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Effect of Eight Weeks Sports Programs on Blood Irisin Level in Healthy Male Sport Practitioners

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Author Contribution

The authors Al- Naemi and Khalid proposed the idea, designed the study, wrote the protocol, and proofread the drafts of the manuscript. The author Aldoski (PhD student) contributed to the design of the study and did the data collection, part of the data analysis, in addition to the literature search. Authors Aldoski and Khalid analyzed and gave the interpretation of data, and wrote the first draft of the article. Author Al-Naemi read and approved the final manuscript.

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Abstract:

The main aim of this study is to assess the effect of three different types of exercises on Irisin hormone level, body fat, visceral fat, BMI and lipid profile in sports practitioners. The experimental approach was used to conduct the study. A 66 healthy male sport practitioners were participated in this study and divided into three experimental groups, each group consist of 22 subjects, the first group performed aerobic exercises (AE), the second group performed anaerobic exercises (AnE), and the third group, performed resistance exercises (RE). Before entering their experimental program, the three groups conducted the beep test for determining the VO2max for each participant, and then the blood samples were taken from each participant. Thereafter, the three groups entered the training program for eight weeks 3 times/week. After ending the training programs, the three groups conducted the beep test again for determining the VO2max, and the blood samples were taken from the participants. All statistical data analyses were performed using SPSS version 25. For checking the differences between the pre-test for all groups one-way ANOVA with Post Hok-Tukey was conducted, and the same for the post-test variables. Comparisons between pre-test and post-test within one type of exercise were performed by the paired sample t-test.

The three types of exercise for the sport practitioners after participating in intervention for 8 weeks' program were effective. Interestingly, the sport exercises were found to have a great effect on increasing Irisin serum level and decrease the bod fat, visceral fat and BMI following the three type of exercise. It was found that resistance exercises are more effective to increase the level of Irisin hormone than aerobic and anaerobic exercises.

Keywords: Aerobic exercises, Anaerobic exercises, Resistance exercises, Irisin, BMI (Body Mass Index), AVF (Abdomen Visceral Fat)

Introduction:

In the recent decade, the importance of regular physical exercise is well known and became a key element of the prevention of many serious chronic and metabolic diseases such as obesity, type 2 diabetes mellitus. Researches have stated that skeletal muscle has an endocrine feature, where secreting hormones called myokines, and this found out makes the role of skeletal muscle as the main source of some hormone secretion induced by exercise (Bostrom et al., 2012). the metabolic changes related to the muscle contractions caused by exercise is the main reason for the production and secretion of chemokines, and this leads to an increase in the releasing of several myokines able of interacting with the adipose tissue, for example, interleukins 6 and 15 and Irisin (Daskalopoulou, et al., 2014). Irisin is a newly discovered hormone that mediates the positive effects of physical exercise such as increasing energy expenditure by fat oxidation. Irisin hormone has an important role by stimulating and changing white adipocytes tissue to brown adipocytes tissue which leads to increase thermogenesis process intervened by increasing in uncoupling protein-1 (UCP-1). as it was reported that a precursor of Irisin is management of fibronectin type III domain-containing 5 (FNDC 5) protein, which caused obvious boosts in UCP-1 mRNA gene expression and consuming oxygen and simplifies weight loss and improving the nutrition style of high fat diet that induced insulin resistance (Boström, et al. 2012).

There are many scientific researcher highlighted the effect of physical exercise on Irisin hormone, it was demonstrated that serum Irisin concentration was declined by 72% in, whereas after 3 weeks of freewheel running the value was significantly elevated (65%) (Yoshifumi, et al., 2014). In human studies, exercise has been shown to significantly increase Irisin concentrations (Boström et al. 2012; Huh et al. 2012; Kraemer et al. 2014). it was compared between endurance with high intensity exercise and low intensity exercise after exercise, the high intensity exercise showed more PGC-1α concentration in the blood than low intensity exercise (Egan et al. 2010), although the effect of exercise-induced on Irisin response was not determined in that study. Although some studies have observed a significant increase in the concentration of serum Irisin after regular dose of physical exercise depending on variables such as intensity and type of exercise (aerobic, anaerobic, resistance) which can be affected the response and

concentration of Irisin hormone in the blood. It was found that aerobic exercises increases the concentration of Irisin hormone in the blood (Norheim, et al., 2014) ,and also (Miyomoto, et al., 2015) concluded that performing aerobic exercises for 8 weeks for 30 min has positive effect on Irisin Hormone. As for anaerobic exercises, it effected was positively in the study of (Huh, et al., 2015) and also in the study of (Yoshifumi, et al. 2014), where the level of Irisin hormone increased significantly. And also (Kim, et al., 2015) emphasized that resistance exercises elevated the concentration of Irisin hormone in the blood, as training according to resistance exercises for 12 week led to a high level of Irisin hormone in blood when comparing pre and post tests.

There are limited studies designed for assessing the effect of different type of physical exercises on Irisin hormone, there for the main aim of the current study is to compare the effect of eight weeks of three different types of exercises (aerobic, anaerobic and resistance) on Irisin Hormone expression for healthy male sport practitioners.

Methodology:

Research approach:

The experimental approach was used to conduct the study.

Sample and participants:

66 healthy male sports practitioner represented the sample of the study, and participated voluntary from college of physical education and sport science university of Duhok for the academic year 2018 – 2019, and divided into three experimental groups, the first group performed aerobic exercises (AE) 22, the second group performed anaerobic exercises (ANE) 22, and the third group, performed resistance exercises (RE) 22.

Experimental Design:

Before starting the experimental period, the three groups asked for their Signature on consent form for participating in the current study and conducted the beep test for determining the vo2max for each participant, and then the blood samples were taken from the participants and fat measurement were done. hereafter, the three groups entered the training program for 8 weeks 3 times in a week. the first group performed aerobic exercises starting with 20 min running in the first week and end up with 45 min running, the second group performed anaerobic exercises which consisted of a group of printings for example (4×30m, 3×40m and 2×50m), and the third group performed resistance exercises which each session involved 8 exercises with 3 sets and 10 repetitions for example (Bench Press, Bench Press dumbbells, Squats, Lat Pull-down, Triceps Pushdown, Barbell Curl, Leg curl, concentration curl). After ending the training programs the three groups conducted the beep test again for determining the VO2max, and the blood samples were taken from the participants, also the body fat was measured.

Blood Analysis:

All blood samples were performed in the same laboratory for control inter-assay variance. Irisin serum was measured by using Human Irisin ELISA Kit use of the commercial assay Kit from Sun Red Biotechnology Company reference DZE201127412.

Body fat measurement:

(BF508) was used for monitoring the body composition (Body weight, BMI, Visceral Fat level and Body Fat percentage), manufactured by Omron model (HBF-508-E) with a serial number (846692).

Statistical Analysis:

All statistical data analyses were performed using SPSS version 25. For checking the differences between the pre-test for all groups for the purposes of homogeneity and equivalence of the sample one-way ANOVA with Post Hok Tukey was conducted, and the same for the post-test for checking the significance between the three groups. Comparisons between pre-test and post-test within one type of exercise were performed by the paired sample t-test. P value was set to < 0.05 be statistically significant.

Results: Table (1) shows the mean and standard deviation of demographic variables in the study, and there as it shown there is no significant different between groups.

Table (1) the mean ± SD of the demographic variables of the study for Pre-tests program

variables	Aerobic	Anaerobic	Resistance	sig
	Mean ± SD	Mean ± SD	Mean ± SD	
Age (years)	20.58 ± 1.3	21.25 ± 2.1	21.66 ± 2.25	0.15
Height (cm)	175.75 ± 7.25	176.54 ± 5.9	176.41 ± 6.5	0.20
Weight (kg)	67.52 ± 6.5	71.4 ± 9.1	70.31 ± 9.3	0.81
BMI (kg/m^2)	22.15 ± 2.42	23.09 ± 2.33	22.89 ± 2.44	0.368
Smokers	6	5	7	

Table (2) presents the results before the interventions, and shows that there was no significant difference between the three groups for all variables

Table (2) the mean ± SD of the of the study for Pre-tests program

variables	Aerobic	Anaerobic	Resistance	sig
	Mean ± SD	Mean ± SD	Mean ± SD	

BMI (kg/m2)	22.15 ± 2.42	23.09 ± 2.33	22.89 ± 2.44	0.37
Body fat (%)	17.07 ± 5.69	19.84 ± 5.7	19.12 ± 7.5	0.31
Visceral fat (level)	5.9 ± 2.48	6.7 ± 2.49	5.79 ± 3.37	0.44
VO2max (mL/kg/min)	39.64 ± 5.4	38.98 ± 7.5	38.77 ± 7.4	0.89
Irisin (ng/ml)	1.61 ± 0.26	2.09 ± 0.65	2.53 ± 1.33	0.140

BMI: Body mass index; BF: Body Fat; VF: Visceral Fat

Table (3) shows the mean and standard deviation and p value of lipid profile before the interventions, and shows that there was no significant difference between the three groups.

Table (3) the lipid profile variables of the study for Pre-tests program

variables	**Aerobic**	**Anaerobic**	**Resistance**	**sig**
	Mean ± SD	Mean ± SD	Mean ± SD	
HDL (mmol/L)	40.16 ± 9.3	42.45 ± 9.76	40.83 ± 7.34	0.66
TG (mmol/L)	72.67 ± 25.01	88.08 ± 36.61	87.79 ± 50	0.24
Chol (mmol/L)	141.16 ± 33.41	148 ± 24.55	151.29 ± 30.75	0.49
LDL (mmol/L)	86.46 ± 25.64	87.31 ± 24.22	91.97 ± 29.20	0.74
VLDL (mmol/L)	14.82 ± 4.18	16.58 ± 7.84	18.31 ± 9.9	0.29

HDL: High-Density Lipoprotein; LDL: Low-Density Lipoprotein; TG: Triglyceride; Chol: Cholesterol; VLDL; very low-density lipoprotein

Table (4) presents the results after the interventions, where there significant difference between the three groups as it shown in the table (4) in BMI (p = 0.01), VF (p = 0.03), Irisin (p = 0.01), whereas there is no significant difference in BF (p = 0.23) and VO2max (p = 0.49).

Table (4) the mean ± SD of the study for Post-tests program

variables	**Aerobic**	**Anaerobic**	**Resistance**	**sig**
	Mean ± SD	Mean ± SD	Mean ± SD	
BMI (kg/m2)	21.37 ± 1.9	22.70 ± 2.1	23.82 ± 1.6	0.01
Body fat (%)	13.20 ± 3.1	15.31 ± 4.5	14.39 ± 4.2	0.23
Visceral fat (level)	4 ± 1.5	5.2 ± 2	3.5 ± 1.5	0.03
VO2max (mL/kg/min)	42.73 ± 3.8	42.54 ± 5.2	44.16 ± 5.4	0.49
Irisin (ng/ml)	3.67 ± 1.93	2.94 ± 1.91	5.83 ± 2.99	0.01

Table (5) shows the results after the interventions for lipid profile variables, where there are significant difference between the three groups in TG (p = 0.03), VLDL (p = 0.01), while there is no significant difference in HDL (p = 0.18) and LDL (p = 0.18) and Chol. (p = 0.50)

Table (5) lipid profile variables of the study for Post-tests program

variables	**Aerobic**	**Anaerobic**	**Resistance**	**sig**
	Mean ± SD	Mean ± SD	Mean ± SD	
HDL (mmol/L)	54.54 ± 22.8	47.37 ± 15.5	58.16 ± 21.3	0.18

TG (mmol/L)	66.75 ± 18.1	88.70 ± 38.8	101.08 ± 61.1	0.03
Chol (mmol/L)	145.29 ± 28.6	140.37 ± 20.4	149.29 ± 28.8	0.50
LDL (mmol/L)	83.13 ± 24.1	77.46 ± 16.1	70.16 ± 28.4	0.18
VLDL (mmol/L)	13.26 ± 3.8	18.12 ± 7.77	21.14 ± 13.1	0.01

Table (6) shows the results of Paired t-test between pre and post tests for each group, where for AE there was significant difference between pre and post-test for BMI (p = 0.01), BF (p = 0.01), VF (p = 0.01), Vo2max (p = 0.01), HDL (p = 0.01), Irisin (p = 0.01). For ANE group there was significant difference between pre and post-test for BMI (p = 0.02), BF (p = 0.01), VF (p = 0.01), Vo2max (p = 0.02), Irisin (p = 0.03). For RE there was significant difference between pre and post-test for BMI (p = 0.01), BF (p = 0.01), VF (p = 0.01), HDL (p = 0.02), LDL (p = 0.001), Irisin (p = 0.01).

Table (6) Paired t-test between pre and post tests for each group

variables	Aerobic			Anaerobic			Resistance		
	pre	post	T-test p. value	pre	post	p. value	pre	post	p. value
BMI (kg/m2)	21.93 ± 2.5	21.32 ± 1.2	0.02	23.13 ± 2.3	22.65 ± 2.05	0.02	22.67 ± 2.5	23.94 ± 1.62	0.02
BF (%)	16.89 ± 5.5	13.08 ± 3.1	0.01	20.15 ± 5.9	15.40 ± 4.44	0.01	18.53 ± 7.61	14.78 ± 4.81	0.01
VF (level)	5.73 ± 2.5	3.96 ± 1.5	0.01	6.73 ± 2.6	5.15 ± 2.01	0.01	5.54 ± 3.39	3.70 ± 1.62	0.01
VO2Max (mL/kg/min)	39.77 ± 5.2	42.88 ± 3.7	0.01	38.71 ± 7.3	42.18 ± 5.33	0.02	38.79 ± 7.15	40.48 ± 5.1	0.06
HDL (mmol/L)	40.17 ± 9.3	54.54 ± 22.8	0.01	42.46 ± 9.8	47.38 ± 15.5	0.22	40.83 ± 7.35	58.17 ± 21.28	0.02
TG (mmol/L)	72.67 ± 25.2	66.75 ± 18.1	0.30	88.08 ± 36.6	88.71 ± 38.8	0.96	87.79 ± 50.10	101.08 ± 61.1	0.19
Chol (mmol/L)	141.17 ± 33.4	145.29 ± 28.6	0.66	148 ± 24.6	140.38 ± 20.3	0.21	151.29 ± 30.8	149.29 ± 28.8	0.74
LDL (mmol/L)	86.47 ± 25.7	83.13 ± 24.1	0.66	87.17 ± 24.8	77.46 ± 16.11	0.08	91.97 ± 29.20	70.17 ± 28.37	0.01
VLDL (mmol/L)	14.83 ± 4.19	13.26 ± 3.8	0.12	16.63 ± 7.8	18.12 ± 7.78	0.49	18.32 ± 9.9	21.14 ± 13.11	0.22
Irisin (ng/ml)	1.62 ± 1.27	3.67 ± 1.93	0.01	2.06 ± 0.65	2.94 ± 1.91	0.03	2.53 ± 2.33	5.83 ± 2.1	0.01

Fig (1) showed the concentration level of Irisin Hormone was significantly increased in comparison between AE and RE (p < 0.01), also there was Significant different in comparison between AE and RE (p < 0.01)

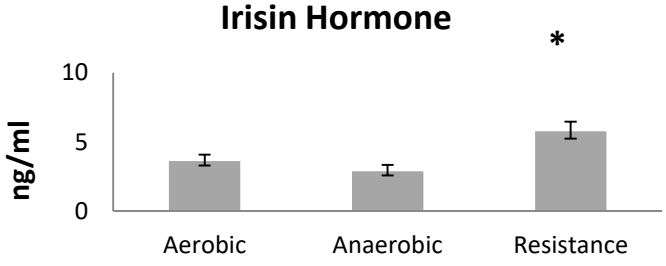

Figure (1) The changes in Irisin and intragroup comparison for post-test in the study groups.
*** Significant different in comparison between AE and RE (p < 0.01)**
 # Significant different in comparison between ANE and RE (p < 0.01)

Discussion

The present findings showed a positive effect of three kinds of exercises on BMI, VF, BF, VO2max, and Irisin hormone, when comparing the data within the group between pre and post testes. Effect of type of exercise on the Irisin level was shown in Fig (1) where there was a significant improvement for the resistance exercise group compared with the aerobic and anaerobic exercise group.

There are some previous studies reporting changes in Irisin concentrations in blood after exercise. The study was designed by Boström et al., (2012) in which 3 weeks of swim training resulted in the increment of 65 % of Irisin level in blood circulation in mice and for 8 human subjects for 10 weeks of endurance exercise increased double in resting Irisin concentrations, and these results correspond with the current study, where anaerobic exercise includes 3 set of 30, 40, and 50 meter sprints and showed increased level of Irisin hormone. Another investigation by Huh et al., (2012) Stated that the acute increases by 18 % in circulating Irisin concentrations after anaerobic exercise for 30 min after completing 2 sets of 2×80 meters sprints with 10 sec or 1 min rest between each sprint and 20 min between sets, there results also agreed with the results of present study.

In addition, current results show positive effect on reduction of body fat, visceral fat and BMI which corresponded with the study of (Murawska-Cialowicz, et al., 2015), it can be justified the improvement of Irisin level because of the reduction of body fat and BMI, where during the physical exercises the Irisin Hormone changed the white adipose tissue to brown adipose tissue which result of to increase the energy expenditure and decrease body fat and BMI. As several researchers examined the relationship between Irisin concentration, adiposity, and obesity in humans, for example, some studies stated a positive correlation between Irisin levels, adiposity and BMI (Liu, et al., 2017; Crujeiras, et al., 2014; Stengel, et al., 2013), whereas a study found a negative correlation between Irisin levels, the amount of fat tissue and BMI (Grygiel-Gorniak & Puszczewicz, 2017). The positive association between Irisin level and BMI might attributed to given the increase in muscle mass, and also other tissues, such as adipose tissues may be involved (Moreno-Navarrete, et al., 2013; Huh, et al., 2012).

Conclusion: The results of the current study demonstrates, the effect of three types of exercise (aerobic, anaerobic and resistance) on blood Irisin hormone level, body fat, visceral fat and lipid profile for sport practitioners after participating in three different interventions for 8 weeks. in general sport exercise has a great effect on improvement of the exercising skeletal muscles abilities and body performances which showed by increasing Irisin level in blood and decrease body fat and visceral fat. Following the resistance exercise which was found to be more effective in the increment of the Irisin hormone level than aerobic and anaerobic exercises, the physiological explanation of this finding that 8 weeks of progressive resistance exercise training increase strength and cause changes in muscle size by stimulating the catabolic effect (muscle tear during progressively resistance exercise) and the re-growth or the anabolic effect after that, might induced muscle fibers hypertrophy. A similar finding by Wayne L Westcott (2012), who suggested that ten weeks of resistance training may increase lean weight by 1.4 kg, increase resting metabolic rate by 7%, and reduce fat weight by 1.8 kg and increasing the density of glucose transporter type 4, and improving insulin sensitivity therefore increasing the influx of glucose and amino acids towards inside of skeletal muscle cells. The Benefits of resistance training include improved physical performance, movement control, walking speed, functional independence, cognitive abilities, and self-esteem.

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تأثير ثمانية أسابيع من البرامج الرياضية على مستوى إيريسين الدم لدى ممارسي الرياضة الذكور الأصحاء

الملخص:

هدفت الدراسة الى الكشف عن تأثير ثلاثة أنواع مختلفة من التمارين الرياضية في مستوى هرمون الايريسين ومؤشر كتلة الجسم ومستوى الدهون لدى ممارسي الرياضة الاصحاء. واستخدام الباحثون المنهج التجريبي لإجراء الدراسة. شارك 66 ممارسًا رياضيًا صحيًا في هذه الدراسة وتم تقسيمهم إلى ثلاث مجاميع تجريبية ، تتكون كل مجموعة من 22 فردًا ، المجموعة الأولى نفذت تمارين هوائية (AE) ، المجموعة الثانية قامت بإداء التمارين اللاهوائية (AnE) ، والمجموعة الثالثة أدت تمارين المقاومة (RE). قبل الدخول الى البرنامج التجريبي تم اجراء (beep test) لتحديد القيمة القصوى لاستهلاك الاوكسجين (VO2max) لمجاميع البحث التجريبية الثلاث ، ثم تم أخذ عينات من الدم وعينات الادرار من كل مشارك. بعد ذلك خضعت المجموعات الثلاث للبرامج التدريبية الخاصة بكل مجموعة ولمدة ثمانية أسابيع ولثلاث مرات اسبوعيا اي بمجموع (24) وحدة تدريبية . وبعد الانتهاء من البرامج التدريبية تم اعادة (beep test) مرة أخرى لتحديد القيمة القصوى لأستهلاك الاوكسجين (VO2max) وأخذت عينات الدم و الادرارمن المشاركين.

وبعد جمع بيانات البحث تم معالجتها احصائيا باستخدام برنامج SPSS الإصدار 25. للتحقق من الفروق بين الاختبارات القبلية لجميع المجموعات تم إجراء ANOVA أحادي الاتجاه مع Post Hok-Tukey ، وكذلك بين الاختبارات البعدية للمجموعات الثلاث . وللتحقق من الفروق بين الاختبارات القبلية والبعدية داخل المجموعة الواحدة تم استخدام اختبار (t) المرتبط .

وبعد معالجة البيانات احصائيا استنتج الباحثون بان للبرامج التدريبية الثلاثة تاثيراً ايجابياً في زيادة مستوى هورمون الايريسين بالاضافة الى خفض دهون الجسم والدهون الحشوية وكذلك مؤشركتلة الجسم بشكل ايجابي لدى ممارسي الرياضة. كما تبين بان لتدريبات المقاومة التأثير الاكبر في رفع مستوى هورمون الايريسين مقارنة بالتدريبات الهوائية واللاهوائية.