

Improving preseason soccer performance: a combination of super high-intensity continuous training and dribbling-based repeated-sprint training

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Abstract

Introduction. The preseason phase is crucial for restoring fitness and preparing players for competitive demands. This study is the first to integrate super high-intensity continuous training (SHCT) with dribbling-based repeated sprint training (RST) as a sport-specific, high-intensity training method. **Aim of Study.** This study analyzes the effects of combining SHCT and dribbling-based RST during preseason on male soccer players' aerobic and anaerobic performance in the Indonesian Third Soccer League. **Material and Methods.** The study uses an experimental method with a randomized parallel matched-group design. The researchers assigned 42 participants into the experimental group (EG) and the control group (CG), 21 participants each. Participants' average age was 20.19 ± 0.86 years, with 6.21 ± 0.87 years of soccer experience. The average height was 170.57 ± 4.76 cm, weight 61.71 ± 6.15 kg, and body mass index 21.21 ± 2.01 kg/m². The EG followed a combined SHCT and dribbling-based RST program, while the CG performed regular club training (technique, tactics, and small-sided games) without additional physical training. The assessors were blinded to group allocation (single-blind) to prevent bias. The study employed the Shapiro–Wilk and Levene's tests as prerequisites, independent sample tests, and the Mann–Whitney U tests, with a significance level of <0.05 . The researchers also used percentages and effect sizes to measure differences. The test instruments included the Yo-Yo intermittent recovery level 1 test and running-based anaerobic sprint test. **Results.** The EG showed significant improvements ($p < 0.05$) in all variables, while the CG had minimal, non-significant changes. Between-group comparisons confirmed that EG achieved significantly greater performance improvements than CG in all measured variables: final speed ($p < 0.0001$), total distance ($p < 0.0001$), $VO_{2\max}$ ($p < 0.0001$),

peak power ($p < 0.0001$), average power ($p < 0.0001$), and fatigue index ($p = 0.0086$). **Conclusions.** This study concludes that the combined super high-intensity continuous training and dribbling-based repeated-sprint training program effectively enhanced soccer players' aerobic and anaerobic capacities.

KEYWORDS: preseason, super high-intensity continuous training, repeated-sprint training, dribbling, combination soccer training.

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Introduction

Preseason in soccer is a critical period for preparing players to face the high intensity of competition. According to Clemente et al. [1], preseason is a crucial

phase because during this period, the adverse effects caused by the off-season, such as reductions in body composition, neuromuscular ability, and aerobic performance, can be corrected. During this time, coaches design training programs to restore physical fitness after the off-season break while improving strength, endurance, and the players' technical-tactical abilities [2]. Maintaining a good fitness level is believed to help manage the increased workload that often occurs in preseason, which can reduce the risk of injury [3]. However, experts often debate the effectiveness of various training methods during preseason. Understanding the physical demands during a match is also essential for structuring preseason programs. Research on the distance covered during competitive matches shows that field players typically cover 9-13 km [4, 5], mostly covered through walking and low-intensity running [6]. However, it is essential to note that only about 10% of the total distance is covered through high-intensity running, highlighting the need for a balance in training between high and low intensities. As far as the demands of the match are concerned, players must be in optimal physical condition, including adequate aerobic and anaerobic capacity, strength and power [7].

One of the methods commonly used during preseason preparation is high-intensity interval training (HIIT) or high-volume running training (HRV), which have proven effective in improving endurance capacity in young, high-level soccer players. However, individual responses vary [8]. Since it does not involve critical technical elements of soccer, physical training without the ball, such as HIIT and HRV, has limitations. Integrating physical and technical aspects has become a pressing need in modern training. The literature study by Kusuma [9] supports this approach, concluding that a holistic approach positively impacts soccer players' performance by helping them achieve optimal fitness while maintaining and improving technical skills. Although a holistic approach shows many benefits, some researchers have differing views. For example, Thomakos et al. [10] found that HIIT without the ball was more effective in improving aerobic capacity during preseason than HIIT with the ball. Their findings suggest that focusing on physical aspects also has certain advantages. However, this physical-focused approach may only partially reflect the demands of the game, which involve technical skills and decision-making in real situations on the field. A paradox exists between developing strength and power while maintaining high technical/tactical training volumes for elite soccer players during preseason. The simultaneous effects

of aerobic and neuromuscular training can lead to a decrease in power performance. However, Kobal et al. [11] suggest that a balanced ratio of soccer and strength-power training can develop aerobic capacity and power in elite players during preseason.

In addition, recent findings highlight the importance of training for injury prevention. Research by Belamjahad et al. [12] concluded that neuromuscular training during preseason is more effective in improving physical performance and reducing injury risk compared to endurance-dominant training in soccer players. This finding underscores the importance of a multifaceted training approach that targets physical fitness and minimizes injury risks. Additionally, establishing a dose-response relationship between external/internal training loads and endurance and strength adaptations can maximize endurance gains with minimal disruption to strength/power improvements, providing better insights for soccer training practices [13].

Generally, we categorize aerobic and anaerobic training into continuous and interval. A recent approach, called super high-intensity continuous training (SHCT), has emerged [14]. SHCT is a new approach to aerobic training that combines the benefits of continuous and interval training methods. Research shows that combining these two models affects players' aerobic capacity. However, researchers have primarily applied this model in handball, making exploring its potential in other sports, such as soccer, interesting. Research often uses training that combines physical and tactical elements to integrate tactical components into fitness development, improving decision-making, teamwork, and strategy implementation [15-17]. However, limited research systematically combines physical elements with technical aspects such as dribbling, passing, or shooting [18]. This approach has the potential to be an innovation, enhancing both fitness and technical skills in one efficient training session that is relevant to the demands of modern soccer.

To the best of our knowledge, this is the first study to combine SHCT with dribbling-based repeated sprint training (RST) in a soccer preseason setting. Previous studies have largely focused on isolated HIIT or RST programs without incorporating sport-specific technical skills. Our approach aims to bridge that gap by embedding dribbling into the sprint-based conditioning program, thereby offering a game-representative training model that targets both physical and technical development simultaneously. This dual focus aligns with the demands of modern soccer and offers a more efficient, holistic training strategy compared to traditional methods.

Combining SHCT with dribbling-based RST is predicted to be an innovative approach that offers variation in training models using a holistic approach. SHCT is a combination of continuous and interval training methods designed to improve aerobic and anaerobic capacity through measurable work intensity. At the same time, RST is a form of training involving a series of maximal or near-maximal sprints (typically 3-7 seconds) with short recovery periods (10-60 seconds) [19]. Integrating it with dribbling allows for the simultaneous development of players' technical skills through speed-based dribbling exercises. This approach effectively creates an optimal balance between improving physical fitness and sharpening technical skills, making it highly relevant for modern soccer training needs.

Aim of Study

This study aims to explore the effectiveness of combining SHCT and dribbling-based RST in enhancing both aerobic and anaerobic capacity. The primary focus is to analyze the impact of integrating SHCT and RST on players' physical conditioning, particularly in improving aerobic and anaerobic endurance, which are crucial for performance during matches. Although dribbling was included as part of the training protocol, this study did not directly measure its effect on technical performance.

Material and Methods

Study participants

The G*Power software version 3.1.9.7 (University of Düsseldorf, Germany) was used to estimate the sample size. Using an effect size of $d = 0.8$, power = 0.8, p -value = 0.05, and an allocation ratio N_2/N_1 of 1, we determined that the required sample size was 21. The eligibility criteria for participants were: (1) no injury, illness, or physical limitations during the study; (2) completion of at least 90% of the treatment agenda; and (3) completion of all testing procedures (pre-post). This research design was also approved by the Health Research Ethics Committee of Nahdlatul Ulama University of Surabaya (registration number 0374/EC/KEPK/UNUSA/2024).

Study organization

This study used an experimental method with a randomized parallel matched-group design. This design divided the research sample into two different groups. Forty two samples participated in this study, with 21 players in the experimental group (EG) and 21 in the control group (CG). The group allocation used

a matching-group approach, which started with an initial test using the Yo-Yo intermittent recovery level 1 test (YYIR1) for all participants. We conducted this research during the 2024-2025 pre-season period with UNESA Football Club, competing in the Third Division of the Indonesian Soccer League. The study lasted six weeks: one week of pretest, four weeks of treatment, and one final week for posttest.

During the intervention phase, the EG followed a structured training program combining SHCT and dribbling-based RST. In contrast, the CG followed the club's regular training routine, which consisted of technical tactical exercises such as passing, positioning, match simulations, and small-sided games, without any additional physical conditioning. The frequency and duration of training were equalized between both groups, with three sessions per week for four weeks, to ensure equal training exposure. Outcome assessors were blinded to group allocation (single-blind design) to minimize potential bias.

Aerobic power measurements

The yo-yo intermittent recovery test level 1 (YYIR1) started with a warm-up, followed by running back and forth over a 20-meter distance with increasing speed. After each session, participants jogged 2×5 meters for 10 seconds of active recovery. The test ended if the participant failed to reach the finish line twice consecutively, and the distance covered was recorded. VO_{2max} was calculated using the formula: $VO_{2max} \text{ cml} \cdot \text{min}^{-1} \cdot \text{kg}^{-1} = \text{distance} \times 0.0136 + 45.3$. The test was conducted indoors on a cone-marked track.

Anaerobic power measurements

The running-based anaerobic sprint test (RAST) involved six 35-meter sprints with 10 seconds of rest between each. The test was conducted on a flat surface using a photo timer. Times were recorded to calculate maximum, minimum, average power, and fatigue index using the formula: $\text{Power} = (\text{Body Mass} \times \text{Distance}^2) \div \text{Time}^3$.

Statistical analysis

Data were described using mean and standard deviation (SD). Normality and homogeneity were tested with the Shapiro-Wilk and Levene's tests. Independent sample t-test and the Mann-Whitney U test analyzed aerobic and anaerobic power between EG and CG. A p -value < 0.05 was considered significant. Effect size (ES) was calculated using Cohen's ES, with values > 0.8 as large, 0.8-0.5 as moderate, 0.5-0.2 as small, and < 0.2

as not significant. In addition to significance testing and effect size calculations, 95% confidence intervals (CIs) were computed for the differences in key performance outcomes between groups. Confidence intervals were used to estimate the range within which the true mean difference lies, providing an additional measure of precision and statistical relevance.

Training program

Based on Table 1, the total training distance increased weekly, from 7000 meters per day in the first week to 10,000 meters per day in the fourth week. In Week 1, with a distance of 7 km per day and three training sessions, the total distance was 21 km per week. In Week 2, with a distance of 8 km per day, the total became 24 km per week. In Week 3, with 9 km per day, the total reached 27 km per week. Finally, in Week 4,

with 10 km per day, the total was 30 km per week. The program lasted four weeks with three training sessions per week, providing a balance between sufficient intensity and adequate rest time.

Figure 1 shows the overall structure of the training session, with details on the duration and intensity of each training component (dribbling, active walking, and sprinting). Each training session included 160 meters of dribbling per set at a moderate pace, followed by 20 meters of active walking for recovery and 20 meters of sprinting to train speed, explosive strength, and the anaerobic capacity of the players.

Results

Based on Table 2, characteristics of 42 participants (21 EG, 21 CG). Average age: 20.19 years, soccer experience: 6.21 years, height: 170.57 cm, weight:

Table 1. Training program experimental group

Training activity		Week 1	Week 2	Week 3	Week 4
Warm-up	5-10 minutes: light jogging, dynamic stretching (hamstrings, quadriceps, adductors)				
Medium-speed dribbling	160 meters per repetition	35 repetitions (5600 meters total dribbling)	40 repetitions (6400 meters total dribbling)	45 repetitions (7200 meters total dribbling)	50 repetitions (8000 meters total dribbling)
Active walking	20 meters per repetition	35 repetitions (700 meters total walking)	40 repetitions (800 meters total walking)	45 repetitions (900 meters total walking)	50 repetitions (1000 meters total walking)
Maximum sprint	20 meters per repetition	35 repetitions (700 meters total sprint)	40 repetitions (800 meters total sprint)	45 repetitions (900 meters total sprint)	50 repetitions (1000 meters total sprint)
Total distance	Total training distance per day	7000 meters	8000 meters	9000 meters	10,000 meters
Cool-down	5-10 minutes: static stretching (hamstrings, quadriceps, calves, glutes)				

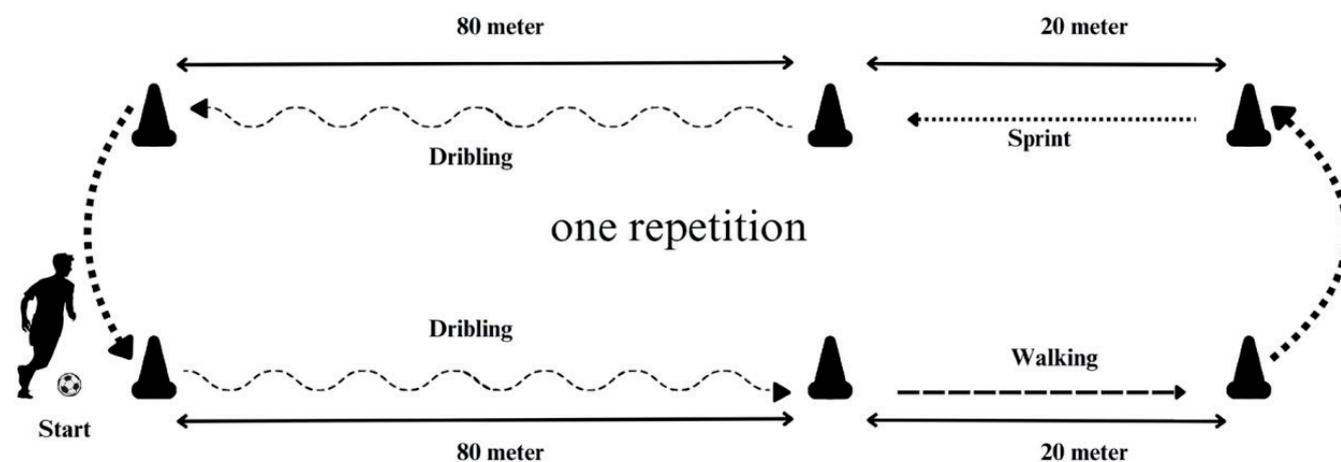


Figure 1. Treatment protocol

61.71 kg, BMI: 21.21 kg/m². Positions: 15 defenders, 17 midfielders, 10 attackers. Training adherence: EG 96.19%, CG 95.24%.

Table 2. Sample characteristics

Variable	EG	CG	Total
Subjects (n)	21	21	42
Age (years)	20.24 ± 0.86	20.14 ± 0.83	20.19 ± 0.86
Soccer experience (years)	6.38 ± 0.99	6.05 ± 0.76	6.21 ± 0.87
Height (cm)	171.10 ± 4.77	170.05 ± 4.90	170.57 ± 4.76
Body mass (kg)	62.57 ± 6.45	60.84 ± 5.75	61.71 ± 6.15
BMI (kg/m ²)	21.37 ± 2.08	21.05 ± 2.02	21.21 ± 2.01
Defenders (n)	8	7	15
Midfielders (n)	8	9	17
Attackers (n)	5	5	10
Adherence (%)	96.19	95.24	95.72

Note: EG – experimental group, CG – control group, BMI – body mass index

Data are presented as mean and standard deviation (SD).

Based on Table 3, the pre- and post-training changes in YYIR1 and RAST performance showed that the EG experienced notable improvements across all variables, accompanied by large ES. These improvements included increases in final speed by 4.4%, total distance by 23.3%, VO₂max by 7.0%, peak power (PP) by 8.67%, and average power (AP) by 11.21%. In addition, the fatigue index (FI) decreased by 8.20%, indicating enhanced anaerobic endurance. In contrast, the CG showed only minimal changes across all variables, including an increase in final speed by 0.6%, total distance by 3.0%, VO₂max by 1.0%, PP by 1.83%, and a slight decrease in AP by 0.09%. The FI in the CG also decreased by only 0.80%.

The normality test results indicate that the EG and CG variables (speed, total distance, VO₂max) are not normally distributed (*Sig* < 0.05), whereas PP, AP, and FI are normally distributed (*Sig* > 0.05). Accordingly, the Wilcoxon and Mann–Whitney U tests were used for the non-normal variables, while paired sample tests, Levene’s tests, and independent tests were applied for the normal variables. Homogeneity test results, based on Levene’s test, show that the variables PP, AP, and FI

Table 3. Pre and post-intervention changes in performance metrics for experimental and control groups (Yo-Yo intermittent recovery level 1 test and running-based anaerobic sprint test)

Variable	Group	Pre-training	Post-training	Change	Change (%)	ES
YYIR1						
Final speed (km/h)	EG	16.40 ± 0.49	17.12 ± 0.53	40.20 ± 20.30	4.4	large
	CG	16.60 ± 0.51	16.70 ± 0.78	9.37 ± 20.76	0.6	
TD (m)	EG	1984.76 ± 278.99	2424.76 ± 249.95	39.05 ± 18.18	23.3	large
	CG	2171.43 ± 353.76	2232.38 ± 382.75	-2.34 ± 20.85	3.0	
VO ₂ max (ml·min ⁻¹ ·kg ⁻¹)	EG	53.07 ± 2.37	56.76 ± 2.08	-3.51 ± 4.60	7.0	large
	CG	54.63 ± 2.98	55.15 ± 3.21	-0.14 ± 3.18	1.0	
RAST						
PP (watt)	EG	472.08 ± 60.18	512.28 ± 62.24	0.72 ± 0.45	8.67	large
	CG	507.02 ± 109.18	516.39 ± 113.56	0.10 ± 0.52	1.83	
AP (watt)	EG	366.87 ± 67.34	405.92 ± 67.58	440 ± 208	11.21	large
	CG	376.26 ± 100.33	373.92 ± 96.07	60.95 ± 179.61	-0.09	
FI	EG	41.69 ± 9.59	38.18 ± 9.31	3.69 ± 1.76	-8.20	large
	CG	43.03 ± 7.78	42.89 ± 8.50	0.52 ± 1.52	-0.46	

Note: EG – experimental group, CG – control group, TD – total distance, VO₂max – maximal aerobic capacity, PP – peak power, AP – average power, FI – fatigue index, ES – effect size

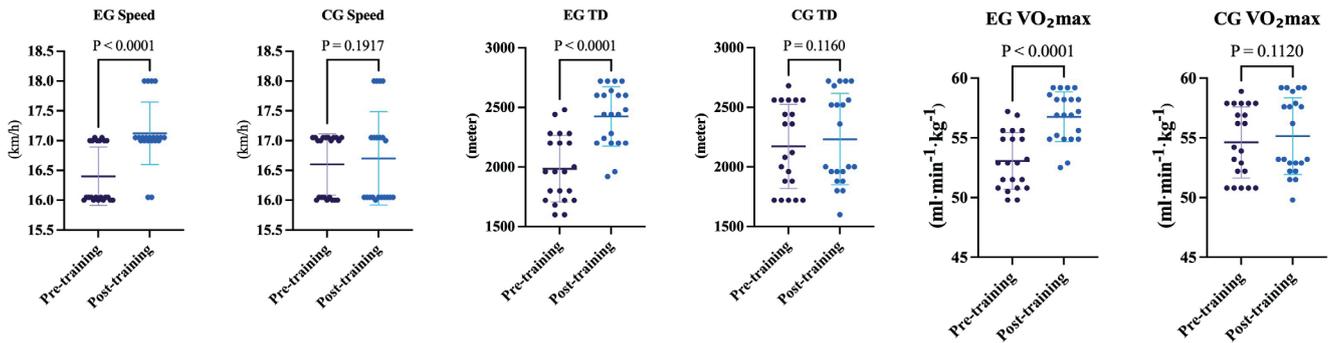
Data are presented as mean and standard deviation (SD).

are homogeneous ($Sig > 0.05$), allowing the use of an independent sample test.

Based on Figure 2, the Wilcoxon test results indicate that the EG experienced significant improvements in speed ($p < 0.0001$), total distance ($p < 0.001$), and VO_2max ($p < 0.0001$). In contrast, the CG showed no significant changes in speed ($p = 0.1917$), total distance ($p = 0.1160$), or VO_2max ($p = 0.1120$), with all p -values

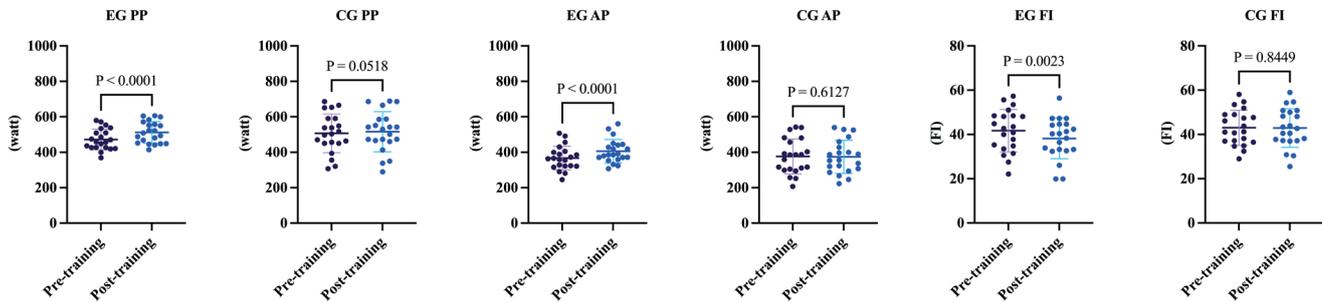
above 0.05. These findings support the effectiveness of the intervention applied in the EG.

The results presented in Figure 3 show statistically significant improvements in the EG for PP ($p < 0.0001$), AP ($p < 0.0001$), and FI ($p < 0.0001$). In contrast, the CG did not exhibit significant changes in any of these parameters: PP ($p = 0.0518$), AP ($p = 0.6127$), and FI ($p = 0.8449$). Further analysis using 95% CIs reinforces



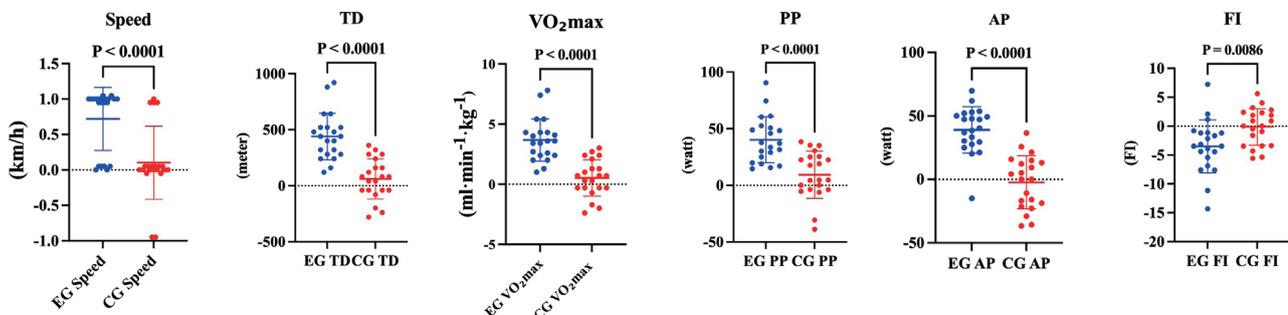
EG – experimental group, CG – control group, TD – total distance, VO_2max – maximal aerobic capacity

Figure 2. Graph of pre-post training difference test for experimental group and control group on speed, total distance, and VO_2max parameters



EG – experimental group, CG – control group, PP – peak power, AP – average power, FI – fatigue index

Figure 3. Graph of pre-post training difference test for experimental group and control group on peak power, average power, and fatigue index parameters



EG – experimental group, CG – control group, TD – total distance, VO_2max – maximal aerobic capacity, PP – peak power, AP – average power, FI – fatigue index

Figure 4. Difference test between experimental group and control group

the statistical significance and practical relevance of the between-group differences. The EG demonstrated substantially higher PP than CG, with a mean difference of 30.83 watts and a 95% CI of (17.61; 44.05). Similarly, AP in the EG exceeded the CG by 41.39 watts, with a 95% CI of (28.80; 53.98), confirming the impact of the training intervention. Regarding FI, the EG showed a greater reduction than the CG, with a mean difference of -3.37 and a 95% CI of (-5.92; -0.82), suggesting better anaerobic endurance and recovery capacity. As none of the CIs cross zero, these findings confirm that the observed differences between groups are both statistically significant and practically meaningful. Overall, the results support the effectiveness of the combined training program in enhancing anaerobic performance in the experimental group.

Figure 4 shows the results of the comparison between the EG and the CG, indicating significant differences in all parameters: speed ($p < 0.0001$), total distance ($p < 0.0001$), VO_{2max} ($p < 0.0001$), PP ($p < 0.0001$), AP ($p < 0.0001$), and FI ($p = 0.0086$). Further supported by 95% CIs, the between-group differences were statistically meaningful, as none of the CIs included zero. Specifically, the EG outperformed the CG with a mean difference in speed of 0.617 km/h [95% CI: 0.307, 0.927], in total distance of 379.05 meters [95% CI: 253.74, 504.35], and in VO_{2max} of 3.17 ml/kg/min [95% CI: 2.11, 4.23]. These findings reinforce the effectiveness of the training intervention in enhancing overall aerobic and anaerobic performance.

Discussion

This study aimed to evaluate the effectiveness of a preseason training program combining SHCT and dribbling-based RST on multiple aspects of soccer players' physical fitness. The findings revealed clear performance differences between EG and CG, indicating that the integrated program provided greater benefits in both aerobic and anaerobic capacities.

Aerobic capacity showed a significant improvement after this preseason program. This increase indicates combining high-intensity training methods and technique-based activities like dribbling can enhance players' cardiovascular capacity. These findings are consistent with previous research on SHCT in elite handball athletes, which showed increases in maximal oxygen uptake (VO_{2max}), maximum relative oxygen uptake (VO_{2rel}), running speed at which maximum oxygen uptake occurs (VO_{2max}) ranging from 9.5% to 11% [14]. We believe that this performance enhancement stems from the continuous dribbling activity in the study,

where the distance covered increased from 5600 meters in the first week to 8000 meters in the fourth week. This activity contributed to improving aerobic metabolism efficiency in professional soccer players. These findings also align with research that states that high-intensity continuous running (HICR) is as effective as moderate-intensity continuous running (MICR) in improving performance. HICR improves maximal aerobic power, while MICR promotes fat oxidation [20].

Similar studies have attempted to combine aerobic and speed training with positive results on soccer players' aerobic capacity [21]. However, the study conducted aerobic and speed training on separate days, which led to the difference in execution. Although research on combining continuous and interval approaches is still limited, several partial studies provide support. For example, a study comparing continuous moderate-intensity training (CMIT) with discontinuous high-intensity training (DHIT) in middle-aged master runners showed that both methods could improve running performance despite reducing weekly training volume. DHIT had the advantage of improving peak running speed [22]. The weekly distance in that study ranged from 33.3 ± 2.8 km/week for CMIT to 34.1 ± 3.1 km/week for DHIT.

In addition, previous studies have also demonstrated significant effects of sprint interval training (SIT) and endurance training (ET) on improving aerobic capacity [23]. Although the duration of this study was shorter (2 weeks less) compared to the SHCT and RST approach with dribbling drills, the results still support the effectiveness of this combined training method. Prior research on SIT concluded that the intervention increased the muscle's ability to use more oxygen during repeated sprints despite declining power output after several repetitions [24]. Even though participants' fitness levels were relatively low, their aerobic fitness level only slightly influenced their physiological response to SIT. Therefore, despite relatively low initial fitness levels, SIT remained effective in training the body, especially in improving muscle capacity and oxygen utilization.

We observed significant improvements in anaerobic capacity, which we can explain by adding explosive training elements and HIIT for short durations in this program. Anaerobic capacity, such as lactate endurance and recovery speed after intensive exercise, is influenced by interval training methods. Although previous programs emphasized long-duration high-intensity training, the incorporation of short sprints in each training set (20 meters per set) provided a substantial stimulus to the anaerobic system.

Continuous dribbling activities interspersed with rest and maximal sprints effectively stimulated physiological adaptations in the anaerobic organ system. Therefore, adding explosive training or sprint intervals with higher intensity can further enhance anaerobic capacity in the training program. A similar study focused on a soccer training approach using repeated 20-meter sprints to improve anaerobic capacity [25]. From a physiological response perspective, HIIT combined with repeated sprints increases lactate production and heart rate responses. Training in lactate zones can support positive adaptations in athletes [26, 27].

In contrast, Milioni et al. [28] concluded that 11 sessions of long HIIT over 4 weeks improved maximal aerobic power but did not lead to improvements in anaerobic capacity or neuromuscular function. The variations in the interventions can explain this difference, as the long HIIT program focused more on high-intensity running with longer durations. At the same time, the repeated 20-meter sprints specifically targeted anaerobic capacity. Additionally, in the training protocol of this study, active recovery was applied by running 20 meters after each set, which served as a transition between high-intensity activities. This training structure, which included short active recovery phases, likely contributed to aerobic and anaerobic adaptations through more sustained stimulation of the energy systems while still allowing adequate recovery for the subsequent sessions [29]. This aligns with research by Arslan et al. [30], which concluded that running at 70% of maximal heart rate (HR_{max}) for active recovery is more effective than passive recovery in improving physical performance, particularly in high-intensity running and total distance.

The results of this study suggest that the preseason program combining SHCT with RST based on dribbling drills can be a practical approach to improving overall physical performance in soccer players. Improving aerobic capacity through continuous dribbling activities and high-intensity repeated sprints provides significant cardiovascular adaptations, supporting players' endurance during matches. On the other hand, the short, explosive sprints in the RST contributed to anaerobic capacity improvements, particularly lactate endurance, and recovery after intensive activity.

This study has several limitations that should be acknowledged. First, the intervention lasted only four weeks, which may not be sufficient to observe long-term physiological adaptations or retention of benefits. Second, the sample size was relatively small and drawn from a single semi-professional soccer club,

limiting generalizability. Third, although the training incorporated technical elements such as dribbling, no specific technical performance metrics (e.g., dribbling accuracy or control time) were collected, so any claims regarding technical skill improvements remain speculative. Lastly, this study did not include any long-term follow-up to assess whether the observed benefits were sustained throughout the season. External validity is also limited, as all participants were male players from a single semi-professional team in the Indonesian Third Soccer League. Therefore, the findings may not apply to athletes from different competitive levels, such as elite professionals, youth academy players, or amateur teams. However, the training model combining SHCT and dribbling-based RST could be adapted and modified to fit various contexts. For instance, coaches in youth academies could scale down the intensity and duration, while elite teams might integrate this model with more sport-specific tactical drills. Similarly, coaches with limited resources could use simplified field markings or cones to replicate the structure of this training without requiring advanced equipment.

Conclusions

The preseason program is based on a combination of SHCT and RST with dribbling drills, which effectively improves both aerobic and anaerobic capacity in soccer players. This method combines high-intensity training with game-relevant physical drills, supporting optimal metabolic efficiency and physiological adaptations. These results emphasize the importance of integrating game-based and HIIT to prepare athletes for competition.

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Conflict of Interest

The authors declare no conflict of interest.

References

1. Clemente FM, Ramirez-Campillo R, Sarmiento H. Detrimental effects of the off-season in soccer players: a systematic review and meta-analysis. *Sports Med.* 2021;51(4):795-814. <https://doi.org/10.1007/s40279-020-01407-4>
2. Hammami R, Negra Y, Nebigh A, Ramirez-Campillo R, Moran J, Chaabene H. Preseason integrative neuromuscular training improves selected measures of physical fitness in highly trained, youth, male soccer players. *J Strength Cond Res.* 2023;37(6):384-390. <https://doi.org/10.1519/JSC.0000000000004394>

3. Malone S, Owen A, Mendes B, Hughes B, Collins K, Gabbett TJ. High-speed running and sprinting as an injury risk factor in soccer: can well-developed physical qualities reduce the risk? *J Sci Med Sport*. 2018;21(3):257-262. <https://doi.org/10.1016/j.jsams.2017.05.016>
4. Beato M, Jamil M. Intra-system reliability of SicS: video-tracking system (digital.Stadium®) for performance analysis in soccer. *J Sports Med Phys Fitness*. 2018; 58(6):831-836. <https://doi.org/10.23736/S0022-4707.17.07267-X>
5. Freire LDA, Brito MA, Muñoz PM, Pérez DIV, Kohler HC, Aedo-Muñoz EA, et al. Match running performance of Brazilian professional soccer players according to tournament types. *Monten J Sports Sci Med*. 2022;11(1):53-58. <https://doi.org/10.26773/mjssm.220306>
6. Kavanagh R, Michele R Di, Oliveira R, McDavid K, Rhodes D, Morgans R. The relationships between distances covered above generic and relative speed thresholds by male soccer players in English Premier League matches across two competitive seasons. The effects of positional demands and possession. *Biol Sport*. 2024;41(4):77-86. <https://doi.org/10.5114/biolSport.2024.135416>
7. Turner AN, Stewart PF. Strength and conditioning for soccer players. *Strength Cond J*. 2014;36(4):1-13. <https://doi.org/10.1519/SSC.0000000000000054>
8. Faude O, Schnitker R, Schulte-Zurhausen R, Müller F, Meyer T. High intensity interval training vs. high-volume running training during pre-season conditioning in high-level youth football: a cross-over trial. *J Sports Sci*. 2013;31(13):1441-1450. <https://doi.org/10.1080/02640414.2013.792953>
9. Kusuma IDMAW, Kusnanik NW, Lumintuarso R, Phanpheng Y. El enfoque holístico y parcial en el entrenamiento de fútbol: integrando componentes físicos, técnicos, tácticos y mentales: una revisión sistemática [The holistic and partial approach in soccer training: integrating physical, technical, tactical, and mental components: a systematic review]. *Retos*. 2024;54:328-337. <https://doi.org/10.47197/retos.v54.102675>
10. Thomakos P, Spyrou K, Katsikas C, Geladas ND, Bogdanis GC. Effects of concurrent high-intensity and strength training on muscle power and aerobic performance in young soccer players during the pre-season. *Sports*. 2023;11(3):1-10. <https://doi.org/10.3390/sports11030059>
11. Kopal R, Carvalho L, Abad CC, Faust B, Rossetti M, Saito T, et al. Preseason in soccer: a paradox between a high volume of technical/tactical training and improvement in the neuromuscular performance of elite women soccer players. *J Sports Med Phys Fitness*. 2022;62(7):763-768. <https://doi.org/10.23736/S0022-4707.21.12427-2>
12. Belamjahad A, Tourny C, Jebabli N, Clark CCT, Laher I, Hackney AC, et al. Effects of a preseason neuromuscular training program vs. an endurance-dominated program on physical fitness and injury prevention in female soccer players. *Sports Med Open*. 2024;10(76):1-17. <https://doi.org/10.1186/s40798-024-00731-7>
13. Papadakis L, Tymvios C, Patras K. The relationship between training load and fitness indices over a pre-season in professional soccer players. *J Sports Med Phys Fit*. 2020;60(3):329-337. <https://doi.org/10.23736/S0022-4707.20.10109-9>
14. Milosevic M, Dopsaj M, Jourkesh M, Milosevic M, Seyhan S. Super high-intensity continuous training: a new approach to aerobic training with huge effects on elite team handball players. *J Sci Sport Exerc*. 2023;7:383-390. <https://doi.org/10.1007/s42978-023-00253-w>
15. Köklü Y, Cihan H, Alemdaroğlu U, Dellal A, Wong D. Acute effects of small-sided games combined with running drills on internal and external loads in young soccer players. *Biol Sport*. 2020;37(4):375-381. <http://dx.doi.org/10.5114/biolSport.2020.96943>
16. Akdoğan E, Yılmaz İ, Köklü Y, Alemdaroğlu U, Cerrah AO. The effect of isolated or combined small-sided games and speed endurance training on physical performance parameters in young soccer players. *Kinesiology*. 2021;53(1):78-85. <https://doi.org/10.26582/k.53.1.10>
17. Arslan E, Kilit B, Clemente FM, Soylu Y, Sögüt M, Badicu G, et al. The effects of exercise order on the psychophysiological responses, physical and technical performances of young soccer players: combined small-sided games and high-intensity interval training. *Biology (Basel)*. 2021;10(11):1-10. <https://doi.org/10.3390/biology10111180>
18. Wiranata FA, Kusuma IDMAW, Phanpheng Y, Bulqini A, Prianto DA. The effect of 6 weeks of combination of three cone exercise using ball and high-intensity interval training on the agility and dribbling ability of student futsal athletes. *Phys Educ Theory and Methodol*. 2023;23(5):686-691. <https://doi.org/10.17309/tmfv.2023.5.05>
19. Thurlow F, Huynh M, Townshend A, McLaren SJ, James LP, Taylor JM, et al. The effects of repeated-sprint training on physical fitness and physiological adaptation in athletes: a systematic review and meta-analysis. *Sports Med*. 2024;54(4):953-974. <https://doi.org/10.1007/s40279-023-01959-1>
20. Jarstad E, Mamen A. The performance and aerobic endurance effects of high-intensity versus moderate-

- intensity continuous running. *Appl Physiol Nutr Metab*. 2019;44(9):990-996. <https://doi.org/10.1139/apnm-2018-0575>
21. Selmi W, Hammami R, Kasmi S, Sehli S, Rebai H, Duncan M, et al. Effects of aerobic and speed training versus active control on repeated sprint ability and measures of self-confidence and anxiety in highly trained male soccer players. *Sports Med Open*. 2023;9(1):1-13. <https://doi.org/10.1186/s40798-023-00619-y>
 22. Pugliese L, Porcelli S, Vezzoli A, La Torre A, Serpiello FR, Pavei G, et al. Different training modalities improve energy cost and performance in master runners. *Front Physiol*. 2018;9(21):1-9. <https://doi.org/10.3389/fphys.2018.00021>
 23. Kelly DT, Cregg CJ, O'Connor PL, Cullen BD, Moyna NM. Physiological and performance responses of sprint interval training and endurance training in Gaelic football players. *Eur J Appl Physiol*. 2021;121(8):2265-2275. <https://doi.org/10.1007/s00421-021-04699-0>
 24. Buchheit M, Abbiss CR, Peiffer JJ, Laursen PB. Performance and physiological responses during a sprint interval training session: relationships with muscle oxygenation and pulmonary oxygen uptake kinetics. *Eur J Appl Physiol*. 2012;112(2):767-779. <https://doi.org/10.1007/s00421-011-2021-1>
 25. Kusuma IDMAW, Kusnanik NW, Lumintuarso R, Setijono H, Muhammad, Muhammad HN, et al. Does short-term speed endurance soccer training improve physical performance? *Phys Educ Theory Methodol*. 2024;24(2):270-275. <https://doi.org/10.17309/tmfv.2024.2.11>
 26. Bharlaman MBF, Kusuma IDMAW, Kusnanik NW, Prianto DA, Pranoto A. Physiological adaptations in small-side games combined with speed-endurance training: analyzing heart rate and rate of perceived exertion. *Pedagogy Phys Cul Sports*. 2024;28(5):407-414. <https://doi.org/10.15561/26649837.2024.0509>
 27. Kusuma IDMAW, Kusnanik NW, Pramono BA, Pranoto A, Phanpheng Y, Nurpratiwi R, et al. Physiological response to speed endurance soccer training in amateur players. *Phys Educ Theory Methodol*. 2024;24(5):704-710. <https://doi.org/10.17309/tmfv.2024.5.04>
 28. Milioni F, Millet GY, de Poli RAB, Brisola GMP, de Souza Malta E, Redkva PE, et al. Effects of 4-week high intensity interval training on anaerobic capacity, repeated-sprints performance and neuromuscular function. *Sport Sci Health*. 2024;20(3):1109-1118. <https://doi.org/10.1007/s11332-024-01214-8>
 29. Zouhal H, Abderrahman AB, Jayavel A, Hackney AC, Laher I, Saeidi A, et al. Effects of passive or active recovery regimes applied during long-term interval training on physical fitness in healthy trained and untrained individuals: a systematic review. *Sports Med Open*. 2024;10(21):1-19. <https://doi.org/10.1186/s40798-024-00673-0>
 30. Arslan E, Alemdaroglu U, Koklu Y, Hazir T, Muniroglu S, Karakoc B. Effects of passive and active rest on physiological responses and time motion characteristics in different small sided soccer games. *J Hum Kinet*. 2017;60(1):123-132. <https://doi.org/10.1515/hukin-2017-0095>