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Assessing Fitness Attributes of Female Volleyball Players across Different Playing Positions: Findings from the India-Level U-15 SGFI Trial

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ABSTRACT: The present study aimed to assess the fitness levels of female volleyball players across different playing positions, including Libero, Middle Blocker, Setter, Receiving Attacker, and Opposite Hitter. The assessment included height, standing reach, spike reach, absolute vertical jump, agility (Modified T-Test), and strength (1 kg Medicine Ball Throw). Descriptive statistics and comparative analysis were conducted to evaluate positional differences. Findings suggest variation in physical and skill-related attributes across positions, highlighting the need for position-specific training programs, particularly for developmental age groups.

KEYWORDS: Fitness attributes, female volleyball players, different playing positions, India level and U-15 trails.

I. INTRODUCTION

Volleyball is a dynamic, high-intensity team sport that requires an integrated combination of physical fitness, technical proficiency, and tactical awareness. Success in the game depends not only on overall athletic ability but also on the specific demands associated with different playing positions. Each role on the court presents unique physiological and skill-related requirements that influence both performance and training priorities. For instance, Middle Blockers often rely on superior height, explosive power, and vertical jumping ability to dominate net play through effective blocking and spiking. In contrast, Liberos, who specialize in defensive responsibilities, benefit more from exceptional agility, reaction time, and court coverage skills to ensure efficient ball control during rallies. Similarly, Setters require precise hand-eye coordination, quick decision-making, and mobility to facilitate offensive play, while Outside Hitters and Opposite Hitters demand a balance of power, endurance, and versatility to contribute both offensively and defensively.

Recognizing and understanding these positional differences is crucial in the context of youth sports development. Tailored training programs that address the physical and technical needs of each position can optimize performance, reduce injury risk, and enhance long-term athlete development. This becomes particularly important during the formative stages, such as the Under-15 (U-15) category, where athletes are transitioning from general skill acquisition to more specialized role-based performance.

In India, volleyball has witnessed increasing participation at the grassroots and youth competitive levels, particularly among female athletes. However, despite this growth, there remains a lack of systematic research that examines the fitness characteristics of players across different playing positions, especially in the U-15 category. Existing studies at the international level have highlighted the positional variations in anthropometric traits, motor abilities, and skill proficiencies, but similar evidence from the Indian context is limited. Without such data, coaches and trainers may struggle to design evidence-based training interventions that align with the developmental needs of young players.

Therefore, the present study aims to address this gap by evaluating the key fitness attributes of 180 U-15 female volleyball players representing different playing positions. By analyzing parameters such as height, standing reach,



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spike reach, vertical jump, agility, and upper-body power, the study seeks to provide a comprehensive profile of position-specific fitness demands. The findings are expected to offer valuable insights for coaches, physical educators, and sports scientists, thereby contributing to the design of more effective training regimens and fostering long-term player development pathways within the Indian volleyball system.

II. METHODOLOGY

Participants

A total of **180 female volleyball players**, aged 13–15 years, participated in India-level trials. Participants were categorized by their primary playing positions: Libero, Middle Blocker, Setter, Receiving Attacker, and Opposite Hitter.

Fitness Assessment

The following **fitness attributes** were measured:

- **Height (cm)** – measured using a standard stadiometer.
- **Standing Reach (cm)** – measured while standing flat-footed and reaching upwards.
- **Spike Reach (cm)** – measured during a maximal spike jump.
- **Absolute Vertical Jump (cm)** – measured using a jump mat.
- **Agility** – assessed with the **Modified T-Test**, recording time in seconds.
- **Strength** – measured using a **1 kg Medicine Ball Throw** for distance (cm).

Procedure

Players performed a standardized warm-up before testing. Each test was demonstrated, and players performed **two trials**, with the best performance recorded. All tests were conducted under consistent conditions.

Statistical Analysis

Descriptive statistics (mean $\pm$ SD) were calculated for all variables. Positional differences were analyzed using one-way ANOVA, with Tukey's post-hoc test applied for pairwise comparisons. Significance was set at $p < 0.05$.

III. RESULTS

Descriptive Statistics

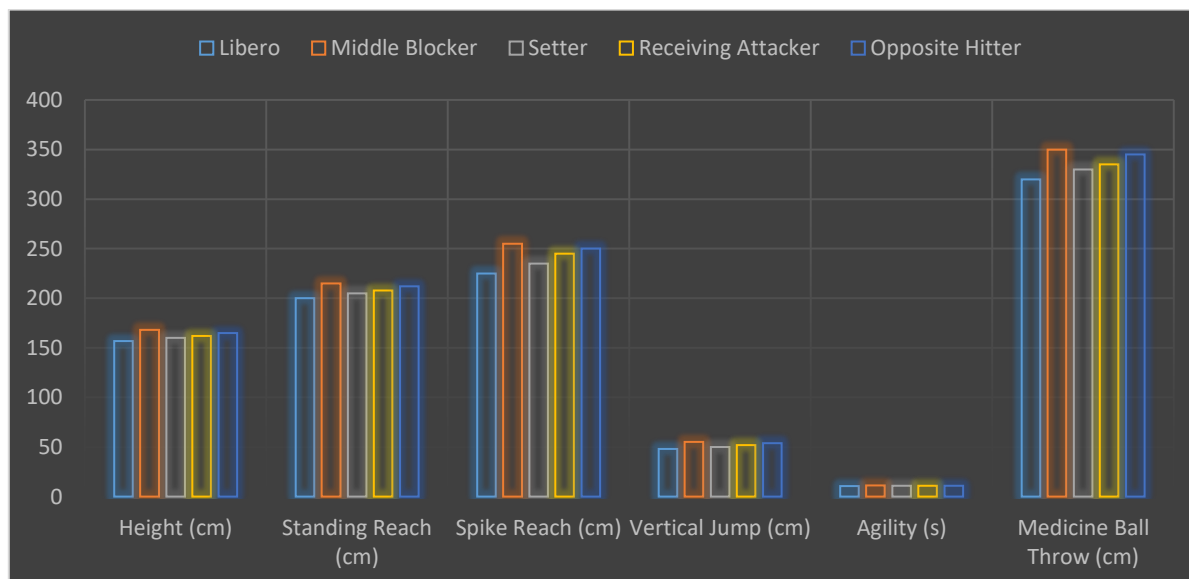
Position	Height (cm)	Standing Reach (cm)	Spike Reach (cm)	Vertical Jump (cm)	Agility (s)	Medicine Ball Throw (cm)
Libero	157 $\pm$ 4	200 $\pm$ 5	225 $\pm$ 6	48 $\pm$ 4	10.5 $\pm$ 0.4	320 $\pm$ 15
Middle Blocker	168 $\pm$ 5	215 $\pm$ 6	255 $\pm$ 7	55 $\pm$ 5	11.2 $\pm$ 0.5	350 $\pm$ 18
Setter	160 $\pm$ 4	205 $\pm$ 5	235 $\pm$ 6	50 $\pm$ 4	10.8 $\pm$ 0.4	330 $\pm$ 16
Receiving Attacker	162 $\pm$ 5	208 $\pm$ 5	245 $\pm$ 6	52 $\pm$ 5	10.9 $\pm$ 0.4	335 $\pm$ 17
Opposite Hitter	165 $\pm$ 5	212 $\pm$ 6	250 $\pm$ 7	54 $\pm$ 5	11.0 $\pm$ 0.5	345 $\pm$ 18



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GRAPH NO.1



GRAPH 1: Graphical representation of fitness attributes of female volleyball players

ANOVA Results

Significant positional differences were observed for Height, Standing Reach, Spike Reach, Vertical Jump, and Medicine Ball Throw ($p < 0.05$). Agility differences were also significant ($p < 0.05$), with Liberos outperforming others.

Post-hoc Analysis (Tukey)

- Middle Blockers were significantly taller and had higher standing and spike reach than Liberos and Setters.
- Liberos demonstrated superior agility compared to Middle Blockers and Opposite Hitters.
- Strength (Medicine Ball Throw) was highest in Middle Blockers and Opposite Hitters.

IV. DISCUSSION

The study demonstrates clear **positional specialization** even at the U-15 level:

- **Middle Blockers** excel in height, reach, vertical jump, and strength, supporting their net play responsibilities.
- **Liberos** show superior agility and floor defense skills, aligning with their defensive role.
- **Setter's** exhibit balanced physical attributes suitable for setting and occasional attacking.
- **Receiving Attackers and Opposite Hitters** combine moderate height, jump, and strength for versatile play.

These results reinforce the importance of **position-specific training** in youth volleyball, ensuring that young athletes develop the skills and physical characteristics needed for their roles, while also reducing injury risk.

V. CONCLUSION

This study identifies significant differences in fitness attributes among U-15 female volleyball players across positions. Middle Blockers and Opposite Hitters excel in height, reach, and strength, whereas Liberos demonstrate superior agility. Position-specific assessments and training programs are recommended for youth players to optimize performance and long-term development.



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