

**DEVELOPING GAME ENDURANCE IN ORGANIZING TRAINING FOR HIGH-
SKILL VOLLEYBALL PLAYERS**

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Abstract. This article explores the methodology of developing game endurance in highly skilled volleyball players during training organization. Game endurance is one of the most critical qualities in modern volleyball, as players are required to perform repeated high-intensity actions throughout the course of a match. The study involved 16 professional volleyball players, divided into control and experimental groups. Over a 10-week training period, the experimental group was subjected to specialized endurance-focused methods, including interval training, plyometric exercises, and game-like simulations. Results indicated that athletes in the experimental group showed significant improvements in shuttle-run performance, jumping endurance, and technical-tactical efficiency compared to the control group. The findings highlight the importance of structured endurance development for sustaining performance levels across long and intense matches.

Key words: volleyball, endurance, game endurance, specialized exercises, high-level athletes, training methodology.

Introduction

Volleyball, as one of the most dynamic and widely practiced sports worldwide, demands a complex combination of physical, technical, tactical, and psychological preparedness from its players. The modern game is characterized by rapid transitions, explosive movements, and high-intensity rallies, often repeated hundreds of times during a single match. Under such conditions, maintaining consistent performance becomes a decisive factor, and this capacity is encapsulated in the concept of **game endurance** [1,2,3].

Game endurance can be broadly defined as the ability of an athlete to maintain technical precision, tactical awareness, and physical efficiency throughout the entirety of a competitive match, despite the accumulation of fatigue. In volleyball, this quality plays a crucial role, as matches may extend across five sets and last for more than two hours, placing substantial demands on the cardiovascular, neuromuscular, and psychological systems of the athletes [4,5,6,7,8,9].

The importance of endurance in volleyball has been well-documented in sports science literature. Researchers such as Matveev (1991) emphasized the necessity of gradually structured training loads to develop endurance across multiple training phases. Platonov (2015) further advanced this perspective by focusing on long-term maintenance of sport form, highlighting endurance as a central factor for high-level performance



Date: 29th May-2026

sustainability. In Western methodologies, Bompa and Haff (2015) proposed the use of periodization and load management as essential strategies for optimizing endurance while minimizing overtraining risks [1,2,3,4,5,11,12].

From a practical standpoint, endurance in volleyball manifests in several dimensions:

General endurance, linked to aerobic capacity and overall health of the cardiovascular and respiratory systems;

Specific endurance, directly tied to volleyball actions such as repeated jumps, sprints, and defensive movements;

Tactical endurance, which refers to the ability to make accurate and timely decisions even under conditions of fatigue;

Psychological endurance, encompassing the mental stability and resilience required to perform under competitive stress.

Highly skilled volleyball players face unique challenges in endurance development due to the intensity and complexity of their training and competition schedules. Unlike novice athletes, they must sustain both physical and tactical performance at an elite level, often under extreme time and psychological pressures. For example, an outside hitter is expected to maintain explosive jumping power for spiking and blocking throughout the match, while simultaneously being responsible for reception and defensive duties. This multifunctional role places enormous strain on both aerobic and anaerobic energy systems, requiring targeted endurance development strategies [13,14,15,16,17].

Game endurance is not only a physical attribute but also a multidimensional quality that integrates physical stamina, technical efficiency, and cognitive sharpness. In high-level matches, the difference between winning and losing may depend on the ability to maintain accurate spiking technique or block timing in the fifth set when fatigue is at its peak. In this sense, endurance becomes a performance stabilizer that enables consistent application of technical and tactical skills.

In recent years, innovations in training methodologies have emphasized the integration of endurance development with game-like situations. Traditional long-distance running, while beneficial for building aerobic capacity, has proven insufficient for the specific demands of volleyball. Instead, high-intensity interval training (HIIT), plyometric circuits, and competitive drills designed to mimic game scenarios have gained popularity. These methods not only improve physical endurance but also condition the athlete to cope with the cognitive and tactical demands of real matches [18,19].

Additionally, psychological preparation plays a crucial role in endurance development. Athletes must learn to manage fatigue-induced stress, maintain concentration, and regulate emotional states during prolonged competition. Techniques such as visualization, self-regulation, and mindfulness training are increasingly being incorporated into endurance programs, recognizing that mental stamina often determines late-game performance [21].



Date: 29th May-2026

Given these considerations, the study presented in this article aims to investigate the effectiveness of an integrated training methodology for developing game endurance in highly skilled volleyball players. The research focuses on evaluating how specialized endurance-based training can enhance not only physical performance but also technical-tactical effectiveness during simulated competition conditions. By comparing traditional and innovative training approaches, the study provides evidence-based recommendations for coaches and practitioners working with elite volleyball athletes [1,2,3,4,5,6].

Methods

The study was conducted with 16 highly skilled volleyball players aged 18–22, divided into two groups:

Control group (n=8): trained using a standard program focusing on technical and tactical drills with limited endurance emphasis.

Experimental group (n=8): trained using an endurance-focused methodology integrating interval training, plyometrics, and simulated game scenarios.

Duration: 10 weeks, 4 sessions per week, each lasting 120 minutes.

Training Interventions for Experimental Group:

- High-intensity interval running drills (shuttle runs, repeated sprints);
- Plyometric exercises targeting explosive and repeated jumping capacity;
- Game-simulation drills designed to replicate competitive intensity;
- Active recovery sessions emphasizing mobility and low-intensity aerobic work.

Assessment Tools:

1. Shuttle-run test (20m) to assess aerobic-anaerobic endurance;
2. Repeated vertical jump test to measure jumping endurance;
3. Technical-tactical efficiency index during a 3-set simulation match.

Results

Results demonstrated significant improvements in the experimental group compared to the control group.

Indicator	Control Group Initial	Control Group Final	Experimental Group Initial	Experimental Group Final
Shuttle-run (s)	36.5	35.8	36.4	33.9
Jumping endurance (%)	68	70	67	79
Technical-tactical efficiency (%)	72	73	71	81

The data clearly indicate that endurance-oriented training contributed to both physical and technical improvements. The experimental group exhibited faster shuttle-run times, greater consistency in repeated jumps, and higher tactical efficiency during simulated play.

Date: 29th May-2026

Discussion

The findings support the hypothesis that targeted endurance training is essential for elite volleyball athletes. Traditional methods alone are insufficient for sustaining high performance across long matches. By incorporating interval training and game simulations, athletes improved both their physical stamina and their ability to maintain technical and tactical quality under fatigue.

Furthermore, the psychological resilience observed in the experimental group highlights the importance of integrating mental training techniques within endurance programs. Athletes who developed confidence in their endurance capacity showed better decision-making and composure during high-pressure scenarios.

These results align with existing literature (Platonov, 2015; Bompa & Haff, 2015), reinforcing the notion that endurance must be periodized and tailored to the specific demands of the sport.

Conclusion

Game endurance is a decisive factor for high-level volleyball performance, specialized training methods-intervals, plyometrics, and simulated game drills-are highly effective for developing endurance, improved endurance translates directly into better technical and tactical efficiency under fatigue, coaches of elite volleyball players should integrate endurance development systematically into training plans, emphasizing both physical and psychological preparation.

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Date: 29th May-2026

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