The Effectiveness of Complex Training to Develop Muscular Power in the Light of Genetic Diversity of Angiotensin-Converting Enzyme (ACE) on the Numerical Level in Triple Jump

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The objective of the current research was to identify the effect of using a program of complex training in the light of genetic diversity of Angiotensin-Converting Enzyme (ACE) through knowing the effect of using the complex training on muscular power of legs, arms and the level of numerical level in the triple jump event in the light of genetic diversity (ACE). The researcher applied the experimental method to a sample of (18) students in the 4th grade specialized in training field and track events, Faculty of Physical Education for Boys, Zagazig University, divided into two experimental groups representing the 1st experimental group of (8) students characterized by having ACE/lD gene and the 2nd experimental group of (10) students characterized by having ACE/DD gene. The research tools included muscular power, the numerical level in triple jump event and the content of the complex training program.

Results:

1- The proposed complex training program had a significant positive effect at 0.05 significance level on muscular power of legs and arms and the level of numerical level in the triple jump event in student of the 1st experimental group having ACE/ID gene and the 2nd experimental group having ACD/DD gene.

2- There were significant differences at 0.05-significance level between the two post-measurements of the 1st and 2nd experimental groups in muscular power of legs and arms and the numerical level of triple jump in favor of the 2nd experimental group having ACD/DD gene.

Introduction and research problem:

* Asst. Prof. Dept. of Theories and Applications of Field and Track Events Faculty of Physical Education for Boys, Zagazig University Abstract:

The athletic individual needs the suitable gene to reach the top level of the sport. One of the most important genes has been discovered and called ACE gene as it is associated with angiotensin-converting enzyme which is active in muscular tissues to regulate blood flow and hence, it affects physical performance.

Hopekins, (1998), Montgomry, (1998) and Tsianos, *et al*., (2004) indicated that ACE gene was important and associated with the athletic field. They added that each individual had a type of genetic diversity of ACE gene as there were the long ACE II gene (Insertion), the short ACE DD gene (Deletion), the ACE ID gene as the diversity (I) is longer than the diversity (D) by (287) base pairs.

Tsianos, *et al*., (2004) added that there was a correlation between genetic diversity of ACE/I gene and performance of endurance athletes whereas the genetic diversity of ACE/D gene was correlated with the performance of speed and muscular strength athletes.

Complex training is considered as a blend of power and speed exercises to reach the optimal performance as the player gives the maximum results within the shortest possible time, moreover, it is one of the major training techniques used by athletes.

Ebben, *et al*., (2002) indicated that the complex training was weight exercises with high intensity followed directly by plyometric exercises to improve one physical characteristics that was muscular power that one weight set should be performed first then one plyometric set to be followed within a mechanically similar training series i.e. the muscular groups used in weight exercises should be the same muscular groups used in plyometric exercises.

The triple jumper needs enough strength for all muscles contracting joints of thighs, knees and ankle to push the body in the required direction as the explosive power is considered as the most important supports on which this skill acquisition and mastery is built so it is an attribute combining the power and speed since jumps need a specific speed together with pushing power of common

amount controlled by performance requirements.

The researcher noticed through his scientific and practical experience in teaching and training field and track events to students at Faculty of Physical Education, Zagazig that students in the 4th grade at the faculty have been unable to achieve high numerical levels in the triple jump event, however, they studied it practically in previous years at the faculty meaning that there was a problem needing suitably scientific solutions and the researcher suggested that one of the reasons leading to not achieving numerical levels in such event might be due to lacking muscular power of the lower limbs i.e. legs in students.

Also the researcher noticed through his perusal of scientific studies and web sites and to the limits of his information that Arab and foreign studies have not introduced the complex training in the light of genetic diversity of triple jumpers and its effect on muscular power of the lower limbs (legs) and consequential development of the numerical level in the triple jump event.

In this respect Mohammed Sobhi Hassanein (2002) indicated that the athletic champion was limited to what he had inherited whatever the training programs and the athletic practice were perfect as they could not make a champion from anybody free from factors of superiority and creativity.

From the foregoing the researcher decided to establish a training program for complex training to develop muscular power of legs and arms in the light of genetic diversity of angiotensin converting enzyme (ACE) to improve the numerical level in the triple jump event for students in the 4th grade at Faculty of Physical Education for Boys, Zagazig University.

Research objectives:

The purpose of the current investigation was to recognize the following:

1- The effect of using complex training on the muscular power of legs and arms in the light of genetic diversity of (ACE).

2- The effect of using complex training on the numerical level in the triple

jump event in the light of genetic diversity of (ACE).

Research hypotheses:

1- There are significant differences between the pre and post-measurements of the 1st experimental group of (ACE ID) gene and the 2nd experimental group of (ACE DD) gene in muscular power of legs and arms and the numerical level in the triple jump event in favor of the post-measurement.

2- There are significant differences between the two post-measurements of the 1st and 2nd experimental groups in muscular power of legs and arms and the numerical level in the triple jump in favor of the 2nd experimental group having ACD/DD gene.

Research procedures:

Method:

The researcher applied the experimental method for suiting the nature of the research by using the experimental layout of two experimental groups and conducting the pre and post-measurements.

Research sample and population:

The research population was students in the 4th grade specialized in training field and track events at Faculty of Physical Education for Boys, Zagazig University in the 1st term in 2015/2016 academic year amounting (25) students. After excluding students participating in the pilot study of (7) students, the researcher have selected the main research sample of (18) students intentionally by (72%) of the research population. The researcher classified the main research sample into two experimental groups representing the 1st experimental group of (8) students having ACE/ID gene and the 2nd experimental group of (10) students having ACE/DD gene.

Normality of distribution of the research sample individuals was computed in variables of growth, muscular power and the numerical level in the triple jump that may effect on the experimental variable.

Also the researcher found out equivalence between the 1st and 2nd experimental groups in the above variables under investigation as shown in Tables (1 & 2).

Table (1)

Significance of differences between the 1st and 2nd experimental groups in rates of growth, height and weight and the numerical level in the triple jump

variable	Units	1st experimental group ACE/ID n= 8		2nd experimental group ACE/DD n = 10		*t* Values
		$\bar{X}$	SD	$\bar{X}$	SD	
Age	yr.	٢١.٥٢	٠.٤٨	٢١.٧١	٠.٥٧	٠.٧١
Height	cm	١٧٥.٣٣	٤.٢٥	١٧٦.٠	٤.٩١	٠.٢٩
Weight	kg	٧١.٤٥	٣.٦٩	٧١.٨٢	٤.١٥	٠.١٩
Numerical level in triple jump	m	١٠.٣٠	٠.٣٢	١٠.٣٥	٠.٣٨	٠.٢٨

Tabulated *t* value at 0.05 significance level = 2.120

Data in Tale (1) show that there are no significant differences at (0.05) significance level between the 1st and 2nd experimental groups in rates of growth (age, height and weight) and the numerical level in the triple jump meaning that the two research groups are equivalent in such variables.

Table (2)

Significance of differences between the 1st and 2nd experimental groups in muscular power of legs and arms under investigation

Variables	Units	1st experimental group ACE/ID n= 8		2nd experimental group ACE/DD n = 10		*t* Values
		$\bar{X}$	SD	$\bar{X}$	SD	
Muscular power of legs on the vertical axis	cm	٣٩.١٥	٤.١٦	٣٩.٣٨	٤.٤٢	٠.١١
Muscular power of legs on the horizontal axis	m	١.٩٧	٠.١٣	٢.٠٢	٠.١٥	٠.٧١
Distance of 3 hops on the right	m	٦.٨٣	٠.٣٠	٦.٩٠	٠.٣٣	٠.٤٤
Distance of 3 hops on the left	m	٧.٣٦	٠.٣٩	٧.٤٧	٠.٤٢	٠.٥٤
Muscular power of arms	m	٥.٦٤	٠.٥٢	٥.٧٣	٠.٥٩	٠.٣٢

Tabulated *t* value at 0.05 significance level = 2.120

Data in Table (2) illustrate that there are no significant differences at (0.05) significance level between the 1st and 2nd experimental groups in muscular power of legs and arms indicating that the two experimental groups are equivalent in such variables.

Tools of collecting data:

I. Muscular power tests:

1- Stand vertical jump test.

2- Stand broad jump test.

3- 3 hops right/left.

4- 3kg medical ball push test.

II. Measurement of the numerical level in triple jump:

The numerical level in the triple jump event was measured according to what stated in the international law of immature athletics.

III. Biochemical measurements under investigation:

- A blood sample of (5cm) was taken from each student to carry out the necessary analyses by Polymerase Chain Reaction (PCR) that is a laboratory technique depending on in vitro multiplication of reduplication of (DNA) nucleic acid so it is a biological technique for cloning a specific piece of the nucleic acid and multiplication of it to be able to conduct extra medical measurements and examinations and such measurements were done at Faculty of Medicine, Zagazig University.
- Measurement of percentage of cholinesterase by using Spectrophotometer.
- Measurement of percentage of total protein in blood by using Spectrophotometer.

The proposed complex training program:

I. The program objectives:

1- Improving muscular power of legs and arms.

2- Improving the numerical level in triple jump.

II. Bases of placement of the program:

- Suitability of the selected exercises in the training unit for the research sample individual abilities.
- Diversity of performance of exercises in the training unit to make the student not feel of boredom.
- Performing extension and flexibility exercises at the

beginning of the daily training unit.

- Considering the principle of integration of exercises of (legs, arms and trunk) to achieve most possible benefit.
- The daily training unit included weight and plyometric exercises for the upper and lower limbs taking into account always starting with weight exercises to stimulate the greatest muscle group to be used directly in plyometric exercises.
- Giving a positive rest interval between each group and another for 1 m to 3 min.
- The researcher used the interval training method with its both parts of low and high intensities within the proposed training program.

Load intensity:

Foran, (2001) indicated that weight and plyometric exercises should be graded from low to medium and high intensities and in each phase the form of exercises should be changed according to the intensity to reach a higher level of performance.

In the light of foregoing, the researcher defined the intensity of the training load by 60% of the maximum load the student could endure. The load intensity in the proposed training program should not exceed 90%.

The size of load (repetition and sets):

Abu Al-Ella Abdel Fattah and Ahmed Nasr (2003) showed that the size of weight and plyometric exercises for the young should be in the range from (10 to 20) repetitions in one set and the number of sets should be in the range between (5 and 8) sets.

Internal rest intervals:

The majority of scientific references specialized in weight and plyometric exercises agreed that the rest interval should be till recovery and from this point, the researcher outlined the rest interval among sets between (1 and 2) min.

Time distribution of the complex training program:

- The time period of the training program was (8) weeks.
- Time of the training unit was (90) min.
- Rate of training was (3) units per week.

- The training program included (24) units.
- Total time of the program was (36) hr.

On the basis of the foregoing the content of the proposed training program to develop muscular power of legs and arms and the numerical level in triple jump was placed and prior to application, the program was presented to a group of experts in field and track events and athletic training who agreed by (80%) on the validity of the program for application.

Pre-measurements:

The researcher conducted the pre-measurements of individuals of the two experimental groups from 4/10/2015 to 7/10/2015 in muscular power and the numerical level in triple jump.

Applying the proposed program of complex training:

The content of the proposed program of complex training was applied to individuals of the 1st experimental group having (ACE/ID) gene and the 2nd experimental group having (ACE/DD) gene from 11/10/2015 to 5/12/2015 for (8) weeks by (3) training units a week after the end of the college day.

Post-measurements:

The researcher conducted the post-measurements of individuals of the first and second experimental groups in muscular power and the numerical level in triple jump from 7/12/2015 to 9/12/2015 with the same order and conditions of the pre-measurements.

Presentation and discussion of results:

I- Presentation and discussion of results of the 1st hypothesis stating "there are significant differences between the pre and post-measurements of the 1st experimental group having (ACE/ID) gene and the 2nd experimental group having (ACE/DD) gene in muscular power of legs and arms and the numerical level of the triple jump event in favor of the post-measurement".

Table (3)
Significance of differences between the pre and post-measurements of the 1st experimental group of ACE/ID gene in muscular power of legs and arms and the numerical level in triple jump n=8

variables	Units	Pre-measurement		Post-measurement		*t* Values
		$\bar{X}$	SD	$\bar{X}$	SD	
Muscular power of legs on the vertical axis	cm	٣٩.١٥	٤.١٦	٤٣.٢٧	٣.١٩	٢.٢١
Muscular power of legs on the horizontal axis	m	١.٩٧	٠.١٣	٢.١٥	٠.٠٦	٣.١٤*
Distance of 3 hops on the right	m	٦.٨٣	٠.٣٠	٧.٠٥	٠.٢٢	١.٩٧
Distance of 3 hops on the left	m	٧.٣٦	٠.٣٩	٧.٤٨	٠.٣٣	١.٠١
Muscular power of arms	m	٥.٦٤	٠.٥٢	٦.٢٣	٠.٣٨	٢.٥4*
The numerical level in triple jump	m	١٠.٣٠	٠.٣٢	١١.١١	٠.٢٧	٥.٣٨*

Tabulated t value at 0.05 significance level = 2.365
* Significant at 0.05 level.

Data in Table (3) illustrate that there are significant differences at 0.05-significance level between the pre and post-measurements in muscular power of legs on the horizontal axis and the muscular power of arms and the numerical level in the triple jump event in favor of the post-measurement but there are no significant differences in the other variables.

Table (4)
Significance of differences between the pre and post-measurements of the 2nd experimental group of ACE/DD gene in muscular power of legs and arms and the numerical level in triple jump n=10

Variables	Units	Pre-measurement		Post-measurement		*t* Values
		$\bar{X}$	SD	$\bar{X}$	SD	
Muscular power of legs on the vertical axis	cm	٣٩.٣٨	٤.٤٢	٤٧.٦١	٣.٣٣	٤.١٩*
Muscular power of legs on the horizontal axis	m	٢.٠٢	٠.١٥	٢.٣٨	٠.١٠	٥.٧٧*
Distance of 3 hops on the right	m	٦.٩٠	٠.٣٣	٧.٤٠	٠.٢٦	٥.٣١*
Distance of 3 hops on the left	m	٧.٤٧	٠.٤٢	٧.٩٥	٠.٣١	٤.٥٢*
Muscular power of arms	m	٥.٧٣	٠.٥٩	٦.٧٦	٠.٣٥	٦.٠٤*
The numerical level in triple jump	m	١٠.٣٥	٠.٣٨	١١.٦٠	٠.٢٩	٨.١٧*

Tabulated *t* value at 0.05 significance level = 2.365
* Significant at 0.05 level.

Data in Table (4) show that there are significant differences at 0.05-significance level between the pre and post-measurements of the 2nd experimental group in muscular power of legs and arms and the numerical level of the triple jump event in favor of the post-measurement.

The researcher attributed the improvement in muscular power of legs and arms and the numerical level in the triple jump event in individuals of the two experimental groups to the effectiveness of the proposed complex training program containing a sort of weight and plyometric exercises for the

upper and lower limbs where weight exercises were considered to be initiated first followed by plyometric exercises to stimulate the greatest number of muscle fibers. Also training loads were rationalized to match the nature of the research sample. This result agreed with that of Donald Chu (2000) who indicated that the complex training with weight exercises followed directly by explosive plyometric training serving to get the maximum benefit from resistance training in performing the explosive exercise as the resistance training stimulated the nervous system greatly with the result that more muscle fibers were stimulated and used in the explosive exercise and consequently, the greatest possible benefit was gotten when performing jump events in athletics.

Also this result agreed with that of Mahmoud Mohammed Essa (2006), Nada Hamed Rammah (2008) and Mohammed Kamal Amish (2013) indicating the effectiveness of using the weight and plyometric complex training in improving the muscle power and the numerical and technical levels in individual sports players.

Mohammed Hassan Allawi (1994) and Adel Abdel Basir (2005) were in agreement that the improvement of special physical characteristics was highly correlated with the development of motor skills in athletes.

Bastawisi Ahmed (1997) and Abdel Rahman Zaher (2001) added that muscular power of legs had a greatly active role in achieving high achievement levels in jumping events including the triple jump event. Hence, the validity of the 1st hypothesis is verified.

III. Presentation and discussion of results of the 2nd hypothesis stating, "there are significant differences between the two post-measurements of the 1st and 2nd experimental groups in muscular power of legs and arms and the numerical level in the triple jump event in favor of the 2nd experimental group having ACE/DD gene".

Table (5)
Significance of differences between the two post-measurements of the 1st and 2nd experimental groups in muscular power of legs and arms and the numerical level in triple jump

Variables	Units	1st experimental groupACE/ID N= 8		2nd experimental group ACE/DD n = 10		*t* Values
		$\bar{X}$	SD	$\bar{X}$	SD	
Muscular power of legs on the vertical axis	cm	٤٣.٢٧	٣.١٩	٤٧.٦١	٣.٣٣	٢.٦٥*
Muscular power of legs on the horizontal axis	m	٢.١٥	٠.٠٦	٢.٣٨	٠.١٠	٥.٣٥*
Distance of 3 hops on the right	m	٧.٠٥	٠.٢٢	٧.٤٠	٠.٢٦	٢.٨٧*
Distance of 3 hops on the left	m	٧.٤٨	٠.٣٣	٧.٩٥	٠.٣١	٢.٩٢*
Muscular power of arms	m	٦.٢٣	٠.٣٨	٦.٧٦	٠.٣٥	٢.٨٩*
The numerical level in triple jump	m	١١.١١	٠.٢٧	١١.٦٠	٠.٢٩	٣.٤٥*

Tabulated *t* value at 0.05 significance level = 2.120
*Significant at 0.05 level

Data in Table (5) clarify that there are significant differences at 0.05-significance level between the two post-measurements of the 1st and 2nd experimental groups in muscular power of legs and arms and the numerical level in the triple jump event in favor of the 2nd experimental group having ACE/DD gene. The researcher related this result to the nature of gene diversity between individuals of the 1slt experimental group having ACE/ID gene and the 2nd experimental group having ACE/DD gene. This result was in harmony with that of Tsianos, *et al*., (2004) who indicated that there was a correlation between ACE/I gene diversity and performance of sports enduring athletes and

ACE/D gene diversity and performance of speed and muscular strength athletes.

Also such result agreed with that of James Meek (2002), Cam et al., (2005), Colakoglu et al., (2005), Ehab Ahmed Metwalli (2008), Nada Hamed Rammah (2008), Mahmoud Mohammed Fahmy (2011), Wael Awad Ramadan (2011), Mohammed Kamal Amish (2013) and Abdel Rahman Basyouni Abdel Razek (2015) that athletes having ACE DD gene were characterized by higher level of muscular strength and power and speed whereas athletes having ACE ID gene were characterized by higher level of muscular endurance.

Nazarov *et al.*, (2001) added that ACE DD gene diversity was increased among athletes of strength sports as they were characterized by white speed muscular fibers and greater muscular size and high power production by using glucose during the performance.

Also such result tallied with those of James Meek (2002), Cam *et al.*, (2005) and Colakoglu *et al*., (2005) that differences among players in their responses to the same exercise could be due to many reasons and the most important one of which was gene diversity among athletes. Hence, the validity of the 2nd hypothesis is established.

Conclusions:

1- The proposed complex training program of (the 1st experimental group of ACE ID gene) had a significant positive effect at 0.05 significance level on muscular power of legs on the horizontal axis and muscular power of arms and the numerical level in the triple jump event in favor of the post-measurement but there were no significant differences in the other variables.

2- The proposed complex training program of (the 2nd experimental group of ACE DD gene) had a significantly positive effect at 0.05-significance level on muscular power of legs and arms and the numerical level in the triple jump event.

3- There were significant differences at 0.05-significance level between the two post-measurements of the 1st and 2nd experimental groups in muscular power of legs and arms and the numerical level in the triple jump event in favor

of the 2nd experimental group having ACE/DD gene.

Recommendations:

In the light of the research objectives and conclusions, the researcher recommended the following:

1- Training programs should be directed towards (ACEID/DD) gene diversity for its active effect on the development of muscular power of legs and arms and the numerical level in the triple jump event.

2- Using the complex training to improve muscular power of legs and arms for its positive effect on the numerical level in the triple jump event.

3- It is important to select young players in jumping events according to the biological technique.

4- Classifying and selecting young players in field and track events according to ACE ID/DD gene diversity.

5- More scientific studies on several types of genes should be conducted and they should not be in the limit of one gene only.

References

Arab references:

1- Abu Al-Ella Abdel Fattah and Ahmed Nasr (2003): Physiology of Physical Fitness. 2nd Ed. Arab Thought House, Cairo.

2- Ehab Ahmed Al-Metwalli (2008): Study of the relationship of gene diversity on the response of skeletal muscles to aerobic and anaerobic exercises in students at Faculty of Physical Education, Mansoura University. M.Sc. Thesis, Faculty of Physical Education, Mansoura University.

3- Bastawisi Ahmed (1997): Track Races and Field Events. Arab Thought House, Cairo.

4- Hussein Heshmat and Nader Shalabi (2003): Genetics in Sport. Book Publication Center.

5- Talha Hossam Al-Din Hussein (1997): Scientific Encyclopedia in Physical Training. Book Publication Center, Cairo.

6- Adel Abdel Basir (2005): Physical Training-Integration between Theory and Application. Book Publication Center.

7- Abdel Rahman Basyouni Abdel Razek (2015): The relationship between ACTN3 gene diversity and some physiological and physical variables as means of selecting

Kata Players. M. Sc. Thesis, Faculty of Physical Education, Sadat University.

8- Abdel Rahman Abdel Hamed Zaher (2000): Physiology of Jumping and Vaulting Events. Book Publication Center, Cairo.

9- Abdel Aziz Al-Nemr and Nariman Al-Khatib (1996): Weight Training – Designing the Strength Program and Planning the Sports Season. Book Publication Center, Cairo.

10- Essam Abdel Khalek (2000): Physical Training – Theories and Applications. 10th Ed. Knowledge Institution, Alex.

11- Mohammed Hassan Allawi (1994): Science of Sports Training. 3rd Ed. Knowledge House, Cairo.

12- Mohammed Hassan Allawi and Mohammed Nasr Al-Din Radwan (2001): Tests of Motor Performance. 5th Ed. Arab Thought House, Cairo.

13- Mohammed Sobhi Hassanein (2001): Measurement and Evaluation in Physical Education. Part 1, 4th Ed. Arab Thought House.

14- Mohammed Sobhi Hassanein (2002): Sports Selection. International Scientific Conference. Part 1, Faculty of Physical Education for Boys, Alex. University.

15- Mohammed Abdel Rahim Ismail (1998): Muscular Strength Training and Programs of Weights for Youngers. Knowledge Institution, Alex.

16- Mohammed Abdel Ghani Othman (1990): Encyclopedia of Athletics (Technique- Training- Teaching- Judging), Pen House, Kuwait.

17- Mohammed Kamal Amish (2013): Effect of developing muscular power by using circular exercises on high jump shooting accuracy in handball and its relationship with ACE gene diversity. Journal of Scientific Researches and Studies in Physical Education. No. (26), Faculty of Physical Education, Port Said University.

18- Mohammed Mahmoud Abdel Daim, Medhat Saleh and Tarek Al-Qattan (1993): Physical Preparation Training and Weight Exercises Program. Al-Ahram Presses, Cairo.

19- Mahmoud Mohammed Essa (2006): Effect of a proposed program for complex circle on bone mineral intensity, some free

radicals and the numerical level of long jumpers. Journal of Physical Education Researches, Vol. (39), No. (72), Faculty of Physical Education for Boys, Zagazig University.

20- Mahmoud Mohammed Fahmy (2011): Determination of actinin 3 gene diversity for higher levels players in the sport of weight lifting as a function of selection. M.Sc. Thesis, Faculty of Physical Education, Assiut University.

21- Nada Hamed Ramah (2008): Nada Hamed Rammah (2008): The effectiveness of confrontation exercises on developing muscular power and the level of performance of stoop vault with backward leg extension on vaulting horse in the light of gene diversity of angiotensin converting enzyme (ACE). Journal of Sciences and Arts of Sport, Vol. (29), Faculty of Physical Education for Girls, Helwan University.

22- Wael Awad Ramadan (2011): Training effects according to MCTI gene diversity and its relationship with some biochemical variables and the level of physical performance in handball players. Ph.D. Thesis, Faculty of Physical Education, Mansoura University.

23- Wafaa Farahat (2005): Biology. Dar Al-Youssef for Printing and Distribution, Beirut, Lebanon.

I. Foreign references:

24- Arthur, C.,(1987): Human Physiology and Mechanisms Of Disease , 4th , Ed. , W.B. Saunders Company , Sydney.

25- Barrow, M.,(2000) : Mechanical Kinesiology 2nd edition, C.V., Molsy, Saint Louis.

26- Bauer, T., (1995): Comparison of training modalities for power development in the lower extremity, J., of appl., Sport science research.

27- Blakey, J., & Southard, D., (2000): The Combined Effect of Weight Training and Plyometric on Dynamic leg Strength and leg Power, Journal of Applied Sports Science Research, 1, 14-16.

28- Buochard, C., & Fox, P.,(2000): Genetics and Environmental Contribution to the Acquisition of Motor Skill, Nature, 384 , P. 356 – 358.

29- Cam, F., (2005): Association between the ACE ID Gene

Polymorphism and physical performance in a homogeneous non-elite cohort ,Con., J., Apply Physiol.,Vol.,30,No.,1.

30- Colakoglu, M., (2005): ACE Genotype May have an effect on single versus multiple set preferences in strength training, Euro. J. Apply Physiol. Vol.102, No.3.

31- Daniel, H., (1999): Genetics, 3rd, Ed. Jones and Bartlett Publishers, London.

32- Donald Chu (2000): Explosive Power& Strength Complex Training for Maximum Results, Human Kinetics, London.

33- Ebben, et.al.,(2002): EMG and Kinetic Analysis for Complex Training Exercise Variables. Journal of Strength and Conditioning Research, 14 (4), 451-456.

34- Foran, B.,(2001): High – Performance, Sport Conditioning, Human Kinetics.

35- James Meek (2002): Gene governs muscle power, Thursday February 10 , the guardian.

36- Herm, K., (2003): Koerperfettmessung, Standers der Sportmedizin, Deutsche Zeitschrift fuer Sportmedizin, Jahrgang, 54 ,nr. 5 Deutschland.

37- Hopkins, W.,(1998): Performance Gene Discovered Sport ScienceVol.,2,No.,25.

38- Montgomry, H., (1998):" Human gene for Physical performance", Nature vol. 393.

39- Nazarov, B., et al.,(2001): The ACE ID polymorphism in Russian Athletes, European Journal, Human Genetics .

40- Tsianos, G., (2004): The ACE Gene Insertion /Deletion polymorphism and elite endurance Swimming, Euro. J. Apply Physiol. No., 92.

41- Walfarth, B., (2001): "Genetic polymorphism and performance related phenotypes", An Overview 6 An. Con., Eur. Col. Sport Sc.