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# DIFFERENCES IN SOME SPECIFIC MOTOR SKILLS IN FEMALE BASKETBALL PLAYERS AT THE AGE OF 14, 15 AND 16

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*(Original scientific paper)*

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***Abstract***

*The research was conducted on a sample of 60 respondents, female basketball players aged 14, 15 and 16. The total sample is divided into three subsamples that count 20 female basketball players each. The first subsample includes female basketball players aged 14, the second subsample includes female basketball players aged 15 and the third subsample includes female basketball players aged 16. The subject of study in this research is some specific motor skills in female basketball players aged 14, 15 and 16. The aim is focused at determining intergroup differences in the studied variables. In the research, a total of 6 variables were used to assess specific motor abilities. Based on the obtained results, their interpretation and discussion, it was concluded that in the specific motor variable passing speed with two hands, 16-year-old female basketball players achieve the best results compared to 14- and 15-year-old subjects. In the variable leading between the stands, the best results are achieved by 15-year-old female basketball players. No significant difference was determined in this variable between 14- and 16-year-old female basketball players. In the variable shot at the basket from the free throw line, 16-year-old female basketball players achieve better results than 14- and 15-year-old female basketball players, also 15-year-old female basketball players achieve statistically significantly better results than 14-year-old female basketball players.*

***Keywords:*** *female basketball players, specific, motor, variables*

## Introduction

Basketball is classified as a polystructural sport, characterized by complex movements performed by the players. Cyclic and acyclic movements adapted to the special requirements during the game are observed. Cyclic movements occur in the various ways of running and handling the ball, and acyclic movements in the various technical and tactical movements of players that are performed in the presence of an opposing player. The connection of several appropriate structural models of movement determine a game situation, and an important role in solving a motor problem is played by the assessment of spatio-temporal parameters. The very structure of the basketball game favors players with certain anthropological characteristics, motor abilities, and especially with emphasized situational-motor ability. Each player has certain motor abilities that are influenced differently by innate and acquired abilities. When we talk about the structure of situational motor abilities, we mean the factors that determine the ability to perform complex motor operations. Under motor dimensions are meant those abilities that participate in solving a motor task with appropriate movements, regardless of whether they are acquired through training or arise genetically as a phenotype. When analyzing the movements of the players in the match, it can be noticed without any special effort that it is a very complex motor activity with a "polystructural" basis, for the success of which different human traits or abilities are responsible. It can also be argued without any reservation that they are based on motor skills. There are several objective criteria for game analysis: based on game technique, based on physical preparation, degree of training or "technical-tactical mastery" (TTM), effectiveness of attack or defense and a number of others. Such specific abilities, which are relatively relevant for successful basketball playing, are called situational-motor abilities (SMS) because (according to I. Jovanović 1995) they actually mostly consist of precisely defined combinations of specific motor abilities.

The choice of tests should have adequate reliability and validity (Brini et al., 2021) and correspond to the structure of the sport, because the more specific it is, the more valid the presentation of the athlete's competitive readiness (Drinkwater et al. 2008; Ivanovic et al. 2019; Mancha-Triguero et al., 2019; ).

The aim of this study is focused at determining the intergroup differences between the studied situational motor skills in female basketball players aged 14, 15 and 16.

## Material And Method

*Sample of respondents*

The sample of respondents was drawn from the youth basketball schools of ZKK Badel 1862 from Skopje and ZKK Struga 2009, aged 14, 15 and 16. The total sample of respondents includes 60 female basketball players and it is divided into three subsamples of 20 respondents each. The subsamples are named as: U14 female basketball players, U15 female basketball players and U16 female basketball players.

*Sample of variables*

A total of 6 variables were used for the assessment of situational motor abilities to accomplish the set goals of the research. The variables used to evaluate the specific motor skills of women basketball players are as follows: 1. Two-handed passing speed from chest /sec/ (MBD2R), 2. Speed of passing with one and the other hand alternately /sec/ (MBD2RN), 3. Driving the ball between the posts /sec/ (VTMS), 4. Quick lead to the middle of the playing field with the stronger hand /sec/ (VSIPR), 5. Quick lead to the middle of the court with the weaker hand /sec/ (VSISR), 6. Throwing the ball into the basket from the free throw line. (Metikosh,D.,et al ), (Karaleich,M &Jakovlevich, S). godina i strana (Jovanovich,1994 in Jovanovich – Golubovich, 2003 )

*Conditions and measurement technique*

The measurements were carried out in registered halls according to FIBA standards and proposals for the following ages U14, U15 and U16. The tests were carried out by trained measurers, teachers of physical and health education.

*Data processing method*

Basic descriptive statistical parameters were calculated for all applied variables; Arithmetic mean, Standard deviation, Coefficient of variability, Lower and upper limit of the results (MIN-MAX), Symmetry coefficient – Skweness, Coefficient of flatness – Kurtosis. To determine the quantitative and qualitative intergroup differences, the univariate and multivariate analysis of variance (ANOVA, MANOVA) was applied, and the univariate differences in the analyzed variables were determined by applying the LSD - post hoc test.

## Results and Discusion

Table 1. Basic descriptive statistical parameters of the specific motor abilities of 14-year-old female basketball players

| | Mean | Min | Max | SD | CV% | S.E | Skewn | Kurto | K-S |
|---|---|---|---|---|---|---|---|---|---|
| BD2Race | 5,55 | 3,32 | 9,00 | 1,68 | 30,26 | 0,38 | 0,66 | -0,36 | p > .20 |
| BDNaizm | 7,74 | 6,21 | 9,70 | 0,99 | 12,79 | 0,22 | 0,39 | -0,34 | p > .20 |
| BVPojR | 6,65 | 5,30 | 7,60 | 0,56 | 8,38 | 0,12 | -0,73 | 0,59 | p > .20 |
| BVPosR | 7,44 | 6,44 | 8,60 | 0,62 | 8,29 | 0,14 | 0,25 | -0,20 | p > .20 |
| VTStal | 3,55 | 2,57 | 5,00 | 0,81 | 22,93 | 0,18 | 0,60 | -1,19 | p < ,15 |
| ShutSlFr | 4,65 | 3,00 | 7,00 | 1,18 | 25,42 | 0,26 | 0,34 | -0,92 | p < ,15 |

From the inspection of table 1, where the results of the first subsample, the 14-year-old respondents, are presented, it can be noted that the intervals between the minimum and maximum results contain from one to four standard deviations, which leads us to the conclusion that the applied tests are with satisfactory sensitivity for all variables. Based on the values of the standard deviations (SD) and their ratio with the arithmetic mean, it can be concluded that for most variables there is no statistically significant deviation of the results from the arithmetic mean. Skewness values for almost all variables in 14-year-old female

basketball players are within the limits of the recommended values from -1 to +1, which indicates a symmetrical distribution of the results. From the obtained values it can be noted that all studied variables show flattening (platykurtic distribution). The homogeneity of the results among female basketball players at the age of 14 is at a satisfactory level, which can be seen from the obtained values of the coefficients of variability. The highest percentage of dispersion of the results is observed in the variable "Shot from the free throw line", where CV=25.42%. The results of the Kolmogorov-Smirnov procedure showed that all variables in basketball players at the age of 14 are normally distributed.

Table 2. Basic descriptive statistical parameters of specific motor abilities in 15-year-old female basketball players

| | Mean | Min | Max | SD | CV% | S.E | Skewn | Kurto | K-S |
|---|---|---|---|---|---|---|---|---|---|
| BD2Race | 5,12 | 3,90 | 8,50 | 1,60 | 31,24 | 0,36 | 1,32 | 0,18 | p < ,05 |
| BDNaizm | 7,63 | 5,65 | 11,00 | 1,32 | 17,31 | 0,30 | 0,51 | 0,79 | p > .20 |
| BVPojR | 6,62 | 5,81 | 7,80 | 0,61 | 9,15 | 0,14 | 0,26 | -0,91 | p > .20 |
| BVPosR | 7,31 | 6,69 | 10,10 | 0,74 | 10,07 | 0,16 | 3,08 | 11,47 | p > .20 |
| VTStal | 2,97 | 2,37 | 4,40 | 0,57 | 19,04 | 0,13 | 1,02 | 0,60 | p > .20 |
| ShutSlFr | 6,60 | 4,00 | 8,00 | 1,35 | 20,51 | 0,30 | -0,73 | -0,64 | p < ,10 |

Table 2. presents the basic descriptive indicators for the second subsample, 15-year-old female basketball players. From the inspection of the table, it can be noted that the intervals between the minimum and maximum results contain from one to four standard deviations, which leads us to the conclusion that the applied tests have a satisfactory sensitivity for all variables. Based on the values of the standard deviations (SD) and its ratio with the arithmetic mean (Mean), it can be concluded that for most variables there is no statistically significant deviation of the results from the arithmetic mean. Skewness values for almost all variables among 15-year-old female basketball players are within the limits of the recommended values from -1 to +1, which indicates a symmetrical distribution of the results. From the obtained values it can be noted that all studied variables show flattening (platykurtic distribution). The homogeneity of results among 15-year-old female basketball players is at a satisfactory level, which can be seen from the obtained values of the coefficients of variability. The highest percentage of dispersion of the results is observed in the variable "Speed of passing with two hands", where CV=31.24%. The results of the Kolmogorov-Smirnov procedure showed that all variables in basketball players at the age of 15 are normally distributed, with the exception of the variable Speed of passing with two hands K-S<0.05.

Table 3. Basic descriptive statistical parameters of the specific motor abilities of 16-year-old female basketball players

| | Mean | Min | Max | SD | CV% | S.E | Skewn | Kurto | K-S |
|---|---|---|---|---|---|---|---|---|---|
| BD2Race | 3,95 | 3,28 | 6,20 | 0,99 | 25,12 | 0,22 | 1,76 | 1,76 | p < ,05 |
| BDNaizm | 6,51 | 5,19 | 7,56 | 0,65 | 9,98 | 0,15 | -0,48 | 0,15 | p > .20 |
| BVPojR | 6,39 | 6,08 | 6,55 | 0,15 | 2,36 | 0,03 | -0,82 | -0,40 | p > .20 |
| BVPosR | 7,03 | 6,37 | 7,40 | 0,30 | 4,25 | 0,07 | -0,94 | 0,23 | p > .20 |
| VTStal | 3,75 | 2,83 | 4,99 | 0,65 | 17,39 | 0,15 | 0,18 | -1,09 | p > .20 |
| ShutSlFr | 6,85 | 1,00 | 9,00 | 1,73 | 25,19 | 0,39 | -2,07 | 6,54 | p < ,20 |

The basic descriptive indicators for the third subsample, 16-year-old female basketball players, are presented in table 3. From the inspection of the table, it can be noted that the intervals between the minimum and maximum results contain from one to four standard deviations, which leads us to the conclusion that the applied tests have satisfactory sensitivity for all variables. Based on the values of the standard deviations (SD) and its ratio with the arithmetic mean (Mean), it can be concluded that for most variables there is no statistically significant deviation of the results from the arithmetic mean. Skewness values for almost all variables in 16-year-old female basketball players are within the limits of the recommended values from -1 to +1, which indicates a symmetrical distribution of the results. Positive asymmetry – epicurticity (a greater number of results are in the zone of better results), is observed in the variable "Speed of passing with two hands" (Skewn.=1.76). Negative asymmetry - epicurticity (a greater number of results are in the zone of weaker results), is observed in the variable "Shot at the basket from the free throw line" (Skewn.=-

2.07). From the obtained values it can be noted that most of the studied variables show flattening (platykurtic distribution). The homogeneity of results among 15-year-old female basketball players is at a satisfactory level, which can be seen from the obtained values of the coefficients of variability. The highest percentage of dispersion of the results is observed in the variable "Throwing the ball into the basket from the free throw line", where CV=25.19%. The results of the Kolmogorov-Smirnov procedure showed that all variables in female basketball players at the age of 16 are normally distributed, with the exception of the variable "Speed of passing with two hands", K-S<.05.

*Intergroup differences in specific motor abilities among the three subsamples*

The analysis of significant differences is determined in three ways:

Multivariate analysis of variance (MANOVA) which determined the quantitative differences between the groups of examinees in the morphological characteristics, motor and specific motor abilities among female basketball players of 14, 15 and 16 years old. 2. Univariate analysis of variance (ANOVA) which determined the quantitative differences between the groups of respondents based on each individual variable. 3. Post-hoc analysis with the help of which quantitative differences were determined individually between groups, based on each individual variable.

Table 4. Differences in specific motor abilities between female basketball players aged 14, 15 and 16

| | Value | F | Hypothesis df | Error df | Sig. |
|---|---|---|---|---|---|
| Pillai's trace | 0,74 | 5,19 | 12 | 106 | **,000** |
| Wilks' lambda | 0,40 | 5,12 | 12 | 104 | **,000** |
| Hotelling's trace | 1,19 | 5,04 | 12 | 102 | **,000** |
| Roy's largest root | 0,69 | 6,07 | 6 | 53 | **,000** |

| | 14 год. | | 15 год. | | 16 год. | | F | Sig. |
|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD | | |
| BD2Race | 5,55 | 1,68 | 5,12 | 1,60 | 3,95 | 0,99 | 6,49 | **,003** |
| BDNaizm | 7,74 | 0,99 | 7,63 | 1,32 | 6,51 | 0,65 | 8,81 | **,000** |
| BVPojR | 6,65 | 0,56 | 6,62 | 0,61 | 6,39 | 0,15 | 1,74 | ,186 |
| BVPosR | 7,44 | 0,62 | 7,31 | 0,74 | 7,03 | 0,30 | 2,54 | ,088 |
| VTStal | 3,55 | 0,81 | 2,97 | 0,57 | 3,75 | 0,65 | 7,02 | **,002** |
| ShutSlFr | 4,65 | 1,18 | 6,60 | 1,35 | 6,85 | 1,73 | 14,03 | **,000** |

The results of the multivariate analysis of variance (MANOVA), i.e. by testing the significance of the differences of the arithmetic means of the variables for the assessment of specific motor abilities between the samples of young elite female basketball players (14, 15 and 16 years old), a statistically significant difference was determined, since Wilks' Lambda .40 and for degrees of freedom df=12, gives statistical significance at the Q=.000 level. In order to determine in which measures and tests there are statistically significant differences, a univariate analysis of variance was calculated for each variable. From the review of table 6, it can be seen that there are statistically significant differences in 4 out of 6 variables. Intergroup differences were determined in the variables: two-handed passing speed (F= 6.49; p= 0.003), alternating passing speed (F= 8.81; p= 0.000), leading the ball between the posts (F= 7.02; p= 0.002) and shooting from the free throw line (F= 14.03; p= 0.000). Post hoc (LSD - least significant difference test) tests were also applied to determine which subsamples have statistically significant differences in each individual variable. The analysis of the tests is shown in table 5.

From the results presented in table 5, it can be noted that the respondents from the third sub-sample, 16-year-old female basketball players, are statistically significantly better than the 14- and 15-year-old female basketball players, while no significant difference was found between the 14- and 15-year-old female basketball players in the variable "speed on a two-handed pass". In the alternating passing speed variable, a statistically significant difference was determined in favor of the 16-year-old female basketball players, they achieved better results than the 14- and 15-year-old female basketball players, while no statistically significant difference was determined between the 14- and 15-year-old basketball players in this variable. In the variable leading between the stands, 15-year-old female basketball players show statistically significantly better results than 14- and 16-year-old female basketball players. Among female basketball

players aged 14 and 16, there is no significant difference in this variable. In the variable shot at the basket from the free throw line, 16-year-old female basketball players show statistically significantly better results than 14- and 15-year-old female basketball players. 15-year-old female basketball players achieve significantly better results in this variable than 14-year-old female basketball players.

Table 5. LSD – tests for specific motor tests

| Dependent Variable | | | Mean Difference (I-J) | Std. Error | Sig.[b] | 95% Confidence Interval for Difference[b] | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound |
| BD2Race | 1,00 | 2,00 | ,430 | ,46 | ,35 | -,49 | 1,35 |
| | | 3,00 | 1,603* | ,46 | ,00 | ,68 | 2,52 |
| | 2,00 | 1,00 | -,430 | ,46 | ,35 | -1,35 | ,49 |
| | | 3,00 | 1,173* | ,46 | ,01 | ,25 | 2,09 |
| | 3,00 | 1,00 | -1,603)* | ,46 | ,00 | -2,52 | -,68 |
| | | 2,00 | -1,173)* | ,46 | ,01 | -2,09 | -,25 |
| BDNaizm | 1,00 | 2,00 | ,103 | ,32 | ,75 | -,55 | ,75 |
| | | 3,00 | 1,226* | ,32 | ,00 | ,58 | 1,87 |
| | 2,00 | 1,00 | -,103 | ,32 | ,75 | -,75 | ,55 |
| | | 3,00 | 1,123* | ,32 | ,00 | ,47 | 1,77 |
| | 3,00 | 1,00 | -1,226)* | ,32 | ,00 | -1,87 | -,58 |
| | | 2,00 | -1,123)* | ,32 | ,00 | -1,77 | -,47 |
| BVPojR | 1,00 | 2,00 | ,028 | ,15 | ,85 | -,28 | ,33 |
| | | 3,00 | ,260 | ,15 | ,09 | -,05 | ,57 |
| | 2,00 | 1,00 | -,028 | ,15 | ,85 | -,33 | ,28 |
| | | 3,00 | ,231 | ,15 | ,14 | -,07 | ,54 |
| | 3,00 | 1,00 | -,260 | ,15 | ,09 | -,57 | ,05 |
| | | 2,00 | -,231 | ,15 | ,14 | -,54 | ,07 |
| BVPosR | 1,00 | 2,00 | ,124 | ,18 | ,50 | -,24 | ,49 |
| | | 3,00 | ,404* | ,18 | ,03 | ,04 | ,77 |
| | 2,00 | 1,00 | -,124 | ,18 | ,50 | -,49 | ,24 |
| | | 3,00 | ,280 | ,18 | ,13 | -,09 | ,65 |
| | 3,00 | 1,00 | -,404)* | ,18 | ,03 | -,77 | -,04 |
| | | 2,00 | -,280 | ,18 | ,13 | -,65 | ,09 |
| VTStal | 1,00 | 2,00 | ,582* | ,22 | ,01 | ,15 | 1,02 |
| | | 3,00 | -,200 | ,22 | ,36 | -,63 | ,23 |
| | 2,00 | 1,00 | -,582)* | ,22 | ,01 | -1,02 | -,15 |
| | | 3,00 | -,782)* | ,22 | ,00 | -1,22 | -,35 |
| | 3,00 | 1,00 | ,200 | ,22 | ,36 | -,23 | ,63 |
| | | 2,00 | ,782* | ,22 | ,00 | ,35 | 1,22 |
| ShutSlFr | 1,00 | 2,00 | -1,950)* | ,45 | ,00 | -2,86 | -1,04 |
| | | 3,00 | -2,200)* | ,45 | ,00 | -3,11 | -1,29 |
| | 2,00 | 1,00 | 1,950* | ,45 | ,00 | 1,04 | 2,86 |
| | | 3,00 | -,250 | ,45 | ,58 | -1,16 | ,66 |
| | 3,00 | 1,00 | 2,200* | ,45 | ,00 | 1,29 | 3,11 |
| | | 2,00 | ,250 | ,45 | ,58 | -,66 | 1,16 |

## Conclusion

In the specific motor variable passing speed with two hands, 16-year-old female basketball players achieve the best results compared to 14- and 15-year-old subjects, which confirms their better passing technique and better segmental speed of the upper limbs. In the variable of leading between the posts, unexpectedly the best results were achieved by the 15-year-old female basketball players, which confirms their better leading technique and better mobility. The fact that no significant difference was found in this variable between respondents from the first and third sub-sample is surprising. In the variable shot at the basket from the free throw line, 16-year-old female basketball players achieve better results than the respondents of the first and second sub-samples, also 15-year-old female basketball players achieve statistically significant better results than 14-year-old female basketball players. It is obvious that the chronological age and the time of the aging process have a great influence on the performance of this variable. Based on the obtained results and the performed interpretation, it can be concluded that for girls

of this age, in the training process, special attention should be paid to the improvement of specific motor abilities. Our recommendation is to prepare appropriate training programs in which special emphasis will be given to the perceived weaknesses of basketball players of the studied ages.

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