



Impact Of Weight Training On Serving Skill Performance Of High School Volleyball Players

¹ Dr. Rajashekhar D. Benakanahalli

¹ Associate Professor in Physical Education

¹ Government First Grade College for Women, Gandhi Choke, Vijayapur-586101, Karnataka, India.

Abstract: This research aims to examine the effect of a weight training program on the serving performance of high school volleyball players. Twenty-seven players from Vijayapur, Karnataka, India, who were also high school volleyball players, were randomly assigned to three equal groups of nine. The groups included: Experimental Group I (WR), which engaged in resistance exercises using their own body weight; Experimental Group II (WRS), which combined resistance exercises with weights and specific volleyball skills; and Group III (CG), which served as the control group with no additional training. The participants underwent pre-test evaluations of their serving abilities using the AAHPER Volleyball Serving Test, with performance measured in points. Over twelve weeks, the experimental groups followed their respective weight training programs. Post-test serving performance scores were collected after the training period. Statistical analyses using ANOVA and ANCOVA were conducted to determine significant differences in serving skills among the groups. The LSD post hoc test was employed when the ANOVA F-value indicated significance, with a 0.05 level of confidence set for all statistical tests. The findings highlight the value of combining resistance training with skill-specific practice to enhance serving performance in volleyball. Coaches and trainers are encouraged to integrate both resistance training and skill drills into their programs to achieve optimal performance improvements. Future research could explore the long-term effects of these training methods and their applicability to actual game performance.

Index Terms Serving, Weight training, Resistance exercises, Volleyball, Skill performance, High school players

I. INTRODUCTION

Volleyball is a dynamic and fast-paced sport that requires a unique combination of technical skills, physical fitness, and overall athleticism. The performance of high school volleyball players is influenced not only by their proficiency in skills such as serving but also by their physical strength and power. This research examines the impact of a weight training program on enhancing skill performance, specifically focusing on the serving ability of high school volleyball players.

Importance of Skill Performance in Volleyball: Skill performance is fundamental in volleyball, with serving being among the most crucial skills. Serving requires precise control of the ball, whereas serving necessitates both accuracy and power. These skills are essential for effective offensive and defensive strategies, contributing significantly to a team's success (Carson et al., 2016). Strength and power play vital roles in volleyball, as they enable players to execute powerful movements and contribute to the speed and

accuracy of serves and passes (Sattler et al., 2012). A weight training program specifically targets these physical attributes, enhancing overall athletic performance.

Role of Strength and Power in Volleyball: Strength and power are critical physical attributes that significantly impact a player's performance in volleyball. Strength allows players to exert the necessary force in their movements, while power, a combination of strength and speed, is crucial for the execution of explosive actions such as serving (Sattler et al., 2012). Implementing a weight training program can develop these attributes, thereby enhancing a player's ability to perform effectively on the court.

Impact of Weight Training on Strength and Power: Research has shown that weight training programs are effective in increasing muscle strength and power in athletes (Hoffman et al., 2019). Resistance exercises like squats, deadlifts, and bench presses are commonly utilized to improve muscular strength and power, which in turn can positively influence volleyball skill performance by enhancing the ability to generate force and execute powerful serves and passes.

Skill Variable: Serving in volleyball demands a blend of power and precision. A well-structured weight training program can increase the muscular power necessary for forceful serves (Cormack et al., 2008). Additionally, improvements in core strength and balance, which can result from resistance training, are likely to enhance serving accuracy (Sattler et al., 2012). By integrating weight training with volleyball-specific skill practice, players can achieve a comprehensive approach to development, simultaneously improving physical strength and honing technical skills. This dual focus not only supports individual player growth but also enhances the overall competitiveness of high school volleyball teams. Combining weight training with volleyball-specific skill practice offers a holistic approach to player development. While weight training enhances physical attributes such as strength and power, skill practice refines the technical aspects of serving. This integrated training approach can produce well-rounded athletes who excel both physically and technically, contributing to the success of high school volleyball teams.

The influence of a weight training program on the skill performance of high school volleyball players, particularly in serving ability, is an essential element of player development. Strength and power are fundamental physical attributes that significantly contribute to the execution of these skills. By incorporating a carefully planned weight training program into their training regimen, players can improve their muscular strength and power, leading to better performance in serving. This comprehensive approach not only enhances individual player development but also boosts the overall performance and competitiveness of high school volleyball teams.

II. REVIEW OF RELATED LITERATURE

Several studies have explored the effects of different training methods on the performance of volleyball players. **Sakthivel, Ramesh, and Vinayagamoorthi (2022)** examined the impact of combining strength and plyometric training on the arm and leg strength of female college volleyball players. The study divided participants into an experimental group, which received both strength and plyometric training, and a control group. Over an 8-week period, the experimental group showed significant improvements in both arm and leg strength, demonstrating the effectiveness of combining these training modalities.

Rajesh and Veeramani (2022) investigated the effects of specialized volleyball coaching on skill performance among female high school volleyball players. The study divided participants into experimental and control groups. The experimental group underwent a 12-week coaching program focused on spiking, serving, skills. Results showed significant improvements in these skills for the experimental group, highlighting the importance of targeted coaching in enhancing specific volleyball skills.

In a study by **Nasrulloh et al. (2022)**, the focus was on the benefits of compound set weight training for archery athletes. Although not specific to volleyball, this study demonstrated that an 8-week compound set weight training program significantly increased arm muscle strength and endurance, suggesting that similar training could be beneficial for volleyball players as well.

Kundukulam (2022) explored the impact of strength training on flexibility among female college volleyball players. Participants were divided into a strength training group and a control group, with the training group showing significant improvements in flexibility after 12 weeks. This suggests that strength training not only enhances muscular strength but also positively affects flexibility, which is crucial for volleyball performance.

Kumar & Kumar (2020) examined the effects of skill-focused coaching on volleyball players' performance. The study found that skill-specific instruction significantly improved attacking, serving, forearm and overhead passing skills, underscoring the value of targeted coaching strategies in enhancing volleyball performance.

These studies collectively highlight the effectiveness of various training approaches, including strength and plyometric training, specialized coaching, and compound set weight training, in improving different aspects of volleyball performance such as strength, skill proficiency, endurance, and flexibility. While the benefits of weight training on general sports performance are well-documented, there remains a need for targeted research into its specific effects on the technical demands of volleyball, particularly in skills like serving. This gap suggests that integrating strength and skill-focused training could be key to optimizing volleyball performance.

III. SIGNIFICANCE OF THE STUDY

The need to study the effect of a weight training program on the skill performance of high school volleyball players, particularly their serving ability, arises from several key considerations. Volleyball is a sport that requires a combination of technical skills and physical attributes, where the ability to pass and serve effectively is crucial for success. Therefore, understanding how weight training can enhance these skills is vital for improving overall athletic performance in the sport.

High school volleyball teams often compete at a high level, with athletes seeking ways to gain a competitive edge. By investigating the benefits of weight training, this study aims to provide insights that could help athletes enhance their skills and physical abilities, thereby improving their performance on the court. Additionally, many high school volleyball players aspire to pursue careers at higher levels, such as collegiate, professional, or national teams. A well-structured weight training program that supports skill enhancement could be critical in their long-term athletic development, making them more competitive in the broader volleyball community.

From a coaching perspective, understanding the role of weight training in skill development can help in designing more effective training programs. Coaches and trainers can use evidence-based information to create tailored training strategies that combine strength conditioning with skill practice, optimizing athlete performance while reducing the risk of injury. This research is also significant for its potential contribution to the scientific knowledge base, offering data-driven insights that can inform future studies on athletic training and performance.

Overall, the study's significance lies in its potential to enhance athletic performance, provide a competitive advantage, support long-term athlete development, and inform coaching strategies. By exploring the specific impacts of weight training on volleyball skills, this research could benefit athletes,

coaches, institutions, and the sport of volleyball as a whole, fostering a deeper understanding of effective training methodologies and contributing to the advancement of sports science.

IV. PURPOSE OF THE STUDY

The purpose of this study is to examine the effects of different weight training programs on the skill performance of high school volleyball players (boys), specifically focusing on their serving skill performance. By evaluating how varied weight training regimens impact these critical volleyball skills, the study aims to provide insights into optimizing training strategies for enhancing athletic performance in high school volleyball game.

V. STATEMENT OF HYPOTHESES

It was hypothesized that there would be significant changes in the Serving Performance of high school volleyball players by practicing weight training program.

VI. METHODOLOGY

This research aims to examine the effect of a weight training program on the serving performance of high school volleyball players (boys). Twenty-seven players from Vijayapur, Karnataka, India, who were also college volleyball players, were randomly assigned to three equal groups of nine. The groups included: Experimental Group I (WR), which engaged in resistance exercises using their own body weight; Experimental Group II (WRS), which combined resistance exercises with weights and specific volleyball skills; and Group III (CG), which served as the control group with no additional training. The participants underwent pre-test evaluations of their serving abilities using the AAHPER Volleyball Serving Test, with performance measured in points. Over twelve weeks, the experimental groups followed their respective weight training programs. Post-test serving performance scores were collected after the training period. Statistical analyses using ANOVA and ANCOVA were conducted to determine significant differences in serving skills among the groups. The LSD post hoc test was employed when the ANOVA F-value indicated significance, with a 0.05 level of confidence set for all statistical tests.

VII. ANALYSIS OF THE DATA

The analysis of variance (ANOVA) and analysis of covariance (ANCOVA) were performed to compare the serving skill performance of high school volleyball players across different groups-Control Group (CG), Weight Training with resistance exercises (WR) group, and Weight Training with resistance exercises along with skill practice (WRS) group-at three different stages: pre-test, post-test, and adjusted post-test.

Table-1. ANOVA and ANCOVA Results on Serving Skill Performance Scores of High School Volleyball Players.

Tests		CG	WR	WRS	Source Variance	df	Sum of square	Means square	'F' ratio
Pre-test	Mean	27.77 7	25.77 8	28.33 3	Between Group	2	32.519	16.259	1.00 ^{NS}
	Std. Dev.	2.048	6.098	2.692	Within Group	24	389.111	16.213	
	Std. Error	0.682	2.032	0.897	Total	26	421.630		
Post-test	Mean	25.88 8	30.11 1	31.22 2	Between Group	2	142.519	71.259	4.89*
	Std. Dev.	2.976	5.577	1.922	Within Group	24	349.333	14.556	
	Std. Error	0.992	1.859	0.640	Total	26	491.852		
Adjusted Post-test	Mean	25.48 4	31.38 9	30.35 0	Contrast	2	175.914	87.957	27.34*
	Std. error	0.599	0.614	0.605	Error	23	73.970	3.216	

*Table value at 0.05 level (df-2, 24/23) = 3.40; Significant at 0.05 level; NS = Not Significant

Interpretation of Table-1:

- Pre-Test Scores:** The 'F' ratio for the pre-test scores is 1.00, which is not statistically significant (NS). This suggests there were no significant differences in serving skill performance among the three groups (CG, WR, WRS) before the intervention.
- Post-Test Scores:** The 'F' ratio for the post-test scores is 4.89, which is statistically significant at the 0.05 level. This indicates a significant difference in serving skill performance among the groups after the intervention, implying that the training programs had an impact.
- Adjusted Post-Test Scores:** The 'F' ratio for the adjusted post-test scores is 27.34, which is highly significant at the 0.05 level. This suggests that even after adjusting for covariates, there are significant differences in serving skill performance among the groups, highlighting the effectiveness of the weight training programs, particularly in the WR and WRS groups.

The ANOVA and ANCOVA results demonstrate that while there were no initial differences in serving skill performance among the groups, the interventions led to significant improvements, particularly in the experimental groups. The WR and WRS groups showed notable gains compared to the control group (CG).

Table-2(a). LSD Post Hoc Analysis Results on Serving Skill Performance (Scores) of High School Volleyball Players.

Serving Ability scores			Mean Difference	Critical Difference
CG Group	WR Group	WRS Group		
25.484	31.389	×	5.905*	2.204
×	31.389	30.350	1.039 ^{NS}	
25.484	×	30.350	4.866*	

*Significant at 0.05 of confidence; NS=Not Significant.

Interpretation of Table-2(a):

- CG vs. WR:** The mean difference between the Control Group (CG) and the Weight Training with Resistance Exercises (WR) group is 5.905, which is greater than the critical difference of 2.204. This indicates a statistically significant difference in serving performance between these two groups at the 0.05 level.
- CG vs. WRS:** The mean difference between the Control Group (CG) and the Weight Training with Resistance Exercises along with Skill Practice (WRS) group is 4.866, also greater than the critical difference of 2.204, showing a statistically significant difference in serving performance at the 0.05 level.
- WR vs. WRS:** The mean difference between the WR and WRS groups is 1.039, which is less than the critical difference of 2.204. Thus, there is no statistically significant difference in serving performance between the WR and WRS groups.

The LSD post hoc analysis reveals significant improvements in serving skill performance in the experimental groups (WR and WRS) compared to the control group (CG). However, there is no significant difference between the WR and WRS groups, indicating that both types of weight training programs (with and without skill practice) were effective in enhancing serving performance.

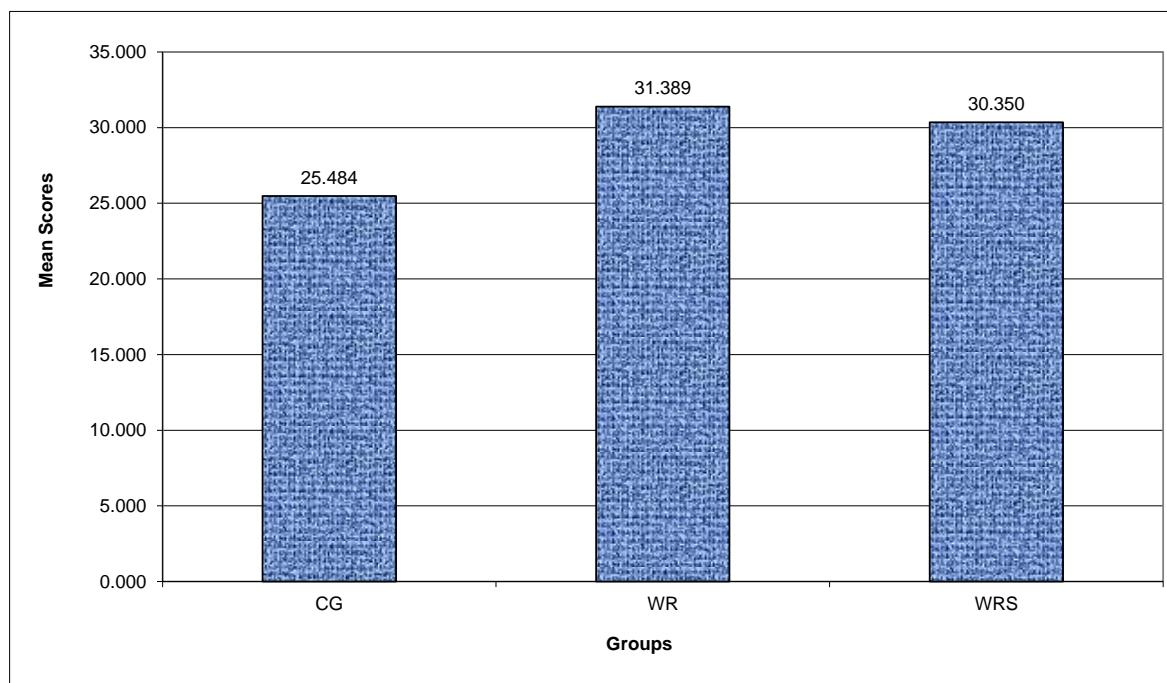


Fig.1: Bar Diagram of Pre-Test, Post-Test, and Adjusted Post-Test Mean Scores on Serving Skill Performance

Fig-1 provides a visual representation of the pre-test, post-test, and adjusted post-test mean scores for serving skill performance among the control and experimental groups. This diagram highlights the differences in performance trends across different phases and groups, emphasizing the impact of the weight training interventions on high school volleyball players.

VII. DISCUSSIONS ON FINDINGS

The findings of this study indicate that targeted training interventions significantly enhanced serving skill performance among high school volleyball players (boys). Notably, the groups that engaged in weight training with resistance exercises, particularly when combined with skill practice (WRS), demonstrated the most pronounced improvements in serving skill performance. This was evident from the substantial increases in their post-test and adjusted post-test mean scores of serving skill performance compared to the control group (CG) and the weight training group without skill practice (WR).

The Control Group, which did not participate in any specific training regimen, showed no significant improvement in either serving ability. This lack of progress highlights the necessity of structured training programs that integrate both resistance exercises and skill-specific practice for developing these essential volleyball skills. The significant improvement in the WRS group suggests that combining physical conditioning with skill practice is more effective than either approach alone. This is in line with previous studies by Rajesh & Veeramani (2022) and Kumar & Kumar (2020), which also found significant improvements in serving ability following strength training programs in volleyball players. These findings highlight the importance of comprehensive training programs that integrate both strength and skill components to enhance volleyball performance. Coaches and trainers should consider incorporating resistance training with skill practice into their training regimens to optimize the development of both serving skill performance among their athletes. This approach not only enhances physical fitness but also translates directly to improved game performance.

VIII. CONCLUSION AND SUGGESTIONS

The study concluded that structured training interventions, particularly those combining weight training with resistance exercises and skill practice; significantly improve serving ability in high school volleyball players. The groups that participated in these combined training regimens showed the most substantial improvements in both skill areas, as evidenced by the higher post-test and adjusted post-test mean scores.

These findings emphasize the critical role of integrated training programs that combine physical conditioning and technical skill development. Such programs are more effective in enhancing volleyball-specific skills than either weight training or skill practice alone. This highlights the potential of comprehensive training strategies to elevate athletic performance in competitive sports, particularly in high school volleyball players.

Implications for Practice:

- 1. Enhanced Training Programs:** Coaches and trainers should design training programs that incorporate both resistance training and skill practice to achieve optimal improvements in serving skill performance. This dual approach can lead to more effective skill development and better overall performance in matches.
- 2. Focus on Skill-Specific Training:** While general physical conditioning is important, the findings suggest that skill-specific training should not be neglected. Combining resistance exercises with targeted volleyball drills can provide a balanced approach to improving both fitness and skill proficiency.
- 3. Customized Athlete Development:** Training programs should be tailored to meet the specific needs of high school volleyball players, focusing on areas that need the most improvement. By identifying

and targeting these areas with appropriate exercises and drills, coaches can better support the overall athletic development of their players.

4. Future Research Directions: Further research could explore the long-term effects of such combined training programs on other volleyball skills and different athlete populations. Additionally, investigating the optimal frequency, duration, and intensity of resistance and skill training could provide more precise guidelines for coaches.

Overall, the study's findings offer valuable insights for optimizing training methods in volleyball and highlight the benefits of an integrated approach to developing key athletic skills.

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