Impact of Cardiovascular-Respiratory Parameters on High-Intensity Football Training

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Abstract
The efficacy of soccer players is influenced by morphological, functional, and psychological characteristics that define the optimal playing style and game outcomes. It is generally accepted that soccer is a prolonged, high-intensity, intermittent sport where players must sprint repeatedly and frequently throughout a 90-minute match. The average intensity of their exercise is between 80 and 90 percent of their maximum heart rate or anaerobic threshold. This innovative study aims to determine how high-intensity football affects cardiovascular and pulmonary characteristics. The data for this study are collected using a Likert scale from university soccer players. The research revealed that cardiovascular and respiratory parameters significantly influence high-intensity football training. This study is innovative due to its research concept and substantial implications for theory and practice. The prospective directions of this research are also essential for critically advancing the body of knowledge.
Keywords. High-Intensity, Football, Cardiovascular, Respiratory, Training

Introduction

Regular physical activity is necessary for preventing metabolic, cardiovascular, and musculoskeletal issues. Youth and adults continue to lead sedentary lifestyles, especially in Western nations. Several morphological and functional cardiovascular changes induced by long-term vigorous training programs occur progressively and revert when the physical activity is discontinued (Mackała et al., 2020). The adaptation of the heart to sustained, intensive physical activity is known as the "athlete's heart," and it is characterized by an increase in intracavitary dimensions and wall thickness that is symmetrical and harmonic. This adaptation depends on many variables, including genotype (hereditary characteristics), the age at which physical activity is initiated for the first time, and the type and intensity of training (Veysel & Patlar, 2022).
Resistance training is characterized by isotonic-dynamic muscle action, necessitating aerobic energy expenditure. Consequently, the telediastolic size of the left ventricle increases, its systolic pulse rises, and systemic arterial and vascular resistance progressively decreases. Both intracavitary dimensions and wall thickness increase in resistance athletes (such as those who swim, run lengthy distances, or pedal). These characteristics induce eccentric hypertrophy and a corresponding increase in myocardial mass due to volume overload (Marín-Pagán et al., 2020). Strength training requires anaerobic energy expenditure and is characterized by static muscle contractions. Myocardial mass steadily increases as the wall thickness increases. The negligible increase in intracavitary diameters results in concentric ventricular hypertrophy. Athletes who participate in weightlifting, sprinting, etc., frequently experience these changes (Nobari et al., 2022).
The physical requirements for playing soccer are complex and related to the workout routine. Mitchell et al. state that football players typically perform static and dynamic exercises. The steps are performed intermittently because they demand frequent variations in measuring and control (such as walking, high-intensity running, sprinting, and jogging) and direction. In actuality, football, like most other sports, is characterized by an excess of anaerobic and aerobic energy consumption, as well as left ventricular size and stress. Competitors in this discipline have thicker walls and larger intracavitary diameters. Consequently, a model of ventricular hypertrophy is produced in the middle of resistance training and power training (de Sousa et al., 2021).
Significant morphological and functional cardiovascular changes occur in professional athletes following protracted, intense exercise. These modifications occur gradually and reverse when physical activity is reduced. Over the past few decades, there has been a gradual transformation in the athletics culture. Professional athletes undergo a variety of musculoskeletal and cardiovascular adaptations due to daily practice sessions and rigorous training regimens. Other variables, such as genotype, age, and the age at which physical activity

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increases, are associated with these alterations (Sarkar, Chatterjee, & Dey, 2019).

Existing research has examined soccer players and their performance in great detail. Nonetheless, the literature has a significant hiatus, as these studies have ignored cardiovascular and pulmonary characteristics. The novel objective of this study is to determine how high-intensity football affects cardiovascular and pulmonary characteristics. The data for this study are collected using a Likert scale from university soccer players. The research revealed that cardiovascular and respiratory parameters significantly influence high-intensity football training. This study is innovative due to its research concept and substantial implications for theory and practice. The prospective directions of this research are also essential for critically advancing the body of knowledge.

Literature Review

All levels of soccer players must possess powerful lower limbs, anaerobic strength, and cardiovascular conditioning. Since adolescent football players must incorporate academic and technical instruction, an effective structure must be established to enhance physical ability. In this study (MICT) (Yan, Kim, & Choi, 2022), the efficacy of a standard, moderate training regimen versus high-intensity interval training (HIIT) for young football players were compared. As a consequence of systemic inflammation and a high prevalence of cardiovascular disease (CVD) risk factors, inflammatory joint disease (IJD) is associated with an increased risk of cardiovascular disease (CVD). Cardiovascular risk factor (CRF) is an essential health metric; routine medical exams should include CRF measurements. Interval training with high intensity (HIIT), one form of exercise, can increase CRF and decrease CVD risk factors (Alvira et al., 2020). CRF risk and CVD risk are linked. In IJD, exercise is rarely used to assess cardiovascular risk, and the cardioprotective effects of HIIT are unknown. In addition, research is required to ascertain whether HIIT is applicable in primary care settings. The primary objective is to assess the effect of HIIT on CRF in IJD patients. Second, this study will evaluate the effect of HIIT on the Cardiovascular risk and disease activity of IJD patients, as well as the feasibility of HIIT in primary care and the effectiveness of non-exercise algorithms for detecting changes in CRF.

Working out wears down the respiratory muscles, reducing their ability to perform optimally and the oxygen flow to the working muscles. The use of respiratory muscles during sports training, particularly for soccer players, merits special attention. To improve the endurance and strength of inspiratory muscles, inspiratory muscle training (IMT) places additional stress on the diaphragm (Sutharsingh & Kaviraj, 2019). According to research on the advantages of IMT for soccer players, incorporating this training into the sport's regular training can increase exercise capacity, expiratory muscle strength, inspiratory muscle strength, and blood lactate levels (BLL) after a cycle of consecutive outings. According to research conducted by Flynn (2022) on 18 female football players, IMT can decrease the metabolic rate of the inspiratory muscles, which increases the oxygen supply to the muscles after strenuous activity. The ability of soccer players to withstand fatigue and their running efficacy can be enhanced through this method. Therefore, Zhang et al. (2023) examined the effect of 5 weeks of IMT on soccer players' respiratory system efficacy and aerobic fitness. They discovered a significant increase in the strength of respiratory muscles for assessed respiratory parameters. However, the respiratory training did not significantly enhance the soccer players' tolerance for intense exertion (Fang, Kim, & Choi, 2021).

To quantify the training burden, optimize performance, and reduce the risk of illness and injury, monitoring training is gaining popularity in soccer. However, observing team sports is more complex than other sports. Measuring the physiologic demands of a player executing movements such as accelerations, decelerations, and direction changes, which are essential elements of soccer games, primarily at high intensities, is a significant challenge. It is essential to quantify the physiologic demand of training to comprehend adaptations and how a player responds to external pressures. Since heart rate (HR) is a non-invasive measurement closely correlated with VO2, it has been used to quantify physiological demand in soccer for decades (Caruso et al., 2020).

On the other hand, HR may not adequately characterize the demands of intermittent activities performed at maximal exercise intensities. It may be sensitive to variations in effort caused by movements such as accelerations, decelerations, and direction changes, particularly during intervals. This is caused by a delayed HR response at the beginning and end of the exercise, resulting from complex interactions between numerous inputs that modify both parasympathetic and sympathetic outflow. Sam and Subradeepan (2019) report that heart rate and session rating of perceived exertion (SRPE), a valuable, simple, and practical measurement of strength training, is typically used to determine the internal load in soccer.

However, the distribution of effort during a training session is not discussed in detail. The difficulties associated with estimating inputs and the pervasive use of GPS devices have benefited the monitoring of external load measurements. Physiological power (PP) is one of the most popular metrics derived from GPS data in soccer (Alzharani et al., 2020). This metric quantifies the player's calorie consumption throughout any activity, including when speed is not constant. Due to the PP calculation's underlying assumptions, the procedure for calculating energy expenditure may be inaccurate. In the end, PP is a useful singular measure of work rate, especially when observing activities with notable accelerations and decelerations. PP, which exhibits no temporal lag and can be used to characterize work productivity during supramaximal intensities, can circumvent some complications that arise when monitoring HR. PP is derived from mechanical data; however, it cannot replace the need to identify a physiological variable that characterizes physical exertion in team sports because it is derived from mechanical data.

Respiratory frequency (RF) is a valuable tool for quantifying physical exertion; however, the available research only applies to cycling exercises. In contrast to VO2, HR, and blood lactate, RF correlates strongly with RPE during high-intensity interval training (HIIT) and other high-intensity exercise protocols (Osawa et al., 2014). This holds under various experimental conditions, including hypoxia, humidity, and muscle exhaustion. RF responds rapidly to the work-recovery cycle during HIIT, whereas HR and V-O2 respond slowly. Due to its quick response time, RF could be beneficial for monitoring physical exertion during infrequent activities such as football and other team sports. However, most of these sports involve running-based movements, and because the respiratory and locomotor rhythms may be linked, RF may not accurately measure physical exertion during running. Additional research is required to corroborate whether RF accurately represents physical exertion during exercise modalities other than cycling (Caruso et al., 2020).

Hypothesis 1: *There is an impact of cardiovascular parameters on high-intensity football training.*

Hypothesis 2: *There is an impact of respiratory parameters on high-intensity football training.*

Methodology

This research is founded on primary data because the respondents are expected to collect the data for the final results. Existing studies did not correspond to the scale items considered for this research, so the scale was developed and validated using the scale development process. This investigation uses the appropriate method for scale development in this manner. Based on Jebb, Ng, and Tay's (2021) recommendations, the scale development procedure utilized in this study is discussed. The scale development process began with operationalization, but before this, the extant literature was reviewed through group discussion. To ascertain the operationalization of the scale items in the research, experts in the field are contacted for a focus group study. A pool of potential scale items was compiled, and each dimension was ensured to be covered for data collection. External experts evaluate the content validity of these development measurements, which is not included in the operationalization or research findings. In the second phase, data collection was conducted for the initial test to ascertain the questionnaire's validity. 80 randomly selected students collected these data from the intended population. However, these respondents were prevented from participating in the ultimate data collection.

The exploratory factor analysis initial validity test was conducted to determine the questionnaire's validity. AMOS 24 was used because it is the most effective instrument for determining the questionnaire's validity. After verifying the validity of the measurement items and removing those that scored below the recommended threshold, data are collected from a second group of respondents. This second data collection is used to test the confirmatory factor analysis. Determining is also crucial because it ensures that the developed items are appropriate for determining the relationship between research variables. On this basis, the data set used for confirmatory factor analysis is analyzed, and the test results revealed that the study has an appropriate relationship between variables. Thus, these development measurement items are regarded as reliable for determining the research's final findings.

In addition, the final data for this study are collected from university athletes who participate in various soccer events. This study has ensured that soccer players provide relevant data for the ultimate conclusions of this study. 433 respondents provided data for the final analysis, and 550 questionnaires were administered to the respondents. The sample size for this study is, therefore 433 respondents. In addition, Smart PLS 3.0 was used to ascertain the results of structural equation modeling in this study. The results of structural equation modeling, the second-generation method for data analysis, are used to evaluate the relationship between the variables. In the meantime, this method is extensively utilized in research studies that collect data using a Likert scale and reflective questionnaires.

Data Analysis and Findings

This research's data analysis section began with a normality test. The results of normality tests are used to determine whether the collected data from respondents is standard enough for further analysis. At this stage of the normality test, absent values are also identified, and the skewness and kurtosis (Royston, 1992) findings are also used to determine whether the data are standard. For the normality of data, it is recommended that skewness values should not exceed +1 and kurtosis values should not be below -1. When skewness and kurtosis values are within the recommended threshold, these findings can be used significantly for further research analysis. This test also helps determine the mean and standard deviation of the obtained data for each scale item utilized in this study. Therefore, the data presented in Table 1 demonstrate the study's data normality.

Table 1

Data Normality

No.	Items	Missing	Mean	Standard Deviation	Excess Kurtosis	Skewness
1	CP1	0	4.095	1.037	0.898	-1.163
2	CP2	0	3.590	1.129	-0.169	-0.616
3	CP3	0	4.000	1.038	0.113	-0.85
4	CP4	0	3.963	0.986	0.068	-0.755
5	CP5	0	3.451	1.128	-0.419	-0.415
6	CP6	0	3.586	1.123	-0.458	-0.49
7	RP1	0	3.597	1.189	-0.513	-0.548
8	RP2	0	4.473	0.926	3.071	-1.882
9	RP3	0	4.220	1.043	0.931	-1.289
10	RP4	0	3.996	1.166	0.417	-1.109
11	RP5	0	4.070	1.170	0.510	-1.185
12	RP6	0	3.930	1.148	0.045	-0.93
13	HIFT1	0	4.066	1.127	0.519	-1.149
14	HIFT2	0	4.128	1.077	0.905	-1.249
15	HIFT3	0	3.784	1.264	-0.414	-0.779
16	HIFT4	0	3.670	1.193	-0.454	-0.630
17	HIFT5	0	3.993	1.038	0.280	-0.895
18	HIFT6	0	4.051	1.001	0.637	-1.008
19	HIFT7	0	4.018	1.022	0.729	-1.032

CP = Cardiovascular Parameters, RP = Respiratory Parameters, and HIFT = High-Intensity Football Training

After confirming the normality of the data, the research assessed the validity and dependability of the collected information. The study examined the Cronbach alpha and composite reliability findings and extracted average variance using measurement model assessment. When the Cronbach alpha values are more significant than 0.70 (Tavakol & Dennick, 2011), the composite reliability findings are more significant than 0.70 (Alarcón & Sánchez, 2015). The average variance extracted findings are more significant than 0.50 (Alarcón & Sánchez, 2015), and the study data are considered reliable. In addition, Shevlin and Miles (1998) determined that factor loadings are statistically significant when their values are greater than 0.60 for each of the research's measurement items. In this way, the data for this test presented in Table 2 and Figure 1 demonstrate that the study has attained the necessary factor loadings for the conclusions of this research.

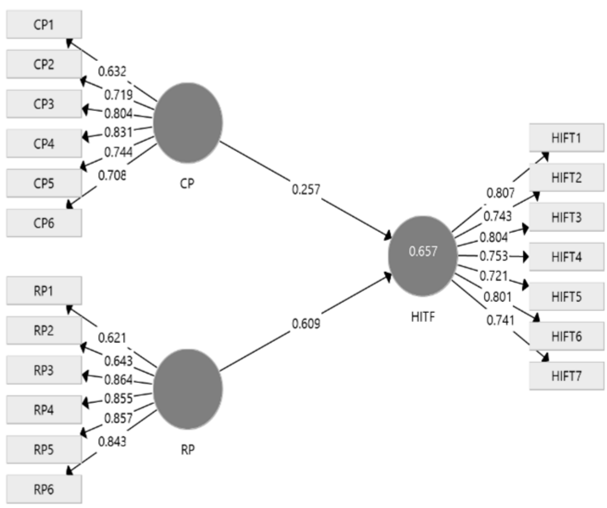

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Figure 1. Measurement Model Assessment

Table 2

Convergent Validity

Constructs	Items	Factor Loadings	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
CP	CP1	0.632	0.835	0.880	0.551
	CP2	0.719			
	CP3	0.804			
	CP4	0.831			
	CP5	0.744			
	CP6	0.708			
HITS	HIFT1	0.807	0.886	0.909	0.590
	HIFT2	0.743			
	HIFT3	0.804			
	HIFT4	0.753			
	HIFT5	0.721			
	HIFT6	0.801			
	HIFT7	0.741			
RP	RP1	0.621	0.873	0.906	0.620
	RP2	0.643			
	RP3	0.864			
	RP4	0.855			
	RP5	0.857			
	RP6	0.843			

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This study also examined the findings of discriminant validity, which is tested to ensure that the measurements used to collect data do not overlap. This study employed two suitable methods to ascertain the discriminant validity. The Heteritrait-Monotrait (HTMT) method was initially used to examine the discriminant validity, and for HTMT, Gold, Malhotra, and Segars (2001) suggested that the matrix values must be less than 0.90. The test results in Table 3 indicate that the required discriminant validity is attained. Furthermore, cross-loadings were used to determine the discriminant validity in this study. Cross-loadings are significant when the values of one item's measurements are greater than the correlational findings of other variables (Barlat et al., 2013). The item values presented in Table 4 demonstrated that the discriminant validity of this study is adequate.

Table 3

Discriminant Validity – HTMT

Constructs	CP	HITF	RP
CP			
HITF	0.778		
RP	0.820	0.848	

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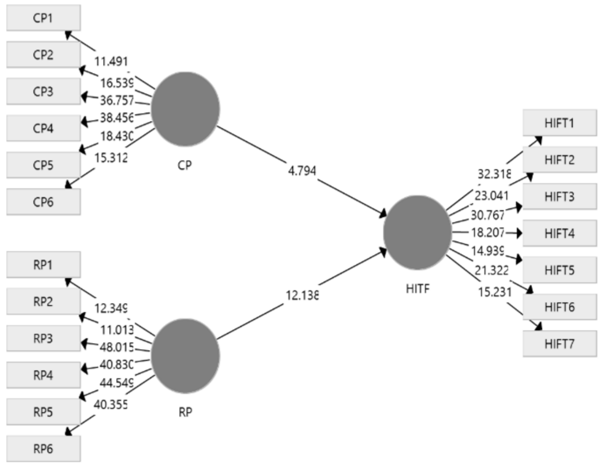
Table 4

Discriminant Validity – Cross Loadings

Items	CP	HITF	RP
CP1	**0.632**	0.431	0.514
CP2	**0.719**	0.461	0.434
CP3	**0.804**	0.581	0.579
CP4	**0.831**	0.588	0.613
CP5	**0.744**	0.498	0.489
CP6	**0.708**	0.464	0.471
HIFT1	0.587	**0.807**	0.758
HIFT2	0.510	**0.743**	0.728
HIFT3	0.594	**0.804**	0.705
HIFT4	0.521	**0.753**	0.480
HIFT5	0.421	**0.721**	0.422
HIFT6	0.526	**0.801**	0.531
HIFT7	0.472	**0.741**	0.469
RP1	0.619	0.558	**0.621**
RP2	0.418	0.394	**0.643**
RP3	0.499	0.629	**0.864**
RP4	0.539	0.645	**0.855**
RP5	0.502	0.681	**0.857**
RP6	0.624	0.742	**0.843**

CP = Cardiovascular Parameters, RP = Respiratory Parameters, and HIFT = High-Intensity Football Training

The study concludes by evaluating the findings of the structural model used to determine the t-values. Based on the empirical findings of the research, these values are used to determine whether the theoretically derived relationship is significant (Ramayah et al., 2018). The recommended threshold for a significant relationship is t > 1.96, indicating that the study has a significant relationship. This research tests the findings of both hypotheses and ensures that both hypotheses are significantly supported. According to the empirical findings of Hypothesis 1, cardiovascular parameters have a positive and significant effect on high-intensity football training. According to the empirical findings of hypothesis 2, respiratory parameters have a positive and significant effect on high-intensity football training. The outcomes are shown in Table 5 and Figure 2.



CP = Cardiovascular Parameters, RP = Respiratory Parameters, and HIFT = High-Intensity Football Training

Figure 2. Structural Model Assessment

Table 5

Relationships

Paths	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
CP -> HITF	0.257	0.260	0.054	4.794	0.000
RP -> HITF	0.609	0.610	0.050	12.138	0.000

CP = Cardiovascular Parameters, RP = Respiratory Parameters, and HIFT = High-Intensity Football Training

Discussion and Conclusion

This research's findings are accepted without question by analyzing the data with structural equation modeling. This study determined that both research hypotheses are significantly supported. According to Hypothesis 1, cardiovascular parameters positively and significantly affect high-intensity football training. Moreover, according to the findings of hypothesis 2, respiratory parameters have a positive and significant effect on high-intensity football training. In this way, the findings of this research are acceptable, as they are consistent with those of previously published studies.

(Sutharsingh & Kaviraj, 2019) CrossFit training can enhance physical capabilities, while compression hosiery can reduce muscle discomfort and improve soccer players' higher-speed match running performance. The influence of the menstrual cycle phase on physical capacity must be considered when evaluating an athlete's endurance potential (Flynn, 2022). The biological effects of HIIT and small-sided games (SSG) regimens are comparable, but SSGs are significantly more enjoyable. In contrast, HIIT disrupts mood while SSG maintains mental equilibrium. Long-term, intense training can alter the structure and function of the heart, generating an "athlete's heart." Still, there is no discernible difference between player roles or abilities in echocardiographic measurements. Inspiratory muscle efficiency improves cardiorespiratory function and VO2max measurement of aerobic endurance, whereas RF is a reliable indicator of physical exertion in the shuttle-run HIIT performed by soccer players. Sleep-disordered breathing increases the risk of acute inflammatory reactions in college football players, and ventilation response is crucial for determining the activity capacity of elite soccer players. Coaches may choose from various training modalities based on the training program's objective and the satisfaction-related advantages of SSGs.

According to research, CrossFit, which incorporates all anaerobic and aerobic components, improves the body composition, cardiovascular fitness, and anaerobic capacity of individuals of any fitness level and of both sexes. CrossFit athletes experience psychological benefits such as workout enjoyment, fulfillment, challenge, and goal achievement (Zhang et al., 2023). A high rate of participant retention and program adherence results from these effects. However, there are risks associated with CrossFit training at high intensities (Yan et al., 2022). These are prevalent musculoskeletal disorders that can affect any part of the body, with lower back, shoulder, and knee injuries being the most common. Exertional rhabdomyolysis is an additional severe but significantly less frequent injury. According to CrossFit Inc., the results of this study indicate that rigorous CrossFit training improves six of the ten general physical abilities of athletes, including endurance, flexibility, strength, and power. The other four physical aptitudes that have not been evaluated are speed, agility, accuracy, and coordination.

Utilizing compression stockings during two soccer games improves high-intensity performance and muscle discomfort. Compression stockings (CS), worn during football games, have not been thoroughly investigated. Fang et al. (2021) examined the toxic effect of CS on match-based fitness indicators and sensory reactivity during two consecutive football matches separated by a 72-hour hiatus. Twenty field players participated in two games after being randomly assigned to either the comparison or CS groups (20-30 mm Hg) (no CS). Although perceived recoveries were lower in the second match for both groups, they were identical for both matches (Alvira et al., 2020). After the second match, the controls' perceived muscle pains increased, but not the CSs. In light of this, using CS during two soccer games separated by a 72-hour recovery period reduces reported muscle soreness and enhances higher-speed running performance in matches.

Recently, female football has expanded significantly, but gender-specific physiological differences have never been considered. The effects of female reproductive hormones on various cardiovascular, pulmonary, metabolic, and thermoregulatory parameters are well-documented, and they can also affect physical activity and football performance (Sam & Subradeepan, 2019). These hormones fluctuate throughout the menstrual cycle. As a consequence, the primary purpose of the study was to examine the potential impact of the menstrual cycle on performance on soccer-specific tests. The research findings support the hypothesis that maximal endurance ability decreases during the mid-luteal phase of a woman's menstrual cycle. However, the same result was not observed in terms of sprinting and jumping ability. Therefore, it may be advantageous to consider the cycle phase when evaluating a player's endurance capacity (Alzharani et al., 2020).

Inadequate dynamic postural control is likely to result in lower limb injury. Several fatigue-inducing regimens impair dynamic postural control (Osawa et al., 2014). Dynamic postural control and intermittent, high-intensity exercise have not been investigated. Examine the influence of a high-intensity, intermittent exercise program (HIEP) on men's and women's dynamic postural stability as measured by the Star Excursion Balance Test (SEBT). Normalized maximal SEBT scores were negatively affected by HIEP-induced fatigue, according to this study. Women performed better on tests and were less negatively affected by HIEP-related fatigue than men (Alba-Jiménez, Moreno-Doutres, & Peña, 2022). The study aimed to determine how high-intensity intermittent training (HIIT) and small-sided games (SSG) affected the physiological and affective states of soccer players. There was no discernible difference between HIIT and SSG in HR, RPE, or reactions. Compared to SSG, HIIT was associated with more significant overall mood disturbance, tension, fatigue, and decreased energy. Even though both HIIT and SSG sessions produced identical physiological effects, HIIT induced a mood disturbance, whereas SSG maintained emotional balance. Clinicians may select one of the two exercises based on the objective of the training, taking into account the benefits of the SSG for mood-related issues as indicated by research.

The objective of the study conducted by Alnuman and Alshamasneh (2022) was to examine the effects of eight weeks of inspiratory muscle training (IMT) on the pulmonary function, aerobic capacity, and lung ventilation of young soccer players participating in a basic preseason soccer training program that also included incremental endurance training (IET). There were sixteen junior club soccer players included in the investigation. Before and after the intervention, the Cooper test, maximal inspiratory pressure tests, and pulmonary function tests were administered. After eight weeks of IMT, the strength of the muscles of expiration improved, but there was no discernible change in respiratory performance metrics. In addition, the findings indicate an increase in inspiratory muscle efficiency, which contributes to an increase in aerobic endurance as indicated by the cardiorespiratory Cooper test's VO2 max, determined by running distance (Tsvetkova-gaberska et al., 2023). The variables currently employed in soccer training monitoring do not accurately reflect the physiological demands of the player during actions such as accelerations, direction changes, and decelerations executed with high intensity. The research investigated the possibility that radio frequency (RF) signals physical exertion during intense soccer-related exercise. According to the study's findings, RF is a reliable indicator of physical effort in soccer players' shuttle-run HIIT. These findings may impact monitoring training in team sports like soccer and others.

Athletes are currently using small-sided games (SSG) and high-intensity interval training (HIIT) to enhance their overall football skills (Nayıroğlu et al., 2022). This investigation determined the effects of SSGs and HIIT on strength, physiological responses, and perceived satisfaction. HIIT and SSG workouts had comparable physiological effects, but SSG workouts were significantly more enjoyable. Given the enjoyment-related benefits of SSGs, trainers can select from various training modalities based on the training session's objective (Ouertatani et al., 2022). SDPT, or short-duration pre-tournament training, is a popular preparation technique for major football competitions. There are few investigations on the effects of SDPT on the cardiovascular measures of university football players in Ghana. The study examined how SDPT affected the cardiovascular function of college football players. SDPT increases the risk of acute inflammatory reactions in college football players, according to the study. With well-planned training duration and intensity, the cardiorespiratory function of college football players would be enhanced, and their fasting plasma glucose would not rise.

Due to the emphasis on cardiorespiratory testing in particular, a review was conducted to examine the methods and materials used to evaluate soccer players' physical condition and general health. The research also revealed a significant distinction between the function and sensitivity of laboratory and field evaluations. The review concludes that field tests are superior to laboratory tests for multiple reasons, including motivation and specificity and their general purpose. In addition, the research literature suggests integrating multiple tests for a comprehensive evaluation of athletes (Falces-Prieto et al., 2022). Additional research will aid in developing a comprehensive test model for soccer players by combining several specific workout modalities. Due to prolonged and intense training, professional athletes undergo substantial morphological and functional cardiac changes. These changes occur gradually and revert when physical activity is discontinued. The disorder known as "Athlete's heart" affects the structure and function of the heart. The investigation compares echocardiographic measurements between two distinct groups of athletes. These findings confirm the scientific principle that long-term, intense training alters the structure and function of the heart, resulting in the formation of an "athlete's heart." Lavoie-Gagne et al. (2022) found no audible echocardiographic variation between standard requirements and other player responsibilities or abilities.

Theoretical and Practical Implications

This study has new theoretical implications that have contributed to expanding human knowledge. Prior research findings did not take into account these implications. This study has empirically demonstrated that cardiovascular parameters positively and significantly affect high-intensity football training. In addition, this study adds new evidence to the literature that high-intensity football training has a positive and significant effect on respiratory parameters. Prior research did not consider these findings, and there was a knowledge vacuum before this study's implications and empirical findings. Accordingly, this study emphasizes the complexity of the fundamental processes and alterations to how the normal respiratory muscle functions in conjunction with optimizations. Therefore, ergogenic support from inspiratory muscle training is acceptable for club-level football players. With well-planned training duration and intensity, the cardiorespiratory function of college football players would be enhanced, and their fasting plasma glucose would not rise. This study revealed that training employees is necessary to improve their chances of success in a superior game. Consequently, the study's empirical findings can be used to advance the practices of the participants in order to improve their game performance.

Future Directions

This study is unquestionably novel due to its research concept and significant implications for theory and practice. However, the prospective directions of this research are also essential for critically expanding the body of knowledge. The research has a limitation in that it collected data from only student-athletes from various universities. In this manner, the results of this study cannot be generalized. However, future research must be conducted on a distinct data set to contribute more meaningful findings to the body of knowledge. Accordingly, this study has only considered direct relationships, but it is conceivable that moderators and mediators may influence these relationships. Future studies must therefore identify potential mediators and moderators to advance the findings of this study.

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