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METHODOLOGY FOR DEVELOPING SPEED PHYSICAL QUALITIES OF STUDENTS ENGAGED IN TABLE TENNIS

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Abstract

This article analyzes the methodology for developing speed physical qualities of students (18-22 years old) engaged in table tennis. The research developed a system of exercises aimed at developing the main types of speed — movement speed, reaction speed, maximum speed and special speed. In the experimental group, a special methodology was applied — a combination of interval method, repeated method, circuit training and special exercises for developing reaction speed. The research results showed that in the experimental group, speed indicators significantly improved compared to the control group: 30 m run improved by 11.8%, reaction speed — by 29.4%, "herringbone run" — by 12.2%, stroke speed — by 18.6%. The developed methodology serves to improve the speed training of students engaged in table tennis.

Keywords: table tennis, students, speed, reaction speed, movement speed, special speed, interval method, circuit training.

Introduction

Table tennis is one of the fast-paced, complex coordination sports that requires a high level of speed, precise movements, and quick thinking from the athlete. During the game, the athlete must make decisions in tenths of a second, respond to the opponent's strokes, and execute their movements rapidly. For this reason, the physical quality of speed is considered one of the main components of training for those engaged in table tennis. A specific characteristic of the student-age contingent is that their bodies are at a high stage of physical development at 18-

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22 years old, and this period is considered the most favorable for developing speed qualities. At the same time, due to students being occupied with academic studies, their sports training has time constraints. Therefore, it is important to apply time-efficient, effective methodologies when working with students.

Research conducted on table tennis shows that over 80% of movements performed during the game are speed-oriented. Especially in modern table tennis, high-speed shuttle-run movements, sharp changes of direction, and quick reactions play an important role. The "Herringbone run" (54 m) special test developed by researchers is important in assessing athletes' special movement speed.

The relevance of this research lies in the fact that special methodologies aimed at developing speed qualities of student-youth engaged in table tennis have not been sufficiently developed. Existing methodologies are mainly designed for adolescent athletes and do not consider the specific characteristics of the student-age contingent.

Research aim — to develop and substantiate an effective methodology for developing speed physical qualities of students (18-22 years old) engaged in table tennis.

Literature Review

Research conducted by Uzbek scholars on table tennis has focused on issues of improving special movement training. In particular, the "Herringbone run" (54 m) special test has been developed, through which athletes' special movement speed is assessed. Research results confirm that implementing this test and the experimental set of exercises based on it into the training process serves to increase athletes' movement speed, stroke accuracy, and overall physical fitness level.

In a study conducted by Bekimuratov (2025), issues of the formation and development of table tennis playing technique were covered. The study emphasized that speed and accuracy are important in table tennis, and that players' technical skills directly affect their success. It was also noted that increasing players' physical fitness helps them perform techniques more effectively.

Analysis of the literature shows that although there are studies devoted to the issue of developing speed qualities in table tennis, they are mainly focused on

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adolescent athletes. Methodologies that consider the specific characteristics of working with the student-age contingent (18-22 years old) have not been sufficiently developed.

Analysis and Results

Organization of the Research

The research was conducted over 2024-2025 at the sports complex of Fergana State University. Twenty-four students aged 18-22 engaged in table tennis participated in the study. Twelve of them were assigned to the experimental group (EG) and 12 to the control group (CG). The research duration was 6 months.

Table 1 Tests used in the research and their description

№	Test name	Unit of measurement	Which type of speed it assesses
1	30 m run (high start)	seconds	Movement speed (maximum speed)
2	Reaction speed (ruler method)	cm	Simple reaction speed
3	"Herringbone run" (54 m)	seconds	Special movement speed
4	3x10 m shuttle run	seconds	Agility and direction change speed
5	Stroke speed (video analysis)	m/s	Special speed (stroke speed)
6	Number of forehand strokes in 20 seconds	repetitions	Movement frequency

Research Methods

1. Theoretical analysis and generalization of literature;
2. Pedagogical observation;
3. Pedagogical testing;
4. Pedagogical experiment;
5. Mathematical-statistical analysis (Student's t-test).

Speed Assessment Tests

Training sessions were conducted in the group for 6 months (3 times per week, 90 minutes each) based on a specially developed methodology. The main content of the methodology consists of the following:

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1. **Interval method** (30% of training): high-intensity special exercises — 15-20 seconds of work at maximum speed, 40-60 seconds of rest. 3-4 series. Exercises: running in place at maximum frequency, rapid movement around the table, "shuttle" running.
2. **Repeated method** (25% of training): running short distances (5-10 m) at maximum speed, 5-6 repetitions with 2–3-minute rest intervals. Exercises: rapid movement from table to table, sharp starts in different directions.
3. **Circuit training method** (25% of training): speed-developing exercises at 6 stations:
   - Station 1: rope jumping (at maximum speed)
   - Station 2: reaction speed exercises (movement by signal)
   - Station 3: "shuttle" running (3x5 m)
   - Station 4: movement around the table (imitation)
   - Station 5: quick passing of a medicine ball
   - Station 6: running in place at maximum frequency
   - 30 seconds work at each station, 15 seconds rest, 2-3 rounds.
4. **Special exercises for developing reaction speed** (20% of training):
   - Starts by various signals (sound, visual)
   - Striking a moving target
   - Responding to balls coming from a robot in different directions
   - Mobile balance exercises
   - Exercises performed with eyes closed

The control group trained according to traditional methodology — general developmental exercises, multiple repetition method, and game exercises.

Results

At the initial stage of the research (September 2024), the speed indicators of all participants were determined. Initial test results showed that both groups were approximately equal ($p>0.05$), indicating the equivalence of the groups.

After the 6-month pedagogical experiment (March 2025), a retest was conducted. The obtained results are presented in Table 2.

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Analysis of Speed Indicators:

- In the 30 m run, an improvement of 0.58 seconds (11.8%) was observed in EG, while in CG an improvement of 0.23 seconds (4.7%) was recorded. This indicates the effectiveness of the experimental methodology in developing movement speed.
- In the "Herringbone run" (54 m) special test, an improvement of 1.9 seconds (12.2%) was observed in EG, while in CG an improvement of 0.9 seconds (5.7%) was observed. This test assesses special movement speed characteristic of table tennis.

Table 2 Changes in speed indicators in experimental and control groups (X±σ)

№	Test types	Group	Beginning of research	End of research	Difference	Increase, %
1.	30 m run, s	EG	4.92±0.18	4.34±0.15	-0.58	11.8
		CG	4.94±0.20	4.71±0.18	-0.23	4.7
2.	Reaction speed (ruler), cm	EG	17.3±1.9	12.2±1.5	-5.1	29.4
		CG	17.5±2.0	15.3±1.8	-2.2	12.6
3.	"Herringbone run" (54 m), s	EG	15.8±0.6	13.9±0.5	-1.9	12.2
		CG	15.9±0.7	15.0±0.6	-0.9	5.7
4.	3x10 m shuttle run, s	EG	8.7±0.4	7.8±0.3	-0.9	10.3
		CG	8.8±0.5	8.4±0.4	-0.4	4.5
5.	Stroke speed (forehand), m/s	EG	14.5±1.2	17.2±1.3	+2.7	18.6
		CG	14.6±1.3	15.7±1.2	+1.1	7.5
6.	Number of forehand strokes in 20 s	EG	24.3±2.1	29.8±2.3	+5.5	22.6
		CG	24.6±2.2	26.7±2.1	+2.1	8.5

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Analysis of Reaction Speed

- Reaction speed (ruler method) improved by 5.1 cm (29.4%) in EG, while in CG it improved by 2.2 cm (12.6%). The high increase in reaction speed (29.4%) confirms the effectiveness of the special reaction exercises used in the experimental methodology. These results are consistent with the research of Maleh and Youssef.

Special Speed Indicators

- Stroke speed increased by 2.7 m/s (18.6%) in EG, while in CG it increased by 1.1 m/s (7.5%).
- The number of forehand strokes in 20 seconds increased by 5.5 times (22.6%) in EG, while in CG it increased by 2.1 times (8.5%). This shows a significant improvement in special speed (movement frequency).

Comparative Analysis

It was found that the changes achieved in the experimental group were 2-3 times higher compared to the control group. Particularly significant differences were observed in reaction speed (29.4% vs. 12.6%), stroke speed (18.6% vs. 7.5%), and movement frequency (22.6% vs. 8.5%).

The results of statistical analysis showed that the changes achieved in the experimental group were reliable ($p<0.01$). The differences between EG and CG were also statistically significant ($p<0.05$).

Our research results are consistent with the studies of Abbasi and Minasian. In their research, speed improved by 11.9% in the combined exercise group, while in our research an improvement of 11.8% was observed. Also, in their research, agility improved by 8.9%, while in our research shuttle run improved by 10.3%.

Conclusion and Recommendations

The results of the research conducted on developing speed physical qualities of students engaged in table tennis allow drawing the following conclusions:

1. In the training of students (18-22 years old) engaged in table tennis, all types of speed — movement speed, reaction speed, maximum speed, and special speed — are of great importance. These qualities directly affect the effectiveness of game activity.

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2. The methodology based on the combination of interval method, repeated method, circuit training, and special exercises for developing reaction speed in accordance with the age characteristics of students has higher effectiveness compared to traditional methodology.
3. In the group where the developed experimental methodology was applied, speed indicators increased significantly compared to the control group:
- 30 m run — by 11.8% (in CG 4.7%);
- Reaction speed — by 29.4% (in CG 12.6%);
- "Herringbone run" (special movement speed) — by 12.2% (in CG 5.7%);
- Shuttle run (agility) — by 10.3% (in CG 4.5%);
- Stroke speed — by 18.6% (in CG 7.5%);
- Movement frequency — by 22.6% (in CG 8.5%).

4. Research results show that a comprehensive approach — combination of interval, repeated, and circuit methods — is most effective in developing speed. Particularly, special exercises (starts by signal, strikes at a moving target, mobile balance exercises) yield high results in developing reaction speed.
5. The research results can be used to improve training programs aimed at developing speed qualities of students engaged in table tennis.

Practical Recommendations

- It is recommended to allocate at least 2-3 hours per week for developing speed in the training of students engaged in table tennis;
- It is advisable to use a combination of interval method (15-20 seconds of work at maximum speed, 40-60 seconds of rest) and repeated method (running short distances at maximum speed) in developing speed;
- In circuit training method, it is recommended to create complexes consisting of 6-8 stations, with 30-45 seconds of work and 15-20 seconds of rest at each station;
- For developing reaction speed, starts by various signals, striking a moving target, and using robot-trainers are effective;
- For developing special speed, it is recommended to use the "herringbone run" test and the set of exercises based on it;
- It is necessary to regularly monitor speed indicators (every 1.5-2 months) and adapt training loads to individual characteristics.

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