



The performance of young football players in terms of their respiratory function, contingent upon their position on the field

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Abstract

Objective of the study was to comparative analysis of the key indicators of external respiration in football players across different stages of adolescence.

Methods and structure of the study. The function of external respiration was studied in 102 adolescents aged 12-17 years who study at the Zenit-Izhevsk SSHOR Football Center. All athletes were divided into groups according to two criteria: age and playing role. The Spirolab III device was used, designed for the most complete assessment of the function of external respiration. The following spirometric tests were performed.

Results and conclusions. All indicators of respiratory function, expressed as a percentage of the expected values, undergo the following transformations: an increase from 12 to 13 years, followed by a decrease, sometimes abruptly, in the 13-15 year range, and then a gradual rise in the values of all indicators up to 16-17 years. This pattern suggests a significant decline in the function of external respiration and, consequently, aerobic abilities during the 13-15 year period. Therefore, it is crucial to recognize not only sensitive but also challenging phases in the development of general endurance. It is imperative to conduct a comprehensive analysis of respiratory function indicators in adolescent athletes to accurately assess their aerobic capabilities and pinpoint the onset and conclusion of each sensitive period for the purposeful enhancement of general and, to some extent, specific endurance.

Keywords: *sports training, football, endurance, respiratory function, sensitive periods.*

Introduction. In modern sports, a very dangerous phenomenon is often observed: athletes cannot fully reveal their innate, sometimes quite high potential due to excessive forcing of the training process in childhood, adolescence and adolescence. Particularly negative is the fact that the harm caused to health during sports activities at the age of 10-16 years, turned out to be impossible to compensate for in the future [1]. It is known how important general and special endurance are in modern football. The use of methods of influencing the body through the respiratory system enhances the positive effect of training loads on the body, contributes to the formation of more advanced adaptation mechanisms and an increase in the performance of athletes [5]. But at the same time, knowl-

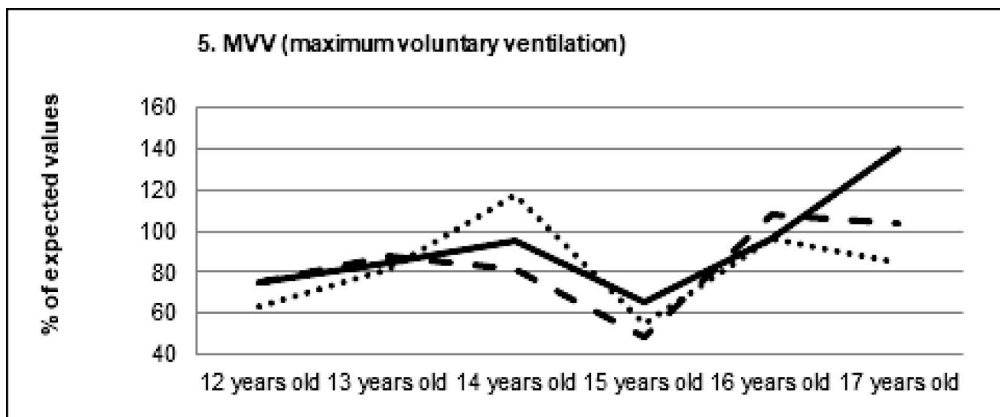
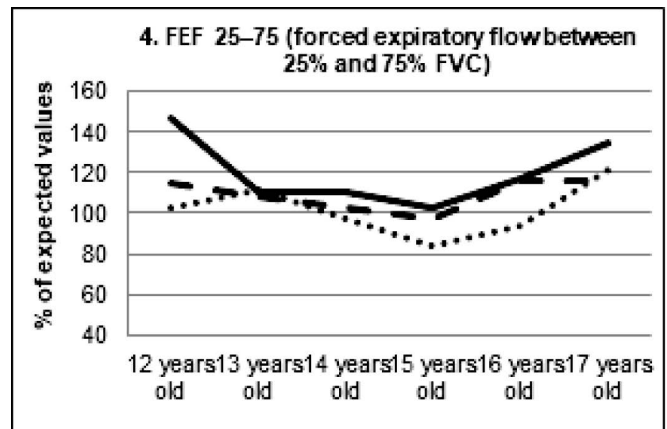
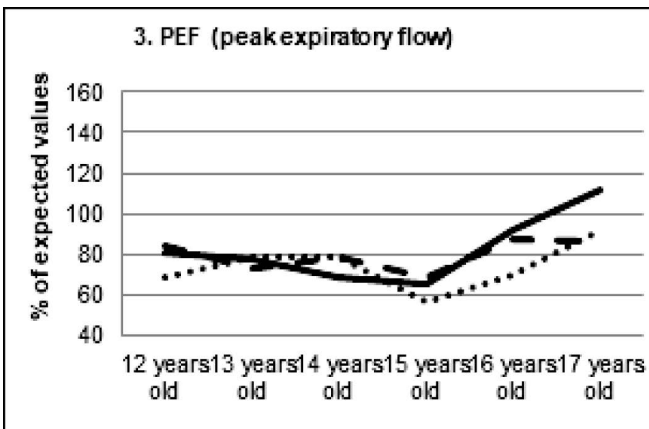
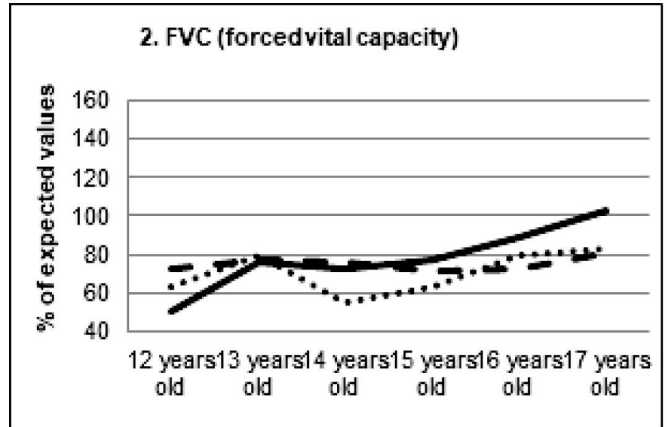
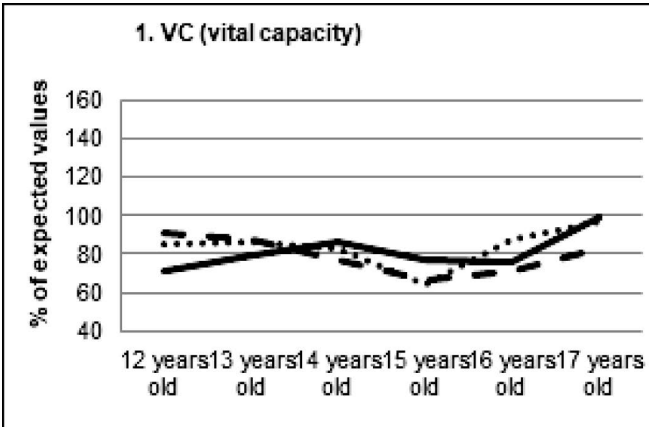
edge of the initial parameters of external respiration of young athletes is absolutely necessary. The planning and implementation of training loads, especially with the "advanced" principle of preparation, should be approached very carefully. The basis for this should be, in particular, truly informative methods for studying the parameters of external respiration of young athletes. However, although the principles of studying the functional capabilities of the external respiration system are well known [2. pp. 140-141], they are rarely used in practice in the required volume of the parameters studied, as a rule, they are limited to simple spirometry. Football, like other team sports, is one of the most successful models in studying the degree of development of reserve and adaptive capabilities of the res-



piratory system. At the same time, today the characteristics of external respiration in football players at a young age, when the necessary foundation is laid not only for the high development of physical qualities, but also for sports skills in general, are still insufficiently studied.

Objective of the study was to comparative analysis of the key indicators of external respiration in football players across different stages of adolescence.

Methods and structure of the study. The respiratory function was studied in 102 adolescents aged



Note: — attackers; - - - - - midfielders; defenders.

Spirometry indicators (% of expected values) in football players aged 12-17 years, taking into account their playing role



12-17 years, training at the Autonomous Educational Institution of Additional Education of the Udmurt Republic "SShOR for Football "Zenit-Izhevsk". All athletes were divided into groups based on two criteria: age (in one-year increments) and playing position (forwards, defenders, midfielders). The SpirolabIII device, an automatic spirometer designed to provide the most complete assessment of the respiratory function, was used. The following spirometric tests were performed: measurement of forced vital capacity of the lungs, measurement of vital capacity of the lungs, measurement of maximum ventilation of the lungs. Other parameters of external respiration are obtained by calculation in automatic mode. In our study, five main indicators of the respiratory function were used: VC (vital capacity of the lungs in liters); FVC (forced vital capacity of the lungs in liters); PEF (peak expiratory flow); FEF 25-75 (forced expiratory flow between 25% and 75% FVC); MVV (maximum voluntary ventilation in l/min). For each parameter, the percentage ratio between the measured and calculated values was automatically calculated.

Results of the study and discussion. The scientific work interprets the indices of the external respiration function expressed as a percentage of the expected values, taking into account the length and weight of the subjects, gender and ethnic group. This approach allows us to consider the average group values of the studied indices and evaluate their dynamics.

Changes in the VC (vital capacity) index turned out to be multidirectional at the age of up to 13 years in football players of different playing positions. From the age of 13 to 15 years, they also observe a decrease in this index, but not equally: if this index noticeably decreases in defenders and midfielders, then in forwards it is very small. From 15 to 16-17 years, a significant increase in this index is observed in everyone, and the most in defenders, and noticeably less in midfielders and forwards (Figure 1.1).

The FVC (forced vital capacity) index up to 13 years increases to approximately the same level. Then, by the age of 14, there is a significant decline in defenders, while this indicator remains at approximately the same level as at the age of 13 for forwards and midfielders. From 14-15 to 17 years, there is an increase in FVC for all players, but it is highest for forwards. The greatest increase in this indicator is observed in defenders (Figure 1.2). The PEF (peak expiratory flow) indicator is approximately at the same

level for all football players from 12 to 14 years old. However, from 14-15 years, this indicator decreases for forwards and midfielders, but especially for defenders – by 1,4 times. At 15-17 years, there is a significant increase in PEF for football players of all playing positions, but the highest indicator was found in forwards, as well as the degree of its increase – by 1,7 times (Figure 1.3).

According to the FEF 25-75 indicator (forced expiratory flow between 25% and 75% FVC), at 12-13 years old, almost maximum values are recorded for each of the positions, but the forwards have the highest value of this indicator. Then, by the age of 15, this indicator noticeably decreases for all football players, especially for forwards. At 15-17 years old, an increase in FEF 25-75 is observed for all football players, to a greater extent for forwards. It is characteristic that only defenders had a small, but still an increase at 17 years compared to the age of 12 (Figure 1.4). The MVV (maximum voluntary ventilation) indicator for forwards and defenders from 12 to 14 years increases slightly, and for midfielders this occurs only up to 13 years. Then, a sharp decrease is observed for everyone from 14 to 15 years. This is especially pronounced for defenders – by 2,1 times. From the age of 15, this indicator increases significantly in defenders and midfielders up to the age of 16, after which it relatively stabilizes. In forwards, MVV increases by 2,1 times by the age of 17 (Figure 1.5). As a result, it was shown that in the age period of 14-15 years, all the studied indicators significantly decrease. A distinctive feature of this age is that it is then, against the background of the ongoing puberty of the body, that the so-called "growth spurt" occurs, that is, a sharp increase in the longitudinal indicators of body size. Due to uncoordinated technique, adolescents spend more energy on performing standard running work than adults. Therefore, their oxygen consumption significantly exceeds the oxygen consumption of adults [5]. Hence the danger of health problems at the age of 13-15 years due to inattention to the established sensitive periods of development of general endurance: 10-12 and 17-18 years [3].

Conclusions. The average value of each of the studied indicators of the external respiration function, as a rule, does not depend on the playing role of the football players (defenders, forwards, midfielders); this applies to each studied age in the range from 12 to 17 years.



For all the studied indicators of the external respiration function, the following age-related pattern of a general nature was revealed: an increase from 12 to 13 years, then a decrease, sometimes sharp, in the period of 13-15 years, and then a gradual increase in the values of all indicators up to 16-17 years. This indicates a significant decrease in the function of external respiration, and, consequently, aerobic abilities at the age of 13-15 years.

In the age range of 13-15 years, intensive training of general endurance is not only inappropriate, but also dangerous for the health of adolescents, which is confirmed by the data we obtained on the decrease in a number of indicators of the external respiration function at the age of 13-15 years. If a significant decrease in the indicators of external respiration function is detected, plans for training young football players should be promptly adjusted in terms of developing general and special endurance, as well as the total duration of training, especially in hot summer conditions, when the need for oxygen increases.

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