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The Determination of the Relationship between Somatotypes and Speed of Sub-Elite Athletes

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Abstract

This study aims to analyze the relationship between somatotypes and speed of 180 male sub-elite athletes aged between 18 and 25. Athletes were divided into two categories as balanced group (balanced somatotype groups) and randomly selected groups (groups outside balanced somatotypes groups) based on their somatotype structures. The arithmetic means and standard deviations of groups are (n=30) 21.95±2.80 years of age, height 168.40±2.62 cm, weight 69.20±5.26 kg in balanced endomorph group, (n=30) 21.60±3.15 years of age, height 170.25±6.39 cm, weight 67.25±6.09 kg in balanced mesomorph group, and (n=30) 20.40±1.46 years of age, height 175.10±5.02 cm, and weight 60.05±5.09 kg in balanced ectomorph group. On the other hand, the same values are (n=30) 21.35±2.30 years of age, height 160.10±2.20 cm, and weight 69.30±5.70 kg in random endomorph group, (n=30) 21.36±2.40 years of age, height 169.24±2.21 cm and weight 65.40±3.25 kg in random mesomorph groups, and (n=30) 20.50±1.85 years of age, height 176.15±3.30 cm and weight 70.10±4.45 kg in random ectomorph group. The measurement data were analyzed using SPSS 2.0 package program for Windows. Somatotype calculations were done in SOMATOTURK Calculation Program. The statistical analysis demonstrated that a highly positive significant correlation ($p<0.001$) was found between balanced somatotype groups (balanced endomorph, mesomorph and ectomorph) and randomly selected somatotype groups (random endomorph, mesomorph and ectomorph).

Keywords: Sub-elite athletes, Somatotypes, Speed.

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Ethical: This study follows all ethical practices during writing.

Contents

1. Introduction

It is not possible to reach a certain level of performance without physical properties suitable to the sports that an individual performs (Marangoz and Polat, 2017). Body structure is one of the factors influencing performance. Physical properties or body structures affect an individual's physiological capacity (Hazır and Açıkada, 2002). Strength and condition training are key elements in terms of reaching a high speed. Athletes need to effectively reach a maximum speed running speed for a successful performance (Murphy *et al*., 2003). Success requires a fast start, reaching the highest running speed as possible and keeping it for a certain duration (Delecluse *et al*., 1995; Johnson and Buckley, 2001) which is influenced by anthropometric, metabolic, neural and biomechanical factors (Abe *et al*., 2001; Ross *et al*., 2001).

2. Materials and Method

180 male sub-elite athletes aged between 18 and 25 and living in Kırşehir and Kahramanmaraş provinces of Turkey voluntarily participated in this study. They were divided into two categories as balanced group (balanced somatotype groups) and randomly selected groups (groups outside balanced somatotypes groups) based on their somatotype structures. The somatotypes and speed of sub-elite athletes were measured. Average means and standard deviations are given below:

Balanced endomorph group (n=30) 21.95±2.80 years of age, 168.40±2.62 cm height, 69.20±5.26kg weight.
Balanced mesomorph group (n=30) 21.60±3.15 years of age, 170.25±6.39 cm height, 67.25±6.09 kg weight.
Balanced ectomorph group (n=30) 20.40±1.46 years of age, 175.10±5.02 cm height, 60.05±5.09 kg weight.
Random endomorph group (n=30) 21.35±2.30 years of age, 160.10±2.20 cm height, 69.30±5.70 kg weight.
Random mesomorph group (n=30) 21.36±2.40 years of age, 169.24±2.21 cm height, 65.40±3.25 kg weight.
Random ectomorph group (n=30) 20.50±1.85 years of age, boy 176.15±3.30 cm height, 70.10±4.45 kg weight.

2.1. Determination of Somatotypes

The somatotype values of the participants were determined using Heath Carter method of somatotyping. Based on this method, body weight, height, biceps and calf circumference during flexion, humerus and femur breadth, triceps, subscapular, suprailiac and calf skinfold as well as following formulas (Ross and Marfell-Jones, 1991; Carter, 2002) are used to calculate somatotype values. In addition, "SOMATOTURK" program was used for calculations (Marangoz and Özbalcı, 2017).

2.1.1. Determination of Endomorph

A = triceps + subscapular + suprailiac
B= (170.18 / height) (Adjustment coefficient for height)
Adjusted sum X = A.B
Endomorph= - 0.7182 + 0.1451 (X) - 0.00068 (X^2) + 0.0000014 (X^3)

2.1.2. Determination of Mesomorph

Mesomorph = (0.858 HB + 0.601 FB +0.188 CAG + 0.161 CCG) - (0.131 H) + 4.5

HB	:	Humerus breadth (cm)
FB	:	Femur breadth (cm)
CAG	:	Arm circumference during flexion – Triceps skinfold /10
CCG	:	Maximal calf circumference – Calf skinfold /10
H	:	Height (cm)

2.1.3. Determination of Ectomorph

Height and weight are calculated in cm and kg, respectively. Height is divided by the cube root of weight to calculate HWR (HWR=height/cube root of weight). Ectomorph is calculated based on HWR value using one of the formulas below:

$$IF\ HWR \geq 40.75,\ Ectomorph = 0.732 \times HWR - 28.58$$
$$IF\ 38.25 < HWR < 40.75,\ Ectomorph = 0.463 \times HWR - 17.63$$
$$IF\ HWR \leq 38.25,\ Ectomorph = 0.1$$

2.2. 10 and 20 m Speed Performance

10 m and 20 m speed performances were measured using a New Test 2000 photocell device. The athletes warmed up for 10 minutes prior to the test. The track closing time was recorded in milliseconds. The test was repeated twice following a full rest, and the best results were used in the study.

2.3. Statistical Analyses

In this study, which analyzes the relationship between speed and balanced/randomly selected endomorph, mesomorph and ectomorph groups of sub-elite athletes, Windows SPSS 22.0 package program was used for spearman correlation analysis with a significance level of 0.05.

3. Findings

Table-1. Descriptive analyses of balanced and random somatotype groups

	BALANCED GROUPS			RANDOM GROUPS		
	Endomorph Group (n=30)	Mesomorph Group (n=30)	Ectomorph Group (n=30)	Endomorph Group (n=30)	Mesomorph Group (n=30)	Ectomorph Group (n=30)
	x±sd	x±sd	x±sd	x±sd	x±sd	x±sd
Age (years)	21.95±2.80	21.60±3.15	20.40±1.46	21.35±2.30	21.36±2.40	20.50±1.85
Height (cm)	168.40±2.62	170.25±6.39	175.10±5.02	160.10±2.2	169.24±2.21	176.15±3.30
Weight (kg)	69.20±5.26	67.25±6.09	60.05±5.09	69.30±5.70	65.40±3.25	70.10±4.45
10 m (sec)	2.30±0.09	1.90±0.18	2.05±0.13	2.63±0.14	2.40±0.19	2.26±0.18
20 m (sec)	3.05±0.15	2.40±0.29	2.81±0.12	3.25±0.16	2.98±0.22	2.99±0.14

(±) (Mean and standard deviation)

Table-2. The comparisons of 10m Pearson correlation analysis between balanced and randomly selected somatotype groups

		Balanced Endomorph	Random Endomorph	Balanced Mesomorph	Random Mesomorph	Balanced Ectomorph
Random Endomorph	r	1.000***	-	-	-	-
Balanced Mesomorph	r	1.000***	1.000***	-	-	-
Random Mesomorph	r	1.000***	1.000***	1.000***	-	-
Balanced Ectomorph	r	1.000***	1.000***	1.000***	1.000***	-
Random Ectomorph	r	1.000***	1.000***	1.000***	1.000***	1.000***

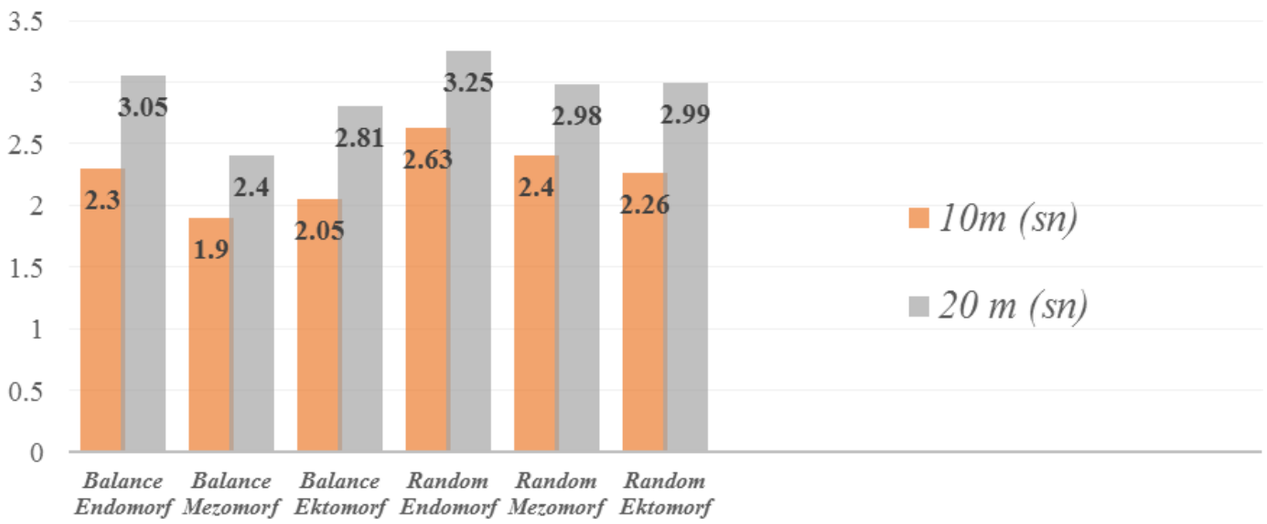
***p<0.001

Table-3. The comparisons of 20m Pearson correlation analysis between balanced and randomly selected somatotype groups

		Balanced Endomorph	Random Endomorph	Balanced Mesomorph	Random Mesomorph	Balanced Ectomorph
Random Endomorph	r	1.000***	-	-	-	-
Balanced Mesomorph	r	1.000***	1,.000***	-	-	-
Random Mesomorph	r	1.000***	1.000***	1,.000***	-	-
Balanced Ectomorph	r	1.000***	1.000***	1.000***	1.000***	-
Random Ectomorph	r	1.000***	1.000***	1.000***	1.000***	1.000***

***p<0.001

Pearson correlation between balanced and randomly selected somatotype groups for 10m and 20m distance ranges were compared as shown in Table 2 and 3. The results indicate a very highly positive correlation with a significance level of p<0.001 between balanced somatotype groups (balanced endomorph, mesomorph and ectomorph) and randomly selected somatotype groups (random endomorph, mesomorph and ectomorph) for 10m and 20m distance ranges.



Graph-1. Speed graph of balanced and randomly selected somatotypes

4. Discussion

Speed is the rate of change that enables a player to reach the highest speed within the shortest amount of time (Gambetta, 1996). In a study on 24 male sub-elite athletes (8 rugby players, 8 sprinters and 8 active athletes), 5-10m test values of rugby players, sprinters and active athletes were measured as 0.71±0.09, 0.68±0.04 and 0.74±0.04, respectively. On the other hand, the same study found out 10-15 m test value of rugby players, sprinters and active athletes as 0.63±0.03, 0.63±0.03 and 0.66±0.05, respectively. A significant was also found between rugby players and sprinters in terms of group correlation (Dowson *et al.*, 1998). Speed times of physical education students whose average years of age was 20.1±0.9, height was 1.79±8.4 cm and weight was 74.5±9.8 kg (n=24) were measured for 0-5m, 5-10m and 10-15m distance ranges, and average time was measured as 1.86±0.06 seconds for 5-10 m and as 2.60±0.10 for 10-15 m (Kukolj *et al.*, 1999). A study found 10 m speed of 14 sub-elite male athletes as 1.7 seconds (Chaouachi *et al.*, 2009). In a similar study, 10 m speed values of 16 male athletes were measured as 1.92±0.15 (Cochrane *et al.*, 2004). Another study found speed values as 0.80±0.05 for 5-10m and as

0.72±0.05 for 10-15m (Gabbett *et al.*, 2008). While speed is defined as the time that elapses in the first 10 m, maximum speed time is defined as the time that elapses in 20 m (Little and Williams, 2005).

In conclusion, when the correlation between balanced and randomly selected somatotype groups of sub-elite athletes and their speed in 10m and 20m distance ranges is analyzed, it was observed that the speed of athletes who have balanced endomorph, mesomorph and ectomorph groups are fairly better than sub-elite athletes who have random endomorph, mesomorph and ectomorph groups, and that a highly positive correlation with a significance level of $p<0.001$ was found between them. It can be argued that this results from differences of physical properties and sports branches.

References

Abe, T., S. Fukashiro, Y. Harada and K. Kawamoto, 2001. Relationship between sprint performance and muscle fascicle length in female sprinters. Journal of Physiological Anthropology and Applied Human Science, 20(2): 141-147. *View at Google Scholar | View at Publisher*

Carter, J.E.L., 2002. The heath-carter anthropometric somatotype-instruction manual. USA: San Diego.

Chaouachi, A., M. Brughelli, K. Chamari, G.T. Levin, N.B. Abdelkrim, L. Laurencelle and C. Castagna, 2009. Lower limb maximal dynamic strength and agility determinants in elite basketball players. Journal of Strength & Conditioning Research, 23(5): 1570-1577. *View at Google Scholar | View at Publisher*

Cochrane, D.J., S.J. Legg and M.J. Hooker, 2004. The short-term effect of whole-body vibration training on vertical jump, sprint, and agility performance. Journal of Strength & Conditioning Research, 14(4): 828-832. *View at Google Scholar | View at Publisher*

Delecluse, C., H.C. Van, E. Willems, M.L. Van, R. Diels and M.N.A. Goris, 1995. Influence of high-resistance and high-velocity training on sprint performance. Medicine and Science in Sports and Exercise, 27(8): 1203-1209. *View at Google Scholar | View at Publisher*

Dowson, M.N., M.E. Nevill, H.K.A. Lakomy, A.M. Nevill and R.J. Hazeldine, 1998. Modelling the relationship between isokinetic muscle strength and sprint running performance. Journal of Sports Sciences, 16(3): 257-265. *View at Google Scholar | View at Publisher*

Gabbett, T.J., J.M. Sheppard, K.R. Pritchard-Peschek, M.D. Leveritt and M.J. Aldred, 2008. Influence of closed skill and open skill warm-ups on the performance of speed, change of direction speed, vertical jump, and reactive agility in team sport athletes. Journal of Strength & Conditioning Research, 22(5): 1413-1415. *View at Google Scholar | View at Publisher*

Gambetta, V., 1996. In a blur: How to develop sport-specific speed. Sports Coach, 19(3): 22-24. *View at Google Scholar*

Hazır, T. and C. Açıkada, 2002. Reliability of bioelectric impedance analysis in assessing body composition: Comparison study. Journal of Sports Sciences, 13(2): 02-18.

Johnson, M. and J.G. Buckley, 2001. Muscle power patterns in the mid-acceleration phase of sprinting. Journal of Sports Sciences, 19(4): 263-272. *View at Google Scholar | View at Publisher*

Kukolj, M., R. Ropret, D. Ugarkovic and S. Jaric, 1999. Anthropometric, strength, and power predictors of sprinting performance. Journal of Sports Medicine and Physical Fitness, 39(2): 120–122. *View at Google Scholar*

Little, T. and A.G. Williams, 2005. Specificity of acceleration maximum speed, and agility in professıonal soccer players. Journal of Strength and Conditioning Research, 19(1): 76-78. *View at Google Scholar | View at Publisher*

Marangoz, İ. and Ü. Özbalcı, 2017. Somatotype calculation program (SOMATOTÜRK). Journal of Academic Social Research (ASOS), 47(47): 288-293. *View at Publisher*

Marangoz, İ. and Y. Polat, 2017. Effects on body composition and somatotypes acceleration rate in male sportsmen. Journal of Academic Social Science, 54(5): 345-360.

Murphy, A.J., R.G. Lockie and A.J. Coutts, 2003. Kinematic determinants of early acceleration in field sport athletes. Journal of Sports Science & Medicine, 2(4): 144–150. *View at Google Scholar*

Ross, A., M. Leveritt and S. Riek, 2001. Neural influences on sprint running. Sports Medicine, 31(6): 409-425. *View at Google Scholar | View at Publisher*

Ross, W. and M. Marfell-Jones, 1991. Kinanthropometry. In MacDougall, DJ., Wenger AH & Green H J.(Eds). Physiological testing of the high-performance athlete. Illinois: Human Kinetics Books. pp: 223-308.