

The analysis of the functional somatic changes in the 8-10-year-old football players reveals 50.8% of pathologic cases. The pathologic somatic changes are 30.2% of the cases and refer to: sloped shoulders, pectoral asymmetry, postural kyphosis, pectus excavatum and scoliosis. The study of the specialized literature highlights that the avulsion of the glenohumeral ligament labral complex at the glenoid (Bankart lesion) and also the ligamentous laxity are usual causes of anterior shoulder instability. A lesser known injury, the humeral avulsion of glenohumeral ligaments (HAGL), was studied to find out its incidence and its role in anterior glenohumeral instability (Wolf, Cheng & Dickson, 1995). If early identification and treatment are achieved, healing of the joint

is often rapid and stable. A review of the specialized literature suggests the use of a sling for at least 4-8 weeks, aiming at the return to competitions if all goes well and the athlete has a pain-free full range of motion (Choi et al., 2008). Kicking and cutting in football are clearly unilateral; they require asymmetric motor patterns and lead to the development of asymmetric adaptations in lower limbs musculoskeletal function. It is assumed that these adaptations are a chronicity-dependent process, highlighting the effects of the strength-profile of knee and ankle joints in football players (Fousekis, Tsepis & Vagenas, 2010). Costal cartilage fractures and disruptions in athletes are rarely reported in the specialized literature and can have serious implications for the ability of the athlete to return to playing if the ribcage is destabilized (Lopez et al., 2013). Posture, a possible injury risk factor, is considered important for injury screening/prevention in athletes; however there is a small number of studies that analyze the relationship between posture and injury. Static postural deviations found out in male football players in the pre-season are not typically associated with non-contact lower limb injury risk; so, probably they do not add value to pre-season screening programs (Snodgrass et al., 2021). Low back pain is often found out among young athletes. Such cases are risk factors for important structural injuries or non-mechanical problems that can be related to their symptoms. Any athlete who complains of severe, persisting or activity-limiting symptoms must be assessed carefully (Standaert, 2008). Referring to skeletal abnormalities, these ones include arm span to height ratio greater than 1.05, tall stature, hyperextensibility and ligamentous laxity, arachnodactyly, scoliosis and chest wall deformity (pectus excavatum or carinatum). Other problem that can affect athletes is ectopia lentis (lens dislocation) (Halabchi, Seif-Barghi & Mazaheri, 2011).

The functional pathologic changes in the football players of 8-10 years old highlight 20.6% cases of bradycardia, LVH, arrhythmia, sinus tachycardia, atopic dermatitis, ventricular allure. In this sense, there are studies that address the pathology of the system cardio-vascular in the football players aged 8-10 years. A study conducted with over six thousand consecutive patients submitted to Holter monitoring, because of bradycardia symptoms or problems identified in the resting ECG, revealed a prevalence of pauses above 3 seconds in 0.8% of cases (Peidro & Pelliccia, 2017). Moreover, certain training-related ECG patterns, such as sinus bradycardia and isolated increase in R/S-wave voltage were studied. Athlete's heart syndrome in adult and adolescent elite male soccer players were analyzed by electrocardiography (ECG) and echocardiography (ECHO) and the typical ECG or ECHO findings were described (Kervio et al., 2013; Pambo et al., 2021). A common congenital heart arrhythmia that affects 1 out of every 2500 people within the United States is the supraventricular tachycardia, but the arrhythmia usually corrects itself by adolescence. Typically, it is considered a non-lethal and manageable dysfunction in athletes due to vagal maneuver breathing techniques, medications and procedures that can be taught, administered or carried out (Placca, & Howland, 2016). The involvement of 5-HT4 receptors in the development of sinus tachycardia and atrial fibrillation was analyzed. The use of 5-HT4 receptor antagonists proved to be effective in the treatment of this type of arrhythmias. Thus, the study of the serotonergic system role in the development of cardiovascular diseases will allow new approaches of the pathogenesis of arterial hypertension in childhood (Sadykova, Nigmatullina & Aflyatumova, 2015).

Conclusions

The results of the somatic assessment of the 8-10-year- old football players show that the values of weight, height and BMI are within the normal limits (with the exception of 9.52% with values <5th and 4.76% - >95th). The metabolic rate has an increase by 5.3% kcal at 9 years and by 6.8% kcal at 10 years. The normal mass increases the range by 1.8 kg at 9 years and by 3.47 kg at 10 years.

The analysis of the functional somatic changes highlight 14 indicators with 50.8% pathologic cases (out of which 30.2% are somatic and 20.6% - functional).

Sports medical assessment of the 8-10-year-old football players highlighted the changes in the functional somatic indicators (normal values and pathologic ones as well), which draws attention to the necessity of adjusting the physical effort parameters during training and of observing the medical recommendations.

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