ANTHROPOMETRIC CHARACTERISTICS AND INDICES OF FEMALE NATIONAL SOCCER PLAYERS OF THE SLOVAK REPUBLIC

JANKA PERÁČKOVÁ
Faculty of Physical Education and Sports
Comenius University in Bratislava
Slovak Republic

ABSTRACT

This study investigated anthropometric characteristics within a group of elite female soccer players. Author find out anthropometric characteristics of female national soccer players of the Slovak Republic in relation to age (U17, U19, "A" national team) and find out how these characteristics change due to ontogenetic development. There are no clear limits of ideal body shape and body composition for female soccer players. Anthropometry is used to assess and predict performance. The four building blocks or measures used to undertake anthropometric assessment are: age, sex, height, and weight. Each of these variables provides one piece of information about person. When two of these variables are used together they are called an index. Our collection of anthropometric data is for the purpose of a research in which we want to present some outcomes on existence or absence of differences in the indicators and indices of physical development in female national soccer players of the Slovak Republic.

Anthropometric variables measured in this study was: height, weight, waist circumference, hip circumference and from measurements derived indices: BMI (Body Mass Index), WHR (Waist to Hip Ratio), WHtR (Waist to Height Ratio), W/H ratio (Waist for Height ratio), H/A (Height for Age), W/A (Weight for Age), Ponderal Index (weight divided by height raised to the power of 3 – corpulence index), ABSI (a body shape index – may correspond to a greater fraction of visceral fat compared to peripheral tissue). When the measurements are used together they can provide important information about person's status. In this study we present the distribution of body weight, height and body indices by age of female soccer players selected to national teams of Slovak Republic.

Acknowledgement: This study is a part of VEGA research grant No. 1/1252/12: "*Improvement of identification and selection system of young male talented soccer players for junior national teams in the Slovak Republic and streamlining the content of their training and preparation*."

Keywords: soccer, female national players, anthropometry

INTRODUCTION

In the past, females had to be good and quiet housewives, obedient wives and good nurturers for their children. Sport was mainly manly domain. This is partly due to the masculine imagine of sports generally and soccer in particular. Opportunities for women in sport have nowadays expanded. Most of all, London 2012 is a reminder that women are capable of doing extraordinary things when nurtured in an environment that doesn't make them feel inferior (Balding, 2012). Soccer is considered a men´s-dominated sport in terms of participation. Many girls strive to attain excellence in some kind of sport and soccer, so called men's sport, is no exception. Women´s soccer is also a game that is characterized by variations in intensity, but women play soccer differently from men and as the main differences we can point out anthropometric characteristics, because these influence game. A link between anthropometric characteristics and performance in soccer has been proven to exist, and therefore, it is plausible to utilise such characteristics to direct the process of identifying talented players (Williams & Reilly, 2000).

If there are some articles presenting the importance of anthropometric characteristics and body composition on performance in male soccer (Rico-Sanz 1998, Reilly et al. 2000, Rienzi et al. 2000, Reeves and Collins 2003, Iglesias-Gutiérrez et al. 2005), the same importance is in female soccer. Soccer has been termed „maximal intermittent game". Soccer is a complex, intermittent sport, which requires maximum intensity efforts in a short period of time, where players with various body size and body composition can take part. Performance in soccer is influenced with anthropometric characteristics (Pavlík, 1999). That is why we focused in research in soccer from this point of view. „*The main task of the research work in the morphology of the athletes is an importance of these characteristics for athletes own performance, study the possibility of selecting the appropriate somatic types and possibilities of influencing specific training load*," (Ulbrichová, 1980). Soccer player profiles cannot be considered without body and its anthropometric characteristics. Success in sport competitions has been associated with specific anthropometric characteristics, body composition and somatotype (Bayios et al., 2006, Duncan et al., 2006, Hakkinen, 1993).

The growth of popularity and success of girls and women in sport influenced also progress in women´s soccer that has been made during and after Women´s World Cup in the summer of 1999. Soccer is a pleasurable team sport. It can never again be doubted that women soccer players can attract interest, fill stadiums or earn high television ratings. With the Women´s World Cup 1999, as de Varona (2005) wrote, this myth: "*Women will never be as popular as male athletes; therefore, they will not attract audiences large enough to make women´s sport financially profitable and viable,*" was broken. The audience for USA – China final match was 92 000 at the Rose Bowl. It was the largest crowd ever to witness a women's sporting event. Soccer is very popular sports game worldwide. Due to this popularity and acceptance among people is soccer developed in women's populations.

Participating in sport is a powerful tool also for girls and young women how to become successful in life. To be soccer professional is very interesting, and to be soccer representative of the country is honour.

Soccer research in sport science has focused mainly on men's soccer; while women's soccer has been not taken in account so much. Cantor & Konin (2006) in the article – Body Mass Index for FIFA World Cup Professional Soccer Players recommended: "*Identify BMI for female professional soccer players*." It was a challenge, so we decided, beside measurement of young soccer players, measure also women.

The aim of this article is to broaden the knowledge about anthropometric characteristics and indices of female soccer players of the Slovak Republic from the various national team categories (U17, U19 and „A" women team).

METHODS

Samples

This study investigated the anthropometric characteristics of 71 female soccer players divided into 3 age groups, who represented the Slovak Republic as the female national teams:

"A" team (n=25): age – 23.02, $s_{d(„A")}$ = 4.226, age-range varies from 18.11 to 31.58,
U19 (n=22): age – 16.94, $s_{d(U19)}$ = 0.579, age-range varies from 15.90 to 17.78,
U17 (n=24): age – 15.07, $s_{d(U17)}$ = 0.532, age-range varies from 13.94 to 15.72.

This paper refers to various measurements that have been used to evaluate specific aspects of the anthropometric

characteristics. The variables analysed were 22 anthropometric measurements: body height (H), body weight (W), Body Mass Index (BMI), waist circumference (Wst), hip circumference (Hp), Wais to Hip Ratio (WHR), biacromial diameter (BIA). Women were measured over-bust chest circumference (OBCC) at the level of the fullest part of the breast during three respiratory states, on the end in maximal inspirium (Ins) and in maximal expirium (Exp) and in mid-chest during talking (Norm). Taking skinfold measurement is a common method for determining body fat composition. Skinfolds are generally taken at specific sites on the right side of the body. Several of the sites were measured also on the left side, because of future analysis concerning laterality of the players (the next paper in preparation). The Harpenden Caliper was used.

1. Biceps – front side of the upper arm (right side, left side).
2. Triceps – the back of the upper arm (right side, left side).
3. Subscapula – beneath the edge of the shoulder blade (right side).
4. Abdomen – next to the belly button (right side).
5. Suprailiac – just above the iliac crest of the hip bone (right side).
6. Quadriceps – middle of the upper thigh (right side, left side).
7. Calf – the medial calf skinfold site (right side, left side).

Body fat percentage (%fat) was calculated. All measurements were measured by one anthropometrist.

Statistical analysis

Standard statistical methods were used to calculate the mean and standard deviations. Descriptive statistics were reported as mean ± SD, min., max., and xmax – xmin for all measures. Mutual comparisons were made between each of groups (t-test – for independent samples). Several significant differences $p<0.05$, $p<0.01$ were observed in the variables that characterize the sample of various categories.

RESULTS

The subjects' decimal years and anthropometric characteristics data are summarized in Table 1, and significant differences between groups are indicated. The aim of this study was to describe and compare the anthropometric characteristics of female national soccer players from the various age groups of Slovak national teams.

Table 1 Research data of anthropometric characteristics female national soccer players of the Slovak Republic

„A“	Dec. Years	H	W	BMI	Wst	Hp	WHO	Ins	Exp	Norm.	BIA	%fat
mean	23,02	169,0	61,92	21,62	72,28	99,04	0,730	92,62	87,40	88,96	38,50	16,29
SD	4,226	6,738	7,615	1,641	4,546	4,623	0,031	5,231	5,230	5,238	2,165	3,859
median	22,08	170,0	61,0	21,78	72,5	99,0	0,727	93,0	89,0	90,0	38,5	17,61
min.	18,11	158,0	49,0	18,82	65,0	90,0	0,667	81,5	77,0	78,0	35,0	9,77
max.	31,58	185,0	76,0	23,99	78,5	106,5	0,783	102,0	98,0	99,0	43,0	23,33
xmax-xmin.	13,47	27,0	27,0	5,17	13,5	16,5	0,116	20,5	21,0	21,0	8,0	13,56
U19	Dec. Years	H	W	BMI	Wst	Hp	WHO	Ins	Exp	Norm.	BIA	%fat
mean	16,94	165,3	58,45	21,37	70,27	96,52	0,729	90,77	85,64	86,22	38,30	15,02
SD	0,579	6,500	6,501	1,759	2,995	4,441	0,024	3,915	4,279	4,076	1,616	3,607
median	16,92	164,5	58,0	21,33	70,8	96,3	0,730	90,5	85,3	86,0	38,0	14,92
min.	15,90	156,0	44,0	17,63	64,0	86,0	0,667	83	79,5	80,5	35,0	7,06
max.	17,78	177,5	78,0	25,08	75	106	0,763	98,0	95,0	96,0	41,0	24,93
xmax-xmin.	1,88	21,5	34,0	7,45	11	20	0,097	15	15,5	15,5	6,0	17,87
U17	Dec. Years	H	W	BMI	Wst	Hp	WHO	Ins	Exp	Norm.	BIA	%fat
mean	15,07	163,3	55,67	20,87	68,38	93,79	0,729	89,67	84,54	85,67	37,00	13,69
SD	0,532	5,639	6,838	2,162	4,842	4,980	0,028	5,058	5,844	5,742	2,604	4,299
median	15,05	161,0	55,5	20,96	68,8	94,3	0,725	88,3	83,5	84,8	36,8	14,48
min.	13,94	155,0	46,0	17,33	59,5	85,0	0,672	83,0	78,0	78,5	32,5	7,48
max.	15,72	174,0	73,5	25,28	81,0	104,5	0,776	102,0	99,0	99,5	43,0	24,09
xmax-xmin.	1,79	19,0	27,5	7,95	21,5	19,5	0,104	19,0	21,0	21,0	10,5	16,62
t-test for independet samples												
		H	W	BMI	Wst	Hp	WHO	Ins	Exp	Norm.	BIA	%fat
t - test	„A“ : U19	**1,896(*)**	1,665	0,503	**1,761(*)**	**1,897(*)**	0,155	1,355	1,254	**1,979***	0,363	1,162
		p<0,10			p<0,10	p<0,10				p<0,05		
t - test	„A“ : U17	**3,204****	**3,020****	1,368	**2,912****	**3,825****	0,118	**2,008***	**1,806(*)**	**2,099***	**2,196***	**2,231***
		p<0,01	p<0,01		p<0,01	p<0,01		p<0,05	p<0,10	p<0,05	p<0,05	p<0,05
t - test	U19 : U17	1,132	1,414	0,853	1,581	**1,958(*)**	0,036	0,824	0,719	0,376	**2,005***	1,131
						p<0,10					p<0,05	

Most significant differences were found between groups of female players from "A" team in comparison to group of female players U17. Comparison of height, weight, waist circumference, hip circumference reached significance $p < 0.01$ and comparison of inspirium, normal circumference (mid-chest), biacromial diameter and body fat percentage (%fat) reached significance $p < 0.05$.

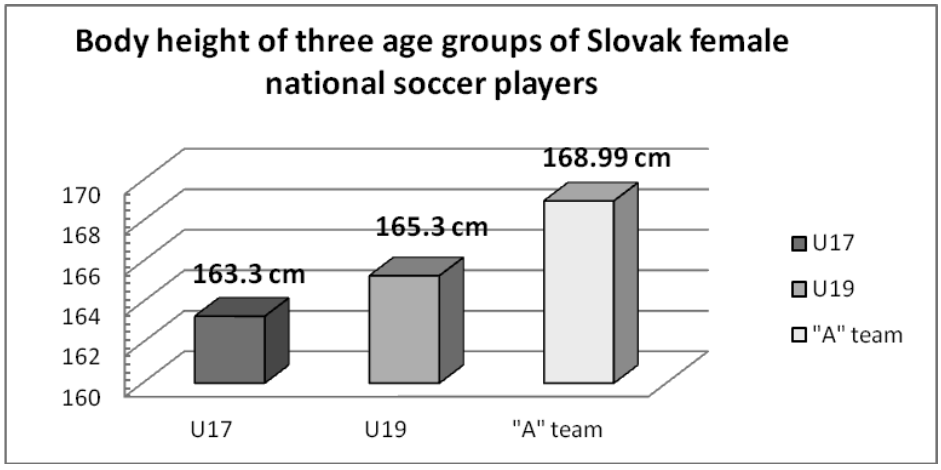

Figure 1
Body height of three age groups of Slovak female national soccer players

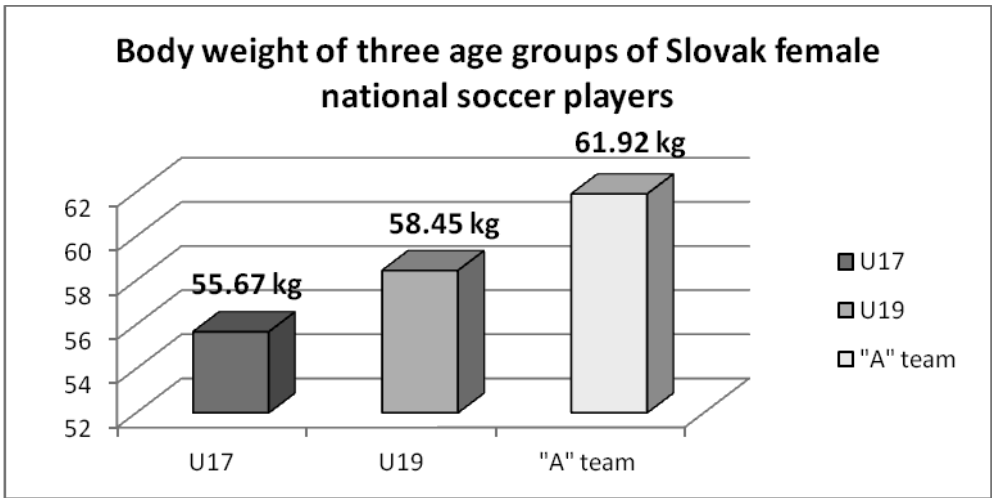

Figure 2
Body weight of three age groups of Slovak female national soccer players

The average percent body fat is in "A" team 16.29%, in U19 team 15.02% and in U17 team 13.69%. Body composition is an important variable related to soccer fitness as excess adipose tissue acts as dead weight in activities in which body mass must be lifted repeatedly against gravity or moved over distances. The leaner the soccer player the less mass she has to move (Brooks, Clark, Dawes, 2013).

DISCUSSION

Twenty two elite female soccer players (aged 23.95 ± 4.52, height 168.82 ± 7.19 cm, weight 61.4±6.0kg, body mass index 21.5 ± 1.3kg) from Serbian A-national team (Milanovic, Sporis, Trajkovic, 2012) are very close to Slovak "A" team with the anthropometric characteristics data (aged 23.02 ± 4.23, height 169 ± 6.74 cm, weight 61.92±7.62 kg, body mass index 21.62 ± 1.64kg). The study from Dillern, Ingebrigtsen & Shalfawi (2012) produced mean values for the group of 32 Norwegian female soccer players as a whole of 21.87 for BMI, 60.27 kg for body weight, and 166.22 cm for body height. They are younger, lighter and smaller than players from Slovak female national "A" team.

Greek female soccer players (Kotsavasileiadou, Vitsikanou, Volakis, Pylianidis, 2004) aged 24.2 ± 5.4, height 162 ± 9.6 cm, weight 60±5.3 kg are older, smaller and lighter as Slovak "A" team.

Female Lebanese soccer players (Hage, 2013) are younger (22.2±3.1), lighter (60.2±7.8 kg), and smaller (162.7±5.7 cm) than players from the Slovak "A" team. Also female Spanish soccer players – 90 players from regional league and 100 players from national league (Campo, Sáenz, Castán, de Benito Trigueros, 2009) are both smaller (161.39 cm resp. 161.3 cm) and lighter (61.2 kg resp. 57.88 kg) than players from the Slovak "A" team. Female soccer has grown substantially in Brasilia. Fifteen female soccer players aged 22.3 ± 6.2, weight 58.2 ± 8.3 kg and height 162.5 ± 6,1 cm were measured by Silva et al. (1999) and they are younger, smaller and lighter in comparison to Slovak "A" team. In the author's opinion (Silva et al., 1999), a greater volume of investigation is needed focusing various female soccer features. Our current female players can be highly comparable to elite Norwegian female soccer players (Ingebrigtsen, Dillern & Shalfawi, 2011), female university players (Rhodes & Mosher, 1992), and both Danish (Jensen & Larsson, 1993) and English (Dowson, Cronin & Presland, 1999) female national team players, Spanish female first division (Mujika, Santisteban, Impellizzeri & Castagna, 2009) and Australian female national soccer players (Tumilty, 1993).

CONCLUSION

The requirements for soccer play are multifactorial and distinguishing characteristics of elite players can be investigated. Most significant differences were found between groups of female players from "A" team in comparison to group of female players U17. Several above mentioned publications shows the possibilities to bear in account and select potential female soccer players based on anthropometric attributes because performance in soccer is influenced with anthropometric characteristics.

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