



The Effect of Interspersed Exercises on Developing Arm Explosive Power and Back-Row Spike Accuracy in Volleyball Players

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Abstract

The study aimed to prepare interspersed exercises and identify the effect of these exercises on some physical and skill abilities. The research hypotheses stated that the prepared exercises have a positive effect on some abilities and skills in volleyball, and that there are statistically significant differences between the results of the pre- and post-tests for the experimental group, as well as statistically significant differences between the control and experimental groups. The researcher used the experimental approach with a two-independent-groups design. The research population included first-division volleyball club players in the Ramadi district, totaling (5) clubs. The sample consisted of the Abu Risha club representing the experimental group and the Al-Somoud club representing the control group for the (2023-2024) sports season, participating in the first-division league, and representing (40%) of the population. The researcher prepared (10) interspersed exercises to develop the explosive power of the arms and the accuracy of the back-row spiking skill for the research sample players. The researcher concluded that the prepared exercises helped the players self-evaluate, assess themselves, and increase their confidence through training and recognizing the level of success they achieved. The researcher recommended using interspersed exercises in conditions similar to real competition due to their effective impact on the level of volleyball players.

Keywords: Explosive power, precision of the skill of smashing, players, volleyball

1. Introduction

The significant progress occurring in all sports and the massive development has made it imperative for those involved in the sports field to establish appropriate plans and studies for each sporting event; volleyball is one of the most famous sports globally. To achieve high performance in volleyball, professionals in the sports field have resorted to sound planning that relies on scientific foundations in various areas, as well as following correct scientific methodologies. This is achieved by studying all the factors affecting training processes and developing them to reach the best possible level, by examining all the capabilities, knowledge, and sciences that can contribute to the integration of performance.

Most countries around the world have focused on young age groups, including cubs, cadets, and youth, in order to prepare the player properly. They have also established precise scientific training curricula to achieve high performance. The game of volleyball requires great speed and accuracy in performance, as well as high effort; therefore, it necessitates the interspersed skills and abilities with one another to achieve optimal performance. Volleyball is one of the team sports officially recognized in the Olympics, and practicing it requires the performance of skills with special characteristics, precise technical execution, and adherence to complex tactical pathways. The skill and physical aspects play a prominent and important role in many matches, especially when the level between players is close. Volleyball is among the sports that have rapidly paved their way toward reaching the highest levels.

The focus on developing motor and skill abilities is highly correlated with the player's performance accuracy during the execution of the back-row spike from a jump in volleyball. This offensive skill has a significant



impact on scoring points, which requires precision in execution, as it is considered one of the skills that play a major role in deciding most matches, especially if there are players who master this skill correctly.

The researcher believes that using interspersed exercises will create new situations for the players that they can acquire or imagine during performance, and consequently, their ability to retain the skill will increase. Therefore, the researcher decided to study interspersed exercises and their effect on the motor and skill abilities of first-division club players in Al-Anbar Governorate, as well as to determine the development occurring in abilities and skills and the impact of these exercises on them.

1.2 Research Problem

It is no secret to many, especially researchers in the sports field, that there is a significant deficiency among most volleyball coaches when preparing training units and diversifying the use of exercises that contribute to developing the abilities and skills that serve as field solutions to decode the opposing team. The skill of spiking from the back row is one of the important skills that rely on the player possessing high-level physical and skill abilities; this deficiency has led to the decline of this game to its lowest level.

Through the researcher's experience as a former player with modest experience, a follower of volleyball, and currently an academic teaching the game of volleyball, and through direct observation of many first-division league matches, he noticed that our players do not reach optimal performance due to deficiencies in the physical and skill aspects. Therefore, through this research, the researcher sought to identify the effect of interspersed exercises on developing some physical and skill abilities among first-division club players in the Ramadi district.

1.3 Research Objectives

1. Preparing interspersed exercises to develop some physical and skill abilities for volleyball players.
2. Identifying the effect of interspersed exercises on the dependent variables of volleyball players.

1.4 Research Hypotheses

There are statistically significant differences between:

1. The pre- and post-tests for the experimental group players in the research variables.
2. The post-tests for both the control and experimental research groups in the investigated variables.

1.5 Research Domains

- 1.5.1 Human Domain: Volleyball players of the Abu Risha and Al-Somoud clubs in the Ramadi district for the (2023-2024) season.
- 1.5.2 Temporal Domain: From 15/7 to 1/10/2024.
- 1.5.3 Spatial Domain: The training center in the city of Ramadi.

2. Methodology

2.1 Research Methodology

The researcher used the experimental approach with a two-independent-groups design because it is the most appropriate for solving the research problem (Mohammed Hammood et al., 2025; Mohammed et al., 2025; Omar et al., 2025).

2.2 Research Population

The research population consisted of first-division volleyball club players in the Ramadi district, totaling (5) clubs. The research sample was represented by the Abu Risha club, which acted as the experimental group, and the Al-Somoud club, which acted as the control group (they were divided using a lottery method). They are officially registered in the rosters of the Iraqi Central Volleyball Federation for the (2023-2024) sports season, totaling (28) players. The Libero players, totaling (4), were excluded because they do not participate in offensive skills; thus, the total sample size reached (24) players, representing (40%) of the research population.



2.3 Equivalence of the Two Research Groups in the Investigated Variables

Table (1) Shows the equivalence of the control and experimental groups in the research variables.

Sequence	Variables	Measuring Unit	Control Group (Pre-test)	Experimental Group (Pre-test)	Calculated T	Tabulated T	Significance
			Mean (\bar{x})	SD (\pm)	Mean (\bar{x})	SD (\pm)	
1	Explosive Power	cm	4.25	0.86	4.1	0.91	0.405
2	Spiking	Score	14.08	1.08	13.67	1.49	1.989

Tabulated (T) value at a degree of freedom ($24-1=23$) and a significance level of (0.05).

2.4 Devices, Tools, and Means of Data Collection

- Personal computer (HP).
- Video camera (Sony).
- Regulation volleyball court.
- Volleyballs (20).
- Benches (2).
- Metal measuring tape.
- Paper masking tape.
- Colored paints (Pentelite).
- Whistle.
- Cones (10).
- Stopwatch.
- Arabic and foreign references.
- The Internet.

2.5 Tests Used

2.5.1 Test for the Explosive Power of the Arms *Test:* Two-handed seated 3 kg medicine ball push.

- Objective of the test: To measure the explosive power of the arms and shoulder regions.
- Required tools: A flat open area, a small rope, medicine balls weighing (2.70 - 3.00) kg each, a chair, an appropriate number of flags or markers, and a measuring tape.
- Performance Description: (See Figure 1)
 - The subject sits on the chair holding the medicine ball with both hands so that the ball is in front of the chest and below chin level, and the trunk must be touching the edge of the chair.
 - A rope is placed around the subject's chest and securely held from behind to prevent the subject from moving forward while pushing the ball with both hands.
 - The pushing motion is executed using the hands only.
- Test Instructions:
 - The subject is given three consecutive attempts.
 - The subject is given an independent attempt at the beginning of the test as practice for the performance.
 - If the subject shakes or moves on the chair during an attempt, the result is not counted, and another attempt is given as a replacement.
- Test Administration:

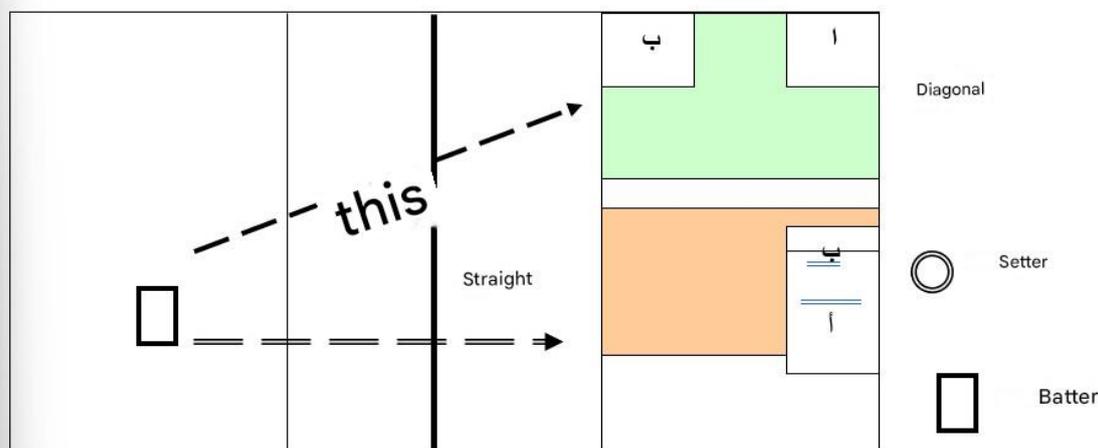
- A recorder calls the subjects and records the results.
- A judge secures the rope, observes the performance, and measures.
- An observer determines the ball's drop point and measures.
- Scoring:
 - The score for each attempt is the distance between the front edge of the chair and the closest mark made by the ball on the ground towards the chair, rounded to the nearest (15) cm.



(Figure 1 shows the medicine ball push test).

2.5.2 Test for the Accuracy of the Back-Row Spike from Position (6) in Straight and Diagonal Directions (Al-Aydawi, 2009)

- Objective of the test: Measuring the accuracy of the spike from position (6) in both straight and diagonal directions.
- Tools:
 - A volleyball court marked with a square area of (1.5 × 1.5 m) as shown in Figure (2).
 - Ten volleyballs.
 - Adhesive tape.
 - Measuring tape.
- Conditions:
 - The player performs the spike skill from position (6) legally.
 - The player performs (10) attempts distributed as (5) attempts in the straight direction and then in the diagonal direction.
- Scoring:
 - A spike that lands inside square (A) (5 points).
 - A spike that lands inside square (B) (3 points).
 - A spike that lands inside the shaded area (2 points).
 - A spike that lands outside the designated area easily (Zero).
 - The maximum score is (25 points) for each direction.



(Figure 2 illustrates the layout for the accuracy test of the spike from position (6) in straight and diagonal directions, depicting the Setter, the Spiker, and the target zones A and B for both straight and diagonal trajectories).

2.6 Field Research Experiment

2.6.1 Pilot Experiment The researcher conducted a pilot experiment on (18/7/2024) on a sample of (12) players representing the Abu Risha Sports Club in volleyball. Its objectives were:

- Identifying the difficulties that the researcher might face.
- Determining the appropriate time to conduct the tests.
- Verifying the validity of the tools and devices.
- Checking the competence of the assistant work team.

2.6.2 Pre-tests The pre-tests for the control and experimental groups were conducted by the assistant work team on Saturday (20/7/2024) at (10:00) AM, in the indoor hall of the College of Physical Education and Sports Sciences at the University of Anbar. The physical abilities tests included (explosive power of the arms), while the technical skills tests were (back-row spike from position 6), and the data were recorded on a form.

2.6.3 Main Research Experiment After conducting the pre-tests, the main research experiment was implemented on Saturday (28/7/2024) at 4:00 PM in the Abu Risha Volleyball Club hall. The program was designed for (eight weeks) with (three) training units per week on (Sunday - Tuesday - Thursday). The implementation time for the interspersed exercises (Appendix 1) ranged between (25 to 40) minutes of the main section. The researcher adopted high-intensity and repetition training methods, taking into account the principles of progression and undulation in the training load.

2.6.4 Post-tests After completing the main research experiment, post-tests were conducted for the control and experimental groups in the investigated variables on Sunday (29/9/2024). The researcher ensured the provision of conditions similar to the method of performing the pre-tests, under the exact same conditions, exact spatial and temporal circumstances, using the same tools, and with the presence of the assistant work team in both tests.

2.7 Statistical Means

The researcher utilized the statistical package (SPSS) (Abdullateef AbdulJabbar et al., 2025; Fayyad et al., 2025, 2026).

3. Results

3.1 Presentation of Results



Table (2) Shows the arithmetic means, standard deviations, (T) values, and their significance between the pre- and post-tests for the control group.

Sequence	Variables	Measuring Unit	Pre-test	Post-test	Mean Diff (\bar{x}_d)	SD Diff ($\pm d$)	Calculated T	Tabulated T	Significance
			Mean (\bar{x})	SD (\pm)	Mean (\bar{x})	SD (\pm)			
1	Explosive Power	cm	4.25	0.86	4.43	0.83	0.18	0.16	3.48
2	Spiking	Score	14.08	1.08	14.67	0.98	0.583	0.9	3.47

Tabulated (T) value at a degree of freedom ($12-1=11$) and a significance level of (0.05).

Table (3) Shows the arithmetic means, standard deviations, (T) values, and their significance between the pre- and post-tests for the experimental group.

Sequence	Variables	Measuring Unit	Pre-test	Post-test	Mean Diff (\bar{x}_d)	SD Diff ($\pm d$)	Calculated T	Tabulated T	Significance
			Mean (\bar{x})	SD (\pm)	Mean (\bar{x})	SD (\pm)			
1	Explosive Power	cm	4.1	0.91	5.3	0.80	1.2	0.52	7.94
2	Spiking	Score	13.67	1.49	16.25	1.54	2.66	1.43	6.44

Tabulated (T) value at a degree of freedom ($12-1=11$) and a significance level of (0.05).

Table (4) Shows the arithmetic means, standard deviations, and calculated (T) value for the post-test between the experimental and control groups in the arms explosive power test (horizontal distance).

Research Groups	Measuring Unit	Post-test	Calculated T	Tabulated T	Significance Level
		Mean (\bar{x})	SD (\pm)		
Control	Distance / cm	4.43	0.83	2.514	2.069
Experimental		5.3	0.80		

Tabulated (T) value at a degree of freedom ($24-1=23$) and a significance level of (0.05).

Table (5) Shows the arithmetic means, standard deviations, and calculated (T) value for the post-test between the experimental and control groups in the back-row spiking accuracy test.

Research Groups	Measuring Unit	Post-test	Calculated T	Tabulated T	Significance Level
		Mean (\bar{x})	SD (\pm)		
Control	Score	14.67	0.98	2.86	2.069
Experimental		16.25	1.54		

Tabulated (T) value at a degree of freedom ($24-1=23$) and a significance level of (0.05).

4. Discussion

Table (1) shows that the calculated (T) values between the pre- and post-test results for the research variables (explosive power of the arms and accuracy of the back-row spike) were greater than the tabulated value, indicating that there are statistically significant differences in favor of the post-test for both research groups.



This demonstrates the positive impact of the interspersed exercises prepared by the researcher to solve the problem and achieve the research objectives. The researcher attributes the occurring development to the interspersed training method, which focused on developing the targeted variables—namely the explosive power of the arms and the back-row spike—and considering the relationship between them so that the skill execution is optimal while all players adhered to the training.

Furthermore, the prepared exercises were suitable and aligned with the players' levels, and the training load method followed was appropriate in terms of volume, intensity, and density; all of this tipped the scale of the experimental research group's results over the control group's results in the post-tests. The researcher prepared these exercises in a standardized scientific manner, and this was confirmed by Al-Hilla (2001) stating that the training curriculum used contributed to improving technical performance and the soundness of the studied abilities; training techniques allow players and coaches to communicate and relay training objectives to each other, making training more efficient and effective, inspiring players to participate in more training scenarios, encouraging them to persist and engage in further training, and through knowledge retrieval, it also aids in the recall process.

The researcher believes that the method and style of interspersed training contribute to the activity of neural pathways to send and receive impulses to and from the working muscles in minimal time. This was affirmed by Ahmed (1996) stating that voluntary mechanical action plays a more effective role than fiber action in both concentric and eccentric contractions, which results in elasticity in muscle action to produce greater force. Additionally, the commitment and continuity of the players in the training yielded positive results and an improvement in the athlete's level in general and their level according to the game's requirements specifically. The benefit of the method adopted by the coach is that it gives the player confidence and high motivation to present these skills at a high level, especially when these exercises are executed under conditions similar to playing conditions. Continuous effective performance with escalating efficiency and a decrease in errors must occur through demonstrating the appropriate strength and speed together for executing technical skills in defense and offense. This is what Abd El-Basir (1998) pointed out: "The explosive power of the extremities plays an important role as one of the essential physical preparation components that distinguish sports activities such as leaping and jumping for the spiking skill and the block in the game of volleyball".

4. Conclusions

4.1 Conclusions

1. The prepared interspersed exercises contributed with high effectiveness to the players' performance, which helped them significantly and tangibly raise their skill level as shown by the results in the investigated skills.
2. The prepared exercises assisted the players in self-evaluating and assessing themselves, and in increasing their confidence through training and knowing the level of success they achieved.

4.2 Recommendations

1. The researcher recommends utilizing interspersed exercises in conditions similar to real competition due to their effective impact on the level of volleyball players.
2. Coaches should utilize the principle of diversity and variation in selecting exercises and the necessity of training according to modern methods to achieve the best results and avoid routine and boredom.
3. Conducting other studies and research on different samples in terms of age group, gender, and level, across all sporting events.



Appendix (1): Examples of Interspersed Exercises

Exercise (1) The coach serves the ball to a back-row player located in position (1), who in turn passes the ball to the setter located in the front row. The setter then sets the ball to the player located in position (6) to attack from the back row against the player in position (1) (who delivered the ball to the setter), preparing for the event of the attack being blocked by the blocker to execute a court defense operation.

Exercise (2) The serve is received by back-row players, who in turn pass the ball to the setter. The setter executes a set to the player located in position (4); the players must prepare for the event of the ball being blocked by the blocker to execute a court defense operation.

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