

MORPHOLOGICAL AND FUNCTIONAL CHARACTERISTICS OF THE HANDBALL PLAYERS AT THE PUBERTY AGE

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Abstract: *The identification of morphological and functional characteristics of adolescents allows programming the suitable effort of sports training in handball game.*

Programming of sports training for handball players at pubertal age requires individual biological characteristics, leading to changes in several systems of the body such as: musculoskeletal, respiratory, cardiovascular, as well as of in the central and peripheral nervous system.

Hypothesis: The development of the appropriate content of teaching programs is for handball players-beginners, based on the professional investigations and their implementation in the training process will contribute to the efficiency of the training games capabilities and their integration, to achieve genuine results in practice.

The research objective is to highlight the morphological and functional features of the middle age school students to learn technical and tactic methods of the handball game, a pre -competitive training program, the preparation of study programs in schools with sports programs structures and the identification of the game models on positions. **The applied methods** included first of all the knowledge of the literature in the field, and the technological testing of the pubertal students who in general practice sports games and especially, the handball game.

Discussions and debates

Severe nature of the sports games, the release of a large amount of energy during the execution of throwing the ball at the goal, the "jagged" rhythm of the game, the evidence of the majority of the motile capabilities, the actions that could lead to trauma are landmarks of the

handball game, and it requires the teacher, coach to know the biological features of the juniors of different ages and genders.

Enhancing the practical knowledge of young professionals and their “resuscitation” by experienced teachers would lead to a correct interpretation, in terms of teaching, of learning potential of the handball game. Intensive development of the body occurs during puberty from 11 to 15 years age, and is characterized by the imbalanced growth of some parts of the body versus the development of the internal organs – acceleration. This heterochrony is characteristic and for physiological systems.

According to some specialists in sports (Gujalovski AA, Khrushchev SV) the age of the students is divided in periods as follows: 4-7 years age, girls and boys; 8-12 years age, boys, and 8 -11 years age, girls; adolescence - 12 - 15 years age, girls, and 13 - 16 years age, boys; juniors - 16 to 20 years age. The criteria beyond these differences are the biological passport of the body: the body size and of the organs, the skeleton ossification, the teeth, the development of the endocrine glands, the degree of the genital organs development, the strength of the muscles. In this context is taken into account the characteristics of the girls and of the boys, but fixed barriers of the age division do not exist, the longevity of some periods are unpredictable, and the indices that would indicate an objective information are in the study. Only the typological parallelism of the age characters according to objective factors allow modeling of pedagogical aspect of the handball players training.

Taking into consideration that the motile apparatus reflects the status of the entire body, during the juvenile period it is necessary to limit the physical efforts. The development of the capacities strength-speed of the legs, the learning of throwing the ball through a jump, demands avoid jumping from heights that would result in strong deformation of lower leg bones.

The mobility of the movements is indirectly regulated by the amounts of myofibrils, the main ingredient of the muscles. For muscles it. In newborns each line contains 50-120 of myofibrils, at the age of 7 years the amount increases by 15-20 times. A stormy growth of muscle fibers occurs at the age of 15 and 17 (10% more), where they get longer and thicker at the expense of existing fiber diameter size-hypertrophy (90%) and new-formations hyperplasia (10%). For a normal way of this process it is required a strict balance of the physical effort.

The muscles as executors of the nervous system (NS) demanding a large amount of knowledge, taking in consideration the nervous superior activity (nervous system activity).

The most phylogenetic structures of the SN (from below the cortex) are maturing earlier than the cortex of the large hemispheres, and highlights their increasing indirectly, demonstrated by electroencephalogram's indices, which later will lead to the domination of the cortex action that it stabilizes in children from 10-12 years age.

During puberty again it activates the actions of the structures from below the cortex and that's why in the adolescents behavior it is observed a high irritability, instable emotional reactions which at the age of 16-17 go back, grace to counteraction of the cortex over the structures below the cortex, that is reflected through the more quiet behavior and thought actions.

ANS is a supreme form of the nervous system functioning, reflects also age aspects. In children 6 years (grade 0) strength and liability of the nervous system increase nervous system, the holding back feelings become more stable increasing the capacity of the large hemispheres of the cortex. Due to those changes the children may concentrate their attention to study the simplest technical methods of dynamic games. Compared with children of age 5, the actions of differentiation and stubbornness is created two times faster, that showing the availability toward learning new movements, followed by cardiovascular, respiratory and autonomic changes of NS, and the amplification of the role of the second channel –the verbal thinking. The memorizing capacities of the actions are developed and more than that, the prediction of the results – an important fact to obtain motile skills.

At 7-9 years age, the connections of the conditioned reflexes interfere, which allow the formation of the reflexes for new stages more complicated of the irritations, which individualize personality and the appearance of new references of methods learning – visual, lowering the verbal ones. This confirms the superiority of the indication method at given age.

At the age of 10 to 12, there are the intensification of the processes of starting and holding on the impulses, quickly and simultaneously to create new complexes, there are conditions for the accumulation of thinking, a fact that is mentioned by specialists such as: Latischevici L.A., Certova N.V., Capatina G.A. [6] Latîş LA, Certova NV, G.A., as

the most optimal time for initial training of the handball players of different educational networks. [6]

At the age of adolescence (boys and girls separately) excitation processes prevail not only in the cortex of the large hemispheres, also and in the structures below the cortex, the response reactions is inadequate, more stormy than necessary, there the visual conditioned reflexes predominate over the others, and must be used, as usefully, by the specialists in this domain.

Changes occur and autonomic functions is related to the physical, the gasping appears, the pulse increases, emotions are intensified, the holding back feelings lowers and the structures below the cortex are activated, all being related to the age and gender. Changes in motor activity are reversed: the boys suddenly increases, for girls are holding back. The feelings of age megalomania appears and is evidenced by increasing the criticism, criticism toward the adults, offending them, negations with rapid changes in overrating the underestimation of the facts, that requires a quiet attentive behavior from the others, in order to assure normal activity conditions.

One of the most exceptional characteristics of SN, is the ability to learn, a character bearing age in children, manifested by comparison of the learned things and improvement through physical exercises, that reach a functional maturity at the age 10-12, and can be driven by the mechanism of pivot of memory – the conditioned reflex formed on unconditioned reflex that has an emotional background, which later will condition the temper. dithionite bearing an emotional background, which later determines temperament. Depending on the strength and liability of the psychological processes the correlation between the actions of the cortex and the methods which take place below the cortex, as the connection between the signaling systems lead to crystallization of the four types of the known temper. The plasticity of the large hemispheres cortex cells, their adaptation to changing conditions of the environment forms a morphological – functional base that allows the character education of the future handball player.

Handball game is a sportive game of high dynamism that requires highlighting a choleric temper, which should form the necessary base for an analytical and synthesis activity to lead the complex training methods. Taking in consideration the related issues as the student is younger so are and the possibilities of correct and rapid orientation in game till the age

of 13-14 (Ivanhin D. I. 1986; Dutciac M. P., 2000), but better replaced with dynamic games that contain handball game elements.

For the newborns the sensorial system is morphologically visualized and is ready for activity, and at age of 7 is matured. The auditory system has generally the same meanings, but the differentiations are at the verbal excitations and have the tendency to extend to form, up to 6-7 years age.

In the first months of the child, but a bit later as visual and auditory reflexes appear, the vestibular ones appear to have the age character – as bigger the baby as lower the excitation.

The analysis of the objective sources of information shows that between the related specific centers of the motile systems and of the regulation of the internal organs there is an organic connection which requires a strict dosing of the efforts that lead at the formation of different specific skills in the handball game.

The autonomic function of the body is provided by the normal functionality of the motile and psychic processes. The main role in realization of these processes plays the blood circulatory system with all the specific functions. There are many transformations in the ontogenesis process, one of which is the heart size. During the systematic practice of the sports must consider that from age of 7 to 12, the tempo of the heart development is relatively lower. Providing the heart muscles with blood is different, and with the age the arteries of myocardium increase in number, and the muscle of the left ventricle have more vessels than the right. The changes appear and regarding the diameter of different blood vessels (arteries, veins and others) the venous blood volume, makes easier the blood reflex and intensifies the exchange of the substances. During the period of puberty the maturation of the cardiac muscles is more intense than the increase of thickness of the vessels. This characteristic of the cardiovascular system must be considered when programming the physical efforts during the training of the handball players. The pulse has the tendency to go lower while the body develops on its way, proportionally reversing and the volume of the eliminated blood during the contractions, the blood pressure also change. The changes take place also in the respiratory system. Artificial changes take place under the influence of the physical exercises, and also under the same circumstances.

This age, characterized by a significant increase of development, makes that the body of the adolescents more affordable to training, but in

the same time more sensitive at the tasks that exceed the individual tolerance at the effort, the structures of the musculoskeletal passive system presenting a high risk prone to trauma or lesions (Weineck J., 1994). In sustaining this affirmation, the authors refer to Mark-Jensen Law, who shows that, the tissues sensitivity is proportionally with their development speed. The adolescents who practice sports present an accelerated rhythm, of growth and development of the organs, apparatus and systems from the somatic and autonomic spheres. The uneven growth and development continue till puberty, become suddenly chaotic and unaesthetic at this age. Certain segments of the body continue to develop, sometimes even with an accelerated rhythm, while the others stagnate.

Somatic development

A. Demeter and colleagues (1979), noted at this age an increased in the waist area and a slower weight gain, the increased limbs relative to the trunk and causing body asymmetry, the bones mainly developing in thickness, mineral salts (calcium and phosphorus) and through the consolidation of the intimate functional structures. All the experts agree that at this age there is a hyper laxity of all joints, and ligaments do not provide sufficient tensile strength at traction and twisting and for the boys, age of 12-15, weight and stature growth is greatest.

As shown by Weineck J. (1994), Buhlmann U. (2001), pubertal growth period produces a fragility of the bones and joints that lead to increased risk of trauma, the tasks of the training becoming at this age, excessive and non physiological. During the peak of the development phase, the effort capacity of the development areas is decreased. Talking about critical body relationships of this age, it highlights the following aspects: the bones are more flexible, their resistance to traction and pressure is lower, limiting the capacity of the skeletal system to support heavy weights, the tendons and the ligaments tissues are not yet enough resistant to traction, due to their weak developed micellar structures and the proportion of the intercellular substance, the connecting cartilages are not yet ossified and present a high risk of trauma during the powerful pressures or “scissors” exercises. In the same time, the reports of the leverages toward the muscle potential become less favorable. Due to the slower adaptations of the passive musculoskeletal system compared with the active one in relation with the physical demands, it imposes that the doses of the effort to be implemented after a rigorous progression.

Nervous system and analyzers is growing rapidly at this age. Demeter A. (1981) indicates that at the athletes at puberty age all the features of the activity of the central nervous system, directly influences the formation of the speed and stabilization of the motile skills encouraging the appearance of fatigue, somehow weaken the will and the perseverance. Instead, the high plasticity of the cerebral cortex favorites the elaboration of the unconditioned central nervous system activity, directly affects the speed of formation and stabilization of motor skills, promote fatigue, weakened to some extent, the will and perseverance. Instead, the great plasticity of the cortex favors the elaboration of some conditioned motile reflexes and dynamic complex stereotypes of which fixation needs a reduced number of repetitions and exercises. The analyzers are presented at this age at a very high level, morphologically and functionally almost perfect. The skeletal muscles develop through the elongation of the muscles fibers, their thickness being reduced, accordingly and their strength is diminished. The total weight of the muscles represents in adolescents 25-30% from the body weight, compared to 40% as it was at birth.

In the early stages of puberty (10-12 years) there is an increase in muscle strength, by “leaps”, especially at the extensor muscles level.

The autonomic liability represents a serious handicap for adolescents from the all points of view, but mainly through sportive performance. The metabolic disorder, both by strong anabolic action of sex hormones, steroids and the occurrence of new acid metabolites in the blood leads to a marked cortical-visceral hyper excitability, seriously disturbing the homeostasis of the body in general and reducing considerably the physical and psychical performance. The morphological development of the cardiovascular system is ongoing. Functionally, however, this one presents a pronounced liability, the adaptation for the high demands of the sportive training being still poor. It results that the aerobic possibilities of this age are limited, and to the end of the puberty age cannot reach the superior limits of the effort capacities.

Regarding the development of the motile capacities for adolescents, Weineck J. (1994), shows that at this age the training availability of the physical condition is at the maxim level. So there are reported high achievements of speed, reaching adult values equivalent. About the strength exercises, the opinion of the specialists has changed over time. Popovici et al. (1972) showed that it is not allowed to perform those exercises in full, during puberty age. As shown by Ifrim M[2]

(1986, 1993), Demeter A. et al. (1979), it is absolutely necessary to review the old concepts which contraindicated the use of strength exercises at this age, invoking the morphological and functional arguments; it is contraindicated the use of some maximal efforts and high amounts of neuromuscular charges that presents the risk of overuse of the muscle and ligaments system. Weineck J. (1994) believes that developing strength and mobility must take into account the connection of the cartilages which suffer morphological and functional changes, and also and the fragility of the spine. Thus, some efforts addressed to the spine cause chronic conditions and pains that last. At the puberty age the development of the resistance is optimal, (Demeter A. et al (1979), Weineck J. (1994), and the most indicated methods are those of the continuing the effort and on the intervals with less amount of lactic acid accumulation. Due to the high opportunities to provide and support the physical effort, it can be said, that at this age will be set up the bases of their subsequent performance capacity. Starting with the puberty age, the coordination of motile learning is more rational and not spontaneous as the younger ages. As shown by Starosta W. (1985) if it misses the pubertal period, will be harder later, to influence the coordination processes. [4] Weineck J. (1994) believes that at pubertal age, the special coordination are strongly diminished, especially due to rapid growth of the waist and of the body weight in relation to strength. The coordination capabilities at this age must be re-adapted to the new and extensive development of the systems and capacities. However, the improvement and the consolidation of the sports techniques and of the movements already learned must be continued.

From the previous researches the puberty age is the most appropriated period of improving the dynamic balance, the balance in the rotational movements, the strength of the shoulders, the speed of the rotational movements, the speed of the hands movements, the accuracy of the abduction movement of the left hand, the accuracy of the abduction movement of the right hand and the learning as rapidly possible of the handball game technique. [6]

Conclusions:

1. The knowledge of the morphological and functional changes – at puberty increases sufficient premises in terms of theoretical and methodological aspect to develop educational and formative contents.

2. The existing practice of this given process is characterized by mismatch of the methodological guidelines with the specificity of the educational profile among pubertal age students.
3. From the investigated domain it was found the insufficiency of the indications and methodological recommendations regarding the content and forms of organization-development of the learning process of the technical methods and of the tactical actions and tactical actions for handball players at puberty age.
4. Examining the physiological aspects of the motile activity, allowed us to witness that at this stage of the adolescents it was obtained the somatic sensory physiological status of the original maturity, characterized by more instabilities to coordinate various attributes of teaching material, which requires correcting and revising the handball game curricula at the given age.

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Titlu: Particularitățile morfo-funcționale ale handbaliștilor de vârstă pubertară.

Cuvinte cheie: antrenamentul adolescenților, handball, schimbări morfo-funcționale.

Rezumat: Identificarea particularităților morfo-funcționale ale adolescenților permite programarea adecvată a efortului antrenamentului sportiv în jocul de handbal. Programarea antrenamentului sportiv pentru jucătorii de handbal de la vârsta de pubertate impune caracteristicile individuale biologice, ceea ce duce la schimbări în mai multe sisteme ale corpului, cum ar fi: musculo-scheletice, respiratorii, cardiovasculare, precum și în sistemul nervos central și periferic.

Titre: Morpho-fonctionnelles particularités des joueurs de handball de l'âge pubertaire.

Mots-clés: formation des adolescents, le handball, les changements morphologiques et fonctionnels.

Résumé: Identification de la morpho-fonctionnelles des caractéristiques des adolescents permettent effort de planification adéquate en handball sport de formation. Planification des entraînements sportifs pour les joueurs de handball de l'âge de la puberté nécessite individuels caractéristiques biologiques, entraînant des changements dans plusieurs systèmes du corps, tels que les troubles musculo-squelettiques, respiratoires, cardiovasculaires, et le centre et le système nerveux périphérique.