



Effect of Training Program in Terms of ACTN3 Gene Alleles on Strength Achievement Endurance and Snatch for Youth Weight-Lifters

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ABSTRACT

The aim of this study was to know the effect of training program in terms of the ACTN3 gene alleles on strength endurance and snatch achievement for youth weight-lifters. 17 youth weight-lifters of Altadhamin Club/ Alnajaf province was intentional assigned to 3 groups by depending on ACTN3 gen test. Group (1) included 4 players who have type of pure (RR) alleles, group (2) involved 8 players who have type of hybrid (RX) alleles, and group (3) included 5 players who have type of recessive (XX) alleles. Participants in all groups performed 12 weeks of high-intensity training 70-100% (2-5 sets with 1-15 repeats of one repeat maximum, 2-5 minutes rest), 3 times a week. Data were analyzed by SPSS program and paired sample T-test was used to compare mean of previous and post of information. Finally a significant change was observed on developing muscles strength endurance and snatch achievement of subject to three groups and players that have gene (ACTN3) Alleles (XX) types had high ability in strength endurance comparatively with others have same gene but (RX) type and (RR) type.

Keywords: Training program, ACTN3 gene alleles, strength endurance, snatch, youth weight.

1. Introduction

Many previous studies and researches are focused on muscle strength in weight-lifting and how to improve and develop the strength for weight-lifters, through these previous researches and studies have been structured many training courses using the ways and different styles during the training process, this subject has been starting study, discovery, and planning of the training process depending on all of the other sciences related with sport training, however, all these studies have not interested in the subject of genetics during their researches, studies and construct the training curriculums in spite of the importance of this vital issue which is the first factor to effect in the process of training.

Genetics have a great importance in the field of sports especially regarding the composition of athletes genetic especially it is responsible for determining the type of physical characteristics of these athletes, moreover subject of genetics is occupied thinking of all the scientists and specialists in the developed world and how we can benefit from it in the various life fields including the sports field. The fast development in the science of genetic engineering, genes, and discover the human genome map have been identified the genes responsible for physical performance which has been divided into four types according to the types of sports activities aerobic and anaerobic and lactic system and fourth type regards to the body composition and fat percentage, for instance (the gene responsible for the strength and fatigue ACTN3), (the gene responsible for endurance HIF1A), (the gene responsible for lactate MCT1), and finally (the gene responsible for body composition ADRB2) these genes clarify the differences in performance between athletes (Baha., 2010).

The importance of present study is investigated exclusively subject of genetics especially genes responsible for the production of muscle strength in the skeletal muscle of weightlifters a gene ACTN3 during the preparation of the curriculum in accordance with this gene and the alleles of this gene as well as how it relates to the kinds of muscle strength in general and strength endurance in particular and reflection of this on the development of endurance strength of weightlifters and achievement of kidnapping eminence which is reflected in turn benefit the subject of the study in addition to coaches during prepare the training curriculums and shortcut the time and effort during the training process. So the aim of current study is to know the effect of training program in terms of the ACTN3 gene alleles on strength endurance and snatch achievement for youth weight-lifters.

2. Methodology

2.1 Subject:

17 youth weight-lifters of Altadhamin Club/ Alnajaf province was intentional assigned to 3 groups by depending on ACTN3 gen test. Group (1) included 4 players who have type of pure (RR) alleles, group (2) involved 8 players who have type of hybrid (RX) alleles, and group (3) included 5 players who have type of recessive (XX) alleles.

2.2 ACTN3 and alleles tests:

Researchers depended on a group of specialists in the field of laboratory analyzes especially genetics, however, the analysis of gene has been conducting using equipment and chemicals using a series of polymerase chain reaction, where the process of laboratory analysis of knowing the type alleles of the gene ACTN3 gone through several stages as follow.

A. Collection blood sample.

B. Stages lab tests.

First stage: This stage is included following steps.

1. Extraction and purification of DNA.
2. Electrical deportation (used in all three phases for the detection of DNA).

Second stage: Preparation polymerase chain reaction (PCR).

1. Primers preparation.
2. Preparation polymerase chain reaction (PCR).

Third stage: included following.

1. Polymerase chain reaction and restriction fragment length polymorphism experiments.
2. Electrical deportation for detection about ACTN3.

2.3 Physical tests of speed strength:

Researchers have read list of scientific resources relate to present study and they discussed the tests with specialists of measurement and test in weight-lifting sport as well as researchers have been showed the list of tests through questionnaire to the experts to know the validity of tests.

2.3.1 Test of ballast kidnapping above the knee (the first third of the thigh) with 70% intensity until effort exhausting:

The aim of present test is to measure speed strength for body muscles participated in gravity kidnapping performance. weightlifter Stands in front of ballast and take the correct position in terms of distance between the feet and arms who are in status couch the bar which is stable on the table rise 40 cm to be a ballast slightly higher than the knee joint (the first third of the thigh). However, weightlifter has to be made all conditions required to put the start in terms of tightening muscles of the body and the chest being in front with the back arched and arms stretched out and coach the bar as well as position of the head has to be in the front of the top and look in front, when the start signal is heard the weightlifter will kidnapping of bar above the knees until reach to the cross-legged sitting position and the promotion of stability and heaviness of weight was in intensity of 70% of the maximum counts. Weightlifter from unsustainable and leads to repeat it till exhausting effort. Noting, we recorded the correct performance with a 70% intensity.

2.3.2 Achievement test of kidnapping lifting:

Achievement tests were conducted for the study subject in Al-Tadhamin Club/ Al-Najaf province by giving every weightlifter three or four attempts as in international law has been to choose the best weight and the successful attempt.

2.4 Pre-tests:

Dated 21st of October 2012 on Sunday at nine o'clock in the morning was conducted tests of kidnapping lifting for study subject in Al-Tadhamin Club/ Al-Najaf province and on 22nd of October 2012 Monday at nine o'clock in the morning was achieved tests of strength endurance for study subject in Al-Tadhamin Club/ Al-Najaf province too.

2.5 Training approach:

Participants in all groups performed 12 weeks of high-intensity training 70-100% (2-5 sets with 1-15 repeats of one repeat maximum, 2-5 minutes rest), 3 times a week. The time of one training unit was 90-100 minutes whereas time of used exercises in training approach during main part of 55-70 minutes.

2.6 Post-tests:

Dated 1st of February 2013 on Friday at nine o'clock in the morning was conducted tests of kidnapping lifting for study subject in Al-Tadhamin Club/ Al-Najaf province and on 2nd of February 2013 Saturday at nine o'clock in the morning was achieved tests of strength endurance for study subject in Al-Tadhamin Club/ Al-Najaf province too.

2.7 Statistical analysis:

SPSS was used to analyze data of present study and we used mean, standard deviation, different coefficient, independent T test, F test for unequal samples, and test of L.S.D.

3. Results and Discussion

(Table 1)

Shows mean, SD, calculated T value for tests of maximum strength and achievement of the snatch lifting for first experiment group (gene RR)

Variables	Measure	Pre-test		Post-test		T test	Significant
		Mean	SD	Mean	SD		
Strength endurance	Numbers	9.75	0.95	11.75	1.25	3.46	S
achievement of the snatch lifting	Relativity	1.32	0.07	1.73	0.14	9.51	S

Tabulated T value at the freedom degree (3) and significant level (0.05)= 3.182

Table (1) showed significant differences between the results of pre and post-tests for all variables of study for the benefit of the post tests. The value of calculated (T) of strength endurance (3.46) while the value of calculated (T) of the snatch lifting (9.51), which are greater than tabulated (T) value (3,182) at the degree of freedom (3) and the level of significance (0.05). Through the results above, we observed the progress of experiment group by increasing the values of all variables of study in the post tests when compared to the values of pre-tests, this shows the evolution and improvement of the strength endurance that had an impact on the snatch lifting.

(Table 2)

Shows mean, SD, calculated T value for tests of maximum strength and achievement of the snatch lifting for second experiment group (gene RX)

Variables	Measure	Pre-test		Post-test		T test	Significant
		Mean	SD	Mean	SD		
Strength endurance	Numbers	10.12	1.35	11.25	0.70	3.21	S
achievement of the snatch lifting	Relativity	1.39	0.09	1.60	0.12	10.52	S

Tabulated T value at the freedom degree (7) and significant level (0.05)= 3.21

Table (2) showed significant differences between the results of pre and post-tests for all variables of study for the benefit of the post tests. The value of calculated (T) of strength endurance (3.21) while the value of calculated (T) of the snatch lifting (10.52), which are greater than tabulated (T) value (3.36) at the degree of freedom (7) and the level of significance (0.05). Through the results above, we observed the progress of second experiment group by increasing the values of all variables of study in the post tests when compared to the values of pre-tests, this shows the evolution and improvement of the strength endurance that had an impact on the snatch lifting.

(Table 3)

Shows mean, SD, calculated T value for tests of maximum strength and achievement of the snatch lifting for third experiment group (gene XX)

Variables	Measure	Pre-test		Post-test		T test	Significant
		Mean	SD	Mean	SD		
Strength endurance	Numbers	9.8	1.32	17.6	1.49	7.64	S
achievement of the snatch lifting	Relativity	1.33	0.16	1.42	0.12	3.42	S

Tabulated T value at the freedom degree (4) and significant level (0.05)= 2.77

Table (3) showed significant differences between the results of pre and post-tests for all variables of study for the benefit of the post tests. The value of calculated (T) of strength endurance (7.64) while the value of calculated (T) of the snatch lifting (3.42), which are greater than tabulated (T) value (2.77) at the degree of freedom (4) and the level of significance (0.05). Through the results above, we observed the progress of third experiment group by increasing the values of all variables of study in the post tests when compared to the values of pre-tests, this shows the evolution and improvement of the strength endurance that had an impact on the snatch lifting. Researchers attribute the improvement in variables of study into training approach which helped to increase the ability of working muscles through performance to resistance the fatigue for longer period of time, where development strength endurance is very important because it helps to bear the loads of increasing the quantity and quality of effort that was underwent a weightlifter during trainings forms of muscular strength and contributes to avoid sports injuries, the aim of the training curriculum prepared by the researcher to develop the muscle strength

endurance through the development of the ability of muscle groups to produce repeated contractions under conditions of fatigue where organized exercises through training modules including the diversity of intensities and repetitions in addition to its proximity to the actual performance of the snatch led to raise the level of strength endurance of these muscles, these results support the principle of diversification as the "training which has a sufficient level of intensity and size in addition to their diversification in the excitability of the nervous system is a successful approach in the development of strength endurance as well as maximum strength and speed-strength" (Carter & Achland, 1994).

(Table 4)

Shows the average squares between groups and within them with calculated and tabulated (F) value for post-test between three study groups for tests of maximum strength and snatch lifting

N	Variables	Source of variation	Total squares	Freedom degree	Average squares	Calculated F value	Tabulated F value	Significant
1	Strength endurance	Between groups	135.609	2	67.804	48.805	3.73	S
		Within groups	19.450	14	1.389			
2	Snatch lifting	Between groups	0.215	2	0.108	6.067		S
		Within groups	0.248	14	0.018			

Tabulated F value at the freedom degree (14-2) and significant level (0.05).

Table (4) showed varying differences of preference between the three groups. The calculated (F) value for the snatch lifting (6.067), this value is greater than the tabulated (F) value amounting to (3.73) at the level of significance (0.05) and the degree of freedom (2-14) which shows there are varying differences preference between the three groups. To know the best group between three experiment groups clearly researchers were achieved value less of significant difference (L.S.D).

(Table 5)

Shows comparison of mean differences between the three groups and values of mean differences and value of standard error and significant of maximum strength and snatch lifting tests

Tests	Comparison between groups	Mean	comparison between mean differences	standard error	Significant
Strength endurance	G1-G2	11.25 -11.75	0.50	0.721	0.500
	G1-G3	17.60 -11.75	*5.85	0.790	0.000
	G2-G3	17.60 -11.25	*6.35	0.671	0.000
Snatch lifting	G1-G2	1.60 – 1.73	0.12	0.081	0.137
	G1-G3	1.42 – 1.73	*0.30	0.089	0.004
	G2-G3	1.42 – 1.60	*0.17	0.075	0.035

Significant level (0.05).

Through results which showed in tables (4 and 5) there were clear outweigh for one of the experimental groups on the other two groups in specific variable of study variables, so the researchers see this excellence and significant difference for any of these groups to type allele which subject of these groups have a gene of ACTN3 which had an active role in the development of that variable better than the other two groups because all three experimental groups underwent the same training curriculum and the same intensities, repetitions and rest periods (the same volumes of training) and in the same time period, both units training or curriculum as a whole as well as the same circumstances surrounding the performance of approach.

Third experimental group who its individuals have gene ACTN3 with hybrid allele XX was outweighed in strength endurance variable clearly on the other two groups with allele (pure RR, hybrid RX) which indicates the members of this group to what are characterized by the type allele (dominant recessive XX) where enabled them to achieve this superiority to members of the other groups in strength endurance despite all of groups had the same training curriculum and were equal in all circumstances except type allele of the gene ACTN3 which was different from the others, we mean (allele XX) with the capacity and efficiency of this allele to increase ability of muscle to resistance the fatigue and work for a longer period of time under conditions of fatigue and this is due to the structural and biochemical characteristics.

Muscles that lose actin protein -3 shows a change in the characteristics of the fastest to slowest (Bustamante *et al.*, 2010), mechanical changes indicate increasing demolitions cellular metabolism Catabolic for a group of individuals living with allele X and a defect in muscle performance compared to individual people living with installation RR and RX while the state of oxidative stress in muscle of individuals with installation XX is characterized by a total change in cellular metabolism. However, the reductase enzyme of glycogen phosphorylation prevents power supply by anaerobic cellular metabolism, reduction in the absorption of calcium ions

Ca⁺⁺ for endoplasm of the muscle cell, cause longest time of relaxation, small in the vicinity of the muscle, and a high level of enzymes oxidation of all these factors explain the loss of functional muscle fibers type II in individuals with genotype XX leading to the changes in the properties of contraction and cellular metabolism compared to the activities of frequent and high intensity in deviation from the center inotropic (eccentric) (Pimenta *et al.*, 2012). As a result of genotype of allele XX has a high capacity of endurance or fatigue resistance for a certain time period, so the member of allele XX group was excellence on the other groups, moreover, the results of present study were agreed with number of other studies for instance (Yang *et al.*, 2003; Macarthur & North., 2004; Moranet *et al.*, 2005; Niemi & Majamaa., 2005) where they said that genotype does not show strength or speed itself, but to determine strength endurance.

The differences and preference for variable of snatch lifting achievement note outweigh all of the members of the two groups, which holds its members the allele RR and the second group which holds its members RX allele at the expense of the third group which holds its members allele XX. Researchers confirm that snatch lifting requires strength maximum during motor performance of lifting especially in some of its stages which require overcoming the resistance of ballast in addition to overcome resistance ground attraction for it. This explains the causes of outweigh two groups RR and RX in snatch lifting due to the subject of these groups distinguished the ability to perform the skill at maximum strength and speed (Vincent., 2005).

4. Conclusion

We concluded that a significant change was observed on developing muscles strength endurance and snatch achievement of subject to three groups and players that have gene (ACTN3) alleles (XX) types had high ability in strength endurance comparatively with others have same gene but (RX) type and (RR) type.

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