P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (RJIF): 5.93
IJPESH 2025; 12(5): 675-679
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https://www.kheljournal.com
Received: 04-08-2025
Accepted: 06-09-2025

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Impact of aerobic training with volleyball specific exercises on cardiovascular endurance in male pre-university volleyball players

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DOI: https://doi.org/10.22271/kheljournal.2025.v12.i5j.4047

Abstract
This paper aspires to see the degree to which aerobic training could improve cardiovascular endurance among male pre-university volleyball players. A total of 38 participants from Pre-University College, Bengaluru (Karnataka-India), were randomly separated into 2 (two) groups: viz., Experiment Group-I (AT-VSE, 18 players) received aerobic training with volleyball specific skills practices and the other is Group-II (CG, 18 players), was the control group. The pre test scores were obtained for equally groups utilizing the 800 mtrs. Run (minutes) to assess the cardiovascular endurance of the subjects. Group-I involved in aerobic exercises with volleyball specific skills 3 three times (a week for eight weeks) along with their routine, whereas the control group uphold their regular timetable. After the training period, post-test scores for cardiovascular endurance were collected. A paired dependent 't' test and an independent 't' test sample were utilized to find out the significance in the cardiovascular endurance scores at both 0.05 and 0.01 levels of confidence. The consequences, as examined by utilizing SPSS software as well as MS Excel application, revealed that the cardiovascular endurance of the pre-university volleyball players receiving aerobic exercise had a significant improvement. The study definitely shows that combining aerobic training and volleyball-specific activities enhances cardiovascular endurance among male pre-university volleyball players. The result shows the importance of appropriate training techniques for boosting one's performance as an athlete. Contrastingly, the low levels of improvement in the control group indicate normal activities very limited contribution to resulting in such improvements.

Keywords: Aerobic training, cardiovascular endurance, volleyball, pre-university college students

1. Introduction
Aerobic training, which is also known as cardiovascular exercise, is consistent physical activity that develops the heart and lungs so that the body can use oxygen more effectively. Aerobic exercises have been proved to enhance the general cardiovascular fitness of sports athletes, such as volleyball players, so that they can perform for long or in a highly demanding game. It encourages the growth of these important physical fitness aspects: endurance, quickness, muscular endurance and elasticity-which are all crucial to volleyball players. This mode of aerobic training can go a long way in enhancing performance on the court if complemented with specific skill drills that emphasize agility, endurance and explosive strength. It not only enhances cardiovascular fitness but also encourages quicker recovery, which decreases fatigue during even tough match play (Naik & Sarojini, 2025) [7].
Aerobic training is important for volleyball players because it improves endurance and cardiovascular system efficiency. According to research, aerobic activities raise the VO2 max, or the greatest quantity of oxygen an athlete can use during intensive activity, which is critical for increasing performance in dynamic sports such as volleyball (Kausar *et al*., 2015) [5]. Moreover, aerobic exercises, like in volleyball training, enhance muscle endurance and agility, which enables a player to move fast and recover from effort throughout the game (Arangannal & Desingurajan, 2015) [1]. As a consequence, the amalgamation of aerobic instruction with specific volleyball skill exercises not only improves physical fitness but also refines the strategic and technological mechanism of the sport, enabling players to perform at their best in various match conditions.

Despite extensive studies that have proven the benefits of aerobic training, it is still under-explored how skill-specific exercises could be added into aerobic training for volleyball. Other related studies include that of Kantikar (2022) [3] and Kaveri's (2024) [6], which aimed to discover the effectiveness of aerobic programme on factors like agility, strength and cardiovascular endurance. However, to bridge this gap in research, little is known on how different intensities of aerobic training, when complemented with skill-related exercises, interact with these factors in volleyball players. The study conducted by Naik & Sarojini, 2025 [7] and Patil, 2024 [8] highlight that varied intensity aerobic training positively impacts physical variables, but the exercise drills that lead to specific volleyball skills must be isolated and correlates with increased cardiovascular endurance, requiring further investigation to develop the best training programs for volleyball players. The gap that this study is trying to close is in relation to the benefits of combined aerobic and skill-based training on volleyball players' cardiovascular endurance, agility and overall performance.

2. Review of Related Literature

One of the major topics of sports science research has been the efficiency of aerobic training in enhancing physical fitness components, especially cardiovascular endurance. Aerobic exercises are well known for improving cardiovascular capacity, muscular strength, flexibility and overall athletic performance. These exercises are often defined as extended, low-to-moderate intensity physical activities. A number of researches have investigated how aerobic exercise influences different physical aspects, specifically in sports such as volleyball, in which endurance and agility play an essential role for successful playing. The following is a review of the combined effects of different researchers in examining how aerobic exercise affects volleyball players' various physical attributes in cardiovascular endurance, agility, flexibility and strength.

Studies Related to Aerobic Training

Naik and Sarojini (2025) [7] analyzed the influence of intensity of aerobic exercise (low, moderate as well as high leels) on specific physical characteristics in volleyball players and the investigation was conducted and results showed that moderate and high-intensity groups had marked changes in cardiovascular endurance, agility as well as flexibility as compared to the control group. Though high intensity protocol was supposed to be better in terms of agility and cardiovascular endurance than moderate intensity guidance, moderate-intensity training proved the mainly useful for increasing flexibility as well as strength of muscle. This research work emphasizes the requirement of intensity in training for optimum physical advancement.

Patil (2024) [8] worked on aerobic exercise and Cardio Vascular Endurance (CVE) of degree college intercollegiate level students. The result from the experiment indicated that aerobic exercise training showed marked improvement in cardiovascular endurance in comparison with the 800-meter run test, showing positive impacts of aerobic exercise training on heart and lung function.

Kaveri (2024) [6] explored aerobic and circuit training's impact on the components of physical fitness and physiological factors, in college female volleyballers. The present study found a significant increase in cardio respiratory endurance along with resting pulse rate when exposed to aerobic training when contrasted with the controlled group. Data indicate aerobic training (AT), combined with circuit training, enhances volleyball players' cardio-vascular health.

Kantikar (2024) [4] studied the benefits of aerobic exercise on the cardio vascular endurance of volleyball players of Gulbarga University. The results of the study revealed that eight weeks of aerobic training improved the cardiovascular endurance by achieving a marked improvement based on the Cooper test, which established that indeed aerobic exercise would improve the cardiovascular health.

Kantikar, in the research of 2022, investigates the aerobic trainings impact on volleyball players' agility and strength. This investigation revealed that the seven-week period of aerobic trainings increases the agility and strength, further noting that general fitness from aerobic exercises should be seen by volleyball players to acquire both endurance and agility.

Kausar *et al*. (2015) [5] has compared the level of cardio-respiratory fitness among university level volley ball game players versus inactive young adults hailing from Marathwada district. These authors reported an elevated aerobic capacity of volleyball players compared to inactive youngsters as determined using VO2 max, supporting frequent athletic activity - particularly team games such as volleyball - which will considerably improve the cardiovascular fitness profile.

Arangannal and Desingurajan (2015) [1] investigated the effects of asymmetrical training and aerobic exercises on specific endurance measures in male volleyball players at college level and the study found that both intermittent training and aerobic exercise enhanced speed and muscular endurance. However, the intermittent training group performed better in these measures than the aerobic training group, which suggests that different training regimens have varied effects on specific endurance components.

Research Gap

The above listed researches indicate that aerobic exercise improves a number of physical variables including cardiovascular endurance, agility and flexibility in volleyball players. The majority of the above research indicates that the structured aerobic activities, if conducted along with sport-specific training, do considerably improve the cardiovascular and muscular endurance among other fitness components. The effectiveness of training intensity, duration and the combination of different exercise methods, such as aerobic and circuit training, has been investigated in various contexts, with findings showing that higher intensities or combined training programs result in better performance for specific physical attributes.

Although a great wealth of studies exists around aerobic training, the long-term outcome of different intensity levels of varied aerobic training to volleyball performance has remained relatively scant. Earlier studies were based around overall fitness elements and only a small number have had direct relationships concerning the outcomes in aerobic training concerning match performance and particularly specific games skills like agility as well as quick response in games played in high competitive environments. Furthermore, not much study is conducted into the impact of combining aerobic exercises training along with added complementary training viz., strength otherwise plyometric exercise to better improve volleyball performance.

Most of these studies have low sample sizes that are mainly on just one particular subgroup or age class. Larger diverse sample sizes on different age ranges, gender classes and other skill levels should be used to carry out subsequent studies.

This study might as well help explain the effects of extended aerobic training exceeding a few weeks and how their long-term effect may prolong the volleyball athlete's performance in any season. Though studies conducted nowadays prove the potency of aerobic exercises on physical fitness in volleyball players, still, the long-term benefits and its particular impact on match performance and game-specific skills need to be researched. This will help develop more focused and effective training regimens with which coaches can foster performance in players.

3. Research Topic Selected

"Impact of Aerobic Training with Volleyball Specific Exercises on Cardiovascular Endurance in male Pre-University Volleyball Players"

4. Aim and Objectives

The aim and objective of investigation is to assess the influence of aerobic training with volleyball specific exercises on the cardiovascular endurance in male volleyballers.

5. Hypotheses

1. There is no significant difference in the pre-test and post-test scores of cardiovascular endurance among male volleyball players in the control group and the experimental group (AT-VSE).
2. There is no significant difference in the cardiovascular endurance levels of male volleyball players between the control group and the experimental group in the pre-test and post-test scores.

6. Methodology

This paper aspires to see the degree to which aerobic training could improve cardiovascular endurance among male pre-university volleyball players. A total of 38 participants from Pre-University College, Bengaluru (Karnataka-India), were randomly separated into 2 (two) groups: viz., Experiment Group-I (AT-VSE, 18 players) received aerobic training with volleyball specific skills practices and the other is Group-II (CG, 18 players), was the control group. The pre test scores were obtained for equally groups utilizing the 800 mtrs. run (minutes) to assess the cardiovascular endurance of the subjects. Group-I involved in aerobic exercises with volleyball specific skills 3 three times (a week for eight weeks) along with their routine, whereas the control group uphold their regular timetable. After the training period, post-test scores for cardiovascular endurance were collected. A paired dependent 't' test and an independent 't' test sample were utilized to find out the significance in the cardiovascular endurance scores at both 0.05 and 0.01 levels of confidence. The results examined using SPSS and MS Excel, revealed a significant change in cardiovascular endurance among pre university volleyball players who underwent aerobic training with specific skills practices.

The 8 (eight) weeks training schedule for the development of cardiovascular endurance in male pre-university volleyball players is an integration of aerobic and volleyball-specific exercises, meant to improve fitness as well as sport-specific performance. During the first two weeks, the initial aerobic workouts of moderate intensity involve continuous running for 20-30 minutes and are then supplemented with volleyball-specific drills like shuttle sprints and agility ladder exercises to improve speed, footwork and response time. Weeks 3-4 focus on interval training through activities of vertical jumps, short sprints and quick changes in direction to mimic game-like situations. For weeks 5-6, the intensity level is increased by fartlek training, which changes speeds while jogging, to improve endurance, while volleyball drills that are increasingly harder, such as full-court sprints, spiking and passing under fatigue are implemented. In the last weeks (7-8), high-intensity interval training is introduced, combining longer sprint intervals with volleyball skill development, such as quick transitions, serving and blocking, to ensure players can maintain energy levels throughout a game. The programme closes with a focus on recovery, including cool-down stretches, enough hydration and rest days to prevent overtraining. This balanced strategy enhances both overall cardiovascular endurance and volleyball specific conditioning, allowing players to perform at their best in high-intensity game conditions.

7. Data Analysis

The data composed prior to and following the investigational periods on AT-VSE training on cardiovascular endurance of Experimental Group-I (AT-VSE), receiving aerobic training and Group-II (CG), the control group were analyzed and presented in the following tables.

Table 1: Showing pre and post tests scores on cardio vascular endurance of male Volleyball players of control & experimental groups.

Group	Post	Mean	Number	Standard Deviation	't' and 'P' values	Sig. Level
CG Group	Pre	4.900	18	0.882	1.42 (P=0.173)	NS
	Post	4.772	18	0.844		
AT-VSE Group	Pre	4.857	18	0.743	6.73 (P=0.000)	**
	Post	3.947	18	0.538		

NS indicates Not Significant; ** shows significant at 0.01 level (df = 17, 2.90)

The mean cardiovascular endurance scores for the control group (CG) decreased slightly between pre-test and post-test (from 4.900 to 4.772), with a computed t-value of 1.42 and a p-value of 0.173. Because the p-value is more than 0.05, the difference is not statistically significant, indicating that the control group did not improve significantly in cardiovascular endurance. In contrast, the experimental group (AT-VSE) demonstrated significant improvements in cardiovascular endurance. The average duration fell from 4.857 minutes in the pre-test to 3.947 minutes in the post-test, with a t-value of 6.73 and a very significant p-value of 0.000. This suggests that aerobic training combined with volleyball-specific exercises significantly increased cardiovascular endurance in the experimental group.

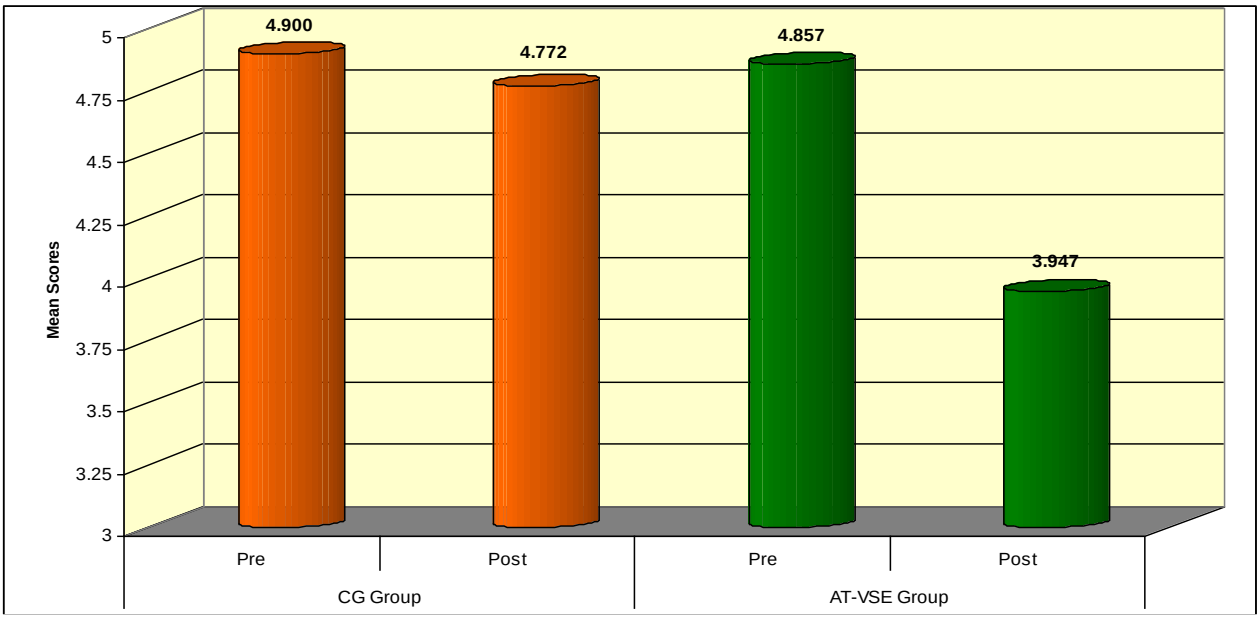

Fig 1: Assessment of cardiovascular endurance between of pre and post tests scores of volleyball players in control and experimental groups.

Table 2: Paired 't' test outcomes of pre and post tests scores of cardio vascular endurance of male Volleyball players of control and experimental groups.

Tests	Groups	Mean	Number	Standard Deviation	't' and 'P' values	Sig. Level
Pre Test	CG Group	4.900	18	0.882	0.16 (P=0.876)	NS
	AT-VSE Group	4.857	18	0.743		
Post Test	CG Group	4.772	18	0.844	3.50 (P=0.002)	**
	AT-VSE Group	3.974	18	0.538		

[NS]explains Not Significant; **illustrate Significant at 0.01 level (df = 34, 2.72)

The dependent paired 't' test findings for both groups' pre-test scores show no significant difference (t = 0.16, p = 0.876). This demonstrates that both groups had comparable baseline cardiovascular endurance prior to the intervention. In post-test scores, the experimental group had a significantly lesser mean time (3.947) than the control group (4.772), with a 't' value of 3.50 and a 'p' value 0.002 (p<0.01). This study shows that the experimental group outperformed the control group in terms of cardiovascular endurance due to aerobic training combined with volleyball-specific workouts.

Both tables show that aerobic training combined with volleyball-specific activities (AT-VSE) significantly improves cardiovascular endurance in volleyball male players compared to players from control group. This emphasizes the need of implementing tailored training regimens to improve athletic performance.

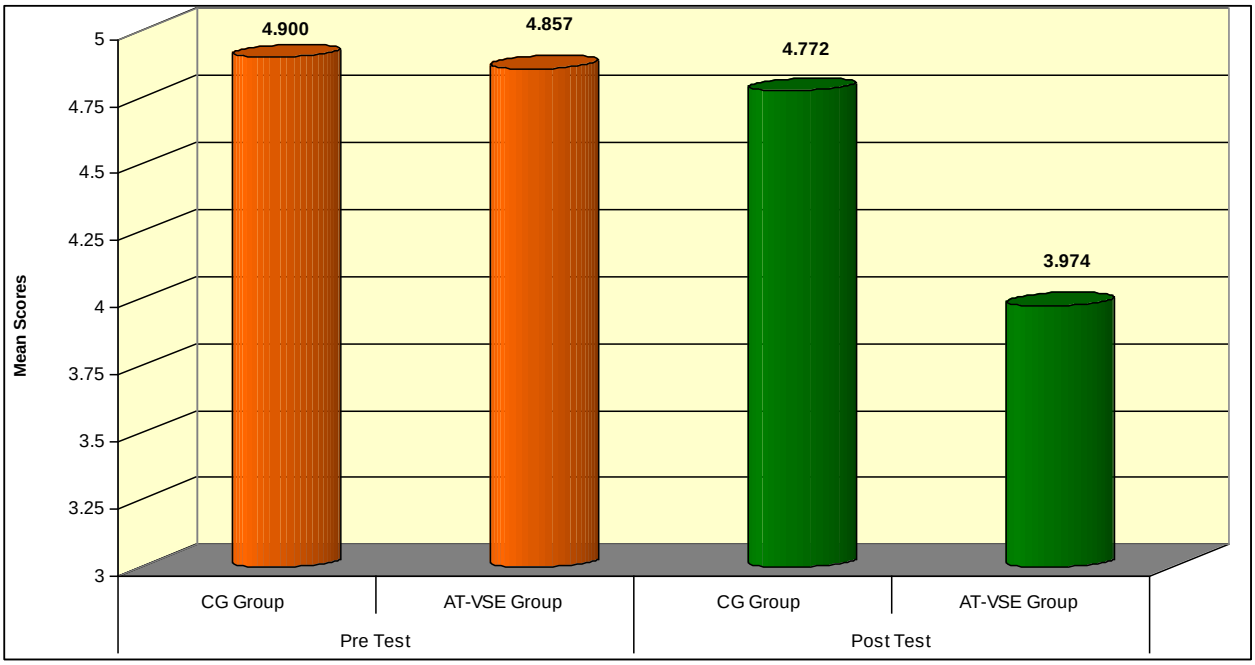

Fig 2: Assessment of pre-test and post-test scores of cardiovascular endurance of volleyball players between control and experimental groups.

8. Discussion on Findings

The discussion of the findings from the analyzed studies demonstrates how aerobic training improves physical fitness, particularly cardiovascular endurance, which is critical for volleyball athletes. The studies show that aerobic exercise can greatly improve endurance, agility and flexibility in athletes, which is consistent with the current study's findings. Naik and Sarojini (2025) [7] discovered that moderate with high intensity aerobic intervention increased cardiovascular endurance, agility and flexibility in volleyball players. Kaveri (2024) [6] similarly concluded that aerobic exercise improved endurance and heart rate recovery in female volleyball players. Therefore, the present study is consistent with this study. Patil (2024) [8] and Kantikar (2024) [4] established that aerobic training improved cardiovascular endurance in male volleyball players, thereby supporting the hypothesis that aerobic activities are required for developing endurance in volleyball athletes.

This is in conformity by the present study's consequences, which reveal that aerobic exercise greatly enhanced players' cardiovascular endurance. Kausar *et al.* (2015) [5] and Arangannal & Desingurajan (2015) [1] established that aerobic activities improve endurance and strength, both of which are critical for volleyball performance because players need explosive strength and agility to play well. In this experiment, the combination of aerobic exercise with specific volleyball abilities, such as agility drills, improved endurance and performance. Kantikar (2022) [3] supports this strategy, which helps players develop their cardiovascular fitness as well as game-specific skills like rapid movements and forceful jumps. The combination of these two training approaches results in more complete physical development for volleyball players. Though these studies clearly indicate the advantages of aerobic training, still there is no research done regarding the best combination of aerobic training and skill workouts that increase volleyball play, especially in India. Therefore, the current study helps bridge this gap by exploring how a combination of aerobic training with volleyball abilities enhances the cardiovascular endurance of players and also their overall performance.

The current study's findings concluded that aerobic exercise is critical for enhancing cardiovascular endurance and total physical fitness in volleyball players. Combining this with volleyball-specific abilities can result in improved performance on the court. Future research can look into the most effective ways to combine different training approaches to improve volleyball players' overall physical talents.

9. Conclusion

The study confidently established that a practice that involves an aerobic training component combined with volleyball-specific activity enhances the cardiovascular endurance of male pre-university volleyball players. Much shorter 800-meter run times for the experimental group clearly show that an organised training programme is effective. These results show the importance of concentrated training methods in the improvement of athletic performance. On the other hand, the control group player's exhibit low improvement manifested the limited utility of normal activities in producing similar results.

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