



The Effect Of Resistance Training Using The Vertimax Method On Developing Explosive Leg Power And Accuracy In The Volleyball Spike For Young Players

Ali Ammar Yasser, Zainab Nabil Lafta , Haider Sadiq Makki

*Corresponding Author: ali.ammaryasser@alayen.edu.iq

^{1,2,3}College of Physical Education and Sport Science, Al-Ayen Iraqi University, An Nasiriyah, Iraq

Abstract

The importance of this research lies in the researcher's attempt to use resistance training with the Vertimax method to develop explosive leg power, in addition to achieving accuracy in performance by reaching the highest possible height to hit the ball, thus achieving better performance in the game. Volleyball: The research problem stems from monitoring the developments in volleyball in general, and the development of the spiking skill in particular at the local level, given its impact on match results. Researchers observed that the technical level of this skill is not consistent. With the advancements in sports training and volleyball, and the significant weakness and inconsistency among players in the accuracy of their spikes, researchers have sought to utilize resistance training with the Vertimax method to develop explosive power. The research aimed to develop resistance training using the Vertimax method to improve leg explosive power and volleyball spiking accuracy, and to identify statistical differences between pre- and post-tests of strength. The explosiveness and accuracy of the volleyball smashing skill, and the researchers used the experimental method in the single group style to suit the nature of the problem in order to obtain accurate information and results. The experimental method is one of the most efficient means of reaching reliable knowledge. The research population consisted of (16) players from the Akkad Sports Club, from which (10) players were selected to represent the research sample, constituting (62.50%) of the population. One of the most important conclusions was that resistance training using the Vertimax method had a significant impact on development. The explosive power of the two men in the research group is such that these exercises work to develop the ability.

Keywords: Resistance training, the VertiMax device, explosive leg power, and the accuracy of the spike skill.

1- Introduction to the Research:

1-1 Research Introduction and its Importance:

The sports sector today constitutes a vital aspect of life due to its importance in many different fields. This importance is evident through the ongoing research and investigation into how to improve and develop this vital sector, which contributes to multiple areas, most importantly health. Society and increased productivity, as well as specialized, high-performance sports, are a major concern for many developed countries. This involves finding ways to prepare and develop athletic champions and to achieve top positions in championships and sporting events, which will make those [countries/entities]... Countries are a model of progress and development, and therefore it is no wonder that sports have become a measure of the progress and advancement of nations.

The multiplicity of performance improvement methods, all aimed at developing skill levels, has a significant and substantial impact on enriching coaches and those interested in this field with everything available to delve into regarding sports in general and volleyball in particular, in the field of scientific research or training. The athlete's ultimate goal is to reach the highest levels, and training methods and techniques play a crucial and effective role in developing and preparing the player. Among these training methods are resistance training, which focuses on building the player's lower limb muscle strength through consistent practice. In performing resistance exercises and using them according to what the specialized sport requires, including the game of volleyball, which is characterized by the multiplicity of its offensive and defensive skills, and among those skills is the skill of the smash hit.

The smash is a key offensive skill that plays a crucial role in deciding game points. Therefore, those working in this field focus on improving players' proficiency in this skill, thereby raising the team's overall technical performance through diversifying offensive smash techniques. The different playing areas make it easier to deceive the opposing team's defenses, such as the block and defensive lines, thus allowing for easy scoring. To achieve this, it is necessary to use drills that target and develop the players' various weaknesses. The researcher aimed to utilize resistance training exercises using the Vertimax device. Therefore, the importance of this research lies in the researcher's attempt to use resistance training exercises with the Vertimax device to develop explosive leg

power, in addition to achieving accuracy in performance. By reaching the highest possible height to hit the ball, thus achieving the best performance in volleyball.

1-2 Research Problem:

Through monitoring the developments in volleyball in general, and the development of the spike skill in particular at the local level, and considering its impact on match results, researchers observed that the technical level of this skill does not align with the advancements in sports training and the field of volleyball. There is a significant weakness and inconsistency among players in the accuracy of their spiking technique.

Therefore, researchers sought to use resistance training with the Vertimax method to develop explosive leg power and spiking accuracy in volleyball.

1-3 Research Objectives:

- 1- To develop resistance training exercises using the Vertimax method to improve leg explosive power and the accuracy of the volleyball spike.
- 2- To identify statistical differences between pre- and post-tests of leg explosive power and the accuracy of the volleyball spike.

1-4 Research Hypotheses:

- 1- There are statistically significant differences between the pre-tests and post-tests for the research group, favoring the post-tests.

1-5 Research Scope:

1-5-1 Human Scope: Players of the Aked Volleyball Club's youth team for the sports season.

1-5-2 Time Scope: November 1, 2025 – March 15, 2026.

1-5-3 Spatial Scope: The Aked Volleyball Club's indoor hall.

2- Research Methodology and Field Procedures:

2-1 Research Methodology:

The researchers used the experimental method with a single group approach to suit the nature of the problem in order to obtain accurate information and results.

The experimental method is considered one of the most efficient means of reaching reliable knowledge.

2-2 Research Population and Sample:

The selection of the research sample is closely linked to the objectives set by the researcher for their research. Often, when studying a phenomenon, it is difficult for the researcher to utilize the entire population, as it is often impossible or even impossible to select, observe, or measure all these individuals under controlled conditions. Therefore, researchers select a sample representative of the original population.

The research population consisted of (16) players from the Akkad Sports Club, and (10) players were selected to represent the research sample, constituting (62.50%) of the population.

2-3 Sample Homogeneity:

To verify sample homogeneity, the researchers implemented several procedures to control variables, even though the selected sample was from a similar age group. Therefore, statistical methods were used, specifically the arithmetic mean and standard deviation. The coefficient of variation for morphological measurements is used to determine whether or not there is a difference, as illustrated in Table (1).

It was established that the value of the coefficient of variation is less than 30%, and sources indicate that the lower the coefficient of variation, the more homogeneous the sample.

Table (1) shows the homogeneity of the research sample in age, height, and weight using the coefficient of variation, which shows values less than 30%.

on	Morphological measurements	Unit of measurement	Arithmetic Mean	Standard Deviation	Coefficient of Variation
1	Chronological age	Year	17.25	1.69	%9.79
2	Body mass	kg	79.95	3.34	%4.17
3	Height	cm	180.02	3.25	%1.80

2-4 Methods and Tools Used:

□ Methods of Information Gathering:

- Arabic and foreign sources.
- Observation and analysis.
- Experimentation.
- Testing and measurement.

□ Tools and Devices Used:

- Measuring tape.
- Vertimax device.
- Medical balance.
- Whistle.
- Manual stopwatch.
- A Dell Ci7 laptop computer (Irish made)
- A regulation volleyball court
- (10) regulation volleyballs

2-5 Tests used in the research:

First: Test to measure the explosive power of the legs (Amr Allah Al-Basati: 1998):

- Test name: Standing long jump test (Qais Naji Abdul Jabbar and Bastawisi Ahmed: 1987). Purpose of the test: To measure the explosive power of the legs.

Equipment: Measuring tape – plasterboard – two parallel lines 5 meters apart.

Performance description: The subject stands behind the take-off line and begins a powerful jump from a bent knees position. The torso leans slightly forward, ensuring both footwork and landing are controlled. Each participant is given two attempts, and the best is recorded.

Recording: The distance is measured from the inside edge of the take-off line to the last mark left by the participant.

Second: Accuracy test for the smashing skill • Purpose of the test: - To measure the accuracy of the spiking in the diagonal direction.

• Equipment: - A volleyball court, 6 volleyballs, and tape to mark the designated landing area of the ball, as shown in Figure (2).

• Performance specifications:

The test subject performs the smash from position 4, with the coach passing from position 3 using a high, forward pass. The test subject then performs (5) smash attempts on the backcourt, followed by (5) more attempts on the frontcourt. The attempts are counted for the test subject.

Correct shots in the 10 attempts allotted to him according to the scoring rules.

Scoring:

4 points for each correct smash where the ball lands inside the square.

3 points for each correct smash where the ball lands in the striped area.

2 points for each correct smash where the ball lands in area (A) or (B).

1 point for each correct smash where the ball lands in area (C).

2-6 Pilot Test

To ensure the accuracy and validity of the research work and to address any obstacles that might arise during the field experiment, the researchers conducted a pilot test on Saturday, December 6, 2025, at 10:00 AM with players (outside the sample). The exploratory experiment aimed to address shortcomings by specifying the location, time, and duration of the experiment (Wajih Mahjoub: 1993). The objective of conducting the exploratory experiment was:

1. Preparing and guiding the support team according to the research objectives.
2. Preparing the necessary equipment and tools.
3. Determining the time required for the test.

2.7 Scientific Foundations of the Test:

1. Test Validity:

The researchers presented the tests to experts and specialists in the field of training through personal interviews, and they agreed on the validity of the tests, as shown in Table (2).

Table (2) shows the percentage of validity of the research tests.

ت	Test Name	Number of Experts	Number of Agreeing Opinions	Percentage
1	Leg Strength Endurance Test	7	6	%85.7
2	Diagonal Smash Test	7	7	%100

2- Test Reliability:

Researchers used the test-retest method to calculate the reliability coefficient, with a time interval of (7) days between the first and second tests. The test-retest method is one of the simplest methods and is characterized by its ability to determine the interval for consistency, since the error associated with the measurement is, fortunately, always greater. This is particularly evident when there is a period of one day or more between the two tests (Ibrahim Ahmed Salama, 1980). Researchers have calculated the reliability coefficient using Pearson's correlation coefficient between the results of the first and second tests and determined the significance of the correlation. The researchers concluded that... These tests are highly significant because the (sig) value is $> (0.05)$.

Table (3) shows the reliability coefficient for the research tests.

on	Test	Reliability Coefficient
1	Explosive Leg Power Test	0.000
2	Smash Test	0.000

The correlation coefficient is significant at a significance level $> (0.05)$

1- Objectivity:

The objectivity of a test primarily depends on the clarity of the instructions for administering the test. Test objectivity is high when tests with specific conditions are used, and since the tests used have specific and clear conditions, they are characterized by objectivity. High, as the results do not accept interpretation. "The test is highly objective when the test conditions are specific, because it is not affected by the subjective assessment of the judges (Nasrallah Radhi Mashjal: 2017).

2-8 Field Research Procedures:

2-8-1 Pre-tests for the Research Sample:

The researchers conducted pre-tests and measurements before commencing the training program on Saturday, December 13, 2025, at 10:00 AM. All (6) players

in the research sample were present, and their measurements (height, mass, and age) were recorded. The researchers and their support team conducted the research tests and extracted the results.

3.8.2 Resistance Training Using the Vertimax System:

To obtain effective training, it was necessary to consult up-to-date sources and references in sports training science to enrich the researchers' understanding. With the information that helps him in setting the Vertimax training program, the researchers prepared the exercises for the research sample, basing their preparation on the scientific foundations of training and on some scientific sources and references, as well as the opinions of some specialists in the field of sports training science and volleyball.

The exercises were implemented starting on Tuesday, November 23, 2025, and continuing until Tuesday, February 17, 2026, for a period of eight weeks, with three training sessions per week (Sunday, Tuesday, Thursday). The research sample was supervised by the researchers and the assisting team. The following are some clarifications regarding the curriculum:

- The training period is two months.
- The training phase that aligns with the curriculum is the "Specialized Preparation Phase."
- The number of training units per week is three (3) units.
- The total number of training units is twenty-four (24) units. - Training days (Sunday, Tuesday, Thursday).
- Submaximal and moderate intensity levels were used.
- The average intensity for the experimental group was calculated to standardize intensity and start with a single starting point.

2-8-3 Post-tests of the research sample:

The post-test was conducted on the research sample on Sunday, February 23, 2026, after the completion of the methodology application period, which lasted (8) weeks. The researchers ensured the provision of the pre-test conditions and procedures followed for the research tests.

2-9 Statistical Methods:

The researchers used statistical methods that helped in processing the results and testing the research hypotheses through the use of the statistical package (IBM SPSS Statistics 24), which are:

- Arithmetic mean.
- Standard Deviation
- Coefficient of Variance
- Pearson Correlation Coefficient
- T-test for paired samples
- Percentage

3- Presentation, Analysis, and Discussion of Results:

3-1 Presentation and Analysis of Pre- and Post-Test Results for the Sample

Table (4) shows the values of the arithmetic means, standard deviations, and calculated (T) value for the pre- and post-tests of the sample.

Physical Abilities	Unit of Measurement	Pre-test		Post-test		Calculated T-value	Sig	Result
		x	sd	x	sd			
Explosive Leg Power	Repetition	39.01	1.98	50.24	2.32	9.11	0.000	Significant
Smash	Score	21.76	3.98	30.54	2.18	8.96	0.000	Significant

Significant at a significance level $> (0.05)$

Table (4) shows the arithmetic means, standard deviations, and calculated t-value between the pre- and post-test results. The results presented in the table show that the significance level for all values was (0.000), which is less than the significance level of (0.05), indicating the presence of statistically significant differences. Significance between the pre-test and post-test results for the sample.

3-2 Discussion of Results:

Table (4) shows a significant difference in the post-test results for the research group. The researchers attribute this to resistance training using Vertimax, which led to the development of explosive power through the use of specific exercise sets that contributed to this improvement. Developing this quality, and this was reflected positively in improving the accuracy of the smashing skill, through the use of intensity, repetitions, and appropriate rest periods, led to improved accuracy test results. It is known that accuracy is one of the components of motor fitness and that it requires muscular coordination. The nervous system is involved in the muscles of the arms, abdomen, and legs. As Muhammad Subhi Hassanin states, "Directing voluntary movements towards a specific goal requires high efficiency from the muscular and nervous systems. Accuracy requires complete control over the voluntary muscles to direct them towards a specific goal." (Muhammad Subhi Hassanin, 1998) As is well known, accuracy means having the ability to score a point or goal. In many sports, developing accuracy is a cornerstone of team victory, as is the case in boxing, handball, volleyball, and football. Accuracy is also a crucial component in volleyball. When performing the smashing skill, as it determines the result of the team's victory or defeat, the volleyball player needs to possess the attribute of strength in the body muscles and coordination in order to be able to perform this skill with maximum strength, speed and accuracy in performance.

It is well known that every sport relies on specific muscle groups that differ from one sport to another depending on the sport's specialization, as volleyball is one of the sports whose players must possess strong leg, arm, abdominal, and torso muscles, in addition to neuromuscular coordination. Accuracy in performing skills requires attention to these groups through the use of modern training programs with appropriate intensity in terms of repetitions and rest periods, in addition to following the appropriate training method. All of these things were obtained by the researcher through the research results, which developed the characteristic of endurance. Strength in the legs, and consequently, improved accuracy in the diagonal smash.

This development aligns with Iman Hussein's opinion that "there is a statistically significant positive correlation between strength in the legs and shooting accuracy" (Iman Hussein, 1999). A volleyball player is constantly moving on the court, whether in a defensive or offensive position. Therefore, in addition to possessing the main physical attributes, they need endurance when performing skills. Thus, when performing the spiking skill, they need neuromuscular

coordination. Likewise, accuracy when performing the smashing shot, and strength and fluidity in movement when performing the ball strike. This is consistent with what Essam Abdel Khaleq indicates, that "the motor performance of the skill depends on the special motor abilities (Essam Abdel Khaleq: 1994).

4- Conclusions and Recommendations

4-1 Conclusions:

- 1- Resistance training using the Vertimax method had a significant impact on developing the explosive power of the legs in the research group, as these exercises work to develop power.
- 2- Resistance training using the Vertimax method with this load fluctuation led to this amount of development in endurance and accuracy of the smashing skill.

4-2 Recommendations:

- 1- Use resistance training with the Vertimax device, which develops most of the physical abilities of volleyball players.
2. Emphasize the use of resistance training with the Vertimax device, as it is suitable for this type of training.
3. Use varying weights, intensities, and wave patterns in the load, which may lead to better results.
4. It is essential to use different resistance training methods with the Vertimax device and not limit one method to another.
5. Use resistance training with the Vertimax device for different categories of athletes.

Sources

- Amr Allah Al-Basati: Foundations and Principles of Sports Training and its Applications, Al-Maaref Establishment, Alexandria, 1998.
- Qais Naji Abdul-Jabbar and Bastawisi Ahmed: Tests and Principles of Statistics in the Sports Field (Baghdad: Higher Education Press, 1987).
- Wajih Mahjoub: Scientific Research Methods and Approaches, 1st ed., Baghdad, Dar Al-Hikma for Printing and Publishing, 1993, p. 239.
- Ibrahim Ahmed Salama: Research Methods in Physical Education, Dar Al-Maaref, Cairo, 1980.
- Nasr Allah Radhi Mashjal: A Comparative Study of the Values of Some Biomechanical Characteristics of the Performance Techniques of the Blocking Skill from Positions (4, 6) for National Volleyball Team Players, Master's Thesis

– University of Dhi Qar, 2017. • Mohamed Sobhi Hassanin: The Relationship Between Body Composition and Athletic Performance, International Association of Athletics Federations (IAAF), Athletics Bulletin, Regional Development Center, Cairo, No. 22, 1998.

• Iman Hussein: The Relationship Between Some Anthropometric Measurements and Elements of Physical Fitness and Skill with Actual Handball Performance, University of Baghdad, PhD Dissertation, College of Physical Education, 1999.

• Essam Abdel-Khaleq: Sports Training, 1st ed., Alexandria, Dar Al-Maaref, 1994.

Appendices:

Appendix (1) shows some of the exercises used and explains the performance

Exercise Name	Purpose of the Exercise	Performance Description
Two-Foot Forward Jump	Developing leg strength	From a standing position, the player jumps forward using both feet over the hurdle. The jump height depends on the training intensity. (Number of hurdles: 10)
Depth Jump onto Boxes	Developing leg strength	From a standing position, the player jumps onto an elevated box, then jumps down to the ground and immediately onto the next box. (Number of boxes: 4)
Single-Leg Hopping (Left then Right)	Developing leg strength	From a standing position, the player hops to the left over the hurdle using the left foot, then changes direction to the right using the right foot. (Number of hurdles: 10)
Alternating Side Knee Raises	Developing leg strength	From a standing position, the player alternately raises the knees while crossing the hurdle to the left, then returns to the right. (Number of hurdles: 10)
Alternating Feet on the Apparatus	Developing leg strength	Standing sideways, the player crosses the hurdle with a straight leg to the left, then returns using the same movement pattern to the right. (Number of hurdles: 20)

Two-Foot Lateral Jump	Developing leg strength and endurance	From a standing position, the player jumps laterally to the left and lands on both feet, then returns to the right. (Number of hurdles: 20)
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Appendix (2) Sample of training units used

Goal	Develop explosive leg strength			Week	First	
Main Section Duration	minutes 24.25			Training Unit	The first	
Date	Tuesday, March 19, 2019			severity	%.80	
ت	Exercise Name	Size		Rest between repetitions	Comfort between groups	Total exercise time
		Frequ ency	Totals			
1	Both-Footed Jump	3 * 6		s 25	s 90	s 485
2	Deep Jump	3 * 6		s 25	s 90	s 485
3	Running by jumping	3 * 6		ت 25	s 90	s 485