RESEARCH PAPER

Effects of the “Bizon-1” Friction Simulator on Grip Strength and Punch Performance in Young Boxers

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Abstract

Background and Study Aim: The aim of this research is to assess the impact of punching exercises in boxing using friction simulators with advanced muscle development features. Specifically, the study focuses on the effectiveness of devices like the “Bizon-1” in enhancing muscle strength, punching speed, and overall technique by incorporating cushioning during technical movements.

Materials and Methods: The study involved 13-15-year-old boxers, with a Digital Hand Dynamometer utilized to measure hand strength indicators for both experimental and control groups. Over a one-month training program, the experimental group trained using the “Bizon-1” friction simulator, while the control group adhered to conventional training.

Results: The “Bizon-1” friction simulator led to significant muscle strength gains in the experimental group. After one month, the group exhibited an 11% increase in punching speed and a statistically significant improvement in hand strength compared to the control group ($P<0.05$). These improvements indicate a direct correlation between friction-based resistance training and enhanced explosive power, grip strength, and muscle endurance in young boxers. The results suggest that friction simulators like the “Bizon-1” provide a novel approach to strength and conditioning in boxing. Compared to conventional training, the addition of friction-based resistance allows for a more targeted and progressive development of punching power.

Conclusion: This study demonstrates the potential of friction simulators, such as the “Bizon-1,” as a valuable addition to traditional strength programs for improving muscle strength and punching speed in boxers. The significant improvements observed in grip strength and punching velocity highlight the effectiveness of integrating friction-based resistance training into boxing conditioning programs.

Keyword: Hand muscle response, Friction simulator, Boxing training, Resistance Training, Hand Strength, Muscle Strength, Adolescent Athletes

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Introduction

One of the fundamental aims in sport is to maximize athletes’ performance. Research and innovation technology provide an increasing amount of information about motor characteristics, technique, tactics and psychological features of the athletes, supporting thereby physical training [1, 2, 3]. A common element of many performance athletes’ physical fitness regimens and sports regimens is strength training. As this adaptation can lead to an increased capacity for power development, it is evident that maximizing muscular strength is a crucial component of such training regimens. Strength training augments muscular force, which is contingent upon the contracting muscles’ capacity to produce and apply energy, typically leading to the movement of an object [4]. Dumbbells, gym equipment, resistance straps, stretchable tubes, and even a person’s own body mass can all be utilized in power-building routines. Since workout resistance bands are considered a highly convenient, cost-effective, and efficient way to enhance muscular strength, they are appealing to both recreational exercisers and athletes.

Among various components the striking force is considered a major determinant of a fighter’s victory [5, 6]. Generally, striking aims to impose physical damage, develop tactical advantage, and score points against an opponent [7, 8]. Boxing is aimed to deliver a clean and correct punch to the opponent without being punched in return [9]. The accuracy and strength of punches are

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strongly related to win in a boxing competition [10]. Since punches, major techniques in boxing, are extremely dynamic and brief actions, muscle power in both the upper and lower limbs is necessary for high-level boxing performance [11]. Coaches and researchers are seeking effective methods for developing muscle power in athletes. Recently, the optimum power load, defined as load capable of maximizing power output, method has been reported for an effective way to increase strength and power in different sports including boxing [12]. Although previous studies reported a high level of physical fitness as being a key factor for the performance of amateur boxing, there is few studies regarding the association between physical fitness and punch power [13, 9,14].

Limited boxing equipment facilities are an obstacle to the success of technical training [15]. Therefore, boxing training also requires a variety of exercises supported by adequate equipment to avoid the athlete's boredom in training [16]. It is necessary to develop training tools developed from existing tools. Specific boxing training equipment will help the users to focus on the exercise [17]. In the process of analyzing the results of pedagogical experiments, the use of friction simulators with high degrees of freedom, in particular, the Bizon-1 device, is a promising direction. Specifically, our aim to investigate how devices like the "Bizon-1" can enhance muscle strength and improve the speed and effectiveness of punches by providing cushioning during technical movements. The aim of this to evaluate the effects of punching drills in boxing when utilizing friction simulators designed to enhance muscle development. Specifically, it examines the efficiency of devices like the "Bizon-1" in improving muscle strength, strike velocity, and overall technique by integrating impact-absorbing mechanisms during technical movements.

Materials and Methods

Study Design

This study utilized a pedagogical experimental design to evaluate the effects of friction-based resistance training using the "Bizon-1" friction simulator. The research was carried out at the Tashkent Regional Children's Sports School, Tashkent, Uzbekistan between September 2023 and January 2024 and followed four structured stages involving preparation, biomechanical assessment, intervention, and data analysis.

Participants of the Study

Participants were male boxers aged 13-15 years enrolled in the sports school. Initially, 32 athletes aged 13, 22 aged 14, and 24 aged 15 were screened. From these groups, athletes were divided into an experimental group (EG) and a control group (CG). The experimental group underwent friction-based training, while the control group continued conventional boxing strength training. All participants and their guardians provided informed consent.

Sampling Technique

A purposive sampling technique was used to recruit adolescent boxers aged 13-15 years who were actively training at the Tashkent Regional Children's Sports School. This method was chosen to ensure that all participants possessed comparable training backgrounds and technical proficiency. Prior to data collection, a sample size estimation was conducted using G*Power 3.1 to determine the minimum number of participants required to detect significant differences between the experimental and control groups. A two-tailed *t*-test for independent means was selected as the statistical model. Using an expected medium effect size of 0.60, an alpha level of 0.05, and a desired statistical power of 0.80, G*Power indicated that a minimum of 24 participants (12 per group) would be sufficient to achieve adequate power. The available sample exceeded this requirement, thereby increasing the robustness of the analysis. All eligible athletes who met the inclusion criteria were invited to participate, and those who consented were allocated to either the experimental or control group.

Experimental Procedure

The study was conducted in four sequential stages. The first stage involved reviewing scientific literature, defining goals and objectives, and identifying appropriate research tools. The second stage focused on analyzing joint movements during straight punches and assessing the feasibility of performing similar movements under friction-based loads. In the third stage, a one-month training program and specific tasks were developed and delivered to the experimental group. The final stage focused on collecting, systematizing, and statistically analyzing the empirical data.

Training Intervention

Table 1. One-Month Training Plan Using the "Bizon-1" Friction Simulator for Young Boxers

Week	Exercise	Description of Movement	Load / Resistance	Sets × Reps	Session Frequency
Week 1	Exercise 1	Opposing rotations of handles around longitudinal axis in a linear position at chest level	Low–Moderate (light clamp)	3 × 12	3 sessions/week
	Exercise 2	Horizontal-plane V-shape to reverse V-shape transitions with straight arms	Low–Moderate	3 × 10	
	Exercise 3	Vertical-plane V-shape "handles up" to "handles down" transitions from hip to chest level	Low–Moderate	3 × 10	
Week 2	Exercise 1	Increased handle rotation speed; slightly	Moderate	3 × 12	3

		higher friction resistance			sessions/week
	Exercise 4	Conical rotations using shoulder and elbow joints with fixed wrist	Moderate	3 × 10	
	Exercise 5	S-shape formation transitions with handle switching pattern	Moderate	3 × 10	
Week 3	Exercise 2	Increased amplitude horizontal-plane movements	Moderate–High	4 × 10	3-4 sessions/week
	Exercise 3	Faster V-shape transitions in vertical plane	Moderate–High	4 × 8	
	Exercise 6	Punch-specific straight-line movement converting V-shape to linear form	Moderate–High	4 × 6 punches	
Week 4	Exercise 4	High-intensity conical rotations emphasizing muscular endurance	High	4 × 12	4 sessions/week
	Exercise 5	Rapid S-shape transitions with reduced rest	High	4 × 10	
	Exercise 6	Punch simulation under maximal friction (speed + stability)	High	5 × 6 punches	

The control group followed traditional boxing conditioning methods throughout the study period. Their training included rubber shock absorbers, resistance bands, light dumbbells, and standard boxing drills. No friction-based equipment or Bizon-1 exercises were used for this group.

Measurement Tools

Grip strength for both hands was assessed using a Digital Hand Dynamometer (Model HFEH20), which provided reliable measurements of hand muscle development. Punch performance was evaluated using "Hardware and software for measuring fighters' punches" was used to determine the dynamics of specific physical fitness of 13-year-old teenage boxers [18]. All athletes completed three attempts per test, and the best performance was used for analysis.

Statistical Analysis

All statistical analyses were performed to determine the effectiveness of the friction-based training intervention compared with traditional boxing training. Descriptive statistics, including mean and standard deviation (±SD), were calculated for all outcome variables. Normality of the data distribution was assessed prior to further analysis. Between-group differences (experimental vs. control) in grip strength and punching force were evaluated using the independent samples Student's *t*-test. The pooled standard deviation was calculated for each comparison using the conventional formula, and degrees of freedom were computed as $(n_1 + n_2 – 2)$. The level of statistical significance was set at $p < 0.05$. Coefficient of variation (CV%) was also computed to assess the consistency and homogeneity of performance within each group. All tests were two-tailed, and the best performance out of three attempts for each test was used for analysis. Statistical procedures followed standard methodologies for small-sample experimental studies in sports science.

Results

Methods of Mathematical Processing of Results and Their Interpretation

T-Student Formula. The t-Student formula is used to calculate the t-statistic, which helps determine if there is a significant difference between the means of two groups, especially when the sample sizes are small and the population standard deviations are unknown.

Formula for the t-statistic.

For two independent samples, the t-statistic is calculated using the following formula:

$t = (\bar{X}_1 - \bar{X}_2) / (s_p \sqrt{(1/n_1 + 1/n_2)})$

Where:

$\bar{X}_1$ = mean of the first sample

$\bar{X}_2$ = mean of the second sample

n_1 = size of the first sample

n_2 = size of the second sample

s_p = pooled standard deviation, calculated as:

$s_p = \sqrt{[((n_1 - 1) s_1^2 + (n_2 - 1) s_2^2) / (n_1 + n_2 - 2)]}$

Where:

s_1 = standard deviation of the first sample

s_2 = standard deviation of the second sample

Steps to Calculate t-Statistic

1. Calculate the means ($\bar{X}_1$ and $\bar{X}_2$) for both samples.
2. Calculate the standard deviations (s_1 and s_2) for both samples.
3. Calculate the pooled standard deviation (s_p).
4. Plug values into the t-statistic formula to find t.
5. Determine degrees of freedom (DF) using: $DF = n_1 + n_2 - 2$.

Preliminary Analysis of the Prospects for Using the Friction Trainer "Bizon-1" in Boxer's Strength Training

During boxers' training aimed at developing arm muscle strength, various means are used. Among the most common are rubber shock absorbers (rubber bands) and small weight loads (medicine balls, dumbbells). When stretching an expander or rubber, the manifested force almost does not depend on acceleration and is mainly determined by the length to which the object is stretched V.M.Zatsiorsky. Thus, rubber shock absorbers have a spatially linear training effect, and their use significantly changes the structure of the technical element. When the counteracting forces are caused by body weight, they do not depend on acceleration and are only determined by weight (as in the case of holding a load stationary).

The solution to the presented problem, in our opinion, lies in the use of innovative technology, actively developing at present, associated with the use of friction trainers with many degrees of freedom N.B.Sotsky. In these constructions, the friction force is used, providing movement braking in the joints and corresponding training resistance. In this work, the “Bizon-1” device was used, as shown in Figures 1. and 2.

Figure 1. Friction Trainer “Bizon-1” with Multiple Degrees of Freedom

The training device “Bizon-1” is designed for effective strengthening of the arm muscles, providing movement in almost all joints of the upper limbs and shoulder girdle. The focus is on the movements of the fingers, wrist, and elbow joints. The “Bizon-1” ensures explosive growth in arm strength and muscular endurance. During training with the Bizon, more than 30 shoulder girdle muscles are simultaneously engaged and effectively worked, which is not typical for traditional trainers that target only specific muscle groups N.Sotsky
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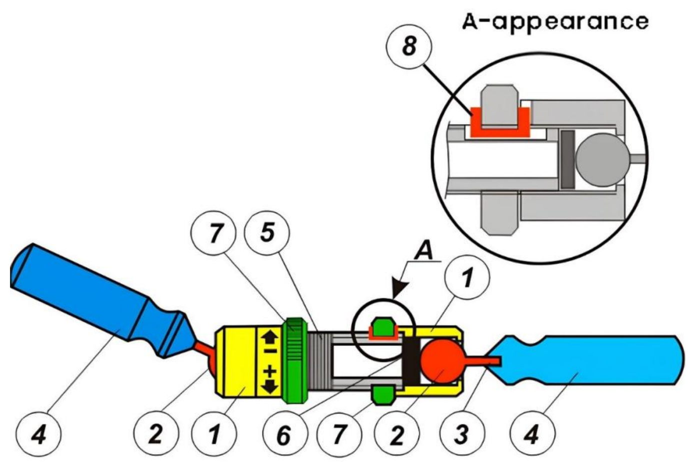

Figure 2. Friction Trainer “Bizon-1” with Multiple Degrees of Freedom
Note: 1-retaining ring, 2-ball, 3-bullet, 4-lever, 5-connecting bushing, 6-friction element, 7-lock nut, 8-clamp. A-appearance.

The technology’s features include the ability to create a spatial field of resistance forces, providing training load for complex spatial movements of a person. At the same time, the device ensures minimal inertia and effective dissipation of mechanical energy.
When developing the trainer and its usage methodology, it is essential to meet basic pedagogical requirements. In particular, working with it should positively impact the boxer’s strength abilities without hindering the development of other components.
In our opinion, such a device should also meet the requirements of competence (ensuring the task’s completion) and reflection (allowing tracking and preventing mistakes made by the fencer at the task’s execution stage).
This training device meets the specifics of special movements in boxing, which involve coordinated muscle work providing spatial power movements, under the condition that the overcome friction effort does not depend on the amplitude and speed of movement, as well as possessing low inertia and effectively dissipating mechanical energy.
The advantage of the developed device is that the load is regulated by the degree of clamp, not by mass. Spatial maneuvering is achieved by using two joints simultaneously, having a total of six degrees of freedom, i.e., allowing for sufficiently complex training movements and focusing the load on muscles providing impact cushioning interactions affecting the functioning of the wrist joint and finger joints.
Developed Set of Training Exercises:
1. Initial Position (I.P.): The trainer (T) has a linear form and is positioned in front at chest level horizontally. Handles are gripped “thumbs towards the body.” Arms are straight. Load is above average.
Motor Action (M.A.): Perform opposing rotations of the handles around their longitudinal axes in opposite directions. Return to I.P, performing movements in reverse sequence.

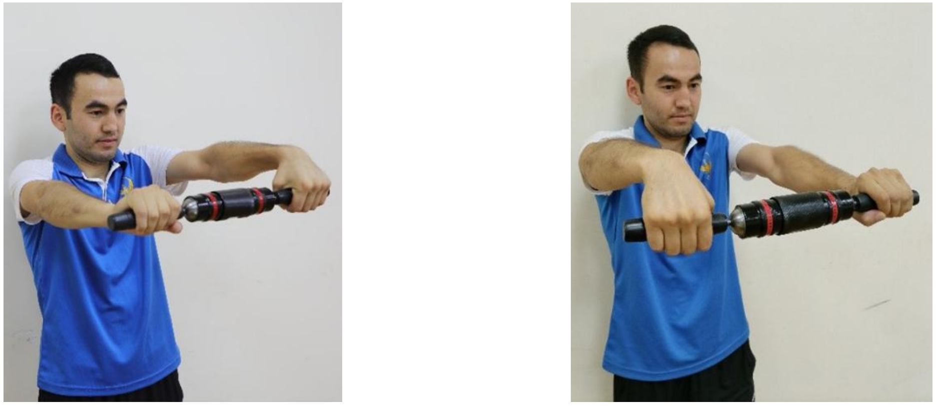

Figure 3. Performing the First Exercise

2. I.P.: The trainer has a V-shaped form and is positioned in front at chest level, in the horizontal plane, with handles "away from the body." Handles are gripped "thumbs towards the trainer's body," arms are straight. Load is above average.
M.A.: Perform handle movements in the horizontal plane, transforming the trainer into a V-shaped form with the handles "towards oneself." Elbows are straight. Return to I.P, performing movements in reverse sequence.

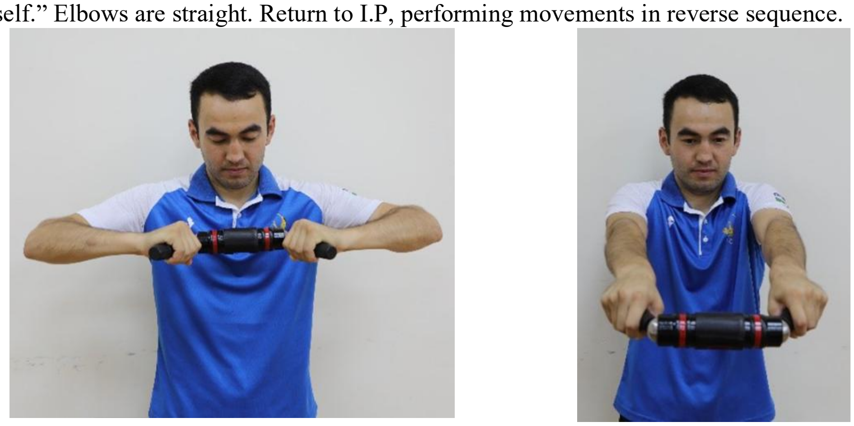

Figure 4. Performing the Second Exercise

3. Initial Position (I.P.): The trainer has a V-shape and is positioned in front at the level of the hip joints in the vertical plane, with handles facing upwards. Handles are gripped "thumbs towards the trainer's body," arms are straight. Load is above average.
Motor Action (M.A.): Raise the trainer up to chest level, transitioning it from the V-shape "handles up" to the V-shape "handles down." Return to I.P, performing movements in reverse sequence.

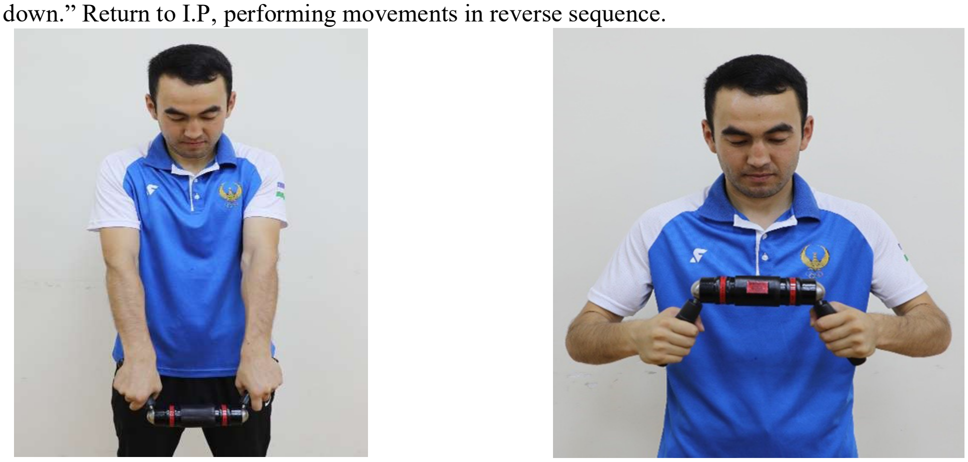

Figure 5. Performing the Third Exercise

4. I.P.: The trainer has a V-shape and is positioned in front at chest level in the horizontal plane, with handles "away from the body." Handles are gripped "thumbs towards the trainer's body", arms are straight. Load is medium.
M.A.: Perform conical rotations of the handles around the longitudinal axis of the trainer's body through shoulder and elbow joint movements. Wrist joints are fixed during the exercise.

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Figure 6. Performing the Fourth Exercise**

5. I.P.: The trainer has an S-shape and is positioned in front at shoulder joint level in the horizontal plane. Handles are gripped “thumbs towards the trainer’s body,” arms are straight. Load is medium.
M.A.: Perform movements in the horizontal plane, transitioning the trainer into an S-shape, in which the handles switch positions (the nearer handle becomes farther, and the farther handle becomes nearer). Wrist joints are fixed during the exercise. Return to I.P, performing movements in reverse sequence.

Figure 7. Performing the Fifth Exercise**

6. I.P.: The trainee is in a fighting stance, half-turn towards an imaginary opponent . The trainer has a V-shape with handles facing upwards. Hands grip the trainer’s handles “thumbs away from the body.” Load is above average.
M.A.: Perform shoulder and elbow joint movements typical for a straight punch, transitioning the device from V-shape to a linear form. Maintain a consistent angle at the wrist joint during the movement.
Return to I.P., performing movements in reverse sequence. Perform 5-6 repetitions.

Figure 8. Performing the Sixth Exercise**

The constructed exercises, aimed at developing muscles that cushion impact interactions, formed the basis of the training methodology. The experimental study of its effectiveness was the main task of further research.

Effectiveness of Boxer Training Using the “Bizon-1” Friction Trainer

During the study, the subjects were tested before the start of the experiment and at the end after a month of training using the “Bizon-1” device. During testing, the subjects performed three attempts to execute the punch. The best result was used for further statistical analysis. After the experiment, the dynamics of the time characteristics of the studied action were analyzed.

The use of friction simulators in boxing training has gained attention due to their potential to enhance grip strength and overall hand muscle development. Grip strength is crucial in boxing, as it directly impacts punching power, endurance, and injury prevention. This study presents data on paw strength indicators (left and right hand) in 13-15-year-old boxers, comparing the effects of traditional training (Control Group, CG) versus the use of friction simulators (Experimental Group, EG) (Table 2).

Table 2. Paw strength indicators of 13-15-year-old boxers (experimental and control group)

Ages	Indicators	CG $\bar{X}\pm\sigma$	CG V, %	EG $\bar{X}\pm\sigma$	EG V, %	t	P
13 ages (n=16)	Left hand paw strength (kg)	28.4±3.6	12.6	28.4±3.6	12.67	1.56	>0.05
		29.2±4.01	17.09	30.8±3.01	9.74	2.31	<0.05
	Right hand paw weight (kg)	29.6±3.1	10.47	29.6±3.42	11.55	1.67	>0.05
		30.4±3.84	12.63	32.9±1.84	5.59	2.74	<0.05
14 ages (n=22)	Left hand paw strength (kg)	30.1±2.7	8.97	30.5±3.2	10.49	1.21	>0.05
		31.8±2.1	6.60	32.7±2.64	8.07	2.51	<0.05
	Right hand paw weight (kg)	32.6±3.7	11.34	32.4±3.12	9.62	1.34	>0.05
		33.1±3.34	10.09	34.6±3.31	9.56	2.39	<0.05
15 age (n=24)	Left hand paw strength (kg)	35.21±3.4	9.65	34.4±3.6	10.46	0.65	>0.05
		37.1±4.01	10.5	38.9±3.01	7.73	2.43	<0.05
	Right hand paw weight (kg)	36.8±4.2	12.80	36.7±4.3	11.71	1.10	>0.05
		37.7±4.84	12.83	39.1±2.84	7.26	2.31	<0.05

Note: CG – control group, EG – experiment group.

Friction simulators are training devices designed to increase resistance in movements, targeting specific muscle groups in the hands, wrists, and forearms. These simulators mimic real-life conditions where boxers must maintain grip strength under pressure, particularly during clinches and punches. By incorporating friction into hand and wrist movements, these simulators help develop the fast-twitch muscle fibers responsible for explosive power.

The literature on strength training supports the use of resistance-based exercises for improving muscle hypertrophy and neural adaptations. Studies show that friction-based resistance can enhance both grip strength and neuromuscular coordination, essential in combat sports like boxing [19].

The data shows a comparison of paw strength between control and experimental groups in 13-year-old boxers. For the left hand, the control group had an average paw strength of 28.4 ± 3.6 kg, while the experimental group achieved a higher strength of 30.8 ± 3.01 kg. The coefficient of variation (V %) was lower in the experimental group (9.74%) compared to the control group (12.6%), indicating more consistency in strength within the experimental group. A t-test result of t = 2.31

and P < 0.05 confirms a statistically significant difference in left hand strength between the groups. For the right hand, the control group recorded a strength of 29.6 ± 3.1 kg, while the experimental group showed a greater strength of 32.9 ± 1.84 kg. The coefficient of variation was again lower in the experimental group (5.59%) compared to the control group (10.47%). The t-test result of t = 2.74 and P < 0.05 shows a statistically significant improvement in right hand strength for the experimental group as well. This suggests that the use of friction simulators in the experimental group led to notable improvements in paw strength for both hands compared to traditional training methods.

In the 15-year-old group, the data reveals significant improvements in paw strength for both the left and right hands in the experimental group compared to the control group. For the left hand, the control group recorded an average strength of 35.21 ± 3.4 kg, while the experimental group reached 38.9 ± 3.01 kg. The coefficient of variation was lower in the experimental group (7.73%) compared to the control group (9.65%), indicating greater consistency in the performance of the experimental group. The t-test result of 2.43, with P < 0.05, indicates a statistically significant difference in left-hand strength between the two groups.

For the right hand, the control group had an average strength of 36.8 ± 4.2 kg, while the experimental group improved to 39.1 ± 2.84 kg. The experimental group showed a much lower coefficient of variation (7.26%) compared to the control group (12.80%), reflecting more uniform strength gains. A t-test value of 2.31, with P < 0.05, confirms a significant difference in right-hand strength.

The results of the pedagogical study to determine the effect of the developed methodology on the development of punching power in young boxers were as follows.

The experiment analyzed the results from 13-year-old boxers weighing 30-34 kg. Initially, the average left-handed direct punch force to the head was 242.06±27.8 N for the control group, while the experimental group averaged 237.3±25.4 N, with no significant statistical differences between these values (t=0.39, p>0.05). By the end of the experiment, the control group’s average punch force remained at 242.06±27.8 N, whereas the experimental group’s average increased to 321.4±31.8 N, showing significant statistical differences (p<0.05).

Table 3. Dynamics of special physical training of 13 year old teenage boxers training in the control and experimental groups (n=32)

Boxer punch type	CG	V%	EG	V%	t	p
F_1	242.06±27.8 278.32±29.4	11.48 10.56	237.3±25.4 321.4±31.8	10.70 9.89	0.39 2.25	>0.05 <0.05
F_2	364.56±42.4 394.94±39.8	11.63 10.08	353.78±40.24 438.06±45.62	11.37 10.41	0.49 3.43	>0.05 <0.001
F_3	320.46±35.4 358.68±37.5	11.05 10.46	321.0±28.54 366.52±34.5	8.89 9.41	0,78 2,30	>0,05 <0,05
F_4	497.84±52.3 526.26±60.8	10.51 11.55	482.16±54.8 584.08±62.6	11.37 10.72	0,64 2,52	>0,05 <0,05

Note: **F_{1234}-**force, left$_1$-handed direct blow to the head, right$_2$-handed direct blow to the head, left$_3$-handed side blow to the head, right$_4$-handed side blow to the head.

At the start of the experiment, the control group’s average left-hand side-to-head punch force was 364.46±35.4 N, while the experimental group’s average was 353.78±40.24 N. There were no significant statistical differences between these initial measurements (t=0.49, p>0.05). By the end of the experiment, the control group’s punch force averaged 358.68±37.5 N (V%=10.46), and the experimental group’s punch force averaged 366.52±34.5 N (V%=9.41). The statistical differences between these final measurements were significant (p<0.05).

Discussion

The main findings were as follows: to establish the presence of reliable positive shifts in the speed of technical action, specifically a direct left-hand punch to the head. The purpose of this research is to study the potential impact of punching in boxing using friction simulators with multiple levels of opportunity for muscle development. When monitoring the training of boxers, the coach first looks at the increase in maximum power, which is roughly a product of muscle strength and contraction velocity [28]. It is possible that the external weights were too heavy for the punching drills because a previous study showed that movement speed in training should be close to the actual speed of athletic performance [29]. It is possible that a disparity between the training and actual contest movement velocities does not provide an efficient training stimulus for the development of the muscle activation and movement coordination required in the competitive setting [12, 14]. Previous research has reported that the muscle energy supply is provided mainly by glycolysis during exercise of similar duration [20], which may lead to accumulation of inorganic phosphate and other metabolites in the muscles and to a decrease in contractile force and power [21]. Ultimately, the responsiveness to training could also be linked to the details of the movement. For instance, it is more challenging to alter the speed of a baseball bat swing than to modify the velocity of a baseball pitch, even though the upper body muscles play a crucial role in both actions. Both anaerobic and aerobic endurance are important in boxing [22, 14]. The activity-to-rest ratio during the three rounds of a 3-min match is about 3:1, and punches are performed in a condition of pronounced fatigue by the end of a contest [11]. This activity pattern calls for a well-developed power endurance capacity [23]. Such very high-intensity training has also been shown to augment aerobic capacity [24].

The main limitation of this study is its small sample size. However, we wanted to restrict our investigation to high-performance boxers, and it is typical to have a low number of participants in studies of specific populations, especially in particular sports [25, 26]. We believe that the results of the present study are applicable mainly to the development of new training devices and methods for their use in various aspects of sports training is one of the most important tasks, the solution of which will contribute to the intensive growth of sports results.

The use of friction simulators in boxing training has a measurable and statistically significant impact on paw strength in adolescent boxers. The experimental group outperformed the control group across all age ranges, demonstrating that friction-based resistance training leads to enhanced muscular development and improved strength consistency. These findings suggest that integrating friction simulators into a boxer’s training regimen may be an effective method for optimizing performance, particularly during crucial developmental stages. The data presented here provides valuable insights into how resistance training influences hand muscle development and could inform future training protocols for young boxers.

Conclusions

The study on the effectiveness of the “Bizon-1” friction trainer in enhancing boxer training provides valuable insights into its impact on grip strength and punch performance among young athletes. The use of friction-based simulators has been shown to significantly improve paw strength in both hands, particularly when compared to traditional training methods. The data presented demonstrates consistent gains in strength and punch speed across different age groups, with notable statistical significance ($P<0.05$) observed in both the experimental and control groups. The use of the “Bizon-1” device has proven to be effective in targeting muscle groups essential for boxing, such as the hands, wrists, and forearms, thus improving grip strength and muscular coordination. This is critical in a sport like boxing where precise control and power in punches are vital. The statistical analysis, supported by t-tests, indicates that the experimental group benefited significantly more from friction training, showcasing better consistency and enhanced muscle development. The study’s findings suggest that integrating friction simulators into a boxer’s training routine can optimize performance, particularly during growth phases. This approach not only helps in developing power endurance and explosive force but also ensures injury prevention by strengthening the necessary muscle groups. The continued use of such training devices could be valuable in not only boxing but also other sports where grip strength and precise muscle coordination are key. Future research should expand on these findings by exploring the long-term effects of friction-based training, varying intensity and frequency, and its broader applications in athletic development. This study opens avenues for enhancing traditional strength and conditioning programs, potentially leading to more effective training methods and improved athletic performance across various sports.

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Conflict of interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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