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The Physical Characteristics of Elite Female Figure Skaters

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Abstract
The physical characteristics of high-level athletes differ in each sport, and coaches and athletes have a tendency to these traits. In this study, the physical characteristics of figure skaters (N=22) were examined. Anthropometric measurements were taken in accordance with ISAK protocol. Variables that were derived from anthropometric measurements and somatotype components of the athletes were calculated. Descriptive statistics analyses were carried out using IBM SPSS 25.0 statistics program. Percentage increase amounts were calculated in age groups and significant increase rates were examined. Body mass (BM), biceps, iliac crest, suprasipinale, abdominal, front tight skinfold thickness (ST), Σ6 and Σ8 between Groups I and II; biceps ST between Groups II and III; BM, subscapular, iliac crest, suprasipinale, abdominal ST and Trunk/Extremity ratio between Groups III and IV; BM, biceps, medial calf ST between Groups IV and V showed changes of 20% and more. In Groups II and IV an increase was observed in more parameters and ST values. In arm girth measurements were observed a change of 15.5% in groups III, IV and in other girth measurements were observed a change of 10% between age groups. In breadth measurement values, the most significant change was seen between Groups IV and V (12-16%). Somatotype components were determined 2.3-3.2-3.4 and 2.3-3.5-3.3 in Group IV, V. In our study, the physical characteristics of the athletes in the groups have changed with maturation. As the age progressed, an increase in the parameters related to the amount of body fat was observed.

Keywords: Physical characteristics, Anthropometric measurements, Figure skating, Athletes.

Introduction

Physical morphology or physical state, body weight or composition, body size and shape are important in a lot of branches of sports to optimize performance (Slater, O'Connor, & Kerr, 2018; Durakovic, 2012). Figure skating is an aesthetic and technical branch of sport performed in different age groups, levels and disciplines (singles, pairs, dance, synchronize) accompanied by music applied with different body dificulties. The harmony of conditional and coordinative capabilities are important in coreographic movements. Balancing movements on thin and slippery ground, using the lines on the ice and space skillfully and perfectly, leaving a good impression on judges and viewers take long training hours and years of a skater. In figure skating, with technical movements, artistic presentation, aesthetic attraction and physical appearance are given great importance.

Athletes competing in aesthetic sports may feel more pressure to lose weight than athletes in different sports branches (de Bruin, Oudejans, & Bakker, 2007). In figure skating, there are studies that indicate eating disorders of athletes to control their body weight (Dwyer, Eisenberg, Prelack, Song, Sonneville, & Ziegler, 2012; Voelker, Gould, & Reel, 2014). In a study conducted, 92.7% of figure skaters (ages 16 - 22), stated that they feel the pressure of losing weight (Taylor, & Ste-Marie, 2001).

Anthropometric measurements are taken regularly for different purposes such as observing athletes, monitoring growth and development, ageing and motor performance, physical activity, nutrition intervention to changes in body composition (Marfell-Jones, Olds, Stewart, & Carter, 2007). Because of the fact that figure skating is a kind of sport that specialized earlier (American Academy of Pediatrics (AAP), 2000), anthropometric measurements could be beneficial to watch training effects, physical developments and compare skaters within their group or with other groups. In this study, physical characteristics of the elite figure skaters competing were examined.

Metod

*Participants:*Twenty-six figure skaters, including national athletes (aged 6 - 17) (decimal age) from The Municipality of İzmir Sports Club took part in this study as competitors in the discipline of singles. Because the number of male athletes were inadequate in age groups (n=4), they were not involved in the study. The sports start ages of the girls (N=22) was 6.0 ± 1.6 year, and the weekly training hour was 8.8 ± 1.6 hour. Five different age categories were created. (Group I; n:5; 6.0 - 8.2 years), (Group II; n:5; 8.5 - 10.3 years), (Group III; n:5; 10.8 - 12.2 years), (Group IV; n:3; 13.0 - 13.1 years), (Group V; n:4; 15.9 - 17.9 years). The aim of this study and the measurements to be applied were explained to the athletes, their families and trainers, and their written consent was obtained.

*Anthropometric Measurements:*Anthropometric measurements were performed according to the ISAK (International Society for the Advancement of Kinanthropometry) (Restricted Profile - 17 parameters, bolded in tables) protocol (Marfell-Jones, Olds, Stewart, & Carter, 2007) by an accredited ISAK Level III anthropometrist in the Kinesiology Laboratory of

Ege University Faculty of Sport Sciences at the beginning of the season, in morning hours and in 2017.

Body mass (BM) was measured through a scale with a sensitivity of 0.1kg, stature (S) was measured by a stadiometer with a sensitivity of 0.1 cm (Seca 769, Germany). Sitting height (SH) and arm span (AS) were measured with a sensitivity of 0.1 cm. Skinfold thicknesses of triceps, subscapular, biceps, iliac crest, supraspinale, abdominal, front thigh, and medial calf regions were measured by skinfold caliper (nearest 0.2 mm, pressure of 10 g/mm², Holtain Ltd., UK), arm (relaxed), arm (flexed and tensed), waist, gluteal (hip) and calf girths were measured with a steel anthropometric tape (Cescorf Brasil, 0.1 cm distinction). The breadths of Humerus and Femur were measured with a small caliper and foot length was measured with a large caliper (Holtain Ltd., UK). Measurements were performed at the right side of the body. By using Microsoft Office Excel 2007 program, data recording and consistency between measurements were ensured.

Variables were derived from anthropometric measurements; Skinfold thickness of Σ6 (*Triceps* + *subscapular* + *supraspinale* + *abdominal* + *front thigh* + *medial calf*), and Σ8 (sum of all skinfold values) were calculated. Body mass index (BMI) was determined using the following formula: [(Body weight (kg) / height (m^2)], body fat ratio (%BF) was determined using the following formula: [0,610 x (*triceps* + *medial calf*) + 5.1] (Slaughter, Lohman, Boileau, Horswill, Stillman, Van Loan, & Bemben, 1988). Manouvrier Index (MI) was determined using the following formula: (Stature – Sitting Height / Sitting Height) x100. Waist/hip ratio (WHR) (%) was calculated. Sitting height/Stature ratio was determined using the following formula: (SH/S) x 100 (Monsma & Malina, 2005). The sum of trunk ST (*subscapular* + *suprailiac/suprasipinal* + *abdominal) /* the sum of extremity ST *(triceps* + *biceps* + *medial calf*) Trunk/Extremity skinfold ratios (T/E) (Monsma et al., 2005), and somatotype components were calculated in Group IV and V (Carter & Heath, 1990).

*Statistical Analyses:*Descriptive statistics analyses were carried out using IBM SPSS 25.0 statistics program. Percentage increase amounts were calculated in age groups and significant increase rates (%) were examined.

Results

Descriptive statistics of the physical properties of figure skaters are given in Table 1. BM, biceps, iliac crest, suprasipinale, abdominal, front tight ST, Σ6 and Σ8 between Groups I and II; biceps ST between Groups II and III; BM, subscapular, iliac crest, suprasipinale, abdominal ST and trunk/extremity ratio between Groups III and IV; BM, biceps, medial calf ST in Groups IV and V showed changes of 20% and more In Groups II and IV an increase was observed in more parametres and ST values (Table 2).

In arm girth were observed a change of 15.5% in groups III and IV and in other girth measurements were observed a change of ≈10 % between age groups. In breadth measurement values, the most significant change was detected between Groups IV and V

(12% - 16%) (Table 2).

Considering somatotype chatacteristics, endomorphy, mezomorphy and ectomorphy values were respectively 2.3 - 3.2 - 3.4 and 2.3 - 3.5 - 3.3 in Group IV and V (Table 1).

Table 1. The physical properties of female figure skaters.

N=22	Group I (n=5) (6-8.2 Age) Mean ± SD	Group II (n=5) (8.5-10.3 Age) Mean ± SD	Group III (n=5) (10.8-12.2 Age) Mean ± SD	Group IV (n=3) (13.0-13.1 Age) Mean ± SD	Group V (n=4) (15.9-17.9 Age) Mean ± SD
Starting (Age)	5.2 ± 0.7	5.2 ± 1.3	5.6 ± 0.5	7.0 ± 1.0	8.2 ± 2.2
Training weekly (h)	9.2 ± 1.7	9.2 ± 1.0	6.8 ± 1.0	9.3 ± 2.0	10 ± 0.0
Body Mass (kg)	**21.9 ± 2.9**	**28.0 ± 3.8**	**33.0 ± 4.4**	**42.5 ± 4.3**	**53.6 ± 4.2**
Stature (cm)	**121.3 ±5.8**	**131.8 ± 7.8**	**148.4 ± 3.6**	**153.8 ± 6.4**	**164.2 ± 5.3**
Arm Span (cm)	120.2 ± 8.3	130.7 ± 10.1	147.8 ± 2.4	153.7 ± 13.9	164.1 ± 6.3
Sitting Height (cm)	65.2 ± 2.2	68.3 ± 2.3	73.7 ± 3.7	77.7 ± 2.1	85.4 ± 1.7
Sitting Height/Stature (%)	53.7 ± 1.8	51.9 ± 1.4	49.6 ± 1.3	50.5 ± 0.8	52.0 ± 2.0
Manouvrier Index (MI)	85.7 ± 6.3	92.7 ± 5.5	101.4 ± 5.6	97.7 ± 3.3	92.3 ± 7.5
BMI (kg/m^2)	14.8 ± 1.1	16.0 ± 1.0	14.9 ± 1.9	17.9 ± 0.6	19.9 ± 1.8
WHR (%)	0.78 ± 0.01	0.78 ± 0.02	0.76 ± 0.04	0.75 ± 0.03	0.71 ± 0.02
BF (%)	14.6 ± 0.9	16.2 ± 2.9	16.2 ± 3.2	16.0 ± 0.5	18.1 ± 3.4
Triceps skf. (mm)	**8.3 ± 0.7**	**9.6 ± 2.8**	**8.9 ± 2.0**	**9.5 ± 1.9**	**9.9 ± 1.5**
Subscapular skf. (mm)	**4.4 ± 0.6**	**5.0 ± 0.5**	**5.4 ± 1.0**	**6.7 ± 0.7**	**6.6 ± 1.3**
Biceps sf. (mm)	**4.7 ± 0.7**	**6.0 ± 1.6**	**4.5 ± 1.1**	**4.7 ± 0.8**	**5.9 ± 3.0**
Iliac Crest skf. (mm)	**5.9 ± 0.8**	**8.4 ± 3.0**	**8.9 ± 4.3**	**9.9 ± 2.4**	**11.6 ± 4.8**
Supraspinale skf. (mm)	**3.6 ± 0.6**	**5.2 ± 1.3**	**4.6 ± 1.1**	**5.9 ± 1.1**	**6.1 ± 1.4**
Abdominal skf. (mm)	**5.1 ± 0.8**	**6.7 ± 1.4**	**7.5 ± 2.1**	**9.6 ± 1.7**	**11.0 ± 5.1**
Front Thigh skf. (mm)	**11.3 ± 1.0**	**14.3 ± 3.7**	**13.7 ± 5.0**	**14.3 ± 3.6**	**14.5 ± 2.9**
Medial Calf skf. (mm)	**7.3 ± 1.3**	**8.6 ± 2.0**	**9.6 ± 3.0**	**8.3 ± 1.1**	**11.3 ± 4.3**
Sum of 6 skf. (mm)	40.2 ± 3.3	49.6 ± 10.9	49.8 ± 13.7	54.4 ± 7.1	59.4 ± 15.1
Sum of 8 skf. (mm)	50.8 ± 4.5	64.0 ± 15.4	63.3 ± 18.1	69.1 ± 10.0	77.0 ± 22.5
Trunk/Ext. skf. (%) 3 Reg.	0.65 ± 0.06	0.71 ± 0.12	0.78 ± 0.13	0.98 ± 0.08	0.87 ± 0.08
Trunk/Ext. skf. (%) 4 Reg.	0.60 ± 0.07	0.66 ± 0.09	0.74 ± 0.15	0.87 ± 0.11	0.84 ± 0.07
Arm Girth (relaxed) (cm)	**16.7 ± 1.1**	**18.8 ± 1.2**	**18.8 ± 1.5**	**21.8 ± 0.6**	**24.1 ± 1.6**
Arm Girth (flexed-tensed) (cm)	**17.9 ± 0.9**	**19.8 ± 1.0**	**20.2 ± 1.8**	**22.8 ± 0.8**	**25.4 ± 1.3**
Waist Girth (min.) (cm)	**48.2 ± 5.7**	**52.9 ± 3.1**	**56.2 ± 5.6**	**61.4 ± 1.2**	**64.5 ± 1.9**
Gluteal Girth (hips) (cm)	**61.6 ± 3.1**	**67.1 ± 4.8**	**73.7 ± 4.3**	**81.2 ± 1.9**	**90.4 ± 3.9**
Calf Girth (max.) (cm)	**24.4 ± 1.7**	**27.4 ± 1.0**	**27.2 ± 2.4**	**30.5 ± 0.9**	**34.3 ± 2.5**
Humerus breadth (cm)	**4.7 ± 0.3**	**4.9 ± 0.2**	**5.4 ± 0.3**	**5.5 ± 0.4**	**6.1 ± 0.2**
Femur breadth (cm)	**7.2 ± 0.3**	**7.6 ± 0.3**	**8.1 ± 0.2**	**8.3 ± 0.2**	**7.9 ± 0.6**
Bi-styloid, breadth (cm)	4.0 ± 0.4	4.3 ± 0.2	4.6 ± 0.1	4.6 ± 0.05	5.4 ± 0.1
Foot length (cm)	18.6 ± 1.1	20.6 ± 1.9	22.3 ± 0.3	22.8 ± 0.7	24.5 ± 0.7
Endomorphy				2.3 ± 0.4	2.3 ± 0.3
Mesomorphy				3.2 ± 0.9	3.5 ± 1.2
Ectomorphy				3.4 ± 0.8	3.3 ± 1.1

Table 2. The amount of increase (%) in physical properties compared to the previous age group of female figure skaters.

N=22	Group I (n=5) (6-8.2 Age)	Group II (n=5) (8.5-10.3 Age) % Increase	Group III (n=5) (10.8-12.2 Age) % Increase	Group IV (n=3) (13.0-13.1 Age) % Increase	Group V (n=4) (15.9-17.9 Age) % Increase
Starting (Age)		0	7.6	25.0	17.8
Training weekly (h)		0	-26.0	37.2	7.1
Body Mass (kg)		27.3	17.9	28.8	26.0
Stature (cm)		8.7	12.5	3.6	6.7
Arm Span (cm)		8.7	13.0	4.0	6.7
Sitting Height (cm)		4.8	7.9	5.4	9.8
Sitting Height/Stature (%)		-3.5	-4.3	1.8	2.8
Manouvrier Index (MI)		7.7	9.3	-3.6	-5.4
BMI (kg/m^2)		7.9	-6.7	19.7	10.9
WHR (%)		0.7	-2.7	-0.9	-5.1
BF (%)		10.7	0.2	-1.0	12.5
Triceps skf. (mm)		15.3	-7.4	7.1	4.3
Subscapular skf. (mm)		14.0	7.9	23.7	-0.8
Biceps skf. (mm)		27.5	-24.9	4.7	24.6
Iliac Crest skf. (mm)		41.8	-10.7	28.0	3.0
Supraspinale skf. (mm)		41.8	-10.7	28.0	3.0
Abdominal skf. (mm)		31.3	11.2	27.3	14.8
Front Thigh skf. (mm)		26.6	-4.5	4.3	1.7
Medial Calf skf. (mm)		17.7	11.6	-13.3	36.5
Sum of 6 skf. (mm)		23.2	0.4	9.2	9.1
Sum of 8 skf. (mm)		25.9	-1.18	9.2	11.3
Trunk/Ext. skf. (%) 3 Regions		10.4	8.9	25.7	-10.7
Trunk/Ext. skf. (%) 4 Regions		9.9	11.7	18.1	4.8
Arm Girths (relaxed) (cm)		12.3	0	15.5	10.7
Arm Girths (flexed-tensed) (cm)		10.3	1.8	13.2	11.4
Waist Girths (min.) (cm)		9.7	6.3	9.2	5.0
Gluteal Girths (hips) (cm)		8.9	9.9	10.1	11.3
Calf Girths (max.) (cm)		12.2	-0.9	12.2	12.3
Humerus breadth (cm)		3.7	9.7	0.6	12.7
Femur breadth (cm)		5.8	6.5	1.7	6.0
Bi-styloid, breadth (cm)		7.4	7.8	-0.2	16.7
Foot length (cm)		11.1	7.9	2.1	5.4

Discussion and Conclusion

Models in "long-term athlete development" programs (Balyi & Hamilton, 1995; Açıkada & Hazır, 2016) are discussed to achieve success in sports. Factors including physiological, biomechanical characteristics and capability features of athletes are important, but an athlete's anthropometric dimensions, body shape, body proportion and body composition are variables involved in determining potential for success (Norton, Olds, Olive, & Craig, 1996). Monitoring physical characteristics together with certain performance data can provide athletes to preserve their sportive lives in a healthy way for a long time. In addition, the mechanical advantages of morphological properties and their effects on movement technique have been the subject of research. In this study, the physical characteristics of figure skaters were examined.

Children generally start ice skating between the ages of 3 and 4 (Barton, Hunter, Williams, McGrigor, & Slaght, 2012). The age to start this sport is between 7 to 9 ages, getting specialized in it is between 11 to 13 ages and development is between 18 and 25 ages (Açıkada et al., 2016). In our study, starting age mean is determined as 6.0 ± 1.6 year (Table 1). Due to the metropolitan advantages and families' awareness, children can start this sport at an earlier age.

The period before puberty and during puberty is the periods when development of BF%, lean body mass and development are at their fastest (Webster & Barr, 1993). Characteristics like body mass, lean mass and fat mass are plastic and can be manipulated (Slater et al., 2018). Training has the effect to change body composition (Malina & Bouchard, 1991). In this study when amounts of increase (%) compared to earlier age group is examined, an increase in more parameters were seen in Group II and IV (Table 2).

BM and length or stature, the most basic information used to assess growth and nutritional status (Zemel, 2002). In figure skating, athletes being relatively small, lean and muscular, own smaller percent fat values compared to normal population (Faulkner, 1976). In a study (age 15.3 ± 2.3, n:60) S, BM and BMI mean values were stated as respectively 157.7 cm, 51.0 kg, 20.4 (Monsma et al., 2005). In our study, the average values of these features were determined as 164.2 cm, 53.6 kg, 19.9 in Group V (matching age group) (Table 1). It was observed that our skaters' S mean values were higher and BM, BMI values had similar characteristics. In addition, the mean BM and BMI values of all our groups were lower than the mean values of non-athletes Turkish girls (at the 25th Percentile) and the S mean values were close to the values at the 50th Percentile (Neyzi et al., 2008).

In figure skating, lower extremity lengths could provide aesthetic attractiveness while creating movement size. SH/S ratio can give information about lower extremity length. In a study conducted this ratio was found as 53.0% (Monsma et al., 2005). In our study the value was found as 52.0%. However, in Groups II, III, a little longer leg structure was observed (Table 1). MI also provides information about lower extremity length and in our study the highest value was observed in Group III (Table 1). However, no comparable data was found in literature considering MI. In a study conducted with figure skating athletes (Duraković, 2005) it was observed that the mean values of S, AS were consistent with the mean values of Group II, III in our study. The AS mean values of Group IV (153.7 ± 13.9) were found to be lower than Turkish children (non athlete - age 13, 157.2 ± 10.0 cm) (Mazıcıoğlu et al., 2009).

In a comprehensive study (Duraković, et al., 2005), conducted on in young female ballet dancers, rhythmic gymnasts, and figure skaters (ages 10-11, N=12), it was observed that the mean values of S and AS were similar to the mean values of our athletes, but BF%, BMI, breadth, girth and skinfold thickness were higher than the mean values of our athletes in Groups II and III. In another study conducted in rhythmic gymnastics, the mean values of BF% and all skinfold thickness of the gymnasts were found to be lower than the mean values of our athletes in Groups I, II, III, but the values of MI, BM, SH, AS, BMI and girth measurements were similar in both sports branches (Kutlay & Türkkanlı., 2012).

In a study (ages 9-12, N=32) (Mostaert, Deconinck, Pion, & Lenoir, 2016), S, SH, BM, BF% mean values were respectively determined as 144.8 ± 8.7 cm, 75.7 ± 4.6 cm, 36.3 ± 7.3 kg, 17.3 ± 5.7 %. It was observed that the values except S were lower in our skaters in similar age groups, and BF% was determined by the Bioelectrical Impedance Analysis (BIA) method, which limited the comparison of this value with our data. It was emphasized in a study that the BF% obtained using the BIA formula could not be compared with the anthropometric method. (Harbili et al., 2008).

Σ6 and Σ8 skinfold thickness values could give better information to estimate fatness level and to make comparisons. Ultrasound measurement technique is also recommended to measure subcutaneous fat without squeezing (Müller et al., 2013), but measurements done with skinfold caliper, is used in large populations and is preferred because of being economical. Measurement methods, measuring equipment, preferred equations, the level of education and experience of the measurer can affect results and limit comparisons.

Special ST and the ratio between skinfold thicknesses are used to show subcutaneous fat distribution (Abernethy, Olds, Eden, Neill, & Baines, 1996). In our study, Σ6 mean value of Group V (*triceps* + *subscapular* + *supraspinale* + *abdominal* + *front thigh* + *medial calf*) was determined as 59.4 mm. At similar age, Monsma et al. (2005) found this value to be 58.7 mm.

To determine the value of Σ6 in our study, 3 trunk, 2 leg and 1 arm areas, whereas in the other study (Monsma et al., 2005) 3 trunk, 2 arm and 1 leg area (triceps + biceps + subscapular + suprailiac / suprasipinale + abdominal + media calf)) has been evaluated. In figure skating, movements like speed up, stops, jumps/leaps, balances, spins, etc. mostly are loaded on lower extremities. No studies were found in the related literature considering the effect of regional fat deposition on athletic skills.

On estimate subcutaneous fat distribution, T/E mean value (n=60, age 15,6 ± 2.4, free style) have determined as 0.94 (Monsma et al., 2005). In our study, skin fold thicknesses were taken from similar regions. The extremity areas of Σ6 (triceps + front thigh + calf) were different (1 arm, 2 leg area) according to ISAK protocol, this value of our athletes was determined as 0.87 in Group V (Table 1). In another approach, in our athletes, T/E value, when the sum of not 3 but 4 trunk region ST were divided by the sum of ST of 4 extremity region, the T/E value was found to be 0.87 in Group IV and 0.84 in Group V. Genetic characteristics, training types, diet and life styles could create these differences.

Waist girth provides a simple yet effective measure of truncal adiposity in children and adolescents (Taylor, Jones, Williams, & Goulding, 2000). In this study skaters' girth measurement increased with age, however, it differed less by skinfold thickness and waist girth values of Group IV, were lower (61.4 ± 1.2 cm) than Turkish children (non athletes - age 13, 63.5 ± 6.0 cm) (Hatipoğlu et al., 2008). While a difference of 15,5% was observed between Group III and IV considering arm circumference, changes of ≈10% were determined in other girth measurements (Table 2). Monsma et al. (2005) determined the mean values of arm (relaxed, bent and stretched) and calf girth as 24.5, 25.8 and 32.6 cm, respectively, these values were determined as 24.1, 25.4 and 34.3 cm in our athletes (Group V). Sportive background, training types and genetic factors are thought to be effective in girth measurements. Extremity girth measurements are used to monitor bilateral muscle tissue development and can be useful to prevent asymmetrical development.

In this study the most significant humerus and femur breadth measurement differences were observed between Groups IV and V (12% - 16%) (Table 2). Maturation process about bone development is related to a number of factors. In this sport branch, training is done indoors on hard ground. Bone development is also important in athletes that can tolerate the mechanical loads of training. It was shown that athletes in singles and pairs categories have higher bone mineral density and the osteogenic effect of training (Prelack, Dwyer, Ziegler, & Kehayias, 2012). Determination of training areas where skaters can benefit from daylight during training at the outside the ice rink and monitoring their diet are important.

No studies were met in literature about foot lengths being an advantage in learning and developing the skill in figure skating. However, in a study (Faulkner., 1976), foot length mean value was stated 23.2cm (age 15.7, n:18). In our study foot length mean value was determined as 24.5 cm for similar ages in Group V.

The somatotype is phenotypical and thus, amenable to change under the influence of growth, ageing, exercise and nutrition (Carter., 1996). In a study conducted on elite female skaters (age 15.7, n=17) ectomesomorphic characteristic was observed and endomorphy, mezomorphy and ectomorphy values were respectively 2.6 - 3.8 - 3.0 (Faulkner., 1976). In another study (age 15,6 ± 2.4, n=60, free style) these values were respectively 3.1 - 3.4 - 3.0 (Monsma et al., 2005). In our study the same values were respectively determined as 2.3 - 3.2 - 3.4 in Group IV and 2.3 - 3.5 - 3.3 in Group V (Table 1) and similar characteristics were observed. There is a need for studies in different categories and levels, followed for a long time and involving more athletes.

A follow-up of anthropometric characteristics, body composition and somatotypes is important in young ballerinas and performers in aesthetic sports (Durakovic, 2012). In this study conducted with a small group also including Turkish National skaters, physical characteristics of ice skating athletes were examined using a standard methot. In our study, the physical characteristics of the athletes in the groups have changed with maturation. As the age progressed, an increasing trend was observed in the parameters determining the body fat ratio. Collected data on athletes' physical characteristics and performance can assist coaches in setting training goals.

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