

**Jovan Gardasevic \***  
**Dusko Bjelica**  
**Ivan Vasiljevic**  
**Bojan Masanovic**

## **DIFFERENCES IN BODY COMPOSITION WITH WATER POLO NATIONAL TEAMS PLAYERS PARTICIPATED IN THE WORLD CHAMPIONSHIP**

### **RAZLIKE V SESTAVI TELESA RAZLIČNIH DRŽAV UDELEŽENIH NA SVETOVNEM PRVENSTVU V VATERPOLU**

#### **ABSTRACT**

This research aimed to determine the differences between the junior (U20) water polo players of national teams of Serbia, Montenegro, and Australia in the anthropometric characteristics and body composition. The first sub-sample of the subjects consisted of 15 water polo players of the Serbian national team, the vice-champions of the FINA World Men's Junior Water Polo Championship in Kuwait 2019. The second sub-sample consisted of 18 water polo players of the Montenegrin national team, who occupied the sixth position and the last sub-sample of the examinees consisted of 13 water polo players of the Australian national team, who occupied the eleventh position on the championship. The players were tested at the final preparations just before the World Championship. Anthropometric characteristics and body composition were evaluated using a battery of 11 tests: body height, body weight, triceps skinfold, biceps skinfold, skinfold of the back, abdominal skinfold, upper-leg skinfold, lower leg skinfold, body mass index, fat percentage, and muscle mass. The results of the ANOVA displayed that the water polo players of the three national teams do not have statistically significant differences in the variables for assessing anthropometric characteristics and body composition. The results obtained in this research showed average team values for the estimated variables of water polo players of the three national teams (U20) who participated in the World Championship. That can serve as model parameters for all teams who want to participate in U20 water polo World Championship. Differences in classification among water polo players may be related to the motor abilities, technical and tactical parameters as their anthropometric parameters were found to be similar.

*Keywords:* junior water polo players; body composition of water polo players, anthropometric characteristics of water polo players, Serbian water polo, Montenegrin water polo

*University of Montenegro, Faculty for Sport and Physical Education, Niksic, Montenegro*

*Corresponding author\*:*

Jovan Gardasevic, University of Montenegro, Faculty for Sport and Physical Education, Narodne omladine bb, Niksic, Montenegro

E-mail: jovan@ucg.ac.me

#### **IZVLEČEK**

Cilj raziskave je bil ugotoviti razlike v antropometričnih značilnostih in sestavi telesa med mlajšimi (U20) vaterpolisti reprezentanc Srbije, Črne gore in Avstralije. V študjo smo zajeli tri podvzorce. Prvi podvzorec je sestavljalo 15 vaterpolisov srbske reprezentance, ki so bili podprvaki svetovnega moškega mladinskega prvenstva v vaterpolu v Kuvajtu 2019. Drugi podvzorec je sestavljalo 18 vaterpolistov črnogorske reprezentance, ki je zasedla šesto mesto; zadnji podvzorec preizkušenih pa je sestavljalo 13 vaterpolistov avstralske reprezentance, ki so na prvenstvu zasedli enajsto mesto. Igralci so bili testirani na zadnjih pripravah tik pred svetovnim prvenstvom. Antropometrične značilnosti in sestavo telesa smo ovrednotili z baterijo 11 testov: telesna višina, telesna teža, triceps kože, biceps kože, kožna guba hrbta, kožna guba trebuha, kožna guba kvadricepsa, kožna guba meč, indeks telesne mase, odstotek maščobe in odstotek mišične mase. Analiza variance je pokazala, da vaterpolisti treh reprezentanc nimajo statistično pomembnih razlik v spremenljivkah za ocenjevanje antropometričnih značilnosti in sestave telesa. Rezultati pridobljeni v tej raziskavi lahko služijo kot vzorčni parameter vsem ekipam, ki želijo sodelovati na svetovnem prvenstvu v vaterpolu do 20 let. Razlike v razvrstitvi med igralci vaterpola so lahko povezani z motoričnimi sposobnostmi ter tehničnimi in taktičnimi parametri, saj so bili njihovi antropometrični parametri zelo podobni.

*Ključne besede:* mlajši vaterpolisti; telesna sestava vaterpolistov, antropometrične značilnosti vaterpolistov, srbski vaterpolo, črnogorski vaterpolo

## INTRODUCTION

Water polo is a popular sport worldwide. It is a highly dynamic and fast team game that, with its richness of movement, belongs to the category of polystructural sport games. Water polo is a sport characterized by numerous and various complex and dynamic kinesiological activities, which are then characterized by either cyclical or acyclical movement. It is contact sport (Cecchi, Monroe, Fote, Small, & Hicks, 2019), characterized by different swimming intensities, duelling, acceleration and deceleration (Gardasevic, Akpinar, Popovic, & Bjelica, 2019). In water polo, top results can be achieved only under conditions of a well-programmed training process. High quality management of the training process depends on knowing the structure of certain anthropological capabilities and water polo players' characteristics, as well as their development. Findings regarding anthropometric characteristics and body composition are of crucial importance for complex sports, such as water polo. The anthropometric space is defined by the longitudinal dimension of the skeleton, the transversal dimensionality of the skeleton, and the mass and volume of the body. The purpose of knowing anthropometric characteristics is to improve skills in many sports (Gardasevic, & Bjelica, 2020; Masanovic, Corluka, & Milosevic, 2018). The anthropometric status of top-level athletes is relatively homogeneous, depending on the sport, and can be defined as a model of athletic achievement (Gardasevic et al., 2020). Research on anthropometric characteristics and body composition among athletes of different sports indicates that athletes of different sports have specific characteristics (Bjelica, Gardasevic, Vasiljevic, Jeleskovic, & Covic, 2019; Popovic, Akpinar, Jaksic, Matic, & Bjelica, 2013), mostly because size of those characteristics contributes a significant percentage of total variance associated with athletic success (Carvajal et al., 2012). Muscle mass improves performance in activities that require muscular strength and endurance, but also in those that require enviable aerobic ability (Rico-Sanz, 1998).

It is well known that water polo in Serbia, Montenegro, and Australia has a long tradition and the best results in international competitions, especially Serbia and Montenegro. Serbians and Montenegrins were the junior world champions several times, and Australians were vice-champions once. Serbia and Montenegro junior national teams are always top-ranked in Europe and the world.

It was expected that the national teams would continue with good results on the FINA World Men's Junior (U20) Water Polo Championship in Kuwait 12 - 20 December 2019, where twenty national teams participated. It is clear that these were the best players in Serbia, Montenegro

and Australia, at age 20, and that they had many years of quality training in order to qualify to wear a representative cap. It is well known in all sports and, therefore, in water polo that long-term and intensive training is one of the critical factors that enable athletes to reach and remain at the elite representative level (Gardasevic, Bjelica, & Vasiljevic, 2019). It became interesting for researchers to determine the models of anthropometric characteristics and body composition of the water polo players who play for these three national teams to determine the differences among them.

This research aimed to determine the anthropometric characteristics and body composition of junior (U20) water polo players of national teams of Serbia, Montenegro, and Australia, who participated on the FINA World Men's Water Polo Championship 2019 in Kuwait. The variables between these water polo players were compared, and the possible differences between them were determined.

## **METHODS**

In terms of time constraint, the research is transversal, consisting of a one-off measurement of the corresponding body composition and anthropometric characteristics of junior (U20) water polo players.

### **Participants**

A sample of the subjects consists of a total of 46 water polo players, divided into three sub-samples. The first sub-sample of the subjects consisted of 15 water polo players of the national team of Serbia of an average age of  $18.40 \pm 1.12$ , the vice-champions on the FINA World Men's Junior Water Polo Championship 2019. The other sub-sample consisted of 18 water polo players of the national team of Montenegro of an average age of  $18.44 \pm 0.98$ , who occupied the sixth position on the championship. The last sub-sample of the examinees consisted of 13 water polo players of the national team of Australia of an average age of  $19.00 \pm 0.91$ , who occupied the eleventh position on the World Men's Junior Championship (Table 1).

Table 1. Final rankings (20.12.2019) at the FINA World Men's Junior Water Polo Championship in Kuwait 2019.

National teams		Place
	Greece	1
	<b>Serbia</b>	<b>2</b>
	Italy	3
	Croatia	4
	Spain	5
	<b>Montenegro</b>	<b>6</b>
	USA	7
	Japan	8
	Hungary	9
	Canada	10
	<b>Australia</b>	<b>11</b>
	New Zealand	12
	Russia	13
	South Africa	14
	Egypt	15
	China	16
	Brazil	17
	Uzbekistan	18
	Iran	19
	Kuwait	20

Players of the Montenegrin and Australian national teams were tested at the joint final preparations in Niksic (Montenegro), one week before the World Championship. Players of the Serbian national team were tested at the final preparations in Kragujevac (Serbia), two days before departure for the World Championship. Considering that they were in the final pre-championship preparations, the final list of players was not formed (possibility of injuries or illness are the reasons there are often surplus of players), that was the reason the number of players tested was different among teams. All participants signed the consent form approved by the Institutional Review Board of the University of Montenegro, which was in accordance

with the Declaration of Helsinki as amended by the World Medical Association Declaration of Helsinki (World Medical Association, 2013).

### **Sample of variables**

Anthropometric research has been carried out with respect to the basic rules and principles related to the selection of measuring instruments and measurement techniques, standardized in accordance with the International Biological Program guidelines. For this study, eight anthropometric measures have been taken: body height, body weight, triceps skinfold, biceps skinfold, skinfold of the back, abdominal skinfold, upper leg skinfold and lower leg skinfold, and three body composition assessment variables: body mass index, fat percentage and muscle mass. An anthropometer, calliper, and measuring tape were used for anthropometric measurements. To evaluate the body composition and body weight, a Tanita body fat scale (model BC-418MA) was used. The scale is based on the principle of the indirect measurement of the body composition; a safe electrical signal is transmitted through the body via electrodes located in the standalone unit. The Tanita Scale enables athletes to closely monitor their body weight, body mass index, fat percentage, fat mass, muscle mass, bones mass, as well as segmental analysis of arms and legs.

### **Method of data processing**

The data obtained through the research were processed using descriptive and comparative statistical procedures. For each variable, central and dispersion parameters have been processed. The significance of the differences between the water polo players of the three national teams in the anthropometric characteristics and variables for assessing body composition was determined by ANOVA, with statistical significance of  $p < 0.05$  using IBM SPSS Statistics 20.0

## **RESULTS AND DISCUSSION**

The variables for assessing anthropometric characteristics and body composition of water polo players of Serbian, Montenegrin, and Australian national teams are shown in Table 2.

Table 2. Descriptive data and ANOVA of 46 water polo players, members of the three national teams.

Variables	Serbia	Montenegro	Australia	ANOVA	
	Mean $\pm$ Standard Deviation			F	Sig.
body height	192.12 $\pm$ 5.49	189.60 $\pm$ 6.89	191.27 $\pm$ 5.52	.734	.486
body weight	90.29 $\pm$ 8.52	88.69 $\pm$ 11.72	89.06 $\pm$ 8.15	.114	.892
triceps skinfold	6.54 $\pm$ 2.24	7.85 $\pm$ 2.38	8.88 $\pm$ 3.20	2.884	.067
biceps skinfold	5.45 $\pm$ 1.32	6.35 $\pm$ 1.86	7.04 $\pm$ 3.87	1.457	.244
skinfold of the back	11.90 $\pm$ 4.16	12.11 $\pm$ 3.31	11.73 $\pm$ 3.54	.042	.959
abdominal skinfold	13.87 $\pm$ 6.47	16.01 $\pm$ 7.45	13.51 $\pm$ 8.24	.544	.585
upper leg skinfold	13.03 $\pm$ 3.74	13.21 $\pm$ 4.25	11.79 $\pm$ 4.16	.509	.605
lower leg skinfold	10.95 $\pm$ 4.15	9.96 $\pm$ 3.54	9.46 $\pm$ 3.49	.592	.558
body mass index	24.50 $\pm$ 2.54	24.59 $\pm$ 2.20	24.35 $\pm$ 1.98	.044	.957
fat percentage	12.69 $\pm$ 3.89	13.13 $\pm$ 4.39	11.31 $\pm$ 4.03	.756	.476
muscle mass	44.51 $\pm$ 3.23	43.47 $\pm$ 4.75	44.61 $\pm$ 3.26	.426	.656

Based on the central and dispersion parameters of the water polo players of Serbia, Montenegro, and Australia (Table 2), it can be stated that the values of all the variables are very similar to all water polo players of this three countries. There were no significant differences in variables among the water polo players of the three national teams.

This study aimed to determine the difference in the anthropometric characteristics and body composition of the junior (U20) water polo players of the Serbian national team, who won a silver medal at the FINA World Water Polo Championship in Kuwait 12-20 December 2019, the water polo players of the Montenegrin national team, who occupied the sixth position, and the water polo players of the Australian national team, who occupied the eleventh position at the Championship. The results were obtained using a battery of 11 tests in the area of anthropometric characteristics and body composition. By examining the basic descriptive statistical parameters, we have analysed the best selected junior age water polo players from these three countries. Similar results in their research were obtained by Kondric, Uljevic, Gabrilo, Kontić, and Sekulić (2012). They found some lower body height 186.92 cm, and lower body weight 84.31 kg, on the sample of 110 the best world water polo players comparing to water polo players from our research, but it was the age of 18 years when growth and development is not finished. Having that in mind, we can say that those of U20 reached similar results as water polo players who were subject of this research. Kondric et. al (2012) at their sample of water polo players found value of skinfold of the back 12.57 which is slightly higher

value of those found in this research. When we compare water polo players of these three national teams with some other sport players, for example football players of the same age (Gardasevic & Bjelica, 2020) we can notice differences in anthropometric characteristics and body composition, which speaks in favour of the specificity of each sport in terms of new variables. It can be noted that the water polo players are taller and have a lower body weight than U19 football players in Montenegro (body height=179.01 cm; body weight=69.58 kg) in Bosnia and Hercegovina (body height=180.99 cm; body weight=73.65 kg) or in Kosovo (body height=178.15 cm; body weight=70.34 kg) (Gardasevic & Bjelica, 2020). Difference in fat percentage is noticeable as well, with football players in Montenegro it is 9.88%, in Bosnia and Hercegovina 9.65% and in Kosovo it is 8.66% (Gardasevic & Bjelica, 2020). These are lower values comparing to water polo players of three national teams. However, muscle mass is more dominant with water polo players and it is in average 8-9 kg on a higher level than it is with football players from mentioned three countries from the research Gardasevic and Bjelica (2020).

It can be observed that the water polo players of three national teams are of the approximately similar mean values of the all variables analysed, which is not surprising because these are the three national teams of the same age, in countries where water polo is popular and in where water polo coaches are highly skilled. If we go with analysing the final achievements at the championship, then we could say that absence of these differences is a surprise. Nevertheless, a final result at some competition affect many other things as well, such as physical preparation, technical and tactical preparation psychological preparation, that all players are without injuries, without penalties, than good timing of form in the championship, etc.

U20 water polo players have years of training experience and spend many hours in the pool each week. The ANOVA results showed that the water polo players of three national teams do not differ significantly in the analysed variables,. For all variables, some values are higher for water polo players of the Serbian national team (body height, body weight, lower leg skinfold), some for those of the Montenegrin national team (skinfold of the back, abdominal skinfold, upper leg skinfold, body mass index, fat percentage) and some for those of the Australian national team (triceps skinfold, biceps skinfold, muscle mass), although, insignificantly for statistics. All of the abovementioned indicates that water polo players of the Serbian, Montenegrin, and Australian national teams have similar anthropometric parameters and body compositions. All of these players have long-term training before a greatest competitions and they are all top water polo players at the world level, so it is no surprise that there are no

differences in anthropometric characteristics and body composition between them. Due to their lifestyle (constant training and sports nutrition), all top athletes take care of body composition, this is confirmed in research Merchiori et al. (2018) where did not get differences in body weight and body composition in 13 water polo players after a three-month training program for the Olympic Games. By using the system of bioelectrical impedance for high-level athletes involved in long and intense training periods helps to evaluate the effects of training and to prevent any decrease in the performance level of body composition (Melchiorri et al., 2018).

Given that the concentration of the best water polo players U20 is at World Championship in Kuwait 2019, the assumption is that the mean values of the analysed variables of three national teams' water polo players should be the model values for all such clubs in the world (Table 3). Of course, it is clear that these are the team average values of analysed variables, that the different positions which water polo players cover as well as their differences in stated variables in relation to these positions were not taken into consideration.

Table 3. Descriptive data of all 46 water polo players.

<b>Variables</b>	<b>Mean <math>\pm</math> Std. Dev.</b>
age	18.58 $\pm$ 1.02
body height (cm)	190.89 $\pm$ 6.06
body weight (kg)	89.31 $\pm$ 9.63
triceps skinfold (mm)	7.71 $\pm$ 2.70
biceps skinfold (mm)	6.25 $\pm$ 2.49
skinfold of the back (mm)	11.93 $\pm$ 3.59
abdominal skinfold (mm)	14.61 $\pm$ 7.31
upper leg skinfold (mm)	12.75 $\pm$ 4.02
lower leg skinfold (mm)	10.14 $\pm$ 3.70
body mass index (kg/m <sup>2</sup> )	24.49 $\pm$ 2.21
fat percentage (%)	12.47 $\pm$ 4.11
muscle mass (kg)	44.13 $\pm$ 3.86

Based on the obtained results in this research, before the start of the World Championship, it could not be assumed which national team would achieve a better placement. The Kuwait Championships showed that they were the national teams in which the nuances decided the final standings. For example, the Serbian national team beat the Montenegrin national team in the quarterfinals with one goal difference in the last minute of the game, thus going into the medal fight. In the finals, the Serbian national team lost to the Greek national team by a small



result and thus won a silver medal. After the defeat of the Serbian national team, the Montenegrin national team fought for 5th to 8th place (winning sixth place). All this confirms that these are the best water polo players in the world under the age of 20, many of whom already play for the senior national teams.

All water polo players of the three national teams had similar levels of subcutaneous adipose tissue. Different authors state the importance of body fat as a positive fact in water polo (Platanou, 2005; Peric, Zenic, Mandic, Sekulic, & Sajber, 2012), however in other studies it is not confirmed (Vila, Manchado, Abraldes, & Ferragut, 2018), and many researches showed that it is disruptive factor for athletes (Masanovic, 2019; Milanovic, & Vuleta, 2013). Also, in previous studies of water polo players of this age, subcutaneous adipose tissue has been shown to be a disruptive factor in defence (Milanovic, & Vuleta, 2013). It is well known that a low fat percentage is desirable for high physical performance in all sports. Although not every body composition characteristic is expected to play a role in optimal performance in professional sport, lower levels of body fat (that are specific to each player) are desirable for optimal performance, as body mass must be moved against gravity (Rienzi, Drust, Reilly, Carter, & Martin, 2000; S.M. Gil, J. Gil, Ruiz, Irazusta, & Irazusta, 2007).

## **CONCLUSION**

All the water polo players of the three national teams had similar muscle mass values; water polo is a strenuous sport that takes place in water and requires significant muscle mass. Body height is important for swimming, and long arms are important for kicks and defence; however, there were no statistically significant differences between the water polo players of the three national teams, which is perhaps surprising, considering that the Serbian national team played the final of the World U20 Championship, the Montenegrin national team dropped out in the quarter-final of the competition, and the Australian national team did not qualify for the quarter-final. The reason for the different placement may be found in the different levels of technical and tactical preparation, and functional and psychological preparation between water polo players of the three teams. Physical preparation at such championships is essential because it is done every day, and we have not analysed it. Experience in playing deciding matches at this level of competition can be the reason for different placement. The Serbian team has the most experience, the Montenegrin team has less experience, and the Australian team has the least experience.

The national water polo associations of Serbia, Montenegro, and Australia should turn to other research studies and check the functional-motoric status, psychological preparation as well as tactical training of their players, and analyse if there are differences at water polo players that influenced the result at this world championship, and whether there is room for improvement. The values obtained in this research can be useful for coaches of these national teams for making a comparison of their players with others and prepare their work in a way that enables the reduction of adverse parameters, and raise the beneficial ones to a higher level. That will surely make their water polo players even better and more successful. The results obtained in this research can serve as model parameters for the estimated variables for water polo players (U20) of all clubs in Serbia, Montenegro, and Australia, because the players that have been analysed were the best and the most successful water polo players in their countries, and participants in the World Championship in Kuwait 2019.

### **Acknowledgment**

The authors wish to thank the members of the Water Polo Association of Serbia, Montenegro and Australia for their cooperation.

### **Declaration of Conflicting Interests**

All authors confirm - no potential conflict of interest exists for this study.

### **REFERENCES**

- Bjelica, D., Gardasevic, J., Vasiljevic, I., Jeleskovic, E., & Covic, N. (2019). Body Composition and Morphological Characteristics of Soccer Players in Bosnia and Herzegovina. *Kinesiology Slovenica*, 25(1), 5–13. ISSN 1318-2269.
- Carvajal, W., Betancourt, H., León, S., Deturnel, Y., Martínez, M., Echevarría, I., et al. (2012). Kinanthropometric Profile of Cuban Women Olympic Volleyball Champions. *MEDICC Review*, 14(2), 16-22. doi: 10.1590/s1555-79602012000200006
- Cecchi, N.J., Monroe, D.C., Fote, G.M., Small, S.L., & Hicks, J.W. (2019). Head impacts sustained by male collegiate water polo athletes. *PLoS ONE*, 14(5), e0216369. <https://doi.org/10.1371/journal.pone.0216369>
- Gardasevic, J., Bjelica, D., & Vasiljevic, I. (2019). Morphological characteristics and body composition of elite soccer players in Montenegro. *International Journal of Morphology*, 37(1), 284-288.
- Gardasevic, J., Akpinar, S., Popovic, S., & Bjelica, D. (2019). Increased Perceptual and Motor Performance of the Arms of Elite Water Polo Players. *Applied Bionics and Biomechanics*, 6763470. doi: 10.1155/2019/6763470.
- Gardasevic, J., & Bjelica, D. (2020). Body composition differences between football players of the three top football clubs. *International Journal of Morphology*, 38(1), 153-158.

- Gardasevic, J., Bjelica, D., Vasiljevic, I., Corluka, M., Arifi, F., & Sermahhaj, S. (2020). Differences in body composition between young football players of football clubs in Montenegro, Bosnia and Kosovo. *Kinesiologia Slovenica*, 26(1), 27-32. ISSN: 1318-2269.
- Gil, S.M., Gil, J., Ruiz, F., Irazusta, A., & Irazusta, J. (2007). Physiological and anthropometric characteristics of young football players according to their playing position: relevance for the selection process. *J. Strength Cond. Res.*, 21, 438-45.
- Kondric, M., Uljevic, O., Gabrilo, G., Kontić, D., & Sekulić, D. (2012). General anthropometric and specific physical fitness profile of high-level junior water polo players. *Journal of human kinetics*, 32, 157–165. doi:10.2478/v10078-012-0032-6
- Masanovic. B., Corluka, M., & Milosevic, Z. (2018). Comparative Study of Anthropometric Measurement and Body Composition of Junior Soccer and Handball Players from the Serbian National League. *Kinesiologia Slovenica*, 24(3), 37-46.
- Masanovic, B. (2019). Comparative study of morphological characteristics and body composition between different team players from Serbian junior national league: soccer, handball, basketball and volleyball. *International Journal of Morphology*, 37(2), 612-9.
- Melchiorri, G., Viero, V., Sorge, R., Triossi, T., Campagna, A., Volpe, S.L., Lecis, D., Tancredi, V., & Andreoli, A. (2018). Body composition analysis to study long-term training effects in elite male water polo athletes. *The Journal of Sports Medicine and Physical Fitness*, 58(9), 1269-74 doi: 10.23736/S0022-4707.17.07208-5
- Milanovic, D., & Vuleta, D. (2013). Association between morphological dimensions of water polo players and play performance indicators. *Sport Mont*, XI(37-39), 447-453.
- Peric, M., Zenic, N., Mandic, G.F., Sekulic, D., & Sajber, D. (2012). The reliability, validity and applicability of two sport-specific power tests in synchronized swimming. *J Hum Kinet*, 32, 135-45.
- Platanou, T. (2005). On-water and dryland vertical jump in water polo players. *J Sports Med Phys Fitness*, 45(1), 26-31.
- Popovic, S., Akpinar, S., Jaksic, D., Matic, R., & Bjelica D. (2013). Comparative Study of Anthropometric Measurement and Body Composition between Elite Football and Basketball Players. *International Journal of Morphology*, 31(2), 461-467.
- Rico-Sanz, J. (1998). Body composition and nutritional assessments in football. *International Journal of Sport Nutrition*, 8, 113-123.
- Rienzi, E., Drust, B., Reilly, T., Carter, J.E.L., & Martin, A. (2000). Investigation of anthropometric and work-rate profiles of elite South American international football players. *J Sports Med Phys Fitness*, 40(2), 162-169.
- Vila, M.H., Manchado, C., Abraldes, J.A., & Ferragut, C. (2018). Predicting playing status in professional water polo players: analysis by gender. *The Journal of Sports Medicine and Physical Fitness*, 58(9), 1234-9.
- World Medical Association (2013). World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects. *The Journal of the American Medical Association*, 310(20), 2191–2194. doi:10.1001/jama.2013.281053