

## MORPHOLOGICAL AND SITUATIONAL-MOTORIC PARAMETERS OF THE JUNIOR HANDBALL PLAYERS

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### Abstract

**Introduction:** Today, handball game is more dynamic, where many beautiful and attractive actions are undertaken, where the sport of handball continues to develop on all its levels, whether by changing its rules, organization, quality trainings, etc.

**Methods:** Approximately 55 junior handball players of 4 handball clubs that play in the handball Super-league of Kosovo were tested for the implementation of this scientific work, with anthropometric variables having a total of 7 seven variables, while motoric and situational-motoric variables were 12 variables. For the processing of results, the following criteria are applied: arithmetic mean, standard deviation, arithmetic mean error, maximum result, minimum result, skew - distribution symmetry, kurt - distribution peak, correlation (Pearson), correlation between two variables, differences between two variables. While other statistical parameters were also regression analysis - for prediction of the variables criterion from the predictive variables system.

**Discussions and Conclusions:** Anthropometric variables have high inter-correlations, but this does not apply to situational-motoric variables. Anthropometric variables have realized connectivity with variables where the potential of explosive force and velocity comes into expression. Situational-motoric variables have valid correlation relations only when general basic skills are required in the situational tests. The impact of the motoric and situational-motoric variables system on the criterion: '20m dribbling between the obstacles' is large, and this variable can be predicted with many variables of the predictive system. This is not the case with the criterion variable 'Shooting on goal in motion', which can only be predicted with the variable 'Dribbling with ball between obstacles', while the whole predictor system is not statistically valid in the prediction of criterion.

*Keywords:* Juniors, morphological parameters, situational-motoric parameters, selection of representation, handball.

### Introduction

The handball as a team sports game, based on the basic motoric features, is part of the human's kinesthetic poly-structural activities. The specific situations of this game condition the demand for selecting the appropriate structural units of motion, both from the content and intensity as well as from the adjustment and synchronization of skills in space and time relations. (Çitaku, 2009). The success of the handball game depends on a number of internal and external factors, and mostly on the links to the anthropological character of the players. Very important anthropologic components are morphological and basic-motoric characteristics of players that need to be in line with the kinesiologic requirements of this sports game (Bolanča and co-workers, 2011).

This sport with movements, fast runs, high explosive jumps, different contact's with opponents, technical-tactical and conditional movements, etc., makes the handball achieve anthropometric, physiological, motoric, cognitive, conative and situational changes.

To increase the results of the youth, today it's important not only the quantity, volume and intensity of the work, but also the quality of work, that is, changing the stereotype of work, eliminating excessive movements, rationalizing the game with elements, etc. (Tahiraj and co-workers, 2011).

Handball is distinguished by three motoric angles, such as the one of running, jumping and shooting, while in anthropometrics it has to do with body height, arms and hands (Tahiraj and co-workers, 2017).

Therefore, the purpose of the scientific work is to have more accurate information, and these data are then targeted in the analysis and changes of some parameters of the morphological and motoric condition of the Super League of Kosovo in handball for juniors.

## **Method of work**

### **Sample of entities and variables**

The sample of entities consists of active players that play in the Kosovo junior Handball Super League, who are to be tested in order to be selected in the national team of Kosovo. From the Kosovo Super League, four clubs have been tested with approximately 12-13 players each, with the total number of players involved in the survey being around 55 players.

Variables for measuring morphological structure are taken from the International Biological System, while motoric and functional variables are taken from the 'Eurofit'. From the variables applied, there are 7 anthropometric and 12 situational-motoric variables.

Anthropometric variables had this composition: body weight (BW), body height (BH), leg length (LL), foot length (FL), arm length (AL), palm length (PL), palm width (PW), while within the situational-motoric variables we have: running 20 m (high start) (R20m), high jump from the place (HJFP), high jump from the place with step (HJFPWS), long jump from the place (LJFP), body rise from the outspread position (BRFOP), leaning forward on the bench - flexibility (LFOBF), medicinal ball back throwing (MBBTH), round trip running - durability (RTRD), running with obstacles 20m without ball round trip (RWB20M), dribbling between obstacles 20m with ball (DBO20m), agility 20m between obstacles (A20mBO), jumps (plyometric) above obstacles 20m (JPAO20m).

### **Conditions, instruments, and measurement techniques**

When we started with handball player's measurements, we have previously provided information to the subjects on the measuring points and standing positions during measurement, and we have continuously shown the goal of measurement, in order not to create confusion during measurements so that handball players are comfortable and at ease. Anthropometric measurements are made in the sport hall during the mornings from 09:00 to 10:30 hrs. Lighting conditions were within normal and temperature ranges from 17 to 21 Celsius degrees. The instruments were standardized and calibrated before the start of the measurement and during measurement. All the subjects tested have been barefooted and dressed in sports shirts.

Based on the intended purpose, the methodology of the processing of results was selected and the basic statistical parameters that were used were as follows: arithmetic mean, standard deviation, arithmetic mean error, maximum result, minimal result, skew – distribution symmetry, kurt – distribution peak, correlation (Pearson), correlation between two variables, differences between two variables. While in other statistical parameters we have also regression analysis - for prediction of the criterion variables from the prediction variables system.

## Results and Discussion

**Table 1.** - Basic statistical parameters of anthropometric and motoric variables of the Super League of Kosovo

| Variables | $\bar{X}$ | Min   | Max  | $S\bar{X}$ | DS    | Skew        | Kurt        |
|-----------|-----------|-------|------|------------|-------|-------------|-------------|
| BW        | 91.76     | 66    | 116  | 1.63       | 12.08 | -.56        | .16         |
| BH        | 195.62    | 176   | 212  | 1.19       | 8.85  | -.34        | -.27        |
| LL        | 115.84    | 101.6 | 130  | .89        | 6.57  | -.19        | -.07        |
| FL        | 28.64     | 24.5  | 33   | .23        | 1.73  | .30         | -.10        |
| AL        | 84.43     | 74.3  | 97   | .65        | 4.81  | .03         | -.05        |
| PL        | 21.07     | 18.5  | 27   | .19        | 1.41  | <b>4.77</b> | 1.34        |
| PW        | 9.46      | 8     | 11   | .08        | .60   | -.04        | -.06        |
| R20M      | 3.08      | 3.96  | 2.76 | .03        | .21   | <b>5.99</b> | <b>1.98</b> |
| HJFP      | 310.65    | 280   | 335  | 1.44       | 10.70 | .75         | -.23        |
| HJFPWS    | 311.84    | 280   | 340  | 1.42       | 10.53 | 1.53        | .11         |
| LJFP      | 239.93    | 205   | 262  | 1.69       | 12.52 | .36         | -.57        |
| BRFOP     | 38.40     | 27    | 50   | .74        | 5.49  | -.26        | -.44        |
| LFOBFB    | 24.67     | 7     | 39   | .92        | 6.83  | -.23        | -.12        |
| MBBTH     | 12.58     | 9     | 16.7 | .19        | 1.40  | 1.06        | -.19        |

In table 1 are presented the statistical descriptive parameters of anthropometric and motoric variables of the Super League of Kosovo. The average body height of the teams in this league was 195.62 cm. With this body height, handball players can jump high with burst at 310.65 cm. On average they run the distance of 20m for 3.08 sec. The variables applied in the paper have the distribution of the results close to normal. The palm length has a positive asymmetry expressed, this is shown by the Skew coefficient which is outside the normal limits and has a value of 4.77. The 20m running variable has an expressed asymmetric distribution as well as a pronounced rise (peak) of the results curve. Since this test is quite sensitive, the subjects that are tested reacted differently in its realization.

**Table 2.** Basic statistical parameters of situational motoric variables of the Kosovo Super League

| Variables | $\bar{x}$ | Min  | Max  | $S\bar{x}$ | DS   | Skew  | Kurt |
|-----------|-----------|------|------|------------|------|-------|------|
| RWB20M    | 4.10      | 5.46 | 3.06 | .06        | .47  | .16   | .55  |
| DBO20M    | 5.11      | 6.81 | 4.19 | .09        | .68  | -1.03 | .38  |
| A20MBO    | 6.00      | 5.04 | 7.71 | .09        | .67  | .06   | .76  |
| PKMP      | 6.08      | 5.45 | 7.49 | .06        | .44  | 1.44  | 1.23 |
| RTRD      | 28.57     | 32   | 26   | .22        | 1.63 | -.56  | .57  |

Table 2 presents the results achieved in the execution of situational motoric tests and the distribution of these results. We note that all the tests are at the normal distribution limits. The average of running through obstacles with ball 4.10 sec. and dribbling with ball 5.11 sec. indicates the level of technical preparation of the ball handling. The greater the difference is between these tests, the mastery of this handball technique is weaker. Thus, during the fast movement on the field, the presence of the ball during the dribbling prevents the handball player for 1.02 seconds, therefore the ball passes are increasingly more applicable to fast counterattack. The difference between the 'shooting on goal in motion' and shooting from the place is  $4.22 - 4.05 = 0.17$ , a difference that is not too great, but when the presence of the defending opponent is added, this difference will increase significantly.

**Table 3.** Correlations of situational motoric variables of handball players

|        | RWB20M       | DBO20M       | A20MBO      | PKMP | MBBTH |
|--------|--------------|--------------|-------------|------|-------|
| RWB20M | 1            |              |             |      |       |
| DBO20M | <b>0.59</b>  | 1            |             |      |       |
| A20MBO | <b>0.59</b>  | <b>0.49</b>  | 1           |      |       |
| PKMP   | <b>0.27</b>  | 0.06         | <b>0.40</b> | 1    |       |
| MBBTH  | <b>-0.21</b> | <b>-0.38</b> | -0.16       | 0.02 | 1     |

Table 3 presents the correlations of situational variables. Of the 32 possible correlations we have only 12 which are statistically valid. The variable 20m running with obstacles is associated with variables that express the ability of speed and explosive force. Medicine ball back throwing has links to the variables that are indicators of speed and explosive force. Precision variables have shown correlations with variables of ball dribbling between obstacles and agility.

**Table 4.** Cross-correlations of anthropometric and motoric variables of handball players

|    | R20M  | HJFP        | HJFPWS      | LJFP        | BRFOP       | LFOBF | RTRD        |
|----|-------|-------------|-------------|-------------|-------------|-------|-------------|
| BW | 0.03  | <b>0.69</b> | <b>0.72</b> | <b>0.29</b> | 0.13        | -0.02 | <b>0.26</b> |
| BH | 0.07  | <b>0.83</b> | <b>0.82</b> | <b>0.25</b> | 0.10        | -0.15 | <b>0.21</b> |
| LL | 0.09  | <b>0.81</b> | <b>0.83</b> | <b>0.24</b> | 0.05        | -0.09 | <b>0.28</b> |
| FL | 0.07  | <b>0.61</b> | <b>0.68</b> | 0.13        | 0.06        | -0.07 | <b>0.23</b> |
| AL | 0.05  | <b>0.76</b> | <b>0.78</b> | <b>0.25</b> | 0.10        | -0.12 | 0.16        |
| PL | -0.03 | <b>0.52</b> | <b>0.63</b> | <b>0.25</b> | 0.15        | -0.05 | 0.10        |
| PW | -0.08 | <b>0.64</b> | <b>0.59</b> | <b>0.34</b> | <b>0.28</b> | -0.13 | 0.02        |

In table 4 are presented the cross-correlations of anthropometric and motoric variables of handball players. In this table, the most correlations have realized the jumping variables with all anthropometric variables. The most successful jumpers have higher body height, they are heavier, and in one word they are bigger. The highest jumps are achieved because the tallest players have the most favorable predispositions to jump higher, while as it seems, these handball players do not have the ability to run fast in a longer time period or in speed durability. Body masses and running 20m have no points of correlation, thus both the taller handball players as well as those that are shorter may run quickly. This also applies to variables that test the flexibility and strength of the abdominal muscles.

**Table 5.** Cross-correlations of anthropometric and situational motoric variables of handball players

|    | RWB20M | DBO20M | A20MBO      | PKMP        | MBBTH       |
|----|--------|--------|-------------|-------------|-------------|
| BW | -0.02  | -0.09  | 0.16        | <b>0.21</b> | <b>0.48</b> |
| BH | 0.05   | -0.02  | <b>0.22</b> | <b>0.22</b> | <b>0.51</b> |
| LL | 0.09   | 0.05   | <b>0.21</b> | 0.18        | <b>0.47</b> |
| FL | -0.02  | 0.04   | 0.14        | <b>0.24</b> | <b>0.39</b> |
| AL | 0.04   | 0.07   | <b>0.21</b> | <b>0.24</b> | <b>0.45</b> |
| PL | 0.01   | 0.03   | 0.05        | 0.10        | <b>0.42</b> |
| PW | -0.11  | -0.12  | -0.02       | 0.09        | <b>0.49</b> |

Table5

shows the correlation between anthropometric and situational motoric variables. Medicine ball back throwing has connections with all anthropometric variables, thus the types with greater morphology have shown better results in medicine ball throwing test. In the Plyometric test, which is carried out with the jump of the obstacles in the fastest time, it is related to body weight and height, but this correlation is negative. This test has been passed faster by

handball players who have shorter morphology, hence lower body weight and height. The variable that measures agility in 20m running distance has negative correlations with body height and leg length. As it seems shorter handball players move faster in different directions.

All variables which have as a measuring unit the time in relation to centimeters or meters have a positive correlation if the sign before the coefficient is negative.

**Table 6.** Cross-correlations of situational motoric variables of handball players

|        | R20M         | HJFP        | HJFPWS      | LJFP         | BRFOP        | LFOBF        | RTRD         |
|--------|--------------|-------------|-------------|--------------|--------------|--------------|--------------|
| RWB20M | <b>0.35</b>  | -0.06       | -0.03       | <b>-0.48</b> | <b>-0.58</b> | 0.17         | <b>0.21</b>  |
| DBO20M | <b>0.35</b>  | -0.05       | 0.01        | <b>-0.37</b> | <b>-0.63</b> | 0.15         | <b>0.48</b>  |
| A20MBO | <b>0.46</b>  | 0.12        | 0.15        | <b>-0.42</b> | <b>-0.40</b> | 0.01         | <b>0.32</b>  |
| PKMP   | <b>0.27</b>  | -0.01       | -0.03       | <b>-0.32</b> | -0.12        | <b>-0.21</b> | 0.16         |
| MBBTH  | <b>-0.36</b> | <b>0.60</b> | <b>0.58</b> | <b>0.55</b>  | <b>0.49</b>  | -0.10        | <b>-0.32</b> |

Table 6 presents the correlations of motoric and situational motoric variables. Basic and situational skills have not achieved so much of connectivity. In 20m running motoric tests, it is unambiguously related to the tests where tasks are required to be performed as quickly as possible, and when explosive force is required.

Medicine ball back throwing is mostly related to all motoric variables. Also, body raising from an extended position has connections to variables that express the high degree of mobility - speed. This is expected because this test has to do with the execution of movements in relation to time. The variable that measures the flexibility and the plyometric test have a negative correlation, this can be justified because the ability of the flexibility and of the explosive force develops in the opposite relation.

**Table 7.** Regression of criterion variable '20m dribbling between obstacles' with situational motoric variables system.

| R   | R Square | Adjusted R | Error | F    | Q          |
|-----|----------|------------|-------|------|------------|
| .78 | .61      | .54        | 2.05  | 9.29 | <b>.00</b> |

|        | Corel       | Partial Cor. | Beta        | Std. Err. of Beta | Q Beta     |
|--------|-------------|--------------|-------------|-------------------|------------|
| R20M   | <b>.37</b>  | .02          | .02         | .08               | .82        |
| HJFP   | -.05        | <b>-.25</b>  | <b>-.52</b> | .22               | <b>.02</b> |
| HJFPWS | .01         | <b>.24</b>   | <b>.48</b>  | .21               | <b>.02</b> |
| LJFP   | <b>-.36</b> | -.01         | -.01        | .10               | .93        |
| BRFOP  | <b>-.61</b> | <b>-.36</b>  | <b>-.36</b> | .10               | <b>.00</b> |
| LFOBF  | .15         | -.09         | -.07        | .08               | .38        |
| RTRD   | <b>.47</b>  | <b>.27</b>   | <b>.23</b>  | .09               | <b>.01</b> |
| RWB20M | <b>.51</b>  | .11          | .10         | .10               | .30        |
| A20MBO | <b>.51</b>  | <b>.26</b>   | <b>.25</b>  | .10               | <b>.01</b> |
| PKMP   | .06         | <b>-.24</b>  | <b>-.20</b> | .08               | <b>.02</b> |
| MBBTH  | <b>-.36</b> | .03          | .03         | .11               | .79        |

The whole system of situational motoric variables in relation to the criterion has shown a valid impact on the probability level of Q = .00. Multiple correlations have a very high coefficient .78. Even the separate contributions of the most variables have connections with the criterion. In the prediction of the criterion, mainly have taken part the jump variables and the fast running, since even the criterion variable is executed at a fast pace of running. This is

also confirmed by the coefficients of partial correlation and beta coefficients, which are statistically valid at the probability level of Q Beta = .02.

**Table 8.** Regression of the criterion variable 'Shooting on goal in motion' with the situational motoric variables system.

| R   | R Square | Adjusted R | Error | F    | Q   |
|-----|----------|------------|-------|------|-----|
| .45 | .21      | .08        | 5.27  | 1.61 | .08 |

|        | Corel       | Partial Cor. | Beta        | Std. Err. of Beta | Q Beta     |
|--------|-------------|--------------|-------------|-------------------|------------|
| R20M   | <b>-.21</b> | -.13         | -.14        | .11               | .21        |
| HJFP   | -.06        | -.14         | -.42        | .31               | .19        |
| HJFPWS | -.05        | .14          | .39         | .30               | .20        |
| LJFP   | .07         | -.08         | -.11        | .15               | .44        |
| BRFOP  | .15         | -.15         | -.21        | .15               | .16        |
| LFOBF  | .03         | .03          | .04         | .11               | .74        |
| RTRD   | -.12        | .03          | .03         | .13               | .79        |
| RWB20M | <b>-.21</b> | -.10         | -.13        | .14               | .35        |
| DBO20M | <b>-.35</b> | <b>-.29</b>  | <b>-.42</b> | .14               | <b>.00</b> |
| A20MBO | -.18        | .01          | .01         | .14               | .95        |
| PKMP   | -.02        | .04          | .05         | .12               | .68        |
| MBBTH  | .09         | .01          | .01         | .16               | .96        |

All the variables together in relation to the criterion have not shown a valid impact on the probability level of Q = .08. As a statistically significant probability in sports research is considered only the one under 0.05.

Multiple correlation is under the important statistical values .45, while the corrected one (Adjusted R) is even smaller. With criterion variable, important correlations have achieved the 20m running, running through obstacles with and without ball, as well as shooting on goal from the place. But, after eliminating the impact of other variables, statistically valid is only the variable of dribbling with ball between the obstacles.

Shooting on goal in motion can only be predicted by the dribbling with ball between obstacles. The standardized coefficient values of Beta - regression for this variable are -.35. The impact of this variable is not negative, but we are dealing with time and precision variables.

**Table 9.** Arithmetic averages of the handball Super League clubs of Kosovo

|        | Super League clubs of Kosovo |           |           |        |
|--------|------------------------------|-----------|-----------|--------|
|        | Besa                         | Prishtina | Kastrioti | Drita  |
| BW     | 97.21                        | 92.21     | 84.60     | 93.83  |
| BH     | 197.58                       | 197.34    | 191.65    | 196.27 |
| LL     | 118.10                       | 115.18    | 113.99    | 116.28 |
| FL     | 28.47                        | 29.29     | 27.67     | 29.28  |
| AL     | 84.36                        | 85.74     | 82.60     | 85.27  |
| PL     | 21.54                        | 20.27     | 20.83     | 20.93  |
| PW     | 9.55                         | 9.62      | 9.38      | 9.28   |
| R20M   | 3.03                         | 3.10      | 3.04      | 3.15   |
| HJFP   | 312.57                       | 309.57    | 311.20    | 309.00 |
| HJFPWS | 315.07                       | 309.07    | 308.73    | 315.17 |
| LJFP   | 242.71                       | 240.93    | 241.20    | 233.92 |
| BRFOP  | 40.36                        | 41.21     | 34.73     | 37.42  |

|        |       |       |       |       |
|--------|-------|-------|-------|-------|
| LFOB   | 25.79 | 19.14 | 26.93 | 27.00 |
| RTRD   | 28.33 | 28.08 | 28.73 | 29.22 |
| RWB20M | 3.90  | 3.92  | 4.55  | 4.20  |
| DBO20M | 4.99  | 4.72  | 5.42  | 5.58  |
| A20MBO | 5.89  | 5.72  | 6.12  | 6.33  |
| PKMP   | 6.02  | 6.27  | 6.03  | 5.98  |
| MBBTH  | 13.50 | 12.46 | 12.29 | 12.02 |

In table 9 are presented the arithmetic averages of anthropometric, and situational motoric variables. Based on the colors, the three largest

## Conclusion

For the Super League of Kosovo four clubs have been tested with approximately 13-14 players each. The total number of players involved in the research is 55 players. Handball players have been tested with 7 anthropometric variables, 12 situational motoric variables, in total of 19 variables. Most of the variables have had distributions at normal limits.

Relationships between and within these spaces have been different. Anthropometric variables have high inter-correlations, but this does not apply to motoric and situational motoric variables.

The anthropometric variables discussed in this paper have achieved connections with variables where the expression of explosive force and velocities is emphasized, so it can be said that Handball is a game of the situation where perception factors have an important role, which is an essential fact, as they are often unpredictable in situations that require timely, rapid, and explosive responses (Njaradi, 2008). Motoric and situational variables have valid correlations only when in situational tests are required basic general skills.

The impact of the situational motoric variables system on the criterion '20m dribbling between obstacles' is large, and this variable can be predicted with many variables of the predictive system. This is not the case with the criterion variable 'Shooting on goal in motion', which can only be predicted with the variable 'Dribbling with ball between obstacles', while the whole predictor system is not statistically valid in the prediction of the criterion.

A continuous training process in handball with a proper selection leads to the optimal formation of specific bio-motoric structural abilities, and the responsible bodies are focused on attaining high-level handball results (Katić et al., 2007).

Averages are graded, according to the order for all variables.

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