

THE EFFECT OF USING HIGH INTENSITY EXERCISES (HIIT) IN THE LACTIC ACID INDEX IN THE BLOOD AND THE DEVELOPMENT OF SPEED ENDURANCE IN SOCCER REFEREES

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Abstract

The study aims to determine the extent to which the intermittent training programme affects some of the respiratory periodic tolerance indicators of football referees by drawing on the experimental curriculum by designing the two experimental and control equal sets and by applying a proposed 8-week training programme with 3 weekly modules using Cooper 12 minutes field testing to measure maximum oxygen consumption, maximum air speed and heart rate, and the study concluded that there is some positive impact on endurance training. (maximum oxygen consumption, maximum air speed and heart rate) at top-flight football referees.

Keywords: Intermittent Training, Maximum Air Speed, Maximum Oxygen Consumption, Heart Rate, Soccer Referees

Introduction

The training process aims to develop and qualify the level of the athlete through adherence to the basic principles and rules of this science. Among these important rules and principles is the rule of gradation in the training load in a way that is commensurate with the reality of the practice or specialized sport by relying on solid physical rules that simulate the logic of physical activity for competition. There are many methods and methods used in the process of physical preparation for athletes, and they differ according to the nature of the event or competition and the goals set, through which each method or method seeks to reach the best achievement. Through quantitative and qualitative analysis of the requirements of the game of football, Bangsbo (1999) states that the activity of playing football The foot is an intermittent effort, as during a football match players repeat efforts of variable intensity, usually random, interspersed with rest periods. This has influenced the development of training methods and hastened the emergence of intermittent training that is consistent with the characteristics of this sport and which, according to research (Dellal 2007), can Developing the aerial aspects in a qualitative manner that takes into account the kinetic nature of football (Mansouri 2019). Intermittent training is a physical effort that combines a period of work followed by a period of rest that may be active or inactive and takes place in a specific unit of time (Dellal, 2017). Therefore, intermittent training allows the athlete to work for a longer period, and also improves aerobic capacity, especially aerobic capacity, and is most consistent with activity. Football and the most regular during the training season (Buckley, 2015)

(Vigne, 2011, p19) states that the game of football consists of alternating periods of play and rest during the match, and that more than half of the periods of play are of an average duration of 15 seconds, and the average duration of rest is also 15 seconds, and thus the alternation between play and rest is (15-15 seconds). This represents 30% of the sequence of play in the match. There is also an alternation (15-7 seconds), which represents 25% of the sequence of play in the match. These timings give a clear picture of the nature of the speed and rhythm of play and what the referee is required to keep up with this level and rhythm, and that these remain. The timings can be used during training, although these timings, according to the source, reflect the lowest level of current efforts achieved by the players, as many specialists have shown, such as (Buchheit, 2008, Mohr, 2003, Dellalm, 2010, Orendurff, 2010, Rampinini, 2009, Salvo, 2010). In their analysis, there is a different division for high-intensity movements with a decrease in effort and recovery time for experienced athletes, while Orendurff (2010) adds: The effort ratios are as follows:

- 43% of the efforts are in a period of less than (6 seconds) and 23% of the efforts are in a period between (6-9 seconds) and
- 13% of efforts are between (9-12 seconds) and 9% of efforts are between (12-15 seconds)
- As for returns:
- 53% of the efforts are in a period of less than (6 seconds) and 22% of the efforts are in a duration between (6-9 seconds)
- 9% of efforts are between (9-12 seconds) and 5% of efforts are between (12-15 seconds)
- This represents 90% of the effort and recovery periods (Orendurff et al, 2010), quoted in (Sadouki Bilal, 2020, pp. 26-27)

According to (Tamrabet 2021), this analysis led specialists to reconsider training curricula and methods and adapt them to the real physical requirements resulting from the physical analysis of sports competition, which accelerated the emergence of modern training methods and methods, including high-intensity intermittent training, which is appropriate to the nature of the effort expended. During the match, it is an alternating training between periods of rest and work, with high intensity. When we analyze the physical activity of a football referee, we find that it is an intermittent activity that is also characterized by repetitive explosive efforts of different intensities. These efforts range from repeatedly running for different distances and at maximum to near-maximum speeds that may reach from 30 to 80 meters, so that the referee is in a suitable place that qualifies him or allows him to take action. The appropriate decision is usually between these repeated efforts of fast running, accelerating and slowing down, for long or short acceleration according to the circumstances of the match. As the large distance that the referee travels during the match, "the referee may run between (8-16) kilometers during the match" (FIFA, 2000), and this large and intermittent distance requires special abilities that qualify him to keep up with the match while maintaining a state of physical, mental and physiological balance and other requirements that he takes her role in preparing the referee throughout the duration of the match, which may extend (90-120) minutes. Therefore, the process of preparing the referee is something that cannot be underestimated, because the great effort he exerts, whether during the match or during the

preparation and performance of tests, which are also tests that require high physiological adaptations and may cause the occurrence of some functional problems for the body's systems. In light of what was discussed, through this study we wanted to identify the extent of the impact of training

,intermittent on some indicators of respiratory cyclic endurance (maximum aerobic velocity VMA,

VO2max (maximum oxygen consumption, heart rate) in football referees. After searching

During the investigation, we posed the following question:

What is the effect of an intermittent training program on some indicators of respiratory cyclic endurance?

(maximum oxygen consumption, maximum aerobic speed, heart rate)

Do you have football referees?

Therefore, the researchers believe that intermittent training simulates the requirements of the referee and the development of his basic abilities (physical and functional), in addition to that intermittent training does not require a lot of time during the course of the training unit, and it is also very similar to the method of the referee's performance and movements on the field of play, in addition to matching his procedures and movements with the content of the tests. The physical fitness required and updated by the FIFA Referees Committees. Therefore, this type of training aroused our interest and prompted us to conduct a study and demonstrate the extent of the effect of the proposed program of interval training on some indicators of respiratory cyclic endurance (maximum oxygen consumption, maximum aerobic speed, and respiratory rate.(For heartbeat) among football referees.The problem of the study is that some Iraqi football referees suffer from a lack of physical fitness, which does not qualify them to lead the match. This fact is one of the many reasons why football refereeing has not developed. Some referees also find it difficult to pass the physical fitness test, which many of them failed in 2020-2021 and several times.

Method and tools

Sample and selection

Choosing a sample is one of the important steps and stages of the research, as the researcher must pay attention to it, as the sample "is the part that represents the original population or the model on which the researcher conducts the entirety and focus of his work" (WagihMahjoub, 2002) A sample of first-class football referees in Baghdad Governorate was relied upon, amounting to (26) referees out of (63) referees. They were distributed randomly and by lottery into two control and experimental groups, each group consisting of (10) referees, and intermittent training (HIIT) was applied. on the experimental group, while the control group was trained on the training curriculum followed by the referees' committee. (4) referees were excluded for applying the exploratory experiment and two others due to their lack of commitment and discipline to the training. The research sample constituted a percentage of (41.269%) from the original research community, as Wajih mentions. Mahjoub, 2002) that the sample "is the part that represents the original population or the model on which the researcher conducts the entirety and focus of his work.

Search procedures

Method: The researcher used the experimental method with the design of two equal control and experimental groups because it suits the nature of the research, and it is one of the methods through which accurate results can be reached, “as experimentation is one of the most efficient means of arriving at reliable knowledge” (Wajeeh, (1993)) (p. 327)

Identifying variables and how to measure them

The independent variable: This means the experimental factor who wants to measure its effect on the dependent variable (Dwidari, 2000). The independent variable in our research is the proposed program of intermittent training.

The dependent variable: It is the phenomenon that exists, disappears, or changes when the researcher applies the independent variable (Al-Shafi'i, 2009). The dependent variable in our study represents some indicators of respiratory cyclic endurance (maximum oxygen consumption, maximum airway speed, and heart rate)

Tools and Research

The necessary means were used and were prepared, arranged, and organized to be used in the research “sufficiently, accurately, with the least effort, and in the shortest time” (Hassanin, 1995, p. 213.)

Cooper test 12 minutes



Cooper test 12 minutes

Then calculate the maximum oxygen consumption from the following equation:

Heart rate and training intensity measurement device (POLAR H10)

(Football field, track and field, 24 training markers, medical scale with a ruler to measure height and weight, Italian-made Peas Personae type, a 50-metre-long metal measuring tape, Japanese-made EstonEston type - training shirts, flags and whistles (2-2)) An electronic watch to measure time, 4 Japanese Casio type, 4 manual Bluetooth watches to measure the pulse, Japanese made - pens - a Bluetooth device to measure distance traveled in steps, a device to measure heart rate and training intensity POLAR H10, a manual electronic calculator type ENKO, an electronic calculator device (LAP-TOP). (1 HP type, work team)

Table (1) shows the statistical description of the research variables in the pre-tests for the control and experimental groups.

Standard error	standard deviation	Arithmetic mean	Sample volume	Totals	the exams
108.83218	344.15759	2205.0000	10	Experimental group	Test: 12-minute continuous run
182.78372	578.01288	2089.0000	10	Control group	
2.42734	7.67593	38.0280	10	Experimental group	Vo2 max
4.08640	12.92232	35.4090	10	Control group	
.69321	2.19213	10.8490	10	Experimental group	VMA
1.16628	3.68810	10.1000	10	Control group	
1.24231	3.92853	74.9000	10	Experimental group	Pretrial heart rate before the experiment
1.52934	4.83621	76.5000	10	Control group	
.95975	3.03498	69.9000	10	Experimental group	Pre-trial heart rate after the experiment
1.79165	5.66569	73.1000	10	Control group	

Table (2) shows the equality of the two groups (control and experimental) in the research variables for the pre-test

			evene's test		the exams
				Df	T calculated
.592				Sig. (2-tailed)	Degree of freedom
.588				F calculated	
.588				Sig.	
.427	18	.545	.169	2.054	12 minutes continuous running
.133	18	.551	.167	2.079	VO2Max

Table (3) shows the statistical description of the pre- and post-tests for the experimental group on the variables under study

Standard error	standard deviation	Sample volume	arithmetic mean	the exams	
108.83218	344.15759	10	2205.0000	Tribal	12 minutes continuous running
87.49921	276.69679	10	3145.0000	after me	
2.42734	7.67593	10	38.0280	Tribal	VO2max

.99744	3.15417	10	56.7820	after me	VMA
.69321	2.19213	10	10.8490	Tribal	
.28531	.90222	10	16.2180	after me	

Table (4) shows the differences of the means, the standard deviation, the calculated t-value, and the standard error for the variables under study for the experimental group.

Sig	Degree of freedom	t calculated	f) Standard error (e)	standard deviation (A F)	Arithmetic mean (F)	the exams	
.000	9	-6.647	141.42332	447.21981	-940.00000	Before after -me me	minutes 12 continuous running
.000	9	-10.040	1.86786	5.90670	-18.75400	fore Be after -me me	VO2max
.000	9	-10.017	.53597	1.69487	-5.36900	Before after -me me	VMA

From what is shown in Tables (3-4), it is clear that there are significant differences between the results of the pre- and post-tests for the tests of the variables under study and the experimental group, as follows:

The results showed that there were significant differences between the results of the pre- and post-tests for the 12-minute continuous running test. The arithmetic mean for the pre-test was (2205.0000), while the value of the arithmetic mean for the post-test was (3145.0000), while the arithmetic mean for the differences between the two means in the pre- and post-tests was (-940.00000) and the sum of the squares of the differences was (447.21981). Treating these results statistically with a t-test showed that there were significant differences in favor of the post-tests, as the calculated t-value was (-6.647) under a degree of freedom (9) and a probability of error (141.42332) This indicates that the differences were significant and in favor of the post-testAs for the VO2max test, the arithmetic mean for the pre-test was (38.0280), while the value of the arithmetic mean for the post-test was (56.7820), while the arithmetic mean for the differences between the two means in the pre- and post-tests was (-18.75400) and the sum of squares of the differences was (5.90670), and by treating these results statistically with the (t) test, it showed the presence of significant differences and in favor of the post-tests, as the calculated (t) value was (-10.040) under the degree of freedom (9) and the probability of error (1.86786), and this indicates that the differences were Significant between the pre- and post-tests and in favor of the experimental group

As for the VMA test, the arithmetic mean for the pre-test was (10.8490), while the value of the arithmetic mean for the post-test was (16.2180), while the arithmetic mean for the differences between the two means in the pre- and post-tests was (-5.36900) and the sum of the squares of the differences was (1.69487). By treating these results statistically with a t-test, it showed that there were significant differences in favor of the post-tests, as the calculated t-value was (-10.017) under a degree of freedom (9) and a probability of error (.53597). This indicates that the differences were Significant between the pre- and post-tests for the experimental group This indicates that the differences were significant between the pre- and post-tests and in favor of the experimental group. Table (5) shows the statistical description of the pre- and post-tests for the control group regarding the variables under study.

Standard error	standard deviation	Sample volume	Arithmetic mean	the exams	
182.78372	578.01288	10	2089.00	Tribal	minutes 12 continuous running
62.58883	197.92325	10	2832.50	after me	
4.08640	12.92232	10	35.4090	Tribal	VO2max
1.39904	4.42415	10	52.0330	after me	
1.16628	3.68810	10	10.1000	Tribal	VMA
.41349	1.30758	10	14.9320	after me	

Table (6) shows the differences of the means, the standard deviation, the calculated t-value, and the standard error for the variables under study for the control group.

Sig] Degree of freedom	t calculated	Standard FH error	A.F	F	the exams	
.003	9	-3.987	186.46723	589.66116	-743.50000	Before me after me -	minutes 12 continuous running
.003	9	-3.988	4.16859	13.18224	- 16.62400	Before me after me -	VO2max
.003	9	-4.095	1.18011	3.73184	-4.83200	Before me after me -	VMA

From Table (6-5), it is clear that there are significant differences between the results of the pre- and post-tests of the tests under study for the control group, as follows:

minute continuous running test. The arithmetic mean for the pre-test was (2089.00), while the value of the arithmetic mean for the post-test was (2832.50), while the arithmetic mean for the

differences between the two means in the pre- and post-tests was (743.50000) and the sum of the squares of the differences was (589.66116). By treating these results statistically with a t-test, it showed that there were differences with significant significance and in favor of the post-tests, as the calculated t-value was (-3.987) under a degree of freedom (9) and a probability of error (186.46723), which is less than 0.05. This indicates that the differences It was significant and in favor of the post-test for the control group. As for the VO₂max test, the arithmetic mean for the pre-test was (35.4090), while the value of the arithmetic mean for the post-test was (52.0330), while the arithmetic mean for the differences between the two means in the pre- and post-tests was (16.62400) and the sum of the squares of the differences was (13.18224). By treating these results statistically with a t-test, it showed that there were significant differences in favor of the post-tests, as the calculated t-value was (-3.988) under a degree of freedom (9) and a probability of error (4.16859). This indicates that the differences were significant. Between the pre- and post-tests for the control group. As for the VMA test, the arithmetic mean for the pre-test was (10.1000), while the value of the arithmetic mean for the post-test was (14.9320), while the arithmetic mean for the differences between the two means in the pre- and post-tests was (-4.83200) and the sum of the squares of the differences was (3.73184). By treating these results statistically with a t-test, it showed that there were significant differences in favor of the post-tests, as the calculated t-value was under a degree of freedom (9) and a probability of error (1.18011). This indicates that the differences were significant between the pre- and post-tests. For the control group.

Table (7) shows the statistical description of the research variables in the post-test for the two groups

Standard error	standard deviation	Arithmetic mean	Sample volume	Totals	the exams
87.49921	276.69679	3145.00	10	Experimental group	12 minutes continuous running
62.58883	197.92325	2832.50	10	Control group	
.99744	3.15417	56.7820	10	Experimental group	VO ₂ Max
1.39904	4.42415	52.0330	10	Control group	
.28531	.90222	16.2180	10	Experimental group	VMA
.41349	1.30758	14.9320	10	Control group	
1.81016	5.72422	155.900	10	Experimental group	Post-exertion heart rate immediately before the experiment
1.29142	4.08384	154.700	10	Control group	
4.13938	13.08986	123.300	10	Experimental group	Heart rate after exertion 1 minute
2.44404	7.72873	119.200	10	Control group	

A COMPARATIVE STUDY OF THE AMOUNT OF FORCE EXERTED ON THE GROUND AND THE TIME OF PROPULSION IN THE VERTICAL AND HORIZONTAL JUMPING TESTS FROM STABILITY USING A FOOT SCAN DEVICE

1.23648	3.91010	103.200	10	Experimental group	Heart rate after 3 minutes of exertion
1.48324	4.69042	100,000	10	Control group	
.78951	2.49666	95.7000	10	Experimental group	Heart rate after 5 minutes of exertion
1.77639	5.61743	93.0000	10	Control group	
2.18581	6.91215	145,000	10	Experimental group	Post-exertional heart rate immediately after the experiment
1.20231	3.80205	150.700	10	Control group	
3.92655	12.41683	111.800	10	Experimental group	Heart rate after exertion 1 minute
2.48574	7.86059	115.700	10	Control group	
1.18509	3.74759	95.4000	10	Experimental group	Heart rate after 3 minutes of exertion
1.31191	4.14863	96.9000	10	Control group	
1.35647	4.28952	88.2000	10	Experimental group	Heart rate after 5 minutes of exertion
1.10805	3.50397	89.5000	10	Control group	

Table (8) shows the differences between the post-test of the experimental and control group regarding the research variables

Sig. (2-tailed)	Degree of freedom	calculated	Levitt		the exams
			Sig. Variance deviations	Mean differences f Calculated	
.009	18	2.905	.750	.105	12 minutes continuous running
.013	18	2.764	.589	.303	VO2max
.020	18	2.560	.468	.548	VMA
.596	18	.540	.147	2.294	Post-exertion heart rate immediately before the experiment
.405	18	.853	.014	7.337	Heart rate after exertion 1 minute
.115	18	1.657	.889	.020	Heart rate after 3 minutes of exertion
.182	18	1.389	.181	1.937	Heart rate after 5 minutes of exertion

A COMPARATIVE STUDY OF THE AMOUNT OF FORCE EXERTED ON THE GROUND AND THE TIME OF PROPULSION IN THE VERTICAL AND HORIZONTAL JUMPING TESTS FROM STABILITY USING A FOOT SCAN DEVICE

.035	18	-2.285	.020	6.573	Post-exertional heart rate immediately after the experiment
.412	18	-.839	.016	7.094	Heart rate after exertion 1 minutes
.407	18	-.848	.651	.211	Heart rate after 3 minutes of exertion
.468	18	-.742	.487	.503	Heart rate after 5 minutes of exertion

From what is shown in Table (8), it is clear that there were significant differences between the results of the post-tests between the experimental and control groups for all the variables under study.

The researcher attributes the reasons for these differences to the effect of high-intensity intermittent training, through which the trainees in the experimental group gained the ability to perform tests with high efficiency, by following exercises in which the heart rate is used as an indicator to determine intensity and rest period, as Nicola Delpch states that: These exercises are activities in which work time and rest time alternate, and this type of training works to maintain a high level of effort that maintains a high heart rate (Nicola Delpch, 2004, p33) Which developed these functional indicators in an optimal way that expresses the internal loads of the individuals in the research sample, through which the training loads that express the external loads are determined. The purpose of this is to conduct a balancing process between the internal training loads represented by the organic devices and the external loads represented by the daily training doses, to reach Developmental status of the research sample members. In addition to the fact that HIIT training works to develop both aerobic and anaerobic capabilities, and this was confirmed by both (Abu Al-Ela and Ahmed Nasr El-Din): “This method develops both aerobic and anaerobic capabilities in the athlete” (Abu Al-Ela, 1993, 274). This confirms:

(Issam Hijab et al., 2021) as both 1960) (Dupont, 2003, Christensen et al, agree that interval training has dual energy coverage, aerobic and anaerobic, while (Bangasbo, 2007) focused on that the rates of intervention of each division are affected by the various characteristics that distinguish Intermittent training (Dellal, 2008, p144). Studies conducted by Pradet, 2002) have proven that intermittent training during the effort period depends on the aerobic system, but in return, oxygen debt is recorded during this effort (Gerber 2013, p16-17)

As for the rest period, research (Balsom 1995, P339) has proven that the bronchi contribute, through oxygen, to replenishing phosphocreatine, which will allow the rate of lactic acid production to be reduced. As an example of the rate of intervention of the bronchi in energy coverage, training with intermittent physical effort at maximum intensity for a period 06 seconds, repeated 10 times. This only allows 20% of the bronchus to be involved in total energy coverage. While Bangasbo insists that the degree of interference of the anaerobic system in the energy coverage of interval training is subject to the intensity and duration of the effort. Balsom

(1995, P400) adds that phosphocreatine is responsible for energy coverage in the first seconds of intermittent training, after which anaerobic glycation intervenes to meet energy expenditure, which leads to the production of a small amount of lactic acid. This quantity is reduced due to the short duration of intermittent exercises, .The body reconverts the lactic acid formed during the recovery period. As an example of the involvement of the non-anaerobic division, a study (Cheetham et al 1986) confirmed that running for 30 seconds at maximum speed results in a decrease in phosphocreatine reserves by 64%, and thus capacity decreases at the 15th second, which allows, according to Billat, 2012, p49) By reducing glycogen in fast muscle fibers by 25% and ATP by 37%.

It is also mentioned (Dellal, 2013, p14) that interval training contains a very important form of improving maximum aerobic capacity in team sports through mixed aerobic and anaerobic energy stimulation.

Since HIIT training involves rationing its training loads in light of physiological indicators, these positive results were obtained for the experimental group of members of the research sample.

Conclusions

After presentation, analysis and discussion, and in light of the results obtained by the researcher, the following conclusions were reached:

1. There is a positive effect between the results of the pre-test and post-test for the control group and in favor of the post-test in all indicators of respiratory cyclic endurance (maximum oxygen consumption, maximum air speed, and heart rate) under study among football referees.
2. HIIT exercises led to an improvement in the level of the variables under study (maximum oxygen consumption, maximum aerobic speed, and heart rate) for football referees for members of the research sample of the experimental group, because the method of performing this type of training simulates the nature of the motor performance of football referees, as the results showed There are significant differences between the pre- and post-tests in favor of the post-tests, and this indicates the effect of this type of training that the researcher followed.
3. The use of intermittent training led to a better rate of development of the experimental group than the control group in the indicators under study among football referees.

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