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Effect of Training Method and Hemoglobin Level on Cardiovascular Endurance of Siliwangi University Football Players

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Abstract

The purpose of this study was to analyze the influence of exercise methods, namely HIIT 10 minutes cardio workout and HIIT walk and run, on the cardiovascular endurance ability of football players, to analyze the effect of normal high and normal low hemoglobin levels on capacity cardiovascular endurance of football players, and to analyze the interaction of HIIT 10 minutes cardio workout and HIIT walk and run exercise methods and hemoglobin levels to cardiovascular endurance ability in unsil football players in 2022. This study used an experimental method with a 2x2 factorial design, a data analysis technique using Analysis Of Variance (ANOVA) at the signification level (α: 0.05). Results of this study: This is a HIIT 10 minutes cardio workout exercise method with an average VO2Max increase of 1.44, while the HIIT walk and run exercise method have an average of 1.35. Until United football SME players In 2022 who have high normal hemoglobin will have an average increase in cardiovascular endurance ability greater than players with low normal hemoglobin. Still, the results of cardiovascular endurance ability in unsil united football SMEs in 2022 showed no interaction because players with low hemoglobin levels get good VO2Max results. Of course, with high hemoglobin, there are also fewer VO2Max results because both methods of HIIT 10 minutes cardio workout and HIIT, walk and run an exercise with the same intensity and administration, so there is no interaction.

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INTRODUCTION

Coaching also has an essential role in sports; sports are a form of quality improvement for those who do physical activity to fill their spare time. The most important goal to achieve the feat is to win the match; then, it is necessary to do training. The pandemic prompted changes in various sectors of economic life, work, and education; before the pandemic, there were many matches from children to college as achievement sports. (Rinekso, 2019) High achievements can only be achieved with systematically planned exercises (Sudaryoto et al., 2017). A quality exercise process and good planning will help develop its best potential.

Siliwangi University has a variety of SMEs to develop student talents according to the potential they want to pursue. There are so many containers or SMEs, one of which is football. Football is one of those games that demands teamwork (Tarju & Wahidi, 2017). Until United makes a talent in football and often supplies its players to needy clubs. During the Covid-19 pandemic, *regeneration* must exist because Unsil United as a forum is in the scope of *academics.* Various physical conditions not by the football game cause the ability not to increase, especially in cardiovascular physical conditions. A game certainly has rules, and football has rules of the game. In a football match, the time played is 2 x 45 minutes, coupled with a rest time of 15 minutes. If the score is tied, it is carried out in a time change of 2 x 15 minutes (Witono, 2017). Football players must play for regular time for 90 minutes, and to support these components requires physical condition, one of which is *cardiovascular.*

Physical condition in football games requires optimal training; *cardiovascular* endurance is the ability of the lungs to suck as much oxygen as possible and supply it throughout the body. Cardiovascular endurance is the ability of the circulatory, respiratory, and digestive systems of the lungs and blood vessels to metabolize oxygen and oxygen in sufficient quantities in cells to meet the demands of constant physical activity. The goal is that *cardiovascular* endurance provides efficiency in bringing okesigen into the lungs and providing blood flow throughout the body. According to (Alex et al., 2012), "Cardiovascular endurance is the ability of the respiration and circulatory systems to provide oxygen for muscle work during rhythmic and continuous activity involving large muscle groups. There are a lot of complex movements, as well as playing 90 minutes in one game. (Samodra et al., 2022) Exercises performed at high intensity tend to influence the increase in VO2 max. Aerobic capacity of a person according to the (Kurnia & Kushartanti, 2013) course, some factors influence the magnitude of VO2Max capacity as follows: 1) Lung Function, 2) Heart Function, 3) Red blood cells, 4) body composition, 5) hemoglobin levels. Physical ability is an internal factor affecting a player's training performance and matches movement skills.

The factor determining the maximum oxygen consumption is that the *cardiovascular*

system runs well so that the oxygen that is sucked in is then delivered to all parts of the body. The process of delivering oxygen to body tissues by blood cells must be expected; that is, the functioning of the heart must be expected, and the hemoglobin concentration must be expected, as well as blood vessels. Hemoglobin is a substance that plays a vital role in exercise because it transports oxygen from the lungs to the muscles that are working. Each heme unit contains iron that contracts with oxygen molecules to become oxyhemoglobin (HbO2). Red blood cells with an oxygen-carrying function are essential for physical activity or work (Prommer et al., 2018). Athletes often do physical activity, so cardiovascular endurance is needed not to cause significant fatigue. Oxygen availability in the blood is critical during *cardiovascular* endurance physical activity because physical activity lasts long. The tarsus is continuously in line with the characteristics of physical endurance activity, which requires much oxygen (Kusnadi et al., 2021). Everyone's hemoglobin level is different, a person's hemoglobin cannot be determined by activity alone, but there are many other factors, such as disease, food, age, gender, and bad habits (Rona, 2020)

It can be concluded from the results above that an athlete often does physical activity, so *cardiovascular endurance is* needed not to cause significant fatigue. (Surbekti, 2018). Hemoglobin is a complex chemical found in red blood cells, which makes it an essential role in exercise, as it transports oxygen from the lungs to the working muscles. Oxygen in the blood and muscles is vital, so it gives good results or performance and achievements for football players and helps during the training process.

The training process (Harsono, 2017) argues, "Exercise is a systematic process of practicing/working, which is carried out repeatedly with the increasing number of training loads or work ."Meanwhile, according to (Mylsdayu & Kurniawan, 2015), exercise is a process of change for the better, namely to improve the physical quality, functional abilities of the body, and the quality of children's physical skills. The main goal is to improve the factors that support physical performance, such as physical fitness, speed, endurance, strength, agility, flexibility, and technical ability in sports. The definition of exercise is an activity that uses methods to improve skills carried out systematically, practicing and repeating the number of training loads to be achieved. Therefore, the primary purpose of athletes doing exercises is to reach the peak of their achievements, so there needs to be excellent and correct coaching based on the concepts and principles of training. (Silalahi & Permono, 2021) A coach must master the basic principles of training, which will be used as a reference in the training process; the coach must be able to master all aspects, namely material or theory or direct practice in the field, and must be able to apply the knowledge mastered thoroughly to achieve optimal football achievements. Therefore, in the preparation of exercises, a trainer must pay attention to the principles of exercise, namely: 1) The principle of *overload*,

2) the Principle of Specialization, 3) the Individual Principle, 4) the Principle of Exercise Variation, 5) Active Pyrnsip 6) Perinsip Pulih Origin.

The sport of football has many components of physical condition that are necessary due to its dynamic and complex grinding. Suppose football athletes have an excellent physical condition component so that the game also becomes good and confident in the game. The exercise program should use the following components of physical exercise: 1) Intensity is the level of effort or effort expended by a person during physical exercise. 2) Duration is the length or duration of performing the exercise. 3) Frequency is the number of physical exercise sessions per week. 4) Cara (mode) is a type of exercise that is carried out (Budiwanto, 2012). Good physical condition is needed by an athlete in all sports, one of which is football, because in football games, the physical condition component is much movement in a complex football game, and almost all limbs move; if the football game has an excellent physical condition component, it will undoubtedly be easy to master movement techniques in the game and be ready to face Match. The physical conditions are strength, reaction, muscle power, speed, flexibility, agility, balance, coordination, accuracy, and endurance. (Primary et al., 2015)

The training method is a way for a coach to carry out so that the exercise goes well. There are so many exercise methods to develop *cardiovascular* endurance to become optimal. Obtaining *aerobic* fitness should do physical exercise aerobically, with a frequency of three to five meetings per week, an intensity of 60% to 90% HR, with a duration of the exercise of 15 to 60 minutes. (Faiz, Mohammad Budi & Sugiharto, 2015) "For sportsmen who prioritize endurance, occasionally training should be at a training intensity of 85-90% DNM". The calculation of HR or cardiac arrest in its classification determines that physical exercise is essential, especially in *cardiovascular* endurance training. (Ardianto et al., 2015) Increased cardiac output will increase the heart rate frequency and pulse rate. It is recommended that at least 130 to 160 permit cardiovascular endurance training. Hence, blood flow becomes smooth and accelerates the removal of metabolic waste substances so that the recovery of belagsung quickly and not experiencing fatigue after carrying out tasks can still do other activities. (Palar et al., 2015) There are many forms of cardiovascular endurance training in sports, but the discussion raised by the researcher this time, the training model is HIIT, using the HIIT *10 minutes cardio* and HIIT *walk and run* applications.

Interval training is an exercise system interspersed with intervals with rest periods (Julianto, 2016). High-*Intensity Interval Training* (HIIT) training model is a form of *cardiovascular* endurance training with many forms of high-intensity movement (Brad A. Roy, 2013). High, high-intensity exercise spurs more challenging heart work to increase oxygen consistency and body metabolism. (Herlan & Komarudin, 2020) High-intensity exercise affects vo2max increase.

(Belegišanin, 2017). This exercise aims to develop *cardiovascular* endurance or oxygen capacity in the lungs. VO2Max describes the level of effectiveness of the body in getting oxygen and then providing it throughout the body (Dahlan & Alimuddin, 2019).

This time the exercise model uses the *HIIT 10 minutes cardio application.* In this century, there are many developments in applications for the world of sports and health, so activities in training and sports are greatly helped by the applications that have emerged today; the application used is *HIIT 10 minutes cardio* because it is to increase *cardiovascular* endurance or oxygen capacity in the lungs. *High-intensity interval* training is an exercise concept that uses a combination of high-intensity training interspersed with medium to low-intensity exercises (Ambarsarie et al., 2016). HIIT is an efficient way of exercising for body fat and aiding weight loss by increasing insulin sensitivity and improving VO2 max and muscle fitness (Klika & Jordan, 2013). A *HIIT 10 minutes cardio Workout* application has ten movements, namely: 1) *butt kicker,* 2) *Drop squat,* 3) *High knee run,* 4) *Skater* jump, 5) *Box s*quat jump, 6) *Super skater* jump, 7) *Power skip* 8) *Step up* jump 9) *long jump* backward 10) *Split Jump.*

Doing HIIT exercises using the *HIIT 10 minutes cardio Workout* application created by *Hicaltech87* is very easy; in this application, there are ten movements, each movement to be 1 minute long with each 30-second rest movement session, and doing this exercise does not require a vast space. Performing exercises performed each repetitive movement interspersed with a short recovery period; the athlete must spend about 15 minutes for an optimal stimulus.

HIIT walk and run training to increase endurance with an interval system is the presence of low intensity (*walk*) and high intensity (*run*). Walk and run training can reduce the feeling of saturation during training because training can be done anywhere, both open and closed, besides that walk and run training with walking and running increases reaction speed because after hitting the running whistle, then returning to walking after pressing the whistle again, and *walk and run* training can burn calories in the body because the form of exercise uses high intensity. Walk and run exercises to increase endurance with interval systems, namely with the presence of low-intensity (*walk*) and high-intensity (*run*).

An activity carried out must provide benefits, as well as a *walk and run activity.* 1) Burn more fat; this exercise trains our muscles to contract strongly and quickly, or it can be called *an explosive exercise of power. 2) Walking and run*ning training can also increase Vo2max, such as in football, basketball, volleyball, badminton, etc. By having a high vo2max value, athletes can work for a long time without experiencing significant fatigue. The 20-minute *walk and run* implementation, in its implementation will use the interval ratio between high-intensity and low-intensity times, including 1:2, 1:1, and 1:1/2. For more details, the author explains the ratio of the implementation of *the walk and run* exercises as follows; The first

ratio is 1:2 because if we do a high-intensity activity (*run*) for 10 seconds, then the low-intensity time (walk) is 20 seconds. At this first ratio is set a time of 6 minutes.

The second ratio is 1:1, carried out for 7 minutes with details, the time to do high-intensity activities (*run*) for 10 seconds, and the time to do low-intensity (walk) for 10 seconds. The last ratio is 1:1/2, with the time of doing low-intensity (*walk*ing) half the time of doing high-intensity (*run*ning). The breakdown of the time of doing a low-intensity (*walk*) is done for 5 seconds, and the time of doing a high-intensity (run) is done for 10 seconds. At this ratio is carried out for 8 minutes.

Based on the above exposure, the exercise is divided into three training sessions, and if the number of the three is, then the exercise is done for 20 minutes. Based on the results of observations and observations made by researchers in the Student Activity Unit (UKM) at the time of the new exercise being carried out again on the campus after the PPKM level decreased, various problems may cause the achievement of the Student Activity Unit (UKM) to decrease. It is sure that every year, there is a *regeneration* of players and administrators, so the author continues his observations at the time of forming a new *squad* and conducting trials; before conducting trials, the training program carried out by UNSIL United is only a maintenance of techniques because they have just returned to training, with the following program:

Day	Jenis Latihan
Monday	- *Passing X* - *Passing Diagonal* - *Passing Y Pattern* - *Dynamic Defending* (1x1, 1x2, 2x2, 2x3, 3x4, 4x5, 4x6,) - Evaluasi
Tuesday	- *Juggling (Warming Up)* - *Passing 1 bola 3 Orang* - *Passing the First touch* - *Rondo* - *Finishing* - *(pasing backpass Shooting)* *(Pasing crossing shooting)*
Wednesday	- *Rondo* - *Passing control* *(Passing backpas move)* - *Small side games (SSG 6vs6)*
Thursday	- *The main game is regular 11 Vs. 11* - *Finishing*

Due to the above explanation, they only practiced technical maintenance in the training program because they had just returned to training. Coincidentally, the UNSIL United Football Association held trials with a team from Sindangkerta, Tasikmalaya.

As a result of the Covid-19 pandemic, in the world of academics, students automatically

keep changing according to the academic calendar. After observing the trial match in Sindangkerta, the average player endurance during the match was only strong, with a time of 43 minutes in the first match, while the second match averaged 41 minutes out of a total playing time of 2 x 35 minutes in one match. In just conducting trial matches which use only 70 minutes once a game, many players are not strong in cardiovascular endurance, especially with the average duration of the game, which is 2 x 45; they can only play well in one round. Until United, at the time of the match, also obtained a total of 197 accurate passes and 54 passing errors, 9 long passes, and 7 long pass errors from this first match, as well as the second match, namely; a total of 198 accurate passing and 36 passing errors, 13 long passes, and 7 long pass errors prove that when cardiovascular endurance is good, it can provide exemplary performance in soccer.

The results of the explanation above clearly show that Unsil United players need physical conditioning. There needs to be a better physique. Therefore, after the trial results, the researcher gave several questions to the first coach, Haikal Millah M.Pd., and the second coach Raden Rizal Shufi S.Pd. Both of them said, "Because of the pandemic, the physical condition of athletes is not trained because campuses carry out online learning makes physical conditions low and needs improvement, especially cardiovascular; this is an essential component in football games; it can be concluded that the overall physical condition is low and needs improvement, especially cardiovascular. So it needs to be studied.

The study's aims were 1) to analyze the differences in the effect of training methods using the HIIT 10 minutes cardio workout application and HIIT walk and run on the increase in cardiovascular endurance of UKM Unsil United soccer players. 2) Analyzing the difference in the effect of average high and low normal hemoglobin levels on increasing cardiovascular endurance in UKM Unsil United football players 3) Analyzing the interaction of training methods (HIIT 10 minutes cardio workout and HIIT walk and run applications) and hemoglobin levels on increasing endurance cardiovascular disease Unsil United football player.

METHODS

This experimental research seeks the influence of independent and dependent variables with a 2x2 factorial. The way to get the data in this study is to use the 2-way ANOVA method with a 2x2 block factorial design, using the initial test (pre-test) and the final test (post-test), which are then analyzed using two-way Annava statistics (Two Way Anova) SPSS version 22. The treatment in this study, namely the treatment with the HIIT application training method 10 minutes cardio workout and a HIIT walk and run. The level of each treatment in this study was the average high hemoglobin level and the usual low level of the players. The factorial experiment in this study paid attention to the possibility of an interaction between the three variables, namely training methods, hemoglobin levels, and

cardiovascular endurance abilities of soccer players.

Table.1. Research Design Framework

Hemoglobin levels (A)	Training Method	
	HIIT 10 Minutes Cardio Workout App (B_1)	*HIIT Walk and run* (B_2)
Normal high (A_1)	A_1B_1	A_1B_2
Normal low (A_2)	A_2B_1	A_2B_2

The table above states that this research will be given treatment in training through two groups of training methods using the HIIT 10 Minutes Cardio Workout Application and HIIT Walk and Run, which will be interacted with hemoglobin levels on cardiovascular endurance in Unsil United soccer UKM Aged 18-22 in 2022 The implementation of this research was carried out at Siliwangi University, Tasikmalaya. This treatment lasts 4 weeks with a frequency of exercise 3 times a week, namely Monday, Tuesday, and Wednesday from 06.00 to 08.00 WIB.

The population in this study were 28 members of the Unsil United Soccer UKM, Siliwangi University Tasikmalaya. The sample used in this study was a purposive random sampling technique consisting of 24 male athletes. The needs needed in this study, namely with the consideration that the researcher has sample provisions by providing inclusion and exclusion criteria, including 1 student who is registered at Unsil United football club Siliwangi University and is still active in routine training activities, 2 students aged 18-22 3 Present when measuring hemoglobin levels and willing to be measured 4 Men's football players 5 Healthy condition Exclusion criteria 1 Student with chronic blood diseases such as thalassemia, sickle cell anemia, and others. 2 Students who have bad habits, such as smoking 3 Students who consume iron supplements and blood boosters The entire population of 28 people will carry out a hemoglobin level test which aims to determine high normal hemoglobin levels and low normal hemoglobin levels based on ranking calculations. Athletes who have too low and too high hemoglobin with a rule of 13-17 grams.

Table.2. Classification of Hemoglobin Levels

Total	Classification	Information
12	High Normal Hemoglobin Level	worn
12	Low Normal Hemoglobin Levels	worn

The independent variables in this study are the training model using the HIIT 10 Minutes Cardio Workout application and the HIIT Walk and Run training model. Attribute independent variables (which are controlled), namely high normal hemoglobin levels and low normal hemoglobin levels. The dependent variable in this study is the result of cardiovascular endurance. Data collection techniques are performed with tests and measurements to obtain objective data.

This research instrument includes steps to measure the research variables. To measure hemoglobin levels, use the Easy Touch tool assisted by UKM KSR to measure the cardiovascular endurance of football players with a beep test (Fukuda, 2020). The data analysis technique used was the analysis of variance (ANOVA) 2x2 factorial design at a (significance level) = 0.05. If the obtained F value (Fo) is significant, the analysis is continued with the Hewmankeuls range test (Sudjana, 2002). To fulfill the assumptions in the Anava technique, a normality test (Kolmogrov-Smirnov test) and the Homogeneity of Variance test (with Leavene's test) were carried out. Test the hypothesis using the General Linear Model (GLM) - Two Way Anova analysis test with the help of the SPSS 22 program. The hypothesis is accepted if the Manova test value is significantly less than α (sig < 0.05). Meanwhile, the hypothesis is rejected if the calculated significance value is more significant than α (sig > 0.05).

FINDINGS AND DISCUSSION

Findings

There is a significant difference in the effect of the HIIT 10 minutes cardio workout and HIIT walk-and-run training methods on the cardiovascular endurance abilities of United soccer players in 2022. There are differences in the cardiovascular endurance of soccer players between the two respondents who have high and low normal hemoglobin levels.

There is no interaction between training methods (HIIT 10 minutes cardio workout and HIIT walk and run) and hemoglobin levels on the cardiovascular endurance abilities of unsil united soccer players in 2022.

Table.3. Hypothesis test using the General Linear Model

Tests of Between-Subjects Effects
Dependent Variable: Kemampuan Daya Tahan *Cardiovascular*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	135.458[a]	3	45.153	8.247	.001
Intercept	4676.042	1	4676.042	854.072	.000
Hemoglobin	70.042	1	70.042	12.793	.002
Metode	63.375	1	63.375	11.575	.003

Hemoglobin * Metode	2.042	1	2.042	.373	.548
Error	109.500	20	5.475		
Total	4921.000	24			
Corrected Total	244.958	23			

a. R Squared = .553 (Adjusted R Squared = .486)

Through SPSS statistical calculations, the first hypothesis can be described that the results of calculations on the exercise variable from the table data above obtained a sig value of 0.001 <0.05; this indicates that there is a difference in cardiovascular endurance between experimental group 1 and experimental group 2 after being given adequate training. Different, so Ho is accepted. From this, there is a significant difference in the effect of the HIIT 10 Minutes cardio Workout training method and the HIIT Walk and Run exercise on the Cardiovascular Endurance Ability of Unsil United Soccer UKM players in 2022.

The second hypothesis can be explained by the hypothesis used in this study: Ho: There is a difference in cardiovascular endurance in Unsil United soccer players in 2022 who have high and low normal hemoglobin levels. Ha: There is no difference in cardiovascular endurance in UKM players until united football in 2022, who have average high and low hemoglobin levels. The hemoglobin level variable obtained Sig = 0.002 <0.05; this indicates a difference in the cardiovascular endurance of football players between the two respondents who have high and low normal hemoglobin levels, so Ho is accepted.

The third hypothesis is from the table data above, that the results of the research from the data analysis that has been carried out can be seen that in the exercise variable (HIIT 10 minutes cardio workout and HIIT walk and run) and hemoglobin levels obtained Sig = 0.548 > 0.05, this indicates that the result Ha. There is no interaction between training methods (HIIT 10 minutes cardio workout and HIIT walk and run) and hemoglobin levels on the cardiovascular endurance ability of unsil united soccer players in 2022.

Discussion

Based on the analysis conducted on the pre-test and post-test on cardiovascular endurance in football. Following is a description of the data, hypothesis testing analysis requirements test, and discussion of the results of research on the effect of the training method (HIIT 10 minutes cardio workout and HIIT walk and run) and hemoglobin levels on the cardiovascular endurance ability of until united soccer UKM players in 2022. The research sample is divided into groups with average high and low

normal hemoglobin levels. Both groups with average high and low normal hemoglobin levels will be given cardiovascular endurance training methods. The high-speed group was divided into two groups, the tall group 1 would do a HIIT 10 minutes cardio workout, and the 2nd group would do a walk and run HIIT exercise. Likewise, the group with low normal hemoglobin levels 1 will do a HIIT 10-minute cardio workout, and the low group 2 will do a HIIT walk and run exercise).

Furthermore, this exercise was carried out for 16 meetings so that the HIIT 10 minutes cardio workout was found to be better for increasing cardiovascular endurance in football than the HIIT walk and run the exercise, this can be seen in Appendix 7 and can be felt by players where the 10 minutes HIIT exercises This cardio workout is an exercise with 10 forms of exercise which aims at cardiovascular but also explosive where it is demanded to maintain body balance when doing jumping movements, and this exercise also does not need to have an extensive training area according to the exercise treatment mechanism. The HIIT training method keeps the body guessing about metabolism as it adapts to be designed to conserve energy. Conversely, HIIT causes heart rate and energy output to fluctuate throughout training.

Hypothesis 1 The increase in both HIIT training methods has a significant effect on low normal hemoglobin levels, with a difference in increase up to HIIT walk and run = 1.41 and HIIT 10 minutes cardio workout = 1.71 with the difference between the two is 0. 30 The increase in VO2Max is according to Appendix 7. Excellence occurs in this training method in the HIIT 10 Minutes cardio workout method because, in its metabolism, this exercise has a very immediate impact; Williams & Kraemer (2015). HIIT is effective in improving musculoskeletal, metabolism, and cardiorespiratory. Both exercises increased cardiovascular endurance; Fcount proved the results of the ANOVA test: 11,575 with a significance value of 0.003. Exercise using the HIIT walk and run method is smaller than the HIIT 10 minutes cardio workout in increasing the cardiovascular endurance of soccer players. The HIIT walk and run training method has an average increase in the difference of 1.35 VO2 max. In comparison, the HIIT 10 minutes cardio workout method has an average increase in the difference of 1.44 VO2Max, increasing cardiovascular endurance in Unsil United UKM football players in 2022.

Both HIIT training methods have the same focus on cardiovascular endurance. The HIIT 10 minutes cardio workout performs with 10 different movement models, with one movement taking 1 minute and 30 seconds of rest, while the HIIT walk and run exercises with 3 different ratios, namely, the first 2:1 with 20 seconds of walking and 10 seconds of running, doing 6 minutes. Second 1:1 with 10

seconds of walking and 10 seconds of running, do for 7 minutes, and third 1:1/2 with 5 seconds of walking and 10 seconds of running, do 8 minutes of movement with running and rest walking. Wen et al. (2019) stated that HIIT effectively increases VO2Max in healthy, overweight/obese adults and athletes. From this description, HIIT is an exercise consisting of several short or medium-duration and high-intensity cycles. Each cycle is interspersed with rest periods in the form of light-intensity exercises. Of course, HIIT is undoubtedly high intensity, namely 80-90% of the maximum heart rate to enter the training zone, and the rest zone is around 50-60%. Therefore, by doing this, the player's VO2Max level increases and allows long-duration activities.

Researchers have the assumption that cardiovascular endurance is essential in any sport, including football because having good cardiovascular will help you play soccer for a long time and do exercises with good repetition without experiencing fatigue. Have good cardiovascular endurance to minimize mistakes in playing soccer and make good movements so that it can be watched more interestingly. Cardiovascular endurance is the ability of the circulatory, respiratory, digestive, lung, and blood vessel systems to metabolize oxygen and oxygen in sufficient quantities in cells to meet the demands of constant physical activity. Asmutiar, (2015:133). The benefits experienced after doing the HIIT training method also have a good impact on the cardiovascular endurance of unsil united soccer players.

Hypothesis 2 Hemoglobin is a protein that contains iron that binds oxygen in red blood cells (Pearce, 2013). The role of hemoglobin largely determines how good or not the ability to perform activities that require VO2Max, which requires endurance, such as football. The action of HIIT training provides the pumping contractions of the heart to circulate throughout the body, pushing oxygen-carrying blood. HIIT training provides efficiency by training the heart to work faster to pump more per beat. It increases blood volume in which blood delivers oxygen from the lungs and nutrients from the digestive system to facilitate energy, as well as increased functions such as delivering oxygen and nutrients to muscle tissue and removing waste such as carbon dioxide around the muscles.

During the treatment process in the field, players with normal high and normal hemoglobin levels are given training with the HIIT 10 minutes cardio workout method, and the HIIT walk and run training method give the results as seen from this study. The conclusion that there is a difference in the effect of average high and low normal hemoglobin levels on the cardiovascular endurance of soccer players is proven by the results of the ANOVA test with Fcount: 12.793 with a significance value of 0.002 with

a significance level of 0.002 <0.05. After doing the HIIT training for the unsil united football UKM players, all players experienced an increase in hemoglobin levels to provide the function of binding oxygen and nutrients. However, in increasing hemoglobin levels, some players have normal high hemoglobin levels, but increasing their VO2 max does not experience a significant increase. Because there are factors that influence this, such as; the geographical location of living things that live at high altitudes are more likely to increase red blood cells due to warming the body. Food nutrition that contains (Fe) or iron so that red blood cells increase, as well as health which affects good condition (Nidianti et al., 2019).

The third hypothesis states that the research results from the data analysis that has been carried out can be seen that in the exercise variable (HIIT 10 minutes cardio workout and HIIT walk and run) and hemoglobin levels obtained Sig = 0.548 > 0.05, this indicates that the result is Ha. There is no interaction between training methods (HIIT 10 minutes cardio workout and HIIT walk and run) and hemoglobin levels on the cardiovascular endurance ability of unsil united soccer players in 2022. Because both methods use the same effect on increasing the cardiovascular endurance of United soccer players. The difference did occur in the results obtained by the group of players using the HIIT 10-minute cardio workout method. The average VO2 max exercise result for high normal hemoglobin levels was 1.17, and at low normal hemoglobin levels, the average was 1.71, so the difference is 0.54. Whereas the player group using the walk-and-run HIIT method with high normal hemoglobin levels, the average exercise result was 1.28. The average exercise result for those with low normal hemoglobin levels was 1.41, so the difference was 0.13.

Based on the description above, the group with the HIIT 10 minutes cardio workout training method has an average difference with an increase in VO2 max of 0.54. In contrast, the HIIT walk and run group has an average increase of 0.13, so the HIIT 10 Minutes cardio workout group significantly increases VO2Max. His. However, in the discussion of interactions with hemoglobin levels, the average hemoglobin with a low normal level which is very significant in increasing VO2Max, is inversely proportional to the high average hemoglobin level, which is not so significant in increasing VO2Max.

The exercises were carried out in 16 meetings, so the discussion was about the interaction between hemoglobin levels on increasing physical cardiovascular endurance, which affected playing football. Because someone has a good VO2Max is an individual's ability to take in oxygen to maximize current, Barus, (2020). hemoglobin will slightly increase. High hemoglobin is inversely proportional to cardiovascular

results because an increase in hemoglobin has several factors that affect the level of hemoglobin and red blood cells (erythrocytes) in a person, namely food, age, gender, activity, and smoking. After all, it can reduce alveoli work to reduce oxygen absorption (Hasyim & Sulaeman, 2021) and accompanying diseases such as leukemia, thalassemia, and tuberculosis (Rona, 2020), so the results of the data show that there is no significant interaction between training methods (HIIT 10 Minutes cardio workout and HIIT walk and run) and hemoglobin levels on cardiovascular endurance of unsil united soccer players in 2022.

CONCLUSION

The conclusion from the results of the research conducted shows differences in the effect of training methods on the cardiovascular endurance of Unsil United soccer players in 2022. The HIIT 10 minutes cardio workout training method has better cardiovascular results than the HIIT walk and run. There is a difference in the effect of high and low normal hemoglobin levels on football UKM players in 2022. Players with normal high hemoglobin levels have an average increase in cardiovascular endurance ability better than players with low normal hemoglobin levels, but the difference is not too big. Significant. There was no significant interaction between training methods and hemoglobin levels on cardiovascular endurance in Unsil United soccer players in 2022. The results of the two training methods impacted increasing hemoglobin. There is an increase in hemoglobin that significantly increases cardiovascular results, and there is also something that is not very significant but has a high impact. However, an average low hemoglobin level also gives good cardiovascular results.

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