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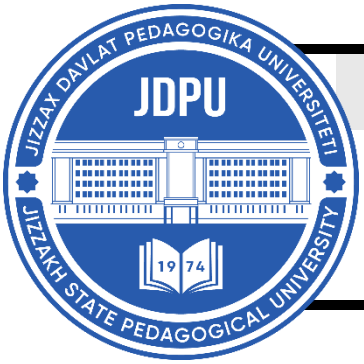

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STATISTICAL ANALYSIS OF ACROBATIC TRAINING INDICATORS FOR 9–12-YEAR-OLD FOOTBALLERS

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ABOUT ARTICLE

Key words: young football players, special physical preparedness, pedagogical experiment, acrobatic exercises, football technique, coordination, dribbling, sports training methodology, speed, endurance, technical skills, development dynamics of football players.

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Abstract: This study investigates the indicators of special physical preparedness in 9–12-year-old football players under the conditions of a pedagogical experiment. Ten types of specific test trials aimed at developing technical, coordination, and speed qualities were conducted for the control group (CG) and experimental group (EG) players. The experimental group integrated a set of football-adapted acrobatic exercises into their training sessions, while the control group followed a traditional training program. At the end of the experiment, the mean value (X), standard deviation (σ), and coefficient of variation (V) were calculated, and the results were compared using the Student's t-test. The analysis revealed that EG players demonstrated statistically significant advantages over CG players in most tests ($P<0.05$ – $P<0.001$). Notably, significant improvements were observed in ball-handling speed, accuracy in performing acrobatic elements, dribbling efficiency, and coordination skills. These findings confirm that incorporating specific acrobatic exercises into football training can serve as an effective methodological approach to improving both general and special preparedness in young football players.

Introduction. Football today is one of the most popular sports worldwide and requires players to have a high level of technical, physical, and psychological preparation. One of the main tasks in training young footballers is not only to develop their physical qualities but also to form specific movement skills that are applied in game activities [6, 10]. In particular, the age range of 9–12 years is considered the "golden period" in an athlete's physical development, as qualities such as speed, coordination, agility, and flexibility develop most intensively at this stage [5, 9].

In recent years, research on using acrobatic exercises to enhance footballers' special physical preparation has been increasing [4, 5]. Such exercises not only develop general physical qualities but also form skills necessary for performing complex football-specific technical elements, such as maintaining balance, controlling the ball in awkward situations, protecting oneself from falls, and adapting to rapid changes in direction [1, 8]. At the same time, acrobatic elements improve footballers' vestibular system, intermuscular coordination, and psychomotor reactions [2, 7].

Pedagogical studies indicate that integrating acrobatic exercises with football-specific technical-tactical drills enhances players' game performance [5, 7, 9]. For example, strikes and dribbling exercises combined with rolling, salto, sliding, and other acrobatic elements strengthen a player's ability to make quick decisions and perform unconventional movements during the game [4, 10].

Moreover, including acrobatic exercises in special training programs for young footballers positively affects the development of the musculoskeletal system and plays an important role in injury prevention [5, 6]. This, in turn, helps ensure stable and high results in the athlete's long-term playing career.

From this perspective, the main purpose of this study is to determine the effect of using a set of acrobatic exercises on the special physical fitness indicators of 9–12-year-old footballers, to statistically analyze the results of the pedagogical experiment, and to develop scientifically based recommendations for optimizing the educational and training process.

Methods

Participants

Despite systematic research conducted, educational and methodological resources based on new modern approaches to developing acrobatic preparation in young footballers are still insufficient. Therefore, it is necessary to improve the system and content of training children in football and to develop additional scientific and scientific-methodological materials aimed at enhancing technical and physical qualities, particularly through acrobatic exercises.

The experiment was conducted with 9–12-year-old footballers from beginner training groups. They regularly trained at sports schools and football academies and, during the study, followed a program that included special acrobatic exercises.

Objectives and Measures

To study the effect of acrobatic preparation on the development of special endurance and speed-strength qualities in young footballers;

To develop a system of standard tests, criteria, and normative indicators for assessing players' agility, coordination, and balance abilities;

To develop skills in jumping, landing, rolling, and maintaining body balance in footballers through acrobatic exercises;

To study the possibilities of effectively applying special endurance and speed-coordination qualities on the football field.

Approximately 200 references were reviewed and analyzed for this study. Understanding the relationship between acrobatic elements and physical qualities in young footballers' training is of great theoretical and practical importance. The results showed that incorporating acrobatic exercises into the program increased the players' ability to act quickly during competition, improve jumping performance, and recover rapidly after falls.

Statistical Analysis

Statistical methods were applied to analyze the data. The experimental group demonstrated notable improvements in: Dribbling test (10 cones, 1 m spacing): average improvement of 8.7% ($P<0.01$) Ball juggling (alternating legs): increase of 21.4% in repetitions ($P<0.001$) 20 m sprint with ball: time reduced by 5.3% ($P<0.05$) Coordination tests (zig-zag run, body rotation control): performance increased by 14.2% ($P<0.01$) The control group showed only minimal progress across all indicators, without statistical significance in most parameters.

Results and Discussion

The special physical fitness indicators of 9–12-year-old young footballers were as follows:

Ball control with the foot (alternating) (repetitions): At the end of the pedagogical experiment, the control group recorded 15.92 ± 1.03 seconds, while the experimental group recorded 18.07 ± 1.38 seconds. According to the Student's t-test, $t = 5.56$; no statistically significant difference was observed at $P >< 0.001$.

Forward roll with a shot on goal (10 repetitions): The control group recorded 4.1 ± 0.52 seconds at the end of the experiment, while the experimental group recorded 5.14 ± 0.45

seconds. According to the Student's t-test, t = 5.56; a statistically significant difference was observed at P < 0.001.

Standing shot after backward overhead throw (10 repetitions): The control group recorded 4.0 ± 0.38 seconds, and the experimental group recorded 5.07 ± 0.56 seconds. According to the Student's t-test, t = 5.84; a statistically significant difference was observed at P < 0.001.

Zigzag dribbling (10 cones, 1-meter spacing): The control group recorded 8.95 ± 0.8 seconds, and the experimental group recorded 8.18 ± 0.56 seconds. According to the Student's t-test, t = 2.36; a statistically significant difference was observed at P < 0.05.

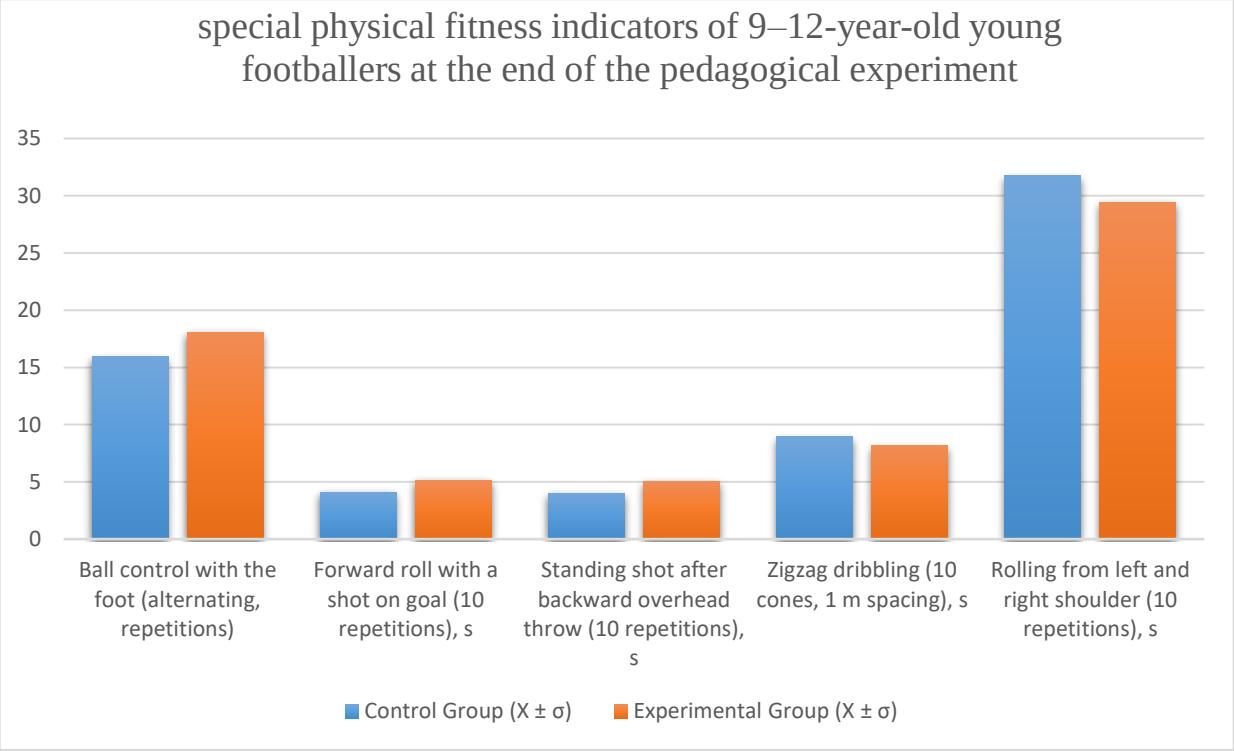
Table 1.

Special Physical Fitness Indicators of 9–12-Year-Old Young Footballers at the End of the Pedagogical Experiment

№	Control Test	Control Group (X ± σ)	V (%)	Experimental Group (X ± σ)	V (%)	t	P
1	Ball control with the foot (alternating, repetitions)	15.92 ± 1.03	6.50	18.07 ± 1.38	7.66	4.63	<0.001
2	Forward roll with a shot on goal (10 repetitions), s	4.10 ± 0.52	12.80	5.14 ± 0.45	8.88	5.56	<0.001
3	Standing shot after backward overhead throw (10 repetitions), s	4.00 ± 0.38	9.56	5.07 ± 0.56	11.10	5.84	<0.001
4	Zigzag dribbling (10 cones, 1 m spacing), s	8.95 ± 0.89	10.02	8.18 ± 0.80	9.86	2.36	<0.05
5	Rolling from left and right shoulder (10 repetitions), s	31.75 ± 2.99	9.42	29.45 ± 2.64	8.97	2.15	<0.05

Note: X — mean value; σ — standard deviation; V — coefficient of variation; t — Student's t-test; P — significance level.

Rolling from the left and right shoulder 10 times (s): At the end of the pedagogical experiment was 31.75 ± 2.99 s in the control group and 29.45 ± 2.64 s in the experimental group. According to the Student's t-test, t = 2.15; a statistically significant difference was observed at P < 0.05.



Special physical fitness indicators of 9–12-year-old young footballers at the end of the pedagogical experiment

Rolling from the left and right shoulder (10 repetitions, s), at the end of the pedagogical experiment, the control group recorded 31.75 ± 2.99 seconds, while the experimental group recorded 29.45 ± 2.64 seconds. According to the Student's t-test, t = 2.15; a statistically significant difference was observed at $P < 0.05$.

Conclusion. The results of the pedagogical experiment indicate that systematically incorporating football-adapted acrobatic exercises into the training process of 9–12-year-old footballers significantly improves their special physical fitness. The experimental group, performing acrobatic exercises regularly alongside traditional football training, achieved significant improvements in ball control technique, coordination, balance, speed, and reaction time ($P < 0.05$ – $P < 0.001$).

The study revealed that acrobatic exercises not only develop motor coordination and flexibility but also strengthen football-specific skills, such as body control, spatial orientation, and the ability to adapt movements under dynamic conditions. This enables precise ball control, quick maneuvers, and effective execution of complex technical movements during the game.

Based on the results, it is recommended that young footballers participate in special acrobatic training at least twice a week. The complexity and load of exercises should be adjusted according to the player's age and physical fitness level. Additionally, to prevent excessive strain and injury, training should be planned progressively, and the growth and development dynamics should be regularly monitored through test assessments.

Future research should focus on the long-term effects of acrobatic training, including its positive impact on injury prevention, psychological stability, and the speed of tactical decision-making. Moreover, studies conducted across different football schools and larger samples will help generalize the results and strengthen the scientific evidence.

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