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Physical Training Methodology for Boxers Aged 13–15 During the Training Phase

This paper presents the results of a study on the effectiveness of an experimental physical training programme for young boxers aged 13–15 years. The aim of the study was to develop, substantiate, and evaluate a physical training programme for boxers at the training stage. The research was conducted at the private boxing club "UPGRADE" in Moscow and involved male and female athletes aged 13–15 years. The training groups were characterised by differences in age, experience, and skill level, with novice and experienced athletes training together. To assess the effectiveness of the programme, participants completed a battery of ten standardised tests measuring general and sport-specific physical fitness. The proposed training methodology incorporated targeted exercises aimed at improving foot stiffness within the general physical training programme of young boxers. The findings demonstrated that the experimental programme contributed to improvements in the physical fitness indicators of the participants and may be recommended for use in the training process of young boxers. Following the implementation of the programme, positive changes were observed in all physical fitness indicators. The most pronounced improvements among girls were recorded in pull-ups (50%) and the 1000-m run (42.2%), whereas boys achieved the highest gains in pull-ups (43.5%) and push-ups (27.9%). The findings suggest that the proposed methodology can be effectively used in the training process of young boxers.

Keywords: boxers aged 13–15, training phase, physical training, methodology.

Introduction

Boxing is a sport classified as a speed-strength discipline characterized by maximum physical intensity. At the current stage of its development, the issue of training in youth boxing is particularly critical, as the intensity of competition in the ring increases, placing high demands on boxers' physical fitness [1, 2].

The participation of young male and female boxers in international competitions at the European and World Championship levels can lead to an accelerated training process for young athletes and an unjustified increase in time spent on specialized training at the expense of general physical conditioning, which results in one-sided development, inconsistent athletic performance, a decline in motivation, and a halt in athletic progress [2, 3].

Women's boxing has been gaining popularity and has been included in the Olympic programme since 2012. At the 2028 Olympic Games, an additional women's weight category is expected to be introduced, resulting in medal competitions across seven men's and seven women's weight classes. The works of E.P. Sharina, V.V. Chumash, L.V. Lagutenko, E.P. Krestovnikova, T.V. Chala, O.V. Domuladzhanova, E.V. Gapesina, V.P. Stroshkov, A.M. Gladkikh, R.R. Magomedov, and others point to a lack of research dedicated to the training of young female boxers [4, 5, 6, 7].

Research Objective. To justify, develop, and verify the effectiveness of a physical training methodology for boxers aged 13–15 during the training phase.

Methods and Materials

The study was conducted at the "UPGRADE" private martial arts club in Moscow, specifically in the boxing section, one of the nine martial arts disciplines practiced at the club.

Six boxers aged 13–15 participated in the study—two girls and four boys—with athletic qualifications ranging from 2nd-class athletes to candidates for Master of Sports. Of the boxers who participated in the study, two girls have been members of the Russian junior national team since 2025, and one boy is a member of the Moscow city team.

A distinctive feature of the training process in the boxing department of a private club is the heterogeneous composition of training groups, where beginners and fairly experienced athletes train at the same time, and there is a high turnover of participants. The age composition of the groups is also heterogeneous, with boys and girls training together.

To validate the experimental methodology for assessing the physical fitness of boxers aged 13–15, the subjects underwent physical fitness testing consisting of 10 standardized tests designed to evaluate their general and sport-specific physical fitness: 10-meter sprint, 3 × 10-meter shuttle run, standing long jump, 1000-meter run, bench press, push-ups, pull-ups on a high bar, half-squats with a barbell on the shoulders, sit-ups from a lying position in 1 minute, and the number of punches on a punching bag in 1 minute.

An analysis of video recordings of boxing matches involving boxers of different weight classes and ages, both men and women, was also conducted, and pedagogical observation of the subjects was carried out.

Results and Discussion

To incorporate exercises for developing foot muscle strength into a general physical training program, we conducted a study whose results revealed the significant role of foot stiffness—particularly that of the transverse arch—in increasing the striking power of boxers [8–11].

We hypothesized that as an athlete's weight increases, maximum acceleration increases; consequently, punching power increases, and the need to enhance foot rigidity—particularly that of the transverse arches—becomes all the more critical.

To validate the experimental methodology, we also measured the foot length of the subjects at the beginning of the study while standing in a relaxed position and while contracting the intrinsic foot muscles ("short foot").

Figure 1 shows the difference in foot length between the relaxed standing position and the "short foot" position (with the internal foot muscles tensed) in female boxers using a right-handed stance, expressed as a percentage.

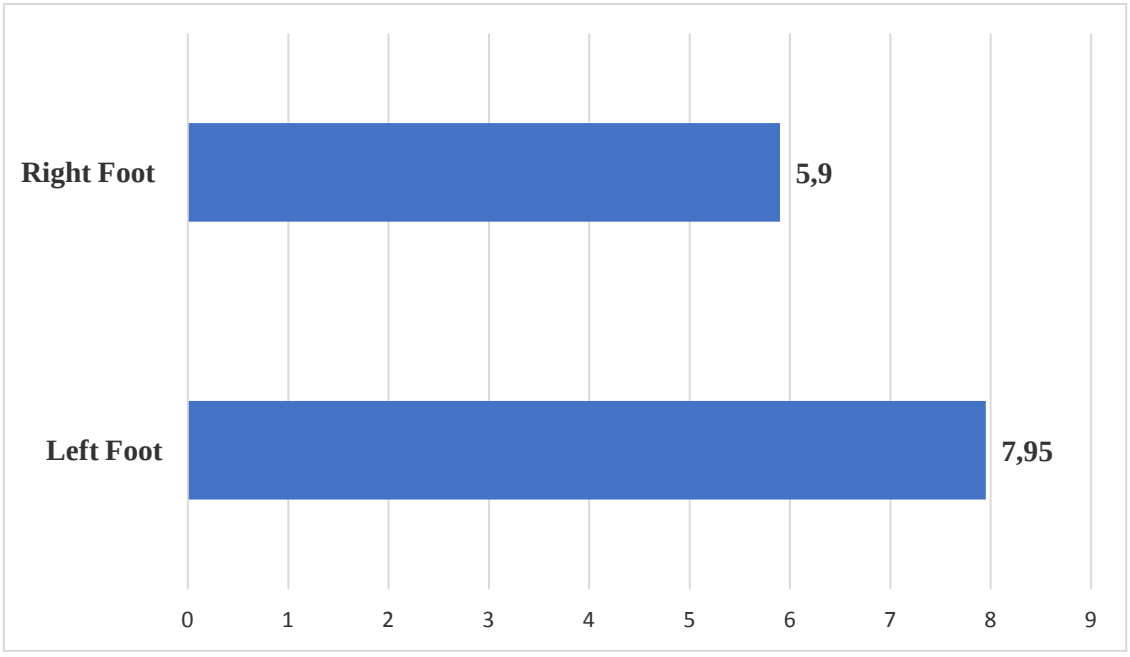

Figure 1. Difference in foot length when standing at rest (1*)
and when the intrinsic foot muscles are contracted (2**) in young women %

The analysis revealed that among the subjects—both female and male boxers who fight in a right-handed stance—the difference between 1* and 2** of the left leg was higher in percentage terms, while for athletes boxing in a southpaw stance, the difference in foot length when standing at rest and when contracting the intrinsic foot muscles was greater on the right leg.

Based on the data obtained, exercises were developed to strengthen the foot muscles and build their strength, specifically to strengthen the metatarsophalangeal transverse arch and the intrinsic foot muscles, which were incorporated into the experimental physical training program for boxers aged 13–15.

List of exercises:

Exercises for strengthening and stabilizing the feet (barefoot):

- balancing on a hemisphere on one leg;
- jumping on the balls of the feet toward oneself;
- juggling tennis balls while standing on a platform at a 45° angle;
- moving across a hard surface by flexing the toes (“caterpillar”);
- walking on the outer edge of the foot 1 set of 5 minutes.

Core exercises (core muscles):

- plank;
- side plank;
- abdominal exercises (lower, upper, and oblique abs).

Exercises to improve coordination:

- forward rolls;
- backward rolls;
- trunk rotation around its axis + shadow boxing;
- 360° jumps;
- forward somersaults;
- walking on hands once;
- juggling a tennis ball.

Exercises to develop strength:

- Half-squat with a barbell on the shoulders onto a bench;
- Bench press;
- Barbell front raises.

To verify the effectiveness of the experimental physical training methodology for 15- to 16-year-old boxers, the subjects’ fitness was tested, after which the developed methodology was implemented in the training process of the boxing division of the private fighting club “UPGRADE” in Moscow from October 2024 to December 2025.

Upon its completion, retesting was conducted, the results of which are presented in Figure 2.

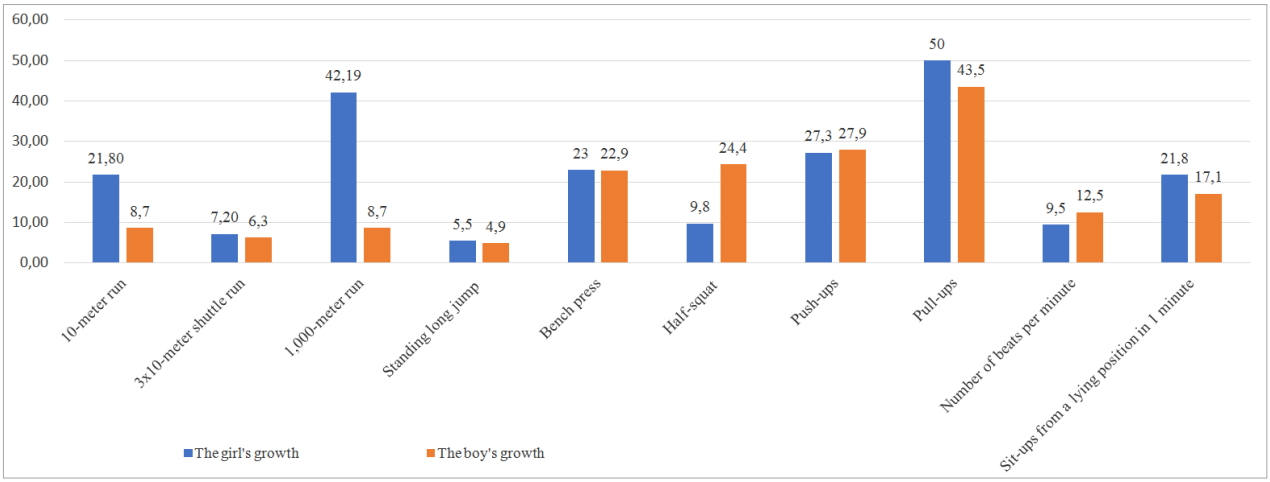

Figure 2. Percentage increase in results for boys and girls at the conclusion of the study

Among the girls, the greatest improvement in performance was seen in pull-ups (180 %), followed by the 1000-meter run. — 42.19 %; in the push-up test, the result increased by 27.3 %; in the bench press, there

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was a 23 % increase; in sit-ups in 1 minute — by 21.8 %, in the barbell shoulder press, the result increased by 9.8 %, the number of punches on the punching bag in 1 minute increased by 9.5 %, speed abilities (10-meter dash) improved by 9.3 %, and the smallest increase occurred in the standing long jump, where the result increased by 5.5 %.

Among the boys, pull-up results improved by 43.5 %; the push-up test ranked second in terms of growth rate, with a 27.9 % increase; in the half-squat with a barbell on the shoulders, performance increased by 24.4 %; in the bench press, results increased by 22.9 %; in the 1-minute sit-up test, results increased by 17.1 %; and the number of punches on the punching bag in 1 minute increased Performance in the 10-meter dash and the 1,000-meter run increased by 8.7 %, and the result in the 3x10-meter shuttle run improved by 6.3 %. And, just as with the girls, the smallest increase was in the standing long jump test, which improved by 4.9 %.

It should be noted that among the young men, the greatest improvement in performance was observed in tests of strength and strength endurance, with gains ranging from 17.1 % to 43.5 %.

A separate study was conducted to evaluate the effectiveness of a set of exercises designed to strengthen the feet.

At the initial stage of the study, foot stiffness was assessed by measuring foot length in a relaxed standing position and during contraction of the intrinsic foot muscles.

During the mesocycle from October 13, 2025, to November 4, 2025, the exercise program was incorporated into the training regimen of boxers aged 13–15. To strengthen the foot muscles and develop their strength, specifically to strengthen the metatarsophalangeal transverse arch and the intrinsic foot muscles, these exercises were included in the experimental physical training program for boxers aged 13–15.

During the study period, 50 training sessions were conducted, of which 14 sessions (28 %) were dedicated to strengthening the foot muscles, 5 training sessions (10 %) were conducted to develop strength, 5 sessions (10 %) to develop strength endurance, 5 sessions (10 %) to develop speed, and 4 sessions each (8 % each) were conducted to develop coordination and general endurance.

The list of exercises is provided above.

At the conclusion of the study, the results of changes in foot length while standing at rest and with the foot's intrinsic muscles contracted are presented in Table 1.

Table 1

Difference in foot length measurements at the conclusion of the study

№	Athlete	Right foot (cm)		Left foot (cm)		Difference (cm) and % Right foot		Difference (cm) and % Left foot	
		1*	2**	1	2				
1	Athlete 1 Weight: 60 kg Candidate for Master of Sports	26	24,7	26	24,1	1,3	5	1,9	7,3
		26	24,8	26	24,3	1,2	4,6	1,7	6,5
2	Athlete 2 Weight: 57 kg Candidate for Master of Sports	22	20,5	22	20,1	1,5	6,8	1,9	8,6
		22	20,6	22	20,1	1,4	6,4	1,9	8,6
3	Athlete 1 Weight: 80 kg Candidate for Master of Sports	26	23,6	26	23,9	2,4	9,2	2,1	8,1
		26	23,8	26	23,9	2,2	8,5	2,1	8,1
4	Athlete 2 Weight 57 1st class	24	21,5	24	21,1	2,5	1,1	2,9	12,1
		24	21,5	24	21,3	2,5	1,1	2,7	11,25
5	Athlete 3 Weight 66 1st class	25	23,2	25	23,5	1,8	7,2	1,8	7,2
		25	23,2	25	23,5	1,8	7,2	1,8	7,2
6	Athlete 4 Weight 57 2nd class	24,5	23,2	24,5	22,5	1,3	5,3	2,0	8,2
		24,5	23,2	24,5	22,5	1,3	5,3	2,0	8,2

An analysis of the results revealed that, following the incorporation of exercises designed to increase foot stiffness into the experimental protocol, changes occurred in a number of athletes, while for other participants, the results remained unchanged from the beginning of the study. An increase in foot stiffness was observed in male and female athletes boxing in a right-handed stance, primarily on the right leg. In our opinion, three weeks (one mesocycle) is insufficient to achieve positive results, and the duration of the intervention must be extended.

Conclusions

An analysis of available sources of information has shown that the number of exercises designed to train the feet in athletes across various sports is quite limited, and specifically, there are virtually none targeting the transverse arch.

In the physical training program for boxers aged 13–15, exercises aimed at strengthening the muscles of the feet and trunk (core) were included in training sessions at the end of the main part, accounting for 28 % of the total number of sessions. A pedagogical experiment to increase foot rigidity showed that 3 weeks are insufficient to achieve positive results and that the duration of the intervention must be increased.

An indirect indicator of the effectiveness of the experimental methodology can be considered the successful performance of the athlete who participated in the study, who took first place in the 60 kg weight class at the European Youth Boxing Championships in Novo Pozar, Serbia. Another athlete won a bronze medal in the 57 kg weight class at the 3rd CIS Games held from September 28 to October 10, 2025, in Ganja, Azerbaijan. Based on the above, it can be concluded that the experimental physical training methodology for boxers aged 13–15 has demonstrated sufficient effectiveness and can be utilized in the training process for boxers during the preparatory phase.

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