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The Effect of Using Plank Exercises on Developing the Skill Performance of Reception and Setting in Volleyball

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Abstract: *This study aimed to measure the effect of Plank Exercises on improving the skills of Reception and Setting among volleyball players. An experimental approach was applied to a sample of 12 players, divided into two groups. The experimental group underwent an 8-week progressive-intensity Plank exercise program (3 sessions per week), while the control group continued with their traditional training. Results showed a statistically significant improvement (<0.05p<0.05) in reception accuracy and setting stability for the experimental group compared to the control group. The study confirms the importance of Core Stability training in enhancing the technical performance of fundamental volleyball skills. It concluded that the Plank exercise program had a statistically significant positive effect on improving the accuracy of reception and setting skills among the experimental group players. The improvement in both skills was substantially greater and statistically significant for the experimental group compared to the control group, which did not undergo the Plank program. The study recommended systematically and progressively incorporating various Plank exercises (front, side, and advanced variations) into volleyball training programs at all levels, and designing specialized Plank programs focusing on aspects most impactful for specific skills (e.g., increasing side plank difficulty to improve reception of deflected balls).*

Keywords: Plank Exercises, Reception, Setting, Volleyball.

Introduction

Volleyball relies fundamentally on technical precision and kinetic stability, where reception and setting skills form the cornerstone of successful attacks. Modern studies indicate that underperformance in these skills often correlates with deficiencies in core muscle strength – responsible for balance and stability during movement (Al-Khulaifi, 2021, p. 45). Within this context, plank exercises emerge as a vital training method to develop endurance and strength in these muscles, potentially enhancing technical skill accuracy (Abu Ayadeh, 2023, p. 112).

Reception and setting are pivotal for constructing effective volleyball attacks, demanding high technical precision and physical stability – particularly in the core region, which serves as the fulcrum for upper-limb movements (Al-Khulaifi, 2021, p. 45). Plank exercises prove instrumental in developing core stability endurance (Abu Ayadeh, 2023, p. 112). This study aims to scientifically measure the impact of a plank-based training program on improving reception and setting quality among young volleyball players.

Research Significance

1. Providing coaches with scientific evidence on core stability training's importance.
2. Designing a practical, club-implementable program to enhance fundamental skills.
3. Opening avenues for future studies on core stability's effect on other skills (e.g., attack spikes).

Research Problem

Despite increased focus on technical training for volleyball skills, there is a notable lack of integrating core stability exercises like Planks into training programs for intermediate-level players. This has resulted in observable weaknesses in reception (inability to accurately direct the ball to the setting zone) and setting (loss of balance during quick sets). This necessitates a scientific study to measure the effect of Plank exercises on developing these two skills.

Research Objectives

The study aims to:

1. Measure the effect of a Plank exercise training program on reception skill accuracy.
2. Assess the program's impact on setting skill stability and accuracy.
3. Compare skill improvement between the experimental group (undergoing the program) and the control group.

Research Hypotheses

1. There are statistically significant differences between pre- and post-test scores for reception skill in the experimental group.
2. There are statistically significant differences between pre- and post-test scores for setting skill in the experimental group.
3. There are statistically significant differences in improvement levels between the experimental and control groups, favoring the experimental group.

Research Scope

- Human Scope: Players from the Olympic City Club, Junior Category.
- Time Scope: May 1, 2025 – July 10, 2025.
- Location Scope: Najaf Al-Ashraf – Olympic City Stadium.

Methodology

Research Methodology

The study adopted an experimental approach with a two-group design (experimental and control) and pre-post testing, suitable for measuring causal effects (Al-Waeli, 2023, p. 143).

Research Population and Sample

Target Population: Volleyball players of the Olympic City Club in Najaf Al-Ashraf. Sample: 12 randomly selected players. The experimental group received the training program; the control group received traditional training only.

Equipment Used

a. 10 volleyballs
b. Camera
c. Whistle
d. Stopwatch
e. Adhesive tape
f. Pens/notebook for recording
g. Bench

Skill Tests

First: Reception Accuracy Test (Al-Dulaimi, 2015, pp. 94-95)

a. **Objective:** Measure accuracy of serve reception in volleyball.
b. **Equipment:** Regulation volleyball court, 10 regulation balls, measuring tape, colored chalk.
c. **Procedure:** The tested player performs:
d. 5 receptions from Zone (A) to Zones (2,3,4).
e. 5 receptions from Zone (B) to Zones (2,3,4).
   The player must receive from the designated zone and direct the ball to the target zone.
f. **Scoring:** Points based on landing zone:
g. Zone (4): 1 point
h. Zone (3): 2 points
i. Zone (2): 3 points
j. Balls landing on lines score the higher zone's points.
   Maximum score: 30 points.

Second: Back Setting Test (Al-Jubouri, 2019, p. 87)

- **Objective:** Measure back setting accuracy in volleyball.
- **Equipment:** A 1.5m diameter circle in Zone 4; ball feeder/assistant.
- **Procedure:**
  a. Player stands in Zone 6.
  b. Assistant tosses a high ball from Zone 5.
  c. Player must set the ball to land:
- Inside the circle (ideal target).
- Outside circle but within Zone 4.

Scoring Criteria:

- 3 points: Inside circle
- 1 point: Outside circle but within Zone 4
- 0 points: Outside Zone 4
- **Scoring:** 10 attempts per player; maximum score = 30 points.

Pilot Study

Pilot tests were conducted on non-research samples (similar level/age) or isolated members of the original sample (excluded later). Purposes:

1. Establish scientific validity/reliability of tests.

2. Identify appropriate tools.
3. Determine suitable time/location.
4. Train assistants.
5. Identify potential challenges.

Conducted 5-7 days before main tests under identical conditions.

Scientific Validity and Reliability of Tests

a. **Validity:** Ensured through expert review (face validity) by specialists (Al-Jabri, 2011, p. 217).
b. **Reliability:** Verified by test-retest method (5-day interval: 28/4/2025 & 3/5/2025). Pearson's correlation showed significant reliability (<0.05p<0.05).

Pre-Test

Reception and setting tests were administered identically to both groups on 5/5/2025.

Main Experiment

The Plank exercise program was implemented from 6/5/2025 to 9/7/2025:

a. Duration: 8 weeks.
b. Frequency: 3 sessions/week (24 total sessions).
c. Intensity: Progressive (80-90% effort), increased via repetitions/variations.

Post-Test

Identical to pre-test; administered on 10/7/2025 with randomized player order.

Statistical Methods

Data analyzed using **SPSS** (Statistical Package for the Social Sciences).

Result and Discussion

Presentation and Discussion of Results

Differences Between Pre- and Post-Tests for the Experimental Group

Table (1)

Skill	Test	Mean	Std. Deviation	*t*-value	Critical *t*	Significance
Reception	Pre-test	14.17	±1.47	—	—	—
	Post-test	22.50	±1.05	12.39	2.57	**Significant**
Setting	Pre-test	12.83	±1.72	—	—	—
	Post-test	20.33	±1.51	10.21	2.57	**Significant**

Differences Between Pre- and Post-Tests for the Control Group

Table (2)

Skill	Test	Mean	Std. Deviation	*t*-value	Critical *t*	Significance
Reception	Pre-test	14.33	±1.63	—	—	—

	Post-test	15.17	±1.47	1.15	2.57	Not Significant
Setting	Pre-test	12.67	±1.51	—	—	—
	Post-test	13.33	±1.21	0.89	2.57	Not Significant

Comparative Analysis of Improvement (Post-Pre) Between Groups

Table (3)

Skill	Group	Mean (Post-Pre)	Std. Deviation	*t*-value	Critical *t*	Significance
Reception	Experimental	+8.33	±1.05	11.84	2.23	**Significant**
	Control	+0.84	±1.47			
Setting	Experimental	+7.50	±1.51	9.75	2.23	**Significant**
	Control	+0.66	±1.21			

Discussion of Results

The derived results fall within an integrated theoretical framework supported by recent Iraqi and Arab research. The experimental group's superiority is explained through the *Neuromuscular* Integration Theory, which highlights the role of plank exercises in enhancing communication between the nervous system and deep trunk muscles (e.g., transversus abdominis and erector spinae). This integration creates a "stable platform" that optimizes force transfer from lower to upper extremities during skill execution.

The control group's limited development exemplifies the constraints of traditional approaches that focus on superficial muscles (e.g., biceps and pectoralis) while neglecting stabilizer muscles. This aligns with the principle that "*neglecting core training creates a gap between muscular strength and kinetic efficiency*."

Skill-Specific Disparities The differential improvement in skills (setting superiority over receiving) stems from their biomechanical distinctions:

a. **Setting** is an *aerobic-dynamic* skill requiring 3D trunk stabilization during jumping/rotation.
b. **Receiving** relies primarily on horizontal positioning. This divergence is explained by Al-Zubaie (2023, p. 134) through the "*Core Stability Pyramid*" model, where vertical stability (for setting) depends 60% on core muscles versus 40% for horizontal stability (receiving).

Training Efficacy Results demonstrate that targeted strength development programs focusing on core muscles (abdominal/lumbar regions) – whether dynamic, isometric, or isokinetic – yield optimal outcomes. Key exercises include weight training, planks, and plyometrics (enhancing leg/lower back muscles). The efficacy of plank exercises is evident in their contribution to improving movement speed among subjects.As noted by Mohamed Lotfy El-Sayed (2006, p. 11): "Athletic training consistently aims to develop athletes' performance and competitive achievement through coordinated amplitude/speed of execution, comprehensive physical development, and technical skill acquisition."

Plank exercises significantly enhanced training readiness. Ehab Al-Badawi & Mohamed Bariqa (2003, p. 13) and Risan Khuraibat (2014, p. 203) further indicate: "Isometric neuromuscular strength relies on static neural firing patterns, creating synchrony between internal/external forces. This coordination optimizes muscular contraction and movement execution precision."

Fundamental Strength Requirement Al-Badawi (2003, p. 25) and Al-Roubi (2005, p. 123) concur that without adequate strength, players cannot execute offensive/defensive techniques effectively. Thus, training must prioritize:

a. Muscular strength/endurance
b. Flexibility/speed enhancement
c. Technical refinement

Correlation Analysis This study confirms a strong positive correlation between plank exercises and improved receptskills performance, attributable to:

1. **Enhanced Core Stability**: Trunk muscles (abdomen, back, pelvis) provide a stable platform for limb movements (Attia, 2021, p. 102), reducing lateral/anteroposterior sway that compromises accuracy.
2. **Optimized Force Transfer**: Effective reception (low passes) and setting (high passes) require precise force coordination from legs → trunk → arms/hands (Al-Ghamdi, 2020, p. 37). A robust trunk enhances kinetic efficiency and ball control (Abu Ayadeh, 2023, p. 115).
3. **Improved Neuromuscular Control**: Refined neural command enhances stability/accuracy of arm/hand movements during ball handling.
4. **Dynamic Balance Enhancement**: Core muscles act as dynamic stabilizers during unstable positions, enabling rapid equilibrium recovery (Al-Khulaifi, 2021, p. 48).

Critical Limitation The control group's minimal improvement confirms that conventional training – without dedicated core stability work (e.g., planks) – is insufficient for significant gains in precision-dependent skills.

Concluding Synthesis As Rubhi Mustafa (2000, p. 95) emphasizes:"Specialized training is imperative for advancing physical/technical performance to elite levels within sport-specific motor pathways." In volleyball, plank exercises constitute multifaceted training that develops strength across arm, core, and leg muscles – all critically engaged throughout matches. They stimulate high-efficiency contractions during stabilization phases, fostering game-specific dynamic balance essential for volleyball performance.

Conclusion

1. The plank program significantly improved reception/setting accuracy
2. Experimental group improvement substantially exceeded controls (effect sizes .
3. Planks are an effective tool for developing core stability/endurance, directly linked to technical skill quality.

Recommendations

1. Systematically integrate planks (front/side/advanced variations) into volleyball training at all levels.
2. Design skill-specific programs (e.g., intensified side planks for angled receptions).
3. Implement periodic core assessments (e.g., timed plank tests) in player evaluations..

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