

DEVELOPING CHARACTERISTICS AND FUNCTIONAL ABILITIES OF TOP FEMALE FOOTBALL PLAYERS

Ivana Mladenović

Department of Sports Medicine, Faculty of Physical Education, University of Niš, Serbia and Montenegro

Summary. Football is a popular sports game not only in Serbia and Montenegro but worldwide. In addition, it is widely played by women. Although female football tradition is far shorter when compared to that of male football, the number of young women who take up football in Serbia and Montenegro is increasing. The aim of this paper is to examine developing characteristics of top female football players of Serbia and Montenegro. The importance of this study adds to the fact that its results can be utilized for recruitment purposes. The study encompassed 20 female football players, all members of the national team, who took part in competitions in 2003. The average age of female representatives was 22.7 ± 3.7 years. A total of 23 anthropometric and 6 functional variables were measured. The results showed that the average height of female football players was 168.1 ± 6.5 cm, and their weight was 61.78 ± 7.05 kg. This suggests that female football players are taller and heavier than average women. Their legs are longer, their shoulders are broader, and their hips are narrower. They can be said to have an athletic figure. The relative values of maximal oxygen uptake were 50.95 ml/min/kg, suggesting that the aerobic abilities of female football players are higher than average. The measured values ranged from 42 to 63 ml/min/kg. This study has shown that the national female football players exert higher values for longitudinal and transversal characteristics and have better functional abilities compared to non-active women.

Keywords: Female, football, anthropometry, oxygen uptake

Introduction

As a sports game football is very popular not only in Serbia and Montenegro but worldwide. In addition to being played by professionals, it is widely accepted among people of all ages. This overall popularity of football has certainly led to its development among women. Although the tradition of female football is far shorter when compared to that of male football, the number of young girls deciding to professionally take up football is nevertheless increasing in Serbia and Montenegro. The success that female players have so far demonstrated in playing a 'male' sport refutes statements that football does not suite female characteristics and functional abilities. Current female football requires that selected female football players be strong, fast, agile and skilled (1,2,3). On average, those women are higher and have broader shoulders and stronger legs. In a word, a strong built suits football-related physical activities, as current female football is most similar to male football in being a fast and rough game, full of technically perfect moves, tactically planned variants, and maximum dynamics in the course of the game itself.

Aim

Within the last ten years, development of female football in Serbia and Montenegro has demanded that

sports medicine take into account medical status, developing characteristics and functional abilities of players so as to protect female bodies against negative influences of modern sport.

The aim of this study is to discern differences in developing characteristics and functional abilities of top female football players in the 2003 National Team of Serbia and Montenegro. The fact that our national team was extremely successful in European football competitions makes the aim of our study even more important as the study results could be of great help to football coaches.

Methods

The study group comprised 20 female football players, all members of the Serbia and Montenegro national team, who took part in competition during the year 2003. Female football players were from 16 to 32 years old, mean 22.7 ± 3.7 years.

The measured anthropometric variables included: body mass (BM), body height (BH), seat height (SHT), bi-acromial diameter (BAD), bi-crystal diameter (BCD), bi-femoral diameter (BFD), circumference of thorax (CTO), circumference of thigh (CTA), maximal circumference of lower leg (MCLL), skin thickness at umbilicus (STU), skin thickness of thigh (STT), skin thickness of lower leg (STLL). The measurements were taken using the International Biological Program (4).

The measured functional variables included: heart rate beats/min (HR); systolic arterial blood pressure (SABP); diastolic arterial blood pressure (DABP); values of maximal oxygen uptake in L/min (FO2LM); values of maximal oxygen uptake in ml/min/kg (FO2ML). These functional parameters were measured using the standard method, while maximal oxygen uptake was measured indirectly using the method of Astrand.

Results and Discussion

Table 1 shows basic anthropometric variables of the top female football players of the 2003 Serbia and Montenegro National Team. The results show that the average age was 22.70 ± 3.72 years, the average period of playing football was 10.95 ± 4.49 years (meaning the players were experienced although still young), and the average height was 168.09 ± 6.60 cm.

Table 1. Anthropometric variables of female football players

Variable	Mean± SD	CV	Min	Max
Age, yrs.	20.70±3.72	15.68	17.00	30.00
Sport practice, yrs.	10.95±4.49	41.00	4.00	18.00
Body mass, kg	62.78±8.05	12.82	54.00	82.00
Body height, cm	168.09±6.60	3.94	156.00	178.70
SHT, cm	93.26±4.82	5.16	86.20	101.00
BAD, cm	87.39±3.67	4.19	81.00	94.20
BCD, cm	36.88±2.00	5.42	33.20	41.00
BFD, cm	27.34±1.42	5.19	23.50	29.00
CTO, cm	31.69±1.62	5.11	28.80	34.60
CTA, cm	83.86±3.74	4.51	77.20	90.20
MCLL cm	55.15±3.11	5.63	49.80	61.50
LLC, cm	34.50±2.37	6.86	31.00	40.30
STU, mm	8.62±2.69	11.60	4.60	16.80
STT, mm	15.20±3.70	21.51	9.00	33.40
STLL, mm	13.42±3.34	21.66	7.20	22.20

Legend: body mass (BM), body height (BH), seat height (SHT), bi-acromial diameter (BAD), bi-crystal diameter (BCD), bi-femoral diameter (BFD), circumference of thorax (CTO), circumference of thigh (CTA), maximal circumference of lower leg (MCLL), skin thickness at umbilicus (STU), skin thickness of thigh (STT), skin thickness of lower leg (STLL).

Considering the body height parameter, it can be concluded that the Serbia and Montenegro national football team is a very homogenous group as only 3.94% of the body height differs from the average one (CV = 3.94). Similar results could be observed in other studies (5,6). The average height of non-active women was 166.85 cm, and the average weight was 58.24 kg (7).

The characteristics of the female football players are long legs, wide shoulders, and long circumference of the chest (83.86 ± 3.74 cm) with strong leg muscles. Those characteristics are the result of a careful selection (longitudinal dimension of body) and impacts of training and competition activities (circular dimension and body mass). We also point to thicker skin of the thigh and lower leg.

The average pulse was lower than in women who do not take up any sport activities, which is in accordance

with previous studies (7). The average heart rate at rest in non-active women is 86.8 beats/min (7). The average heartbeat per minute was 78.40 beats/min at rest and 149.67 during exercise (9). Significantly lower values of arterial blood pressure in comparison to the values of arterial blood pressure in women who do not take up physical activities were also noticed (5,7).

Table 2. Functional variables of female football players

Variable	Means	CV	Min	Max
HR, beats/min	65.22 ± 5.73	8.92	60.00	80.00
SABP, mmHg	101.11 ± 11.18	11.05	80.00	120.00
DABP, mmHg	66.94 ± 5.18	7.74	60.00	75.00
FO2, L/min	3.10 ± 0.63	20.32	2.10	4.20
FO2, ml/min/kg	50.92 ± 7.60	14.92	35.00	63.00

Legend: heart rate beats/ min (HR); systolic arterial blood pressure (SABP); diastolic arterial blood pressure (DABP); values of maximal oxygen uptake in L/min (FO2LM); values of maximal oxygen uptake in ml/min/kg (FO2ML)

Aerobic abilities exert a great influence on success in football, which refers to the relative values of maximum oxygen uptake (VO2max). The average value of this parameter in the female football players of the Serbia and Montenegro national team was 50.00 ± 7.60 ml/min/kg. The average values of top female football players are 1.7 l/min at absolute values and 32.66 ml/min/kg at relative values (9). The average oxygen uptake at absolute values of females who do not take any sport was 3.2 l/min; and at relative values it was 55.43, which is a good result for non-active women (7). Polman *et al.* (2004) compared the efficacy of three physical-conditioning programmes provided over a 12-week period (24 h in total) upon selected anthropometric and physical fitness parameters in female soccer players. Two of the groups received physical-conditioning training based on enhancing speed, agility and quickness (SAQ); one group used special resistance and speed development SAQ equipment (equipment group; n = 12), while the other group used traditional soccer coaching equipment (non-equipment group; n = 12). A third group received their regular fitness sessions (active control group; n = 12). All three interventions decreased (P < 0.001) the participants' body mass index (-3.7%) and fat percentage (-1.7%) while increasing their flexibility (+14.7%) and maximal aerobic capacity (VO2max) (+18.4%) (10). Regarding this parameter, our top female football group exerts high heterogeneity (CV = 14.92). In the study of Stolen *et al.* (2005) elite-level players during a 90-minute game ran about 10 km at an average intensity close to the anaerobic threshold (80–90% of maximal heart rate). Within this endurance context, numerous explosive bursts of activity are required including jumping, kicking, tackling, turning, sprinting, changing pace and sustaining forceful contractions to maintain balance and control of the ball against defensive pressure. The best teams continue to increase their physical capacities, whilst the less well ranked have similar values as reported 30 years ago. Whether this is a result of fewer assessments and train-

ing resources, selling the best players, and/or knowledge of how to perform effective exercise training regimens in less well ranked teams – is not known. As there do exist teams from lower divisions with as high aerobic capacity as professional teams, the latter factor is likely to play an important role (11).

The national team of Serbia and Montenegro was very successful at European football competitions so the results of this study could be of great help to coaches in their training process, as well as for recruitment of young girls for this sport. Current football requires stronger games, which in turn requires higher values of functional abilities.

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Conclusion

1. The average height, body mass and other anthropometric parameters are of higher average values in the top female football players of Serbia and Montenegro than in non-trained women.

2. The frequency of pulse at rest is lower than the pulse of women who do not train football. This is a consequence of the influence of training and adaptation of the cardiovascular system. The values of blood pressure are also lower than average.

3. Oxygen uptake capabilities, estimated at average values of maximal oxygen uptake, are higher than average, which is the result of influences of both selection and training process.

RAZVOJNE KARAKTERISTIKE I FUNKCIONALNE SPOSOBNOSTI VRHUNSKIH FUDBALERKI

Ivana Mladenović

Fakultet fizičke kulture, Katedra za medicinu sporta, Niš

Kratak sadržaj: *Fudbal kao igra popularna je kako u svetu tako i kod nas. Ženski fudbal kod nas je veoma popularan, bez obzira što ima manju tradiciju. Cilj ovog istraživanja je da se utvrde razvojne karakteristike vrhunskih fudbalerki, reprezentacije Srbije i Crne Gore. Značaj ovog istraživanja je da se dobijeni rezultati mogu iskoristiti u selekciji za ovu sportsku granu. Istraživanjem je obuhvaćeno 20 fudbalerki, članica nacionalnog tima-representacije 2003. godine. Prosečna starost fudbalerki bila je 22.7±3.7 godina. Istraživanjem su obuhvaćene 23 antropometrijske varijable i 6 funkcionalnih parametara.*

Rezultati su pokazali da je prosečna visina tela fudbalerki iznosila 168.1 ±6.5 cm, a prosečna težina 61.78 ±7.05 kg. Dužih su nogu, širih ramena i užih kukova u odnosu na osobe ženskog pola koje se ne bave sportom. Prosečne vrednosti potrošnje kiseonika su 50.95 ml/min/kg i veće su odnosu na prosečne vrednosti populacije koja se ne bavi sportom.

Ovo ispitivanje je pokazalo da su žene koje se profesionalno bave fudbalom većih longitudinalnih i transverzalnih dimenzija i boljih funkcionalnih sposobnosti u odnosu na žene koje se ne bave sportom.

Ključne reči: *Žena, fudbal, antropomerija, aerobne sposobnosti*