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Physical Fitness in Preschool Children

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Key words: strength, capacity, speed, agility, endurance, preschool age

Abstract

Introduction. The level of mental and motor development as well as physical fitness and perceptual-motor performance should guarantee success in adapting to the new school environment.

The aim of the research. The aim of the research was to determine physical fitness in preschool children of both genders aged from 4 to 7 years.

Material and methods. The study included 275 children at the chronological age of 4 to 7 years including 134 girls and 141 boys. In order to assess physical fitness, the authors used the Wrocław Physical Fitness Test for preschool children completed by the endurance test

Results. Final physical fitness results showed that six-year-old boys were the fittest and less fit were girls at the age of seven. The least fit were boys and girls at the age of four.

Conclusions

1. The Wrocław Physical Fitness Test and the endurance test revealed that the experimental group of children aged between four and seven years from the Western Pomerania region represented a satisfactory physical fitness level. It should be noted that this level was significantly lower than the ones obtained in tests conducted by other authors in 2006, 1996, 1972, and 1967.
2. The represented fitness level, especially the level of endurance, may result in adaptation disorders during the school shock period.
3. The phenomenon of sexual dimorphism at preschool age is demonstrated by significantly better physical fitness in boys at the age of five and six and balanced fitness at the age of seven.
4. Positive development of physical fitness is not supported by ongoing lifestyle pre-orientation. It is recommended to complete primary school admission criteria for the first form by physical fitness standards, including endurance.

Introduction

Even unmotivated, a preschool child can satisfy ‘‘the hunger for movement” with spontaneous physical activity regardless of any environmental conditions. This positive self-stimulation is characterised by, among others, spontaneity, joy of achieved goals, and imitation [1]. Consequently, physical effort improves motor skills and all internal systems of the child in accordance with the principle of positive feedback. The issue of physical fitness in preschool children have been discussed by Dzierżanka [2], Dzierżanka-Wyszyńska [3], Wilgocka-Okoń [4], Surynt and Wójcik-Grzyb [5], Bolach et al. [6], Ismail and Gruber [za 3], Kephart [7], Plack [8], Słonka et al. [9], and in adults by Puszczałowska-Lizis [10, 11].

Physical activity of a three-year-old child lacks precision and accuracy due to the advantage of stimulation processes over internal inhibition. Less than 30% of children achieve coordination of upper and lower limbs at a preschool age. They can walk and run with confidence, stand on one leg effectively, climb and slide, jump, crawl under an obstacle, throw and carry various not very heavy objects without losing their balance. A child’s run at this age includes a short step length, lack of torso deflection or alternating movements of upper limbs. Physical fitness in a four-year-old child does not differ much from a three-year-old person. They demonstrate a higher level of motor coordination reached by 70 – 80% of population at this age. They are characterised by a greater need for exercise which results in a technically better run, throw, and jump. They often reveal a well-controlled grip and simple balance exercises. The first symptoms of the development leap and the golden age of motor skills appear at the age of five. Significant improvement can be observed in strength, motor coordination, speed, agility, and overall endurance. A five-year-old child’s gait gains the features of an adult’s gait. At this age range, we can observe gender diversity in motor development mainly due to congenital motor skills. At the age of six, a child is significantly fitter. Balanced stimulation and internal curbing make a child’s movements smoother, more unconstraint, dynamic, and purposeful. There is full automation of gait, run, and jumps. Significantly enhanced endurance, strength, and coordination make physical activity unconstraint, dynamic and smooth. At the age of seven, a child should show “school maturity”. The level of mental and motor development, physical performance and perception and motor skills should guarantee success in adapting to the new school environment [12].

The aim of the research was to determine physical fitness in children of both genders aged 4 to 7 years.

Material and methods

The eligibility criteria included the following: the chronological age of 4, 5, 6, and 7 years, good overall health, and a written consent of a child’s legal guardian. The study included 275 children at the chronological age of 4 to 7 years including 134 girls and 141 boys, Table 1. The studies were conducted in four randomly selected kindergartens from Zachodnio-pomorskie and Wielkopolskie voivodeships. Every effort was made to ensure that

all tests could be performed in the most similar conditions possible. Our research was approved by the Ethics Committee at the Casimir the Great University in Bydgoszcz – KEBN 2/2018.

Table 1. Research material

Sex	Age (years)				Total
	4	5	6	7	
K	28	27	35	44	134
M	31	26	36	48	141
Total					275

To assess the level of physical fitness in children at the chronological age of four to seven years, the Wrocław Physical Fitness Test for preschool children was applied consisting of the following four tests [13]: strength tests – overhead 1kg-medicine ball throw, Image 1, power test – standing long jump, Image 2, speed test – 20m sprint test with a standing start, Image 3, agility test – 4x5m shuttle run test including carrying a block, Image 4. The author deliberately avoided detailed characteristics of the four tests as they are widely described in the relevant literature. The test dedicated for 7-year-old children was extended by the fifth test to measure endurance. This required the development of the scoring criteria in line with the spirit of the test author, Table 2. The endurance test was always conducted on a hardened recreation path in compliance with elementary security rules (a nurse, volunteers, and the city guard). Every child, in alphabetical order, started at 30-second intervals in a 300-metre sprint in the high start position. The measure of endurance was the time taken to run the adopted distance, Image 5. Following a short warm-up and the demonstration of how to perform every test immediately before the beginning of the battery, the subjects proceeded to do the test in alphabetical order according to the developed minute program. To promote children's motivation to exercise, all tests were part of Children's Day celebrations.

Image 1. Strength tests – overhead 1kg-medicine ball throw

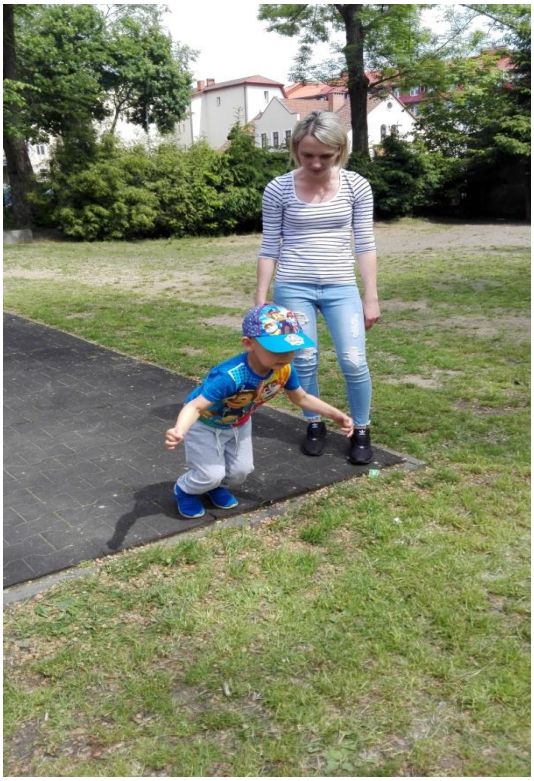


Image 2. Power test – standing long jump

Image 3. Speed test – 20m sprint test with a standing start

Image 4. Agility test – 4x5m shuttle run test including carrying a block

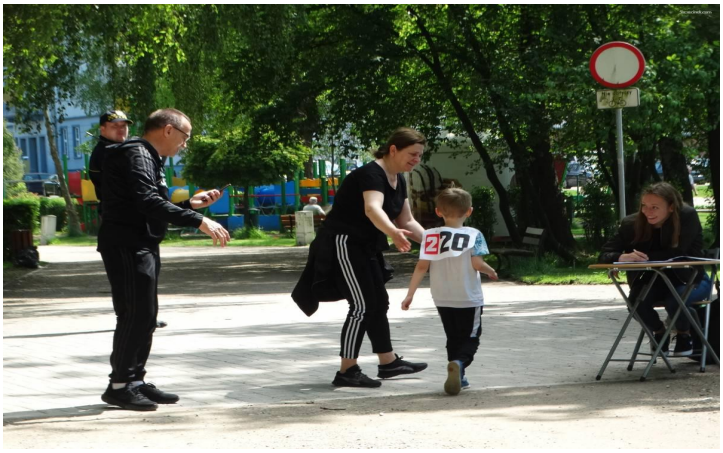


Image 5. The measure of endurance was the time taken to run the adopted distance, Image 5

Table 2. Endurance scoreboard for girls and boys at the age of seven.

Score [min]	Sex	
	Female	Male
	7 years [points]	7 years [points]
3.00-2.57	20	16
2.57-2.54	22	18
2.54-2.51	24	20
2.51-2.48	26	22
2.48-2.45	28	24
2.45-2.42	30	26
2.42-2.39	32	28
2.39-2.36	34	30
2.36-2.33	36	32
2.33-2.30	38	34
2.30-2.27	40	36
2.27-2.24	42	38
2.24-2.21	44	40
2.21-2.18	46	42
2.18-2.15	48	44
2.15-2.12	50	46
2.12-2.09	52	48
2.09-2.06	54	50
2.06-2.03	56	52
2.03-2.00	58	54
2.00-1.57	60	56
1.57-1.54	62	58
1.54-1.51	64	60
1.51-1.48	66	62
1.48-1.45	68	64
1.45-1.42	70	66
1.42-1.39	72	68
1.39-1.36	74	70
1.36-1.33	76	72
1.33-1.30	78	74
1.30-1.27	80	76
1.27-1.24	82	78
1.24-1.21	84	80
1.21-1.18	86	82
1.18-1.15	88	84
1.15-1.12	90	86
1.12-1.09	92	88

Test results

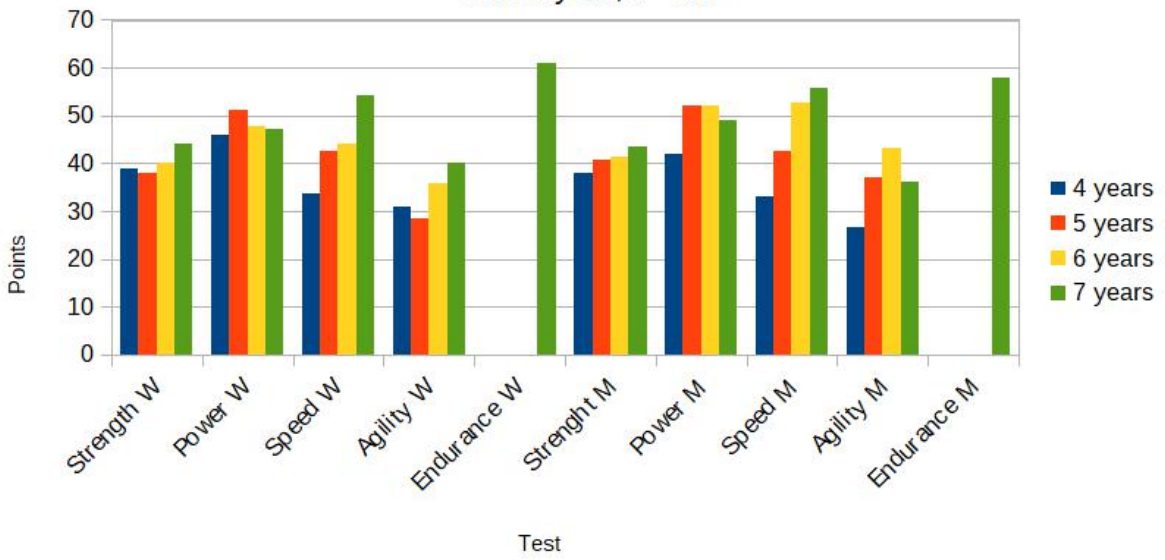
Only the measurements obtained in accordance with the adopted research procedure including the arithmetic mean and the standard deviation, were qualified for the statistical analysis.

The test result analysis has shown that the highest level of strength among girls and boys is represented by seven-year-old children, and the lowest level by five-year-old girls and four-year old boys. Girls represent a greater strength level than boys. The biggest power level can be observed in girls at the age of five and boys aged six. Interestingly enough, the scores are similar. The lowest power is observed in four-year-olds. Seven-year-old boys tend to be faster than girls. The lowest scores are achieved by children at the age of four. The greatest level of agility is represented by seven-year-old girls and six-year-old boys. Yet, the lowest agility level can be seen in five-year-old girls and four-year-old boys. Girls represent a greater strength level and a slightly greater endurance level than boys, Table 3, Figure 1. Final fitness test results have revealed that six-year-old boys are the fittest children and seven-year-old girls are less fit. The least fit children are among boys and girls at the age of four. It is noteworthy that girls had a slightly higher score than boys, Table 4, Figure 2.

Table 3. Fitness score profile for girls and boys aged four to seven years, n=275.

Fitness Test	Age	Girls					Boys				
		n	min	max	M	SD	n	min	max	M	SD
Strength	4	31	27	53	38.71	8.23	34	27	90	38.08	8.21
	5	32	21	44	38.1	7.54	37	27	73	40.6	7.49
	6	36	32	61	40	9.54	35	28	74	41.39	9.44
	7	35	28	68	44.14	10.22	35	27	80	43.46	10.12
Power	4	32	24	67	45.8	8.26	34	23	58	41.82	8.19
	5	32	31	69	51.1	7.58	37	36	87	51.05	7.43
	6	36	40	58	47.81	9.34	35	32	69	51.91	9.21
	7	35	36	66	47	10.02	35	22	65	49.03	10.01
Speed	4	31	12	64	33.53	8.23	34	21	50	33.13	8.21
	5	32	19	60	42.5	7.34	37	24	55	42.65	7.39
	6	36	28	59	44.09	9.11	35	38	61	52.69	9.18
	7	35	42	65	54.19	10.21	35	32	68	55.65	10.92
Agility	4	31	16	49	30.8	8.43	34	16	43	26.52	8.22
	5	32	21	56	28.4	7.89	37	21	49	36.9	7.63
	6	36	18	52	35.81	9.51	35	20	64	43.17	9.28
	7	35	19	57	40.23	9.28	35	14	52	36.07	9.11
Endurance	4	Not applicable to these age categories									
	5										
	6										
	7	35	38	78	60.95	9.16	35	20	76	58.03	9.14

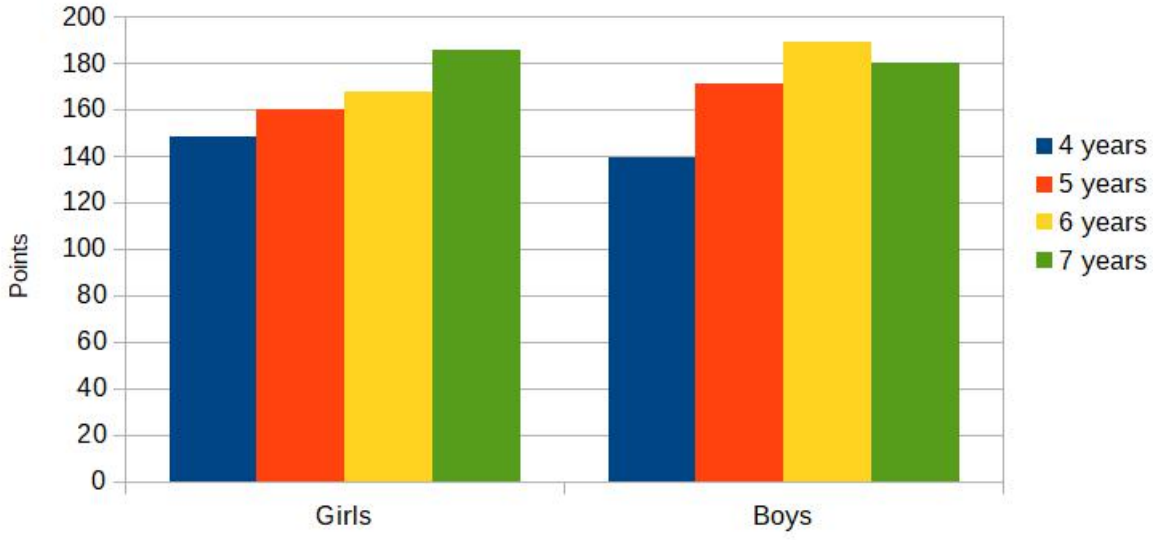
Fig. 1. Score profile for five tests performed by girls (W), and boys (M) aged four to seven yers, n=275



Tab. 4. Final scores of physical fitness in girls and boys aged four to seven years, n=275.

Age	Girls	Boys	Girls	Boys
4	148.53	139.56	Not applicable to these age categories	
5	160.1	170.8		
6	167.72	189.17		
7	185.57	180.15	246.52	242.26

Fig. 2. Final scores of physical fitness in girls and boys aged four to seven years, n=275



The verification of scores obtained by girls against standard values shows that the level of strength at the age of four, five, and six is insufficient, and at the age of seven is satisfactory. The level of power is unsatisfactory at the age of four and five, and satisfactory at the age of six and seven. As far as speed is concerned, it is at a reasonable level at the age of four, five, and six respectively, and in girls at the age of seven. The agility level is unsatisfactory in all girls. Among boys, the level of strength is unsatisfactory at the age of four, satisfactory at the age of five, six, and seven, and the level of power is satisfactory at the age of four and seven, and good at the age of five and six. The speed level in four-year-old boys is unsatisfactory, in five-year-olds satisfactory, and in six- and seven-year-old boys good. Agility is insufficient among four, five, and seven-year-olds and satisfactory among six-year-olds. The final verification of scored points has demonstrated insufficient agility of children at the age of four and satisfactory in other age ranges. The studies did not reveal a good or very good level of agility in any of the groups. Since there are no endurance standards or tests results, it should be concluded based on the author's standard ranges that children subjected to the test did not achieve a positive result, Table 2.

Discourse

Points obtained in the physical fitness tests suggest minor differences between the children involved in the study within assumed age categories. It is required to ask the question again, already posed by Surynt and Wójcik-Grzyb [5], whether the differences between obtained scores and adopted standard ranges are significant enough to prevent the launching of the education process at the age of six or even seven years.

The conducted fitness tests show that both girls and boys in all age groups present a significantly lower level than expected. An overall fitness level demonstrated by children aged five, six, and seven is unsatisfactory. Additionally, the low level of aerobic capacity suggests adaptation problems during the school shock period. The analysis of the obtained results in the context of the standardised scale has shown that final satisfactory marks are considerably lower than the fitness level presented by peers in 2006 and 1996 [14], 1972 [15], and 1967 [16]. Similar conclusions were also drawn by Surynt and Wójcik-Grzyb [5], Gniewkowska, Molier [17], Gniewkowska [18, 19], Chwiedź [20], Lis [20], Harewski [21], and Sekita [13]. This means we are observing a peculiar process of developmental retardation which is probably the consequence of the cultivated lifestyle. The study results confirm the view adopted by Surynt and Wójcik-Grzyb [5] that at the preschool age of acceleration in somatic development is not accompanied by parallel acceleration of motor capacity development. Divergence of somatic development and physical fitness was also identified in children from Wrocław and the Lubuskie voivodeship [5]. Considering the research findings and their comparison with the results obtained by other authors, one might even risk a statement that the children diagnosed in the study are not sufficiently prepared for the educational process in primary school.

Conclusions

1. The Wrocław Physical Fitness Test and the endurance test revealed that the experimental group of children aged between four and seven years from the Western Pomerania region represented a satisfactory physical fitness level. It should be noted that this level was significantly lower than the ones obtained in tests conducted by other authors in 2006, 1996, 1972, and 1967.
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