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THE EFFECT OF RESISTANCE TRAINING USING TRX IN THE DEVELOPMENT OF SPECIAL STRENGTH AND STRAIGHT PUNCH FOR YOUNG BOXING PLAYERS

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Abstract
There is a wide variety of training methods and strategies that have been developed to assist athletes acquire the mental and physical attributes needed to compete, some of which have been inspired by recent cutting-edge scientific achievements. Methodology for Motor Competence It takes a wide range of motor and physical abilities, honed to an extremely fine point, to succeed in combat sports like boxing. As a result, it employs TRX (Total Body Resistance Training) to develop the necessary strength and deliver a clean blow. To tailor the workouts to the preferences of this demographic psoter group, it integrates all kinds of resistance training, including the use of stiff and elastic cues and belts. To determine the function of TRX resistance training approaches in the aforementioned factors, and to develop TRX resistance training protocols for use with knots, elastic ropes, discs, and weights. Out of the whole population of ten boxers from Al-Rafidain Sports Club, the researcher conducted an experiment. Each of the two groups consisting of five boxers—the experimental and control groups—were chosen at random. Following the post-test, the planned exercises were initiated. Both the experimental and control groups engaged in total-body resistance training with the TRX for a duration of two months. The former group used the TRX while the latter used conventional workouts. After the boxer had completed the resistance training (hanging), the researcher found that his motor skills and muscular strength had improved.

Keywords: TRX Resistance Training, Motor Competence, Muscular Strength, Boxing Athletes, Resistance Training Methods.

Introduction

1. Definition of the Study

1-1 Introduction and Significance of the Study

As a result of significant scientific advancements in the past few decades, several training methods and techniques have been developed with the goal of enhancing the technical and

physical efficiency of athletes so that they may achieve better levels of performance in their sport. Competing at a high level in boxing demands a wide range of motor and physical abilities, all of which must be well tuned in order to succeed. It is a famous example of an individual sport that relies on a combination of great aerobic power, constant preparation, and a wide range of competitive talents. You need to be in tip-top shape to keep your competitive advantage across many rounds.

It is common practice to further subdivide boxing abilities into more specific categories, such as defensive maneuvers, counterpunches, uppercuts, hooks, and straight punches. This study only focused on the straight punch, namely the left and right to the head and trunk, due to the fact that the research sample consisted of juvenile boxers. For many boxers, particularly those just starting out, this is the go-to fundamental punch. Because it is the foundation upon which all other striking methods rest, training should focus on perfecting the straight punch from every technical element and movement route.

As a result, trainers and experts should focus on both the technical and physical components of this skill during training since they are interrelated and form an integral part of the process. Achieving success in athletics becomes much more difficult when any one of these factors is disregarded. A fighter's special strength is the deciding element in a battle and one of the physical abilities that substantially impacts the effectiveness of the straight strike. The innovative researcher has proposed using TRX suspension systems—a set of total-body resistance training tools that comprise "rigid ropes, elastic bands, and straps"—to enhance this physical attribute. In comparison to more conventional approaches, these exercises are better tailored to the needs of young boxers and are more in line with the ideas of contemporary sports training. Modern training necessitates non-traditional approaches that may, in the long run, provide greater gains in physical ability and technical proficiency than the conventional method. Therefore, the current study is important because it helps coaches to know where their athletes are strong and where they need improvement by evaluating the short-term effects of TRX resistance training on special strength and its output, measured as straight punch performance.

1-2 Research Problem

The researcher passionately watched boxing matches and training sessions throughout his career. He noticed that most coaches weren't using modern training methods that focused on physical, motor, and technical capacities, which are crucial for boxing performances. The negative consequences of this restriction become apparent when repeated bouts of intense physical effort take place (1), especially when there is little time for recuperation in between bouts because of insufficient technical and physical training.

At the conclusion of each circuit and during the final one, the investigator saw a decline in physical, motor, and skill-related capacities attributed to exhaustion. Offense and defense both tend to suffer as a consequence of this decline.

So, the issue with the study is that physical and technical skills have dropped significantly, which is because people aren't making enough use of the tools and techniques that help them improve these talents. As a result, this research delves into a typical punching

performance and strength aim utilizing TRX resistance training, focusing on the specific muscle regions in the legs and arms that are essential for throwing fast punches. The training concepts of boxing must include both lower-limb motions that fluidly mix placement and movement with upper-limb striking and competitive activities.

1-3 Objectives of the Study

The study aims to:

1. Design TRX resistance training exercises utilizing rigid ropes, elastic bands, straps, and additional weights.
2. Identify the effect of TRX resistance training on the study variables.
3. Determine the superiority between the two groups in the post-test measurements of the study variables.

1-4 Research Hypotheses

The researcher hypothesizes that:

1. Statistically significant differences exist between the pre- and post-tests of both the experimental and control groups in favor of the post-tests for the study variables.
2. Statistically significant differences exist between the experimental and control groups in the post-tests in favor of the experimental group.

1-5 Scope of the Study

1-5-1 Human Domain: Youth boxing players.

1-5-2 Temporal Domain: From 1/6/2025 to 1/10/2025.

1-5-3 Spatial Domain: Al-Rafidain Sports Club boxing ring.

1) 1-6 Definition of Terms

TRX Device:

The TRX device is defined as a tool designed to utilize body weight as a regulated form of resistance applied to a specific muscle or group of muscles. It may be employed as an auxiliary training method to develop muscular strength and general flexibility or to direct muscular work toward specific movement performance. The device can be used independently or integrated with other training methods to enhance a physical component or improve technical performance [1].

B. 3. Research Methodology and Field Procedures

1) 3-1 Research Method

The researcher adopted the experimental method using the equivalent-groups design due to its suitability to the nature of the study. The experimental approach is considered one of the most efficient methods for obtaining reliable knowledge, as experimentation represents a highly effective means of reaching dependable conclusions [2]. Moreover, it is regarded as the only method capable of providing a true test of hypotheses concerning causal or effect relationships [3].

2) 3-2 Research Population and Sample

The research population consisted of boxing players at Al-Rafidain Sports Club, totaling (10) athletes, representing (100%) of the study population. The sample was randomly divided into two groups: an experimental group and a control group, with (5) players in each group. The division was conducted according to the study variables, as shown in Table (1), after establishing the equivalence of the two groups in the research variables based on the pre-test results.

3) Table (1)

Arithmetic Means and Standard Deviations of the Experimental and Control Groups (Youth Category) in the Pre-Tests for the Purpose of Equivalence

No.	Variable	Unit	Experimental Group (Mean ± SD)	Control Group (Mean ± SD)	Calculated t-value	Significance
1	Height	cm	169.8 ± 7.496	168 ± 6.782	0.398	Non-significant
2	Training Age	years	9.8 ± 2.387	8.4 ± 2.88	0.837	Non-significant
3	Weight	kg	55.4 ± 9.502	54.8 ± 9.011	0.102	Non-significant
4	Explosive Strength of Arms	repetitions	11.20 ± 1.012	10.400 ± 2.066	1.362	Non-significant
5	Speed-Strength of Legs	repetitions	10.40 ± 2.220	9.400 ± 1.473	1.696	Non-significant
6	Speed-Strength of Trunk	repetitions	9.20 ± 1.200	8.340 ± 1.420	1.439	Non-significant
7	Straight Left Punch (Head & Trunk)	score	4.70 ± 3.880	4.90 ± 3.80	0.325	Non-significant
8	Straight Right Punch (Head & Trunk)	score	5.30 ± 2.110	5.20 ± 2.097	0.985	Non-significant

The tabulated t-value at a significance level of (0.05) and degrees of freedom (8) is (1.86). Since all calculated t-values are lower than the tabulated value, this indicates the absence of statistically significant differences between the two groups in the pre-tests, confirming their equivalence.

4) 3-4 Data Collection Tools and Equipment Used

a) 3-4-1 Data Collection Tools

(1) 3-4-1-1 Personal Interviews

The researcher conducted several personal interviews with experts and specialists in the field of sports training science. The outcomes of these consultations contributed to shaping the research idea, defining the research problem, and selecting the appropriate scientific methodology.

5) 3-5 Tools, Equipment, and Means Used in the Research

a) First: Data Collection Tools

- Arabic and foreign references
- Tests and measurement scales

- Personal interviews
- Test result recording forms for the players
- Technical scientific observation

b) Second: Equipment and Means Used

- Iron bar (20 kg), quantity (3)
- Weight plates (1.25 – 2.5 – 5 – 7.5 – 10 – 15 – 20 kg)
- Bench presses, quantity (3)
- Medicine balls (1, 2, 3 kg)
- Electronic weighing scale, quantity (1)
- Sony video cameras with tripods (Japanese manufacture), 100 frames per second, quantity (2)
- CD discs, quantity (2)
- Markers and adhesive tapes
- Elastic resistance bands, quantity (10)
- Boxing ring

3-6 Tests

Tests are regarded as one of the essential means for evaluating the level attained by an athlete, as well as determining the effectiveness of any training program [4].

3-8 Measurement of Physical Abilities (Special Strength)

3-8-1 Two-Handed Overhead Medicine Ball Throw (2 kg) from a Seated Position on a Chair [5]

Purpose of the Test:

To measure the explosive power of the arms.

Equipment and Tools:

- Medicine balls weighing (2 kg)
- Measuring tape

Test Description:

Sitting on a chair, one person uses both hands to hold a medicine ball over their head, while the other rests their trunk on the chair's back. Athletes use a backward grip to keep their belts from drifting forward when they throw by fastening them around their trunks. So that the ball can only be propelled with the arms and not with the trunk's motion.

Conditions:

- The athlete is given three attempts.

Scoring:

- All attempts are recorded and calculated.

3-8-2 Speed-Strength Test of the Legs

This test involves continuous half knee flexion and extension for (15) seconds, with emphasis on keeping the entire foot firmly in contact with the ground. The objective is to perform the maximum possible number of repetitions within (15) seconds.

3-8-3 Speed-Strength Test of the Trunk

This test consists of continuous trunk flexion and extension for (15) seconds, ensuring that the hips remain fixed on the ground. The goal is to perform the greatest possible number of repetitions within (15) seconds.

3-8 Skill Performance Test

(Straight Punch – Left and Right to the Head and Trunk)

Purpose of the Test:

To evaluate the performance of the straight punch (left and right) directed toward the head and trunk.

Required Equipment:

- Boxing gloves (4 pairs)
- Manual stopwatch
- Scoring form
- One video camera

Performance Description:

The exercise is performed by two boxers.

First Test:

The boxer performs the straight left punch directed toward the head and trunk for (30) seconds.

Conditions:

The straight left punch must be executed according to the following criteria:

- Proper extension of the punch
- Follow-through with body weight
- Accuracy in hitting the target

Scoring:

A total of (10) points is awarded for the straight left punch directed to the head and trunk, distributed as follows:

1. Proper extension of the punch – (2 points)
2. Follow-through with body weight – (4 points)
3. Accuracy of target contact – (4 points)

Straight Right Punch Test (Head and Trunk)

The straight right punch test was conducted following the same procedures and scoring criteria as the straight left punch test.

3-9 Pilot Study

The researcher conducted a pilot study on 15/6/2025 using the study sample. The objectives of the pilot study were as follows:

- To verify the suitability and functionality of the equipment and tools used in the tests and exercises.

- To determine the appropriate positioning and height of the video camera for recording the technical performance of the boxer.
- To establish the maximum intensities of the exercises employed in the training program.

3-11 Pre-Test

The researcher conducted the pre-tests on 18/6/2025 prior to the implementation of the training program. The tests were carried out on the research sample at the designated training field in order to obtain baseline measurements for the study variables, namely special strength and the technical performance of the straight punch.

Skill performance was recorded using video analysis. The recorded footage was subsequently presented to a panel of experts and specialists in boxing to evaluate the technical execution of the straight punch according to the established assessment criteria.

3-12 Video Recording

To ensure accurate technical observation, the researcher utilized video cameras operating at a speed of (100) frames per second to capture the studied variables. The cameras were positioned as follows:

1. The initial camera was positioned 2.5 meters away and 1 meter high on the right side of the boxer. These measurements were defined from the pilot study to cover all ranges of the movements.
2. Camera 2 — also used with a virtual camera as well, it was on the left side of the boxer at a distance of (2.5)m at (1)m off the ground.

This arrangement allowed comprehensive documentation of the punching movement from both lateral perspectives.

3-13 Experimental Design

There were two groups in the experimental design: the experimental group and the control group. Both groups were administered a pre-test to assess their original level prior to the implementation of the experimental variable.

The intervention was conducted after the pre-testing phase. The control group maintained traditional training while the experimental group applied total-body resistance training by TRX. The balance exercises were performed for (8) weeks, (3) training units per week.

3-13-1 Resistance Training

The total-body resistance training program was developed according to the following procedures:

- Identification of the most relevant physical fitness components associated with the research problem.
- Construction of TRX-based total-body resistance exercises suitable for developing the identified fitness components.
- Preparation of the exercises in the form of a questionnaire and consultation with experts and specialists to select the most appropriate exercises.

• Application of selected resistance exercises on the sample to determine appropriate training load regulation.

Various resistance tools were employed, including elastic bands, training hammers, and different weight loads. The training units incorporated diverse exercises designed to simulate actual performance patterns in boxing.

3-13-3 Implementation of the Training Program

The training implementation was administered by the researcher starting from 20/6/2025 after the pre-tests were conducted. Both groups that performed TRX were designed as experimental group and a control group, the experimental group were given total-body resistance exercise using TRX, and the control group were continued the conventional training exercise.

The program concluded on 22/8/2025. (3) I was trained three times a week for two months.

3-14 Post-Test

Post-tests were administered to all members of the research sample after the completion of the training program. The tests were conducted under the same conditions as the pre-tests and at the same training venue to ensure consistency and comparability of results.

3-15 Statistical Methods

The researcher employed the Statistical Package for the Social Sciences (SPSS) to analyze the collected data.

4. Presentation of Pre- and Post-Test Results for the Control and Experimental Groups in Special Strength Tests

(Results section to follow.)

C. Table (2)

Arithmetic Means, Standard Deviations, and Calculated t-Values Between the Pre- and Post-Tests for the Control Group in Special Strength Tests

Variable	Unit	Pre-Test (Mean ± SD)	Post-Test (Mean ± SD)	Calculated t-value	Significance
Explosive Strength of the Arms	repetitions	10.400 ± 2.066	13.600 ± 0.785	3.11	Significant
Speed-Strength of the Legs	repetitions	9.400 ± 1.473	11.500 ± 0.630	4.031	Significant
Speed-Strength of the Trunk	repetitions	8.340 ± 1.420	12.70 ± 0.490	2.223	Significant

The tabulated t-value at a significance level of (0.05) and degrees of freedom (4) is (2.123). Since all calculated t-values exceed the tabulated value, statistically significant differences exist in favor of the post-test.

D. Table (3)

Arithmetic Means, Standard Deviations, and Calculated t-Values Between the Pre- and Post-Tests for the Experimental Group in Special Strength Tests

Variable	Unit	Pre-Test (Mean ± SD)	Post-Test (Mean ± SD)	Calculated t-value	Significance
Explosive Strength of the Arms	repetitions	11.20 ± 1.012	14.700 ± 0.600	2.131	Significant
Speed-Strength of the Legs	repetitions	10.40 ± 2.220	13.320 ± 0.380	2.172	Significant
Speed-Strength of the Trunk	repetitions	9.20 ± 1.200	14.250 ± 0.320	2.127	Significant

All calculated t-values exceed the critical value at (0.05), indicating significant improvement in favor of the post-test for the experimental group.

E. 4-1 Post-Test Results for the Control and Experimental Groups in Special Strength Tests

1) Table (4)

Arithmetic Means, Standard Deviations, t-Values, and Significance Levels in the Post-Tests for Both Groups

Variable	Control Group (Mean ± SD)	Experimental Group (Mean ± SD)	t-value	Significance
Explosive Strength of the Arms	13.600 ± 0.785	14.700 ± 0.600	3.956	Significant
Speed-Strength of the Legs	11.500 ± 0.630	13.320 ± 0.380	4.606	Significant
Speed-Strength of the Trunk	12.70 ± 0.490	14.250 ± 0.320	3.545	Significant

The calculated t-values exceed the tabulated value, indicating statistically significant differences in favor of the experimental group.

F. 4-2 Percentage of Improvement for the Control and Experimental Groups in Special Strength Tests

1) Table (5)

Pre- and Post-Test Means and Percentage of Improvement for Both Groups

Group	Variable	Pre-Test (Mean ± SD)	Post-Test (Mean ± SD)	Improvement %
Control	Explosive Strength of Arms	10.400 ± 2.066	13.600 ± 0.785	30.76%
Control	Speed-Strength of Legs	9.400 ± 1.473	11.500 ± 0.630	22.34%
Control	Speed-Strength of Trunk	8.340 ± 1.420	12.70 ± 0.490	52.27%
Experimental	Explosive Strength of Arms	11.20 ± 1.012	14.700 ± 0.600	31.25%
Experimental	Speed-Strength of Legs	10.40 ± 2.220	13.320 ± 0.380	28.07%
Experimental	Speed-Strength of Trunk	9.20 ± 1.200	14.250 ± 0.320	54.89%

The experimental group demonstrated greater improvement percentages compared to the control group in all special strength variables.

G. 4-3 Pre- and Post-Test Results for the Straight Punch (Left and Right)

1) Table (6)

Arithmetic Means, Standard Deviations, t-Values, and Significance Levels for the Straight Punch Tests

Group	**Variable**	**Pre-Test (Mean ± SD)**	**Post-Test (Mean ± SD)**	**t-value**	**Significance**
Control	Straight Left Punch (Head & Trunk)	4.90 ± 3.80	6.40 ± 2.483	7.762	Significant
Control	Straight Right Punch (Head & Trunk)	5.20 ± 2.097	7.70 ± 1.868	3.724	Significant
Experimental	Straight Left Punch (Head & Trunk)	4.70 ± 3.880	8.44 ± 3.500	3.813	Significant
Experimental	Straight Right Punch (Head & Trunk)	5.30 ± 2.110	9.20 ± 2.802	7.378	Significant

The tabulated t-value at (0.05) and degrees of freedom (8) is (2.23). All calculated values exceed this threshold.

H. 4-4 Post-Test Results for the Straight Punch (Left and Right)

1) Table (7)

Variable	**Control Group (Mean ± SD)**	**Experimental Group (Mean ± SD)**	**t-value**	**Significance**
Straight Left Punch (Head & Trunk)	6.40 ± 2.483	8.44 ± 3.500	3.956	Significant
Straight Right Punch (Head & Trunk)	7.70 ± 1.868	9.20 ± 2.802	4.606	Significant

The tabulated t-value at (0.05) and degrees of freedom (8) is (2.09). The results indicate significant differences in favor of the experimental group.

I. 4-5 Percentage of Improvement in the Straight Punch (Left and Right)

1) Table (8)

Group	**Variable**	**Pre-Test (Mean ± SD)**	**Post-Test (Mean ± SD)**	**Improvement %**
Control	Straight Left Punch	4.90 ± 3.80	6.40 ± 2.483	30.61%
Control	Straight Right Punch	5.20 ± 2.097	7.70 ± 1.868	71.11%
Experimental	Straight Left Punch	4.70 ± 3.880	8.44 ± 3.500	79.57%
Experimental	Straight Right Punch	5.30 ± 2.110	9.20 ± 2.802	73.58%

The experimental group achieved markedly higher improvement percentages in both left and right straight punches compared to the control group, indicating the effectiveness of TRX-based resistance training in enhancing technical punching performance.

J. 4-6 Discussion of the Results of the Pre- and Post-Tests for the Control and Experimental Groups in Special Strength and Straight Punch Performance

Tables (2) and (3) revealed statistically significant differences between the pre- and post-tests for both the control and experimental groups in the variables of explosive strength of

the arms and speed-strength of the legs and trunk, in favor of the post-test. Likewise, Table (6) demonstrated significant differences between the pre- and post-tests for both groups in the straight punch skill (left and right), also in favor of the post-test.

These significant differences may be attributed to the development of physical abilities, particularly special strength, and its relationship to the improved functional performance of the working muscles among boxers. For the control group, improvement can be linked to the conventional training exercises applied during the program. For the experimental group, the gains are associated with resistance training using TRX, the structured training environment, and the application of training adaptation principles through well-designed exercises that enhanced performance efficiency.

Tables (4) and (7) further indicated statistically significant differences in the post-tests of strength variables and straight punch performance between the control and experimental groups, in favor of the experimental group. The superiority of the experimental group may be explained by the positive impact of the proposed training program based on total-body resistance training using TRX and elastic bands and weighted tools. These methods likely enhanced players' motivation and increased training intensity, which in turn improved muscular efficiency and contributed to the development of special strength.

Improved special strength positively influenced explosive arm power and speed-strength of the legs and trunk, leading to enhanced execution of the straight punch (left and right). Strength development exercises that involve directional changes and varied body positions also appear to have contributed to improvements in agility and coordination, both essential components in boxing performance.

Sareeh and Wahbi (2007) emphasized that muscles should be trained across all types of muscular contractions to increase their effectiveness and efficiency [6]. Repeated performance of exercises contributed to optimizing both eccentric and concentric contraction phases, thereby enhancing the muscle's ability to contract more rapidly during consecutive movements in explosive strength training [7].

According to Burns (2007), suspension training is a type of functional resistance training that aims to apply force production to movement patterns related to performance based movement, which are performed across integrated multi-planar actions [12]. The researcher controlled for both adherence to the actual movement pathway of the skill and for progressive loading across muscle groups.

According to Ralf Gunter Jabs, speed-strength training means exercising against resistance in the movement characteristics of the competitive event, at maximum speed of movement and frequency at moderate-to-high movement volumes with low total training volume to avoid performance suppression by fatigue [8]. Stamper also said that increasing strength in both the arms and legs will directly improve performance times [9].

Pigeon (2005) defined suspension resistance training as appropriate for both novice and advanced trainers, further stating the purpose of suspension training to be the application of strength the muscles gain through resistance training while noting, "the key to balanced musculature requires motor control training in which the strengthening of an isolated muscle aids in simultaneous recruitment in static and dynamic activities" [10]. Similarly,

Suk et al. TRX suspension exercises (2015) are new types of resistance training whereby ropes and straps enable the user to use their body weight as part of the exercise, thereby providing a degree of controlled resistance that can be varied by changing the body position in relation to the angle of the body and gravity [11].

The researcher ends with the statement that dynamic strength training performed by TRX helped in developing force output in the dynamic movement system in boxing. But in boxing we have to force at all times directed to the opponent in motion while transferring and maintaining stability to prepare to continue. The best boxers use just enough force, hit in proportion to how much the opponent is applying on the other side, and quickly chain together blow after blow.

K. 5. Conclusions and Recommendations

1) 5-1 Conclusions

1. While the differences between the post-tests of the control and experimental groups were found statistically significant in favor of the the experimental group.
2. Resistance (suspension) training has a positive effect on special strength variables, such as explosive arm power and the speed-strength of the trunk and legs in this experimental group.
3. Resistance training of suspension training helped for progressing device power and preceding operation as proven in post-tests.
4. For the arms, legs, and trunk, TRX-based resistance training had a positive impact on muscular strength.

2) 5-2 Recommendations

1. TRX resistance training should be added to wrestling, fencing, and weightlifting.
2. We recommend Viper-EX movement training methods here to developing physical capabilities out at peak performance in the throwing and jumping events.
3. Additional research should be aimed to analyse the influence of these exercises on kinematic parameters.

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