

Comparative analysis of the development of swimming skills in preschoolers depending on their physical fitness

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Abstract.

It is difficult to overestimate the importance of movements for the physical development of children, which is greatly facilitated by swimming. The data about the dynamics of physical development and physical fitness allow to differentiate the use of physical education and sports means, to determine a child's readiness for physical education and to find the most suitable physical exercises. The urgency of improving physical education of preschool children is of utmost importance as far as this age period forms the foundations of human potential in general. **This paper aims** to find the correlation between swimming skills and physical fitness in preschool children. **Materials and methods.** For the purpose of the study, the following tests were used: pedagogical observation, physical fitness tests, swimming skills tests, statistical analysis. **Results.** In girls aged 4–6 years, an average correlation was found between the development of swimming skills and physical fitness. At the age of 5–6 years in girls, speed-strength abilities and the strength of the abdominal and back muscles have the greatest influence on acquiring swimming skills, while such quality as endurance is of less importance at this age period. In boys aged 4–6 years, speed and coordination abilities, as well as the strength of the abdominal and back muscles have the greatest influence on acquiring swimming skills. At the age of 6–7 years in boys, acquiring swimming skills is most influenced by speed-strength abilities and endurance, while the abdominal and back muscles are of less importance. **Conclusion.** The study showed the heterochronous development of physical qualities in preschoolers when acquiring swimming skills. The enhancement of swimming skills in preschoolers requires taking into account their physical and physiological characteristics.

Keywords: physical development, preschoolers, swimming skills, correlation analysis.

Introduction.

The struggle for human health and longevity is a challenging and important problem. It can only be successfully solved using a whole range of tools. A special place is occupied by physical education and regular physical exercises (Kabacoff, 2015; Kleschenkova et al., 2014; Han, 2018).

Many experts who monitor the development of children and adolescents consider and confidently recommend swimming as a sport that can have a significant impact on the health of young people (Cherepov et al., 2014; Cherepov et al., 2019; Katchmarchi et al., 2018; Vedernikova et al., 2019).

It is difficult to overestimate the importance of movements for physical development (Rocha et al., 2019; Korableva et al., 2019; Galeeva, 1998) and motor skills acquisition, which can be facilitated by swimming lessons (Galeeva, 1995; Aikin et al., 1997; Vedernikova et al., 2019). The data about the dynamics of physical development and physical fitness allow to differentiate the use of physical education and sports means, to determine a child's readiness for physical education and to find the most suitable physical exercises (Gapicheva et al., 2020; Vedernikova et al., 2019; Pigalova, 2001).

Moreover, the assessment of physical fitness is an effective means of increasing physical activity, developing physical and mental qualities. The urgency of improving physical education of preschool children is of utmost importance as far as this age period forms the foundations of human potential in general (Uberoi et al., 2011; Velichenko, 2000; Kardamonova, 2001; Pustozarov et al., 1997).

The paper aims to find the correlation between swimming skills and physical fitness in preschool children.

Materials and methods.

The study was conducted in the kindergarten with an exercise class and a small-sized swimming pool. Pedagogical observation was used to obtain information about the degree of fatigue and development of swimming skills. For three years, physical fitness and swimming skills were monitored. Physical fitness was assessed using the following tests: static balance test (Romberg position) (s), high-speed running performance (30 m, s), 3 x 10 m shuttle run (s), standing long jump (cm), sit ups, trunk lift exercise, forward bend (cm), 500 m running performance (s). Swimming skills were assessed with the following tests: handstand walks in the

swimming pool (s); exhaling into water (s); floating on water on the chest (s); floating on water on the back (s); gliding on the chest (m); gliding on the back (m); crawl-like swimming on the chest (m); crawl-like swimming on the back (m).

Results.

The correlation between swimming skills and physical fitness in preschool children was found by means of correlation analysis. In girls aged 4–5 (Table 1), an average correlation was found between the development of swimming skills and physical fitness. The static balance test is highly correlated with floating on the back ($r = 0.77$). High-speed running performance demonstrates average correlation with such tests as crawl-like swimming on the chest ($r = 0.68$) and crawl-like swimming on the back ($r = 0.61$). The shuttle run test has a strong correlation with crawl-like swimming on the chest ($r = -0.68$). The standing long jump test has an average inverse correlation with crawl-like swimming on the chest ($r = -0.68$) and crawl-like swimming on the back ($R = -0.57$). The trunk lift test has an average correlation with the following tests: exhaling into water ($r = 0.53$), floating on the chest ($r = 0.56$), gliding on the back ($r = 0.60$). It also demonstrates a strong correlation with the following tests: floating on the back ($r = 0.78$) and gliding on the back ($r = 0.75$). The sit up test has an average correlation with the following tests: gliding on the chest ($r = 0.51$), gliding on the back ($r = 0.50$), crawl-like swimming on the back ($R = 0.70$), crawl-like swimming on the chest ($r = 0.63$). The forward bend test has an average correlation with the following tests: handstand walks in the swimming pool ($r = 0.62$) and floating on the back ($r = 0.50$) and a strong correlation with exhaling into water ($r = 0.75$).

Table 1. The correlation between swimming skills and physical fitness in girls aged 4–5

	Static balance test	High-speed running performance	3 x 10 m shuttle run	Standing long jump	Trunk lifts	Sit ups	Forward bend	500 m running performance
Handstand walks in the swimming pool	0.09	0.29	-0.09	0.04	0.25	0.34	0.62	-0.16
Exhaling into water	0.35	0.48	-0.01	0.15	0.53	0.26	0.75	-0.27
Floating on the chest	-0.1	0.4	-0.12	0.09	0.56	0.23	0.23	-0.25
Floating on the back	0.77	0.23	-0.02	0	0.78	0.34	0.50	0.06
Gliding on the chest	0.16	-0.04	0.33	0.42	0.75	0.51	0.13	0.67
Gliding on the back	0.50	0.2	0.1	0.45	0.60	0.50	0.34	0.27
Crawl-like swimming on the chest	-0.01	0.68	0.83	-0.68	0.14	0.63	0.17	0.35
Crawl-like swimming on the back	0.29	0.61	0.42	-0.57	0.41	0.70	0.23	0.03

Based on the correlation analysis, it can be assumed that at the age of 4–5 years in girls, the development of swimming skills is most influenced by the development of the abdominal and back muscles, as well as flexibility and, to a lesser extent, by speed-strength abilities.

As can be seen from Table 2, in girls aged 5-6, an average correlation can be found between the development of swimming skills and physical fitness. The static balance test is highly correlated with floating on the back ($r = 0.50$). High-speed running performance has a strong correlation with the following tests: crawl-like swimming on the chest ($r = 0.92$) and crawl-like swimming on the back ($r = 0.88$). Average correlations were found with exhaling into water ($r = 0.62$) and gliding on the back ($r = 0.68$). The shuttle run test has a strong correlation with crawl-like swimming on the chest ($r = 0.70$).

The standing long jump test has a strong correlation with gliding on the back ($r = 0.91$). The trunk lift test has an average correlation with the following tests: exhaling into water ($r = 0.61$), floating on the chest ($r = 0.63$), gliding on the chest ($r = 0.66$), crawl-like swimming on the chest and crawl-like swimming on the back ($r = 0.52$) and a strong correlation with the floating on the back test ($r = 0.72$). The trunk lift test is highly correlated with the gliding on the chest test ($r = 0.80$).

The forward bend test has a strong correlation with floating on the back ($r = 0.70$) and an average correlation with such tests as handstand walks in the swimming pool ($r = 0, 57$), floating on the back ($r = 0.51$), and gliding on the back ($r = 0.63$). The 500m running performance test has a strong correlation with the gliding on the back test ($r = 0.75$) and an average correlation with crawl-like swimming on the back ($r = 0.59$).

Table 2. The correlation between swimming skills and physical fitness in girls aged 5–6

	Static balance test	High-speed running performance	3 x 10 m shuttle run	Standing long jump	Trunk lifts	Sit ups	Forward bend	500 m running performance
Handstand walks in the swimming pool	0	0.22	-0.02	0.15	0.34	-0.06	0.57	0.28
Exhaling into water	0.11	0.62	0.38	-0.18	0.61	-0.01	0.42	0.02
Floating on the chest	-0.15	0.43	0.22	0.31	0.63	-0.10	0.51	0.16
Floating on the back	0.5	0.81	0.50	-0.01	0.72	0.48	0.70	0.48
Gliding on the chest	0.01	-0.01	0.09	0.17	0.66	0.8	0.28	0.45
Gliding on the back	0.43	0.68	0.13	0.91	0.11	0.11	0.63	0.75
Crawl-like swimming on the chest	0.25	0.92	0.70	0.25	0.52	0.42	0.28	0.33
Crawl-like swimming on the back	0.45	0.88	0.40	0.27	0.36	0.32	0.42	0.59

Thus, at the age of 5–6 years in girls, speed-strength abilities, as well as the strength of the abdominal muscles and back muscles, and, to a lesser extent, endurance have the greatest influence on swimming skills. Based on the analysis of the correlation between swimming skills and physical fitness in girls aged 6–7 (Table 3), it can be assumed that the static balance test has an average correlation with the floating on the back test ($r = 0.50$). High-speed running performance has an average correlation with the following tests: handstand walks in the swimming pool ($r = 0.65$) and crawl-like swimming on the chest ($r = 0.50$).

The standing long jump test has an average correlation with the crawl-like swimming on the back test ($r = 0.56$). The trunk lift test has an average correlation with the exhaling into water test ($r = 0.55$). The forward bend test has an average correlation with the following tests: floating on the back ($r = 0.60$), gliding on the chest ($r = 0.62$) and a high correlation with: exhaling into water ($R = 0.77$), gliding on the back ($r = 0.84$), crawl-like swimming on the chest ($r = 0.73$) and crawl-like swimming on the back ($r = 0.70$). 500 m running performance has an average correlation with exhaling into water ($r = 0.64$).

Table 3. The correlation between swimming skills and physical fitness in girls aged 6–7

	Static balance test	High-speed running performance	3 x 10 m shuttle run	Standing long jump	Trunk lifts	Sit ups	Forward bend	500 m running performance
Handstand walks in the swimming pool	0.10	0.65	0.10	-0.12	0.44	0.41	0.43	-0.16
Exhaling into water	0.15	0.25	0.03	0.34	0.05	0.55	0.77	0.64
Floating on the chest	0.40	0.08	0.23	-0.15	-0.20	0.30	0.20	0.10
Floating on the back	0.50	0.17	-0.39	0.24	0.38	0.23	0.60	0.39
Gliding on the chest	0.16	0.44	0.14	0.25	0.17	0.32	0.62	0.16
Gliding on the back	0.01	0.16	-0.03	0.35	0.22	0.48	0.84	0.24
Crawl-like swimming on the chest	0.48	0.50	0.01	0.16	0.40	0.47	0.73	0.13
Crawl-like swimming on the back	0.45	0.09	-0.06	0.56	0.47	0.23	0.70	-0.04

Thus, it can be assumed that at the age of 6–7 years in girls the development of swimming skills is most influenced by the abdominal and back muscles, as well as flexibility and speed-strength abilities.

Table 4. The correlation between swimming skills and physical fitness in boys aged 4–5

	Static balance test	High-speed running performance	3 x 10 m shuttle run	Standing long jump	Trunk lifts	Sit ups	Forward bend	500 m running performance
Handstand walks in the swimming pool	0.71	0.21	0.13	0.21	0.16	0.15	-0.28	-0.10
Exhaling into water	0.48	0.31	-0.04	0.17	0.42	0.21	-0.18	0.02
Floating on the chest	0.35	0.17	0.08	0.01	0.54	-0.25	-0.09	-0.16
Floating on the back	0.27	0.44	0.42	-0.03	0.31	0.30	0.27	0.15
Gliding on the chest	-0.07	0.56	0.25	0.10	0.10	0.07	0.38	0.39
Gliding on the back	0.50	0.25	0.29	-0.10	0.03	0.51	0.15	0.05
Crawl-like swimming on the chest	-0.12	-0.15	0.52	0.08	0.32	0.22	-0.03	0.32
Crawl-like swimming on the back	0.22	0.36	0.56	-0.02	0.34	-0.06	-0.14	0.36

Boys 4–5 years of age (Table 4) show a high correlation between the static balance test and handstand walks in the swimming pool ($r = 0.71$). High-speed running performance has an average correlation with gliding on the chest ($r = 0.56$). The 3x10m shuttle run test has an average correlation with crawl-like swimming on the chest ($R = 0.52$) and crawl-like swimming on the back ($r = 0.56$). The trunk lift test has an average correlation with floating on the chest ($r = 0.54$) and gliding on the back ($r = 0.51$). Thus, at the age of 4–5 years in boys, speed and coordination abilities, as well as the strength of the abdominal and back muscles, have the greatest influence on swimming skills. At the age of 5–6 years (Table 5), the standing long jump test has an average correlation with gliding on the chest ($r = 0.63$). The trunk lift test has an average correlation with crawl-like swimming on the back ($r = 0.69$) and floating on the chest ($r = -0.51$). 500 m running performance has an average correlation with the following tests: gliding on the back ($r = 0.52$) and crawl-like swimming on the back ($r = 0.65$).

Table 5. The correlation between swimming skills and physical fitness in boys aged 4–5

	Static balance test	High-speed running performance	3 x 10 m shuttle run	Standing long jump	Trunk lifts	Sit ups	Forward bend	500 m running performance
Handstand walks in the swimming pool	0.27	0.11	-0.01	0.05	0.08	-0.14	-0.20	0.21
Exhaling into water	0.25	0.26	0.09	0.18	0.17	-0.33	0.14	0.32
Floating on the chest	0.02	0.39	-0.06	0.44	0.01	-0.51	-0.10	0.08
Floating on the back	0.14	0.34	0.42	0.22	0.16	-0.42	0.21	0.36
Gliding on the chest	0.01	0.30	0.33	0.63	-0.03	0.09	-0.17	-0.20
Gliding on the back	0.18	0.22	0.29	-0.04	-0.10	-0.29	-0.19	0.52
Crawl-like swimming on the chest	-0.09	0.41	0.24	0.32	0.53	-0.29	-0.07	0.35
Crawl-like swimming on the back	0.12	0.48	0.07	-0.06	0.69	-0.46	0.16	0.65

At the age of 5–6 years in boys, the development of swimming skills mostly depends on endurance, the strength of the abdominal and back muscles, and speed-strength abilities.

At the age of 6–7 years (Table 6), the high-speed running performance test has an average correlation with the following tests: floating on the chest ($r = 0.58$), crawl-like swimming on the chest ($r = 0.50$) and crawl-like swimming on the back ($r = 0.56$). The shuttle run test has a strong correlation with floating on the chest ($r = 0.50$). The forward bend test has an average correlation with the following tests: floating on the chest ($r = 0.58$) and crawl-like swimming on the chest ($r = 0.50$). The 500 m running performance test has an average correlation with the following tests: handstand walks in the swimming pool ($r = 0.65$), floating on the back ($r = 0.69$), crawl-like swimming on the back ($r = 0.69$), and crawl-like swimming on the chest ($r = 0.67$) and a high correlation with exhaling into water ($r = 0.71$) and gliding on the chest ($r = 0.80$).

Table 6. The correlation between swimming skills and physical fitness in boys aged 6–7

	Static balance test	High-speed running performance	3 x 10 m shuttle run	Standing long jump	Trunk lifts	Sit ups	Forward bend	500 m running performance
Handstand walks in the swimming pool	-0.12	0.61	0.38	0.24	0.61	-0.27	0.18	0.65
Exhaling into water	0.31	0.45	0.07	0.41	0.02	-0.28	0.42	0.71
Floating on the chest	0.14	0.58	0.50	-0.11	0.13	-0.18	0.58	0.43
Floating on the back	-0.13	0.61	-0.06	0.24	-0.16	-0.08	0.42	0.69
Gliding on the chest	0.33	0.48	0.15	0.41	0.15	-0.46	0.01	0.80
Gliding on the back	0.36	0.25	0.24	0.35	-0.23	-0.02	0.43	0.48
Crawl-like swimming on the chest	0.21	0.51	0.17	0.25	0.14	-0.35	0.50	0.67
Crawl-like swimming on the back	0.18	0.56	0.10	0.01	-0.01	-0.38	0.29	0.69

Thus, it can be assumed that at the age of 6–7 years in boys, swimming skills mostly depend on speed-strength abilities and endurance, and, to a lesser extent, on the abdominal and back muscles.

Discussion.

The period from 4 to 7 years is very important for the development of a child. These years are associated with endurance enhancement, as well as the improvement of movement technique and speech. Acquiring swimming skills in preschool children will be effective if taking into account the age-related characteristics of physical development. Thus, the knowledge of the age-related characteristics of physical development and the correlation between swimming skills and physical fitness will optimize the process of

acquiring swimming skills among preschoolers. Therefore, it can be noted that swimming combined with physical exercises will contribute to the better development of the following qualities: flexibility, strength, endurance, coordination abilities. The comprehensive development of physical abilities is of utmost importance when it comes to acquiring swimming skills.

Conclusion.

Thus, in the course of the study, it was found that swimming skills in girls aged 4-7 depended on coordination and speed-strength abilities, as well as flexibility and the development of the back and abdominal muscles, and in boys - on speed-strength abilities, the development of back and abdominal muscles and endurance. Improving swimming skills in preschool children requires taking into account their physical and physiological characteristics.

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