

## The effect of the ACE gene forms in the maximum consumption of oxygen according to the central and Peripheral factors also physiological variables associated with the basketball players.

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### Abstract:

ACE gene is an enzyme found in the epithelial cells of the blood capillaries. It affects the circulatory system. This gene is active in the muscle tissue and regulates the blood flow. This facilitates the training of trainers and the effect of genes on the body's functions, which gives the possibility to determine the central factors determining the maximum consumption of oxygen and the most important of influencing it

As for the peripheral factors associated with the extraction of oxygen are the factors determining the maximum consumption of oxygen and there is no doubt that the importance of maximum consumption of oxygen as a determinant of athletic excellence depends to a large extent on the quality of the competition in which that individual, the importance of research, which was to identify the effect of the forms of ACE gene on the maximum consumption of oxygen according to the central and peripheral factors of the basketball players and to identify the effect of the contribution of the forms of ACE gene in both the central and peripheral factors .

As for the problem of research, the recent focus in the sport field directed towards the possibility of using genetics technology to change and improve the performance of the sport by genetic factors is determined the type of sport that fit the physical capabilities of the individual and also by detection of genes to know the functional potential , maximum consumption of oxygen , the central and peripheral factors. Therefore, the researchers decided to go into this study to answer the question that, whether the forms of the ACE gene had an effect on the central and peripheral factors in improving the oxygen consumption of the basketball players .

**Keyword:** ACE gene , central factors and peripheral factors.

اثر اشكال جين ACE في الاستهلاك القصوى للأوكسجين وفقاً للعوامل المركزية والظرفية والمتغيرات الفسيولوجية المرتبطة للاعب كرة السلة

### الملخص :

ان جين ACE انزيم موجود في الخلايا الطلائية للشعيرات الدموية حيث يؤثر بنظام الدورة الدموية حيث نجد ان هذا الجين نشط في نسيج العضلة وينظم تدفق الدم مما تسهل للمدربين توجيه التدريب وحسب تأثير الجينات على وظائف الجسم تعطي من خلالها إمكانية تحديد العوامل المركزية المحددة للاستهلاك الأقصى للأوكسجين والاكثر اهمية للتأثير فيه, اما العوامل الظرفية المرتبطة باستخلاص الاوكسجين هي العوامل المحددة للاستهلاك الأقصى للأوكسجين ومما لاشك فيه ان اهمية الاستهلاك الأقصى للأوكسجين كعامل محدد للتفوق الرياضي تعتمد الى حد كبير على نوعية المسابقة التي يشارك فيها ذلك الفرد , هي اهمية البحث التي تمثلت في التعرف على اثر اشكال جين ACE في الاستهلاك القصوى للأوكسجين وفقاً للعوامل المركزية والظرفية للاعب كرة السلة والتعرف على اثر مساهمة اشكال جين ACE في كل من العوامل المركزية والظرفية.

اما مشكلة البحث فان التركيز الحديث في مجال الرياضة توجه نحو إمكانية استخدام تكنولوجيا الوراثة لتغيير وتحسين الأداء الرياضي و عن طريق الجينات الوراثية يتم تحديد نوع الرياضة التي تناسب القابليات الجسمية للفرد وأيضاً يتم ذلك عن طريق الكشف عن الجينات الوراثية لمعرفة الإمكانية الوظيفية وإمكانية الحد الأقصى لاستهلاك الأوكسجين والعوامل الظرفية والمركزية لذلك ارتأى الباحثان الخوض في هذه الدراسة للإجابة على السؤال التالي هل لاشكال جين ACE اثر في العوامل المركزية والظرفية في تحسين الاستهلاك القصوى للأوكسجين لدى لاعبي كرة السلة.

**1- Introduction:** As a result of the increase of studies and research in the field of sports physiology in recent decades, researchers and specialists have been able to obtain important physiological information contributed to the training of sports to be more suited to the ability of the body, including to know what is accompanied by sports performance of changes to the body of the athlete, including the functional capabilities of the device Respiratory system. The ability of the individual to rely on the circulatory and respiratory systems to perform their functions is sufficient. This depends on the respiratory system obtaining oxygen, exchange of gases and the ability of the heart muscle to pump blood and thus deliver oxygen to the working muscles. Way of blood vessels and the transfer of carbon dioxide from these muscles outside of body ,In order to discover the direct effect of physical practice in general on functions and organs of body, it is the genetic basis that governs differences, characteristics, and individual differences between individuals (Hussein Ahmad, Abed Al-Kafi Abed, 2010, p. 23). So that, we find genetic influence is one of the important subjects that did not get sufficient attention from researchers . Libraries are still poor in the studying of genetic factors, although it governs the individual characteristics and differences among them , also it is important for the functional potential for individuals , so we must discover the importance of biological basis in the outcome of sports training .

The genetic potential of individual is the basis for differences between individuals. It is the genetic gene that has the full effect on all organs of the body that are consist of the smallest structure of the cell which has chromosomes that carrying gene and because of each dominate gene carries character appears on the individual characteristics , so it gives the individual a functional possibility where we find that the ACE gene active in the tissue of the muscle and regulates the flow of blood ,which facilitates the training of trainers according the impact of genes on the functions of body , it gives the possibility of determining the central factors that determines the maximum consumption of oxygen and the most important to influence of it .

The peripheral factors associated with the extraction of oxygen are the factors determining the maximum consumption of oxygen and there is no doubt that the importance of maximum consumption of oxygen as a determinant of athletic excellence depends on the quality of the competition in which that individual take part .The importance of research is to make scientific facts about the forms of ACE gene and its effect on the Maximum oxygen consumption , also to analysis of central and peripheral factors and physiological variables, so the trainers can be achieved their aim when they put their training programs.

## 2-The purpose of the study:

The purpose of the study is effect of the forms of ACE gene in the maximum consumption of oxygen according to the central factors and the peripheral of the basketball players and the effect of the contribution of the forms of ACE gene in both peripheral and central factors .

## 3-Method and procedures used

### 3.1-Sample

The researcher identified the research community players of the province of Diwaniyah basketball (15) players for the year (2017-2018), where they were divided into three groups according to the form of the allele of the ACE gene (II.ID.DD) has reached respectively (4,5,6)

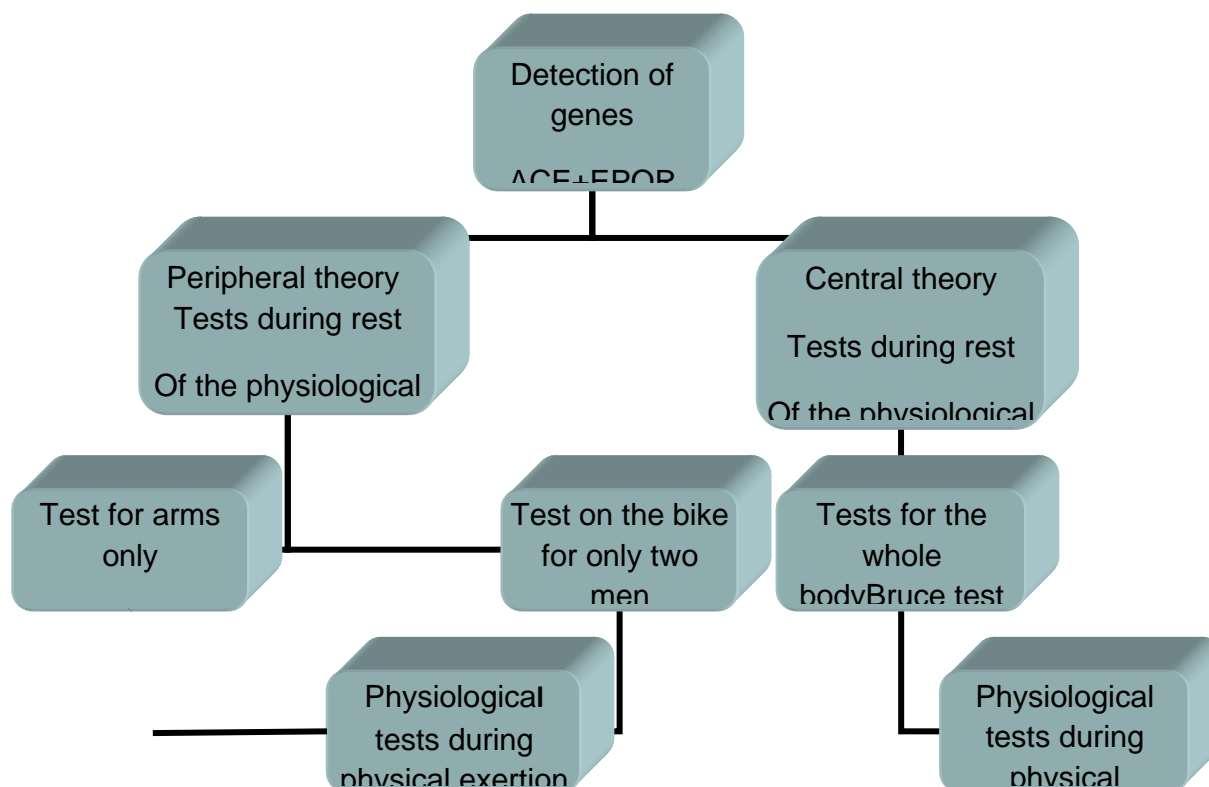
A table (1) A table showing the characteristics of the members of the research sample

Maximum Pulse	BMI	Surface area	the weight	Length	Age	
15	15	15	15	15	15	the number
200.0000	23.3600	2.0180	79.2000	184.0000	20.8000	Mean

200.0000	23.1000	2.0300	79.0000	184.0000	20.0000	Med
1.22474	1.64104	.09257	6.83374	3.16228	1.30384	standard deviation
1.361	1.220	.483	1.061	.000	1.714	Skw
.913	.913	.913	.913	.913	.913	The standard error of torsion
199.00	21.70	1.92	72.00	180.00	20.00	Manimum
202.00	26.00	2.15	90.00	188.00	23.00	Maximum

### 3.2 Design OF Studying

The researchers used the descriptive approach with survey method because it is one of the most appropriate methods for the nature of the research problem.



### 3.3 The studied variables

1- Number of breathing times, normal air volume, pulmonary ventilation, oxygen consumption, carbon dioxide production, respiratory coefficient, oxygen ventilation equivalent, carbon dioxide ventilation equivalent, maximum oxygen consumption.

#### 2. Peripheral factors and central factors.

##### Tests and measurements used:3

##### 1.4.3 First / tests for terminal factors

##### A/ Test of Strand

In this test, the person is subjected to a specific physical effort using a voltage bike for 18 minutes, where the heartbeat is measured to estimate the maximum consumption of oxygen

## Test procedures

1.The examinee sits on the seat of the bike and adjusts the height of the seat as appropriate so that the leg is stretched and the knee angle during its extension not more than 10%.

2.The arm length is also measured to determine the height of the handlebar

3.The examinee begins his test through five stages. He begins by moving the calf at 80 watts after every 3 minutes by moving the calf at 100 watts, then by 130 watts, then 150 watts, and finally 110 watts.

### B/ Arm strain (Hazza bin Mohammed Hazza, 2009, p. 480)

Stress of the hands test begins by moving the hands without resistance for two minutes and at a rotation rate of 60 rpm, then increasing the capacity by 10 candles every two minutes until fatigue .

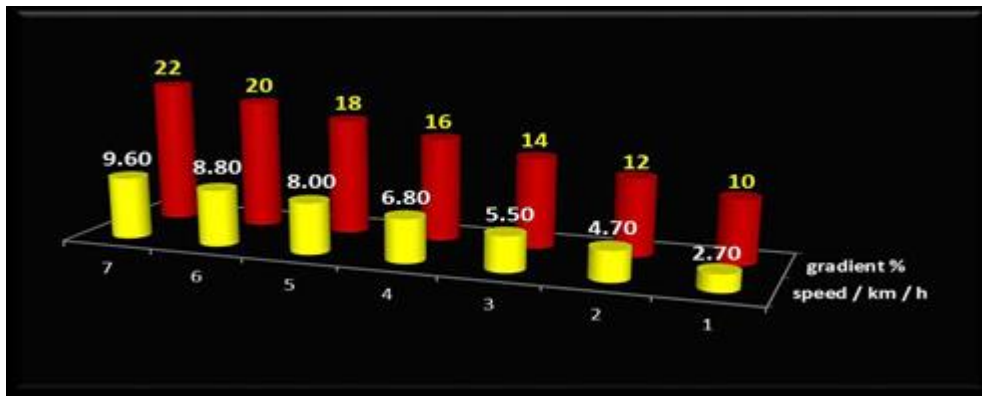
Second/ The test of central factors

### C/Bruce's test to measure the maximum oxygen consumption (Hazza Bin Mohammed Hazza, 2009)

Purpose of the test: Measure the maximum oxygen consumption.

Procedures: The test is carried out on mobile device for 21 minutes divided into 7 stages at each stage, the speed and inclination are increased.

Details of the stages:



## 3-5 Main experience

The experiment was carried out after ensuring the safety of work devices and preparation of all necessary supplies to complete experiment.

The experiment was divided into three stages

Stage 1: Blood samples are withdrawn for the purpose of examining genes as well as complete clinical blood parameters.

Stage 2: It contained , the Bruce test to measure maximum air capacity and physiological variables were examined using a K5 device. At the end of effort, these variables were obtained directly from the database of that device , so it is possible to measure 3 players every day over a period of 8 weeks

Stage 3: where the work is done on arm stress is performed until the exhaustion of the voltage according to the test. The physiological variables were examined by installing the K5 device on tested player. At the end of effort, these measurements are obtained through the continuation of the work device. Thus, 4 players were measured every day over the course of (8) weeks . Here test is for arms only depending on the peripheral factors.

Stage 4: Where the work is done on a physical effort bike according to the Strand test. Physiological variables have been examined by installing a device (K5) on the examinee player. At the end of effort, these measurements are obtained through continuation work of device. So , 3 players are measured every day for 8 weeks . The test is for legs only according to peripheral factors .

#### 4. Presentation and discussion of results

A table (2) Shows the least significant difference (L.S.D) of ACE gene for arms to all groups of forms (II.ID.DD).

Sign	Measurement error	Teams the middleS	Groups		Variables
0.01	0.92294	2.81667*	DD	II	RF
0.01	5.10805	15.52833*	DD	II	VE
0.02	5.30844	14.28100*	DD	ID	
0.01	163.786	495.99833*	DD		
0.02	170.2114	456.19900*	DD	ID	
0.011	122.6679	367.08750*	DD	II	VCO2
0.022	127.4803	333.81350*	DD	ID	
0.013	0.89402	2.61417*	DD	II	VO2HR
0.035	0.9291	2.20750*	DD	ID	

A table (3) Shows the least significant difference (L.S.D) of ACE gene the bike for only two men to all groups of forms (II.ID.DD).

Sign	Measurement error	Teams the middleS	Groups		Variables
0.004	0.85899	3.02000*	ID	II	RF
0.008	0.9516	-3.02000*	DD	ID	
0.015	0.02777	-.07917*	DD	II	VT
0.027	0.02886	-.07250*	DD	ID	
0.013	2.32372	6.76967*	ID	II	VE
0.002	2.57428	-10.38800*	DD	ID	
0	43.97535	370.78333*	ID	II	VO2
0	48.71693	-281.75000*	DD	ID	
0.005	0.02253	-.07667*	ID	II	RQ
0.038	0.87243	-2.03533*	ID	II	VE/VO2
0.039	0.93001	-2.15083*	DD		
0.003	0.77817	2.82000*	ID	II	VO2MAX
0.022	0.86208	-2.27000*	DD	ID	
0.001	0.2342	1.02600*	ID	II	METS
0	0.24965	1.47500*	DD		
0.001	1.48838	6.50000*	ID	II	HR

0	1.64886	-8.50000*	DD	ID	
0.001	0.33472	1.49400*	ID	II	VO2HR
0.007	0.37081	-1.19650*	DD	ID	

A table (4) Shows the least significant difference (L.S.D) of ACE gene for Tests for the whole to all groups of forms (II.ID.DD).

Sign	Measurement error	Teams the middleS	Groups		Variables
0.013	2.14546	6.26333*	ID	II	RF
0	2.28707	11.85833*	DD		
0.036	2.37679	5.59500*	DD	ID	
0	4.71191	24.52567*	ID	II	VE
0	5.02291	40.98167*	DD		
0.008	5.21996	16.45600*	DD	ID	
0.035	1.70785	4.05900*	ID	II	VE/VO2
0.04	1.82058	4.19250*	DD		
0.001	1.37561	6.42533*	ID	II	VO2MAX
0.001	1.4664	6.06083*	DD		

#### 4-1 Discussion of the results of L.S.E test of ACE gene for the terminal coefficient (arms and legs) and by forms.

The differences in alleles (DD.ID.II) are shown in Table (2, 3). The reason of that is genetic structure (ACE) that is produced from epithelial cells of kidneys and lungs , it is responsible of (RAS) that connect with circulatory system, which stimulates the kidneys to produce the resonant enzyme that plays an important role when sodium or blood volume deficiency in body. It is found in cell tissues and is responsible for regulating muscles, especially the heart muscle, so that is one of the genes of physical performance or athletic performance . The scientists certain that kind gene of allele I is longer than allele D by 287 base pairs. It is classified according suitability for activity that requires power and ability for long-distance players and rowing because it is one of the main factors of fatigue and tiredness , so that, the response of players carrying ACE (II) gene for The maximum airway Vo2max was better than in other groups of DD, ID. The researchs referse that, DD is distinguishing characteristic of players jumping , speed and strength activities with the short distance players. This is a sign of the type of white (fiber) which is characterized by speed and rapid fatigue (Ahlaam Najm Abed Allah, 2017, p. 87). Through Results , there were significant differences between genotypes and genotype II, so gas exchange would be regular within the body. When the person raises the intensity of effort, the rate of breathing will rise again and then return to regularity also, this regularity is called fixed or regular case and speed of reaching this case indicates that efficiency of respiratory system of athlete and his ability to adapt to functional, Then decrease speed of breathing and regulate heart beat (Muhammad Yusuf Sheikh Wais Sadeq, 1979, p. 34 .

For VE and VO2, the differences appears between genotypes in favor of genotypes II and ID. Genotypes reduce level of ACE enzyme and less pressure on blood vessels through their expansion , and then , the amount of oxidized blood to muscles (Myerson, S., Hemmingway, 1316,1999). This indicates that carriers of gene ACE have an oxygenation potential to provide the expansion of vessels and arteries to consume oxygen in a high quantity . It represents one of the most important from many important indicators of respiratory system during effort and rest. The process of breathing (inhalation + exhale) provides body with oxygen and get rid of carbon dioxide the rate of breathing is (12-17 times) in almost one minute during rest time .



This percentage varies during effort. The performance of any muscle effort, whatever its degree will lead to an increase in rate of breathing for person, if this effort is average intensity, the rate of breathing will rise in the beginning and then decrease and continue regularly this for a limited period (Mahmoud Kamel, Izzat Abdel Rahman, 1981, p. 104). The players' efficiency is the result of owning ACE gene and it links with capabilities of individual oxygen. In previous studies the researchers confirmed a positive relation between ACE and level of performance of long-distance runners, also ACE effects on the results of physiological functions of circulatory system (Abul-Ela Ahmed Abdel-Fattah, 2003, p. 490). In VT that differences was in favor of DD, which confirms that players can bear physical effort, level of carrying physical effort is determined by functional efficiency of devices of athlete such as breathing, exchange of oxygen, heart and circulatory system, also nervous system, musculoskeletal system, motor compatibility, chemical changes in muscles and extent of reduce in functional work of body (Muhammad Subhi Hassanein, 1989, p. 273). About VCO<sub>2</sub> also showed significant differences in favor of genotypes II and ID, where it is known that increase of CO<sub>2</sub> considered as catalyst that affects on neurons in respiratory centers, so the activity of respiratory centers controls in rate and depth of breathing process, so a speed at which dorsal neurons stop from giving cells determines frequency of breathing. The rate of nerve impulses that given by these neurons affects on depth of breathing. If frequency of nerve impulses increases in unit of time, the greater of kinetic units in muscles of breath will stimulate, which leads to stronger constriction and breathing more profound (Shtiwe Al-Abed Allah, 2012, p. 339).

In case of respiratory factor, there were significant differences in favor of genetic structure ID and value of ID closer to one merely, that is indicating an increase in oxidation of energy substances in body, so CO<sub>2</sub> and water is produced, and so much of oxygen that obtained by body exits through exhalation of CO<sub>2</sub> (Mohammad Hassan Allawi. Abul-Ela Ahmed, 1984, p. 267). Thus, what is associated with the efficacy of VO<sub>2</sub>MAX was the significance of the differences between the ID and DD structures, which is an important factor in efficiency of the body. Abed-Al-Adheem Abed AL- Hameed (1985) indicates that VO<sub>2</sub>MAX "is the largest volume of oxygen measured in liters or milliliters per minute that everyone used by cells of body and its tissues (Abed-Al-Adheem Abed AL- Hameed 1985, p. 71). Depend on that, ACE gene factor has had an effect on improving the oxygenability of sample members within efficiency of maximum consumption of oxygen as it contributed to absorption of the largest amount of oxygen consumed. The results show priority for allele DD." The changes in heart rate during and immediately after physical effort is one of the real indicators of viability of heart and circulatory system. The increasing that happens through effort time and time to return to normal case quickly after end of effort directly is a distinctive relation for body of athlete and represents a clear indication to adaptation of heart and circulatory system with physical effort (Ahmad Naji Mahmood, 1988, p. 19).

#### **4- 2 Discuss the results of (L.S.D) test for ACE gene to central factor (whole body) and according shapes.**

Table 4 shows the differences in alleles (DD.ID.II) that indicates relation of ACE gene to provide oxygen for tissues. Respiratory pulmonary system is responsible for providing adequate pulmonary ventilation by increasing the volume of breath and number of breathing times to ensure that blood leaving lungs and is saturated with oxygen (Hazza Bin Mohammed, 2009, p. 320). About differences between VE and equivalent of oxygen ventilation were for genotypes II and ID. This is confirmed by effect of ACE gene forms on thickness of left ventricle and reduces pressure on blood vessels also amount of blood oxidized to muscles increases. The rate of pulmonary ventilation increases during physical exertion. In addition, we have two methods to increase pulmonary ventilation, one of them is a quick neurological method and the other is a slow chemical method, all contribute to increased pulmonary ventilation (Mohammad Hasan

Allawi, Abul-Ela Ahmed, 1984, p. 290) . This increase in volume of oxygen consumption reflects rate of oxygen requirement of working muscles . That leads to

differences of VO2MAX in genotype II because , It is the most common structure of maximum oxygen consumption because it is called allele to add , that means addition of any oxygen molecule . The relation is clear between these two variables according to genetic structures . The increase in one of them changes in other variables , Each of these variables contributes to development of maximum oxygen consumption to counteract accumulation of lactic acid by pushing more blood during effort. Heart rate increases with increase in oxygen consumption and heart rate increases with increased training intensity (Bahaa Elddeen Salama, 2000, p. 52). But when training begins , pulses increase directly and this connected with increase in oxygen consumption so heart rate increases with increased training intensity (Baha Elddeen Salama, 2000, p. 52)

### Conclusions

1- There is effect of gene's ACE forms on the maximum consumption of oxygen according to peripheral factors , central factors and physiological variables of the arms , legs and the body as a whole.

2- Priority of the influence of dominant genotypes II and DD also the genetic mutation on the maximum consumption of oxygen according to peripheral factors , central factors and physiological variables of the arms , legs and the body as a whole .

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