Research Article

A Comparative Analysis Of High Intensity Interval Training And Low Intensity Interval Training In Male College Volleyball Players

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Abstract

Purpose: This research focuses on evaluating the distinct impact of two training methodologies, high intensity and low intensity interval training on speed and breath holding capabilities of male college volleyball players.

Material and Methods: 30 participants randomly assigned to two groups, Group 'I' subjected to HIIT and Group 'II' to LIIT. Speed and breath-holding capacity assessments utilized 50M sprints and breath-holding tests, respectively, with measurements recorded in seconds. Data analysis employed the 't' test, with a significance level set at 0.05.

Results: Table 3 indicates a significant improvement in speed for the HIIT group, with a mean reduction from 8.78 to 7.51 seconds, a mean difference of 1.27 seconds, and a t-ratio of 1.70. LIIT exhibited a modest improvement, with a smaller mean difference of 0.36 seconds and a non-significant t-ratio of 1.02. Table 4 reveals that both HIIT and LIIT effectively enhanced breath-holding capabilities, with HIIT showing a more pronounced impact. The HIIT group displayed a significant mean difference of 6.2 seconds and a t-ratio of 5.46, while the LIIT group exhibited a moderate improvement with a mean difference of 3.4 seconds and a t-ratio of 2.75.

Conclusion: These findings underscore the necessity for tailored training approaches in sports, with HIIT emerging as an effective means for optimizing athletic performance. The study suggests practical implications for coaches and athletes, emphasizing the potential of HIIT to induce comprehensive physiological adaptations relevant to volleyball gameplay.

Keywords: High Intensity, Low Intensity, Interval Training, Volleyball, Speed, Breath-Holding.

1. Introduction

In contemporary society, sports play a pivotal role in inspiring individuals to pursue their aspirations. Sports empower people to set and chase objectives from an early age, with a significant portion of their lives dedicated to maintaining physical fitness through exercise and a balanced diet [1,2]. The benefits of sports extend beyond physical well-being; they offer alternative pathways to achieving mental and emotional health [3]. It's well-established that individuals who feel good about themselves on the outside are more likely to experience inner happiness, fostering a holistic sense of well-being [4,5]. Those who choose not to participate in sports should reflect upon the potential advantages they are missing out on. For those actively engaged in sports, encouragement to continue their involvement is essential [6]. Sports should occupy an integral place in the lives of individuals, both in educational institutions and within the home environment. Generally, a healthy individual exhibits stronger willpower compared to one who is physically weak. The world of sports has witnessed numerous triumphs, and its integration into our society has marked several significant milestones [3,7]. Participation in sports and games profoundly influences various aspects of personal development, which forms the basis of the present research. This research study aims to evaluate the impact of high-intensity interval training and low-intensity interval training on the speed and breath holding capabilities of college level male volleyball players [2,8].

2.Material and Methods

2.1. Participants

A cohort of 30 male college volleyball players aged 18 to 25 from SRMIST, Kattankulathur, Tamil Nadu, India, participated in the study. Participants were randomly assigned to Group 'I' (n=15), which underwent high-intensity interval training, or Group 'II' (n=15), which underwent low-intensity interval training. The training programs lasted 12 weeks, with Group 'I' engaged in HIIT five days a week, and Group 'II' participated in 30-minute LIIT sessions daily. Data analysis used the 't' test with a significance level set at 0.05.

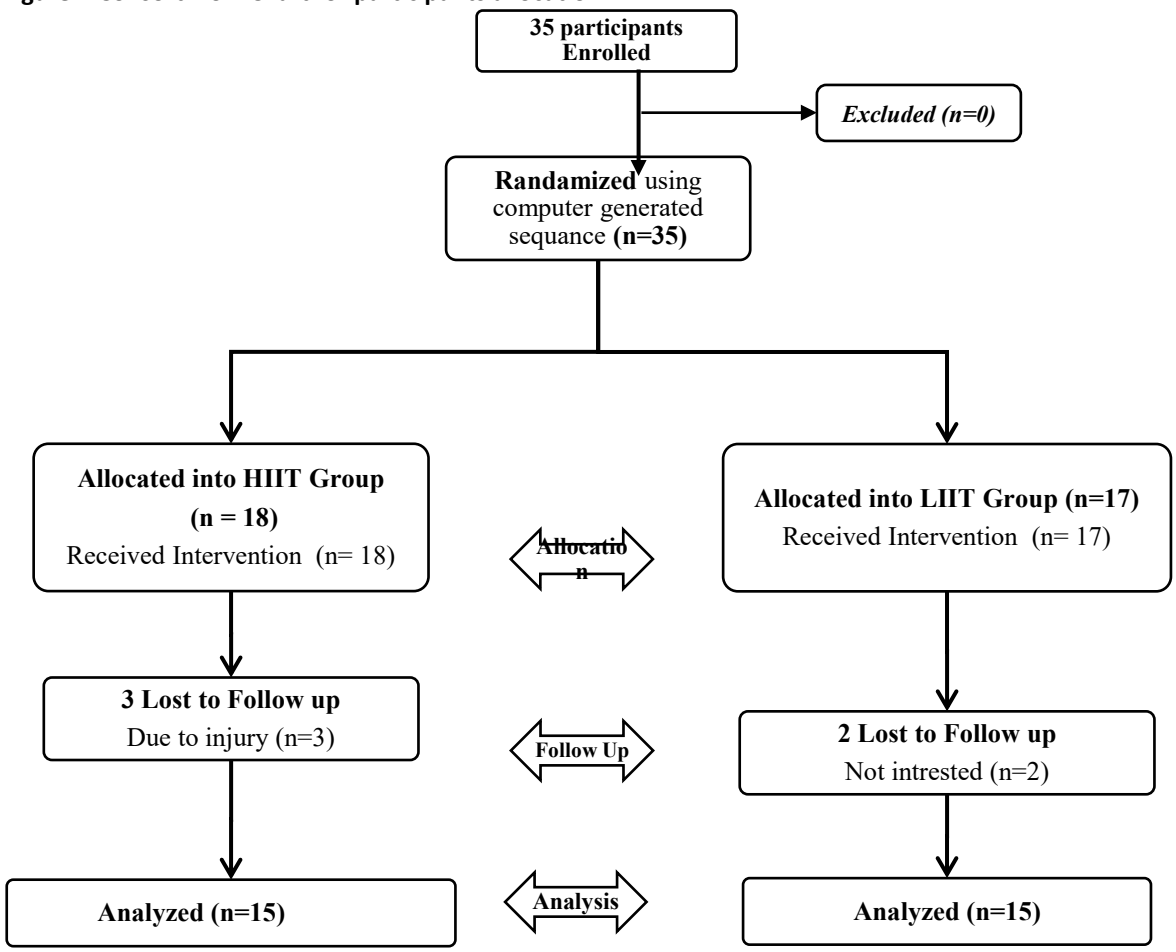
2.3. Experimental Design

The study used a randomized pre-test and post-test experimental design. Before the training program began, all participants completed baseline assessments measuring their speed and breath-holding capacity. After the pre-test, the subjects engaged in their respective training interventions for 12 weeks. Once the training program was completed, post-test measurements were taken using the same testing procedures.

2.4. Sample Size Justification

The sample size was estimated using G*Power software (Version 3.1.9.7). An a priori power analysis was conducted with an alpha level set at 0.05 and a statistical power of 0.80, anticipating an effect size of 0.80. This analysis indicated that a sample size of 30 participants was necessary. To account for a potential dropout rate of 15%, an additional five participants were added, leading to a target sample size of 35 participants. Ultimately, 30 participants completed the study and were included in the final analysis.

Figure.1 Consort Flow Chart for participants allocation



2.5. Training Protocol

Table. 1 – High-Intensity Interval Training (HIIT)

Weeks	Work Interval	Intensity	Recovery Interval	Repetitions
1–4	30 sec sprint/run	85–90% HRmax	60 sec jogging	8–10
5–8	40 sec sprint/run	90–95% HRmax	60 sec jogging	10–12
9–12	45 sec sprint/run	90–95% HRmax	45 sec jogging	12–15

Group I participated in High-Intensity Interval Training (HIIT), which involved repeated bouts of high-intensity exercises interspersed with short recovery intervals. Group II engaged in Low-Intensity Interval Training (LIIT), which was characterized by

lower exercise intensity and relatively longer recovery periods. Both groups followed their designated training protocols for 12 weeks under the supervision of the investigator.

Table. 2 – Low-Intensity Interval Training (LIIT)

Weeks	Work Interval	Intensity	Recovery Interval	Repetitions
1–4	60 sec running	60–70% HRmax	90 sec walking	8–10
5–8	75 sec running	65–75% HRmax	90 sec walking	10–12
9–12	90 sec running	65–75% HRmax	60 sec walking	12–15

2.6. Data Collection

Speed and breath-holding capacity were assessed through a 50M sprint and breath-holding tests, respectively. Measurements were recorded in seconds. Data were gathered before and after a 12-week training period, constituting pretest and posttest measures.

2.7. Statistical Analysis

The collected data was analysed using descriptive statistics, including mean and standard deviation. To determine the significance of differences between pre-test and post-test scores within each group, a paired t-test was employed, with a significance level set at 0.05.

3. Result

The table.3 compares pre- and post-test speed measurements for two groups of male college volleyball players undergoing different training regimes. In the HIIT group, the initial speed mean of 8.78 seconds significantly decreased to 7.51 seconds after 12 weeks, with a notable mean difference of 1.27 seconds and a t-ratio of 1.70, indicating statistical significance. Conversely, the LIIT group exhibited a modest improvement from a pre-test mean of 7.91 seconds to 7.55 seconds, with a smaller mean difference of 0.36 seconds and a non-significant t-ratio of 1.02 (Fig.2). These results suggest that HIIT had a more pronounced and statistically significant impact on enhancing speed among male college volleyball players compared to LIIT, emphasizing the potential efficacy of high-intensity training in optimizing athletic performance.

Table 3. Speed measurements before and after high intensity interval training (HIIT) and low intensity interval training (LIIT) groups' sessions.

Training	Pre-test Mean ± SD	Post-test Mean ± SD	Mean Differences	t-ratio
HIIT	8.78 ± 0.42	7.51± 0.38	1.27	1.70*
LIIT	7.91 ± 0.34	7.55 ± 0.27	0.36	1.02

*Significant level p< 0.05

Table 4. Pre and post - test breath holding time for high and low intensity interval training groups.

Training	Pre-test Mean ± SD	Post-test Mean ± SD	Mean Differences	t-ratio
HIIT	45.2±3.33	51.4±4.30	6.2	5.46*
LIIT	44.5±3.27	47.9±4.01	3.4	2.75*

*Significant level p< 0.05

The table.4 presents pre- and post-test breath-holding time data for male college volleyball players undergoing high intensity and low intensity interval training. In the HIIT group, participants demonstrated a significant increase in breath-holding time from a pre-test mean of 45.2 seconds to a post-test mean of 51.4 seconds, with a mean difference of 6.2 seconds and a t-ratio of 5.46, signifying statistical significance. Conversely, the LIIT group also showed improvement, albeit to a lesser extent, with a pre-test mean of 44.5 seconds and a post-test mean of 47.9 seconds, resulting in a mean difference of 3.4 seconds and a t-ratio of 2.75

(Fig.3). The standard deviations indicate moderate variability in both groups, with the HIIT group experiencing a slightly higher post-test standard deviation. Overall, the results suggest that both HIIT and LIIT contributed to enhanced breath-holding capabilities, with HIIT leading to a more substantial and statistically significant improvement in this aspect among male college volleyball players.

Fig.2

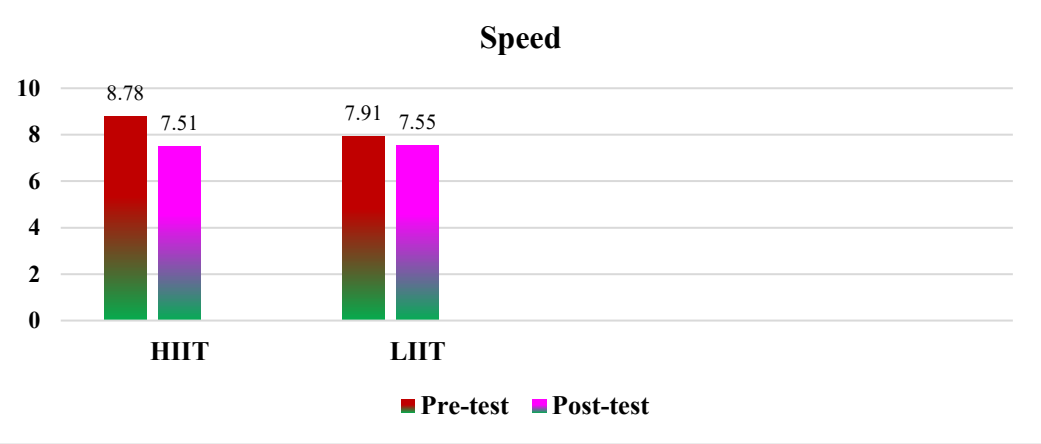
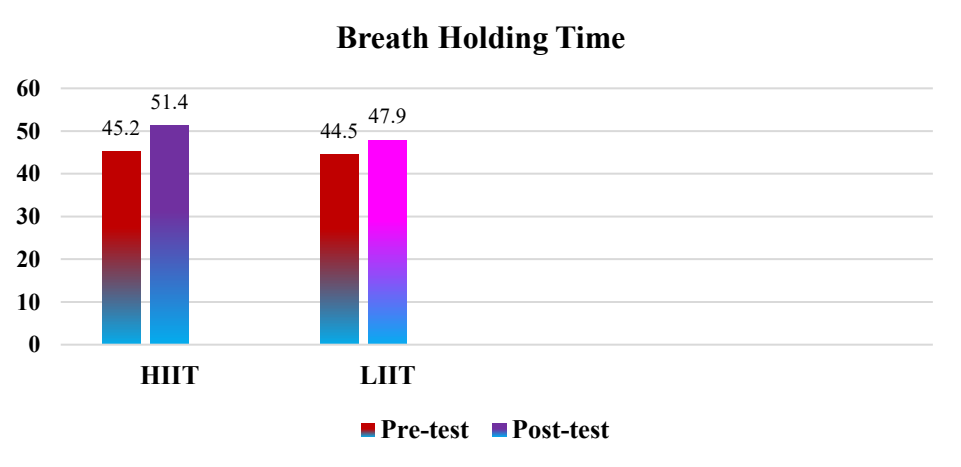


Fig.3



4. Discussions

The results from Table 3 demonstrate that HIIT yielded a substantial and statistically significant improvement in speed compared to LIIT. The HIIT group exhibited a noteworthy reduction in mean speed, from 8.78 to 7.51 seconds, with a significant mean difference of 1.27 seconds and a t-ratio of 1.70. Conversely, while the LIIT group demonstrated a modest improvement, the changes were not statistically significant, as indicated by a mean difference of 0.36 seconds and a t-ratio of 1.02. These findings highlight the superior effectiveness of HIIT in enhancing speed among male college volleyball players [9,10,11].

Analysis of Table 4 indicates that both training methods were effective in improving breath-holding capabilities [12]. However, HIIT once again emerged as the more impactful intervention. The HIIT group experienced a substantial increase in breath-holding time, with a significant mean difference of 6.2 seconds and a t-ratio of 5.46. In comparison, the LIIT group showed a moderate improvement, reflected in a mean difference of 3.4 seconds and a t-ratio of 2.75. Collectively, these results suggest that high-intensity interval training has a more pronounced influence on athletic performance parameters such as speed and breath-holding time among male college volleyball players [13,14].

This study offers valuable insights into the effectiveness of HIIT and LIIT in enhancing physical capabilities relevant to volleyball performance [15,16]. The outcomes emphasize the need to tailor training programs to specific athletic demands, with HIIT emerging as a promising approach for speed and breath-holding improvement in this context [17]. Future research exploring long-term effects and potential physiological adaptations would contribute to a more comprehensive understanding of optimal training methods for volleyball players and athletes in similar sports [18,19,20].

Conclusion

In conclusion, this study sheds light on the distinct effects of high intensity (HIIT) and low intensity interval training (LIIT) on the speed and breath-holding capacities of male college volleyball players. The results unequivocally highlight HIIT as the more effective intervention, significantly improving both speed and breath-holding time in a statistically significant manner compared to LIIT. The HIIT group demonstrated substantial enhancements, supported by notable mean differences and t-ratios, whereas the improvements observed in the LIIT group, while modest, did not reach statistical significance. These findings underscore the importance of tailored training approaches, with HIIT emerging as a preferred method for optimizing athletic performance within the realm of volleyball. Beyond contributing to sports science, this study offers practical implications for coaches and athletes seeking targeted physical improvements. The significant improvements seen in the HIIT group suggest its potential for comprehensive physiological adaptations relevant to volleyball gameplay.

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Author contributions

Gokul Raj M: Conceptualization, Data curation, Project administration, Resources, Supervision, Validation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing – original draft, Writing – review and editing. Shihabudheen Paikarathodi: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing – original draft, Writing – review and editing. Abdul Ahad P: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing – original draft, Writing – review and editing. Afsal T: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing – original draft, Writing – review and editing. Thamaraiselvi Saravanakumar: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review and editing.

Conflict of interest. The authors have no conflicts of interest in the material presented in this article.
Ethical Considerations. In adhering to with the 1975 Helsinki Declaration, the study proposal was accepted by the Departmental Ethical Committee of SRM Institute of Science and Technology in Chengalpattu, Tamil Nadu. Informed consent was collected by all the participants.
AI Policy. The authors declare that no generative AI was used in this manuscript.
Data availability. Due to ethical and privacy concerns, the data supporting the study's findings are not publicly available.

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