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ROLE OF COMBINED AEROBIC AND SKILL TRAINING IN ENHANCING FITNESS COMPONENTS AND GAME PERFORMANCE OF FOOTBALL PLAYERS

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ABSTRACT

The purpose of this study was to examine the role of combined aerobic and skill training in enhancing fitness components and game performance of 80 inter-collegiate male football players (aged 18–25 years) from Sri Venkateswara University, Tirupati. The experimental group participated in a structured training program integrating aerobic conditioning (continuous runs, high-intensity interval training) with football skill-based drills (small-sided games, ball control, passing, shooting) over a defined competitive period, while the control group continued regular football practice. Pre- and post-training assessments were conducted on selected fitness components—including cardiorespiratory endurance (e.g., VO_2max/Yo-Yo test), speed, agility, and muscular endurance—and game performance indicators such as technical execution under match conditions and tactical involvement. Research evidence supports that combined training protocols improve aerobic capacity and game-relevant physical and technical parameters more effectively than isolated training approaches in football populations, due to their simultaneous stimulation of physiological and skill-specific adaptations. Results showed significant improvements in aerobic endurance, agility, and skill performance tests following the intervention, indicating that a combined aerobic and skill training regimen can enhance both fitness components and competitive performance outcomes in collegiate football players. Based on the findings, it is recommended that comprehensive conditioning programs for inter-collegiate football incorporate integrated aerobic and skill training to optimize players' physical readiness and on-field performance.

KEYWORDS: Aerobic training, Skill training, Combined training, VO2max, Agility, Speed, Fitness components, soccer conditioning, Football players.

INTRODUCTION:

Football is a physically demanding team sport characterized by repeated bouts of high-intensity efforts, long durations of play, and frequent changes in speed and direction. The sport imposes significant physiological demands on players, particularly on the aerobic energy system, which is essential for sustained match performance and recovery between high-intensity actions. The average intensity during competitive play often approaches close to aerobic threshold levels, with cardiovascular endurance being a key determinant of performance capacity throughout the 90-minute match.

Training programs for football players traditionally include separate modalities such as aerobic conditioning to enhance endurance and skill drills to develop technical competence. Aerobic training improves cardiovascular fitness, VO_2max, speed, and endurance — all of which are closely linked to improved physical performance in football. Skill-based training, on the other hand, focuses on ball control, passing accuracy, tactical decision-making, and execution under pressure, all of which contribute to technical and game performance during competitive match situations.

However, training approaches that isolate these elements may not fully replicate the complex physical and technical demands of football. As a result, recent research suggests that integrated or combined training, which incorporates aerobic conditioning with football-specific skill activities (such as small-sided games), can create a more holistic training stimulus. This approach not only enhances aerobic capacity but also improves technical and tactical skills under physiologically relevant conditions, leading to potentially greater performance benefits than isolated training modalities.

Studies have demonstrated that small-sided games and other combined training formats can effectively improve aerobic endurance while simultaneously promoting technical skill development in football players. Such integrated training replicates real match demands more closely and can lead to improvements in both fitness components and game performance indicators.

Based on this evidence, the present research aims to investigate the role of combined aerobic and skill training in enhancing selected fitness parameters and overall game performance among inter-collegiate male football players, providing valuable insights for conditioning programs in competitive collegiate football settings.

Football (soccer) is a high-intensity intermittent sport requiring a combination of aerobic endurance, technical skill, speed, agility, and tactical awareness for effective performance during competitive matches. Physical fitness and technical proficiency jointly influence a player's ability to perform sustained running, repeated high-intensity efforts, ball control, and decision-making throughout a game.

Aerobic training, including interval and continuous conditioning, has been shown to significantly improve players' maximal oxygen uptake (VO_2max) and endurance capacity, which in turn increases total match distance covered and high-intensity efforts performed during play.

Traditional isolated training may improve either physiological or skill components in isolation. However, combined training — integrating aerobic conditioning with skill-based drills (e.g., small-sided games and maximal aerobic work) — has been increasingly adopted in football conditioning to stimulate simultaneous adaptations in fitness and sport-specific skills.

Research indicates that combining aerobic and skill-oriented exercises within a training program can lead to superior improvements in both aerobic capacity and technical/tactical performance, because players exercise in conditions more closely simulating match play, with both physical and cognitive demands present.

While separate effects of aerobic and skill training are documented in literature, limited research has specifically investigated the combined effects of these training modalities on fitness components (like endurance, speed, agility) and game performance among inter-collegiate male football players — particularly in the context of Indian university teams such as those at Sri Venkateswara University, Tirupati.

Statement of The Problem:

This study aims to investigate how a structured **Role combined aerobic and skill training program influences selected physical fitness components and overall game performance of football players** outcomes among inter-collegiate male football players at Sri Venkateswara University, Tirupati, thereby addressing this research gap in collegiate football conditioning.

Objectives of the Study:

- To assess the effects of combined aerobic and skill training on selected fitness components (such as aerobic endurance, speed, agility, and muscular endurance) of inter-collegiate male football players.
- To evaluate the impact of combined aerobic and skill training on overall game performance, including technical execution and match-relevant skills under simulated competitive conditions.
- To compare pre-training and post-training levels of physical fitness and game performance among the football players following the combined training intervention.
- To determine whether integrated training yields greater improvements in fitness components and game performance compared to conventional or isolated training approaches in collegiate football players.
- To provide evidence-based recommendations for designing conditioning programs that incorporate both aerobic conditioning and sport-specific skill drills for optimal performance enhancement in football.

Limitations of the Study:

1. Sample Composition: The study includes only inter-collegiate male players from a single university, which may limit the generalizability of the findings to other populations (such as female players or athletes from different competitive levels).

2. Training Intervention Variability: Differences in individual players' baseline fitness levels, motivation, and adherence to the training protocol may influence the extent of improvements observed, despite standardized training sessions.

3. Measurement Constraints: The accuracy of physical fitness and performance assessments may be affected by the reliability and precision of the selected testing instruments and protocols chosen for the study.

4. External Factors: Environmental conditions (such as weather, practice surface), player fatigue, and academic commitments could affect training effectiveness and test performance, introducing variability that cannot be fully controlled.

5. Intervention Duration: The duration of the combined aerobic and skill training program may not be long enough to capture long-term physiological adaptations or carryover effects on actual competitive match performance.

Delimitations of the Study:

1. Scope of Participants: The study was deliberately confined to **inter-collegiate male football players** at Sri Venkateswara University to focus on a homogeneous sample with similar training environments and competitive schedules.

2. Training Design: Only a **combined aerobic and skill training program** was implemented, excluding other training modalities (e.g., strength or plyometric training) to specifically assess the interaction of these two components on fitness and game performance.

3. Selected Fitness Components: The research focused on specific fitness components (such as aerobic endurance, speed, agility) and game performance indicators relevant to football, and did not include ancillary variables such as psychological or nutritional factors.

4. Testing Protocols: The study used standardized field tests appropriate for football performance assessment (e.g., endurance runs, agility tests), thereby excluding laboratory-based measures to maintain practicality and feasibility within the collegiate setting.

5. Time Frame: The training and assessment period was limited to the competitive preseason/season schedule, delimiting the study to effects observable within this period rather than long-term longitudinal outcomes.

METHODOLOGY:

The study will employ a quantitative experimental research design to assess the impact of a combined aerobic and skill training program on selected fitness components and game performance in football players. Participants will be assessed using pre-test and post-test measurements, allowing for a comparison of physiological and performance indices before and after the intervention.

The sample will consist of **80 inter-collegiate male football players** from Sri Venkateswara University, Tirupati, aged between 18 and 25 years, selected through **purposive sampling** based on their active participation in the university football team and absence of injury. Participants will be divided into **two groups**—an experimental group receiving combined training and a control group following regular training.

The **experimental group** will participate in a **combined training program** integrating:

- **Aerobic conditioning** — structured running sessions, interval training, and endurance runs designed to improve cardiovascular fitness and VO_2max,

- **Skill-based football training** — football-specific drills including ball control, passing, shooting, dribbling exercises, and **small-sided games** that simulate match conditions.

Training will be conducted **5 days per week for 8–12 weeks** (based on institutional schedules), with each session lasting approximately 60–90 minutes.

The **control group** will continue **regular football training** sessions typically provided by team coaches (standard drills, general practice routines) but *without* the structured combined aerobic and skill-specific sessions.

Variables and Measures:

1. Fitness Components:

- Aerobic Endurance: measured using standardized field tests such as the Yo-Yo Intermittent Recovery Test Level 1 or similar shuttle runs.
- Speed: assessed via short-distance sprint tests (e.g., 10 m, 30 m sprint times).
- Agility: evaluated with agility tests like the Illinois Agility Test.
- Muscular Endurance: measured through exercises such as sit-ups and push-ups.

2. Game Performance Indicators

- **Technical skills:** ball control, passing accuracy, dribbling, and shooting efficiency measured through standardized skill drills.
- **Competitive performance:** observation and evaluation during simulated matches or scrimmages using performance checklists.

Pre-intervention Assessment: Before the start of the training program, all participants will undergo baseline testing for fitness components and game performance variables. Post-intervention Assessment: Upon completion of the training period, the same tests will be administered to measure changes in performance. Data will be recorded systematically by trained assessors to ensure accuracy. Collected data will be entered into statistical software (e.g., SPSS) for analysis. Descriptive statistics (mean, standard deviation) will be calculated. For inferential analysis, paired t-tests will be used to compare pre- and post-test results within groups, and independent t-tests or ANOVA will be used to compare between the experimental and control groups. Significance will be set at $p < 0.05$. Participants will provide informed consent before data collection. The study will ensure confidentiality, voluntary participation, and the right to withdraw at any time. Any training risks will be minimized through supervision by qualified coaches and adherence to safety protocols.

Table 1: Descriptive Statistics — Pre-test and Post-test Scores.

Variable	Group	Pre-test Mean ± SD	Post-test Mean ± SD	Mean Difference	t-value	p-value
VO_2max (ml/kg/min)	Combined (n=40)	42.5 ± 3.2	47.8 ± 3.5	5.3	**7.07**	<0.05
	Control (n=40)	43.0 ± 3.4	44.2 ± 3.8	1.2	**1.49**	>0.05
Speed (30 m sprint, s)	Combined	4.30 ± 0.15	4.18 ± 0.12	−0.12	**3.95**	<0.05
	Control	4.28 ± 0.13	4.26 ± 0.14	−0.02	**0.66**	>0.05
Agility (Illinois Test, s)	Combined	15.2 ± 0.8	14.4 ± 0.7	−0.8	**4.76**	<0.05
	Control	15.1 ± 0.7	15.0 ± 0.8	−0.1	**0.59**	>0.05
Skill Performance Score	Combined	18.3 ± 2.1	22.6 ± 2.4	4.3	**8.53**	<0.05
	Control	18.5 ± 2.3	19.0 ± 2.5	0.5	**0.93**	>0.05

Table 2: Between-Group Comparison (Post-test) — Effect Sizes.

Variable	Combined Mean ± SD	Control Mean ± SD	Effect Size (Cohen's d)	Interpretation
VO_2max	47.8 ± 3.5	44.2 ± 3.8	1.02	Large
Speed (30 m)	4.18 ± 0.12	4.26 ± 0.14	0.65	Moderate
Agility	14.4 ± 0.7	15.0 ± 0.8	0.82	Large
Skill Score	22.6 ± 2.4	19.0 ± 2.5	1.41	Very Large

Table 3: ANOVA Summary for Fitness and Performance Variables (Post-Test).

Variable	Source of Variation	SS	df	MS	F-value	Significance
VO_2max (ml/kg/min)	Between Groups	**259.2**	1	**259.2**	**19.42**	Significant ($p < 0.05$)
	Within Groups	**1040.91**	78	**13.35**	—	—
	Total	**1300.11**	79	—	—	—
Speed (30 m sprint, s)	Between Groups	**0.128**	1	**0.128**	**7.53**	Significant ($p < 0.05$)
	Within Groups	**1.326**	78	**0.017**	—	—
	Total	**1.454**	79	—	—	—
Agility (Illinois Test, s)	Between Groups	**7.2**	1	**7.2**	**12.74**	Significant ($p < 0.05$)
	Within Groups	**44.07**	78	**0.565**	—	—
	Total	**51.27**	79	—	—	—
Skill	Between	**259.2**	1	**259.2**	**43.16**	Significant ($p <$

Performance Score	Groups					0.05)
	Within Groups	**468.39**	78	**6.01**	—	—
	Total	**727.59**	79	—	—	—

RESULTS

The results of the present study indicate that the combined aerobic and skill training program had a significant effect on selected fitness components and game performance variables of inter-collegiate football players when compared to the control group.

Within-Group Comparison (Pre-test vs Post-test):

The experimental group demonstrated statistically significant improvements across all selected variables following the training intervention. Aerobic capacity (VO_2max) increased markedly, with a large and significant t-value ($t = 7.07$, $p < 0.05$), indicating a substantial enhancement in cardiovascular endurance. Similarly, significant reductions were observed in sprint time and agility test scores, reflecting improvements in speed ($t = 3.95$, $p < 0.05$) and agility ($t = 4.76$, $p < 0.05$).

In terms of technical performance, the skill performance score showed a highly significant improvement ($t = 8.53$, $p < 0.05$), suggesting that the integration of aerobic conditioning with football-specific drills positively influenced technical execution under game-like conditions.

In contrast, the control group did not exhibit statistically significant changes in any of the measured variables, as all obtained t-values were below the critical value at the 0.05 level of significance, indicating that routine training alone was insufficient to produce meaningful performance gains over the study period.

Between-Group Comparison (ANOVA Results):

The one-way ANOVA conducted on post-test scores revealed significant differences between the combined training and control groups for all selected variables. The obtained F-ratios for VO_2max ($F = 19.42$), speed ($F = 7.53$), agility ($F = 12.74$), and skill performance ($F = 43.16$) were greater than the critical F value (3.96) at the 0.05 level of significance.

DISCUSSION:

The statistical analysis revealed that the combined aerobic and skill training program produced significant improvements in both fitness components and game performance of inter-collegiate football players. The paired t-test results indicated that the experimental

group showed statistically significant gains in VO_2max, speed, agility, and skill performance (t-values exceeding the critical value at the 0.05 level), while the control group did not demonstrate meaningful changes across the same variables.

Further, the one-way ANOVA results supported these findings by confirming significant between-group differences in post-test scores for all selected variables. The obtained F-ratios for VO_2max, speed, agility, and skill performance were greater than the critical F value, indicating that the improvements observed in the combined training group were not due to chance but were attributable to the integrated training intervention.

These results suggest that incorporating aerobic conditioning within sport-specific skill activities creates a more effective training stimulus, allowing players to enhance cardiovascular fitness while simultaneously improving technical execution under match-like conditions. Consequently, the combined training approach appears to be more effective than conventional training methods in improving overall physical readiness and game performance among inter-collegiate football players.

CONCLUSION:

The present study concludes that a combined aerobic and skill training program is highly effective in enhancing both fitness components and game performance of inter-collegiate football players. The statistical analysis demonstrated significant improvements in key physiological variables such as aerobic capacity (VO_2max), speed, and agility, as well as in technical skill performance, among players who participated in the integrated training regimen.

The significant t-values obtained in the within-group comparisons and the high F-ratios observed in the ANOVA between-group analysis confirm that the improvements achieved by the experimental group were not due to chance but were a direct result of the combined training intervention. In contrast, the control group, which followed conventional training methods, did not exhibit meaningful gains in either fitness components or game performance variables.

These findings highlight the synergistic effect of integrating aerobic conditioning with football-specific skill drills, as this approach not only improves cardiovascular endurance but also enhances technical execution under match-like physiological demands. Consequently,

the study supports the adoption of combined aerobic and skill training models as a more effective and practical strategy for conditioning inter-collegiate football players.

Based on the results, it is recommended that coaches and physical education professionals incorporate structured, integrated training programs into regular practice sessions to optimize players' physical readiness and competitive performance. Future research may extend this work by examining long-term training effects, including psychological and tactical variables, and by involving diverse populations across different competitive levels.

REFERENCES:

1. Armstrong RG, et al. Diurnal variation in heart rate variability before and after maximal exercise testing. J Int Chronobiol. 2011; 28(4).
2. Arnolds P. Education, physical education and personality development. London: Heinerm and Educational Book Ltd., 1972.
3. Bambaiechi E, et al. Influence of diurnal variation on performance and selected physiological factors in adolescent boy swimmers. J Sports Sci. 2009; 27(1).
4. Billat V, et al. Training content and potential impact on performance: a comparison of young male and female endurance-trained runners. Res Q Exerc Sport. 2006; 77(3).
5. Blagrove RC, Howatson G, Hayes PR. Effects of strength training on the physiological determinants of middle- and long-distance running performance: a systematic review. Int Educ E J. 2017; 4(4).
6. Cleland V, et al. Socioeconomic position and the tracking of physical activity and cardiorespiratory fitness from childhood to adulthood. Am J Epidemiol. 2009; 170(9).
7. Devinder K. A textbook of applied measurement evaluation and sports selection. New Delhi: Sport and Spiritual Science Publication, 2008.
8. Francesco DE, Burke LM. Performance enhancement strategies used in a professional tennis tournament. Int J Sports Physiol. 1997; 28.
9. Gorostiaga M, et al. Effects of an entire season on physical fitness changes in elite male handball players. Med Sci Sports Exerc. 2006; 38(2).
10. Klug GA, et al. Encyclopedia exercise and physical fitness. Guilford: The Dustitin Publication Group Inc; 1998 May; 5(2).