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Original Research Article

Impact of Varied Training Interventions on Selected Physiological Variables among Inter-Collegiate Male Football Players

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Abstract

Football is a physically demanding sport that requires well-developed physiological capacities, including cardiovascular endurance, pulmonary function, and efficient oxygen utilization. Modern training approaches such as plyometric training and functional training have gained considerable attention for their potential to improve athletic performance. While each training method offers unique physiological benefits, combining these approaches may produce greater adaptations than using either method independently. Therefore, the present study was undertaken to examine the effectiveness of varied training interventions on selected physiological variables among intercollegiate male football players. The purpose of this study was to investigate the impact of varied training interventions on selected physiological variables among intercollegiate male football players. Sixty male football players aged 18–25 years were randomly selected from various colleges in Visakhapatnam District, Andhra Pradesh, India. The participants were randomly assigned to four groups of fifteen players each. Group I underwent plyometric training, Group II participated in functional training, Group III received combined plyometric and functional training, and Group IV served as the control group. The experimental groups followed their respective training programmes for twelve weeks, with three training sessions per week, while the control group continued their regular routine without any specialized training intervention. The selected physiological variables vital capacity were measured before and after the intervention using standardized testing procedures. The collected data were analyzed using Analysis of Covariance (ANCOVA), with the level of significance set at 0.05. The findings revealed statistically significant improvements in all selected physiological variables among the experimental groups compared with the control group. Furthermore, the combined plyometric and functional training group exhibited significantly greater improvements than the plyometric training and functional training groups individually, indicating the superior effectiveness of the combined training approach. The study concludes that varied training interventions, particularly the integration of plyometric and functional training, are highly effective in enhancing physiological capacities and overall athletic performance among intercollegiate male football players. Coaches and physical education professionals may incorporate combined training programmes into regular football conditioning to optimize players' physiological fitness and competitive performance.

Keywords: Plyometric Training, Functional Training and Vital Capacity.

INTRODUCTION

Football is one of the most popular and physically demanding team sports in the world. Success in football depends on a combination of technical skills, tactical awareness, psychological preparedness, and physiological fitness. Modern football requires players to perform repeated bouts of high-intensity activities such as sprinting, jumping, tackling, changing direction, and maintaining sustained effort throughout the duration of a match. Therefore, the development of physiological

capacities is essential for enhancing football performance and reducing the risk of injury. Physiological variables such as resting pulse rate, vital capacity, maximal oxygen uptake (VO_2 max), and cardiovascular efficiency play a crucial role in determining a football player's ability to perform prolonged and intensive physical activity. Well-developed physiological characteristics enable players to recover quickly, maintain a high work rate during competition, and sustain optimal performance levels. Consequently, coaches and sports scientists continuously seek effective training methods to improve these physiological parameters. Training interventions have evolved considerably in recent years, incorporating scientific principles to maximize athletic performance. Among the various training approaches, plyometric training and functional training have gained significant attention due to their effectiveness in enhancing sport-specific fitness components. Plyometric training focuses on explosive movements that utilize the stretch-shortening cycle of muscles, thereby improving power, speed, and neuromuscular efficiency. Functional training, on the other hand, emphasizes integrated movement patterns that enhance strength, balance, coordination, stability, and overall athletic performance.

Research has shown that both plyometric and functional training can positively influence physiological and performance-related variables. However, the effectiveness of varied training interventions, particularly when different training methods are applied independently or in combination, requires further investigation among football players. Understanding the comparative effectiveness of these training approaches can assist coaches and practitioners in designing evidence-based training programmes that optimize player development. Intercollegiate football players represent a competitive population that requires systematic training to achieve higher levels of performance. In the context of Indian collegiate football, there is a growing need for scientific training programmes that enhance physiological efficiency and support long-term athletic development. Despite the increasing popularity of football in Andhra Pradesh, limited research has examined the effects of varied training interventions on the physiological characteristics of intercollegiate football players.

Therefore, the present study aims to examine the impact of varied training interventions on selected physiological variables among intercollegiate male football players. The findings of this study are expected to provide valuable insights for coaches, trainers, and sports scientists regarding the effectiveness of different training methods in improving physiological fitness and enhancing football performance.

METHODOLOGY

The purpose of this study was to examine the impact of varied training interventions on selected physiological variables among intercollegiate male football players. To achieve this objective, an experimental design involving pre-test and post-test measurements was adopted.

Selection of Subjects

Sixty male intercollegiate football players aged between 18 and 25 years were randomly selected from colleges affiliated with universities in Visakhapatnam District, Andhra Pradesh. The selected subjects were medically fit and had prior experience in competitive football participation. Prior to the commencement of the study, informed consent was obtained from all participants.

Experimental Design

The study employed a randomized group experimental design. The sixty selected intercollegiate male football players were randomly assigned into four groups of fifteen subjects each. Group I (PTG) served as the Plyometric Training Group, Group II (FTG) served as the Functional Training Group, Group III (CFTG) served as the Combined Plyometric and Functional Training Group, and Group IV (CG) served as the Control Group. The subjects in the experimental groups participated in their respective training programmes for a period of twelve weeks, whereas the control group did not undergo any specialized training intervention and continued with their regular routine activities throughout the experimental period.

Training Procedure

The training programme was conducted for a period of twelve weeks, with three training sessions per week on alternate days. Each session lasted approximately 60 minutes and consisted of a warm-up period, the main training component, and cool-down exercises. The intensity and volume of the training programme were progressively increased throughout the experimental period to facilitate continuous physiological adaptation and performance improvement. The Plyometric Training Group participated in exercises such as squat jumps, bounding, hurdle jumps, box jumps, and depth jumps. The Functional Training Group performed exercises including lunges, planks, medicine ball drills, balance exercises, agility drills, and other multi-joint movement patterns designed to enhance overall functional fitness. The Combined Training Group followed a structured programme that integrated both plyometric and functional training exercises within the same training session. The Control Group did not undergo any specialized training intervention and continued with their regular daily activities throughout the duration of the study.

Testing Procedure

Pre-tests were conducted before the commencement of the training programme, and post-tests were administered immediately after the completion of the twelve-week training period. Standardized procedures and calibrated instruments were used to ensure the reliability and validity of the measurements.

Statistical Analysis

The collected data were analyzed using appropriate descriptive and inferential statistical techniques. Analysis of Covariance (ANCOVA) was employed to determine the significance of differences among the groups while controlling for pre-test differences. Whenever significant F-ratios were obtained, Scheffe's post hoc test was applied to identify the paired mean differences. The level of significance was fixed at 0.05 for all statistical analyses. If your study includes different physiological variables (e.g., resting heart rate, breath-holding time, systolic blood pressure, diastolic blood pressure, or anaerobic capacity), I can revise the methodology accordingly.

The pre-test, post-test, and adjusted post-test means of the Plyometric and Functional Training Group (PFG), Plyometric Group (PG), and Control Group (CG) on vital capacity were analyzed using Analysis of Covariance (ANCOVA). The results are presented in Table - 1.

Table 1: Analysis of Covariance of Vital Capacity among PFG, PG, and CG

Test	PFG	PG	CG	Source of Variance	Sum of Squares	DF	Mean Squares	F-ratio
Pre-Test Mean	3.62	3.61	3.60	Between Groups	0.004	2	0.002	0.72
				Within Groups	0.158	57	0.003	
Post-Test Mean	4.28	4.07	3.65	Between Groups	4.186	2	2.093	**96.84***
				Within Groups	1.232	57	0.022	
Adjusted Post-Test Mean	4.27	4.08	3.66	Between Groups	4.091	2	2.046	**97.43***
				Within Groups	1.176	56	0.021	

Significant at 0.05 level of confidence. The table F-value required for significance at 0.05 level with df (2, 56) is 3.16.

It is evident from Table 1 that there was no significant difference among the Plyometric and Functional Training Group (PFG), Plyometric Group (PG), and Control Group (CG) in the pre-test scores of vital capacities. The obtained F-ratio of 0.72 was lower than the critical table value of 3.16 at the 0.05 level of significance, indicating that the three groups were statistically homogeneous before the commencement of the experimental training programme.

Following the training intervention, the post-test analysis revealed a statistically significant difference among the groups. The obtained F-ratio of 96.84 exceeded the required table value of 3.16, demonstrating that the training programmes had a significant influence on the vital capacity of the participants. After adjusting the post-test scores for initial differences through Analysis of Covariance (ANCOVA), the adjusted post-test mean analysis also showed a significant difference among the groups. The obtained F-ratio of 97.43 was considerably higher than the critical F-value of 3.16, confirming the effectiveness of the training interventions in improving vital capacity.

The adjusted post-test means values indicated that the Plyometric and Functional Training Group (PFG) recorded the highest vital capacity (4.27 L), followed by the Plyometric Group (PG) (4.08 L), whereas the Control Group (CG) recorded the lowest value (3.66 L). These findings demonstrate that the combined plyometric and functional training programme was more effective in enhancing vital capacity than plyometric training alone, while the control group showed only minimal change during the experimental period.

The superior improvement observed in the Plyometric and Functional Training Group may be attributed to the combined effects of functional movement exercises and plyometric training, which enhance respiratory muscle efficiency, improve oxygen uptake, and promote better cardiopulmonary adaptations. Although the Plyometric Group also exhibited improvements in vital capacity, the magnitude of improvement was comparatively lower than that of the combined training group. In contrast, the Control Group did not show any meaningful improvement, indicating that regular daily activities alone were insufficient to produce significant physiological adaptations.

Figure 1 illustrates the pre-test, post-test, and adjusted post-test mean values of vital capacity among the Plyometric and Functional Training Group (PFG), Plyometric Group (PG), and Control Group (CG). The figure clearly demonstrates that the Plyometric and Functional Training Group achieved the greatest improvement in vital capacity after the training programme, followed by the Plyometric Group, whereas the Control Group exhibited only negligible improvement.

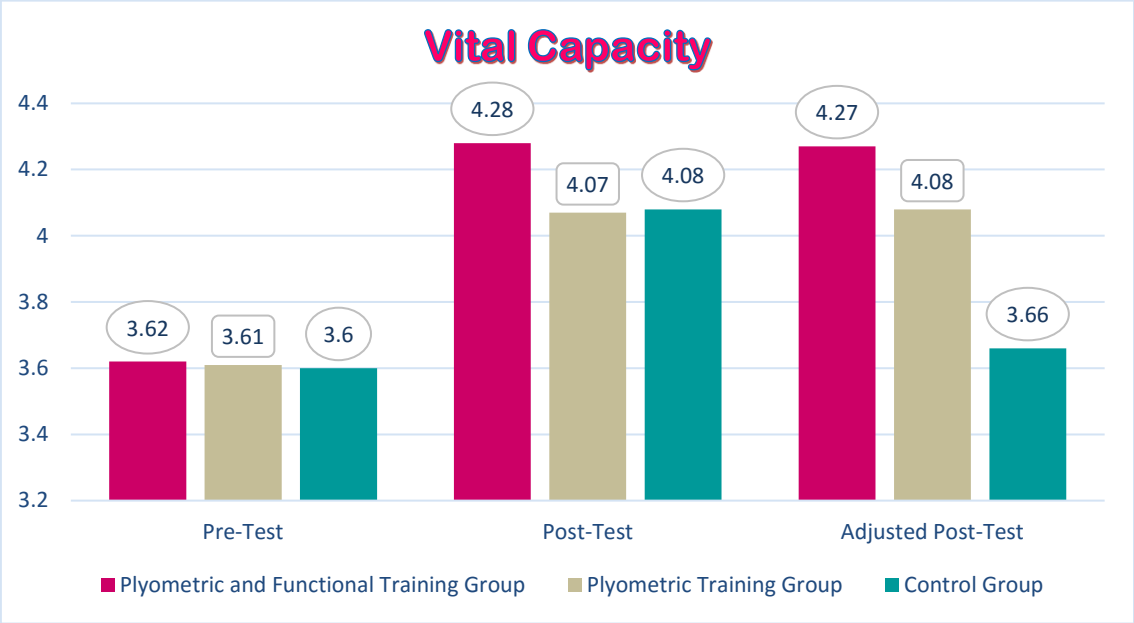

Figure 1: Bar Diagram Shows the Pre-Test, Post-Test, and Adjusted Post-Test Mean Values of the Plyometric and Functional Training Group Plyometric Group and Control Group on Vital Capacity

RESULTS AND DISCUSSION

The analysis of data pertaining to the vital capacity of intercollegiate male football players revealed significant improvements among the experimental groups following the twelve-week training intervention. The Analysis of Covariance (ANCOVA) indicated a statistically significant difference between the adjusted post-test means of the four groups at the 0.05 level of significance. The experimental groups demonstrated greater improvements in vital capacity compared to the control group, which showed only marginal changes during the experimental period. Among the experimental groups, the Combined Plyometric and Functional Training Group exhibited the highest improvement in vital capacity, followed by the Functional Training Group and the Plyometric Training Group. The superior improvement observed in the combined training group may be attributed to the synergistic effect of plyometric and functional exercises, which enhanced respiratory efficiency, cardiovascular adaptation, and overall physiological functioning. Functional training exercises involving integrated movement patterns and core stabilization likely contributed to improved breathing mechanics and oxygen utilization, while plyometric exercises enhanced neuromuscular efficiency and exercise tolerance.

The findings suggest that varied training interventions are effective in improving vital capacity among intercollegiate male football players. The significant enhancement observed in the combined training group indicates that integrating plyometric and functional training may provide greater physiological benefits than either training method performed independently. These results are consistent with previous research studies that reported positive effects of structured training programmes on respiratory function and aerobic fitness among athletes. Therefore, it may be concluded that a twelve-week programme of varied training interventions, particularly the combination of plyometric and functional training, is an effective strategy for improving vital capacity and enhancing the physiological preparedness of intercollegiate male football players.

CONCLUSION

Based on the results of the study, it was concluded that the varied training interventions produced significant improvements in the vital capacity of intercollegiate male football players. The analysis revealed significant differences among the experimental and control groups in the adjusted post-test scores of vital capacities. Among the training interventions, the Plyometric and Functional Training Group demonstrated greater improvement when compared to the Plyometric Training Group and the Control Group. Therefore, it was concluded that a combined programme of plyometric and functional training is more effective in enhancing vital capacity and improving the physiological efficiency of intercollegiate male football players.

RECOMMENDATIONS

Based on the findings of the present study, it is recommended that coaches and physical education professionals incorporate combined plyometric and functional training programmes into the regular training schedules of football players to enhance physiological fitness and overall athletic performance. Future studies should be conducted with larger sample sizes involving participants from different age groups, competitive levels, and geographical regions to improve the generalizability of the findings. Researchers are also

encouraged to examine the effects of varied training interventions on additional physiological, physical, psychological, and performance-related variables to gain a more comprehensive understanding of training adaptations. Comparative investigations involving different training methods, such as resistance training, circuit training, high-intensity interval training, and sport-specific conditioning programmes, may provide valuable insights into their relative effectiveness in improving football performance. Furthermore, extending the duration of training interventions may help determine their long-term effects on physiological adaptations and competitive performance. Similar studies should also be undertaken among female football players and athletes from other sports disciplines to assess the applicability of the findings across diverse populations. Finally, sports scientists, strength and conditioning specialists, and coaches may utilize the findings of this study to design evidence-based training programmes that enhance cardiorespiratory efficiency, physiological fitness, and overall sports performance.

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