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Effect of self-propulsive strength exercises on the development of specific muscular abilities and selected holds in greco-roman wrestling athletes

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Abstract

The purpose of the study is to design self-propulsive strength exercises to build some specific muscular skills and the choice of Greco-Roman wrestling holds. It further aims to determine the impact of self-propulsive strength training to gain these muscular skills and to improve some of the important wrestling techniques. The experiment method was used because it is appropriate in solving the research problem because it involves two groups of equal size, that is, experimental and the control group. The groups were balanced in terms of all conditions except experimental which was done in the experimental group. The experimental group was planned to rely on a training program based on self-propulsive exercises as the control group remained training through the old method that the coach used.

The researcher came up with a number of major findings and recommendations. One of the most significant findings was that the self-propulsive strength training program was effective to enhance the particular strength and explosive strength of the arms and legs of the involved athletes. The show also helped the invention of some of the necessary Greco-Roman wrestling positions. In view of these results, this study provides that to improve such physical capabilities and fundamental wrestling techniques, there is a need to continuously implement ballistic-style training in sports training programs, particularly in the special preparation stage. It also focuses on the necessity of uniting self-propulsive strength exercises in a combination (physical and technical) fashion, especially during the special preparation period, in order to realize physical and technical performance improvements tangibly.

Keywords: Self-propulsive strength, specific muscular abilities, holds, greco-roman wrestling

1. Introduction

Sports training science is a wide industry that has evolved through the advancement of different sports and the numerous approaches that coaches use to convert the theoretical knowledge into the real world. The main object is the qualified coach, whose activity is based on the extensive scientific knowledge and the experience. This base allows the coach to identify meaningful exercises that will facilitate the develop of an athlete who is strong-willed and resilient so that he or she can withstand the training requirements and rigors to achieve the skills and qualities that are unique to that particular sport.

Every proper training is based on the application of scientifically valid methods that seem to be adequate to the aspect of training that is being developed, be it physical or technical. The coach needs to know how to adopt the most appropriate approach to use in the specific sport they operate in, and this necessitates the coach to consider different training techniques to enhance any aspect of physical fitness in order to get the desired results. The history of Greco-Roman wrestling is full of experiences, victories, and setbacks, which have seen it pass through various stages of growth and evolution to its present sophisticated and high level performance. It involves long-term and uninterrupted training, because it incorporates physical strength, technical performance, tactical sensitivity as well as psychological conditioning. One of the requirements that make the athlete perform optimally is physical fitness, especially.

The strength training on the self-propulsion is one new training method whereby the coach can come up with a good program to improve muscular power and speed. This technique is also explosive, as it combines the plyometric exercise with weightlifting and consists of

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comparatively light weights lifted at a high pace.

The importance of the study is the design of a training program based on the method of self-propulsive strength with the purpose to train particular muscle skills regarding a set of Greco-Roman wrestling holds.

2. Research Problem

One of the oldest sports is Greco-Roman wrestling which has become a very popular and much spread sport in many countries around the world owing to the fact that it has technical skills that are of high quality and it improves fitness and wellbeing besides other benefits. Since the researcher is also among the coaches in Greco-Roman wrestling, he has noticed observable deficiencies in the particular muscular strength concerning wrestling holds in the high-level wrestlers. Another significant aspect that attracted the attention of the researcher is the marginal or inadequate application of modern training programs in this sport programs that lead to the development of particular muscular strength that is fundamental in Greco-Roman wrestling, and provides the basis of technical performance in the athletic activity.

This situation prompted the researcher to design self-propulsive strength exercises aimed at developing these specific muscular abilities and to investigate their impact on selected wrestling holds in Greco-Roman wrestling. Furthermore, the study seeks to determine the effectiveness of the proposed training program within the training process and to explore how coaches can apply this program to improve athletes' abilities.

2.1 Research Objectives

1. To design self-propulsive strength exercises aimed at developing certain specific muscular abilities and Greco-Roman wrestling holds.
2. To identify the effect of self-propulsive strength exercises on improving specific muscular abilities and selected Greco-Roman wrestling holds.
3. To determine the percentage of improvement in specific muscular abilities and selected Greco-Roman wrestling holds resulting from the self-propulsive strength training program.

2.2 Research Hypotheses

1. There are statistically significant differences between the

pre-test and post-test results of the control and experimental groups in certain specific muscular abilities and Greco-Roman wrestling holds.

2. There are statistically significant differences between the post-test results of the control and experimental groups in certain specific muscular abilities and Greco-Roman wrestling holds.

2.3 Research Fields

- **Human Field:** Athletes of Al-A'zamiyah Sports Club.
- **Time Field:** From 21/5/2025 to 13/7/2025.
- **Place Field:** Al-A'zamiyah Sports Club Hall, Baghdad - Al-A'zamiyah.

3. Research Methodology and Field Procedures

3.1 Research Method

The researcher employed the experimental method due to its suitability for addressing the research problem. This was done using two equivalent groups control and experimental where both groups were made fully equal in all conditions except for the experimental variable applied exclusively to the experimental group.

3.2 Research Sample

The researcher intentionally selected the sample from advanced-level Greco-Roman wrestlers at Al-A'zamiyah Sports Club. The sample consisted of 16 athletes who continued regular training and possessed the necessary conditions for implementing the research procedures.

The sample was randomly divided by lottery into two equivalent groups:

- **Experimental group:** 6 athletes
- **Control group:** 6 athletes

Four athletes were excluded due to their commitments with the national teams for advanced-level wrestlers.

To ensure equivalence in physical performance and in selected basic wrestling holds, the researcher analyzed the pre-test results of both groups using the t-test. The calculated t-values for all tests were lower than the tabulated value of 1.76, indicating the absence of statistically significant differences between the two groups. This confirms that the sample groups were equivalent, as shown in Table (1).

Table 1: Sample Equivalence Results

Variables	Control Group		Experimental Group		Calculated (t)	Difference
	-Mean	± SD	-Mean	± SD		
Upper Body Strength with Arm Speed	13.88	1.55	13.63	1.30	0.35	Not significant
Lower Body Strength with Leg Speed	32.00	1.69	32.5	1.60	0.61	Not significant
Explosive Strength of the Arms	4.34	0.41	4.40	0.42	0.30	Not significant
Explosive Strength of the Legs	2.24	0.63	2.22	0.62	0.23	Not significant
Hamal Hold	4.63	0.92	4.50	0.93	0.27	Not significant
Sakif Hold	4.13	0.64	3.88	0.64	0.78	Not significant
Pulling Hold	3.75	0.89	4.00	1.19	0.48	Not significant

3.3 Research Tools, Equipment, and Instruments

The researcher used the necessary tools and instruments, whether data, samples, or devices, which were prepared, arranged, and organized to be utilized in the practical work efficiently, accurately, with minimal effort, and in the shortest possible time.

3.3.1 Tools Used

- Al-A'zamiyah and international references and sources.
- The Internet.
- Personal interviews.

- Information extraction forms to identify the most important tests for specific muscular and technical abilities relevant to Greco-Roman wrestling.

3.3.2 Equipment and Devices Used in the Research

- Electronic scale for measuring body mass.
- Stopwatch (2 units).
- Wrestling hall.
- Wrestling mat.
- Taekwondo paddles (16 units).
- Wrestling dummy (16 units).
- Exercise bag (2 units).
- Leg weight cuffs (16 units).
- Arm weight cuffs (16 units).
- Medicine balls of various weights (5 units).
- Whistle (2 units).
- Measuring tape (1 unit).
- Chalk.
- Chair (1 unit).
- Dumbbells of different weights.
- Barbell.
- Front leg curl machine (1 unit).
- Rear leg curl machine (1 unit).
- Pushdown machine (1 unit).
- Weight vests (8 units).
- Camera (Sony).

3.4 Identification of the Most Important Physical Abilities and Holds in Greco-Roman Wrestling

Based on the researcher's experience in Greco-Roman wrestling, the dependent variables of the study were determined according to his knowledge and understanding of the research problem. Accordingly, the dependent variables were selected within the researcher's perspective, focusing on the sport-specific physical abilities, as well as identifying the wrestling holds derived from these specific physical abilities.

3.5 Tests Adopted in the Research

3.5.1 Physical Tests

3.5.1.1 Test of Specific Strength with Arm Speed (1)

3.5.1.2 Test of Specific Strength with Leg Speed (1)

3.5.1.3 Test of Explosive Strength of the Legs (2)

3.5.1.4 Test of Explosive Strength of the Arms (3)

3.5.2 Identification of the Most Important Tests for Basic Greco-Roman Wrestling Holds

Evaluation of Technical Performance of Throwing Holds

The researcher relied on the sequence of holds according to their difficulty, as he is familiar with all wrestling techniques. Each skill was evaluated by three judges (see Appendix 3). The tested athletes were recorded using high-resolution cameras from different angles. The resulting recordings were then distributed on CDs to the evaluators for both pre-test and post-test assessments for the control and experimental groups.

- **Performance Specifications:** The wrestler in test has the holds that are visualized in the video and hence the evaluators can give marks. The movement was divided into three sections namely preparation phase, which is worth 3 points; the main phase which is worth 4 points and the final phase which is worth 3 points.

3.6 Scientific Foundations of the Tests

The researcher used the tests on a sample of 5 athletes of Al-

A'zamiyah Sports Club in order to identify the scientific basis of the tests prior to conducting the exploratory experiment. Validity, reliability and objectivity measures were, however, obtained as in Table (2).

3.6.1 Test Validity

One of the necessary criteria of a good test is validity, which is said to be the ability of a good test to measure what it was intended to measure (1). The researcher applied content validity to guarantee the validity of the tests and this was achieved through a group of experts and specialists. They concurred that the tests are correct when gauging the attribute or ability that they are intended to measure.

3.6.2 Test Reliability

A test is good, and reliability is considered to be the quality of a test such that it can give the same or close results when used on the same situation several times. The researcher was testing the reliability of the tests hence he employed the test-retest technique where the same tests were administered to the same sample after 7 days. The correlation coefficient of the two applications was determined and it indicated the high rate of test reliability.

3.6.3 Test Objectivity

Another test requirement is objectivity. An objective test is one that gives a consistent score to the test during differences in the evaluators. "A good objective test minimizes doubt and disagreement among evaluators during application". The Pearson correlation coefficient was calculated between the results of the evaluators, and the results indicated a high degree of objectivity in the tests.

Table 2: Shows the validity, reliability, and objectivity coefficients of the tests used.

S	Tests	Validity	Reliability	Objectivity
1	Specific Strength with Arm Speed	0.96	0.93	0.93
2	Specific Strength with Leg Speed	0.93	0.87	0.95
3	Explosive Strength of the Arms	0.94	0.89	0.89
4	Explosive Strength of the Legs	0.93	0.88	0.84

3.7 Exploratory Trials

Exploratory trials serve as practical training for the researcher to personally identify the strengths and weaknesses encountered during the testing process, with the aim of addressing them in advance (1). The researcher conducted the exploratory trial on a sample of 5 athletes on 8/5/2025.

The objectives of this trial were:

1. To ensure the suitability of the equipment and tools used.
2. To train the assisting team in administering the tests and recording the results (*).
3. To determine the time required for each test and for all tests combined.
4. To assess the ability of the sample to perform the tests.
5. To evaluate the appropriateness of the exercises for the research sample.

The exploratory trial demonstrated the following:

1. The assisting team was adequate.
2. The equipment and tools used in the research tests were suitable.
3. The exercises were appropriate for the research sample.
4. The exercises were organized in a manner that did not negatively affect the performance of the sample.

3.8 Field Research Procedures

3.8.1 Pre-Tests

The pre-tests began at 11:00 AM on Friday, 13/5/2025, in the hall of Al-A'zamiyah Sports Club. The tests included:

1. Explosive strength of the arms
2. Explosive strength of the legs
3. Specific strength with arm speed
4. Specific strength with leg speed

The tests also included evaluations of basic Greco-Roman wrestling holds, conducted at 11:00 AM on Saturday, 14/5/2025.

3.8.2 Main Experiment

After presenting the program to experts and specialists in the field of physical education and incorporating all their recommendations and required modifications, the detailed program was applied to the experimental group from Saturday, 21/5/2025 to Wednesday, 13/7/2025.

- **Program Duration:** 2 months
- **Number of Training Units:** 24 units
- **Units per Week:** 3 units
- **Total Program Time:** 543 minutes and 40 seconds
- **Days of Training:** Saturday, Monday, Wednesday
- **Time of Each Training Unit:** 6:00 PM
- **Training Location:** Al-A'zamiyah Sports Club Hall
- **Program Objective:** To develop specific strength of the

arms and legs, enhance explosive strength of the arms and legs, and improve wrestling holds derived from the specific abilities in Greco-Roman wrestling.

The control group continued training according to the regular program.

For detailed information, see the training methodology.

3.8.3 Post-Tests

After implementing the training program on the research sample, the researcher conducted the post-tests on Tuesday, 19/7/2025, at 6:00 PM in the hall of Al-A'zamiyah Sports Club. The same procedures used in the pre-tests were followed, taking into account the same temporal, spatial, and environmental conditions, as well as using the same testing tools and instruments as in the pre-tests.

3.9 Statistical Methods

The researcher used the ready-made statistical package **SPSS** to process the data and obtain results in a manner that serves the objectives of the study.

4. Presentation, Analysis, and Discussion of Results

4.1 Presentation of Physical Abilities Test Results

4.1.1 Presentation of Pre-Test and Post-Test Results for the Physical Abilities of the Experimental Group

Table 3: The following shows the arithmetic mean, mean differences, standard deviation of the differences, calculated t-value, and level of significance for the experimental group in the physical abilities tests for both the pre-test and post-test. The tabulated t-value at 7 degrees of freedom and a significance level of 0.05 is 1.895.

S	Test	Unit of Measurement	Pre-Test Mean	Post-Test Mean	F-	F-H	Calculated (t)	Statistical Significance	Percentage of Improvement
1	Specific Strength with Arm Speed	Repetition	14.12	16.12	2.00	1.92	2.93	Significant	12.40%
2	Specific Strength with Leg Speed	Meter	32.50	34.25	1.75	2.25	2.19	Significant	5.10%
3	Explosive Strength of the Arms	Meter	4.40	5.53	1.13	1.07	2.98	Significant	20.43%
5	Explosive Strength of the Legs	Meter	2.21	2.35	0.14	0.23	2.85	Significant	5.95%

4.1.2 Presentation of Pre-Test and Post-Test Results for the Physical Abilities of the Control Group

Table 4: Shows the arithmetic mean, mean differences, standard deviation of the differences, calculated t-value, and level of significance for the control group in the physical abilities tests for both pre-test and post-test.

S	Test	Unit of Measurement	Pre-Test Mean	Post-Test Mean	F-	F-H	Calculated t	Statistical Significance	Percentage of Improvement
1	Specific Strength with Arm Speed	Repetition	13.50	14.25	0.75	0.89	2.39	Significant	5.26%
2	Specific Strength with Leg Speed	Meter	29.75	30.38	0.63	1.30	1.36	Not Significant	2.07%
3	Explosive Strength of the Arms	Meter	4.46	4.51	0.05	0.046	3.06	Significant	1.10%
4	Explosive Strength of the Legs	Meter	2.02	2.18	0.16	0.37	1.24	Not Significant	7.33%

The tabulated t-value at 7 degrees of freedom and a significance level of 0.05 is 1.895.

4.1.3 Presentation of Post-Test Results for Physical Abilities of the Experimental and Control Groups

Table 5: Shows the arithmetic means, standard deviations, calculated and tabulated t-values, and statistical significance for the experimental and control groups in the post-tests

S	Test	Control Group		Experimental Group		Calculated t	Statistical Significance
		Mean-	±SD	Mean-	±SD		
1	Specific Strength with Arm Speed	14.25	1.90	16.12	1.12	2.39	Significant
2	Specific Strength with Leg Speed	30.38	1.76	34.25	1.75	4.40	Significant
3	Explosive Strength of the Arms	4.51	0.56	5.53	0.93	2.63	Significant
4	Explosive Strength of the Legs	2.18	0.16	2.35	0.18	1.98	Significant

*The tabulated t-value reached 1.76 at a significance level of 0.05 and 14 degrees of freedom.

4.1.4 Analysis and Discussion of Physical and Motor Abilities Tests

By reviewing the pre-test and post-test results for the experimental group, a significant difference was observed in favor of the post-test. The researcher explains this by the fact that the planned training program was effective, and the researcher designed it in compliance with the valid scientific principles that suit the nature and capacities of this group of the athletes. The exercises were introduced slowly in terms of difficulty and repetition and the items that comprised the exercise were varied according to the group level. The program was expected to build up these abilities gradually, through incremental increase of the intensity of the training units and modulating the training load through the ballistic training method. According to this strategy, the working and rest times were manipulated closely and the number of repetitions of the exercise.

The results on the pre-test and the post-test of the control group showed that there were slight significant differences in the tests of specific strength with arm speed and explosive strength of the arms, which had more favorable results in the post-test. The researcher ascribes this to the frequent training program of the players that failed to incorporate activities that focused on self-propulsive power, and instead, the focus was on the traditional training routine that was developed by the coach. Concerning the specific strength tests using the leg speed and the explosive strength of the legs, the test did not show any statistically significant difference between the pre-test and post-test.

The differences in training intensity influenced the production

of a particular adaptation in the working muscle groups. Self-propulsive exercises play a great role in developing the motor speed of the players by increasing the particular speed-strength of the leg and arm muscles. A new approach is self-propulsive strength training that enables the coach to develop a productive training program with the goal of developing muscular strength and speed. It is typified by explosive execution, a combination of plyometric and resistance training and lifting relatively light weights and at high speed.

This achieved superiority is the result of using training exercises that closely resemble the nature of performance in Greco-Roman wrestling holds, ensuring specificity in training. As noted by Brain, "The golden rule of any training program is specificity, meaning that the movements performed by the athlete during training must closely resemble the movements they will encounter during competition.

The use of light to moderate loads performed at maximum speed stimulates the fast-twitch muscle fibers in the working muscles. This, in turn, enhances the speed of skill performance by applying force at maximum velocity, which is essential in Greco-Roman wrestling. This is supported by Michael Stone and others, who stated that "ballistic training increases the muscles' ability to contract faster and more explosively throughout the range of motion at all movement velocities.

4.2 Presentation of Skill Tests Results

4.2.1 Presentation of Pre-Test and Post-Test Results for Skill Tests of the Experimental Group

Table 6: Shows the arithmetic mean, mean differences, standard deviation of the differences, calculated t-value, and level of significance for the experimental group in the basic wrestling holds for both pre-test and post-test.

S	Test	Unit of Measurement	Pre-Test Mean	Post-Test Mean	F-	F-H	Calculated t	Statistical Significance	Percentage of Improvement
1	Hamal Hold	Degree	4.50	7.37	2.87	1.24	6.52	Significant	38.94%
2	Takef Hold	Degree	3.87	7.50	3.62	1.18	8.63	Significant	48.4%
3	Pulling Hold	Degree	4.01	7.75	3.75	1.28	8.27	Significant	48.25%

The tabulated t-value at 6 degrees of freedom and a significance level of 0.05 is 1.895.

4.2.2 Presentation of Pre-Test and Post-Test Results for Skill Tests of the Control Group

Table 7: Shows the arithmetic mean, mean differences, standard deviation of the differences, calculated t-value, and level of significance for the control group in the basic wrestling holds for both pre-test and post-test.

S	Test	Unit of Measurement	Pre-Test Mean	Post-Test Mean	F-	F-H	Calculated t	Statistical Significance	Percentage of Improvement
1	Hamal Hold	Degree	4.00	4.70	0.75	0.89	2.39	Significant	14.89%
2	Takef Hold	Degree	4.00	4.88	0.88	0.84	2.96	Significant	18.03%
3	Pulling Hold	Degree	4.50	4.75	0.25	1.04	0.68	Not Significant	5.26%

The tabulated t-value at 7 degrees of freedom and a significance level of 0.05 is 1.895.

4.2.3 Presentation of Post-Test Results for Skill Tests of the Experimental and Control Groups

Table 8: Shows the arithmetic means, standard deviations, calculated and tabulated t-values, and statistical significance for the experimental and control groups in the post-tests of skill performance.

S	Test	Control Group		Experimental Group		Calculated t	Statistical Significance
		Mean-	±SD	Mean-	±SD		
1	Hamal Hold	4.75	0.71	7.27	0.91	6.41	Significant
2	Takef Hold	4.87	0.64	7.50	0.92	6.59	Significant
3	Pulling Hold	4.75	0.70	7.75	0.46	10.04	Significant

*The tabulated t-value reached 2.14 at a significance level of 0.05 and 14 degrees of freedom.

4.2.4 Discussion of Skill Tests Results

Observing the results above reveals significant differences between the post-tests of the experimental and control groups

in favor of the experimental group. The researcher explains this by the fact that they subject themselves to various and particular self-propulsive strength exercises, which result in

improved performance of the skills. The difference in the initial points and the final points of the exercises is an effective contributor towards skill development. Abdelghafar Jabbari (2012) gave the following cognizant statement in support of this suggestion: To support the principle of specificity in training muscular strength, developmental means of muscular strength development should meet the nature of elongation and shortening of sporting skills. The point of training is to conserve as much kinetic energy as possible so that the switching between the lengthening contraction phase and shortening contraction phase could happen at the highest speed possible. This shift is referred to as reference strength and the capability to produce muscular force hastily is known as the speed of development rate. This rate depends on methods of development of the rapid strength, such as ballistic and plyometric training.

The researcher also explains this disparity by the fact that Greco-Roman wrestling takes self-strength exercises, which quantifies the capacity of the competitor to produce a force rapidly with little dependence on external aid: quantifying ability in both stationary and dynamic conditions, and enhancing balance, stability, and fatigue. It is also associated with neuromuscular accommodation, which minimizes the risk of injury and enables high-level performance with repeated high-level performance.

Greco-Roman wrestling is all about power exercising which forms a strong base to control. Wrestlers use pulling, pushing, single-lift, and fixed apparatus to strengthen and increase flexibility of the core. Stabilization of the opponent and prevention of collisions are impossible without motor strength and endurance. Exercises on the shoulders, back and hips enhance stability and train the capacity to make prompt and changes in the performance.

Consequently, the researcher points out that the design of internal propulsive strength exercises is a critical tool in the designing of specific speed-strength in both arms and legs, and explosive power that is important in Greco-Roman wrestling. Propulsive strength is the possibility to produce a high level of force quickly as a result of neuromuscular coordination and the optimal application of technical posture, breathing, and the center of gravity control.

In the case of the arms, this strength is transferred into the accurate accelerations in the grip of the wrestler and allows a series of explosive actions of pulling, lifting and twisting with the help of wrestling holds like the Hamal Hold, Sakef Hold and the Pulling Hold. In the case of the legs, speed-strength depends on fast movement of the hips, knees and ankles with core spinal stability to ensure that the wrestler has a solid foundation to stand on and a forward push to the opponent.

Relation to Greco-Roman wrestling holds

- The Hamal Hold enhances pushing and sliding ability.
- The Sakef Hold accelerates angle adjustment and stabilization.
- The Pulling Hold supports explosive execution in strategic movements.

Through balanced training, wrestlers achieve high control over locks, twists, and stabilization, ensuring that explosive strength in the arms and legs is combined with technical precision and confidence. Overall, internal propulsive strength exercises integrated with explosive training create a skilled wrestling performance that relies on speed of execution and accuracy in the holds.

5. Conclusion and Recommendations

5.1 Conclusion

Based on the test results and their discussion, the researcher was able to reach several conclusions as follows:

1. The training program using the self-propulsive strength method prepared by the researcher led to the development of specific speed-strength and explosive strength in the arms and legs of the research sample players.
2. The training program using the self-propulsive strength method prepared by the researcher contributed to the development of certain types of basic Greco-Roman wrestling holds for the research sample players.
3. The percentage of improvement was high for all physical and skill tests of the experimental group compared to the control group.

5.2 Recommendations

1. To use ballistic training continuously during sports training, especially by our coaches during the special preparation period, to develop these physical capacities and important Greco-Roman wrestling holds.
2. To emphasize the use of the self-propulsive strength method in a mixed form (physical and skill-based), particularly during the special preparation period, to achieve significant development in physical and skill preparation.
3. To conduct practical studies on this training method for complex offensive and defensive skills, as it plays an important role in improving technical performance and completing the physical and skill preparation of the player.

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