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Effect Of High-Intensity Interval Training With Specific Drills On Physiological And Skillperformance Variables Of Football Players

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Abstract

Integrating specific drills within a High-Intensity Interval Training (HIIT) framework provides a systematic and effective means to develop physiological and skill performance variables in football players. It uses short bursts of intense exercise with recovery, reflecting the fast and intermittent nature of the game. By including drills such as sprinting with ball dribbling, shooting after shuttle runs, passing under pressure, and defensive, HIIT improves aerobic and anaerobic capacity along with agility, speed, reaction time, coordination, and shooting accuracy, leading to better overall performance. **(Granados** et al., **2007).** To examine the impact of high-intensity interval training (HIIT) with specific drills on physiological and skill performance variables, the investigator selected forty male football players from affiliated colleges of bharathiar University, aged between 18 and 25 years. The subjects were divided into two groups: Group I underwent HIIT with specific drills, while Group II served as the control group. The experimental group participated in the training program three days per week (Monday, Wednesday, and Friday) for a duration of eight weeks, whereas the control group continued with their routine activities without additional training Physiological variables, namely vital capacity (measured by the web spirometer test) and dribbling (measured by the sir bobby Charlton soccer school of Australia test), were assessed both before and after the training period. The results analyzed through the 't' test indicated that eight weeks of HIIT with specific drills produced significant improvements in vital capacity and dribbling among the football players. These

findings confirm that HIIT with specific drills is an effective training protocol for enhancing physiological and skill performance variables in football.

Keywords: High-Intensity Interval Training, Specific Drills, physiological, Skill Performance, Vital Capacity, Dribbling and Male Football Players.

1.INTRODUCTION

High-Intensity Interval Training (HIIT) is an effective method for improving football performance by enhancing endurance, speed, agility, and technical skills. Football-specific HIIT workouts involve short, intense bursts of activity followed by brief recovery periods, simulating real-game scenarios. Drills such as sprint intervals, dribbling under pressure, quick direction changes, and explosive jumps help players develop match fitness while refining their technique. A typical HIIT football session may include 30-second sprint drills, immediately transitioning into cone dribbling to improve ball control at high speeds. Agility ladder drills combined with rapid passing exercises enhance coordination and quick decision-making. Small-sided games with limited recovery time replicate match intensity, boosting stamina and game awareness. Shooting drills performed under fatigue conditions improve finishing ability under pressure. Additionally, plyometric exercises such as box jumps and lateral bounds strengthen lower-body power for explosive movements. By incorporating football-specific HIIT drills, players develop both physical and technical attributes in a time-efficient manner. This training method enhances anaerobic capacity, allowing players to sustain high-intensity efforts throughout a match. With regular HIIT-based football training, athletes can improve overall performance, maintain energy levels, and stay sharp in crucial moments of the game.**(Krustrup** et al., **2004).**

A large number of other muscular adaptations also occur with high-intensity training. For example, both aerobic high-intensity and speed-endurance training up-regulate several mitochondrial oxidative proteins and increase the muscle glycogen content29—the most important substrate for energy production in football. **(Bangsbo** et al., **2006).** The overall effect is pronounced changes in muscle metabolism with an increased fat oxidative capacity and reduced glycogenolysis, carbohydrate oxidation, and energy expenditure at a given exercise intensity**. (Iaia** et al., **2003).** These adaptations may be beneficial in football, where an improved capacity to use muscle triglycerides, blood free fatty acids, and glucose as substrates for oxidative metabolism could spare the limited muscle glycogen stores, thus allowing a player to exercise at a higher intensity toward the end of the game.

Muscle CA pillarization is also enhanced in response to speed-endurance training. (**Jensen** et al., **2004)** An enriched capillary network may lead to a shorter diffusion distance between capillaries and muscle fibers, and a larger area available for diffusion. Collectively, the enhanced CA pillarization may favor the release of compounds from muscle interstitial and delay fatigue development during intense exercise. In support of this contention, a higher capillary density is associated with performance

improvements in an approximately 3-min exhaustive bout, and related to muscle force maintenance (during and in recovery period) from short-term intense exercise.

A well-structured HIIT workout for footballers may include short bursts of sprinting, quick direction changes, dribbling, and passing drills, followed by brief recovery periods. For example, a session could start with 30-second sprint intervals, immediately transitioning into cone dribbling drills to improve ball control at high speeds. Then, players can engage in explosive plyometric exercises like squat jumps or lateral bounds to boost leg power. Another effective drill is the high-intensity rondo, where players rapidly pass under pressure to enhance decision-making and composure. Shooting drills with limited recovery time can also simulate real-game fatigue, improving finishing ability under pressure. The combination of these drills in a structured HIIT format conditions the body to perform at peak levels throughout a match, reducing fatigue and increasing recovery speed. Furthermore, HIIT enhances anaerobic capacity, which is crucial for repeated sprints and quick recoveries in football. By integrating skill-based HIIT drills, footballers can maximize fitness while sharpening technical abilities, creating a well-rounded and game-ready athlete.

1.2 REASON FOR THE PRESENT STUDY

Football is unarguably the world's most popular sport. A common aspect of this sport is the necessity of teamwork to complement individual skill. Player's roles can also be expanded to greater outputs, such as attacking higher like a center- attacking midfielder or defending deeper like a center-defensive midfielder. Since the game of football requires performing football techniques and skill while playing the game. **(Edwards** et al., **2017).**

The techniques and skills of football players and fully depend on the importance of functional variable like vital capacity and skill performance variables like dribbling. This is designed to assist players in becoming better players overall, developing various skills that will improve their performance and be noticed on the field.

Therefore, the investigator reviewed several literature and found that there was no study conducted on high intensity interval training with specific drills and impacts on physiological and skill performance variables. Hence, the researcher selected the problem for his research.

2. MATERIALS AND METHODS

2.1 Participants

To test the hypothesis of the study, forty male football players from affiliated colleges of Bharathiar University, aged between 18 and 25 years, were selected as subjects. The participants were randomly assigned into two equal groups: the High-Intensity Interval Training with Specific Drills Group (HIITWSDG, n = 20) and the Control Group (CG, n = 20). The experimental group underwent the HIIT with specific drills program three days per week (on alternate days) for a period of eight weeks, while the control group continued with their routine activities and did not receive any additional training.

2.2 Research Design

The physiological and skill performance variables assessed in the study included vital capacity and dribbling. Vital Capacity was measured using the wet spirometer test, recorded in litres, while dribbling was assessed with the sir bobby Charlton soccer school of Australia test, measured in seconds. These parameters were measured at baseline and again after eight weeks of High-Intensity Interval Training with Specific Drills (HIITWSD). The training intensity was progressively increased every two weeks based on variations in the exercises to ensure continuous improvement and adaptation.

2.3 Training Protocol

The training program lasted for 90 minutes per session, conducted three days a week (Monday, Wednesday, and Friday) for a period of eight weeks. Each session included a 10-minute warm-up, 70 minutes dedicated to the High-Intensity Interval Training with Specific Drills (HIITWSD), and a 10-minute cool-down. The 70-minute training component consisted of structured exercises with specific drills, ensuring that each action was performed at high intensity throughout the three weekly sessions.

2.4 Administration of Test

Vital Capacity

To measure lung volume. Wet spirometer, mouth pieces, nose clip, pencil and score sheet were used. Vital capacity was measured by means of wet spirometer. The spirometer consisted of six litre container, filled with water up to one inch from the top and was counter balanced by a chain, which passed over free running pulley. The spirometer was placed at a height that allowed that subjects to stand erect. Before the test each subject was asked to take fullest possible inhalation and then slowly and forcefully expelled all the possible air in the rubber hose through the mouth pieces. Care was taken to prevent air from escaping through the nose by using nose clips. The point of the indicator at the top of the drum indicated the volume of air expelled in cubic centimeter. It was ensured that a second breath was not taken by the subject during the test. Care was taken to lower the drum without spilling the water each time after use. Only one trial was given to each subject and the measurement was recorded to the nearest cubic centimeter. (**Ostchega** et al., **2011).**

Dribbling

Dribbling ability was assessed by using sir bobby Charlton soccer school of Australia test. The subject was asked to run the slalom course up and down, with the ball, and then run with the ball at his feet to the starting point, and stop the ball dead on the starting lin e. Seven cones were set out in a slalom effect and the subject started the dribbling from a set distance away, fifteen meters. Total time taken was recorded as the final score.

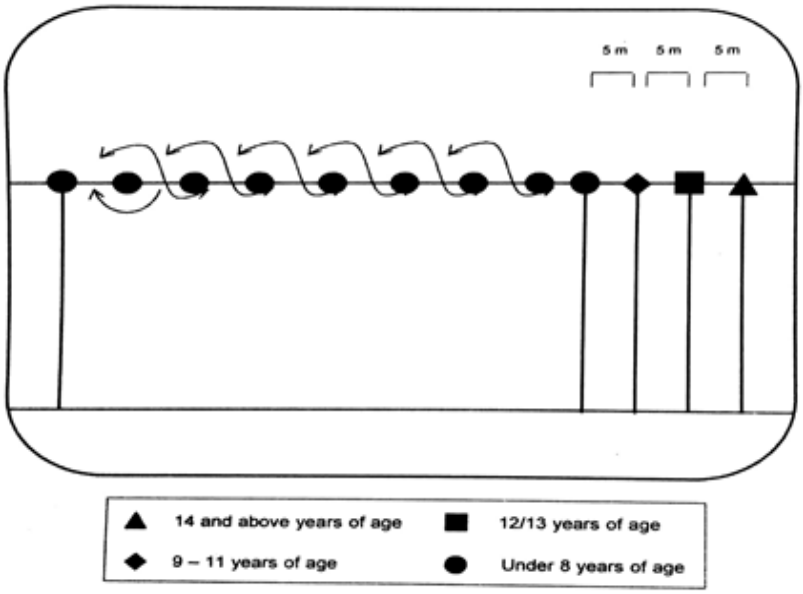

TABLE – I

HIGH-INTENSITY INTERVAL TRAINING WITH SPECIFIC DRILLS SCHEDULE FOR FOOTBALL PLAYERS

Training week	Name of the Exercises	Sets & Repetition	Intensity
I to II (Phase: 1 - Aerobic Conditioning & Base HIIT)	High Knees Mountain climbers Burpees Skater Hops Cone dribbling Pass and move drills Jog-sprint intervals	2X5 2x5 2x5 2x5 2x5 2x5	75%
III to IV (Phase – II Anaerobic HIIT + Speed)	Squat Jumps Sprint in Place Push-up to Sprint Lateral Bounds Sprint-Dribble-Sprint 1v1 Attack-Defend Ball Drop Sprint Reaction Drills	3x6 3x6 3x6 3x6 3x6 3x6	80 %

V to VI (Phase – III Power-Endurance & Handball - Specific HIIT)	Bear Crawl to Jump Burpee + Tuck Jump Box Jumps Broad Jumps Repeat Sprints with Ball Control Small-Group Keep-Away Shooting After Sprint Drills	3x7 3x7 3x7 3x7 3x7 3x7 3x7	85%
VII to VIII (Phase IV Match Conditioning & Game Simulation)	Suicides with Push-Ups Agility Cone Sprints Battle Rope 1v1, 2v2 Under Time Pressure Full-field Repeated Sprint Circuits Shot Under Fatigue Small-Sided Games	3x6 3x6 3x6 3x6 3x6 3x6	80%

2.4 Statistical Analysis

The statistics calm on physiological and skill performance variables, resulting from the High-Intensity Interval Training with Specific Drills, were statistically analyzed using the "t" test to determine any significant differences between the pre-test and post-test scores. In all cases, the level of statistical significance was set at 0.05 ($P < 0.05$).

3. Results

All subjects completed the study following the prescribed methodology. The 20 participants in the training group maintained an average attendance of 96%, and no injuries were reported during the training program. Additionally, there were no significant differences in height or weight between the groups, either before or after the training and detraining periods.

TABLE - II

SUBTRACTION OF 'T' RATIO ON VITAL CAPACITY OF MEN FOOTBALL PLAYERS ON EXPERIMENTAL GROUP AND CONTROL GROUP

(Scores in liters)

Group	Test		Mean	Std. Deviation	T ratio
Vital Capacity	Experimental Group	Pre test	3.35	0.15	10.16*
		Post test	3.61	0.13	
	Control	Pre test	3.36	0.10	0.69

	Group	Post test	3.37	0.14	

*significant level 0.05 level (degree of freedom 2.09, 1 and 19)

Table II presents the mean, standard deviation, and 't' ratio for vital capacity in the experimental and control groups. The obtained 't' ratio for the experimental group was 10.16, while the control group had a 't' value of 0.69. The table value at the 0.05 level of significance for 19 degrees of freedom was 2.09. Since the experimental group's 't' value exceeded the table value, the improvement in vital capacity was found to be statistically significant. In contrast, the control group's 't' value was below the table value, indicating no significant change.

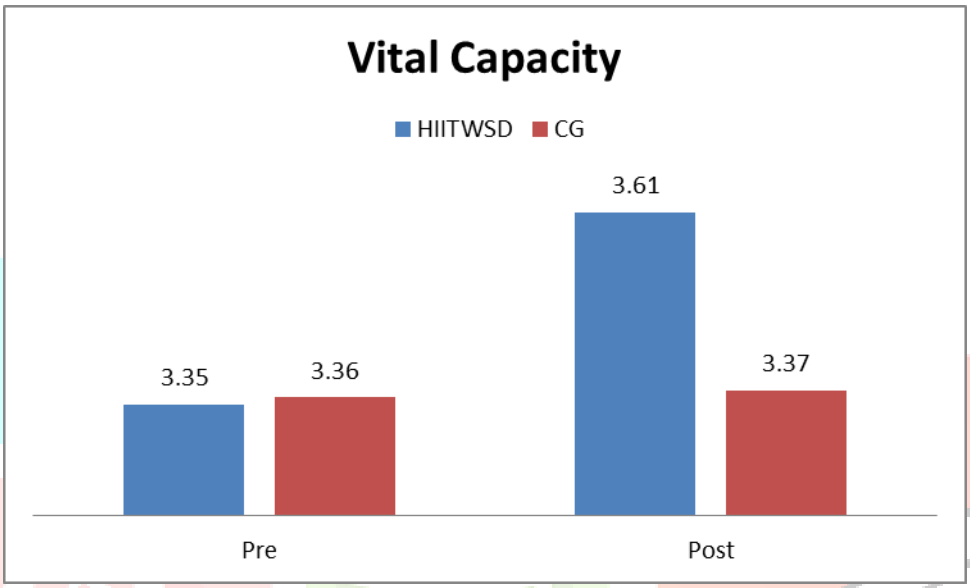

FIGURE- I

BAR CHARACTER SHOWING THE DESPICABLE VALUE ON VITAL CAPACITY OF MEN FOOTBALL PLAYERS ON EXPERIMENTAL GROUP AND CONTROL GROUP

TABLE - III

ADDITION OF 'T' RATIO ON DRIBBLING MEN FOOTBALL PLAYERS ON EXPERIMENTAL GROUP AND CONTROL GROUP

(Scores in Seconds)

Group	Test		Mean	Std. Deviation	T ratio
Dribbling	Experimental Group	Pre test	14.66	0.88	13.25*
		Post test	13.19	0.89	
	Control Group	Pre test	14.69	0.81	0.56
		Post test	14.89	1.04	

*significant level 0.05 level (degree of freedom 2.09, 1 and 19)

Table III shows the mean, standard deviation, and 't' ratio for dribbling in both the experimental and control groups. The experimental group obtained a 't' ratio of 13.25, while the control group's 't' value was 0.56. The table value at the 0.05 level of significance with 19 degrees of freedom was 2.09. Since the experimental group's 't' value exceeded the table value, the improvement in dribbling was statistically significant. Conversely, the control group's 't' value was below the table value, indicating no significant change.

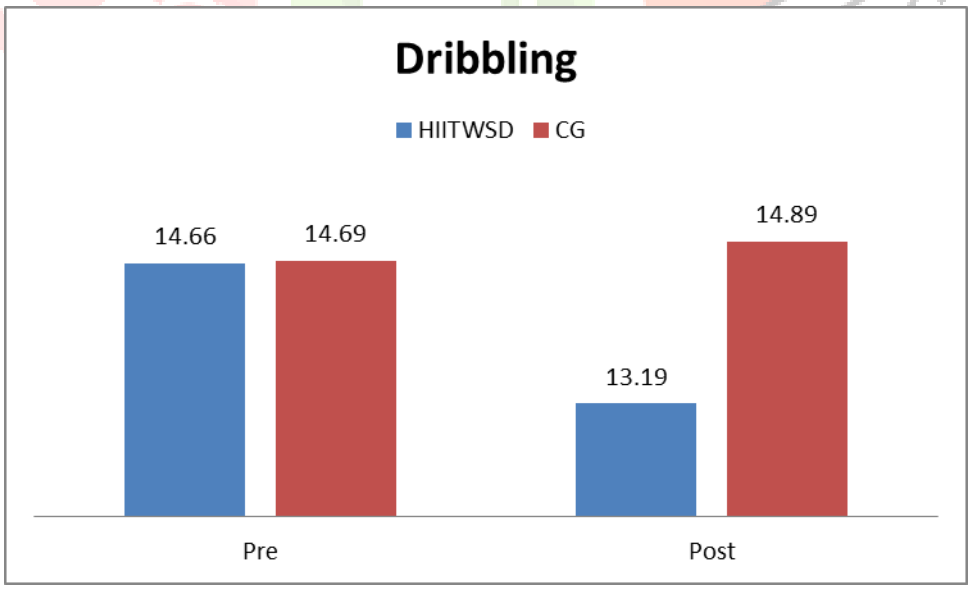

FIGURE- II

BAR PLAN VIEWING THE MEAN VALUE ON DRIBBLING OF MEN FOOTBALL PLAYERS ON EXPERIMENTAL GROUP AND CONTROL GROUP

4. DISCUSSION

Football games are conducted for 90 minutes, with an additional 30 minutes if the score is tied. To adapt to that time, a good VO_2 max is needed (**Oman** et al., **2019).** During football training to be evaluated at regular intervals to assess the training load imposed on athletes **(Kargotich** et al., **2007).** Regular monitoring of theses health related variables of football players can provide valuable information about their health, metabolic and cardiovascular status **(Kelly** et al., **2009).** Studies have shown that during a match, football players actively use about 90% of their aerobic capacity at an intensity of 75% of their vo_2max while the match total distance is between values **(Zahira** et al., **2023).** Physiological perspective, the present results extend previous work demonstrating that skill based conditioning games are acceptable substitutes for aerobic fitness during the competitive season (**Gabbet, 2006).**

Previous research has clearly established that High-Intensity Interval Training (HIIT) combined with specific drills produces greater adaptations in key physiological variables compared to Functional Strength Training (FST) with specific drills. HIIT stimulates both aerobic and anaerobic energy systems, leading to enhanced oxygen utilization, cardiorespiratory efficiency, and metabolic function. According to **Buchheit and Laursen (2013),** repeated high-intensity efforts interspersed with short recovery periods vital capacity, and oxygen saturation, while simultaneously reducing resting pulse rate through improved cardiac efficiency. Similarly, **Iaia** et al., **(2009)** highlighted that HIIT significantly elevates anaerobic power and aerobic endurance, resulting from enhanced oxidative enzyme activity and buffering capacity in skeletal muscles.

Helgerud et al., **(2001)** further demonstrated that soccer players who engaged in high-intensity interval running showed substantial gains in VO_2 max and vital capacity, leading to improved endurance and recovery. In contrast, although functional strength training with specific drills improves neuromuscular coordination, muscular strength, and power, its effect on cardiorespiratory variables such as O_2 saturation and VO_2 max remains comparatively moderate **(Hoffman** et al., **2004; Yildiz** et al., **2019).**

Conversely, HIIT combined with specific drills focuses on repeated, high-intensity bursts that closely simulate the demands of in-game play. This method effectively enhances dribbling performance, as it develops not only aerobic and anaerobic capacity but also rapid footwork and control during fatigue conditions. **Hammami** et al., **(2018)** noted that skill-based HIIT significantly improves agility and ball control in football players. Similarly, **Bueno and Souza (2019)** highlighted that high-intensity, emotionally engaging drill sessions enhance players' concentration and coordination, which are essential for effective dribbling under pressure.

The findings of the present study are consistent with these earlier works, revealing that High-Intensity Interval Training with specific drills resulted in greater improvements in vital capacity and dribbling performance. These outcomes support the notion that integrating both training models provides a

comprehensive approach to developing both technical precision and dynamic control in football performance.

5. CONCLUSIONS

1. High intensity interval training with specific drills training (HIITWSDT) was found to be suitable protocol to bring out desirable changes over vital capacity and dribbling performance of football players than control group(CG).
2. It is concluded that the high intensity interval training with specific drills training need to be incorporated in the training protocol to enhance the overall performance of team sports.

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