
THE EFFECT OF DEVELOPMENTAL TRENDS ON SOMATOTYPE COMPONENTS IN ELITE MALE HANDBALL PLAYERS

František URBAN¹, Róbert KANDRÁČ²

1. Member of the Union of University Handball Teachers, EHF

2. Faculty of Sports, University of Presov in Presov, Slovakia

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- kinanthropometry,
- morphological parameters,
- body composition,
- sports games.

Abstract:

The purpose of the cross-sectional study was to determine the effect of developmental trends on particular somatotype components from the viewpoint of playing positions. The results revealed lower endomorphy and ectomorphy with comparable level of mesomorphy in wing players, center backs and backs. Contemporary top male handball players compared to their counterparts are characterized by muscular somatotype and lower body fat percentage. With regard to somatotype categorization, the most significant changes were observed in goalkeepers and center backs.

INTRODUCTION

Over recent decades, team handball has changed due to the implementation of new rules. Along with developmental trends, the game itself has become faster and more dynamic in terms of the execution of game skills. This has resulted in more demanding tempo game in both the offensive and defensive phases of the game. The rules alterations have significantly increased the effectiveness of the playing time utilization placing emphasis on special endurance, power and coordination and taxing the energy systems needed to effectively perform required game skills [8, 14, 17]. As reported by previous studies [1, 5, 6, 7, 9, 10, 11, 18], athletic performance in both individual and team sports is determined by overall somatic profile expressed by somatotype, which is one of the biological factors underlying the effective execution of the specific game skills. This poses the question of the effect of developmental trends and rules changes on somatotype components in elite male handball players with respect to playing positions.

METHODS

The first sample consisted of 256 elite male handball players who participated in 2010 Men's U20 European Handball Championship in Bratislava [18]. The sample tested in 2010 was compared with the sample consisting of 122 elite U19 male handball players who participated in the Handball Tournament Družba held in former Czechoslovakia in 1980² [12]. Consistent with the research objective, the players were assigned into position-specific groups: G – goalkeepers, W – wings, CB – center backs, B – backs and P – pivots (see Table 1).

Table 1. Sample characteristics

Sample	Mean age	Age (n)						Playing position (n)					Σ
		20	19	18	17	16	G	W	CB	B	P		
2010 ¹	19.6	65	82	8	1	-	38	71	45	63	39	256	
1980 ²	18.3	-	64	39	15	4	19	32	19	34	18	122	

The somatotypes of the U20 players were determined according to Heath, Carter using the following somatic parameters: body height, body mass, skinfold thickness: triceps skinfold, subscapular skinfold, supraspinale skinfold and calf skinfold, biepicondylar humerus breadth and biepicondylar femur breadth as well as flexed and tensed upper arm girth and standing calf girth [4]. The morphology according to Heath, Carter is expressed in a 3 number rating indicative of endomorphic, mesomorphic and ectomorphic somatotype components. The player's somatotypes were classified using 13 somatotype categories devised by Carter, Heath [2].

The collected data were processed using basic statistical characteristics: \bar{x} - arithmetic mean and s - standard deviation. The somatotypes were computed using the Somato software. The somatocharts were plotted in CorelDRAW X5. The differences in somatotype components between the samples and playing positions were determined by independent samples t-test.

RESULTS AND DISCUSSION

The endomorphic component is indicative of the volume of subcutaneous fat relative to body build [2]. Endomorphy-dominant athletes are endowed with muscle gain capacity with lower rate of fat reduction [3]. Therefore, the endomorphic and mesomorphic components may be to a large extent influenced by training. In elite male handball players, the endomorphy and mesomorphy values range from 1.0 to 2.5 and from 4.0 to 6.0, respectively. The ectomorphic component is indicative of body linearity, which cannot really be influenced. The recommended ectomorphy values range from 1.5 to 3.0 [19].

Difference in endomorphic component was found in all playing positions but goalkeepers. The differences between mean values ranging from 0.5 to 0.7 were statistically significant (see Table 2). This finding may be attributed to the frequent ball possession of back court players who perform a lot of short sprints with changes of direction as compared to other playing positions. Therefore, back players perform physically demanding and explosive actions. In wing and pivot players, the playing functions have not changed substantively, which is confirmed by the adjustment to the contemporary game trends.

Differences in mesomorphic component in favor of the 1980 sample were observed in goalkeepers, center backs and backs. The differences ranging from 0.1 to 0.3 were statistically insignificant as both samples were found to have well-developed musculature relative to body height. Minimal differences have confirmed the need for high muscle volume. The intensification of the game skills execution has resulted in the increase in the number of physical encounters during the game. Therefore, adequate physique significantly determines the efficiency in 1:1 game situations.

Higher mean ectomorphy values are indicative of relative linearity of body segments. The differences in mean ectomorphy values were found in all playing positions favoring the 1980 sample. The greatest difference of 0.8 was observed in the goalkeeper position. The endomorphy component is important for goalkeepers due to the fact the lengths of individual body segments underlie goalkeeping efficiency. Statistical difference was found in wing and back players as well. Overall, the body build was more linear in players of the 1980 sample.

Table 2. Difference in somatotype components with respect to playing functions

Somatotype	Sample	G	W	CB	B	P	Σ
Endomorphy	2010 ¹	2.2±0.92	1.4±0.45	1.7±0.61	1.7±0.65	2.0±0.81	1.8±0.73
	1980 ²	2.2±0.48	2.1±0.55	2.2±0.68	2.3±0.72	2.5±0.70	2.2±0.63
	Diff.	0	0.7	0.5	0.6	0.5	0.4
	t	0.05	2.22**	6.22**	4.13**	2.85**	
Mesomorphy	2010 ¹	4.5±1.27	4.8±1.11	5.0±0.94	4.6±0.89	4.8±0.99	4.8±1.05
	1980 ²	4.6±1.08	5.1±0.87	5.2±0.93	4.9±0.85	4.8±0.89	4.9±0.92
	Diff.	0.1	0.3	0.2	0.3	0	0.1
	T	0.29	0.14	1.37	1.59	0.77	
Ectomorphy	2010 ¹	2.5±0.90	2.5±0.75	2.6±0.76	2.7±0.89	2.3±0.78	2.5±0.82
	1980 ²	3.3±0.99	2.7±0.79	2.7±0.93	3.1±0.71	2.9±0.84	2.9±0.84
	Diff.	0.8	0.2	0.1	0.4	0.5	0.4
	t	3.00**	2.58*	1.22	2.24*	0.44	

* $p < .05$; ** $p < .01$; diff. - difference

The change in somatotype category in the goalkeeping position showed that contemporary goalkeepers are classified as balanced mesomorphs endowed with muscular physique. It may be assumed that such somatotype is beneficial when saving shots from the wing positions, dive shots from the pivot positions and jump shots performed by backs. On the other hand, if a more muscular somatotype is to be productive, the ratio between body mass, percent subcutaneous fat and muscular development should be appropriate relative to body height. The ectomorphy is indicative of body linearity and the symbiosis of the frontal body size and the length of individual segments are among important morphological parameters.

The change in somatotype category was recorded in the playing position of center back as well. Contemporary center backs are categorized as ectomorphic mesomorphs. The primary role of a center back player is to organize, create and complete the game situations predominantly from longer range or under restrained conditions. The players occupying the center back position encounter the opponent's defense consisting of robust and tall players. The need for relatively high values of body height, robust skeleton and muscle mass are highly relevant for contemporary back court players. Center backs, backs and wings showed low endomorphy values. However, the difference between these playing positions is significant in terms of speed, dynamics and coordination of movement.

As reported by Grasgruber, Cacek [3], contemporary male handball players are characterized by balanced somatotype with the rating of 2.5 - 5.0 - 3.0. The overview of studies in elite male handball players (see Table 3) confirms this finding. On the other hand, it should be noted that overall mean value does not refer to the team composition. Therefore, to evaluate players with respect to playing positions seems more appropriate.

Table 3. Somatotypes of male handball players – overview of studies

Study	Sample	n	Age	Somatotype
Štěpnička (1972)	Elite Czechoslovak players	21	24.3	2.7 - 5.0 - 3.0
Štěpnička et al. (1980)	Handball Tournament Družba	122	18.3	2.2 - 4.9 - 2.9
Šibila, Pori (2009)	Slovenian national team	78	25.1	2.3 - 4.9 - 3.0
Urban (2010)	Slovak national teams	49	18.3	2.0 - 4.8 - 2.3
Urban, Kandrác (2010)	Men's U20 European Handball Championship	256	19.6	1.8 - 4.8 - 2.5

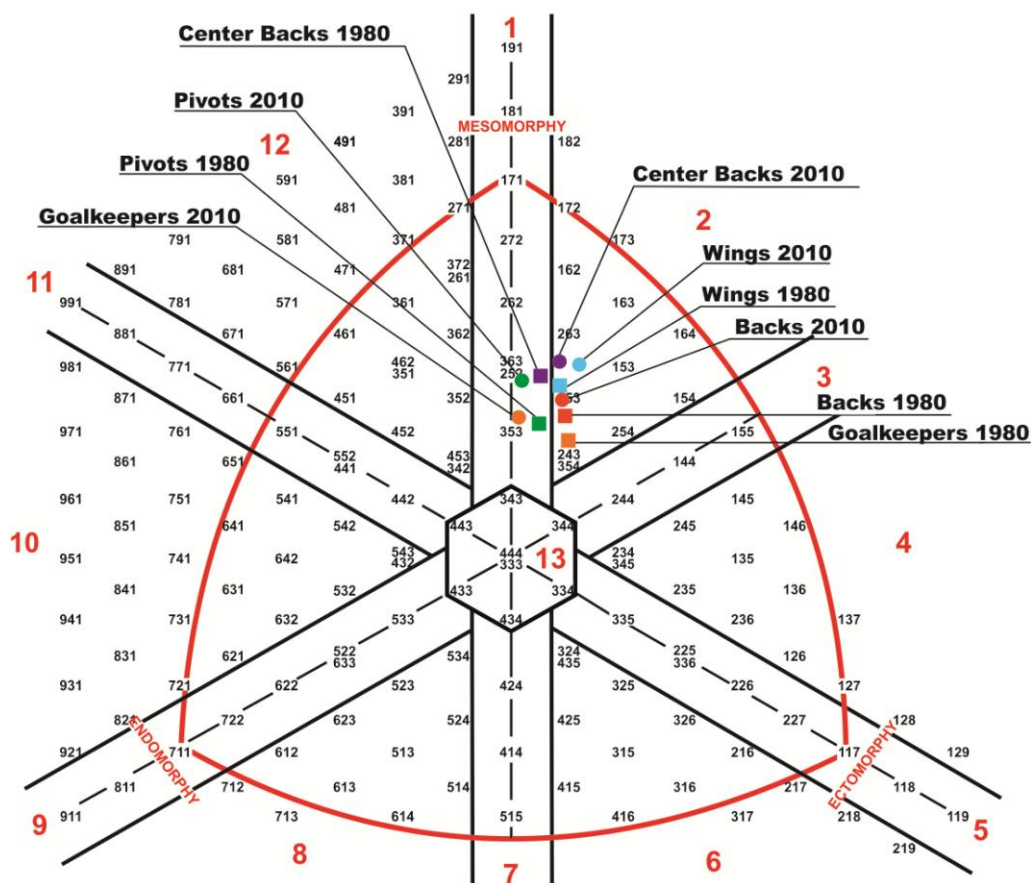


Fig. 1. Categorization of somatotypes

CONCLUSIONS

With respect to particular somatotype components, the differences in endomorphy were found in wing, center back, back and pivot playing positions. Contemporary players have lower volume of subcutaneous fat, which reflects the current character of dynamic handball. In the mesomorphic component, minimal differences were found favoring the 1980 sample. In ectomorphy the differences favored 1980 goalkeepers, wing players and backs. All playing positions were characterized by robust skeleton and well-developed musculature relative to body height. Contemporary players in all playing positions except goalkeepers are endowed with relatively linear physiques and lower amount of storage fat, which confirms the change in the game character and increased training demands necessary for efficient execution of handball skills. Overall, it may be concluded that the developmental trends and rules changes affected mainly endomorphic somatotype component. With respect to playing most profound changes in somatotype components were found in backs and wings.

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