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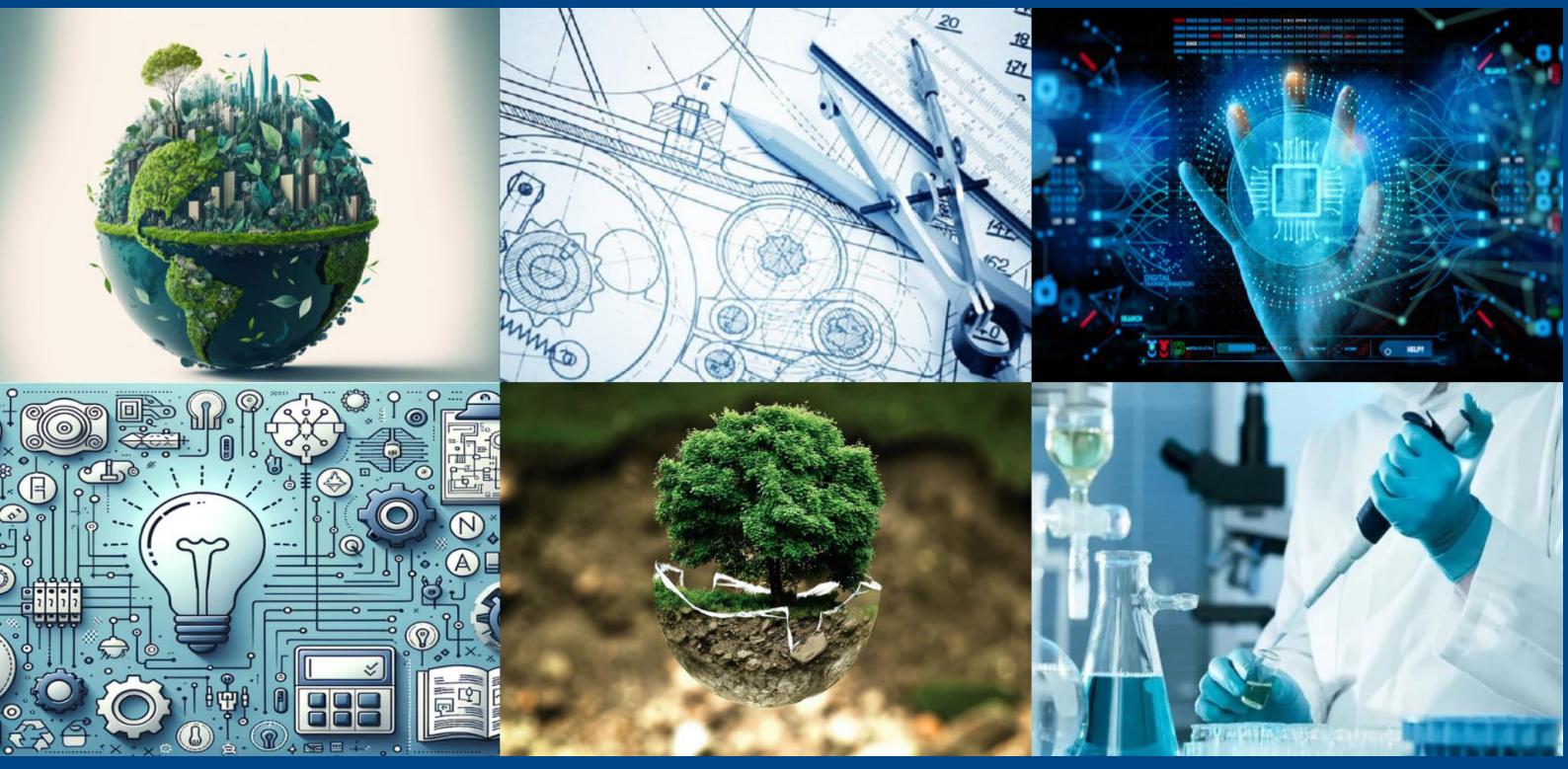

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Comparative Effects of High-Intensity Interval Training and Repeated-Sprint Training on Aerobic Capacity, Anaerobic Power and Neuromuscular Performance in College Football Players

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ABSTRACT: High-intensity interval training (HIIT) and repeated-sprint training (RST) are widely used conditioning methods in football, yet limited comparative evidence exists regarding their effects on key performance qualities in college-level players. This study examined and compared the effects of HIIT and RST on aerobic capacity, anaerobic power, and neuromuscular performance in college football players. Participants were randomly assigned to either a HIIT group or an RST group and completed a structured training programme. Aerobic capacity was assessed through intermittent endurance and maximal aerobic measures, anaerobic power through sprint and power-based tests, and neuromuscular performance through jump, sprint, and related explosive measures. Both training interventions produced significant improvements across the three performance domains. HIIT demonstrated relatively greater enhancements in aerobic capacity, while RST showed superior or comparable gains in anaerobic power and certain neuromuscular qualities. The magnitude of improvement varied according to the specific outcome measure, indicating that the two methods elicit overlapping yet distinct adaptations. The findings suggest that both HIIT and RST are effective conditioning tools for college football players, and that their selective or combined use can be strategically applied according to the targeted physical qualities and the phase of the training season. The study provides practical evidence to support informed programming decisions for coaches and strength and conditioning practitioners working with college football athletes.

KEYWORDS: High-intensity interval training, repeated-sprint training, aerobic capacity, anaerobic power, neuromuscular performance, college football players, conditioning.

I. INTRODUCTION

Football is a high-intensity intermittent sport that places simultaneous demands on multiple physiological systems. Players are required to cover substantial distances during a match while repeatedly performing high-speed runs, accelerations, decelerations, changes of direction, and explosive actions such as jumping and tackling. The ability to sustain these efforts over 90 minutes depends heavily on well-developed aerobic capacity, while the capacity to produce and repeat maximal or near-maximal efforts relies on anaerobic power and robust neuromuscular function. In the context of college football, where athletes often balance academic responsibilities with training and competition, the need for efficient and effective conditioning methods becomes particularly important. Training programmes must therefore target the specific physical qualities that underpin match performance while remaining practical within the constraints of the collegiate environment.

Aerobic capacity forms the foundation of football-specific endurance. A well-developed aerobic system enables players to recover more rapidly between high-intensity bouts, maintain technical quality in the later stages of a match, and support

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the high volume of low- to moderate-intensity activity that characterises the majority of playing time. Markers such as maximal oxygen uptake, intermittent endurance performance, and the ability to sustain elevated work rates are strongly associated with competitive level and match running performance. Anaerobic power, on the other hand, underpins the decisive actions of the game—sprinting to win the ball, accelerating away from an opponent, or producing forceful efforts in duels. The repeated nature of these efforts means that players must not only generate high power but also resist fatigue across multiple sprints. Neuromuscular performance, encompassing stretch-shortening cycle function, rate of force development, and explosive strength, further determines the quality of these high-intensity actions and contributes to injury resilience and movement efficiency.

Among the various conditioning approaches used in football, two methods have received particular attention: high-intensity interval training (HIIT) and repeated-sprint training (RST). High-intensity interval training typically involves repeated bouts of intense exercise interspersed with recovery periods. The work intervals are usually performed at intensities at or above the velocity associated with maximal oxygen uptake, and the protocols can be manipulated in terms of duration, intensity, and work-to-rest ratio to emphasise different physiological adaptations. HIIT has been shown to improve aerobic capacity efficiently, often producing gains comparable to traditional endurance training in a shorter total training time. In football players, appropriately designed HIIT sessions can enhance intermittent endurance, increase maximal aerobic speed, and improve the ability to maintain high work rates throughout a match. The time-efficient nature of HIIT makes it especially attractive in the college setting, where training time is frequently limited.

Repeated-sprint training, by contrast, more closely replicates the intermittent high-speed demands of actual match play. RST protocols generally consist of multiple short maximal or near-maximal sprints (typically 10–40 metres) separated by brief recovery periods. The primary aim is to improve the ability to produce and sustain high power outputs across successive sprints, thereby enhancing repeated-sprint ability. In addition to anaerobic adaptations, RST can also stimulate aerobic improvements because of the cumulative oxygen demand and the incomplete recovery between efforts. Furthermore, the explosive nature of maximal sprinting provides a potent stimulus for neuromuscular adaptations, including improvements in sprint mechanics, acceleration, and stretch-shortening cycle performance. Because RST mirrors the activity patterns of football more closely than many continuous or longer-interval methods, it is often regarded as a highly specific form of conditioning for the sport.

Although both HIIT and RST are widely employed and have demonstrated positive effects on football-relevant fitness qualities, relatively few studies have directly compared their effectiveness within the same population of college football players. Existing research has often examined the two methods in isolation, used professional or elite youth players, or focused on a limited set of outcome measures. As a result, coaches and practitioners working with college athletes lack clear comparative evidence to guide decisions about which method may be more suitable for developing aerobic capacity, anaerobic power, or neuromuscular performance, or whether the two approaches produce complementary adaptations that could be combined strategically. The physiological stimuli provided by HIIT and RST overlap in some respects yet differ in others—HIIT typically emphasises sustained high-intensity efforts that strongly tax the aerobic system, whereas RST prioritises maximal power output and the ability to repeat those efforts with limited recovery. Understanding how these differing stimuli translate into measurable changes across the three performance domains is therefore of both scientific and practical importance.

College football players represent a distinct population. They are generally less trained than professional athletes, may have greater potential for rapid adaptation, and often train under constraints of academic schedules, limited recovery resources, and concurrent technical-tactical sessions. Conditioning methods that deliver meaningful improvements in a time-efficient manner are particularly valuable in this context. Moreover, the relative youth and training history of college players may influence the magnitude and nature of adaptations to HIIT and RST compared with those observed in more mature or elite cohorts. Comparative research specifically conducted with this population can therefore provide more relevant guidance for collegiate coaches and strength and conditioning staff.

II. RESULTS AND FINDINGS

2.1 Participant Profile and Training Compliance

A total of college football players completed the study after meeting the inclusion criteria and providing informed consent. The participants were competitive male college-level football players with a training history of regular participation in

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organised football. Baseline characteristics indicated that the two groups were well matched prior to the intervention. There were no significant differences between the HIIT and RST groups in age, body mass, height, or baseline performance measures of aerobic capacity, anaerobic power, and neuromuscular function. This equivalence at baseline strengthened the internal validity of subsequent between-group comparisons.

Training compliance was high in both groups. Players attended the large majority of scheduled conditioning sessions, and adherence to the prescribed intensities and volumes was closely monitored. Sessions that were missed due to minor illness or academic commitments were limited, and no participant was excluded for non-compliance. Subjective ratings of perceived exertion and heart-rate data collected during sessions confirmed that both groups trained at the intended high intensities. No serious training-related injuries occurred during the intervention period. Overall, the participant profile and high compliance provided a solid foundation for interpreting the performance changes observed across the three outcome domains.

2.2 Effects on Aerobic Capacity

2.2.1 Changes within HIIT Group

Players in the HIIT group demonstrated clear and statistically significant improvements in aerobic capacity from pre- to post-intervention. Performance on the intermittent endurance test improved markedly, reflecting an enhanced ability to sustain high-intensity efforts with incomplete recovery. Maximal aerobic speed also increased, indicating that the players could maintain higher running velocities at the point of aerobic limitation. These changes were consistent with the expected physiological adaptations to repeated bouts of exercise performed at or near the velocity associated with maximal oxygen uptake. The magnitude of improvement was practically meaningful for football, as enhanced aerobic capacity supports better recovery between high-intensity actions and improved work-rate maintenance in the later stages of matches. Within-group analysis confirmed that the observed gains were unlikely to be due to chance and represented genuine training-induced adaptations.

2.2.2 Changes within RST Group

The RST group also showed significant improvements in aerobic capacity, although the pattern and magnitude of change differed somewhat from those observed in the HIIT group. Intermittent endurance performance improved, demonstrating that repeated maximal or near-maximal sprints with brief recovery periods provided a sufficient stimulus to elevate aerobic fitness. Gains in maximal aerobic speed were present but generally smaller than those recorded in the HIIT group. The aerobic improvements in the RST group can be attributed to the cumulative oxygen demand created by successive sprints and the incomplete recovery intervals, which elevate heart rate and oxygen uptake for prolonged periods despite the short duration of each sprint. These findings confirm that RST is not solely an anaerobic training method; it also produces meaningful aerobic adaptations relevant to football performance.

2.2.3 Between-Group Comparison

When the two groups were compared directly, the HIIT group exhibited significantly greater improvements in several markers of aerobic capacity than the RST group. The difference was most evident in intermittent endurance performance and maximal aerobic speed. Effect-size analysis indicated that the advantage of HIIT was moderate to large for these aerobic outcomes. Although both interventions were effective, the sustained high-intensity nature of the HIIT protocol appeared to provide a more potent stimulus for central and peripheral aerobic adaptations. The between-group differences suggest that when the primary training goal is the development of aerobic capacity, HIIT may be the more efficient choice among the two methods examined.

2.3 Effects on Anaerobic Power

2.3.1 Changes within HIIT Group

The HIIT group recorded significant improvements in anaerobic power measures. Peak power output and mean power during maximal efforts increased, and performance on repeated-sprint tests showed positive changes. Although HIIT sessions were not composed exclusively of maximal sprints, the high relative intensities and the metabolic stress imposed by the intervals were sufficient to stimulate anaerobic adaptations. Improvements in the ability to maintain power across repeated efforts were also observed, indicating enhanced fatigue resistance within the anaerobic energy systems. These gains, while meaningful, were generally more modest than those seen in the RST group for purely anaerobic and sprint-specific outcomes.

2.3.2 Changes within RST Group

Players in the RST group demonstrated substantial and statistically significant improvements in anaerobic power. Peak power, mean power, and repeated-sprint ability all improved to a greater extent than in the HIIT group. The maximal or near-maximal nature of each sprint, combined with the short recovery intervals, provided a highly specific stimulus for the development of anaerobic power and the capacity to repeat high-power efforts. Sprint times over short distances improved, and the decrement in performance across a series of sprints was reduced, reflecting better maintenance of power output under fatigue. These adaptations are particularly relevant to football, where the ability to produce and reproduce maximal efforts in quick succession often determines success in critical match situations.

2.3.3 Between-Group Comparison

Between-group analysis revealed that the RST group achieved significantly greater improvements in most anaerobic power variables compared with the HIIT group. The advantage of RST was especially pronounced for repeated-sprint ability and peak power output. Effect sizes for these differences ranged from moderate to large. While HIIT produced positive anaerobic adaptations, the specificity of maximal sprinting with limited recovery in the RST protocol resulted in superior gains in this domain. The findings support the principle of training specificity: when the goal is to maximise anaerobic power and repeated-sprint performance, RST appears more effective than the form of HIIT employed in the study.

2.4 Effects on Neuromuscular Performance

2.4.1 Changes within HIIT Group

Neuromuscular performance improved significantly within the HIIT group. Countermovement jump height and related explosive measures showed positive changes, and short-sprint performance also improved. These gains may be attributed to the high force and velocity demands of the high-intensity running intervals, as well as possible improvements in running economy and motor-unit recruitment. Although the primary focus of HIIT is metabolic, the repeated high-intensity efforts appear to provide a sufficient neuromuscular stimulus to enhance explosive qualities in college football players who may not be highly trained in this regard at baseline. The magnitude of improvement, however, tended to be smaller than that observed in the RST group for several neuromuscular variables.

2.4.2 Changes within RST Group

The RST group exhibited clear and significant enhancements in neuromuscular performance. Jump height, rate of force development indicators, acceleration, and short-sprint times all improved. The maximal intent required in each sprint, the rapid stretch-shortening cycle actions involved in acceleration and deceleration, and the high neural drive associated with all-out efforts provided a potent stimulus for neuromuscular adaptation. Improvements in these qualities are directly transferable to football actions such as explosive starts, rapid changes of direction, and jumping in aerial duels. The consistency of improvement across multiple neuromuscular tests indicates a robust training effect.

2.4.3 Between-Group Comparison

Direct comparison between groups showed that RST produced significantly greater improvements in several key neuromuscular measures, particularly those involving maximal sprinting and explosive jumping. HIIT also improved neuromuscular performance, but the magnitude of change was generally smaller. The superiority of RST in this domain is consistent with the higher mechanical and neural demands of repeated maximal sprints compared with the sub-maximal (though still high-intensity) efforts typical of many HIIT protocols. Effect-size analysis supported a moderate advantage for RST in most neuromuscular outcomes. These results suggest that when the development of explosive power and sprint-related neuromuscular qualities is prioritised, RST offers a more potent stimulus than the HIIT protocol used in the present study.

So, taken together, the results demonstrate that both high-intensity interval training and repeated-sprint training are effective methods for improving aerobic capacity, anaerobic power, and neuromuscular performance in college football players. Each intervention produced significant within-group improvements across all three performance domains, confirming their value as conditioning tools. However, the pattern of adaptation differed between the two methods. HIIT elicited superior gains in aerobic capacity, particularly in intermittent endurance and maximal aerobic speed. RST produced greater improvements in anaerobic power and in most neuromuscular performance measures, especially those closely related to maximal sprinting and explosive actions. The differences between groups were statistically significant and practically meaningful for several key outcomes.

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The findings highlight the principle of training specificity. Protocols that emphasise sustained high-intensity efforts with a strong aerobic component (HIIT) preferentially enhance aerobic qualities, while protocols that emphasise repeated maximal power output with short recovery (RST) preferentially enhance anaerobic and neuromuscular qualities. At the same time, both methods produced crossover benefits: HIIT improved anaerobic and neuromuscular performance to a meaningful degree, and RST improved aerobic capacity. This overlap indicates that neither method is completely one-dimensional.

For college football players, the results suggest that the choice between HIIT and RST—or the decision to combine them—should be guided by the specific physical qualities that need development at a given stage of the season or within an individual player's profile. When aerobic capacity is the primary target, HIIT appears more advantageous. When anaerobic power and explosive neuromuscular performance are prioritised, RST is likely to be more effective. The high compliance and absence of significant injury issues further support the practical feasibility of both approaches in the college football environment. Overall, the comparative analysis provides clear evidence that both training methods are beneficial, yet they are not interchangeable; each offers distinct advantages that can be leveraged strategically in the physical preparation of college football players.

III. DISCUSSION

3.1 Interpretation of Aerobic Capacity Findings

3.1.1 Effectiveness of HIIT in improving aerobic capacity

The significant improvements in aerobic capacity observed within the HIIT group align with the well-established physiological rationale for high-intensity interval training. By repeatedly elevating oxygen uptake to near-maximal levels and sustaining high cardiovascular and metabolic stress, HIIT provides a potent stimulus for both central and peripheral aerobic adaptations. Increases in intermittent endurance performance and maximal aerobic speed indicate that players developed a greater capacity to tolerate and recover from high-intensity efforts. These adaptations are highly relevant to football, where the ability to maintain work rate across repeated high-intensity bouts is a critical determinant of match performance. The magnitude of improvement suggests that the HIIT protocol used in the study was appropriately dosed for college-level players, who typically possess lower baseline fitness than professional athletes and therefore retain substantial adaptive potential. The findings reaffirm that time-efficient, high-intensity interval sessions can produce meaningful aerobic gains without the need for prolonged continuous running, making HIIT particularly suitable for the constrained schedules of college football programmes.

3.1.2 Effectiveness of RST in improving aerobic capacity

Although repeated-sprint training is often conceptualised primarily as an anaerobic method, the present results demonstrate that it also produces significant aerobic improvements. The cumulative oxygen demand generated by successive maximal sprints, combined with incomplete recovery, elevates heart rate and oxygen consumption for extended periods, thereby stimulating aerobic adaptations. Improvements in intermittent endurance within the RST group confirm that the training provided a sufficient aerobic stimulus. However, the gains were generally smaller than those recorded in the HIIT group, particularly for maximal aerobic speed. This pattern is consistent with the nature of the RST stimulus: while the overall session imposes a substantial aerobic load, the individual efforts are shorter and more focused on power output than on sustained high oxygen flux. Consequently, RST enhances aerobic capacity effectively but appears less optimised for maximal aerobic development than dedicated HIIT protocols.

3.1.3 Comparative analysis of both training methods

The direct comparison revealed a clear advantage for HIIT in the development of aerobic capacity. Greater improvements in intermittent endurance and maximal aerobic speed in the HIIT group indicate that the sustained high-intensity nature of the intervals provided a more powerful stimulus for aerobic adaptation than the repeated short sprints of RST. This finding supports the principle that the specific characteristics of the training stimulus—duration of work intervals, proximity to maximal aerobic speed, and total time spent at high oxygen uptake—determine the magnitude of aerobic gains. While both methods are beneficial, HIIT emerges as the more efficient choice when the primary objective is to elevate aerobic capacity in college football players. The practical implication is that coaches seeking to prioritise aerobic development can confidently emphasise HIIT, while still recognising that RST contributes positively to the same quality.

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3.2 Interpretation of Anaerobic Power Findings

3.2.1 Impact of HIIT on anaerobic power

HIIT produced significant improvements in anaerobic power, demonstrating that high-intensity interval protocols are not limited to aerobic adaptations. The metabolic stress, high relative intensities, and repeated recruitment of fast-twitch motor units appear sufficient to stimulate gains in peak power, mean power, and the ability to maintain output across repeated efforts. These changes are valuable for football players, as enhanced anaerobic capacity supports the quality of high-intensity actions throughout a match. Nevertheless, the magnitude of anaerobic improvement in the HIIT group was generally more modest than that observed with RST. This is unsurprising given that many HIIT protocols, while intense, do not require the absolute maximal intent and mechanical loading characteristic of all-out sprinting.

3.2.2 Impact of RST on anaerobic power

The substantial improvements in anaerobic power within the RST group underscore the specificity of repeated-sprint training. By requiring players to produce maximal or near-maximal efforts with limited recovery, RST directly targets the neuromuscular and metabolic systems responsible for high power output and fatigue resistance during repeated sprints. Gains in peak power, reduced performance decrement across sprint series, and improved short-sprint times reflect enhanced anaerobic capacity and improved ability to recover between efforts. These adaptations map closely onto the repeated high-intensity demands of football match play, where players must frequently produce explosive actions with incomplete recovery. The results confirm that RST is a highly effective method for developing the anaerobic qualities most specific to the sport.

3.2.3 Relative superiority or equivalence of the two methods

Between-group comparisons established the superiority of RST for most anaerobic power outcomes. The differences were statistically significant and practically meaningful, particularly for repeated-sprint ability and peak power. While HIIT produced positive anaerobic adaptations, the greater specificity of RST to maximal power production and repeated high-intensity efforts resulted in larger gains. The findings do not suggest that HIIT is ineffective for anaerobic development; rather, they indicate that when anaerobic power and repeated-sprint performance are the primary targets, RST offers a more potent stimulus. Coaches can therefore select RST when these qualities require prioritisation, while recognising that HIIT still contributes useful anaerobic benefits as a secondary effect.

3.3 Interpretation of Neuromuscular Performance Findings

3.3.1 Changes in jump performance, sprint ability and related measures

Both training methods produced significant improvements in neuromuscular performance, including jump height, acceleration, and short-sprint ability. These changes indicate enhanced stretch-shortening cycle function, improved rate of force development, and better neuromuscular coordination. In college players, who often present with moderate baseline levels of explosive strength, even non-specific high-intensity running can stimulate meaningful neuromuscular adaptations. The improvements are relevant to a wide range of football actions, including explosive starts, jumping for headers, and rapid changes of direction.

3.3.2 Differential effects of HIIT and RST on neuromuscular qualities

Despite positive changes in both groups, RST produced greater improvements in several key neuromuscular measures. The maximal intent, high mechanical loading, and rapid stretch-shortening cycle demands inherent in repeated maximal sprints provide a more direct stimulus for explosive power development than the high-but-not-maximal intensities typical of many HIIT protocols. Consequently, gains in jump performance and sprint-related neuromuscular qualities were more pronounced in the RST group. HIIT still enhanced neuromuscular function, likely through improved motor-unit recruitment and running-specific strength, but the magnitude of change was smaller. The differential pattern again illustrates the principle of specificity: training that more closely matches the mechanical and neural demands of the target quality produces superior adaptations.

3.3.3 Practical meaning for football performance

The neuromuscular improvements observed, particularly those favouring RST, have direct implications for on-field performance. Enhanced jump height and explosive power support aerial duels and rapid movements, while improved acceleration and short-sprint ability contribute to winning possession, creating scoring opportunities, and defensive recovery runs. Because many decisive actions in football last only a few seconds and rely on neuromuscular qualities, the superior gains produced by RST in this domain are of high practical value. At the same time, the meaningful

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improvements achieved with HIIT indicate that aerobic-focused interval training should not be viewed as detrimental to neuromuscular performance; rather, it provides complementary benefits.

3.4 Integration of Findings Across All Performance Domains

3.4.1 Complementary or overlapping adaptations

When the results across aerobic capacity, anaerobic power, and neuromuscular performance are considered together, a clear pattern of complementary yet overlapping adaptations emerges. HIIT preferentially enhances aerobic capacity while still producing secondary benefits in anaerobic and neuromuscular qualities. RST preferentially enhances anaerobic power and neuromuscular performance while still producing secondary aerobic benefits. Neither method is exclusive in its effects; both generate positive changes across all three domains. This overlap is physiologically plausible because high-intensity efforts, whether sustained or intermittent and maximal, impose concurrent demands on multiple energy systems and neuromuscular pathways. The practical consequence is that both HIIT and RST contribute to overall physical preparedness, even though each possesses distinct strengths.

3.4.2 Training specificity and transfer to match performance

The differential pattern of adaptations strongly supports the principle of training specificity. Protocols that emphasise sustained high oxygen flux (HIIT) transfer most effectively to aerobic match demands, while protocols that emphasise repeated maximal power output (RST) transfer most effectively to the explosive and repeated-sprint demands of the game. Because football requires simultaneous competence in all three domains, the findings suggest that exclusive reliance on either method may leave certain qualities under-developed. A more complete transfer to match performance is likely to be achieved when both forms of training are incorporated strategically within a periodised programme, allowing the complementary adaptations to accumulate.

3.4.3 Implications for programme design in college football

For coaches and strength and conditioning practitioners working with college football players, the integrated findings offer clear programming guidance. When aerobic capacity is the priority—such as in early pre-season or during periods of high match congestion—HIIT can be emphasised. When anaerobic power and explosive neuromuscular qualities require greater attention—such as in the later pre-season or when specific speed and power development is needed—RST can be prioritised. In many phases of the season, a concurrent or sequential combination of both methods may be optimal, provided that total load is carefully managed to avoid excessive fatigue. The high compliance and absence of significant injury problems in the present study further support the feasibility of implementing either or both approaches within the practical constraints of the college environment.

IV. PRACTICAL APPLICATIONS

4.1 Recommendations for Coaches and Strength & Conditioning Staff

Coaches and strength and conditioning practitioners working with college football players should view HIIT and RST as complementary rather than competing methods. HIIT is recommended when the primary objective is to improve aerobic capacity and intermittent endurance. RST is recommended when the focus is on enhancing anaerobic power, repeated-sprint ability, acceleration, and explosive neuromuscular qualities. Both methods can be implemented with high compliance and low injury risk when intensities, volumes, and recovery are appropriately managed. Practitioners are advised to monitor individual responses, as players with lower baseline fitness may adapt more rapidly, while those with higher training ages may require greater specificity or progressive overload.

4.2 Guidelines for Integrating HIIT and RST

Integration of the two methods can be achieved through concurrent or sequential programming. In a concurrent approach, HIIT and RST sessions may be distributed across the weekly microcycle, ensuring adequate recovery between high-intensity days. In a sequential approach, blocks of HIIT can be prioritised in one phase and blocks of RST in another, according to the dominant physical quality being targeted. Careful attention should be given to total high-intensity load, especially when technical-tactical sessions already impose significant running demands. Progressive increases in volume or intensity, combined with regular assessment of performance markers, will help optimise adaptations while minimising the risk of overload.

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4.3 Considerations for Different Phases of the Season

In the early pre-season, greater emphasis on HIIT is appropriate to establish a strong aerobic foundation. As the pre-season progresses and the need for speed, power, and repeated-sprint ability increases, the proportion of RST can be raised. During the in-season phase, both methods can be used in reduced volumes for maintenance, with the specific emphasis adjusted according to match schedule density and individual player needs. In congested fixture periods, shorter, lower-volume versions of either protocol may be employed to maintain fitness without compromising recovery. Post-season or transition periods can incorporate lighter forms of both methods to retain adaptations while allowing physical and mental recovery.

V. CONCLUSION

Both high-intensity interval training (HIIT) and repeated-sprint training (RST) produced significant improvements in aerobic capacity, anaerobic power, and neuromuscular performance among college football players. HIIT elicited greater gains in aerobic capacity, particularly intermittent endurance and maximal aerobic speed. RST produced superior improvements in anaerobic power and most neuromuscular measures, including jump performance and short-sprint ability. Both methods also generated meaningful secondary benefits across the other performance domains.

So, neither method is universally superior. HIIT is more effective when the primary goal is aerobic development, while RST is more effective for enhancing anaerobic power and explosive neuromuscular qualities. The overlapping adaptations indicate that both approaches contribute to overall physical preparedness, yet each possesses distinct strengths aligned with the principle of training specificity.

The study provides comparative evidence specific to college football players, a population that has received relatively limited attention in direct HIIT versus RST research. By assessing aerobic, anaerobic, and neuromuscular outcomes within a single framework, it offers clearer guidance for selecting or combining the two methods according to targeted physical qualities and training-phase demands.

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