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Research Paper

The Effect of (Physical- Skill) Training with an Aid in Developing Explosive Power and Blocking Accuracy among the Players of the Amreli Volleyball Team

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ABSTRACT

This study aims to develop physical and skill-based exercises using assistive devices and to identify their effect on developing explosive power and blocking accuracy among the players of the Amreli volleyball team .To solve this problem, the researcher used an experimental design with two equivalent groups: a control group and an experimental group ,using pre- and post-tests .The researcher selected the research sample purposively, which included the players of the Amerli volleyball team for the 2024/2025 season, totaling twelve players The researcher reached several conclusions ,the most important of which was that the (physical -skill) exercises prepared with an assistive device had a positive impact on developing the explosive power and blocking accuracy of the Amerli volleyball team players .Among the most important recommendations is to utilise the (physical skill) exercises prepared with an assistive device and to develop similar exercises to further develop the explosive power and blocking accuracy of the Amerli volleyball team players. The researcher also recommends disseminating these (physical-skill) exercises to sports clubs and teams in other regions.

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KEYWORDS: Physical-skill exercises, assistive device, explosive power, accuracy, blocking skill, volleyball.

1. INTRODUCTION

The science of sports training has made significant progress in various sports. This progress must continue through the application of training principles and laws, and the introduction of modern training methods and equipment for using diverse exercises, including combined physical and skill-based exercises, to keep pace with the rapid and significant development in all sciences and disciplines resulting from modern scientific advancements in all fields of human knowledge. Among the sports that the training provided was "volleyball, which is one of the most popular and beloved sports among its practitioners, as it is practiced in most places, whether in closed sports halls or in open fields, and is practiced by all categories of children, youth, the elderly, and women, and this is what made it take on the character of popularity" (Zaid & Others, 2014) [14]. Volleyball players must possess different physical abilities in order to reach the required goal, including explosive power, speed-related power, movement speed, reaction speed, agility, flexibility, and endurance, which play a

major role in developing the skill abilities in volleyball. The importance of the research lies in using (Physical- skill) exercises as an aid in developing the explosive power and accuracy of the blocking wall among the players of the Amreli volleyball team. The aid used is a mechanical device used in the training process in volleyball to develop some of the physical and skill abilities of the players by attaching its special elastic ropes to the waist and arms.

Research Problem: Volleyball training sessions for the Amreli national team players were observed, revealing a lack of training methods utilising elastic ropes. Elastic ropes are essential for developing explosive power and improving blocking accuracy. To address this gap, a specialised training method incorporating elastic ropes was implemented. Physical and skill-based exercises using this approach were designed with the objective of enhancing explosive power and blocking accuracy, thereby elevating players' performance to a higher standard.

2. RESEARCH OBJECTIVES

- The development of physical-skill exercises with supplementary aids aims to enhance explosive power and blocking accuracy among players of the Amreli volleyball team.
- This study seeks to determine the effects of physical-skill exercises, implemented with supplementary aids, on the development of explosive power and blocking accuracy in Amreli volleyball team players.

Research assumptions

- There are statistically significant differences between the pre-test and post-test results in developing explosive power and blocking accuracy among the players of the Amreli volleyball team for both the experimental and control groups, favouring the post-tests.
- There are statistically significant differences between the post-test results for developing explosive power and blocking accuracy among the players of the Amreli volleyball team in the experimental and control groups, favouring the experimental group.

Research areas

- Human domain: The players of the Amreli volleyball team for the 2024/2025 sports season, numbering 12 players.
- Spatial field: playground Youth and Sports Forum Amrli.
- Time frame: From 1/12/2024 to 10/3/2025.

3. METHODOLOGY

Research Methodology: An experimental method was employed, utilising a two-group equivalent design (control and experimental groups) with both pre-tests and post-tests.

"The experimental method is one of the best and most suitable methods because it allows for direct and accurate observation, and it is the most efficient means of reaching knowledge" (Dawood, 2025a) [5].

Research Sample: The researcher purposively selected the research sample, specifically choosing players from the Amreli volleyball team for the 2024/2025 season. The team included 14 players. Two liberos were excluded, as they do not perform offensive skills according to volleyball rules and were not relevant to the study. This left a sample of 12 players. The researcher performed homogenization for height, height with arms extended, body mass, chronological age, and training age, as shown in Table 1. Next, players were randomly divided into two groups: an experimental group of 6 and a control group of 6. This ensured parity between groups in the pre-tests (physical and skill-based), as shown in Table 2.

Tools, equipment, and methods for collecting information:

- Regulation volleyball court
- Legal volleyballs: the type is Mikasa, made in Japan, and the total quantity is five.
- Iron metric scale, quantity one.
- One Fox brand whistle and colored adhesive tape for marking.
- (10) Elastic ropes of different lengths.
- Sony video camera, one unit used for documentation.
- Dell electronic laptop computer, one unit.
- Manual calculator, quantity one.
- A mechanical aid is used in training volleyball players through special exercises that involve using elastic ropes as resistance. Exercises include jumping, leaping, movement drills, and transitioning between positions on the volleyball court. These exercises help develop physical and skill-based volleyball abilities.

Fig 1: Resistance-based vertical jump test setup.

Description of the tests used in the research
"Standing Vertical Jump Test
The purpose of the test: To measure the explosive power of the leg muscles.

Equipment and tools: A whiteboard mounted on the wall with its bottom edge 150 cm above the ground, then gradually increased from 151 cm to 400 cm (the whiteboard can be replaced by marking the wall), Manizia.

Performance Specifications: The subject dips their fingers into the magnesia, then stands with their forearm beside the board. The subject raises their forearm fully extended to make a finger mark on the board, ensuring their heels remain off the ground. The number marked is recorded. From a standing position, the subject swings their arms forward and upward, then forward and downward, bending their knees halfway. They then swing their arms forward and upward, straightening their knees to perform a vertical jump as far as possible, making another finger mark with their forearm fully extended, as shown in Figure 2. The number marked for this second jump is also recorded. Terms and Conditions:

1. When performing the first sign, one or both heels should not be lifted off the ground, and the marked arm should not be raised above the level of the other shoulder while making the sign, as the shoulders should be in a straight line.
2. The laboratory has the right to perform two swings (if desired) when preparing for the jump.
3. Each laboratory has two attempts, and the best one is recorded.

Recording: The distance between the first and second marks is considered to be the amount of explosive force the tester possesses for the two men, measured in centimetres" (Hassanin, 1995) [7].

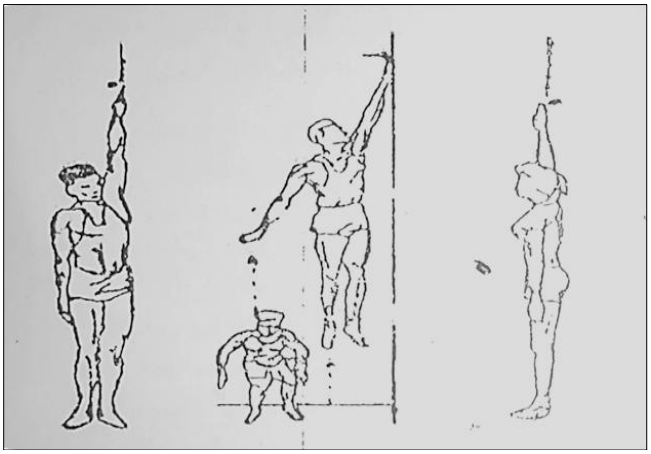

Fig 2: Vertical jump test from a standing position

- **Tools used:** Legal volleyball court, (5) legal volleyballs, colored measuring tape to divide the court as shown in Figure 2 below.
- **Performance specifications:** The player being tested stands in position (2), ready to perform the blocking skill, while the coach climbs onto a table to perform the smash in the normal position.
- **Performance conditions:** Each player is given (3) attempts from each position (2, 3, 4). The correct ones (only offensive ones) are counted, where the maximum score is 27 points.
- **Scoring:** The player takes the score of the area where the ball falls, as shown in Figure 3 (Al-Beik & Zeid, 2003) [2].

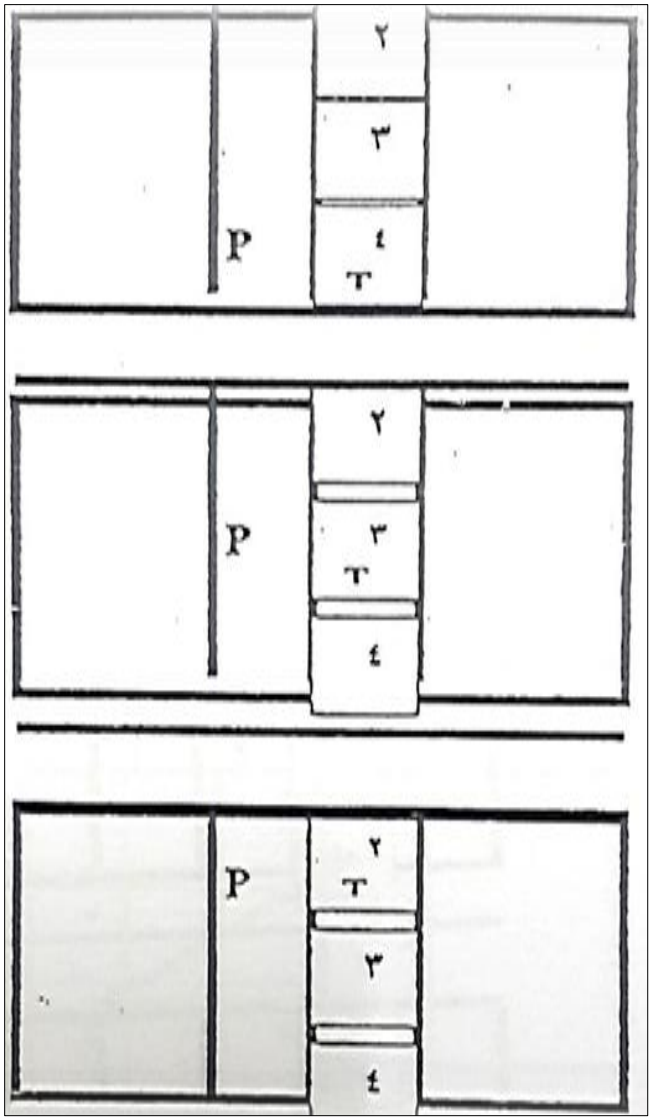

Fig 3: Accuracy test for the offensive blocking skill

"Testing the accuracy of the offensive blocking skill
The purpose of the test :to measure the accuracy of the offensive blocking skill.

The pilot study: The pilot study is considered a practical training for the researcher to identify the advantages and disadvantages he encounters while conducting the tests

(Dawood, 2025b) [6]. The researcher conducted a pilot study before starting the main experiment at the Amerli Youth and Sports Forum volleyball court on Saturday ,December 7, 2024 , at 4:00 PM, with the help of the support team, for the following purposes:

- Ensuring that participants comprehend the terminology used in the tests. Identifying potential obstacles and challenges encountered during test administration to facilitate their resolution.
- Determining the duration required to administer the tests.
- Determining the necessary number of support staff required for test administration.
- Providing training to support staff on standardised test administration procedures.
- Familiarise support staff with the contents and proper use of testing aids.
- Ensuring comprehension of the correct application of exercises.
- Determining the optimal number of exercises to include in each training session.
- Establishing the appropriate intensity and volume for the exercises implemented.

Pre-tests

The research sample was conducted on Thursday, December 12, 2024, at 4:00 p.m. at the Amerli Youth and Sports Forum stadium, with the assistance of the support team. Conditions for both pre-tests were fixed to match those in the post-tests.

Main experiment

The researcher prepared (physical-skill) exercises with an aid and presented them to experts for review. Exercises designed to develop leg explosive power and offensive blocking accuracy were selected for the experimental group. The control group performed the coach's routine exercises. The experimental group's exercises included:

- The duration of the training program (physical and skill-based) is 8 weeks. Abu Al-Ala also pointed out that "most of the changes resulting from training usually occur within 6-8 weeks"(Ahmed, 1996) [1].
- Total number of training units: (24) units.
- Number of training units per week: (3) units.
- Time taken from the main section in training units: between 30 and 45 minutes.
- Training intensity: Intensity was gradually increased from moderate to maximum, ranging between 60%-95% of the player's maximum.
- Training days per week: Saturday, Monday, Wednesday.
- The exercises included a special preparation period.
- The (physical-skill) exercises with an assistive device began on Saturday, 14/12/2024 and ended on Wednesday, 5/2/2025.
- The researcher used high-intensity interval and repetitive training methods for the (physical-skill) exercises.
- The researcher used wave training with different ratios each month. For the first month, the ratio of units was 1:2. For the second month, it was 2:1. The load was low for the first unit and high for the second and third units within the same week. This served as a stage of extra compensation for the first and second units from the previous week, preparing for high-load units. Alternatively, sometimes a high load was used for the first and second units and a low load for the third unit. This functioned as an additional compensation for the previous two units and prepared students for post-tests. "as some sources confirmed that training using equal load degrees during the training units will not lead to the best results, as the training load must reach the external limit of its ability, i.e., it reaches the stage of fatigue and not exhaustion"(Ismail, 1996) [8].
- The researcher used a work-to-rest ratio ranging from 1:3 to 1:6 between repetitions. For example, if the work time is 15 seconds, the rest period is 45 seconds. The researcher also determined the rest periods between sets. "They are determined according to the specific goals of the program and the energy system used. If it is from one set up to three sets, depending on the anaerobic energy system, then the muscle needs rest periods of no less than 2-3 minutes"(Muhammad & Rasheed, 2023) [11].
- The training intensity for the elastic rope used was determined as follows:

The researcher assessed the training elastic cord using the Tinius measuring device (Olsen) at the Materials Testing Laboratory, Department of Materials, College of Engineering, Al-Mustansiriya University. The tests determined the rope's maximum elongation and tensile strength, which were then used to specify the rope lengths required for each exercise intensity as follows:

The maximum elongation for each 1 cm of elastic rope is 3.5 cm.

For example, if the rope length is 90 cm, its elongation at 100% intensity is calculated as 90 × 3.5 = 315 cm. At 95% intensity, the elongation is 315 × 0.95 = 299.25 cm. The rope's elongation should not exceed 299.25 cm during training at 95% intensity.

The maximum tensile strength per 1 cm of elastic cord is 0.108 kg, or 108 g.

Exercises used

1. Two players stand inside the device, and the elastic cords are tied from two loops (V) on the device to the waist area of the players. Then, together they perform the blocking wall with the ball suspended above the net.
2. Two players stand inside the device, and the elastic cords are tied to their hands from two loops (II), then together they perform the blocking wall with the ball suspended above the net.
3. Two players stand inside the apparatus with cords tied to their waists from two loops (e), take a short step forward, then perform the blocking wall with the ball suspended above the net.

4. Two players stand inside the device, cords tied to their waists from two loops (V), then perform the blocking wall with their arms tilting right high, front high, and left high.
5. Place equipment near the post, lengthwise along the right side. Two players stand left of the equipment, separated by the net. Attach elastic cords from the player's V-ring in the centre number (2) to the right waist, number (4) to the left waist, then both move to the centre (3) and perform wall repulsion.
6. Set the tool near the pole, lengthwise to the left. Two players stand right of the tool, separated by the net. Tie elastic cords from loop (V): player (2) left waist, player (4) right waist. They move together to (3) and perform the blocking wall.
7. Place the tool above the nearest midline from (3), crosswise. Two players stand left of the tool, separated by the net. Tie elastic ropes from the ring (V) to the player moving to (4), right waist, and to the player moving to (2), left waist. Both move together and perform the blocking wall.

The tool is placed above the centerline near point (3), transverse to it. Two players stand right of the tool, separated by the net. Tie elastic ropes from the loop (V): to the player moving to (2), left waist; to the player moving to (4), right waist. Both move together and perform the blocking wall.

Post-tests: The two post-tests were conducted in accordance with the points followed in the two pre-tests, specifically in terms of location, climatic conditions, measurement tools, and tests, on Thursday, June 2, 2025.

Statistical Methods: The researcher used the statistical package SPSS to process the results.

4. RESULTS

Table 1: Sample Homogeneity

Variables	Middle	Deviation	The mediator	Torsion coefficient
Length (cm)	182,32	2.78	182	0.34
Length and arm extended (cm)	244.80	7.80	242.25	0.98
Body mass (kg)	74	2.91	73.30	0.72
Biological age (years)	23.07	0.71	23	0.29
Training age (months)	35.81	4.90	35	0.49

Table 1 shows that all skewness coefficient values fall between +1 and -1, indicating that the research sample is homogeneous with respect to the variables listed in the table.

Table 2: Sample equivalence between the control and experimental groups

Variables	Unit of measurement	The officer		empiricism		Value of t	p value	Indication
		M	SD	M	SD			
Vertical jump from a standing position (jump to block)	poison	56.57	1.76	57.30	1.55	1.08-	0.293	Immaterial
Accuracy and skill of the offensive and defensive wall	degree	18.50	1.51	19.15	1.75	0.97-	0.341	Immaterial

The results of the independent samples t-test showed no statistically significant differences between the control and experimental groups in the pre-test measurements for both the vertical jump from a standing position and the accuracy of the offensive blocking skill, as the significance level (p) values were greater than 0.05, indicating the equivalence of the two groups before the exercises were performed.

Table 3: Presents the arithmetic means, standard deviations, t-values, and statistical significance of the differences between the pre-test and post-test results for the control group.

Variables	Unit of measurement	Tribal		The post		value of t	p value	Indication
		M	SD	M	SD			
Vertical jump from a standing position (jump to block)	poison	56.57	1.76	57.56	1.67	-1.00	0.36	immaterial
Accuracy and skill of the offensive and defensive wall	degree	18.50	1.51	19.73	1.44	1.44	0.21	immaterial

Below the significance level (0.05) and at a degree of freedom of (5)

Table 4: Presents the means, standard deviations, t-values, and statistical significance of the differences between the pre-test and post-test results for the experimental group.

Variables	Unit of measurement	Tribal		The post		Value of t	p value	Indication
		M	SD	M	SD			
Vertical jump from a standing position (jump to block)	poison	57.30	1.55	61.40	1.50	-4.66	0.006	moral
Accuracy and skill of the offensive and defensive wall	degree	19.15	1.75	21.80	1.30	-2.98	0.03	moral

Below the significance level (0.05) and at a degree of freedom of (5)

Table 5: Shows the means, standard deviations, t-values, and significance levels for differences in post-test physical and skill variables between the control and experimental groups.

Variables	Unit of measurement	The officer		Empiricism		Value of t	p value	Indication
		M	SD	M	SD			
Vertical jump from a standing position (jump to block)	poison	57.56	1.67	61.50	1.50	-6.08	0.00	Moral
Accuracy and skill of the defensive wall	degree	19.73	1.44	21.50	1.30	-3.16	0.004	Moral

At a significance level of 0.05 and with 10 degrees of freedom

5. DISCUSSION

Based on the data in Tables 3 and 4, it is evident that there were measurable differences between pre-test and post-test results for the physical and skill variables across both the control and experimental groups.

We find that the control group achieved positive results in the physical and skill tests. However, unlike the experimental group, it did not exhibit clear and significant development in the explosive power of the legs or the accuracy of performing the offensive blocking skill, as indicated by the (t.test) values. The researcher attributes the improvement in the experimental group's explosive power and offensive blocking accuracy to the effect of using (physical-skill) exercises prepared with the aid of. The experimental group wrapped the waist or arms with elastic bands and performed these exercises according to sound scientific principles. Proper training intensity, appropriate repetitions, correct work-to-rest ratios, and suitable sets and intervals contributed to developing the legs' explosive power. As a result, leg movements became faster and stronger due to the use of waist or arm weights during training. “Increases the speed of movement performance, meaning that the strength gained from this type of training leads to better movement performance in the practised sport by increasing the muscles' ability to contract at a faster and more explosive rate”(Young, 2006) [13]. Explosive power exercises occupy a large part of their physical preparation phases, which necessitated the use of exercises with modern training methods that are more effective in developing this ability, according to the preparation. The game's specific skill, and variably organising the exercise, is more effective in learning and training than organising the training fixedly .“The researcher believes that using exercises with assistive devices and good regulation of the training intensity in them achieves the required goals” (Muhammad & Korsheed, 2023) [10].

The improvement in the accuracy of the offensive blocking skill in the experimental group was greater than in the control group, which the researcher attributes to the development of explosive power. This development, in turn, led to the improvement in the vertical jump at the moment of takeoff, thereby enhancing the accuracy of the offensive blocking skill. Clearly, the explosive power of the legs is crucial for developing the accuracy of the offensive blocking skill in volleyball players, as confirmed by Elham Abdel Rahman. The increase in explosive power directly enhances a player’s ability to perform accurate offensive blocks. “Explosive power is one of the most important and essential physical abilities that must be present in activities that require vertical jumping” (Rahman, 1997) [12].

Table 5 presents the results of the independent samples t-test, which revealed statistically significant differences between the control and experimental groups in both vertical jump from a standing position and the accuracy of offensive blocking skill performance. The experimental group outperformed the control group. These findings may be attributed to the implementation of combined physical and skill-based exercises, supplemented with vertical jump training .The researcher states that “the use of vertical jump exercises with resistance bands played an effective role in this development, especially when the exercise is effective and not dangerous, whether for juniors or youth” (Crossly, 1984) [4]. These exercises were specifically targeted at particular muscles, leading to their development in a way that facilitates the performance of the required tasks for these muscles in the skill studied by the researcher. The researcher further states that “training directed at a specific muscle group leads to its development” (Al-Khafaji, 2005) [3], especially when the training or resistance used in the training units is of objective intensity ,scientifically designed, progressively increasing, and with varying repetitions that correspond to the intensity. The required and performing the exercise in it according to the allotted time, “If you want to develop strength, you must use exercises with progressively increasing resistance in intensity” (Jamil, 1994) [8], As this training load makes the muscle or muscle groups more efficient and able to cope with the new resistance and effort, it is not possible to benefit from training without increasing its intensity. This naturally helps to develop explosive power.

6. CONCLUSIONS

(Physical-skill) Exercises with an assistive device had a positive effect on leg explosive power and accuracy in offensive blocking skills. The experimental group showed greater improvement than the control group. The control group showed less improvement, likely due to the lack of the assistive device. The elastic band device proved effective and did not restrict skill execution. The researcher recommends using these (physical-skill) exercises with an assistive device to develop leg explosive power and blocking accuracy in volleyball players. These exercises should be generalised for district teams and sports clubs. Coaches should focus on the special preparation stage and use the two tests adopted by the researcher to measure abilities. The researcher also recommends similar studies for other skills, games, ages, and both genders.

Thanks and appreciation

I extend my sincere thanks and appreciation to the research sample for their cooperation with me throughout the experiment and test period. I must also record my thanks and appreciation to the faculty of the College of Physical Education and Sports Sciences, Kirkuk University, for their effective contribution to our preparation throughout the study period. May God preserve them to serve researchers and students.

Conflict of interest

There is no conflict of interest.

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