ISSN: 2392-5442 ESSN : 2602-540X		Sport system journal
V/09 N/01 Year/2022		International scientific journal published by: Ziane Achour –Djelfa- Algeria
P 157 - 174		Received: 22/10/2021 A ccepted: 11/12/2021

The effect of intermittent training on improving the Maximal Aerobic Speed, Agility and Heart Rate of the Basketball players Senior Category.

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Abstract:

The purpose of this study was to examine the effect of the intermittent Training method To improve the Maximal Aerobic Speed and the Agility and Heart Rate of the basketball players Senior Category, we have used the Experimental method with two groups, The experimental group consists of (12) players and the control group consists of (12) players to , We applied the program for (08) weeks and (03) time per week and the tools were Used as follows: 20 meters shuttle test , T test agility and Heart Rate test

The results suggest that the use of the intermittent Training method has an effect on both the maximum Aerobic speed and the Agility and Heart Rate of the basketball players Senior Category.

Keywords: intermittent Training ; Maximal Aerobic Speed ; Agility ; Heart Rate

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1. INTRODUCTION

Athletic performance is always linked to how you practice, what is practiced and what is intended, choosing the right method and type of exercise will support the same practitioner field (F Fajrin, N W Kusnanik, & Wijono, 2017)

Understanding the physical requirements of competitive sports is a key factor in determining optimal training processes (LORENA TORRES-RONDA et al, 2015). Determining competition requirements will enable coaches to design training programs, especially in specific sports, that maximize performance during competition.

Basketball is a team sport that depends on intermittent efforts performed with high intensity, such as running moves, accelerations, decelerations, fast running, continuation of changes in direction, jumps and special technical skills (Abdelkrim, NB, et all, 2010), (Ben Abdelkrim, N, 2007).), (McInnes, SE, 1995) (Attene et al., 2015) and a combination of physical fitness, repetition of sets of performances interspersed with short periods of low intensity (Carvalho HM, 2011) and having a high level of anaerobic endurance as well as the ability to Good jumping (Jenson, 1995) and the ability to repeat these movements during the competition period is the key to success (Torres-Ronda, et al., 2016).

Any adaptations in basketball require us to consider a range of physical and physiological features relevant to competition (Torres-Ronda et all, 2016).

It becomes clear to us through the subtraction that the nature of efforts in basketball are intermittent efforts, whose performance depends on work periods followed by rest periods, and this is what makes the exercises in basketball require reciprocal exercises with short-term bouts of high intensity, followed by longer rest periods and moderate recovery (Be Abdelkrim, El Fazaa, & El Ati, 2007) (Abian-Vicen, J et all, 2014). These efforts are similar to many other team sports such as handball (Akashi, Tanaka, Tanaka, & Higaki, 2015).

Therefore, we find that there are many studies that link the method of intermittent training with various team sports. Rather, we find that they have tended to compare the method of intermittent training with other methods in order to highlight the importance of the intermittent training method, and others concerned with designing training programs aimed at identifying the effect of intermittent training. on many variables such as aerobic capacity, anaerobic capacity, maximum oxygen consumption, endurance of strength, Agility,... Among these studies, we find (G.Baquet et all, 2002), (Yanaoka et al., 2017), (Meng) Yu Chang et all, 2015),

(Koubaa, 2013), (Ouerghi et al., 2014), (Puttaswamy Gowda. P & Dr. M. Govindaraj, sd), (Meng Yu Chang et all, 2015) and many more. from other studies.

As for basketball, we find that there are some studies that have been concerned with designing training programs using the intermittent training method, which dealt with some variables such as speed, agility and aerobic abilities, such as the study (Kilding, Dobson, & Ikeda, 2016), (F Fajrin, NW Kusnanik, & Wijono, 2018), (Attene et al., 2014), (Yanaoka et al., 2017) and a study (Sanchez-Sanchez et al., 2018). Also, a study (Mindaugas Balčiūnas et al., 2006) showed that intermittent training may be more useful in preparing basketball players.

We found that the preparation of training programs that depend on the method of intermittent training are few in the Arabic content, especially in the sport of basketball, as we did not encounter any Arab study that concerned itself with studying the effect of reciprocal training in basketball, all of this within the limits of the researcher's knowledge.

Also, there is still very limited information regarding the effect of intermittent training, for example on performance in aerobic capacity. (Dufour et al. 2006), (Zoll et al. 2006), (Milosz Czuba et all, 2011), and scientists and trainers are still wondering how to set and adjust intermittent training eg: The intermittent work and its duration, the recall period and its type, the number of repetitions in the set and the number of sets (Millet et al., 2003). (Millet et al., 2003).

Therefore, we will aim through our study to seek to design a training program to identify the effect of reciprocal training on the Maximal Aerobic Speed MAS , agility and heart rate in the state of rest for basketball players of a larger class. After research and investigation, we raised the following problem:

Does the proposed training program using the cross-training method improve the maximum aerobic speed (MAS), maximum aerobic speed, agility and heart rate in a state of rest for basketball players of the higher class?

2- Research Hypotheses:

There are statistically significant differences in the experimental and the control group between the pre and post measurement on the variables of Maximal Aerobic Speed, agility and heart rate.

There are statistically significant differences between the experimental group and the control group at the post-measurement on the variables of Maximal Aerobic Speed, agility and heart rate at rest.

3- research aims:

This research aims to identify the effect of the intermittent training on improving the maximum aerobic speed, agility and heart rate at rest in The study sample

To identify whether the proposed training program improves the maximum aerobic speed, agility and heart rate at rest, on our basketball players Senior Category compared to the traditional program.

4- research importance:

- Highlighting the importance of the intermittent training method on basketball, as it is a method that matches the physical requirements of this sport.
- Clarify how intermittent training works in terms of controlling the training load.
- Highlighting the importance of the intermittent training method on preparing the players.
- look at the intermittent training in terms of its importance and position as an integral part of the process of preparing players and bringing them to high levels.

5- Terminology of study:

- **Intermittent training:** It is one of the sports training methods, which depends on work periods followed by rest periods, which are types: short, medium, and long and are according to sequences (30-30, 10-20, 15-15, 5-25 .. .) Its intensity is adjusted using the Maximal Aerobic Speed.
- **Maximal Aerobic Speed**: It is the speed that is during reaching the maximum oxygen consumption, and in terms of energy systems, the player reaches the Maximal Aerobic Speed after the minute (08), and in the Aerobic sector specifically, the Maximum aerobic capacity.
- **Agility**: is the athlete's ability to change the direction of his movement in the least possible time.
- **Heart rate at rest** : It is the number of times the Heart rate per minute, That is, blood is pumped to all parts of the body during the rest period, and the normal pulse for the average person is between 70-80 beats per minute, and it decreases in the athlete.

6- The methodological procedures used in the study:

6-1 Research Methodology : The researcher relied on the experimental method using the experimental and control groups (with pre and post measurement) and this is due to its relevance to the nature of the study

6-2 study community : the research community represented in all basketball teams, the class of seniors active in the Eastern Regional Championship, which numbered (12) teams.

6-3 Study sample: The research sample was intentionally selected from two teams at the level of the state of Batna

6-4 study tools :

Table 1. Describe the tools that were used in the measurement process

Variables	Test name	Objective of the test
Maximal Aerobic Speed	20m shuttle run test	Maximal Aerobic Speed (MAS)
Agility	T . test	agility measurement
Heart rate	Heart rate test	Heart rate measurement while resting

6-5 Scientific basis for the tests:

The references that dealt with the tests showed that they enjoyed high honesty, stability, and objectivity transactions, in addition, the researcher presented them to specialized arbitrators to express their opinions and observations about them, and their opinions were that the tests have credibility and have a good degree of measurement. The researcher also calculated its reliability and validity coefficient.

6-5-1 The reliability and validity of the tests: The reliability coefficient of the tests used was calculated by applying and re-applying them (Test-Retest) with a time difference of one week from the date of making the first application on a sample of (10) players from the experimental group and the control group to find the correlation coefficient between the first and second applications, as well as finding self-honesty. This is on the same sample and under the same conditions, and they were subsequently excluded from the pilot study.

And then the coefficient of self-honesty was calculated by using the root of the reliability coefficient, and the results were as follows:

Table 2. It shows the coefficient of stability and subjective validity of the tests, height, weight and age

Tests		Sample volume	correlation coefficient (test stability)	correlation coefficient (self-honesty)	value at Indication level 0.05	Df N-1
20m shuttle run test		10 players	0.93	0.96	0.60	09
T . test			0.88	0.93		
Heart rate test			0.95	0.97		
height	**body measurements**		0.84	0.91		
weight			0.70	0.84		
ages			0.84	0.91		

It is evident from Table No. (2) that the correlation coefficients for tests measurements and age exceed the value of the tabular correlation coefficient at the level of significance (0.05) estimated at (0.60) at the degree of freedom (09), The values of the correlation coefficient range between (0.70) as the lowest value and (0.97) as the highest value, and this indicates the strong and complete correlation between the results of the pre and post measurement, and what can be interpreted that the tests measurements enjoy a high degree of reliability and validity.

6-5-2 Calculation of homogeneity among the sample members:

Table 3. It shows the homogeneity between the experimental group and the control group in the Maximal Aerobic Speed (MAS) , agility, heart rate, as well as in height, weight and age.

Tests		Sample volume	Shapiro-Wilk Test value (sig)	Level indication	Indication
20m shuttle run test		10	0,262	0.05	Statistically significant
T . test			0,198		
Heart rate test			0.865		
height	**body measurements**		553.0		
weight			566.0		
ages			0,262		

It is clear from Table N° 3 that the (sig) values of Shapiro-Wilk coefficient, which range between (0.198-0.865), are greater than the significance level (0.05), and this means that there is statistical significance, that is, that the experimental sample and the control sample are two homogeneous samples.

6-6 Training Program:

Before designing the training program, we reviewed many previous and similar studies that concerned the design of training programs on the method of intermittent training, whether in basketball or other sports, to identify the nature of these programs and how they were designed, and on what basis they were established in terms of training load (volume, intensity, intensity) or terms of its position in the annual chart.

The program implementation period was (08) weeks, with (03) lessons per week. A pre-measurement was conducted for the two groups. After four weeks of training, the first-dimensional measurement was conducted for the experimental group to identify the extent of the development of the target elements and also to obtain new

values of Maximal Aerobic Speed for use in monitoring the intensity of work, after which the dimensional, third and final measurement of the two groups was carried out, and the design of the training program was based on what Gilles Cometti brought in his research and also what he mentioned in his book La préparation physique en Basker by (Cometti, G, 2002)

And also for the experiences of previous studies and theoretical research on intermittent training and how they distribute training loads and control them. The intensity of work was monitored by relying on the value of the Maximal Aerobic Speed and also the measurement of maximum forces (1-RM) for use in load control, in addition to the use of a ladder (the Borg RPE), where it was explained to the players what each value represented. The research (Lupo, C et all ., 2017) mentioned that RPE can be used for load control in basketball training sessions, and the following table shows the distribution of the weeks of implementing the training program and dates measurements.

Table 4. Explain the distribution of macrocycle and microcycle and their objectives

	microcycles	**weeks**	**general objective**
	pre-measurement (first measurement)	Week 01	Application of pretests
Macrocycle 01	microcycle 01	Week 02	intermittent "force"
	Microcycle 02	Week03	intermittent "speed"
	Microcycle 03	Week 04	intermittent "Vertical jump"
	Microcycle 04	Week 05	intermittent "run-jump"
	Microcycle of recovery 05	Week 06	Positive rest (Tests 2 + Tactical Skill Work)
Macrocycle 02	Microcycle 06	Week 07	intermittent "force"
	Microcycle 07	Week 08	intermittent "Vertical jump"
	Microcycle 08	Week 09	intermittent "force"
	Microcycle 09	Week 10	intermittent "speed"
	Microcycle of recovery 10	Week 11	Final tests

6-7 Statistical methods used: The results of the tests were unloaded and analyzed through the Statistical Package for the Social Sciences.25 V SPSS.
The following were calculated: means, standard deviation, Parsons correlation coefficient,
Shapiro-Wilk test, t-test for two independent groups, t-test for two correlated groups.

7- Presentation and Analysis of Results

7-1 Presentation of the differences for the results of the pre- and post-measurement measurements for both the experimental group and the control group in the variables: Maximal Aerobic Speed, agility and heart rate at rest

Table 5. It shows the results of the differences for the pre and post measurements for the experimental group and the control group

Variables	experimental group					control group				
	Post-tests		Pre-tests		t	Post-tests		Pre-tests		t
	sd	X	sd	X		sd	X	sd	X	
test MAS	1.46	13.54	1.13	12.12	*6.99	0.78	12.45	0.98	11.83	*4.48
test T	0.58	10.40	0.67	11.70	*8.92	0.45	11.00	0.57	11.20	1.52
HR rest	9،45	60.00	10.03	66.91	*5.27	5.29	67.33	5.86	71.41	*2.92

Sample size = 12, degree of freedom = 11, significance level = 0.05, tabular t-value = 0.179
(*=statistically significant)

It is clear from Table No. (05) that the mean of the variables of Maximal Aerobic Speed and Heart rate of the control group were (11.83, 71.41), respectively, and the mean value of the post-tests is (12.45, 67.33), respectively, and that the value of (T) calculated (4.48, 2.92), respectively, which is greater than the tabular (t) value (1.795) at the significance level (0.05), and from it there are statistically significant differences between the pre- and post-measurement in the results of the variables of Maximal Aerobic Speed and heart rate in the rest and in favor of the post-

measurement and this is in the control group. As for the change in agility, we note that the value of the mean in the pre-test was (11.20) and the value of the arithmetic mean in the post-test is (11.00), and that the calculated (T) value was (1.52) which is less than the value of (T) Calculated and from it there are no statistically significant differences in the results of the T-test to measure agility

As for the experimental group, it becomes clear that the mean of the three variables of the experimental group was in the pre-tests as follows (12.12, 11.70, 66.91), respectively, and the mean value of the post-tests is (13.54, 10.40, 60.00), respectively, and that the calculated (t) value (6.99, 8.92, 5.27), respectively, which is greater than the tabular (t) value (1.795) at the significance level (0.05), and from it there are statistically significant differences between the pre- and post-measurement in the results of the variables of Maximal Aerobic Speed, agility and heartbeat In the rest and in favor of the dimensional measurement, this is in the experimental group.

7-2 Presentation of the differences between the experimental group and the control group at the post-measurement in the variables of Maximal Aerobic Speed, agility and heart rate

Table 6. It shows the results of the differences between the control group and the experimental group in the study variables

Variables	control group		experimental group		t
	sd	X	sd	X	
Test MAS	0.78	12.45	1.46	13.54	*2.25
Test T	0.45	11.00	0.58	10.40	*2.79
HR rest	5.29	67.33	9،45	60.00	*2.34

Sample size = 12, degree of freedom = 11, significance level = 0.05, tabular t-value = 1.717
(*=statistically significant)

It is clear from Table No. (06) that the mean of the three variables for the experimental group was as follows: (13.54, 10.40, 60.00) respectively, and the value of the mean for the control group is (12.45, 11.00, 67.33), respectively, and that the value of (T) Calculated (2.25, 2.79, 2.34), respectively, which is greater

than the tabular (t) value (1.717) at the significance level (0.05), and from it there are statistically significant differences between the experimental group and the control group in the results of the variables of Maximal Aerobic Speed, agility and Resting heart rate for the experimental group.

8- Discussion and interpretation of the results

8-1 Presentation and discussion of the results of the first hypothesis, which states:

There are statistically significant differences in the experimental and the control group between the pre and post measurement on the variables of Maximal Aerobic Speed, agility and heart rate.

It is clear from Table No (05) and this for the control group that there are statistically significant differences in the variable of Maximal Aerobic Speed and heart rate at rest, and we refer this improvement to the large volume that was used in the control group program. As for the agility variable, there are no statistically significant differences and this is because the program used was not based in its training on changes in direction and taking into account the development of anaerobic people, and this was shown by the study (Sanchez-Sanchez et al., 2018) and a study (Budd & Egea, 2017).

As for the experimental group, the results showed that there were statistically significant differences between the pre-measurement and the post-measurement in the variables: Maximal Aerobic Speed, agility and heart rate at rest .

As for the Maximal Aerobic Speed variable, we refer this improvement to the training program that was designed based on scientific foundations and what was reported by various researches and studies, and these results were consistent with many previous and similar studies. Intermittent training by jogging with the use of explosive strength exercises has improved the maximum aerobic speed, which is what we used in the training sessions, as it was based on the use of strength Intermittent training , that is, a combination of jogging and jumping exercises, as well as the introduction of external loads as indicated (Cometti, G, 2002), Also, what was shown by the study (Ouerghi et al., 2014) that intermittent training improved the maximum aerobic speed, and in terms of the energy Systems, there are studies that have shown that intermittent training improves the aerobic capacity (Assadi & Lepers, 2012) and what was shown by the study (Chittibabu. , 2014) that reciprocal training for a period of (08) weeks has improved aerobic capacity

As for Agility variable : we refer this improvement to the training program that was designed based on scientific foundations and the results of various research and studies, and these results came in agreement with many previous and similar studies. High-intensity intermittent training for Agility

In view of the training program and its implementation method, especially in running the distances extracted from the MAS for each athlete, it exceeded the length of the basketball court, and therefore we did not make the athlete cross it once, but rather with the change in direction (180°), and this is consistent with the study of (Sanchez- Sanchez et al., 2018) which showed that running with a change in direction once or twice improved the performance of basketball players and their agility.

We also attribute this improvement to the fact that the intermittent training had a positive effect on the neuromuscular work, which in turn affected the agility, as indicated by (F Fajrin et al., 2018). This is what was shown by a study (Sanchez-Sanchez et al., 2018).

In terms of aerobic energy, intermittent training has shown that it can be an effective strategy in stimulating the anaerobic system, and this is what was shown by the study (Attene et al., 2014) and also what studies showed, for example (G.Baquet et all, 2002), (Tabata et al. ., 1996) and (G. Baquet et all, 2002) that intermittent training improves anaerobic Capacity and anaerobic Power, which in turn reflects positively on agility.

As for heart rate at rest variable We return this improvement to the training program that was designed on the basis of scientific foundations and the findings of various researches and studies. These results were in agreement with many previous and similar studies , Which showed that intermittent training has a significant effect on lowering the heart rate at rest, As a study (Wilmore JH et al. 2001), And also what was shown by the study (Koubaa, A, 2013) that training using the intermittent training method achieved better results in cardiorespiratory fitness than the group that trained using the continuous training method, and also with what was shown by the study (Kilding, Dobson, & Ikeda, 2016) that intermittent training has an effect on maximum heart rate and also reported (Nourry et al., 2005) that 08 weeks of high-intensity alternating jogging improves resting heart function and leads to deeper aerobic exercise that reflects better effectiveness.

After the application of the training program using reciprocal training, we found that there was progress in aerobic abilities and a decrease in heartbeat, as demonstrated by the study (Heydari, Boutcher, & Boutcher, 2013) and we interpreted the changes that occurred to the heart to the same study, which is a

stimulation of the heart and blood vessels, and this is also confirmed by (Gamelin et al., 2009) that intermittent training has significantly improved the functioning of the heart and blood vessels.

Through this proposition, we find the validity of the first hypothesis, which states: There are statistically significant differences in the experimental and the control group between the pre and post measurement on the variables of Maximal Aerobic Speed, agility and heart rate.

8-2 Presentation and discussion of the results of the second hypothesis, which states:

There are statistically significant differences between the experimental group and the control group at the post-measurement on the variables of Maximal Aerobic Speed, agility and heart rate at rest.

It is clear from Table No. (06) that there are statistically significant differences between the experimental group and the control group in the results of the variables of Maximal Aerobic Speed variable , agility and heart rate at rest in favor of the experimental group, and we refer these differences to the proposed training program using the reciprocal training method, which It was designed based on scientific foundations and also reviewing the findings of many studies in the field of reciprocal training such as research (Cometti, G, 2002) and others , control and also one of the reasons for the existence of differences between the control group and the experimental group is to respect the principles of training, the most important of which is progressive overloading and continuity, Also taking into account individual differences , Where the members of the experimental sample during the application of the training units, the appropriate load is distributed to each individual separately, unlike the control sample that was using the same load for all individuals, All of these factors made there are statistically significant differences between the experimental group and the control group at the post-measurement in the variables of

Maximal Aerobic Speed, agility and heart rate at rest.

Through this proposal, we can see the validity of the second hypothesis, which states: There are statistically significant differences between the experimental group and the control group at the post-measurement on the variables of Maximal Aerobic Speed, Agility and Heart Rate at rest.

8-3 Suggestions and recommendations:

Through our findings in this research, we finally offer a set of suggestions and recommendations as follows:

- Focusing on designing training programs based on scientific foundations because of their high success rate.
- Do other studies on new variables in order to identify the impact of intermittent training on them, whether in basketball or in other sports.
- Conducting similar studies on the effect of intermittent training in individual sports because we did not encounter them often during the research.
- Organizing study days and concourses on modern methods in the field of training and physical preparation.

9- Conclusion

The issue of preparing players and Development them is the main concern for all sports teams, and the field of preparing players, especially in terms of physical preparation, has become so important that there is a coach for physical preparation, Through our presentation of this topic, which is to study The effect of intermittent training on improving the Maximal Aerobic Speed, Agility and Heart Rate of the Basketball players Senior Category, We tried to study one of the important methods of training and physical preparation, and it has been shown to us through our study that this method is very effective in developing both the maximum aerobic speed, agility and heartbeat, and this is in basketball players , We tried to study one of the important methods of training and physical preparation, and it has been shown to us through our study that this method is very effective in developing both the Maximal Aerobic Speed, Agility and Heart Rate at rest., and this is in basketball players, it is necessary to work on designing standardized training programs that provide us with solutions to the problems dictated by the modern requirements of sports, Finally, we recommend conducting other studies to study the effect of the intermittent training method on other sports and on other variables such as blood pressure, fat percentage, and agility .

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