

## BASIC MOTOR ABILITIES OF YOUNG HANDBALL PLAYERS FROM MONTENEGRO

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### Abstract

*This research has been conducted on 100 young handball players aged from 14 to 15, from Montenegro. They were divided into 2 (two) groups according to their regional belonging. The first group consists of 50 players from the continental region, and the second group - 50 players from the Mediterranean region. They were tested by 21 motor tests for estimating 7 motor abilities, with the aim to compare basic motor abilities between the two groups. Of the motor abilities the following were tested: frequency of movement; flexibility; explosive power of legs; explosive power of arms and shoulders; repetitive power; coordination and equilibrium. After processing the data with the basic descriptive methods, and having established the differences by t-test and discriminative analysis, the conclusion is that the handball players from the continental region have achieved far much better results than those of the Mediterranean players.*

**Key words:** athletes aged 14-15, motoric, tests, continental region, Mediterranean region

### Introduction

Montenegro is a country of diversity regarding all and even the climatic view. This is a consequence of its position, separations and dissections of the relief, relocations and confrontations of air masses of different physical characteristics, proximity to the sea, character of the soil and other factors. The motive of this research was to try in its own community to give importance and contribution to that branch of sport that gave Montenegro most trophies. Regarding that Montenegro is divided into Mediterranean and continental region, the very idea was to be conducted a research in that area on the younger population of boys-who are actively involved in the handball sport. By acquisition of the state independence and the performances of our national team, was given a right opportunity to show Europe and the world what kind of potential Montenegrin handball has. Games, especially sport's games, which operate using a large number of players who are in constant motion simultaneously confronting on the individual, group and collective level, are a unique phenomenon that is not easy to analyze (Rogulj, 2000). Handball, as one of the most popular sports games, belongs to a set of very complex, complex sport's activities dominated by cyclic and acyclic structures of the movement. It takes place in the intermittent stress mode. In the sport's activities during the training and competitions in the handball great importance have general and basic motor skills. Contemporary approach to the basic and specific anthropological characteristics of handball players and the specific requirements and characteristics of handball game requires scientifically based analysis and insights that can be reached only on the basis of scientific - research projects. At the sport's training the greatest emphasis is placed on developing biomotor dimensions. The elementary biomotor dimensions are the force, speed and endurance. All other dimensions are either of the constitutional nature, or are derived from the elementary dimensions (Bjelica, 2007).

In Montenegro, there are seven clubs that compete in an organized cadet league.

### Problem and aim

The problem of this research is the determining of the differences at the level of motor skills of young handball players, from the Mediterranean and continental regions that are organizationally involved in the handball training. The object of this study were the handball players of age 14-15 years, as well and their motor abilities. The main goal of this study was to determine possible differences at motor abilities among handball players from the continental regions and the handball players from the Mediterranean region. Starting from the goal, the following research tasks were set: - determination of the level of motor abilities at the handball players from continental regions; - determination of the level of motor abilities at the handball players from the Mediterranean region; - to compare motor abilities among handball players from the continental regions and handball players from the Mediterranean region in the manifested space; - to compare the motor skills among handball players from the continental regions and handball players from the Mediterranean region in the latent space. Based on the formulation of the problem, objects, set goal and tasks, the general hypothesis of this paper could be formulated as follows: Ho - statistically significant differences are expected in the motor skills at the young handball players from the continental and Mediterranean region; H1 - statistically significant differences are expected at the motor abilities in the manifested space among the handball players from the continental and Mediterranean region, in favor of the handball players from the continental regions; H2 - statistically significant differences are expected at the motor skills in the latent space among the handball players from the continental and Mediterranean region, in favor of the handball players from the continental regions.

## Methods

The measurement was conducted in Nikšić (RK "Sutjeska") and Berane (RK "Berane") – continental region, and Danilovgrad (RK "Danilovgrad") and Bar (RK "Mornar") – Mediterranean region. The sample was divided into two subsamples (groups), as follows: The first group (50), handball players from continental regions. The second group (50), handball players from the Mediterranean region. The sample of measurement tools for assessing motor abilities:

- For movement frequency: 1. Taping by hand (MBFTAP); 2. Taping by leg (MBFTAN); 3. Taping by foot against the wall (MFTAZ);
- For flexibility: 4. Bent straddle (MFLPRR); 5. Deep bent on the bench (MFLPRK); 6. Flexibility with bat (MFLISK);
- For estimation of the explosive leg power: 7. Jumping forward from a place (MFESDM); 8. Jump vertically from a place (MFESVM); 9. Running at 20 m-from a high start (MFT20V);
- For explosive power estimation of the hand and shoulder area: 10. Throwing a handball ball from straddle sitting on the ground (MFEBRL); 11. Throwing a basketball from a chest and sitting position on a chair (MFEBKL); 12. Throwing medical ball from lying on the back (MFEBML);
- For estimation of the repetitive power: 13. Raising the trunk for 30 seconds (MRCPRE); 14. Push-ups on the ground (MRCSKL); 15. Knuckle on the gymnastic bar using hanging position (MRCZGV);
- For estimation of the coordination: 16. Eighth with bending (MAGOOS); 17. Agility in the air (MKTOZ); 18. Side steps (MAGKUS);
- For estimation of the balance: 19. Standing on two legs lengthwise on the bench for balance with open eyes (MBAU20); 20. Standing on two legs crosswise on the bench for balance with closed eyes (MBAP2Z); 21. Standing on one leg lengthwise on the bench for balance with closed eyes (MBAP1Z).

The data obtained by testing were analyzed by the procedures of basic (primary) descriptive statistics: The normality of results' distribution was tested by the method of Kolmogorov and Smirnov. The quantitative differences between the two groups of respondents in the motor and motor- situational skills were determined by the t-test for large independent samples. The qualitative differences in general and motor situational abilities were processed by discriminative analysis between the groups according to the region.

## Results

According to the results in table 1 which shows motor skills (21 variables), of the handball players from the continental regions, can be observed that the values of arithmetic mean (Mean), minimal (Minimum) and maximal (Maximum) results, as well as the standard deviation (Std.Dev.) and standard error (Standard Error). Based on the values of the asymmetry (skewness) on the distribution of the results we see that the more pronounced asymmetry was found at the variables: throwing a basketball from the chest from sitting position on a chair (MFEBKL), Knuckle on the gymnastic bar using hanging position (MRCZGV), agility in the air (MKTOZ), standing on two legs longitudinally on the bench for balance (MBAU20), standing on two legs crosswise on the bench for balance with closed eyes (MBAP2Z) and standing on one leg lengthwise on the bench for balance with closed eyes (MBAP1Z). At five of these variables they are dominated the results of respondents who have smaller values than the values of arithmetic means, while only at the variable maneuverability in the air (MKTOZ) most of the results achieved are in the area of larger values than the arithmetic mean value.

Table 1. The basic descriptive parameters of the applied variables at the handball players from the continental regions

Varijable	Valid N	Mean	Minimum	Maximum	Std.Dev.	Std Error	Skewness	Kurtosis	K-S
MBFTAP	50	37.82	27.00	54.00	6.41	0.91	0.55	-0.43	0.37
MBFTAN	50	38.52	31.00	45.00	3.44	0.49	-0.64	-0.21	0.47
MFTAZ	50	22.74	18.00	30.00	2.81	0.40	0.55	0.49	0.26
MFLPRR	50	56.43	35.50	76.50	10.31	1.46	0.11	-0.17	0.38
MFLPRK	50	44.62	31.00	58.00	7.18	1.01	-0.10	-1.03	0.46
MFLISK	50	80.50	30.00	106.00	17.42	2.46	-0.53	0.54	0.83
MFESDM	50	2.10	1.70	2.40	0.20	0.03	-0.47	-0.84	0.38
MFESVM	50	43.56	31.00	55.00	7.19	1.02	-0.05	-1.29	0.18
MFE20V	50	4.04	3.40	4.84	0.31	0.04	0.46	-0.03	0.17
MFEBRL	50	17.82	12.00	27.00	3.81	0.54	0.59	0.14	0.70
MFEBKL	50	9.07	5.90	18.60	2.24	0.32	1.40	5.18	0.85
MFEBML	50	9.75	5.00	15.27	2.80	0.40	0.21	-0.53	0.87
MRCPRE	50	23.30	18.00	32.00	3.43	0.49	0.18	-0.73	0.22
MRCSKL	50	19.76	5.00	38.00	8.77	1.24	0.41	-0.57	0.59
MRCZGV	50	4.82	0.00	16.00	3.63	0.51	1.25	2.03	0.20
MAGOOS	50	18.99	16.56	22.56	1.33	0.19	0.38	-0.01	0.97
MKTOZ	50	4.69	3.50	8.82	0.88	0.12	2.23	9.04	0.08
MAGKUS	50	9.84	8.56	11.45	0.77	0.11	0.18	-0.74	0.63
MBAU20	50	6.44	1.17	55.75	8.24	1.17	4.85	27.07	0.00
MBAP2Z	50	3.63	1.37	9.60	1.88	0.27	1.83	3.16	0.03
MBAP1Z	50	9.85	1.11	58.80	15.04	2.13	2.34	4.47	0.00

Table 2. Basic descriptive parameters of applied variables at the handball players from the Mediterranean region

Variables	Valid N	Mean	Minimal	Maximal	Std.Dev.	Std Error	Skewness	Kurtosis	K-S
MBFTAP	50	32.06	26.00	39.00	2.68	0.38	0.59	0.67	0.26
MBFTAN	50	40.40	35.00	48.00	2.78	0.39	0.38	-0.11	0.24
MFTAZ	50	22.04	10.00	27.00	3.35	0.47	-1.04	2.22	0.30
MFLPRR	50	50.26	29.00	69.00	9.05	1.28	-0.27	0.11	0.70
MFLPRK	50	41.92	12.00	54.00	7.49	1.06	-1.66	4.96	0.17
MFLISK	50	86.99	40.00	125.00	18.85	2.67	-0.44	0.20	0.75
MFESDM	50	1.98	1.50	2.35	0.18	0.03	-0.67	0.55	0.18
MFESVM	50	39.80	30.00	55.00	7.01	0.99	0.31	-0.50	0.38
MFE20V	50	3.62	3.16	4.33	0.31	0.04	0.44	-0.77	0.68
MFEBRL	50	14.31	8.50	23.00	3.49	0.49	0.56	-0.32	0.32
MFEBKL	50	8.69	5.50	13.00	1.87	0.26	0.41	-0.26	0.65
MFEBML	50	10.42	6.50	13.80	1.96	0.28	-0.09	-1.13	0.55
MRCPRE	50	23.62	9.00	30.00	3.52	0.50	-1.31	4.67	0.79
MRCSKL	50	17.54	0.00	38.00	10.45	1.48	-0.16	-0.88	0.34
MRCZGV	50	4.66	0.00	13.00	3.66	0.52	0.64	-0.49	0.32
MAGOOS	50	19.53	16.75	22.56	1.43	0.20	0.37	-0.12	0.82
MKTOZ	50	4.87	3.59	8.70	1.07	0.15	1.92	4.89	0.20
MAGKUS	50	10.51	8.47	13.20	1.07	0.15	0.23	-0.20	0.99
MBAU20	50	5.02	1.56	43.31	6.18	0.87	5.11	30.86	0.00
MBAP2Z	50	2.63	1.03	10.37	1.71	0.24	2.46	7.98	0.00
MBAP1Z	50	3.78	1.50	11.31	2.63	0.37	1.61	1.62	0.01

A positive value of the asymmetry at this variable is treated as a negative value (it has an inverse interpretation) because the lower result (lower value of obtained results) is a better achievement. Less time spent for execution of this test is a better result. Based on the value of flattening (Kurtosis) results distribution we can see that more pronounced kurtosis is determined at the variables: throwing a basketball from the chest from sitting position on a chair (MFEBKL), agility in the air (MKTOZ), standing on two legs lengthwise on the bench for balance (MBAU20) and standing on one leg lengthwise on the bench for balance with closed eyes (MBAP1Z). Their values are above 3.00, and it is in favor of the constatation that these variables have more expressed peak sharpness of the normal distribution. The exception is the variable, standing on two legs crosswise on the bench for balance with closed eyes (MBAP2Z), which has a shape of the schedule that is closest to the normal schedule (value 3.16), at the other applied variables, the kurtosis values are less than 3.00 and therefore, their distribution is platikurtic i.e. these variables have a flatter shape than the normal. In relation to the normal distribution of treated motor skills and motor -situational skills of the handball players from the continental region that has been tested by Kolmogorov-Smirnov test, at only two variables was found a significant deviation from the normal distribution. These are the variables for assessment of balance (MBAU20) and (MBAP1Z). According to the results at table 2 which shows motor skills (of the first 21 variables) of the handball players from the Mediterranean region, for all applied variables (tests) are logical and within the expectations. This is the same conclusion as at the handball players from the continental regions. Based on the values of the asymmetry (skewness) distribution's results can be noted that the more expressed asymmetry

was determined on the variables: deep bend on the bench (MFLPRK), raising the trunk for 30 seconds (MRCPRE), agility in the air (MKTOZ), standing on two legs lengthwise on the bench for balance with open eyes (MBAU20), standing on two legs crosswise on the bench for balance with closed eyes (MBAP2Z) and standing on one leg lengthwise on the bench for balance (MBAP1Z). At the variables: MFLPRK, MRCPRE and MKTOZ the majority of the achieved results are in the area larger than the arithmetic means value. At the variables for balance assessing MBAU20, MBAP2Z and MBAP1Z dominate results of subjects which are characterized by smaller values than the values of arithmetic means. Based on the value of flattening (Kurtosis) distribution of results can be noted that pronounced kurtosis is determined at five variables: deep bent on the bench (MFLPRK), raising the trunk for 30 seconds (MRCPRE), agility in the air (MKTOZ), and the variables for the equilibrium (MBAU2) and (MBAP2Z). Their values are above 3.00, and therefore we can note that these variables have a pronounced peak sharpness of the distribution. At the other applied variables, the kurtosis values are less than 3.00 and therefore, their schedule is platikurtic and these variables have a flatter shape than normal. In relation to the normal distribution of treated motor skills and motor situational skills of the handball players from the Mediterranean region, which has been tested by Kolmogorov-Smirnov test, only at the variables for balance assessment was found significant deviation from the normal distribution. These variables were: standing on two legs lengthwise on the bench for balance with open eyes (MBAU20), standing on two legs crosswise on the bench for balance with closed eyes (MBAP2Z) and standing on one leg lengthwise on the bench for balance with closed eyes (MBAP1Z).

Table 3. T-test between the arithmetic means of handball players from the continental region - G<sub>1</sub> and the Mediterranean region - G<sub>2</sub>

Variables	Mean G <sub>1</sub>	Mean G <sub>2</sub>	t-value	df	p
MBFTAP	37.82	32.06	5.86	98	0.00
MBFTAN	38.52	40.40	-3.01	98	0.00
MFTAZ	22.74	22.04	1.13	98	0.26
MFLPRR	56.43	50.26	3.18	98	0.00
MFLPRK	44.62	41.92	1.84	98	0.07
MFLISK	80.50	86.99	-1.79	98	0.08
MFESDM	2.10	1.98	3.22	98	0.00
MFESVM	43.56	39.80	2.65	98	0.01
MFE20M	4.04	3.62	6.81	98	0.00
MFEBRL	17.82	14.31	4.81	98	0.00
MFEBKL	9.07	8.69	0.93	98	0.35
MFEBML	9.75	10.42	-1.37	98	0.17
MRCPRE	23.30	23.62	-0.46	98	0.65
MRC SKL	19.76	17.54	1.15	98	0.25
MRCZGV	4.82	4.66	0.22	98	0.83
MAGOOS	18.99	19.53	-1.96	98	0.05
MKTOZ	4.69	4.87	-0.95	98	0.35
MAGKUS	9.84	10.51	-3.60	98	0.00
MBAU20	6.44	5.02	0.97	98	0.33
MBAP2Z	3.63	2.63	2.78	98	0.01
MBAP1Z	9.85	3.78	2.81	98	0.01

For determining significance of the differences between the arithmetic means of handball players from the continental region and the Mediterranean region was applied t-test for large dependant samples, while the difference is treated for statistical significance at the level of 0.05 (5%). According to the gained results, among the treated groups of respondents, statistically significant difference between them was found at 11 variables of the 21 applied. There was also determined and certain differences at the other 10 variables among them, but this difference was not statistically significant. Respondents from the group of handball players from the continental region (G<sub>1</sub>) achieved significantly better results than the group of handball players from the Mediterranean region (G<sub>2</sub>) at 9 variables: taping by hand (MBFTAP), bent straddle (MFLPRR), jump forward from a place (MFESDM), vertical jump from a place (MFESVM), throwing a handball ball from the ground using straddle position (MFEBRL), making eighth with bending (MAGOOS), side steps (MAGKUS), standing on two legs crosswise on a bench for balance with closed eyes (MBAP2Z) and standing lengthwise on one leg on the bench for balance with closed eyes (MBAP1Z). The respondents from the group of handball players from the Mediterranean region (G<sub>2</sub>) achieved significantly better results than the group of handball players from the continental region (G<sub>1</sub>), and only at 2 variables: leg taping (MBFTAN) and sprint from a standing position at 20m (MFE20V). In the other variables that do not show any statistically significant difference, handball players from continental regions (G<sub>1</sub>) had better results than groups of handball players from the Mediterranean region (G<sub>2</sub>) at 8 variables: leg taping against a wall (MFTAZ), deep

bend on the bench (MFLPRK), flexibility with a bat (MFLISK), throwing a basketball from the chest sitting on a chair (MFEBKL), push-ups on the floor (MRC SKL), Knuckle on the gymnastic bar using hanging position (MRCZGV), agility in the air (MKTOZ) and standing on two legs longitudinally on a bench for balance with opened eyes (MBAU20). Respondents from the group handball players from the Mediterranean region (G<sub>2</sub>) had better results than group of handball players from the continental region (G<sub>1</sub>) only at 2 variables: throwing medical ball from lying position on a back (MFEBML) and raising the trunk for 30 seconds (MRCPRE). According to the gained results referring to testing the differences between the arithmetic means of the handball players from the continental regions and the Mediterranean region by using the t-test for large dependent samples, lead us to the conclusion that the handball players from the continental regions are generally better regarding the motor skills in relation to handball players from the Mediterranean region. This is a result of having a much larger number of tests G<sub>1</sub> which had better and statistically more significant achievements than G<sub>2</sub>. According to the gained results of the general hypothesis H<sub>g</sub> - statistically significant differences are expected in motor skills at the young handball players of continental and Mediterranean region is partially accepted.

Table 4. Discriminant analysis of motor tests among handball players from the continental and Mediterranean region

Eigen-value	Canonical R	Wilks' Lambda	Chi-Sqr.	df	p-level
4.94	0.91	0.17	155.88	21	0.00

By the discriminative analysis were detected differences in motor tests among handball players from the continental and Mediterranean region. According to table 8, the values of the correlation canonical coefficient (0.91), chi-square test (Chi-Sqr. = 155.88), with 21 degrees of freedom, was found a statistically significant difference between the treated groups of handball players according to the region at the level of 0.00. In the table 5 is shown the single discriminant function for handball players from the continental and Mediterranean region. According to its values, more evident discrimination, we can say that there is at the variable sprint from a standing position (MFE20V) - 0.31. For other variables, their projections are below the set value (0.30) and we cannot conclude that they are significant. In the table 6 in which are displayed the groups of centroids, the higher the value of the centroids is at the handball players of the continental region (G<sub>1</sub> = 2.20) compared to handball players from the Mediterranean region (G<sub>2</sub> = -2.20). This leads to the conclusion that in the treated motor area handball players from the continental regions have achieved significantly better results compared to handball players from the Mediterranean region.

Table 5. The structure of discriminative function of motor tests among two groups of handball players

Variables	Root 1
MBFTAP	0.27
MBFTAN	-0.14
MFTAZ	0.05
MFLPRR	0.14
MFLPRK	0.08
MFLISK	-0.08
MFESDM	0.15
MFESVM	0.12
MFE20V	0.31
MFEBRL	0.22
MFEBKL	0.04
MFEBML	-0.06
MRCPRE	-0.02
MRC SKL	0.05
MRCZGV	0.01
MAGOOS	-0.09
MKTOZ	-0.04
MAGKUS	-0.16
MBAU20	0.04
MBAP2Z	0.13
MBAP1Z	0.13

According to the gained hypothesis results H2 - are expected statistically significant differences in motor abilities at the latent space among handball players from the continental and Mediterranean regions, in favor of the handball players from the continental regions is accepted.

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Table 6. group centroids - continental region (G\_1), and the Mediterranean region (G\_2)

Groups	Root 1
G_1	2.20
G_2	-2.20

## Conclusion

Based on studies realized on a sample of 100 respondents - a handball players by region (50 from the continental and 50 from the Mediterranean region) where were applied a total number of 21 variables (tests) from the basic motorics, we can conclude the following: 1. The general conclusion would be that in the treated motor area the handball players from continental regions have achieved better results than handball players from the Mediterranean region. 2. The results achieved in the treated variables for both groups of respondents are logical and in accordance with the expectations. 3. Respondents, handball players from continental regions have achieved statistically more significant and better results than the handball players from the Mediterranean region in 9 variables. 4. Respondents, handball players from the Mediterranean region have achieved statistically more significant and better results than the handball players from the continental regions in 2 variables. 5. In the latent motor space, using discriminant analysis, we can conclude or confirm the conclusion that the established differences were inclined in favor to the group of handball players from the continental regions.

**BAZIČNE MOTORIČKE SPOSOBNOSTI MLADIH RUKOMETASA IZ CRNE GORE****Sažetak**

Ovo istraživanje je realizirano sa 100 mladih rukometaša uzrasta od 14 do 15 godina iz Crne Gore. Oni su bili podijeljeni u 2 (dvije) grupe prema regionalnoj pripadnosti. Prva grupa je bila sačinjena od 50 igrača iz kontinentalne regije, a druga grupa – 50 igrača iz mediteranske regije. S njima je primijenjen 21 motorički test za procjenjivanje 7 motoričkih sposobnosti, s ciljem da se usporede bazične motoričke sposobnosti između dvije tretirane grupe. Od motoričkih sposobnosti tretirane su: frekvencija pokreta, fleksibilnost, eksplozivna snaga nogu, eksplozivna snaga ruku i ramenog pojasa, repetitivna snaga, koordinacija i ravnoteža. Nakon obrade podataka osnovnih deskriptivnih metoda i nakon utvrđivanje razlika t-testom i diskriminativnom analizom, zaključeno je da su rukometaši kontinentalne regije postigli značajno bolje rezultate od rukometaša mediteranske regije.

**Ključne riječi:** sportaši uzrasta 14-15 godina, motorika, testovi, kontinentalna regija, mediteranska regija

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