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ANGIOTENSİN-CONVERTİNG ENZYME POLYMORPHİSM İN ELİTE TAEKWONDO ATHLETES OF TURKİSH AND AZERBAİJAN TAEKWONDO TEAMS

Mehmet Günay¹, Melahat Kurtuluş Ülküer², Çağrı Çelenk¹, Şakir Bezci³, Kadir Gökdemir¹, Cecilia Gevat⁴, Tahsin Kesici⁵

¹ Gazi University, School of Physical Education and Sports, Gazi University, Ankara, TURKEY

² Gazi University, Department of Pharmaceutical Microbiology , Faculty of Pharmacy, Ankara, TURKEY

³ Pamukkale University, School of Sports Science and Technology, Denizli, TURKEY

⁴ Ovidius University of Constanta, Faculty of Physical Education and Sport, ROMANIA

⁵ TOBB Economics and Technology University, Ankara, TURKEY

Email: mgunay@gazi.edu.tr, 15.03.2010 / 22.03.2010

Abstract

A few attempts have been made to shed light upon the influence of genes in making an Olympic champion. The aim of our study is to elucidate the genetic differences among 18 athletes from National Turkish and Azerbaijan taekwondo teams. Athletes were defined as elite. Angiotensin converting enzyme (ACE) genotypes of athletes were analyzed by polymerase chain reaction technique (PCR) in this study.

The ACE gene is located on human chromosome 17 expressing three genotypes within the intron 16 of the related gene structure. These genotypes are classified as I and D alleles which are termed as insertion and deletion, respectively. Genomic DNA was isolated from peripheral blood and blood stain samples of control and sportsmen. First of all, the genotyping of ACE gene was performed by site specific ACE primers using PCR. To avoid mistyping, each sample found to have the DD genotype was amplified by inserting specific primers. As a result, 18 samples including 2 II genotype, 11 ID genotype and 5 DD genotype were determined by conventional PCR. Allele frequencies were determined by gene counting. Genotype and allele frequencies between groups were compared by Chi-square test. P values of >0.05 were not considered statistically significant. There was no difference in ACE genotype frequencies between sedentary group and elit athletes.

Key words: Angiotensin converting enzyme (ACE), taekwondo, athletic performance, polymerase cahin reaction.

Introduction and research objective

Recent advances in genetic research have provided new opportunities for maintaining health and identifying athlete and persons. The development of

technology for DNA sequencing and genotyping has allowed the identification of the individual genetic traits that contribute to athletic performance.

Human physical performance is determined by a variety of environmental and also genetic factors. Several studies have revealed that heredity is a strong component of endurance and phenotypes, and that a lot of genes are in the same way responsible for the normal functioning of metabolic pathways and processes which are necessary for a healthy state of an organism in addition to the athletic performance capacity. With regard to athletic performance, more than 200 genes and quantitative trait loci have shown some associations with exercise related phenotypes.

In many cases, the variants associated with performance traits and elite athlete status are common in general population. A common polymorphism in the angiotensin converting enzyme I gene (the ACE I/D variant) is the most crucial genetic variant in the evaluation of elite athlete status and performance-related traits (G.A. Sagnella et al., 1999). The ACE I/D polymorphism could also influence athletic performance via local effects on skeletal muscle function (A. Jones et al., 2003). Another study in this field points out that I allele increases endurance performance through an increase in skeletal muscle efficiency, because of effects on fibre type proportions (B. Zhang et al., 2003), whereas the D allele may enhance sprint/power activity through an increase in muscle strength, potentially via the muscle hypertrophic effects of increased angiotensin II (A. Jones et al., 2003).

This study aims at analysing the ACE gene I/D polymorphism representing the relationships with genotype and athletic performance in some athletes of the National Turkish and Azerbaijan taekwondo teams and sedentary groups.

Research methods and procedures

Subjects

The ACE I/D genotypes were determined in DNA samples from some athletes of the National Turkish and Azerbaijan taekwondo teams (18) and sedentary group (49). Blood samples were collected from blood stain of elite athletes and peripheral blood of sedentary group.

ACE genotyping

Genomic DNA was extracted from blood stain and peripheral blood by phenol-chloroform method (J. Sambrook et al., 1989). ACE genotype was determined by polymerase chain reaction (PCR) method.

Statistical analysis

Genotype and allele frequencies of elite athletes and sedentary group were compared by Chi-square test. ACE I/D genotype frequencies in athletes of the National Turkish taekwondo team and athletes of the National Azerbaijan taekwondo team were compared via Fisher's exact test. As theoretical frequencies in groups are under 5, the chi-square test was not applied.

Results

The ACE genotypes of 12 athletes from the National Turkish team, 6 athletes from the Azerbaijan taekwondo team and 49 subject from sedentary group were determined by PCR (Table 1). Genotypes were analyzed according to presence or absence of the insertion allele - II (homozygote for the insertion allele-490 bp), ID (heterozygote-490 bp and 190 bp) or DD (homozygote for the deletion allele-190 bp). All of DD genotypes were subjected to the second independent PCR amplification with a primer pair, which recognizes an insertion-specific sequence, due to the preferentially amplification of D allele in the heterozygote individuals. Each DD genotype was verified by a second PCR with primers specific to the insertion sequence (K. Lindpaintner et al., 1995).

Table 1- ACE I/D genotypes of the National Turkish and the Azerbaijan taekwondo team

	DD	ID	II	Total
Athletes	5	11	2	18
Sedentary group	17	24	8	49

Amplification products were shown on 2% agarose gel electrophoresis. ACE genotyping was determined according to presence or absence of insertion allele - I allele (490 bp) and D allele (190 bp) (Figure 1).

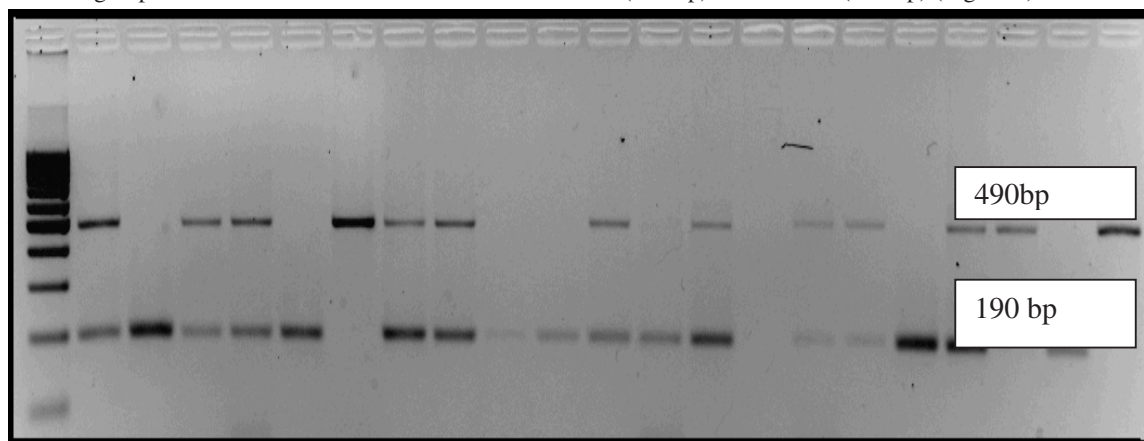


Figure 1. ACE I/D genotypes in the National Turkish and the Azerbaijan taekwondo teams and sedentary group. Lane 1-100 bp marker Lane 3,6,10,11,18,21- DD genotype Lane 2,4,5,8,9,12,13,14,16,17,19,20 ID genotype Lane 7, 22 II genotype

Genotype frequencies were calculated by direct counting of alleles one by one. ACE genotype frequencies of the sedentary group were compared with the genotype frequencies of the National Turkish and the Azerbaijan taekwondo teams. No statistically significant difference was observed in the comparisons made via Chi-square test ($p > 0.05$) (Table 1).

Beside ACE I/D genotype frequencies were compared in some athletes of the National Turkish taekwondo team and athletes of the National Azerbaijan taekwondo team via Fisher's exact test. P values of > 0.05 were not considered statistically significant (Table 2).

Table 2- ACE I/D genotypes of the National Turkish and the the Azerbaijan taekwondo team

	DD	ID	II	Total
Turkish taekwondo team	2	9	1	12
Azerbaijan taekwondo team	3	2	1	6

It was determined that DD genotype of elite athletes is 27.78%, II genotype is 11.11% and ID genotype is 61.11% in this study.

Discussion

Genetic studies related to taekwondo sport branch have rarely been observed. This study examines the distribution of insertion/deletion (I/D) polymorphism in the ACE gene among some athletes of the National Turkish and the Azerbaijan taekwondo teams. Studies in ACE I/D polymorphism, which determine performance traits and elite athlete status, are common. For instance, one of the studies in the literature indicated that the ACE I allele has frequencies of more than 30% (G.A. Sagnella et al., 1999). The human ACE gene contains a polymorphism known as the presence (insertion, I) or absence (deletion, D) of a 287 base pair sequence in intron 16 (B. Rigat et al., 1990). The I allele of the angiotensin-converting enzyme gene is associated with endurance performance; an excess occurs in elite distance runners, rowers and mountaineers (G. Gayagay et al., 1998; H.E. Montgomery et al, 1998). Conversely, the D allele is associated with strength gain and increasing elite power-oriented performance.

As stated above, the purpose of this study is to determine the influence of ACE I/D polymorphism in athletic performance. In line with this aim, two different athletes group in, 12 of whom are elite taekwondo athletes from the National Turkish taekwondo team and 6 of whom are from the National Azerbaijan taekwondo team were used as subjects of this study. These athletes were from various geographic origins, which may have affected genetic properties. In order to find out the differences between two groups of athletes ACE I/D genotype frequencies of athletes from the National Turkish taekwondo team and athletes from the National Azerbaijan taekwondo team were

compared via Fisher exact test. As a result, no association between ACE I/D polymorphism and athletic performance of taekwondo athletes was found in this study ($p > 0.05$). However, researches indicating that frequencies of the ACE I/D alleles and genotypes vary considerably across different ethnical groups exist in the literature (J. Barley et al., 1994, A. Foy et al., 1996, J.L. Rupert et al., 1999).

This study consists of a small group as subjects. There is no difference in ACE genotype frequencies between elite athletes and sedentary group. A smaller cohort was the limitation of this study. The efficiency of larger cohort might be useful in achieving accurate results. A lot of studies have explained some confusions on the effectiveness of ACE I/D polymorphism and athletic performance. Although no significant differences between the athletes and sedentary group was found according the allele and genotype frequencies of ACE I/D gene in our results, many studies have also revealed that there may be an association between ACE I/D polymorphisms and enhanced physical performance (K.H. Myburg, 2003). However, some previous studies similar to the results of this study, mentioned above, have reported that there was no association between ACE I/D polymorphism and athletic performance (T. Rankinen et al., 2000, R.R. Taylor et al., 1999).

Conclusion: No significant relationship was found between some athletes of the National Turkish and Azerbaijan taekwondo teams and sedentary group. Further studies with a larger subject group are required in order to study the association between I/D polymorphism and athletic status.

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STATISTICAL ANALYSIS OF BALANCE AND ANTHROPOMETRIC VARIABLES OF MALE BASKETBALL PLAYERS, AGES 9-11

Olga Sevim, Ceren Suveren

Gazi University, School of Physical Education and Sports, Ankara, TURKEY

Email: sevimliolga@gmail.com / 02.03.2010 / 10.03.2010

Abstract

Basketball is a physically demanding team game, utilizing dynamic movements, such as jumping, shooting, passing, dribbling, rebounding, defending and running at different intensities and lengths of times. In order to effectively coordinate these movements and to achieve maximum potential, players must master balance, which is essential for success in any sport. Furthermore, anthropometric characteristics are one of the most significant factors that affect body movements and sports performance. The purpose of this study is to determine whether there is a relationship between body fat percentages and extremity segmental lengths with balance in 26 players, ages 9 to 11, of the Gazi University Junior Male Basketball team.

Each subject performed six different equilibrium measurements: 1) the transferring of weight from left foot to right foot and from right foot to left foot, 2) height, 3) weight, 4) skin fold measurements taken from 7 different body points, 5) length of full arm and leg, and 6) length of overarm. Body fat percentages were calculated according to the “Zorba Formula” ($BF\% = 0.99 + 0.0047 (\text{body mass}) + 0.132 (\text{body fat thickness from 7 different points})$). Body fat measurements were taken with a Holtain brand skin fold caliper, length measurements with a Holtain tape measure and equilibrium measurements with a Lafayette 16020 IRF/E stabilometer. By means of a statistical analysis (mean values,