Anthropometrical and Molecular Aspects in Elite Gymnasts

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INTRODUCTION

The researchers that work on sport field try to understand why and how an athlete can reach the top level in different sports, in order to set up the factors that contribute to shape an elite athlete. In this way, the anthropometrical and molecular aspects cover a great importance. The anthropometrical aspects are focused on the athlete’s physical structure in different sport, the molecular aspects could contribute to define the genetic profile of the athlete.

Gymnastics is a highly skilled sport with a great coordinative component which significantly influences the athletes’ performance and consequently the results. A high coordinative characteristic makes the study of this sport extremely complex, but, at the same time, it is also the factor that stimulates the setting up of specific methodologies to investigate the biomechanical and functional aspects that regulate gymnastics performance. Besides, this discipline requires years of hard training since a very young age, as it is very important to obtain an exact knowledge of the relation between growth and physical structure of athletes. From the restricted literature available on the subjects, gymnasts appear to have specific morphological characteristics, as small stature, short legs, broad shoulders, narrow hips and very developed muscular structure (Clasen et al. 1999).

As a matter of fact, in agreement with some authors’ gymnasts are amongst the strongest athletes when the strength is measured in relation to body weight. Some researchers suggest that when top level gymnasts started play gymnastics, they already had the basic physique structure, genetically determined, suited for that special sport. According to the biomechanical studies applied to elite gymnast reported that successful performance depends on the interplay between the inherent properties of the body segment and the external and internal forces which act on those body segment (Ackland et al. 2003).

For what genetic analysis is concerned, we still do not have scientific publications that are selectively focused on gymnast’s genotype. In matter of sport, one of the most studied genetics markers, that can be interesting to analyze on gymnasts, is the ACE polymorphism. From different researches (Savigey et al., 1998; Woods et al., 2001) allele I of the ACE insertion/deletion polymorphism results associated with enhanced endurance performance in elite distance runner, rowers, mountaineers etc. Whereas the latest researches indicate that allele D seems to be correlated with performance in elite power and sprint athletes, in which gymnastics can be included. Another polymorphism recently studied in relation to sport activity is ACTN3. The allele-3 is an ancient family of actin-binding proteins that play structural and regulatory roles in cytoskeletal organization and muscle contraction. Some research (Yang et al., 2003) has recently demonstrated that the frequency of the D allele is significantly lower in elite sprint and power athletes than in control, suggesting that the allele D may be required for optimal muscle performance at high velocity.

PURPOSE OF THE WORK

The work is a preliminary note of a broader projects that has the aim of studying the anthropometrical and molecular factors associated to the attainment of high level performances in male and female elite artistic gymnast.

RESULTS

Some of the characteristics of the athletes are shown in table 2. Athletes of different specialities show some variability for the considered lengths (Fig.2). Three of the four athletes that don’t have any specialisation (A, C and D), are grouped between the 14th and 17th percentile. One of the athletes (B) is the only exception of the athlete specialized in rings that is andromorphic mesomorph and of the other specialities is a mesomorphic lepto or endomorph. By evaluating the height and body weight of the athletes, we can observe that the athletes are plotted in a diagonal line which passes from the youngest athlete (A2) to the eldest athlete (E1) and validate the cumulative variability of height weight and hand-grip strength. We observe that the athletes are plotted in a diagonal line which passes from the youngest athlete (A2) to the eldest athlete (E1) and validate the cumulative variability of height weight and hand-grip strength.

CONCLUSION

The results of this first approach to the study of the National Team of gymnastic men give some indication of interest. The anthropometrical aspects suggest a certain variability of body size and shape related to the practised specialities. The molecular aspects also suggest a mutation in ACTN3 577X genotype and related to the speciality. This data is a first approach to the study of the D allele associated with high ACE activity. These aspects seem to be in agreement with high level of performances.

MATERIAL AND METHODS

The examined sample was composed by 10 gymnasts of the present Italian National Greater Male Artistic Gymnastics Team. All the gymnasts reached a competitive International and Olympic-Level.

The factors that we are going to evaluate in all the athletes for the purposes we appointed are: height, weight, length of diameters, skinfold thickness. Body composition and height. Carter and Heath somatotypes were calculated. Besides, we measured the strength of the flexors muscles of the hand with the use of the hand-grip. The index of relative strength, (hand-grip strength/height) was compared with the reference values reported in the literature. The following polymorphisms were analyzed: ACE - ACTN3. The analysis was extracted by buccal swab using the commercial available kit by Qiagen.

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ESSENTIAL BIBLIOGRAPHY


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