



# Ita. J. Sports Reh. Po.

Italian Journal of  
Sports Rehabilitation and Posturology

## COMPARATIVE ANALYSIS OF BODY COMPOSITION OF YOUNG HANDBALL AND BASKETBALL PLAYERS

Kristina Joksimovic<sup>1</sup>, Stefan Stojanovic<sup>2</sup>, Rosario D'Onofrio<sup>3</sup>

<sup>1</sup>Faculty of Physical Education and Sport, University of East Sarajevo, Bosnia and Herzegovina

<sup>2</sup> Faculty of Sport and Physical Education, University of Nis, Serbia

<sup>3</sup>Member of the Medical - Scientific Multidisciplinary Commission, Association of Italian Football Doctors L.A.M.I.CA, Italy



**Abstract:** *It has been confirmed several times that physically active persons are characterized by "positive", ie health-desirable body composition. The main goal of this research was to examine and compare the body composition of young handball players and basketball players. The parameters for BF%, MM% and VF% were measured on a total sample of 30 participants (n = 15 handball players and n = 15 basketball players; years  $13.65 \pm 1.36$ ; height  $171.36 \pm 9.1$ ; weight  $64.11 \pm 11.4$ ; BMI  $22.75 \pm 5.1$ ). The results of the research showed the presence of statistically significant differences in the percentage of body fat ( $p = 0.01$ ), while in the other monitored parameters there was no statistical significance. It was concluded that handball players had lower values in all parameters, which could be assumed based on the view of anthropological dimensions and typicality for the younger sports age, where the selection and development of abilities are not completed.*

**Key words:** *fat percentage, muscle tissue, visceral fat, handball, basketball*



**Citation.** *Kristina Joksimovic , Stefan Stojanovic , Rosario D'Onofrio - Comparative analysis of body composition of young handball and basketball player - Ita. J. Sports Reh. Po. 2021; vol. 8 ; Suppl. 1 al n°3 ; 31 – 39 ; ISSN 2385-1988 [online]; IBSN 007- 11119-55; CGI J OAJI 0.201). Published Online. Open Access (OA) publishing- Authorship Credit: "Criteria authorship scientific article" has been used "Equal Contribution" (EC)*



## Introduction

Size and composition of the body, ie. body composition, which is largely predetermined by genetic inheritance, can be slightly altered when it comes to body size. It can also change significantly with diet and in the presence of a specific exercise program.<sup>11</sup> Determining the composition of body composition is a common method, not only in the medical disciplines but also in sports, then in anthropology and pedagogy. There is great interest in new methods and modern procedures in determining the composition of body composition.<sup>1</sup> The focus is most often on determining the amount of fat component, due to the analysis of health status and assessment of the possible health risk.<sup>19</sup> Physical composition and physical appearance change under the influence of exercise.<sup>5</sup>

Physiological load is considered a factor that can shape human stature,<sup>6,23,26</sup> and this includes the impact of physical activity, or sports. The first noticeable difference between athletes from different sports is in the morphology of the body, where specific constitutions correspond to specific sports,<sup>8</sup> so today the constitution and body composition of athletes are seen primarily as an important prerequisite and important part of the structure of elements relevant to athletic performance. Quantification of human body composition is one of the elements within the physiological profile, and occupies a very important place in the athlete population because it plays an important role in monitoring all athlete performance and training regimen.<sup>3,10</sup> Otherwise, during growth and maturation, body composition changes significantly.<sup>16</sup> During adolescence, girls are twice as likely as boys to gain weight, while boys are twice as fatless as girls.<sup>13,14</sup> Also, to understand the body composition as a whole, including all the parameters that can affect the structure of the body, as well as to get acquainted with all the health formula, is a particularly pronounced health community.<sup>27</sup>

Body composition parameters in junior handball players and their average values obtained by the authors (eg BMI  $24.47 \pm 1.71$ ) show that the handball training program acts similarly on body composition parameters in different schools of sports, competition rank, etc.<sup>15</sup> In some sports (eg basketball), enormous body height, along with other necessary characteristics, will give a significant advantage in achieving success in that discipline.<sup>20</sup> In the same way, those who have a lower body weight, who are of average height, will have the advantage of achieving greater success in performing elements that require good explosiveness and agility, as is the case in handball.<sup>9</sup>

The main goal of the research is to determine the body composition of the sports population and to determine the difference in body composition between athletes of different sports, in this case handball and basketball.



## Methods

### Participants

Thirty participants (n = 15 handball players, years:  $13.8 \pm 1.56$ ; n = 15 basketball players, year:  $13.5 \pm 0.89$ ) was included in this study. Subjects were free of injuries or illness prior to testing and were informed, as were parents, of the objectives and protocols of testing and gave written consent to participate in the study. To avoid potential bias, participants were not informed of the theoretical background and did not receive feedback from the tester. The study was conducted in accordance with the Declaration of Helsinki.

### Procedure

Data were collected during December 2021. By interviewing the participants, we came to information about their age (date of birth). Body composition parameters, body weight (kg), body mass index - BMI, body fat percentage - BF%, muscle mass percentage - MM (%), visceral fat percentage - VF%, were estimated by tetrapolar bioimpedance device - Omron BF511 (Kyoto, Japan), after entering data on the age, sex and body height of the participants. All tests were performed under the same conditions (20-25°C), in the same field indoors. Participants were introduced to the test procedure, through explanations and demonstrations.

### Statistical procedure

All statistical analyzes were performed using SPSS Statistics 21 software (SPSS Inc., Chicago, IL). Descriptive statistics were used to calculate the minimum, maximum and mean values of the results (Minimal, Maximal, Mean), standard deviation (Standard Deviation) and standard error (Standard Error), for each variable separately. The T Test was used for differences in body composition between handball players and basketball players. The alpha level was set to  $p < 0.05$  to indicate statistical significance.

## Results

Table 1. shows the basic descriptive parameters for the whole sample and especially for handball players and basketball players.

**Table 1.** Basic descriptive parameters of handball and basketball players

	Handball players (n = 15)	Basketball players (n = 15)	In total (N = 30)
Years (Mean $\pm$ SD)	$13.8 \pm 1.56$	$13.5 \pm 0.89$	$13.65 \pm 1.36$
Body height (cm) (Mean $\pm$ SD)	$169.73 \pm 9.4$	$173 \pm 8.5$	$171.36 \pm 9.1$
Body weight (kg) (Mean $\pm$ SD)	$61.1 \pm 12.6$	$68.12 \pm 10.6$	$64.11 \pm 11.4$
BMI (Mean $\pm$ SD)	$21.6 \pm 4.08$	$24.9 \pm 6.2$	$22.75 \pm 5.1$

Legend: N - number of participants; n - subsample; Mean - average value; SD - standard deviation

Basketball players ( $173 \pm 8.5$ ) were, on average, slightly higher than handball players ( $169.73 \pm 9.4$ ), which could be assumed, and they also had a higher body weight ( $68.12 \pm$



10.6 - 61.1 ± 12.6). Based on these parameters, a higher mean BMI in favor of basketball players compared to handball players (24.9 ± 6.2 - 21.6 ± 4.08).

Table 2. shows the mean ± standard deviation for all measured variables, as well as the differences obtained using the T Test, where the alpha level was set to  $p < 0.05$ .

**Table 2.** Basic descriptive parameters of body composition and differences (T Test)

	Handball players (n = 15)	Basketball players (n = 15)	In total (N = 30)	P
BF% (Mean ± SD)	12.27 ± 9.04	19.56 ± 6.14	14.91 ± 7.80	0.01
MM% (Mean ± SD)	36.39 ± 3.6	36.80 ± 5.2	36.59 ± 4.1	0.17
VF% (Mean ± SD)	5.75 ± 2.59	7.02 ± 2.57	5.88 ± 2.50	0.24

**Legend:** N - number of participants; n - subsample; Mean- average value; SD - standard deviation; BF% - body fat, MM% - muscle mass, VF% - visceral fat; p - significance level set to 0.05.

Based on these data, we see that basketball players, compared to handball players, had higher average values at BF% (19.56 ± 6.14 - 12.27 ± 9.04), while a smaller difference, and again in favor of basketball players, was at MM% (36.80 ± 5.2 - 36.39 ± 3.6) and VF% (7.02 ± 2.57 - 5.75 ± 2.59). Differences, at the level of statistical significance, occurred only in BF% ( $p = 0.01$ ), while there were no differences in other monitored parameters.

## Discussion

The aim of this research was to compare body composition, ie to determine whether there are differences between young handball players and basketball players.

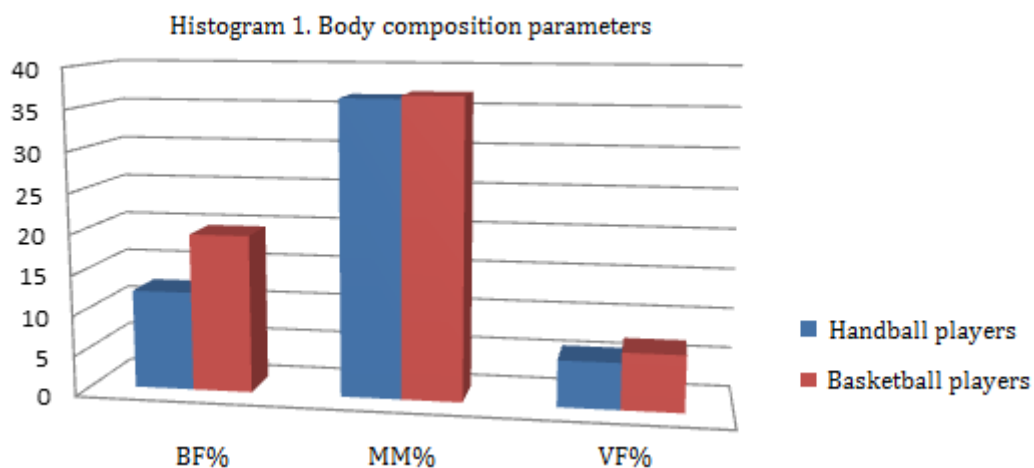
Analyzing the results, especially for each respondent, and onbased on the BMI evaluation scale, two thirds of handball players (n = 10) were normally fed (66.6%), 4 of them were overweight (26.7%) and one handball player was obese (6.6%). In most basketball players (n = 12) normal values of nutrition parameters were recorded (80.6%), two basketball players were overweight (13.3%) and one basketball player was obese (6.6%). Based on these indicators of BMI values, similar values were obtained in another study (handball, 22.66 ± 2.83; basketball 21.32 ± 1.99) on the same sample of these sports.<sup>22</sup> These results are satisfactory, given that the lives of young people today are increasingly linked to sedentary activities. The study<sup>12</sup> came to similar results, as far as body mass index is concerned 23.32%. The same study observed lower body weight values, and 2.36% higher body height values.

In this research, higher BMI values were recorded on a sample of basketball players, and this cannot be attributed to the type of sport, given that basketball is a sport of high-intensity type, which can also be said for handball.<sup>2,24</sup> In this regard, these BMI values can be attributed to the individual habits of athletes. The study, which monitored the body composition parameters of junior basketball and handball players, recorded a mean height of handball players (171.51 ± 5.33) and basketball players (193.60 ± 7.70), which is not a big difference in handball height compared to this study, but certainly statistically a

significant difference in the sample of basketball players, which can be attributed to the selection of basketball players, especially when working in professional basketball, in which success is largely determined by anthropology dimensions of the player.<sup>18</sup>

Adipose tissue is, as is generally known, a negative factor,<sup>4</sup> that burdens the cardiovascular system, but perhaps an even bigger problem, primarily from the health segment, is abdominal obesity, ie. the presence of visceral fat. Abdominal obesity is somewhat more typical and present in the male population. However, among individuals who are physically active, ie. athletes, as is the case with the current sample of respondents, the status of visceral fat is favorable. Most handball players (n = 13, 86.67%) have a normal level of visceral fat, noting that there are those with a high level (n = 2, 13.33%), but this is the lower limit. Also, most basketball players have normal values of multi-calar fat (n = 13, 93.65%).

Namely, the sample, which was composed of handball players from the Priboj handball club, had, on average, 7.29% less body fat, which can be an important factor in success in sports. Also, the period of life of 12-15 years is a specific period of development where boys, due to the influence of sex hormones, lose 2-3% of fat after the age of 13.<sup>17</sup> Boys, aged 12 and 13, have between 12 and 22% body fat, and between 12 and 21%, respectively.<sup>25</sup> Mean values, which belong to the group of basketball players, do not deviate from normal values, but are closer to the upper limit of the percentage of body fat that is recommended. A very important component of body composition, which positively and highly correlates with a physically active lifestyle, is relative muscle mass.<sup>7</sup> Given that the sample of respondents in this study is a physically active population, ie. population that trains handball and basketball, the results obtained are fully consistent with all previous research conducted on the sports population.<sup>15,21,22</sup>



Inspecting Histogram 1, we conclude that there are differences in the percentage of body fat between basketball players and the population that trains handball. Differences in other parameters are minimal (MM% and VF%), where higher levels were observed in basketball players, but there is no statistical significance. A similar result was obtained by a study,<sup>15</sup> but in that case they recorded a "positive picture" of BF% in favor of basketball



players. All other results are in line with the already existing literature, which dealt with the anthropological dimensions of players in various sports.

## Conclusion

By applying adequate statistical procedures, the values of the components of body composition, each subsample individually and the sample as a whole were determined, as well as the comparison of two subsamples of respondents. The results of this study confirmed the findings of other studies, such as the percentage of MM and the percentage of VF. Also, the assumption for anthropological status was confirmed, ie for the basic parameters of height and weight in favor of basketball players, from which we obtained slightly higher parameters for body composition, but only at the level of statistical significance for the variable BF%. The percentage of body fat differed, in favor of handball players, which is an atypical figure, in accordance with previous research, although the percentage of fat is within the physiological limit. The limitation of this study is reflected in the modest sample, where a larger number of respondents and a larger number of monitored parameters are needed,





## References

1. Bjelica B, Aksović N, Cicović B, Milanović Lj, Colak R, Zelenović M. Effects of different physical activities on the body composition of middle-aged people. *Anthropologie*. 2022; 60(1).
2. Bojić I, Kocić M, Valdevit Z. Differences in body composition and motor abilities among female handball players relating to positions in the team. In N. Stojilković (Eds.), *XXII Scientific Conference "Fis Communications 2019" in physical education, sport and recreation and III International Scientific Conference, 2019*; (pp. 91–98). Niš: Faculty of sport and physical education, University of Niš
3. Chengliang B, Li C. Analysis of body composition comparison between the Han and Uygur PE majors. In C. Liu (Ed.), *Proceedings of the 2011 International Conference on Future Computer Science and Education ICFCS 2011*, (pp. 387-390) Xi'an, CN: The Institute of Electrical and Electronics Engineers.
4. Cox-York K, Wei Y, Wang D, Pagliassotti MJ, Foster MT. Lower body adipose tissue removal decreases glucose tolerance and insulin sensitivity in mice with exposure to high fat diet. *Adipocyte*, 2015; 4:32–43.
5. Dorđević D, Stanković M, Zelenović M, Stamenković A, Manić M. Effects of Aerobic Exercise on Students' Body Composition Systematic review research. *Sport Mont*, 2021; 19(3): 89-93.
6. Đurašković R. *Biologija razvoja čoveka sa medicinom sporta – Praktikum*. 2001; Niš, RS: S.I.I.C.
7. Edholm P, Veen J, Kadi F, Nilsson A. Muscle mass and aerobic capacity in older women: Impact of regular exercise at middle age. *Experimental Gerontology*, 2021; 147, 111259.
8. Guth LM, Roth SM. Genetic influence on athletic performance. *Current Opinion in Pediatrics*, 2013; 25(6): 653-658.
9. Jeukendrup AE, Gleeson M. *Sport Nutrition: An Introduction to Energy Production and Performance*. 2009; Champaign, Human Kinetics,
10. Kershaw EE, Flier JS. Adipose tissue as an endocrine organ. *J. Clin.Endocrinol. Metab.*, 2004; 89(6): 2548-56.
11. Komiya S, Masuda T, Ube M, Mitsuzono R. Body size and composition in different somatotypes of Japanese college-aged women. *Appl Hum Sci*, 1996; 15(1): 5-11.
12. Lancho A, Leiva JR, Gómez MS, Poblador A. Body composition in 10 to 14-year-old handball players. *European Journal of Anatomy*, 2015; 6(3):51-56.
13. Malina RM, Bouchard C. *Timing and sequence of changes in growth, maturation, and performance during adolescence*. 1991; Champaign, IL: Human Kinetics.
14. Malina RM, Bouchard C, Bar-Or O. *Growth, maturation, and physical activity (2nd edition)*. 2004; Champaign, IL: Human Kinetics.
15. Masanovic B, Gardasevic J, Bjelica D. Comparative Study of Morphological Characteristics and Body Composition between Different Team Players from Serbian Junior National League: Soccer, Handball, Basketball and Volleyball; *Int. J. Morphol.*, 2021; 39(1):287-293.
16. Mišigoj-Duraković M. *Kinantropologija. Biološki aspekti telesnog vježbanja*. 2008; Zagreb, HR: Kineziološki fakultet Sveučilišta u Zagrebu.
17. Neovius MG, Linne YM, Barkeling BS, Rossner SO. Sensitivity and specificity of classification systems for fatness in adolescents. *Am J Clin Nutr*, 2004; 80:597e603
18. Ostojic SM, Mazic S, Dikic N. Profiling in basketball: Physical and physiological characteristics of elite players. *J. Strength Cond. Res.*, 2006; 20:740–744.
19. Ostojic S. Savremeni trendovi u analizi telesne strukture sportista. *Sportska medicina*, 2005; 5(1): 1-11.
20. Popovic S, Bjelica D, Jaksic D, Hadzic R. Comparative study of anthropometric measurement and body composition between elitesoccer and volleyball players. *Int. J. Morphol.*, 2014; 32(1): 267-74,
21. Silva DA, Petroski EL, Gaya AC. Anthropometric and Physical Fitness Differences Among Brazilian Adolescents who Practise Different Team Court Sports; *Journal of Human Kinetics volume*, 2013; 36: 77-86.
22. Stanković V, Malacko J, Doder D. The differences in morphological characteristics among top handball, basketball and and football players. *Acta Kinesiologicala*, 2019; 3(2):90-94





23. Stewart AD. *The concept of body composition and its applications*. In A.D. Stewart, & L. Sutton (Eds.), *Body composition in sport, exercise and health*, 2019; (pp. 1-19). London, UK: Routledge.
24. Svilar L, Jukić I, Castellano J, et al. *Load monitoring system in top-level basketball team*. *Kinesiology*, 2018; 50(1): 25–33.
25. Talma H, Chinapaw MJ, Bakker B, HiraSing RA, Terwee CB, Altenburg TM. *Bioelectrical impedance analysis to estimate body composition in children and adolescents: a systematic review and evidence appraisal of validity, responsiveness, reliability and measurement error*. *Obes Rev*. 2013; 14: 895–905.
26. Weiner JS, Lourie JA. *Human biology, a guide to field methods*. International Biological Programme. 1969; Edinburgh, UK: Blackwell Scientific Publications.
27. Zelenovic M, Bjelica B, D'Onofrio R, Bosiljcic S. *Overview of the current research about antropological space of male and female young scholars*. *Italian Journal of Sports Rehabilitation and Posturology*, 2021; 8(16), 1, 4, 1731-1744.

