Talent Identification of Elite Iranian Male Artistic and Trampoline Gymnasts

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Abstract: The purpose of this study is to compare the anthropometric and body composition profiles of artistic versus trampoline gymnasts of Ardabil city. The research was conducted on a sample of 47 male gymnasts divided in two groups: 31 artistic gymnasts (age 12.64±3.11 years) and 16 trampoline gymnasts (age 13.31±3.41 years). Anthropometric and body composition variables (height, weight, waist to hip ratio, body fat percent, body segment lengths, body circumferences) of the gymnasts were measured by the means of standard procedures. Artistic gymnasts had low height, weight and other anthropometric variables than trampoline athletes. Furthermore, there were significant differences in head circumference (P< 006), knee circumference (P< 032) and upper body length (P< 035) between the two groups. In conclusion, the anthropometric profile charts in elite artistic and trampoline gymnasts can contribute to talent selection and identification and could be of great importance for optimal construction of strength/power and endurance training programs to improve gymnastic performance by the coaches.

Key words: Artistic Gymnasts · Trampoline Gymnasts · Body composition · Talent Identification

INTRODUCTION

Gymnastics is one of the oldest and famous sports in the Olympic program. Within the competitive sphere, gymnastics incorporates 4 separate and totally different styles: rhythmic gymnastics, trampoline and men's and women's artistic gymnastics [1]. It's a sport that differs from the others for its plenty of hard moves, performed under especial conditions: in the equipment, where it is evaluated the gymnast's level by a group of judges, as per the program's difficulty criterion, the composition and the quality of the performance [2]. In terms of hours of training, diversity and intensity it may be one of the most demanding sports for children, who are already experiencing significant changes in their growth, development and maturation [3]. However, athlete development is the result of organized physical and technical training, methodical, rigorous and based on the sports demands and the participants morphological profile [4]. Actually scientific literature review indicates that mean height and weight of gymnasts are lower than the heights and weights of many top class sportsmen [1]. Results of another study revealed that Japanese gymnasts have short tibias and short arm than their US counterparts [1]. Gymnastic athletes are low in fat, with a percentage fat between 3 and 4% and a lean body weight of approximately 63.5 kg [1]. With the innumerable variety of human physique, it has become a generalized consideration that some sports events are more appropriate to individuals with specific physique than others [5, 6]. It has been well established that specific physical characteristics or anthropometric profiles indicate whether the player would be suitable for the competition at the highest level in a specific sport [7-9]. These anthropometric and morphological parameters are the sensitive indicators of physical growth and nutritional status of the athletes for their maximal performances [5, 10]. Thus, in selection of athletes for a particular sport, the focus should be on those traits and abilities which have the most significant influence on sport performance, such as physiological and anthropometric characteristics.

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Unlike in women's artistic gymnastics, in men's artistic gymnastics there are few studies that use anthropometric techniques to assess certain somatic variables [11, 12]. Therefore, the purpose of this study is to compare the anthropometric measures in young elite Iranian artistic and trampoline athletes as two events of gymnastics.

MATERIALS AND METHODS

Subjects: Forty-seven young elite male gymnasts who volunteered to participate in the study read and signed an informed consent document prepared and approved by the Board for Protection of Human Rights affiliated to the University of Mohagheghe Ardabily, Ardabil, Iran. They were healthy volunteers with no history of cardiovascular disease, orthopedic problems, or other medical conditions that would contraindicate exercise (Artistic: n=31; 12.6±3.1 year old and Trampoline: n=16; 13.3±3.4 year old). All the subjects were professional gymnasts with at least 4 years experience.

Anthropometric Characteristics: All anthropometric characteristics were measured 14 hours after the last training session. To assess the percentage of body fat, the three points skinfold measurement (Chest, Abdomen and Thigh) was taken on the right side. Measurements were taken when the skin was dry and not overheated. The Lafayette standard caliper was used to measure the skin-fold thickness in millimeters. Relative body fat was calculated using the Jackson and Polack skin folds equation [13] and then, fat free mass was calculated.

To estimate body weight and height the participants were barefoot and wore only underwear. Body weight (kg) was measured using a standard balance beam (Seca 220). Body height (cm) was measured using a precision stadiometer (Seca 220), attached to the balance beam. The subjects stood upright, with feet together, knees straight, heels, buttocks and back touching the back part of the stadiometer and the head held so that the Frankfurt line was horizontal. To compute BMI (kg/m2), data were converted into metric units of kilograms (mass) and meters (height).

Using Standards anthropometry procedures [14-16], 9 circumferences (head, neck, chest, waist, hip, mid-upper arm, wrist, knee, ankle) and 5 body lengths (arm, hand, upper body, leg, knee to ankle) were measured to the nearest centimeter using flexible tape rule (Holtain Ltd). Waist circumference was divided by the hip to determine the waist to hip ratio.

Data Analysis: Data were screened for problems of skew, kurtosis and outliers. Standard descriptive statistics were determined for directly measured and derived variables. Independent samples t-test was used for the comparison of anthropometric indicators between the artistic and trampoline gymnasts. Data were analyzed using SPSS (Statistical Package for Social Science) version 18.0. A 5% level of probability was used to indicate statistical significance.

RESULTS

All variables approximated a normal distribution (skew: <3, kurtosis: <10). Anthropometric characteristics of the Gymnasts are presented in Table 1. The results of this table (Table 1) show significant differences in head circumference (P< 006), upper body length (P< 035) and knee circumference (P< 032) between the two groups.

DISCUSSION

It is worth to note that data on gymnastics, considering the artistic and trampoline events at the Iranian level are very few. The artistic athletes in the present study were therefore described in terms of how they compared with those in trampoline. Previous investigations in male athletes showed that there are differences in the anthropometric characteristics and body composition associated with training exercise [7-9]. The results of present study indicated significant differences in upper body length, head circumference and knee circumference between the two gymnastic groups (Table 1). It has been well established that mean height and weight of gymnasts are lower than the height and weight of many top class sportsmen [1]. Results of previous study have also reported that Japanese gymnasts have short tibias and short arms than their US counterparts [1]. Although there was no significant difference in height and body segment lengths between the groups, artistic gymnasts were shorter than trampoline athletes and they had low values of body segment lengths in this study. Low values of stature and lower limbs length seemed to be required to reach high performance in artistic gymnastic. For instance, floor specialists tend to be the shortest, stockiest and most powerful, a physique most suitable for fast tumbling and rapid aerial rotations. This example demonstrates an even more specific structure function relationship in which physiques are biomechanically efficient for different events within gymnastic performance.

Table 1: Comparison of anthropometric and body composition variables between two groups of the gymnasts

Variables	Artistic (n=31) (means ±SD)	Trampoline (n=16) (means ±SD)	P-value
Age (year)	12.64±3.11	13.31±3.41	.504
Height (cm)	142.51±18.17	151.12 ±25.98	.057
Weight (kg)	39.83±13.74	46.23±18.56	.187
Arm length (cm)	64.90±8.02	68.99±9.50	.127
Hand length (cm)	15.96±2.11	16.73±2.33	.263
Upper body length (cm)	77.77±8.66	84.08±10.76	.035*
Leg length (cm)	74.69±8.51	79.06±9.77	.120
Knee to ankle length (cm)	36.70±4.76	39.20±5.47	.111
Head circumference (cm)	53.28 ± 1.86	55.08 ± 2.32	.006*
Neck circumference (cm)	30.69 ± 3.47	31.73 ± 3.75	.352
Mid upper arm circumference (cm)	22.39 ± 3.79	22.93 ± 4.03	.656
Wrist circumference (cm)	14.93 ± 1.90	15.29 ± 1.96	.551
Chest circumference (cm)	74.52 ± 10.69	77.47 ± 12.13	.396
Waist circumference (cm)	63.38 ± 7.33	67.23 ± 10.01	.140
Hip circumference (cm)	73.13 ± 9.08	78.86 ± 11.56	.069
Knee circumference (cm)	30.77 ± 3.28	33.20 ± 4.03	.032*
Ankle circumference (cm)	19.14 ± 2.57	19.97 ± 2.35	.286
Body fat (%)	12.32±4.30	14.04±3.90	.186
Fat free mass (kg)	38.77±14.12	32.55±11.47	.135
WHR	0.86±.03	.85±.029	.113

*$p<0.05$

Gymnasts are low in fat, with a percentage fat between 3 and 4% and a lean body weight of approximately 63.5 kg [1]. Surprisingly, not important differences were found in body fat and waist to hip ratio between the two groups in this study. However, artistic gymnasts had low values in the two mentioned variables. Men's artistic gymnastics involves competition on the pommel horse, vault, floor, high bar, parallel bars and rings. In terms of hours of training, diversity and intensity it may be one of the most demanding sports for children, who are already experiencing significant changes in their growth, development and maturation [3]. Therefore, this way of practice may result in muscular strength and endurance enhancement. The results of present study and related studies can become the guide for sport scientific, coaches and athletes alike as they progress through the hierarchy of competition. It also provides baselne anthropometric and physiological data that can be used in the prescription of individual training programs for gymnastic athletes.

CONCLUSION

Artistic gymnasts were shorter in height and body segment lengths, with low values of body fat and waist to hip ratio than trampoline athletes. The anthropometric profile charts in elite artistic and trampoline gymnasts can contribute to talent identification and could be of great importance for optimal construction of strength/power and endurance training programs to improve gymnastic performance by the coaches.

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