

SHORT COMMUNICATION

Specialities of assessment of endurance capabilities in sport active children

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Maximal oxygen uptake (VO₂max) belongs to most important functional parameters of physical fitness testing and consideration of endurance capabilities. The value of VO₂max depends on age, gender, genetic disposition, body dimensions and physical fitness. Spiroergometric examination was done on cycle ergometer (ramp 25—35 W per minute) at vita maxima. One hundred and seventy children (129 boys and 41 girls) at the age of 8 to 17 were examined. The obtained results showed that absolute values of maximal oxygen uptake progressively rise during the course of childhood and gender differences between boys and girls started at the age 12—13 years. (Short communication)

Regulated exercise test within laboratory conditions has a long-lasting tradition in the field of applied clinical physiology in coincidence with the assessment of physical fitness. Exercise tests in children and adolescents are indicated not only in coincidence with the diagnosis of pathologic findings of the cardiovascular and respiratory systems (Hupka et al, 1992, 1993), but also in the diagnosis of physical fitness in young sportsmen.

The testing of endurance (aerobic) capabilities is carried out by means of terrain tests of motor activity. In laboratory conditions, the response of the cardiorespiratory system to the model exercise load in relation to the intensity and time of sport output is investigated by means of spiroergometry. Spiroergometric examination is used in the selection of talented individuals and in investigation of training effects. The training programme of children should play the basic role focused on the development of general physical fitness and dexterity. The most frequent mistakes include premature specialisation, incorrect comprehension of competition and especially disrespect for the stage of growth and development of child's organism regarding the exercise load.

Referential values of spiroergometric parameters in our population older than 12 years (Seliger et al., 1977) do not reflect the current development regarding the equipment, protocol systems used in regulated exercise loading and the development of population. The focus of this study was to evaluate the results of spiroergometric examinations in sporting children and adolescents carried out at the Clinic of Sport Medicine of Me-

dical Faculty, Comenius University in 1999—2000 and to indicate particular specialities coinciding with examinations and result interpretations in comparison with the adult population.

Examined set and methods

129 boys at the age from 8 to 17 and 41 girls at the age from 9 to 17 (collective games and sport) were examined. For the purpose of endurance judgement, the probands have absolved spiroergometric examinations at vita maxima on bicycle ergometer with a continual gradually increasing load of 23—35 W/minute, according to age and sex.

Results and discussion

Out of spiroergometric parameters measured in children and adolescents, the maximum oxygen uptake, maximum pulse oxygen and maximum output are easy to judge. Minute ventilation is easily interpretable in adults, in children and adolescents, how-

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Tab. 1. Changes in maximal oxygen uptake with age.

Age (yrs)	Boys		Girls	
	n	VO ₂ max (ml/min)	n	VO ₂ max (ml/min)
8	2	1280,0±610	0	
9	8	1557,3±288	1	1602,0±0,0
10	26	1724,6±274	4	1614,8±198
11	11	1758,9±243	3	1679,3±435
12	6	2151,8±290	6	1763,3±297
13	9	2469,9±854	3	1947,0±131
14	13	2861,2±461	5	2193,2±289
15	30	3436,0±658	11	2267,0±392
16	18	3437,8±735	5	2507,4±239
17	6	3790,2±544	3	2732,0±457

ver, it is minimally used due to psychical impact, hyperventilation and wide range of statistical deviations.

The assessment of anaerobic threshold in children is exclusively non-invasive. It is ascertained on the basis of parameters of breathing gas exchange and heart frequency during increased exercise load in regulation breakthrough of ventilation parameters. The problems with assessment occur in children who hyperventilate already in the resting phase of examination.

Maximum oxygen uptake expresses the maximum ability of aerobic production of aerobic macroergic phosphates. It is a global indicator of output of the whole transport system of respiration gases. The size of VO₂max is effected by age, sex, genetic dispositions, physical measurements and training. Maximum oxygen uptake achieves the highest values between 15 and 26 years of age, afterwards it gradually decreases.

Investigated probands at the age from 10 to 11 years do not yield any significant sex differences (Tab. 1).

A significant difference was recorded in the category of 12—13-year old, i.e. sooner than according to Seliger (1977). The VO₂max of girls is lower by 15—20 % regarding to lighter muscularity, lower values of haemoglobin, lower ejection heart volume and smaller blood volume in comparison with boys. The hereditary factor is significant (up to 80 %), the fact of which is proved by its high values in some untrained individuals. In result of endurance training as to its time and intensity, VO₂max can increase by 5—30 % about the anaerobic threshold. Higher values

of maximum oxygen uptake form the assumptions for better endurance output. VO₂max belongs among the most important indicators of functional diagnosis in coincidence with physical fitness testing and endurance judgement.

It is calculated in relation to weight, body surface and body height. Despite this fact only children at app same biological age can be compared by relative values. Rowland (1996) draws attention to the fact that the referential values within children do not exist regarding the differences in used measurement equipment, loading protocols and in the selection of the so-called control group from non-sporting population. It is necessary to assess the influence of habitual physical activity and to regard the socio-economic differences. The laboratory of functional diagnosis should therefore form its own referential values in dependence on the used apparatus equipment and exercise load protocol.

In children, the results of spiroergometric examinations are influenced by motivation and co-operation of the child. Therefore, psychological preparation in children examined for the first time is very important since it can overcome their fright of examination.

Spiroergic examination in young sportsmen is important in coincidence with response of cardiorespiratory system to model exercise loading. Maximum oxygen uptake is an important indicator of endurance abilities as well as individual evaluation in prolonged investigation in children. The laboratory of functional diagnosis should therefore form its own referential values in dependence on the used apparatus equipment and exercise load protocol.

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