



Statistical Analysis Of Gender Differences In Serve And Smash Speeds Among University Volleyball Players: A Mixed Gender Model Perspective

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Abstract: This study examines the serve and smash speeds of male and female university volleyball players to develop a balanced mixed-gender volleyball model. Using data collected from 29 players (15 males and 14 females), to check significance of difference in the serve and smash speed in both genders, the t-test has applied. The results reveal significant differences in smash speeds but not in serve speeds. This paper discusses implications for mixed-gender team formation and game design.

Index Terms - Volleyball, Gender Differences, Serve Speed, Smash Speed, Mixed-Gender Model, T-Test

I. INTRODUCTION

Volleyball is a high-intensity sport that requires a combination of speed, precision, and teamwork. Mixed-gender volleyball formats are gaining popularity as they promote inclusivity and equity in sports. However, physical and physiological differences between genders often influence performance, necessitating the need for data-driven strategies to ensure balanced gameplay.

This study investigates gender-based differences in key volleyball performance metrics—serves speed and smash speed.

The aim is to develop insights for creating a mixed-gender volleyball model that accounts for these differences, ensuring fairness and competitiveness.

II. METHODOLOGY

PARTICIPANTS:

The subjects for the study who participated here 29 university level players. Out of these 29 players; 15 were male and 14 were female players. These players were from various states represent the GGV University, Bilaspur (C.G.).

Data Collection:

The following parameters were measured for each player:

SERVE SPEED:

- Standing Serve
- Jump Serve
- Smash Speed:
- Under Attack Line
- From Attack Line
- 1m Behind the Attack Line

STATISTICAL ANALYSIS:

A two-sample t-test was conducted to compare the means of serve and smash speeds between male and female players. The statistical significance threshold was set at $\alpha = 0.05$. Key metrics included mean, standard deviation, t-statistics, and p-values.

III. RESULTS:

The statistical results for serve and smash speeds are summarized below:

SERVE SPEED (STANDING)

- Male Mean: 58.15 km/h
- Female Mean: 54.50 km/h
- T-Statistic: 1.56
- P-Value: 0.131
- Interpretation: No significant difference was observed.

SERVE SPEED (JUMP)

- Male Mean: 64.75 km/h
- Female Mean: 57.00 km/h
- T-Statistic: 1.15
- P-Value: 0.265
- Interpretation: No significant difference was observed.

SMASH SPEED (UNDER ATTACK LINE)

- Male Mean: 62.08 km/h
- Female Mean: 48.50 km/h
- T-Statistic: 2.33
- P-Value: 0.034
- Interpretation: A significant difference was observed.

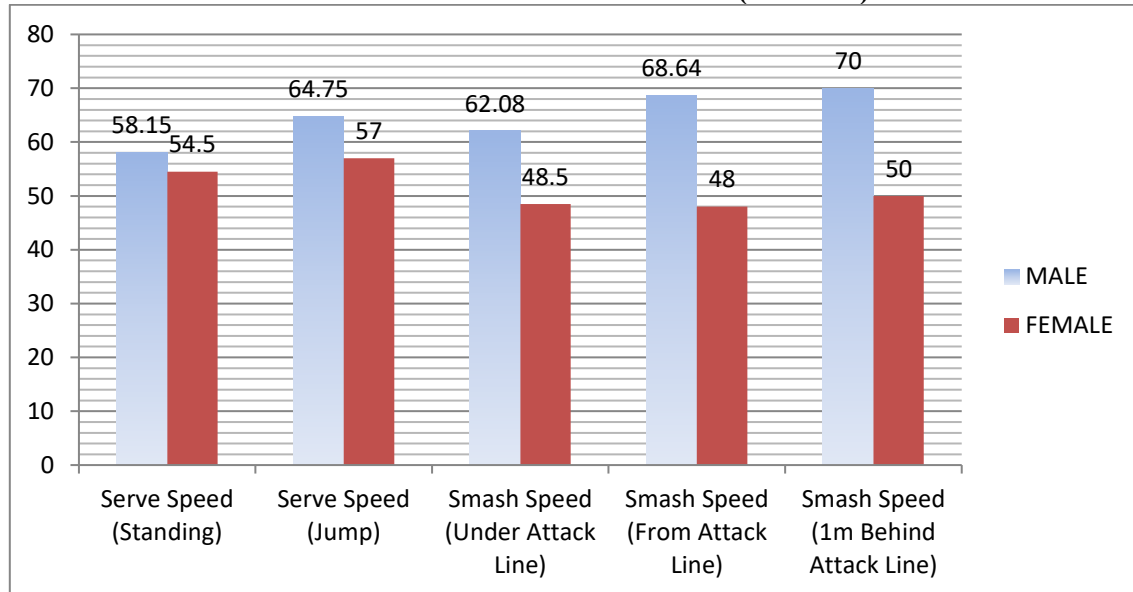
SMASH SPEED (FROM ATTACK LINE)

- Male Mean: 68.64 km/h
- Female Mean: 48.00 km/h
- T-Statistic: 3.53
- P-Value: 0.003
- Interpretation: A significant difference was observed.

SMASH SPEED (1M BEHIND ATTACK LINE)

- Male Mean: 70.00 km/h
- Female Data: 50.00 km/h
- Interpretation: A significant difference was observed.

COMPARISON SERVE AND SMASH SPEED (KM/HR) BY GENDER



IV. DISCUSSION

Key Findings -

The analysis reveals significant gender-based differences in smash speeds but not in serve speeds. These findings align with existing literature, suggesting that male players typically possess higher upper-body strength, contributing to faster smashes. However, the lack of significant differences in serve speeds highlights areas where mixed-gender teams can achieve parity.

IMPLICATIONS FOR MIXED-GENDER VOLLEYBALL MODELS

1. **Smash Contributions:** Male players can be strategically positioned to capitalize on their higher smash speeds for offensive plays.
2. **Serve Balance:** Equal opportunities can be provided for both genders in serving roles to ensure balanced gameplay.
3. **Training Focus:** Targeted training programs for female players can help bridge the gap in smash speeds.
4. **Game Rules:** Adjustments in court positions and rotations can help balance team dynamics, promoting fairness in mixed-gender matches.

LIMITATIONS AND FUTURE RESEARCH

1. The study's sample size is relatively small; future studies should include a larger and more diverse participant pool.
2. Additional performance metrics such as agility, accuracy, and teamwork should be considered to develop a comprehensive mixed-gender model.
3. The impact of psychological and social factors on mixed-gender gameplay warrants further investigation.

V. CONCLUSION

This study provides valuable insights into gender-specific performance metrics in volleyball. While significant differences in smash speeds exist, serve speeds are relatively balanced, offering opportunities for equitable mixed-gender team formation. These findings can inform training strategies, team composition, and game rules, fostering inclusivity and competitiveness in mixed-gender volleyball.

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