Developing Some Physical Abilities for the U-8 Artistic Gymnastics Girls in Light of the Genetic Diversity of the Angiotensin Converting Enzyme (ACE)

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Abstract: This research aimed at identifying the impact of using a training program in light of the genetic diversity of angiotensin converting enzyme (ACE) through the recognition of the effect of the training program on some of the physical abilities (muscular power - transitional speed - muscular endurance) of the U-8 artistic gymnastics young ladies, in light of the genetic diversity of ACE. The researcher used the experimental approach on a sample of sixteen gymnastics U-8 junior women, divided into two experimental groups according to the genetic variation. The first experimental group is distinguished of possessing ACE/ID gene and totaling seven junior women. The second experimental group is distinguished of possessing ACE/DD gene and totaling nine U-8 gymnastics junior women. Research tools included: physical tests; biochemical measurements and the suggested training program. Results showed that: (1) Training using genetic diversity (ACE ID/DD) has a positive effect on the physical abilities (muscular power of the legs and arms - transitional speed - muscular endurance of the arms, abdomen, trunk and legs) for the artistic gymnastics U-8 girls. (2) Artistic gymnastics U-8 girls who possess ACE ID gene are distinguished of improving the physical abilities represented in the muscular endurance of the arms, abdomen, trunk and legs in comparison with the group which possesses ACE DD gene. (3) Artistic gymnastics U-8 girls who possess ACE DD gene are distinguished of improving the physical abilities represented in the muscular endurance of the legs, muscular power of the arms and transitional speed in comparison with the group which possesses ACE ID gene.

Key words: U-8 Artistic Gymnastics %Genetic Diversity %ACE

INTRODUCTION

Genetics and the study of genes have improved rapidly as genes play an important role in the sports field as they are considered responsible for many of the changes that take place in the physical performance. Therefore, genes may be more important than training in explaining the difference in the performance of the players.

Reaching the peak of performance in the sports activity for the athlete depends on the appropriate gene as it was discovered one of these most important genes and is called ACE gene. It is so called for it is connected to angiotensin converting enzyme. This enzyme is active in the muscular tissues as it regulates the flow of blood hence it can effectively affect the physical performance.

The gene is a specific sequence of the nitrogenous bases. This sequence carries a message that shows the required instructions to synthesizing the different proteins that form the body tissues in the living organism, as well as the required enzymes for the vital functions of the body and the biochemical interactions. Montgomery [1] points to the importance of ACE D gene in improving the physical performance as this gene increases the mechanical efficiency of the trained muscles, while some researchers objected to these results as Fuentes et al. [2] pointed that as to ACE I/D gene no relationship was proved between the two types of the gene and the physical fitness.

Every country sets a group of tests that measure and determine the levels of players in the physical abilities according to the age group and the nature of the technical
performance requirements. In this regard, Yusuf [3] indicates that the supreme committee for training the gymnastics team in Germany set a plan for training and evaluating the gymnastics players for various levels that includes these physical and motor abilities and upgrading it as an important and determining factor of the level of performance. The trainer infers the extent of the advancement of the player in these physical and motor elements through a group of different tests that have determinants as major objectives the player as to reach and achieve as a basic rule to improving the level of performance.

Further, the Egyptian Gymnastics Federation, in the athletic season 2009/2010 and for the first time, has organized a competition in the physical for the under seven and eight years old girls gymnastics besides the artistic mandatory, for which the female player is required to pass a group of physical tests set by the Egyptian Gymnastics Federation. Through her following up the artistic gymnastics female juniors and through her presence during the competitions of junior women artistic gymnastics, the researcher noticed a decrease in the level of physical performance of these physical tests set by the Egyptian Gymnastics Federation, which negatively affects the artistic aspects of the female juniors during the competition. This is clear from the reality of the exploratory study which the researcher conducted on the U-8 gymnastics female juniors in the 2009/2010 competition, as it showed 25% of all female juniors were holding poor level in performing the physical tests set by the Egyptian Gymnastics Federation despite the effort of the gymnastics trainers. The researcher thinks that the process of athletic training is the basis in developing the physical abilities of the female juniors. Therefore, advantage should be taken from the naturally inherited readiness of the gymnastics female juniors under eight years old and obtaining the best results through the biological technology, in addition to the scarcity of the scientific studies in the athletic field which linked between athletic training and molecular biology.

That is what led the researcher to think in developing some physical abilities (muscular ability - transitional speed - muscular endurance) of the U-8 artistic gymnastics girls in light of the genetic diversity of the angiotensin converting enzyme (ACE).

**Research Objectives:** The research aimed at identifying the impact of using a training program in light of the genetic diversity of the angiotensin converting enzyme (ACE) through identifying the effect of using the training program on some physical abilities (muscular power - transitional speed - muscular endurance) of the artistic gymnastics U-8 girls in light of the genetic diversity of the angiotensin converting enzyme (ACE).

**Research Hypotheses:**

C There are statistical significant differences between the averages of the pre and post measurements for the first experimental group (ACE ID Gene) and the second experimental group (ACE DD Gene) in the physical abilities (muscular power - transitional speed - muscular endurance) in favor of the post measurement.

C There are statistical significant differences between the averages of the two post measurements for the two experimental groups the first and the second in the muscular power of the two legs and the two arms, transitional speed in favor of the second experimental group which possesses the ACD/DD Gene, while there are statistical significant differences in the muscular endurance for the two arms, abdomen, trunk and the two legs in favor of the first experimental group which possesses the ACE/ID gene.

**MATERIALS AND METHODS**

The researcher used the experimental approach by using the experimental design for two experimental groups by conducting the post pre measurement for its appropriateness to the nature of this study.

**Research Sample:** The sample of the study was chosen by the intentional method from among the U 8 gymnastics female juniors who are registered with the following sports clubs: Smouha Sporting Club, Sporting Club in the Alexandria Gymnastics Board in the athletic season 2010/2011 and who are registered with the Egyptian Gymnastics Federation. The total size of the sample before conducting the basic experiment was 22 female juniors. The researcher excluded six female juniors who participated in the exploratory study; therefore the size of the basic sample of the research became 16 female juniors. The researcher classified the members of the basic sample into two experimental groups. The first experimental group is characterized by possessing the ACE/ID Gene and they total seven female juniors. The second experimental group is characterized by possessing the ACE/DD Gene and they total nine gymnastics female juniors under 8 years old.
Further, the researcher made the equivalence between the first and the second experimental groups in the physical variable under consideration.

**Tools of Data Collection:**

*First: The Physical Tests*

- C Wide jump test from the stationary position
- C Vertical jump test
- C Tensile test on the horizontal bar
- C The 20-meter sprint test from high start
- C Full bending of arms test from horizontally lying down
- C Sitting from squatting position test
- C Horizontally slanted lying test as legs lean on a seat and stability

*Second: The Biochemical Measurements under Consideration*

A blood sample (3 cm) was withdrawn from each female student for conducting necessary analysis by Polymerase Chain Reaction (PCR) device, which is a lab technology consists of multi reproduction of the nucleic acid (DNA) outside the vital system. Therefore, it is a vital technology for cloning a specific portion of the nucleic acid and multiplying its output so that additional measurements and medical examinations can be conducted. These measurements have been made in the biochemical laboratory at the Faculty of Medicine, Alexandria University.

- C Measuring the ratio of Cholinesterase Enzyme using Spectrophotometer analysis.
- C Measuring the ratio of the overall Protein in blood using Spectrophotometer analysis.

**The Suggested Training Program:**

*First: The Bases of Establishing the Suggested Training Program*

- C The consideration of the physical, technical and functional abilities of the members of the research sample
- C The determination of the period of applying the program and the number of weekly units was according to prior studies [4-6]. Pointing out that the physical powers do not develop rapidly in juniors, that training for several weeks contribute to developing and improving them and that a period of eight weeks is enough time to developing the physical powers and evaluating the program and the training time for 45-60 minutes. Also, previous researches [7-9] pointed to the importance of assigning three times weekly trainings to develop physical powers by using weights exercises. Based on this, the researcher determined the period of implementing the program as eight weeks at the rate of three times trainings per week and the duration of the main part of the training unit was 45 minutes.

*Second: The Components of the Training Load for the Suggested Program*

**Load Intensity:** Each of Ellawy [4], Hammad [9] and Abdel Fattah and Nasr El-Deen [10] pointed to not using the maximum load whose intensity ranges between 90-100% when developing the physical powers in juniors. In light of this, the researcher thinks that the maximum intensity in this study should be 90% of the maximum the female player can perform.

**Load Size:** The researcher determined the frequency of the exercise for developing the muscular power to be from 8-12 times and the number of the groups from 3-5 groups in the suggested program based on what some scientific references indicated.

**Breaks:** The results of exploratory study indicated that break times for rest between the groups is between 2-3 minutes.

*Third: Content of the Suggested Program*

Going through several specialized scientific references in the field of physical exercises with weights, physical fitness, physical preparation and athletic training, the researcher was able to prepare a set of exercises for developing the muscular power, speed and muscular endurance by using weights exercises (dumbbells - medical balls) then it was presented to a group of experts in the field of athletic training and gymnastics to determine the most suitable exercises for the level of abilities of the members of the research sample. Based on this, 29 exercises (dumbbells-medical balls) were reached for developing the physical powers.
under consideration. The pre-measurements of the research variables for the two experimental groups were conducted in the period from 6/6/2011 to 7/6/2011. The researcher applied the suggested training program in the period from 9/6/2011 until 3/8/2011 on the members of the two experimental groups: the first experimental (ACE/ID gene) and the second experimental (ACE/DD gene) over eight weeks, at the rate of three training units per week. After finishing applying the suggested training program, the researcher conducted the post-measurements in the period from 4/8/2011 to 6/8/2011 for the two groups of the study in the same order and terms of the pre-measurements.

RESULTS AND DISCUSSION

It is clear from Table 1 that there are statistical significant differences at 0.05 level between the pre and post-measurements for the first experimental group in terms of physical powers (muscular power - transitional speed - muscular endurance) in favor of the post measurement and the ratios of improvement ranged from 10.39% to 71.15%.

It is clear from Table 1 that there are statistical significant differences at 0.05 level between the pre and post-measurements for the second experimental group in terms of physical powers (muscular power - transitional speed - muscular endurance) in favor of the post measurement and the ratios of improvement ranged from 12.92% to 82.07%.

It is clear from Table 3 that there are statistical significant differences at 0.05 level between the two post measurements for the first and second experimental groups in terms of the muscular power of the two legs and two arms and the transitional speed in favor of the second experimental group which possesses the ACD/DD Gene, while there are statistically significant differences in the muscular endurance of the two arms, abdomen, trunk and the two legs in favor of the first experimental group which possesses the ACE/ID Gene.

DISCUSSION

By noting the results of Table 1 it is clear there are statistical significant differences at the 0.05 level between the pre and the post measurements for the first experimental group in terms of the physical powers (muscular power - transitional speed - muscular endurance) in favor of the post measurement. The improvement ratios ranged from 10.39% to 71.15%.

Also, the results of Table 2 show statistical significant differences at level of 0.05 between the pre and post measurements of the second experimental group in terms of physical powers (muscular power - transitional speed - muscular endurance) in favor of the post measurement. The improvement ratios ranged from 12.92% to 82.07%.

The researcher attributes the improvement in physical powers (muscular power - transitional speed - muscular endurance) for the members of the first experimental group which possesses the ACE/ID gene and the second experimental group which possesses ACD/DD gene to the effectiveness of the content of the training program where the abilities and the level of the members of the research sample were considered along with systemizing the training loads to be appropriate with the members of the sample abilities, which affected positively on the physical power under consideration.

This result agrees with what Taha [11] pointed out that inheritance affects the textural and biological qualities with which the athlete is born and which are represented in his muscular, nervous and endocrine system as well as his other biological systems. He also thinks that the differences in genetic abilities which distinguish an athlete individual than another are what later on affect his performance in general during the events of training and competitions.

The results of this study agree with the results of the study of each of previous studies [12-18] that the players who possess the ACE/DD gene are distinguished as having a high level of muscular endurance and circulatory respiratory system. This result also agrees with what Tsianos [15] indicated that there is a correlation of the genetic diversity ACE/I with the performance of the endurance athletes and the genetic diversity ACE/D with the performance of the speed and muscular power athletes. Hopkins [19] adds that the genetic diversity ACE/ID means a great deal of response for the endurance trainings.

Also, the results of Table 3 revealed the existence of statistical significant differences at the 0.05 level between the two post measurements for the first and the second experimental groups in terms of the muscular power of the two legs and arms and the transitional speed and in favor of the second experimental group which possesses the ACD/DD gene, while there are statistical significant differences in terms of the muscular endurance for the two arms, abdomen, trunk and the two legs and in favor of the first experimental group which possesses the ACE/ID gene.
The researcher attributes this to the nature of the genetic diversity among the members of the first experimental group which possesses ACE/ID Gene and the second experimental group which possesses ACD/DD gene. This result agrees with the results of the study of each of other works [15, 18, 20-22] that the difference among the athletes in terms of physical powers is due to the genetic diversity. Athletes who possess ACE ID Gene their muscular endurance has developed more, while the athletes who possess ACE DD gene their muscular power of the and arms and the transitional speed had developed, which indicates that the genetic diversity plays an important role in the response of the physical powers (muscular power of the legs and arms - transitional speed - muscular endurance of the arms, abdomen, trunk and legs) to improvement through athletic training programs.

In this regard, Othman [23] indicates that at athletic training we find that some individuals have a rapid development in terms of muscular power while his mate is qualified for developing in terms of endurance. Abdel Rahman and Fekry [24] add that the difference among players in their response to the same training is due to many reasons; important among them is the differences in the genetic factors.
CONCLUSION

C Training using genetic diversity (ACE ID/DD) has a positive effect on the physical abilities (muscular power of the legs and arms - transitional speed - muscular endurance of the arms, abdomen, trunk and legs) for the artistic gymnastics U-8 girls.

C Artistic gymnastics U-8 girls who possess ACE ID Gene are distinguished of improving the physical abilities represented in the muscular endurance of the arms, abdomen, trunk and legs in comparison with the group which possesses ACE DD gene.

C Artistic gymnastics U-8 girls who possess ACE DD gene are distinguished of improving the physical abilities represented in the muscular endurance of the legs, muscular power of the arms and transitional speed in comparison with the group which possesses ACE ID gene.

C The ratios of improvement in the post- measurement than the pre measurement for the first experimental group (ACE ID gene) in terms of the physical abilities under consideration ranged from 10.39% to 71.15%.

C The ratios of improvement in the post- measurement than the pre measurement for the second experimental group (ACE DD gene) in terms of the physical abilities under consideration ranged from 12.92% to 82.07%.

Recommendation:

C Directing the training by using the genetic diversity of the ACE gene, because of its effective impact on the level of physical performance in U-8 artistic gymnastics girls.

C The necessity of selecting the artistic gymnastics junior women according to the biological technology.

C The necessity of selecting and classifying the artistic gymnastics U-8 girls according to the genetic diversity ACE ID/DD.

C Conducting more scientific studies on several types of genes and that the studies should not be limited to one gene only.

REFERENCES


