ANTHROPOMETRIC CHARACTERISTICS OF FEMALE JUNIOR NATIONAL TEAM VOLLEYBALL PLAYERS: A COMPARATIVE STUDY

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ABSTRACT

Athlete's anthropometric and physical characteristics may represent important pre-requisites for successful performance in volleyball. Thus, the objective is to compare Macedonian Junior National Team players with National Team players from other countries in terms of anthropometric characteristics in a qualitative manner. Female volleyball players (N=320) aged 13-18 years that are part of Macedonian Junior National Team and Junior National Teams competing at the Girls' U18 World Championships 2017 and 2019 were included in the study. Players' data were extracted from the official player's statistics posted at the official databases of Volleyball Federation of Macedonia and FIVB. Based on data from the Microsoft Office Excel Spreadsheet, graphs were created. Height can be considered as a disadvantage of Macedonian Junior National Team players against players that are part of National Teams competing at Girls' U18 World Championships 2017 and 2019. All National Teams have shown high homogeneity in terms of players' anthropometric characteristics. We advise Macedonian coaches to take in consideration body height and body mass of the players during the volleyball pre-selection process, because anthropometric characteristics of the players highly influence the level of performance and the final match outcome.

Keywords: height, weight, BMI, volleyball players, junior national teams

DOI: https://doi.org/10.24040/sjss.2021.7.2.56-63

INTRODUCTION

An athlete's anthropometric and physical characteristics may represent important pre-requisites for successful participation in any given sport (1). They may influence the level of performance, at the same time helping to determine a suitable physique for a certain sport (2).

Success in performing professional sports is determined by many factors, such as: motor skills, psychological conditions, and morphological structure of players as well (1, 3, 4). Morphological predispositions frequently determine a player's functional abilities (5). Knowledge of morphological body build specific to different sport disciplines facilitates a pre-selection process, and in the case of team games, can be an important factor

determining a player's position on the court (1, 6).

Anthropometric research conducted on women participating in volleyball has examined the specific body-built of volleyball players (6, 7, 8). The majority of research confirms that volleyball pre-selection is based on previously determined, basic somatic criteria, such as body height and mass (5, 9). These somatotype analyses may be useful in terms of talent identification or development of training programs, as somatotypes, as well as other physical characteristics, differ between sports and requirements of play within particular positions (2). An awareness of morphological and physiological characteristics of elite level athletes in a given sport, may be beneficial in terms of optimizing training programs specific to the requirements of particular sports (1, 4). An understanding of the anthropometric and physiological profiles of junior athletes may be important for talent identification within sports and accurate distribution of resources within a team (1).

Therefore, our objective is to compare Macedonian Junior National Team players with National Team players from other countries in terms of anthropometric characteristics, in a qualitative manner.

SAMPLE

The comparative study is realized on a sample of 320 participants, female volleyball players, aged 13-18 years. Inclusion criteria was: 1) players to be part of Macedonian Junior National Team; 2) players to be part of top 20 Junior National Teams competing in the last two Girls' U18 World Championships (Girls' U18 World Championships 2017 and Girls' U18 World Championships 2019). Exclusion criteria: players or countries with missing or no available data.

METHODS

In order to extract data for the players, we used the official player's statistics posted at the official databases of VFM (10) and FIVB (11). A Microsoft Office Excel Spreadsheet was created with all the existing data regarding anthropometric characteristics of the players. Basic mathematical methods were used to calculate Mean Averages, Standard Deviations and Coefficients of Variability (%). BMI was calculated as proposed by WHO (2007) (12). Based on data from the Microsoft Office Excel Spreadsheet, graphs were created.

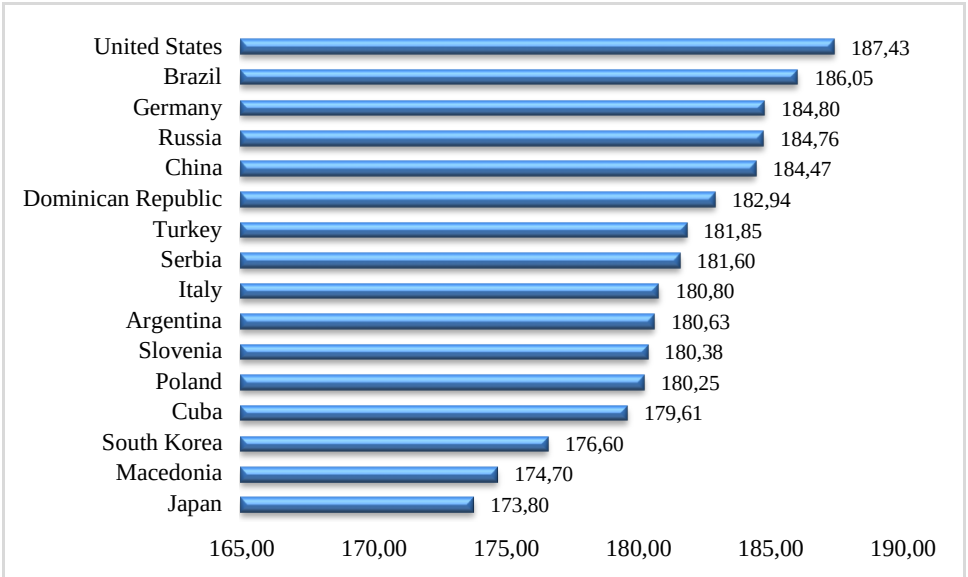
RESULTS

Based on data shown in Table 1, we can conclude that players from Macedonian Junior National Team are shorter than the players from Junior National Teams of: Italy, Dominican Republic, Russia, Turkey, Germany, Argentina, United States, Slovenia, South Korea, Cuba, Brazil, Poland, Serbia and China (Figure 1). However, Macedonian players are taller than the players from Japanese National Team.

Table 1. Mean Average and Standard Deviation of female Macedonian Junior National Team players and players that are part of National Teams competing at Girls' U18 World Championships 2017 and Girls' U18 World Championships 2019

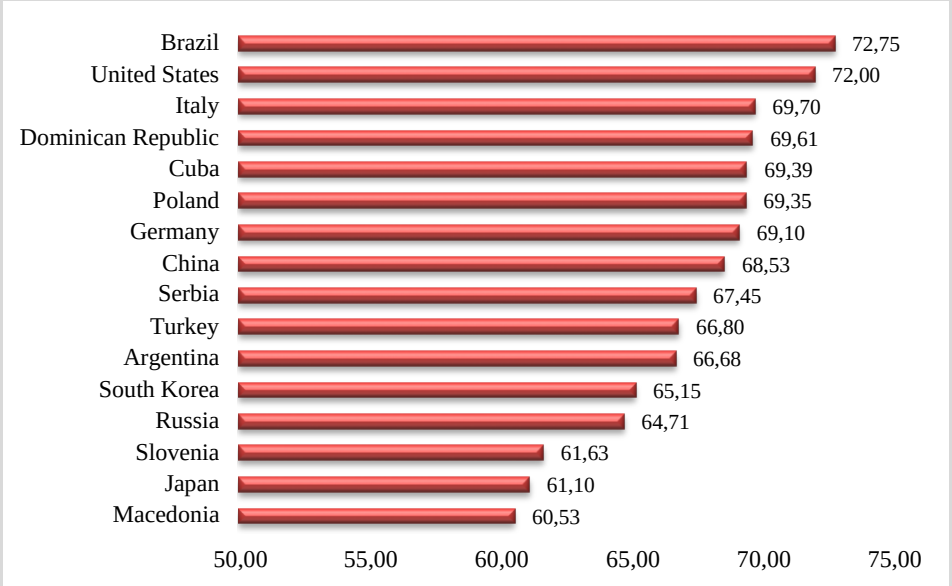
Country	N	X±SD		
		Height (cm)	Weight (kg)	BMI
Macedonia	30	174.70±5.94	60.53±6.28	19.81±1.49
Italy	20	180.80±5.99	69.70±7.95	21.31±2.09
Dominican Republic	18	182.94±6.84	69.61±7.11	20.83±2.16
Russia	21	184.76±5.77	64.71±9.95	18.91±2.42
Turkey	20	181.85±8.91	66.80±6.69	20.20±1.53
Japan	20	173.80±7.09	61.10±6.46	20.21±1.55
Germany	20	184.80±7.40	69.10±6.36	20.21±1.15
Argentina	19	180.63±7.10	66.68±6.06	20.43±1.45
United States	21	187.43±5.94	72.00±7.89	20.48±1.92
Slovenia	16	180.38±4.69	61.63±5.63	18.92±1.22
South Korea	20	176.60±6.42	65.15±6.03	20.87±1.35
Cuba	18	179.61±6.86	69.39±6.26	21.56±2.07
Brazil	20	186.05±7.10	72.75±8.21	20.98±1.54
Poland	20	180.25±7.68	69.35±7.74	21.44±2.96
Serbia	20	181.60±9.24	67.45±8.03	20.41±1.43
China	17	184.47±5.65	68.53±4.08	20.16±1.31

Figure 1. Height (cm) of female players in Macedonian Junior National Team and players that are part of National Teams competing at Girls' U18 World Championships 2017 and Girls' U18 World Championships 2019



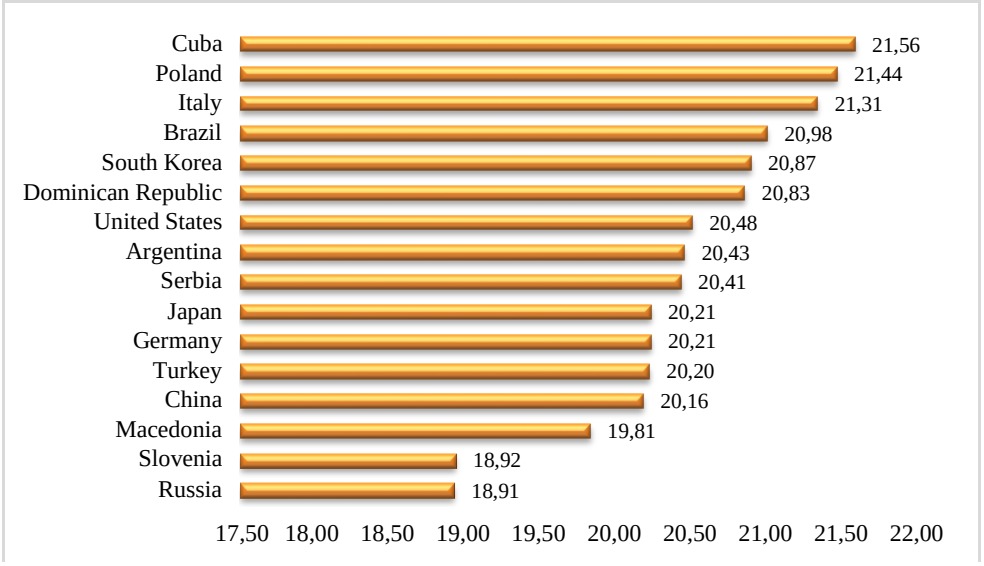
According to the data presented in Table 1 and Figure 2, players from National Teams of: Italy, Dominican Republic, Russia, Turkey, Japan, Germany, Argentina, United States, Slovenia, South Korea, Cuba, Brazil, Poland, Serbia and China have higher body mass than players from Macedonian National Team.

Figure 2. Weight (kg) of female players in Macedonian Junior National Team and players that are part of National Teams competing at Girls' U18 World Championships 2017 and Girls' U18 World Championships 2019



Based on the presented values for BMI, players from Macedonian National Team have a higher BMI than the players from National Teams of Russia and Slovenia. However, players from the National Teams of: Italy, Dominican Republic, Turkey, Japan, Germany, Argentina, United States, South Korea, Cuba, Brazil, Poland, Serbia and China, have a higher BMI than players in Macedonian National Team (Figure 3).

Figure 3. BMI of female players in Macedonian Junior National Team and players that are part of National Teams competing at Girls' U18 World Championships 2017 and Girls' U18 World Championships 2019



Based on values presented for CV% in Table 2, we may conclude that National Teams included in this comparative study are homogenous in terms of players' anthropometric characteristics.

Table 2. Coefficient of variability (%) in female Macedonian Junior National Team players and players that are part of National Teams competing at Girls' U18 World Championships 2017 and Girls' U18 World Championships 2019

Country	N	CV%		
		Height (cm)	Weight (kg)	BMI
Macedonia	30	3.40	10.37	7.50
Italy	20	3.31	11.41	9.82
Dominican Republic	18	3.74	10.21	10.38
Russia	21	3.12	15.38	12.78
Turkey	20	4.90	10.01	7.57
Japan	20	4.08	10.58	7.66
Germany	20	4.00	9.20	5.71
Argentina	19	3.93	9.08	7.08
United States	21	3.17	10.95	9.36
Slovenia	16	2.60	9.14	6.47
South Korea	20	3.63	9.25	6.45
Cuba	18	3.82	9.02	9.62
Brazil	20	3.82	11.28	7.34
Poland	20	4.26	11.16	13.81
Serbia	20	5.09	11.90	7.03
China	17	3.06	5.95	6.50

DISCUSSION

Based on data shown in Table 1, it is evident that height can be considered as a disadvantage of Macedonian National Team players, against players that are part of National Teams competing at Girls' U18 World Championships 2017 and Girls' U18 World Championships 2019 (Figure 1). Anthropometric characteristics such as height that are associated with an ectomorphic mesomorph somatotype, contribute to a greater movement amplitude in attack and block actions during a volleyball game, and ensure a better performance for the team (3, 4). In contemporary volleyball, players should have highly developed defensive and attack skills, as well as great agility, reaction time and explosive force, that are all allied to height (5). Players from National Teams of: Italy, Dominican Republic, Russia, Turkey, Japan, Germany, Argentina, United States, Slovenia, South Korea, Cuba, Brazil, Poland, Serbia and China have higher body mass than players from Macedonian National Team (Table 1 and Figure 2). And taller players with higher percentage of effective mass are more efficient in attack than shorter players with lower body mass (13, 14, 15).

From what is presented in Table 1 and Figure 3, players from Macedonian National Team have a higher BMI than the players from National Teams of Russia and Slovenia. However, players from the National Teams of: Italy, Dominican Republic, Turkey, Japan, Germany, Argentina, United States, South Korea, Cuba, Brazil, Poland, Serbia and China, have a higher BMI than players in Macedonian National Team. Since weight and BMI are not able to differ between body fat % and muscle mass % (16), and with the lack of additional parameters, we are not able to do any further conclusions. Higher weight and BMI values in professional athletes may be a consequence of a higher muscle mass percentage, rather than a high body fat percentage. And, lean body mass is considered to be a predictor of athletic performance in women's volleyball (9). Based on WHO (2007) BMI classification, volleyball players from all National Teams that are involved in this comparative study belong to the healthy weight category (12). According to the values presented for CV% in Table 2, we may conclude that National Teams included in this comparative study are homogenous in terms of players' anthropometric characteristics. And it was previously reported that anthropometric characteristics of the players influence the level of performance and the final match outcome (17, 18, 19).

CONCLUSION

Players from Macedonian Junior National Team are shorter than the players from Junior National teams of: Italy, Dominican Republic, Russia, Turkey, Germany, Argentina, United States, Slovenia, South Korea, Cuba, Brazil, Poland, Serbia and China. Thus, height can be considered as a disadvantage of Macedonian Junior National Team players against players that are part of National Teams around the world. Finally, all National Teams that are included in this comparative study have shown high level of homogeneity in terms of players' anthropometric characteristics.

LIMITATIONS

With regard to the methodological design of this study, and the objective to compare players only in a qualitative manner, we acknowledge the lack of body fat (%) and muscle mass (%) in addition to BMI as the major limitation of this study. Since weight (kg) and BMI are not able to differ between lean mass and fat mass percentage, we were not able to do further conclusions. However, taking in consideration the importance of the anthropometric characteristics of the players in professional volleyball, we propose a future study designed to assess players' body composition in order to be able to see a clearer perspective regarding this topic.

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Authors' Contribution
FV and AV collected the data, designed the study, performed the analysis, and wrote the paper.
Conflict of interest: Authors declare no conflict of interest.
Acknowledgement: There are no funding sources for this study. However, FV holds a fellowship from the Agency for the Management of University and Research Grants (2021 FI_B 00293) supported by the Secretariat for Universities and Research of the Ministry of Business and Knowledge of the Government of Catalonia and the European Social Fund.