Journal of Physical Education and Sport ® (JPES), 16(1), Art 42, pp. 264 - 268, 2016
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Adaptation of 7-8 year old pupils to physical loads with a fixed dosage

KIRIL KOSTOV[1], STEFAN KINOV[2], NEVYANA DOKOVA[3], BILYANA KOSTOVA[4]
[1,2,3,]Department of theory and methodology of physical education South-west University "Neofit Rilski", Blagoevgrad, BULGARIA
[4]Department of International Law and International Relations, South-west University "Neofit Rilski", Blagoevgrad, BULGARIA

Published online: March 25, 2016
(Accepted for publication March 15 2016)
DOI:10.7752/jpes.2016.01042

Abstract:
The purpose of our study is to establish the adaptation abilities of the cardio-vascular system to physical loading of certain dosage with the following character and continuation: intensity 70-80% and continuation up to 1 minute; intensity 50-70% and continuation up to 3 minutes; intensity 30-50% and continuation up to 5 minutes. In the popular school practice, when it comes to the abilities of small pupils to exercise and endure running of relatively bigger distances - 200, 400, 600 and more meters, teachers always have "one in mind" because of their concerns about the reaction of the child organism to these trials. On one side, actually, the studies in the popular school practice which give a definite answer whether these worries are real or not are not too many. On the other side, physiologists are unconditional that every physical loading has its "heart cost" expressed in the number of heart contractions and this cost is rather firm and reproductive for the different individuals (Kr. Krastev, 1998). That is why in the popular school practice in physical education one of the basic methods for evaluation of the loading is pulse measuring. We used this method for evaluation of the adaptation abilities of 7-8 years old pupils to 200, 400, and 600 meters.
Keywords: physical loading, adaptation abilities, physical education

Introduction

In comparison to the active sportsmen, in which the physiological and psychological mechanisms ensuring the adaptation of the organism to competitive and training loading are studied in greater detail, these mechanisms in pupils not engaged in sports and put in usual situations of everyday motive activity are the subject of relatively fewer studies. And yet, in the theory and sports-pedagogical practice of physical education it has been found out, that the systems which directly and first react to the physical influences are the cardio-vascular and the respiratory ones. The studies in this sphere (Grueva, 1967; Karpman, 1961;Kostov, 1987; Rozenblat, 1961; Shabunin, 1978) reveal that the initial primary school age is characterized also with "immaturity and functional inferiority" of these systems. This is due mainly to "the weaker stability of the small pupils to hypoxia, to the less developed anaerobic body metabolism compared to that of the elderly, and to the relatively small beating volume of the heart"(Hripkova, A. et al., 1982). As a consequence of all that, it is pointed out that "with small pupils, the continuous dynamic efforts should be avoided, and the loading with maximum and sub maximum intensity may be exercised more often, but with a shorter duration - 7-8 to 10-12 seconds (3). Besides this, it has been found out, that the work of these systems is most economical at moderate to big power (intensity) and that "...the absolute indications about the power and volume of the work done with this intensity (50-80%) is bigger in boys compared to girls" (Hripkova, A. et al., 1982, Shabunin, 1978, Erikson, B., Koch, A., 1973). These conclusions are made on the basis of the established fact, that the minute volume of the heart (MVH) in this age has greatest values at a loading of 50% of the maximum intensity. The stated above sex peculiarities predetermine also a bigger period of recovery in girls - a fact which we tried to establish experimentally.

In the popular school practice, when it comes to the abilities of small pupils to exercise and endure running of relatively bigger distances - 200, 400, 600 and more meters, teachers always have "one in mind" because of their concerns about the reaction of the child organism to these trials. On one side, actually, the studies in the popular school practice which give a definite answer whether these worries are real or not are not too many. On the other side, physiologists are unconditional that every physical loading has its "heart cost" expressed in the number of heart contractions and this cost is rather firm and reproductive for the different individuals (Kr. Krastev, 1998). That is why in the popular school practice in physical education one of the basic methods for evaluation of the loading is pulse measuring. We used this method for evaluation of the adaptation abilities of 7-8 years old pupils to 200, 400, and 600 meters.

Corresponding Author STEFAN KINOV, E-mail: stefankinov@swu.bg

Material & methods

The main purpose of the study is establishment of the adaptation abilities of the cardio-vascular system to physical loading of certain dosage with the following character and continuation: intensity 70-80% and continuation up to 1 minute; intensity 50-70% and continuation up to 3 minutes; intensity 30-50% and continuation up to 5 minutes.

For measuring the pulse we used special sport-testers (heart rate monitor) with which we registered the change in pulse at the time of running, as well as for a five minute recovery period. We processed statistically the received results, as for this purpose we used prof. Kr. Krastev's idea (1998) to introduce the so-called "pulse measuring" coefficient. It means the distance passed in meters corresponding to one heart contraction at the time of the loading. This coefficient we called adaptation coefficient (Ac).

Results and analysis

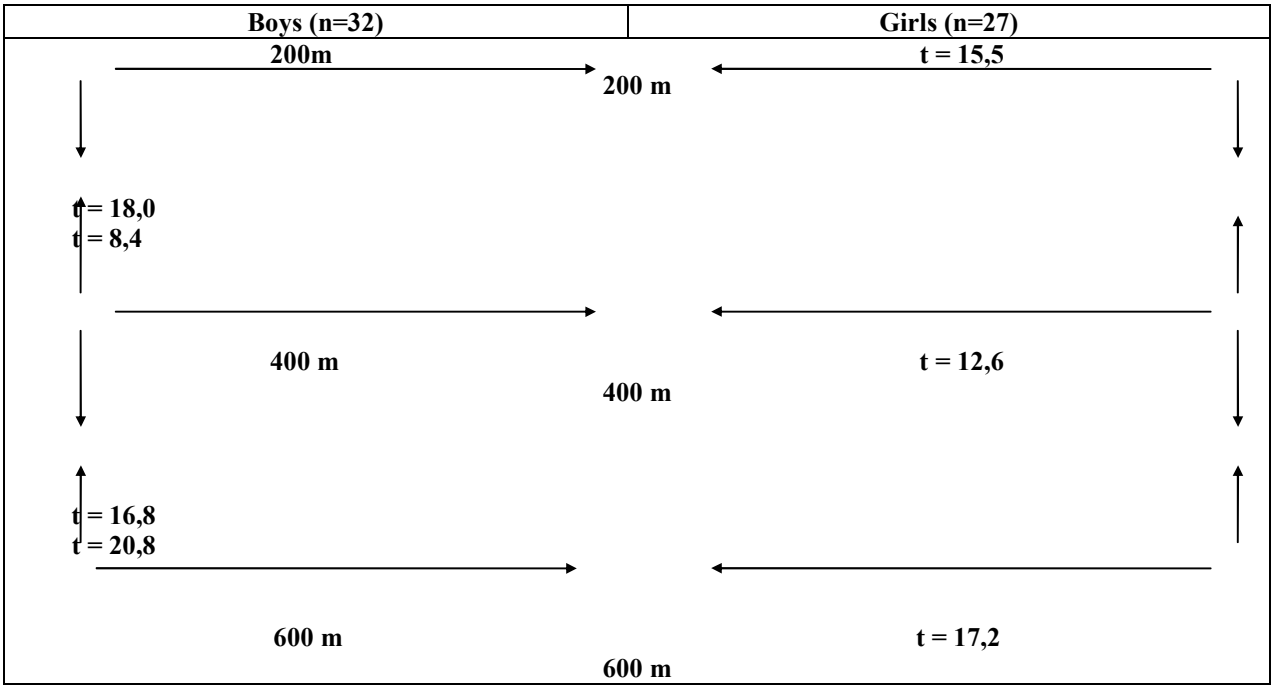
In accordance to the purpose and tasks of our study, we analyzed the received results in three directions.

1. To establish the adaptation abilities of the observed pupils through the introduced by us adaptation coefficient (Ac) and to compare the received results in sex and in the different in continuation and intensity runs - 200, 400, and 600 m. These results we have presented in Tables 1 and 2 and fig. 1.

Table 1. Ac (meters for one pulsation) at the time of running

	Boys /n=32/			Girls /n=27/		
Parameters	**200m**	**400m**	**600m**	**200m**	**400m**	**600m**
X	**1,42**	**1,15**	**0,96**	**1,13**	**1,00**	**0,80**
S	**0,07**	**0,05**	**0,04**	**0,07**	**0,04**	**0,03**
mx	**0,01**	**0,01**	**0,01**	**0,01**	**0,01**	**0,01**
V%	**4,48**	**3,95**	**3,62**	**5,83**	**4,30**	**4,03**

Table 2. Values of the t-measure for the Ac - differences



The results received show unambiguously that there is a clearly expressed tendency for reducing the Ac with the increase of the running distance (Pt>0,999). With the same high guarantee probability we also established the fact that the boys of this age have better abilities for adaptation of the cardio-vascular and the respiratory systems than the girls in all three running distances (see table 2). Other authors have reached the same conclusions but with different means and methods (8, 11).

Ac

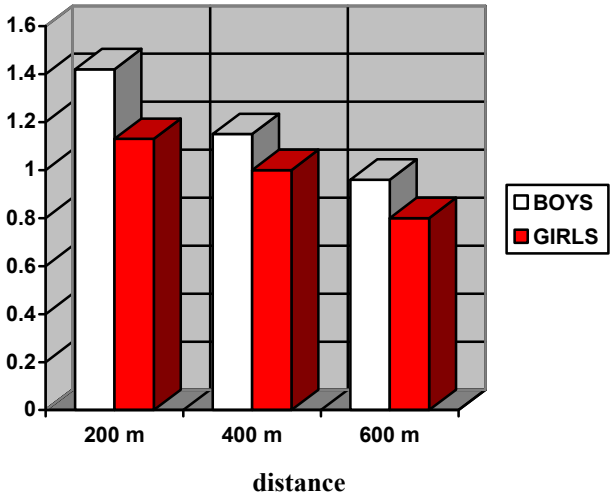


Fig. 1. Values of the Ac (meters for one pulsation) at the different running distances

2. To establish the pulse values both at the beginning of the running and at the time of running. We have presented the results in table 3. A strong impression makes the relatively high initial pulse (around 120 beats/min.) before the beginning of the run, although the run started after at least a 5 minute motive rest. This fact, as well as the relatively high coefficient of variation in exactly this initial pulse suggests clearly that in smaller pupils the psycho-emotional reasons are an important factor for the change in pulse. Such a conclusion has its logical explanation having in mind the excitement and the will of the children to prove their abilities at all costs in such trials and competitions. In support to the above are also the lower pulse values at the end of the 5 minute recovery period than the initial ones (see tables 3 and 5 and fig. 2).

Table 3. Values of the pulse before the running (initial - I) and at the time of running (average - A)

	Boys /n=32/						Girls /n=27/					
	200m		400m		600m		200m		400m		600m	
Parameters	**I**	**A**	**I**	**A**	**I**	**A**	**I**	**A**	**I**	**A**	**I**	**A**
X	114,7	172,4	115,5	172,4	108,0	177,9	120,5	181,3	122,4	186,0	126,2	187,0
S	17,1	13,1	17,8	13,6	14,9	11,7	30,0	12,5	26,8	13,2	29,5	15,3
mx	3,0	2,3	3,1	2,4	2,6	2,1	5,8	2,4	5,2	2,5	5,7	2,9
V%	14,9	7,6	15,4	7,9	13,8	6,6	24,9	6,9	21,9	7,1	23,4	8,2

As far as the average pulse at the time of the different runs is concerned, it is moving around the aerobic-anaerobic border for this age determined by physiologists around 180-190 beats/min. Besides, we make a notice of the fact, that in spite of the individual diversions (V<10%) the average pulse varies in small borders at the different distances in both sexes. In girls, however, it is higher with some 10-15 beats/min. In all three running distances this difference turned out to be statistically true (Pt>0,99), see table 4.

Table 4. Values of the t-measure for the pulse differences (average pulse - A)

Boys /n = 32/		**Girls /n = 27/**
200 m ←	**t measure = 2,7**	→
200 m ←		
400 m ←	**t measure = 3,9**	→
400 m		
600 m	**t measure = 2,6**	→
600 m		

3. To establish the rate of recovery after the three running distances and if there are sex differences on this measure. The results show (table 5) one regularity and logic in the process of recovery, as in the first minute if goes on most intensively and nearly reaches the initial (before the run) values of the pulse. This is again a confirmation of the already established fact, that at this age children get tired quickly but get recovered very quickly, too. At the time of running, as well as at the time of recovery, girls have statistically true higher pulse

values than boys (Pt>0,95). At the end of the fifth minute, girls' pulse values stay around and above 120 beats/min. in contrast to boys whose values are under 110 beats/min. in all three running distances (see table 5 and fig. 3).

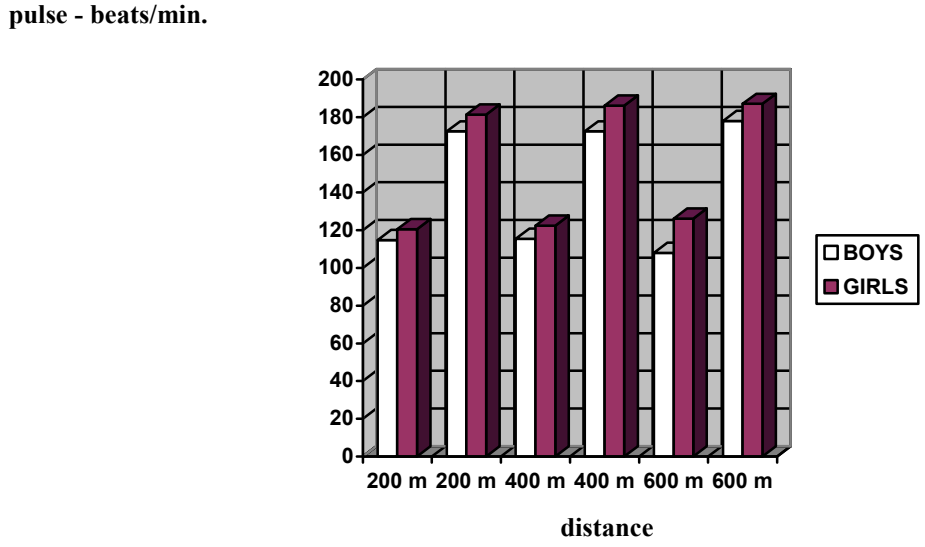


Fig. 2 Values of the pulse before (initial - I) and at the time of running (average - A)

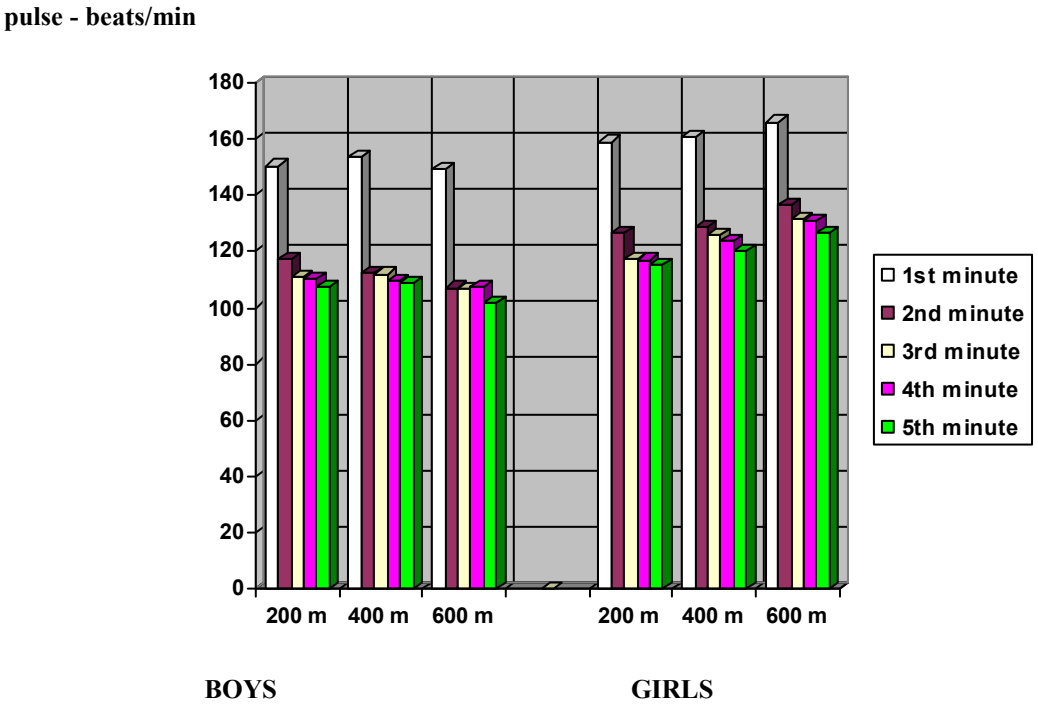


Fig. 3 Pulse values at the time of recovery (X) at the end of the 1st, 2nd, 3rd, 4th, and 5th minute.

Table 5. Values of the pulse at the time of recovery (X)

	Boys /n=32/			Girls /n=27/		
Minutes	**200m**	**400m**	**600m**	**200m**	**400m**	**600m**
First	150,4	153,3	149,2	158,8	160,7	165,9
Second	117,4	112,2	107,1	126,4	128,6	136,7
Third	110,7	112,1	106,8	117,1	125,7	131,6
Forth	110,0	109,3	107,6	116,9	123,7	130,9
Fifth	107,6	109,0	101,8	115,4	120,0	126,5

Conclusions

1. Runs of 200m (I of 70-80%), 400m (I of 50-70%) and 600m (I of 30-50%) are well endured by 7-8 years old pupils. Boys show a relatively better adaptation abilities. In all three runs the differences between both sexes in regard to the Ac are statistically true (Pt>0,999). Our results are in the direction of established also by other authors fact, that the absolute indexes of the power and capacity of the work done with I of 50-80% in boys are better compared to that in girls.
2. In all three runs with the pointed out I, pulse values vary around the aerobic-anaerobic border for this age determined by physiologists around 180-190 beats/min. The adaptation coefficients (Ac), however, show best values in 200m runs, with a tendency to become worse with the increase in distance (Pt>0,95).
3. Although in girls the recovery period is a little bit longer, in both sexes the pulse reaches its initial point at the end of the first minute. Something more, after that, at the end of the fifth minute, it even falls down under its initial values. A fact which, according to us, is a result more of psycho-emotional reasons, which bring about its higher values at the beginning before the run (120-130 beats/min.). In support to this supposition we may also point out that the coefficient of variation at the initial pulse is relatively highest (over 10-15% in boys and 20-25% in girls).

References

Grueva, L., (1967), Methodology of assessing the performance by heart rate stability, *School hygiene*, Moskow, 70-73

Karpman, V., (1961), The phase analysis of the cardiac activity, Moskow, 68-69

Kostov, K., (1987), Optimizing physical activity of primary school age students, HPI-Blagoevgrad, 31-33

Rozenblat, V., (1961), The problem of fatigue, Moskow, 49-60

Silanteva, N. et al., (1974), Age features of hemodynamic and respiratory muscle at increasing load capacity, Physiological mechanisms of adaptation to muscle activity, Svredlovsk, 111-113

Tihvinskiy, S., (1976), Physical performance in children and adolescents, Problems of medical control and exercise therapy in children, Leningrad, 43

Fomin, N., Filin, V., (1975), Age foundations of physical education, Sofia, 80-83

Hripkova, A. et al., (1982), Adaptation of an organism of pupils to educational and physical loading, Pedagogy, Moskow, 200-203, 210-211

Shabunin, R., (1978), Physiological mechanisms, providing adaptation for adolescents of the cardiovascular and respiratory systems for muscular work, Volgograd, 9-10

Åstrand, P., Ryhming, J., (1954), A nomogram for calculations of aerobic capacity (physical fitness) from pulse rate during submaximal work., J. Appl. Physiol., v.7, N2. p. 110-113.

Erikson, B., Koch, A., (1973), Effect of physical training on hemodynamics response during summaximal exercise in 11-13 year old boys., Acta Physiol. Scand., v.87, p.10-12.