

ORIGINAL ARTICLE

The Effect of High Intensity Interval Training and Medium Continuous Training on Visfatin Plasma Levels, Anaerobic and Aerobic Power Female Basketball Players

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KEYWORDS

High intensity interval training;
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ABSTRACT: The present research was conducted with the aim of investigating the effect of high intensity interval and medium continuous training on anaerobic and aerobic power female basketball players. The research method was quasi-experimental with pretest and posttest, and included all female basketball players in Firoozkooh City, Tehran Province, Iran in 2015. Twenty female basketball players were enrolled in this study, which randomly were divided into two groups of intense interval training and continuous medium training. The instrument used to determine VO₂max, VT and respiratory compensation point (RCP), the Gas Analyzer (Model Ganshorn Medizin Electronic GmbH Power Cube-Ergo Germany) and Bruce treadmill test. Data analysis method was descriptive statistics (frequency, percentage, mean and standard deviation) and inferential statistics (*t*-test and paired *t*-test), respectively. Result showed that Intense interval training and continuous moderate exercise had an impact on maximal oxygen uptake (VO₂max), ventilator threshold (VT) and respiratory compensation point (RCP) during of run 3000 meters in girls basketball influence.. There was a significant difference between researches groups two at the level of blood visfatin in male obese wistar rat ($P<0.05$).The finding indicated that, unlike continllous moderate exercise, intense interval training on the peak power production (ppo) and mean productivity (mpo) girl basketball influences.

INTRODUCTION

Exercise has been discussed in various ways in the world. Advance knowledge of exercise physiology, pay

special attention to the development and expansion of the physiological profile is created. Such physiological

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profile, understanding and application of athletics have made it realistic [1]. To this end, researchers and experienced coaches, relying on information obtained from physiological variables, in the training of athletes or sports competition will lead to a clear, So that physiological levels of fitness and athletic ability to plan and Promote the quality and performance of athletes is essential. Coaches and athletes are always looking to employ best practices in training have scientific support in order to achieve significant results and victories [2].

Basketball is a team sport played with a ball. Due to the nature of the discipline, unfortunately, is high risk vulnerability in this field, so that Knobloch, in their study reported that the high-impact sports, the highest rate of injuries occurring in basketball. Hence, the players in this field should respect the principles of exercise science and all stages of pre-season training from basic to advanced and skill behind. The preschool will have the endurance aerobic, anaerobic, work speed and skill with the ball. Studies show that the performance of endurance athletes, according to the type of training in addition to factors such as efficiency, peak aerobic power of the motor, Neuromuscular adaptations, anaerobic power, the adaptability of the endocrine system, and the ability to delay affected lactate threshold [3].

Burgomaster et al 6 sessions of intense interval training program (7-4 replicates pedaling on a bicycle ergometer with intensity every 30 seconds and 4 minutes rest between each repetition interval) indicators of aerobic and anaerobic examined [4]. Their results showed an increase in anaerobic power, muscle oxidative potential and endurance performance capacity without significant change in the maximal oxygen uptake was looking to run approximately 15 minutes of intense interval training was achieved within 2 weeks.

The effect of 6 weeks of intense interval training (8-7 repetitions of 20-second run with an intensity of 170% of maximal oxygen uptake, with 10 seconds rest between each repetition interval of 5 days per week) and

continuous moderate exercise (60 minutes of cycling at 70% of maximal oxygen uptake, 5 days per week) on anaerobic capacity and maximal oxygen uptake were studied [4]. The results showed that interval training group increased 14 and 28 percent respectively in maximal oxygen uptake and anaerobic capacity, experience, while continuous exercise group only a 10 percent increase in maximal oxygen uptake showed no significant changes in the anaerobic capacity.

The results of several studies suggest that, in sports where time is a decisive factor in the selection of training methods, an important point that should be considered.[2, 4] the total time required periodic training, to make similar changes in comparison with the continuous training. In this context, a study has reported that, improvements in maximal oxygen uptake and time to exhaustion of continuous strenuous exercise, significantly greater mean improvements that can be made for continuous training [4].

Some research also seeks to increase the capacity of aerobic interval training For example, Bickham et al in spite of intense interval training program during 6 weeks (30-14 reps of both the 15-5 second-intensity 100-90 percent, compared to the rest of 5: 1 to 3: 1 reduced) did not change significantly in Ventilatory Threshold (VT), run-ventilated show [5].

Due to lack of information and research on the effects of interval training and continuous integration, Aerobic and anaerobic athletic performance, this study seeks to determine the impact of such training on endurance performance in girls basketball practice, The role of cyclic resistance training, especially that little attention has been paid [6]. Since the purpose of athletes participating in training programs, improve performance, and Determine the physiological characteristics of endurance performance and the effect of exercise on these properties in order to provide appropriate training programs for athletes and coaches is of particular importance and applications Considering the importance of basketball as a team sport periodic

severe, Basketball players for better performance in games that require physical fitness to achieve this goal should always be done with proper training, To be physically prepared [7]. Therefore, this study seeks to answer the question of whether intense interval training and continuous aerobic and anaerobic medium can affect girls' basketball?

MATERIALS AND METHODS

The research because of the nature, objectives and hypotheses, is applied. Also in terms of methodology, this study was quasi-experimental pre-test and post-test. The population consisted of all women basketball Firoozkooh city in 2015, which, according to the deputy chairman of the city's basketball, the number are 33 people. To determine the sample size, style, purpose and available from the volunteers, 20 female basketball players were randomly assigned to two groups of intense interval training (10 people) and the continuous medium (10 people). The instrument used to determine VO₂max, VT and respiratory compensation point (RCP), the Gas Analyzer (Model Ganshorn Medizin Electronic GmbH Power Cube-Ergo Germany) and was Bruce treadmill test. Data analysis using descriptive statistics (frequency, percentage, mean and standard deviation) and inferential statistics (t-test and paired t-test), respectively.

Implementation method

Subjects after informed consent procedure and fill in the relevant conduct research were enrolled. During the study, the subjects were asked to refrain from doing other sports. They also were asked to rate their diet than 2 days before the start of proceedings before the exam notes and the diet before repeating the test sessions. They also mentioned, the consumption of foods containing caffeine and strenuous physical activity for 22 hours before testing sessions refrain. Exercise tests in separate meetings with at least 28 hours apart, were performed. The first session of aerobic fitness test was run. In the second session, the test was held at 3000 meters. Anaerobic power test was conducted in the third session. Then, the subjects participated in a training session in the periodic severe or moderate continuous training. After the test sessions with an interval of 3 days after the last training session in the same way, similar to the pre-test sessions were conducted. To avoid the effects of the test day due to the large number of participants, the cyclic group exercises a day later than continuous exercise group started and ended (Department of continuous training and interval training on a couple of days a week and practiced), So that the continuity of pre-test and post-test was performed one day earlier than the other groups.

RESULTS

*Test K-S (Kolmogorov-Smirnov) Check the normality of variables***Table 1.** K-S test table to check the normality of the variables

Groups	Variables	Tests	Tests	Tests			
		K-S	n	Sig.	K-S	n	Sig.
Intense interval training	VO2max	0/491	10	0/965	0/499	10	0/969
	VT	0/524	10	0/787	0/653	10	0/947
	RCP	0/736	10	0/807	0/640	10	0/651
	3000 meters	0/364	10	0/953	0/515	10	0/999
	PPO	0/725	10	0/969	0/492	10	0/670
	MPO	1/039	10	0/789	0/652	10	0/230
Continuous moderate exercise	VO2max	0/665	10	0/851	0/610	10	0/768
	VT	0/564	10	0/812	0/637	10	0/909
	RCP	0/517	10	0/743	0/681	10	0/952
	3000 meters	0/618	10	0/792	0/650	10	0/839
	PPO	0/883	10	0/250	1/019	10	0/417
	MPO	0/919	10	0/490	0/834	10	0/367

The results are given in Table 1, show that at 95% Confidence level ($0/05 = \alpha$), Variables that measure the aerobic and anaerobic indicators include items maximal oxygen uptake (VO2max), ventilatory threshold (VT), respiratory compensation point (RCP), The implementation of 3000 meters, the peak power production (PPO) and average productivity (MPO) in

the pre-test and post-test of a normal distribution, The level of significance (Sig.) Is calculated for each variable, is greater than the value of $0/05 = \alpha$. Therefore, the variables are the normal distribution.

Hypothesis 1: intense interval training and continuous moderate influences on the maximal oxygen uptake in basketball girls.

Table 2. Paired t-test; Effect of intense interval training and continuous moderate to maximal oxygen uptake

Group	Test	Degrees of freedom	Computational t	Difference of means	Standard deviation	Average sample	Samples	P
Intense interval training	Pretest				3/29	51/80	10	0/000
	posttest	9	-9/46	-4/10	2/42	55/90	10	
Continuous moderate exercise	Pretest				4/40	52/40	10	0/000
	posttest	9	-9/24	-4/40	3/97	56/80	10	

The results given in Table 2, showed a 99% confidence level ($0/01 = \alpha$), given the null hypothesis (H0) rejected and the hypothesis (H1) are confirmed. Accordingly, since the intense interval training group, the mean scores on the posttest (55/90) than in the pre-test scores (51/80) increased, Also, continuous moderate exercise group, the mean scores on the posttest (56/80) than in the pre-

test scores (52/40) increased, Thus, one can say with 99% confidence that, intense interval training and continuous moderate exercise influences on the basketball girl maximal oxygen uptake.

Hypothesis 2: intense interval training and continuous mean influences on the ventilatory threshold in basketball girls

Table 3. Paired t-test Effect of intense interval training and continuous moderate to ventilatory threshold

Group	Test	Degrees of freedom	Computational t	Difference of means	Standard deviation	Average sample	Samples	P
Intense interval training	Pretest				2/02	62/90	10	0/000
	posttest	9	-15/46	-3/30	1/99	66/20	10	
Continuous moderate exercise	Pretest				2/84	64/50	10	0/000
	posttest	9	-11/20	-3/10	3/03	67/60	10	

The results given in Table 3, showed a 99% confidence level ($0/01 = \alpha$), given the null hypothesis (H0) rejected and the hypothesis (H1) are confirmed. Accordingly, since the intense interval training group, the mean scores on the posttest (66/20) than in the pre-test scores (62/90) increased, Also, continuous moderate exercise group, the mean scores on the posttest (67/60) than in the pre-

test scores (64/50) increased, Thus, one can say with 99% confidence that, intense interval training and continuous moderate exercise influences on the basketball girls ventilatory threshold.

Hypothesis 3: intense interval training and continuous mean influences on the respiratory compensation point in basketball girls.

Table 4. Paired t-test; Effect of interval training and continuous moderate to severe respiratory compensation point

Group	Test	Degrees of freedom	Computational t	Difference of means	Standard deviation	Average sample	Samples	P
Intense interval training	Pretest				2/23	79/10	10	0/000
	posttest	9	-14/23	-3/00	1/99	82/10	10	
Continuous moderate exercise	Pretest				2/60	78/90	10	0/005
	posttest	9	-3/71	-2/20	2/13	81/10	10	

The results given in Table 4, showed a 99% confidence level ($0/01 = \alpha$), given the null hypothesis (H0) rejected and the hypothesis (H1) are confirmed. Accordingly,

since the intense interval training group, the mean scores on the posttest (82/10) than in the pre-test scores (79/10) increased, Also, continuous moderate exercise group,

the mean scores on the posttest (81/10) than in the pre-test scores (78/90) increased, Thus, one can say with 99% confidence that, intense interval training and continuous moderate exercise influences on the respiratory compensation point (RCP) basketball girls.

Hypothesis 4: intense interval training and continuous mean influences on the implementation time of 3000 meters race in basketball girls.

Table 5. Paired t-test; Effect of intense interval training and continuous medium on the implementation time of 3000 meters race

Group	Test	Degrees of freedom	Computational t	Difference of means	Standard deviation	Average sample	Samples	P
Intense interval Training	Pretest	9	6/09	0/65	1/07	12/90	10	0/000
	posttest							
Continuous moderate exercise	Pretest	9	2/88	0/60	1/20	13/35	10	0/008
	posttest							

The results given in Table 5, showed a 99% confidence level ($0/01 = \alpha$), given the null hypothesis (H0) rejected and the hypothesis (H1) are confirmed. Accordingly, since the intense interval training group, the mean scores on the posttest (12/25) than in the pre-test scores (12/90) decreased, Also, continuous moderate exercise group, the mean scores on the posttest (12/75) than in the pre-

test scores (13/35) decreased, Thus, one can say with 99% confidence that, intense interval training and continuous moderate exercise influences on the implementation time of 3000 meters race in basketball girls.

Hypothesis 5: intense interval training and continuous mean influences on the amount of peak power production in basketball girls.

Table 6. Paired t-test; Effect of intense interval training and continuous mean the peak power production

Group	Test	Degrees of freedom	Computational t	Difference of means	Standard deviation	Average sample	Samples	P
Intense interval training	Pretest	9	-8/65	-1/23	0/94	11/65	10	0/000
	posttest							
Continuous moderate exercise	Pretest	9	-1/50	-0/10	0/90	11/95	10	0/168
	posttest							

The results given in Table 6, showed a 99% confidence level ($0/01 = \alpha$), given the null hypothesis (H0) rejected and the hypothesis (H1) are confirmed. The mean scores

on the posttest (12/88) than in the pre-test scores (11/65) increased, Thus, one can say with 99% confidence that, intense interval training influences on the peak power

production (PPO) girls basketball. But in the middle of continuous exercise at 95 percent Confidence level ($0.05/0 = \alpha$), given the null hypothesis (H_0) are confirmed. Thus, one can say with 95% confidence that the exercise continuous medium does not influence on the peak power production in basketball girls.

Hypothesis 6: intense interval training and continuous medium influences on the average productivity in basketball girls.

Table 7. Paired t-test; Effect of intense interval training and continuous mean the average productivity

Group	Test	Degrees of freedom	Computational t	Difference of means	Standard deviation	Average sample	Samples	P
Intense interval training	Pretest				0/74	7/60	10	
	posttest	9	-3/67	-0/90	0/53	8/50	10	0/005
Continuous moderate exercise	Pretest				0/72	7/75	10	0/208
	posttest	9	-1/36	-0/07	0/66	7/82	10	

The results given in Table 7, showed a 99% confidence level ($0/01 = \alpha$), given the null hypothesis (H_0) rejected and the hypothesis (H_1) are confirmed. The mean scores on the posttest (8/50) than in the pre-test scores (7/60) has increased; Therefore, it can be claimed with 99% confidence that the average productivity of intense interval training (MPO) girls basketball influences. But in the middle of continuous exercise at 95 percent ($0.05/0 = \alpha$), given the null hypothesis (H_0) are confirmed. Thus, one can say with 95% confidence that the exercise continuous medium does not influence on the average productivity in basketball girls.

DISCUSSION

In hypothesis 1, results showed that there was a significant difference between the mean scores in the pre-test and post-test, there was a significant difference, Because the intense interval training group, the mean scores on the posttest (55/90) than in the pre-test scores (51/80) have increased, Also, continuous moderate exercise group, the mean scores on the posttest (56/80) than in the pre-test scores (52/40) have increased, Thus, it can be concluded that intense interval training and

continuous moderate exercise influences on maximal oxygen uptake (VO_{2max}) girls basketball. Due to the fact that the VO_{2max} as the best indicator of cardiorespiratory endurance and aerobic fitness measure is remembered and continuing to increase in VO_{2max} training athletes in most sports are common and almost all of them, The results of recent studies show that intense interval training works is similar to the increase in aerobic capacity, increase VO_{2max} followed by intense interval training program have been reported ranging from 5 % to 14 % .The results of this study also showed a similar increase in VO_{2max} in both intense interval training and continuous training medium. Of course, results in an increase in VO_{2max} followed by intense interval training, it is not consistent with some previous research. For example [4] in a study similar to the present study within two weeks of training have pointed out that, despite increases muscle oxidative potential, not observed significant changes in VO_{2max} . The reason for this difference in results can be attributed to a training intervention. In most previous studies, intense interval training program for more than 2 weeks to be able to make the appropriate changes. In another

study in spite of intense interval training program during 6 weeks (30-14 reps of both the 15-5 second-intensity 100-90 and work to rest ratio of 5: 1 to 3: 1 declined) did not show significant changes in VO₂max[5]. One possible reason for this difference can be traced during every effort interval training program. As mentioned in the study, since any effort between 5-15 seconds, most studies have found a significant increase in VO₂max, with the efforts for more than 12 seconds have used[6,7]. Another reason for this difference could be related to the initial VO₂max in the pre-test. It is reported, the contribution of aerobic system for energy during intense intermittent exercise, the type (active and passive) and recover between each repetition depends [4]. Turn relatively short periods recover between each repetition interval training program that was used in this study; you may need to progressively increase energy through aerobic system. Increase oxygen delivery (for example, increased stroke volume), as well as increased use of oxygen by the active muscles (for example, increased capillary density / mitochondria) as the mechanism can be considered major improvements in aerobic capacity. Previous studies have reported that intense interval training, improvement in the ability of the heart to pump blood to the continuous moderate exercise [4]. This could possibly be due to the increase in VO₂max followed by intense interval training versus continuous moderate exercise has been shown in some studies [5] to explain. . Therefore, further studies on the effects of intense interval training program and continuous moderate exercise on physiological factors affecting aerobic capacity have, despite the smaller interval training program, have reported similar adaptations [8].

In hypothesis, the findings showed that the mean scores in the pre-test and post-test, there was a significant difference, Because of intense interval training group mean scores on the posttest (66/20) than in the pre-test scores (62/90) has increased as well, Continuous moderate exercise group, the mean scores on the posttest

(67/60) than in the pre-test scores (64/50) has increased, so, it can be concluded that Intense interval training and continuous moderate exercise influences on the ventilatory threshold (VT) girls basketball. The results of this study showed that VT in both intense interval training program and continuous moderate exercise increased. These results with the results of the study of Larsen et al the effect of intense interval training on VT, aligned, [10] and by studying Burgomaster et al is the eccentricity direction [4] . Intensity and duration of the training program [4, 9] and sample size [10] can be evaluated as a possible reason for this difference. VT increases muscle oxidative capacity to enable the ability to use more muscle mass, the ability to use fat for energy instead of carbohydrates and also improve cardiovascular fitness.

In Hypothesis 3, results showed that there was a significant difference between the mean scores in the pre-test and post-test, Because the intense interval training group mean scores on the posttest (82/10) than in the pre-test scores (79/10) have increased, also, Continuous moderate exercise group, the mean scores on the posttest (10/81) than in the pre-test scores (90/78) has increased, so, It can be concluded that intense interval training and continuous moderate exercise, influences on the respiratory compensation point (RCP) girls basketball. The results of this study showed that in both groups RCP intense interval training program and continuous moderate exercise increased. . This finding is consistent with results from studies of Larson and colleagues, in line with the research Burgomaster et al is the eccentricity direction. [4, 10] In a similar vein with Hypothesis 2, appears here as the intensity and duration of the training program [4, 8 and 10] and sample size [9] can be evaluated as the reasons for this event.

In Hypothesis 4, results showed that there was a significant difference between the mean scores in the pre-test and post-test, Because of intense interval training group, the mean scores on the posttest (12/25) than in the pre-test scores (12/90) has decreased, Also,

continuous moderate exercise group, the mean scores on the posttest (12/75) than in the pre-test scores (13/35) has decreased, therefore, It can be concluded that intense interval training and continuous training for girls basketball 3000 meters run average over time of impact. In this study, the duration of the implementation of the 3000 meters run at an average interval training and continuous training declined. These findings Burgomaster studies, Esfarjani and Larson and Mackay et al. [4, 6 and 11] are aligned. Appears to be an increase in VO₂max and lactate threshold in endurance performance is the main reasons progression (5). On the other hand, Burgomaster Card and colleagues have reported that the capacity for endurance performance in pursuit of intense interval training program that shows no increase in VO₂max improved [4]. These findings suggest that, other factors also play a role in regulating the endurance run. For example, recent studies have shown that intense interval training program similar to the average continuous program to increase the capacity of lactate and hydrogen ions released from active muscles [4], the capacity to pump sodium / potassium, neural activation and also increase glycogen stores [4,10] the whole body fat oxidation Burgomaster and glucose transport in muscle activation [4].

In Hypothesis 5, the findings showed that there was a significant difference between the mean scores in the pre-test and post-test, The mean scores on the posttest (12/88) than in the pre-test scores (11/65) has increased, so, it can be concluded that intense interval training on the peak power production (PPO) Girls basketball influences. The average continuous training group, the mean scores in the pre-test and post-test, there was a significant difference. Thus, we can conclude that moderate continuous training does not influence on the peak power production girls' basketball. Results showed that only intense interval training group, the peak power production (PPO) increased. This finding is consistent with research Larson is aligned although most studies in this field [10], increase anaerobic capacity intense

interval training has been shown to follow the program, but the answer is different. For example 28 percent increase in anaerobic capacity, followed by 6 weeks of intense interval training program has reported. Also, the effect of aerobic fitness exercise program prior to workouts and measure its response was observed in this study, may be another reason for the observed difference. Some other factors that may play a role in increasing aerobic capacity, muscle creatine phosphate concentrations They reproduce rapidly during the recovery[4,10], anaerobic activity activation of motor units, the type I and type II_x fibers to Type II_a [7,11] and increased muscle buffering capacity [11].

In Hypothesis 6, in theory, the findings showed that the mean scores in the pre-test and post-test, there was a significant difference, The mean scores on the posttest (8/50) than in the pre-test scores (7/60) has increased, therefore, It can be concluded that the average productivity of intense interval training (MPO) girls basketball influences. The average continuous training group, the mean scores in the pre-test and post-test, there was a significant difference. Thus, we can conclude that moderate continuous training cannot influence on the roughness average production girls' basketball. The results showed that intense interval training increase the average productivity (MPO) of the girls' basketball. As hypothesis 5, this finding is consistent with research; Larson (2002) is aligned [10]. The hypothesis to explain the reasons for this difference can be attributed to the number of sessions per week. Also, the effect of aerobic fitness exercises before and the response to an exercise program may be another reason for the observed difference. These findings can be an exercise program designed by fitness coaches, especially teachers who lack the time for possession of athletes (for example, university and school teams), to be employed [12]. Also, the results showed that the increase in anaerobic capacity only after intense interval training program that occurred, it can be of great importance for athletes and coaches in all sports that

involve aerobic and anaerobic energy systems are involved, Be used to design training programs. Therefore, these results suggest that more athletes and coaches in the preparation of athletes in different sports nutrition, especially professional athletes and periodic training and continuing role in the increase in aerobic and anaerobic athletes, full knowledge of the consequences of unauthorized use of dietary supplements and ergogenic aids notice.

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