Age-related dynamics of sexual dimorphism in the structural components of physical performance in children aged 5-7 years

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Abstract

Objective of the study was to evaluation of the expression of sexual differentiation in the physical abilities of children aged 5 to 7.

Methods and structure of the study. Girls and boys aged from 5,5 to 6,0 years (n=28) and from 6,0 to 6,5 years (n= 28), respectively 6,5 to 7,0 years (n=20) and from 7,0 to 7,5 years (n=28), respectively, took part in the pedagogical experiment conducted on the basis of the Krasnodar Kindergarten No. 103 year (n=20). The following structural components of physical performance (PWC150) were subjected to statistical analysis: heart rate, body weight, body length, 10 squats in the first load, 20 squats in the second load and work power.

Results and conclusions. It was discovered that in the annual changes of PWC150 in older preschoolers, compared to their initial measurements, in most cases, there were significant variations in the sexual differences between boys and girls aged 5,5 to 7,5. In the remaining components of PWC150, the initial differences between boys and girls aged 5,5 to 7,5 ranged from 0,91% to 5,71%.

Therefore, the findings regarding the annual changes in the initial components of the physical performance of older preschoolers underscore the need for further investigation to determine the most effective approaches to physical education.

Keywords: *sexual dimorphism, preschool children aged 5-7 years, physical performance and its structural components.*

Introduction. Currently, in the scientific literature, there is a dual opinion among scientists on the issue of the manifestation of sexual dimorphism in various indicators of the physical condition of preschool and primary school children. Thus, E.M. Lapitskaya et al. did not find any differences in the physical and motor development of girls and boys aged 5-7 years, indicating that this is due to their different motor activity [4]. However, K.D. Chermit, K.Yu. Mamgetov, Yu.K. Chernyshenko, V.A. Balandin, V.E. Kuznetsova, N.I. Dvorkina, L.S. Dvorkin and others identified significant differences in the development of physical, mental qualities, and emotional personality traits of children at the stages of preschool ontogenesis [1, 2, 5, 6]. I.A. Krivolapchuk, M.B. Chernova and V.V. Myshyakov revealed that typological differences between children of this age depend, first of all, on the peculiarities of the functioning of bioenergetic mechanisms of energy supply of muscular activity, as well as on the adaptive features of the organism [3]. At the same time, the study of the issue of age dynamics of manifestation of sexual dimorphism in structural components of physical performance of children aged 5-7 years remains open.

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Results of the study and discussion. Table 1 presents the statistical baseline indicators of the structural components of PWC150 in children aged 5,5 to 6,5 years.

Age from 5,5 to 6,5 years

Heart rate (f1). At the age of 5,5 to 6,0 years and

Table 1. Initial indicators of structural components of PWC150 in children aged 5,5 to 6,5 years

Components		Age of children in the first group (M± m)			
		5,5-6,0 years (by n=14)		6,0-6,5 years (by n= 14)	
		Girls	Boys	Girls	Boys
HR, bpm	f1	110,87±0,37	109,32±0,33*	109,73±0,35	108,57±0,31*
		p<0,01; Δ=1,42%		p<0,05;Δ=1,07%	
	f2	121,31±0,48	119,24±0,42*	120,58±0,53	118,06±0,47*
		p<0,01; Δ=1,74%		p<0,01; Δ=2,13%	
Body weight, kg	p	22,15±0,22*	21,19±0,18	22,56±0,21*	21, 87±0,25
		p<0,01; Δ=4,53%		p>0,05; Δ=3,16%	
Body length, m	BL	1,21±0,046*	1,20±0,043	1,22±0,061	1,22±0,066,
		p>0,05; Δ=0,83%		p>0,05; Δ=0,826%	
Squat, times	n1	10	10	10	10
	n2	20	20	20	20
Work power, kgm/min	N1	106,32±0,35*	101,71±0,32	108,29±0,38*	105,10±0,44
		p<0,001; Δ=4,53%		p<0,001; Δ=3,04%	
	N2	212,16±0,75*	203,42±0,68	216,58±0,65*	209,95±0,56
		p<0,001; Δ=4,29%		p<0,001; Δ=3,16%	
PWC_{150} , c.u.		590,38±6,25	630,76±7,31	587,26±18,35	706,61±23,,63*
		p<0,01; Δ=7,84%		p<0,01; Δ=20,03%	

Note: * the indicator of differences in favor of the specified gender, PWC_{150} – indicator of physical performance of children, N1 – power of the first load, N2 – power of the second load; f1 – pulse rate per minute after completion of the first load, f2 – pulse rate per minute after completion of the second load. The load power was calculated using the following formula: N=1,2×p×BL/3×n, where p is body weight in kg, BL in m, n is the number of squats, times.

from 6,0 to 6,5 years, reliable differences were found in favor of boys, respectively, at p < 0,01 by 1,42% in the first case and at p < 0,05 by 1,07%.

Heart rate (f2). After performing the second load, a reliable trend of differences is observed between girls and boys at the age of 5,5 to 6,0 years from 6,0 to 6,5 years, respectively, at p > 0,01 by 1,74% and p > 0,01 by 2,13% in favor of boys.

Body weight. At the age of 5,5 to 6,0 years, the differences between girls and boys in body weight were significant at p> 0,01 by 4,53% in favor of girls, respectively, at the age of 6,0 to 6,5 years, the differences between them in body weight were insignificant at p> 0,05 by 3,16%.

Body length (BL). At the age of 5,5 to 6,0 years, the differences between girls and boys in body length indicators were insignificant at p> 0,05 by 0,83%, respectively, at the age of 6,0 to 6,5 years, the differences between them were also insignificant at p> 0,05 by 0,826%.

Work power (N1). At the age of 5,5 to 6,0 years, the differences between girls and boys in N1 were significant at p<0,001 by 4,53% in favor of girls, respectively, the differences at the age of 6,0 to 6,5 years in N1 were significant at p>0,001 by 3,04% also in favor of girls.

Power of the work (N2). The differences between girls and boys at the age of 5,5 to 6,0 years in N2 were significant at p<0,001 by 4,29% in favor of girls, respectively, at the age of 6,0 to 6,5 years, the differences between them in N2 were significant at p>0,001 by 3,16% in favor of girls.

PWC_{150}. The differences between girls and boys aged 5,5 to 6,0 years in PWC150 were significant at p<0,01 by 7,84% in favor of boys, respectively, the differences between them at the age of 6,0 to 6,5 years were significant at p<0,01 by 20,03% in favor of boys.

Age from 6,5 to 7,5 years

Table 2 presents the statistical baseline indicators of the structural components of PWC150 for children aged 6.5 to 7.5 years.

HR (f1). The differences between girls and boys aged 6,5 to 6,0 years in f1 were significant at p<0,05 by 1,2% in favor of boys, respectively, at the age of 7,0 to 7,5 years, significant differences were found at p<0,05 by 0,91% also in favor of boys.

HR (f2). The differences between girls and boys during the first load were significant at p<0,01 by 1,55% in favor of boys; accordingly, after the second load, the differences were in favor of the latter (at p<0,01 by 1,58%).

Body weight. In girls aged 6,5 to 7,0 years, the differences between them in body weight indicators were significant at p<0,01 by 5,71% in favor of girls; accordingly, the differences between girls and boys aged 7,0 to 7,5 years in body weight were found to be insignificant (at p>0,05 by 1,26%).

Body length (BL). The differences between girls and boys in body length indicators were insignificant at p> 0,05 by 0,82% in favor of girls; accordingly, the differences between girls and boys aged 7,0 to 7,5 years in body length were insignificant at p> 0,05 or by 0,81%.

Work power (N1). The differences between girls and boys in N1 indicators were significant at p < 0,001 by 5,7% in favor of girls, accordingly, at the age of 7,0 to 7,5 years, the same significant differences were ob-

Table 1. Initial indicators of structural components of PWC150 in children aged 5,5 to 6,5 years

Components		Age of children in the second group (M±m)			
		6,5-7,0 years (by n= 10)		7,0-7,5 years (by n= 10)	
		Girls	Boys	Girls	Boys
HR, bpm	f1	108,53±0,35	107,24±0,31*	107,38±0,32*	106,41±0,29*
		p<0,05; Δ=1,2%		p<0,05; Δ=0,91%	
	f2	120,14±0,45,	118,31±0,39*	119,23±0,49	117,38±0,45*
		p<0,01; Δ=1,55%		p<0,05; Δ=1,58%	
Body weight, kg	p	23,69±0,23*	22,41±0,21	24,05±0,26*	23,75±0,28
		p<0,01; Δ=5,71%		p>0,05; Δ=1,26%	
Body length, m	BL	1,23±0,046*	1,22±0,044	1,24±0,068*	1,23±0,072
		p>0,05; Δ=0,82		p>0,05; Δ=0,81%	
Squat, times	n1	10	10	10	10
	n2	20	20	20	20
Work power, kgm/min	N1	116,55±0,46*	110,26±0,38	118,33±0,47*	114,39±0,41
		p<0,001; Δ=5,7%		p<0,001; Δ=3,44%	
	N2	233,11±0,81*	220,51±0,75	236,65±0,82*	228,78±8,79
		p<0,001; Δ=5,71%		p<0,001; Δ=3,44%	
PWC_{150} , c.u.			631,25±7,64*	614,49±7,73	680,29±15,25*
		p<0,01; Δ=5,29%		p<0,01; Δ=10,71%	

Note: the difference index in favor of the specified gender, PWC_{150} – the index of physical performance of children, N1 – the power of the first load, N2 – the power of the second load; f1 – the pulse rate per minute after the completion of the first load, f2 – the pulse rate per minute after the completion of the second load. The load power was calculated using the following formula: N=1,2×p×BL/3×n, where p is the body weight in kg, BL in m, n is the number of squats, times.

tained only at p < 0,001 by 3,44% in favor of the former.

Work power (N2). The differences between girls and boys in N2 indicators were significant at p<0,001 by 5,7% in favor of girls; Accordingly, the differences between girls and boys aged 7,0 to 7,5 years N2 were significant at p<0,001 by 3,44%, but already in favor of boys.

PWC_{150}. The differences between girls and boys in the PWC150 indicators were significant at p<0,01 by 5,29% in favor of boys; accordingly, in girls aged 7,0 to 7,5 years in PWC150, the differences between them were significant at p<0,01 by 10,71% in favor of boys.

Conclusions. It was established that in the annual dynamics of PWC150 in senior preschool children in relation to the initial indicators, in most cases reliable differences in sexual dimorphism were revealed between boys and girls in the age range from 5,5 to 7,5 years. In other structural components of PWC150, its initial indicators of relative differences between boys and girls aged 5,5 to 7,5 years were in the range from 0,91 to 5,71%.

Thus, the obtained results of the annual dynamics of the initial structural components of physical performance of senior preschool children prove the need for further research to substantiate the choice of the most effective means and methods of physical education.

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