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The Effect of Using Fartlek Training Method on Developing Speed, Strength Endurance, and Court Defense Skill Performance in Volleyball

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Abstract. *The study aimed to design a training program using the Fartlek training method to develop speed and strength endurance among preparatory school students, as well as to investigate the impact of Fartlek training on improving the technical performance of court defense skills in volleyball. The researcher adopted the experimental method with pre- and post-test measurements. The sample was selected purposively and consisted of volleyball players, specifically 18 second-year students. Six students were excluded for participating in the pilot experiment, leaving 12 students as the final research sample. The Statistical Package for the Social Sciences (SPSS)، was used to analyze the results. The findings revealed statistically significant differences between the pre- and post-tests in favor of the post-test. The progressive application of exercises positively contributed to the development of both physical and skill-related variables. The researcher recommended emphasizing physical and skill-related variables due to their importance in enhancing player performance. Additionally, the study advocated for implementing the training program—with its physical and skill-focused exercises—in regular training sessions, given its effectiveness in improving all tested parameters. The use of the Fartlek training method in training units was also encouraged, as it proved impactful in developing the physical capacities of the sample .*

Keywords: *Fartlek training method, speed, strength endurance, court defense skill*.

1. INTRODUCTION

The defining feature of our modern era is the tremendous scientific and technological advancements across all aspects of life, including the emergence of modern inventions that have revolutionized contemporary society. This progress has opened new horizons for research and knowledge, extending into all fields, including sports—a key indicator of a nation's cultural and social development. This is evident in the remarkable athletic achievements of advanced countries, driven by innovations in sports training methodologies .

Volleyball is characterized by rapid performance and diverse offensive and defensive strategies, reflecting the significant evolution in training science, particularly the use of advanced methods such as Fartlek training. No coach can overlook these methodologies, which form the foundation for athlete development .

Speed and strength endurance are critical components of physical fitness, playing a pivotal role in meeting the physical and skill-based demands of sports, especially volleyball. The game requires quick execution and endurance in both ball-handling and movement, as players face dynamic match conditions that demand immediate decision-making to counter opponents' actions (Hashim Yasser Hassan, 2011, p. 11) .

Fartlek training is highly effective in developing endurance, speed, and enhancing aerobic and anaerobic energy production (Kamal Jameel Al-Rabadi, 2004, p. 227). Thus, this

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research highlights the importance of utilizing Fartlek exercises to improve speed, strength endurance, and the sustained technical performance of court defense skills in volleyball throughout a match .

Research Problem

Elevating the level of volleyball requires well-structured training programs grounded in scientific principles, focusing on comprehensive player development—particularly in physical and technical aspects, which are essential for improving overall performance .

Through the researcher's observations and attendance at preparatory school volleyball matches, a notable weakness was identified in players' speed, strength endurance, and court defense skills. Players struggled to execute physical and technical tasks efficiently, with visible fatigue undermining their ability to achieve match objectives, such as winning .

Research Objectives

1. Design a Fartlek-based training program to develop speed and strength endurance among preparatory school students .
2. Investigate the impact of Fartlek training on improving the technical performance of court defense skills in volleyball .
3. Identify differences between the experimental and control groups in developing speed, strength endurance, and court defense skill performance .

Research Hypotheses

1. There are statistically significant differences in post-test results between the experimental and control groups in speed and strength endurance tests, favoring the experimental group .
2. There are statistically significant differences between pre- and post-tests in court defense skill performance, favoring the experimental group's post-test results .

Research Scope

Human Scope: Students of Al-Najaf Preparatory School for Tourism and Hospitality .

Spatial Scope: The school's sports facility .

Temporal Scope: February 19, 2024, to May 1, 2024.

2. RESEARCH METHODOLOGY

The scientific methodology is a systematic approach adopted by the researcher to organize, analyze, and present ideas, ultimately deriving reasonable conclusions about the phenomenon under study (Rabhi Mustafa Alyan et al., 2000, p. 23) .

Given the nature of the research problem and its objectives, the researcher employed an experimental method with pre- and post-testing, as it represents the most valid approach for addressing scientific issues both practically and theoretically (Mohamed Hassan Alawi & Osama Kamel Ratib, 1999, p. 217) .

Research Sample

The sample refers to "the group on which the researcher focuses their work" (Wajih Mahjoub, 2002, p. 164). The researcher purposively selected 18 second-year volleyball players. Six students were excluded for participating in the pilot experiment, leaving a final sample of 12 students .

Research Tools and Equipment

These include "the means or methods by which the researcher solves the problem, whether through data, samples, or devices" (Wajih Mahjoub, 2002, p. 133) .

Data Collection Methods

1. Arabic and international scientific sources .
2. Observation .
3. Physical and skill-based tests .

Tools and Equipment

1 .Medicine balls (1 kg, 2 kg, 3 kg, 4 kg, 5 kg) .

2 . Non-stretch colored tape .

3 .A wall marked with centimeter indicators .

4 .Chairs .

5 .Colored cones .

6 .Wooden platforms of varying heights .

7 .Swedish benches .

8 .Elastic ropes .

9 .Barbell with weights .

Physical and Skill Tests

A. Physical Tests

1 . Speed Test

- Test Name: 20m Standing Start Sprint Test (Mohamed Ibrahim Shehata, 2003, p. 91) .
- Purpose: Measure transitional speed .
- Tools: Stopwatch, whistle, flat surface with a straight line, start/finish line, measuring tape .

- Procedure: The participant stands behind the start line and sprints at maximum speed upon hearing the signal .
- Scoring: Time taken (in seconds) to complete the distance .

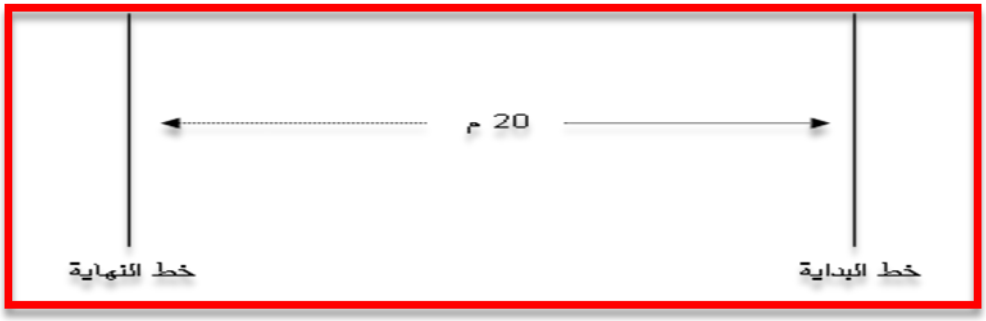

Figure (1) 20 m Sprint Test

2 . Strength Endurance Test

- Test Name: Vertical Squat Jumps (Full Knee Bend) for 30 Seconds (Athir Mohamed Sabri, 1993, p. 136) .
- Purpose: Measure leg muscle strength endurance .
- Tools: Stopwatch, whistle .
- Procedure: From a squat position, the participant jumps vertically with full knee extension, repeating for 30 seconds .
- Scoring: Total number of jumps completed in 30 seconds .

B. Skill Test

- Test Name:Court Defense from Position No. 5 .
- Purpose:Assess accuracy of court defense skill .
- Tools: Volleyball court, net, 5 balls, measuring tape, target-marking tape .
- Setup: Three zones (A, B, C) are marked in the front court. The defender must return the ball to specific zones during an attacker's spike .
- Scoring :

3 - points if the ball lands in Zone A .

2 - points for Zone B .

1 - point for other court areas .

0 - points for failed attempts or rule violations .

- Maximum score: 15 points .

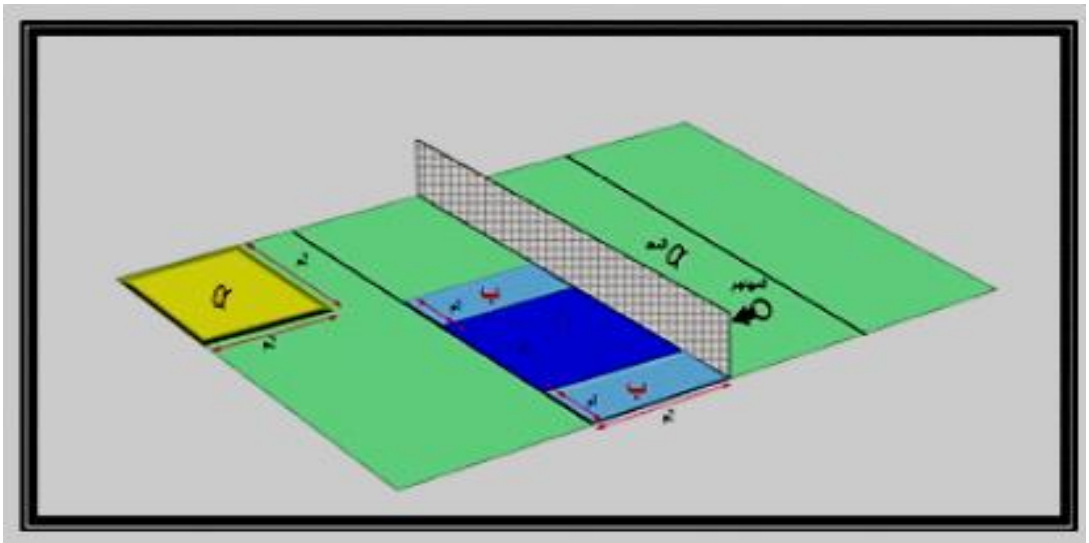

Figure (2) Court Defense Test from Position No. 5

Pilot Experiment

The researcher conducted a pilot experiment on January 14, 2024, with 8 students to refine procedures and identify logistical requirements (Abdul Karim Rahim Al-Marjani, 1998, p. 30) .

Objectives :

1. Calculate setup time for equipment and court preparation .
2. Determine time allocation for physical and skill tests .
3. Train the assistant team and assess their efficiency .
4. Verify equipment suitability .
5. Validate scientific foundations of the tests .

Scientific Validity and Reliability

Validity

Face validity was confirmed by reviewing tests with experts (Kadhim Karim Reda Al-Jabri, 2011, p. 217) .

Reliability

Test-retest reliability was assessed using Pearson's correlation coefficient. The tests were administered on February 18, 2024, and repeated on February 23, 2024, showing statistically significant consistency .

Pre-Tests

Pre-tests were conducted on February 24, 2024, under standardized conditions for the 12 participants .

Training Program Implementation

The Fartlek-based training program ran from February 25 to April 28, 2024, with the following structure :

- Duration: 8 weeks (24 training units, 3 units/week) .
- Methods: Isotonic (dynamic), isometric (static), and plyometric exercises .
- Intensity: Wave loading (75%–95% of max capacity), adjusted weekly .
- Progression: Increased via repetitions, time, or resistance (weights) .
- Circuit Design:6 stations per circuit, targeting legs, core, arms, and back .

Post-Tests

Post-tests were conducted on April 29, 2024, replicating pre-test conditions .

Statistical Analysis

Data were analyzed using SPSS to evaluate physical and skill test outcomes.

Presentation, Analysis, and Discussion of Results

This chapter presents, analyzes, and discusses the results obtained after implementing the researcher's training program, which included the experimental methodology and post-tests for the sample. Data were organized into tables to enhance clarity, reduce errors in subsequent research stages, and strengthen scientific evidence (Ahmed Tawfiq Al-Janabi, 1991, p. 70) .

Data analysis involves extracting quantitative and qualitative evidence to address research questions and validate or reject hypotheses (Saleh Hamad Al-Asaf, 1995, p. 11) .

3-1: Display of Differences Between Pre- and Post-Test Results for Physical Fitness Tests in the Research Sample .

Table (1)

Tests	Unit of Measurement	Pre-Test		Post-Test		Calculated t-value	Tabulated t-value
		Mean	SD	Mean	SD		
Speed	Seconds	8.80	0.70	9.70	0.65	4.23	2.26
Endurance	Score	6.50	1.53	7.90	1.08	3.62	

3-2: Differences Between Pre- and Post-Test Results for Skill Tests in the Research Sample .

Table (2)

Tests	Unit of Measurement	Pre-Test		Post-Test		Calculated t-value	Tabulated t-value
Volleyball Court Defense Skill	Score	Mean	SD	Mean	SD	3.40	2.26
		7.34	1.74	9.33	1.69		

Significant at an error level ≤ 0.05 .

Discussion of Post-Test Results

The results show statistically significant differences between pre- and post-tests, favoring the post-test .

The improvement in the sample's post-test performance is attributed to the use of sub-maximal intensity physical and skill exercises in the experimental program. This aligns with Al-Hayali (2007), who states, "Skill performance at sub-maximal or ideal intensity enhances consistency in gameplay" (Al-Hayali, 2000, p. 151). The systematic progression in exercise repetitions also contributed to development, as emphasized by Al-Mu'min (2008): "Gradual increases in repetitions, task complexity, and sport-specific exercises improve outcomes" (Al-Mu'min, 2008, p. 85) .

Specialists highlight that speed and strength training ensures overall performance quality and skill mastery, particularly in overcoming resistance during angular arm movements. Timothy R. et al. (2009, p. 130) note, "Insufficient strength negatively impacts technical skill proficiency ".

The researcher attributes these differences to the effectiveness of the physical-skill exercises, implemented over 8 weeks with participant commitment. Repetition and variation in training fostered skill retention and neuromuscular coordination, consistent with Qasim Hassan Hussein: "Focusing on motor coordination in training programs enhances movement patterns" (Qasim Hassan Hussein, 1991, p. 47) .

Structured planning and periodic exercise variation prevented monotony and maintained engagement. As emphasized by Hussein Ali Al-Ali and Amer Fakher Shaghati (2010), "Repetitive training without variation risks stagnation in muscular development" (p. 95) .

3. CONCLUSIONS

1 Statistically significant differences exist between pre- and post-tests, favoring the post-test .

2 The experimental training program positively improved the sample's physical and skill capabilities .

3 Progressive exercise application enhanced the targeted physical and skill variables .

4. RECOMMENDATIONS

1 Integrate the physical and skill exercises from this program into regular training for holistic development .

2 Adopt the Fartlek training method in training units for its effectiveness in boosting physical capacities .

3 Conduct similar studies on other age groups and physical/skill variables.

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