ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Puberty Changes of Haemodynamics in Boys-Athletes.

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ABSTRACT

The article describes the results of haemodynamics studies in hockey players aged 11-15 with regard to the stages of sexual maturation and their comparison characteristics with indicators of the boys from control class who do physical activity in terms of comprehensive secondary school. It has been shown that systematic muscle exercises have dominant effect on functional state of cardiovascular system in athletes in the prepubertal and pubertal periods of the development of their organisms; it is observed invariably high stroke volume of blood and systolic arterial pressure; maximum frequency indices of heart beats, volume of blood per minute and diastolic arterial pressure are observed at the 1- st and 2-nd stages of puberty, and minimum - at the 3-d stage, as distinct from the children of control class, whose parameter data dynamics has opposite direction. It may indicate to stress character of physical overactivity by effect of which the adaptive responses of cardiovascular system predominate over puberty change of its functional activity.

Keywords: hockey players aged 11-15, hemodynamics, stages of pubescence.

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ISSN: 0975-8585

INTRODUCTION

In spite of considerable number of works reflecting functional state of hemodynamics of young athletes the changes of its indices are assessed, as a rule, from the standpoint of the trained children [1,2], at the same time the influence of neuroendocrinal change of the period of pubescence, causing increase of sympathetic impulsing on neuromuscular apparatus of heart and blood vessel, is not taken into account [3]. The role of sympathetic regulation in the period of adolescent «jump» is undoubtedly important, enhancement of which is biologically reasonable and necessary for completion of formation of morphological and functional properties of cardiovascular system (CVS). But heightened lability of neural processes, characteristic for puberty [3], reduction of excitability threshold of vegetative nervous system and insufficient involvement of parasympathetic division into compensatory-adaptation body response [4,5] cause adolescent functional disorders of CVS in the form of hypertensive effects, sinus arrhythmia, extrasystole [6]. Irrational physical load can change dynamics of evolutive processes in heart and vessels and cause cardiovascular abnormalities in young athletes as well [7-10]. All this is important in connection with extensive development of athletics for the children and the youth, its initial orientation to preserve good health of rising generation. In literature there are absent data about the longitudinal studies of CVS of young hockey players, and information of their hemodynamics at different stages of sexual maturation (SSM), though indisputable is the fact of influence of level of sexual maturation on physical efficiency and adaptive abilities of the circulatory system of young athletes [11].

All stated above determined the topicality of research, allowed to formulate its objective – the study peculiarities of functional state of CVS of hockey players 11-15 of age at different stages of sexual maturation.

RESEARCH METHODS

In research the boys-athletes (58 boys) who studied in sport specialized classes (SC) of school № 1 in Kazan and played ice hockey with week volume of physical load of 12-14 hours took part in the research. All examinations were conducted in the period of competitions, in parallel to daily practices, at that the children at the age of 11 were at the initial stage of intensive muscle training. For the sake of reliable judgment about specific effect of physical exercises on the level of CVS of the adolescents, the boys from control classes (CC) involved into physical culture in terms of general school (48 boys) were simultaneously studied. The same children aged from 11 to 15 inclusive were continuously observed during 5 years. For the purpose of exclusion of effect of circadian and seasonal rhythms of functional activity of physiological systems [12], and also impact of academic load on the children's organism, examination was conducted at one and the same hours – in the first half of the day, midweek, in the year starting October.

For the study of functional status of CVS, it was used the method of tetrapolar pectoral rheoplethysmography with hardware-software rheographic system «Rheo-Spectrum-2» (LLS «Neurosoft» Ivanovo). Stroke volume of blood (SVB) was calculated by Kubichek formula in modification by Yu. T. Pushkar [13], minute volume of blood (MVB) – as product of SVB per heart rate (HR). General peripheric vascular resistance (GPVR) was calculated by Poiseuille formula [14], measurement of blood pressure (BP) was taken by method of N.S. Korotkov using semi-automatic device «MF–30» (Japan). It was measured systolic, diastolic and medium hemodynamic pressure (SBP, DBP, MHP) [15].

Stages of puberty were determined by method of J. Tanner (1968) depending on the degree of manifestation of secondary sexual characters [16].

Statistical manipulation of the obtained data was carried out by standard methods of variation statistics using software package Microsoft Excel, 2007. For certainty value of differences it was used T-test, based on Student's t-criteria.

THE RESULTS OF RESEARCH AND THEIR DISCUSSION

Taking into consideration that development of CVS in adolescence depends substantially on the level of sexual maturation, the study of its functional status was carried out at each stage of sexual development of young hockey players. At that, it has been established that distribution of the boys according to the stages of sexual maturation in sport and control classes has its peculiarities (table 1).