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Influence of Motoric Abilities on the Success of Performance of Elements in the Game Basketball in the High School Student Population

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Abstract
Aim of this study is to determine the effect of motoric abilities on high school students, by the performance of situational motorical elements of basketball. Sample variables of a predicator area consist of 24 motorical variables, and the sample variables of the criterion area of 3 variables/ elements of basketball. Determination of the effect was carried out by the use of regression analysis. The obtained results show that in the relations of the researched areas (motoric/situational-motoric) an appropriate and significant influence appeared.

Key words: **motoric abilities, high school populations, game of basketball, situational-motoric abilities**

Sažetak
Cilj ovog istraživanja je da se kod učenika u srednjoj školi utvrdi uticaj motoričkih sposobnosti na izvođenje situaciono motoričkih elemenata košarkaške igre. Uzorak varijabli prediktorskog prostora sastojao se od 24 motoričke varijable, a uzorak varijabli kriterijskog prostora od 3 varijable/elementa košarkaške igre. Utvrđivanje uticaja izvršeno je primjenom regresione analize. Dobijeni rezultati pokazuju da se u odnosima istraživanih prostora (motoričko/situaciono-motorički) pojavio odgovarajući i značajan uticaj.

Ključne riječi: **motoričke sposobnosti, srednješkolska populacija, košarkaška igra, situaciono-motoričke sposobnosti**

Introduction

Basketball is one of the most popular sports in the present day. Thanks to this popularity it is regularly presented on TV screens, in sport magazines and on the internet (web pages, portals, chat pages and such). That presence once more in a closed circle draws attention to a basketball game that through league or cup competitions again is found on an important place in the interest of adolescents. Passing that popularity in practical life and in the lessons of sport and physical education, it can be notices that educators of sport and physical education initiate higher prevalence of basketball in comparison to other sports. If we state the fact that for concrete implementation of contents needed for a game of basketball requires very small space (for ex. basket 3 on 3) and sport equipment (a basketball), then it is practical that everything is left "in its place". In this context the interest of researchers for certain laws, interactions and following effects that take place in the above sport, should not be surprising. These studies are particularly interesting when in the context of the entire structure individualized lesson content is introduced, which Findak,(2001) advocates and which should be realized within the framework of lessons, but in an area which is still from 1999., despite the initiatives by governmental and nongovernmental organizations, by Hardman (2008) there is no significant practical progress. Therefore there are a large number of conducted researches regarding the analysis of appropriate relations and effects in basketball. The majority of research conducted within the motoric/situational motorical areas showed a corresponding effect in the investigated areas (predictor/criterion). Mekić (2001) with a sample of 110 basketball players of municipal and regional rank, proves that basic-motoric abilities effect the shooting of the ball into the basket. Mekić (2002) determines the suitable high and significant degree of influence of basic motorical abilities on the preciseness of passing the ball into the basket. Investigated elements and techniques of the same sport (basketball) Bukvić (2003) constitutes that a significant and high relation between basic-motorical and specific-motorical abilities (explosive strength, speed and balance versus the control of the ball and basket shot) exist. Tallir, Valacke, Musch, Philippaters, and Lenoir (2008) with a sample of 30 basketball players, determines that in the game of 5 on 5, motorical readiness can increase. Except before situational-motorical analysis of basketball game the reached effect is registered in the researches carried out by other sports and other researchers. That is also true in the game of handball, Marković (2002) with a sample of 100 handball players he found a significant relation between basic-motorical and situational-motorical abilities. Miletić, Sekulić, and Wolf-Cvitak (2004) in conducted research on 55 gymnasts, constituted that a relation between motoric abilities and the performance of nine different jumps, without devices in rhythmical gymnastics, does exist. Vlašić, Oreb and FurjanMandić (2007) found that there is a statistically significant relation of the predicator morphological-motorical area with criterion specific situational motorical elements (folk dances). The obtained results from the previous research, like in the field of basketball also in other sports suggests that for the aim in this research could determine the influence of motorical abilities by the performance of situational-motorical basketball elements, which are realized in lessons of sport and physical education. Furthermore, it would contribute to the individualization of lesson content and adjustment of lessons to students of vocational high school (Kovač, Leskošek, and Strel, 2007) determined that a difference in morphological-motoric structures between students of different high school programs, i.e. students from vocational high schools had inferior results in comparison to student from reference high schools. Brettschneider and Naul (2004) determined that socio-economical statuses of families', parents' educational level and aspiration of an individual have a strong influence on the motoric status of adolescents).

Methods

Sample examinees

Sample examinees are defined by the male population of vocational high schools in Sarajevo, ages of 16-18. The survey included only students that were, during the testing and measuring process, completely healthy. Total number of examinees in the sample is 151 students. All examinees had appropriate conditions of regular attendance of physical and health education, which represented one of the fundamental requirements for the research. The sample cannot be elected by any criterion for admission to high school.

Sample variables

Selection and definition of the research areas (motorical/situational motorical) in this investigation was performed by standardized and empirically verified test procedures, and on the basis of which it will have come some data on the characteristics of the surveyed examinees.

Sample of predicator variables is defined by the following:
Variables for assessment of coordination

1. Coordination with a bat (MKTKK3)
2. Slalom with three medicine balls (MKOS3M)
3. Figure eight with ducking (MAGOSS)

Variables for assessment of explosive strength

1. Throwing a medicine ball out of a back laying position (MESBML)
2. Standing long jump (MESSD)
3. Running 20M (MBR20M)

Variables for assessment of movement frequency

1. Foot tapping (MBFTAN)
2. Foot tapping against a wall (MBFTAZ)
3. Hand tapping (MBFTAR)

Variables for assessment of repetitive strength

1. Push-ups on a loom (MRASKR)
2. Raising body out of a lying position (MRSPTL)
3. Deep squats with weights (MRLDCT)

Variables for assessment of balance

1. Standing on one leg longitudinally on a bench with open eyes (MBAU1O)
2. Standing on one leg across from the bench with closed eyes (MBAU1Z)
3. Standing on one leg longitudinally on a bench for balance with closed eyes (MBAP1Z)

Variables for assessment of precision

1. Targeting with a long stick (MPCDS)
2. Targeting a vertical target by foot (MPGVCN)
3. Targeting a horizontal target by hand (MPGHCR)

Variables for assessment of flexibility

1. Flex with a bat (MFLISK)
2. Leg lift while laying facedown (MFLZLG)
3. Deep forward bend on a bench (MFLDPK)

Variables for assessment of speed

1. Running 20M out of a high start (MBR20M)
2. Running 20M out of a flying start (MBR20MLS)
3. Running 50M out of a high start (MBR50MVS)

Sample of criterion variables (situational-motorical) defined as follows:

Variables for assessment of basketball

1. Throwing the ball with both hands against a wall (OKBLRZ)
2. Dribbling slalom (OKVLS)
3. Throwing ball into basket (OKBLK)

Data processing methods

Processing of data obtained was done by the software package SPSS 12.0 for Windows. At a multivariate level for determining the relation, a canonical correlation analysis was used, which represents an extremely suitable mathematical-statistical procedure in cases where it is necessary to determine a relationship between two sets of different variables.

Results and Discussion

Regression analysis of the criterion variable **Throwing a ball with both hands against a wall – OKBLRZ** (Table 1.), provides sufficient information on the effects of applied motoric variables on the success of performance on the treated criterion variables. The relation of the predictor area with the criterion variable is R = .6 and 44% of common variability with the criterion is explained. That relation is significant on a level of .00. Analysis of the influence on individual motoric variables (Table 2; Table 3), can be seen that the largest and statistically significant effect on the criterion variable has variable flexibility (two to three representatives of area) MFLISK and MFIZLG and explosive strength MESBML and MESSD, also with two to three representatives of the explosive strength area. Besides these and variables – targeting a vertical target by foot (MPGVCN) slalom with three medicine balls (MKOS3M) are significant on a level of .01 to .05. This takes us to the conclusion that a large influence on the criterion variable throwing a ball with both hands against a wall has flexibility with explosive strength. Here we can also add variables of precision and coordination, and possibly variables of precision MBAP1Z with a coefficient of significance that is on the verge of significance from (.052). Observing the test whose performance requires stamina, precision, coordination and flexibility due to constant change of ball direction during blocking, those explosive forces that become visible due to time limitations during testing, such settings of predictor variables is logical. What we can state, and what leads us to the variable of flexibility is that the examinees were inadequately familiar with the techniques of performing elements. The element of when the ball is blocked by imprecise blocking goes into different directions "away from the examinee" which then requires flexibility and also forceful explosive features in order to keep the same ball in the game (sudden changes in movement).

Table 1. *OKBLRZ*
(Basketball-Throwing a ball with both hands against a wall)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.667	.445	.339	5.654

Table 2. *ANOVA*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3229.175	24	134.549	4.209	.000
	Residual	4028.268	126	31.970		
	Total	7257.444	150			

Table 3. *Coefficients*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
1		B	Std. Error	Beta		
	MKTKK3	-.078	.531	-.013	-.147	.883
	MKOS3M	-.454	.200	-.184	-2.274	.025
	MAGOSS	.129	.313	.035	.411	.682
	MESBML	.072	.032	.190	2.286	.024
	MESSD	.064	.031	.214	2.100	.038
	MBR20MVS	-1.433	2.426	-.044	-.591	.556
	MBFTAN	.250	.267	.090	.935	.351
	MBFTAZ	.091	.174	.046	.525	.601
	MBFTAR	-.266	.180	-.131	-1.481	.141
	MRASKR	.140	.111	.122	1.263	.209
	MRSPTL	-.019	.096	-.019	-.196	.845
	MRLDCT	.042	.076	.047	.557	.578
	MBAU1Z	.254	.418	.051	.608	.544
	MBAP1Z	-2.036	1.039	-.153	-1.960	.052
	MBAU1O	-.018	.016	-.103	-1.133	.259
	MPCDŠ	-.008	.017	-.036	-.480	.632
	MPGVCN	.069	.029	.190	2.413	.017
	MPGHCR	.043	.026	.134	1.674	.097
	MFLISK	-.113	.037	-.228	-3.060	.003
	MFIZLG	-.135	.067	-.172	-2.033	.044
	MFLDPK	.019	.070	.022	.266	.791
	MBR20MVS	2.455	3.822	.062	.642	.522
	MBR20MLS	-6.083	4.541	-.140	-1.340	.183
	MBR50MVS	-1.481	2.170	-.090	-.683	.496

Regression analysis of the criterion variables **Dribbling a ball slalom – OKVLS** (Table 4), provides sufficient information on the effects of applied motoric and conative variables on on the success of performance on the treated criterion variables. The relation of the predictor area with the criterion variable is R = .68 and 47% of common variability with the criterion is explained. That relation is significant on a level of .00. Analysis of the influence on individual motoric variables (Table 5; Table 6) can be seen that the statistically significant effect on the criterion variable has the variables MESSD – standing long jump, MBFTAN- leg tapping, MBFTAZ- foot tapping against a wall, MBAU1O- standing on one leg longitudinally on a bench with open eyes, MPGVCN- targeting a vertical target by foot and MBR20MVS – running 20m out of a high start, are all significant on a level of .01 to .05. This takes us to the conclusion that a large influence on dribbling slalom takes up explosive force, followed by two variables of fast performance of movement and variables of balance and speed. Since characteristics of speed are necessary for test performance with some requirements of maintaining balance in sudden movement changes and retention of control on the ball in slalom, it can be concluded that the suitable logical relation of the predicator space with the criterion variable was obtained.

Table 4. *OKVLS (Basketball- Dribbling slalom)*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.689	.475	.375	.661

Table 5. *ANOVA*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	49.882	24	2.078	4.748	.000
	Residual	55.156	126	.438		
	Total	105.038	150			

Table 6. *Coefficients*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
1		B	Std. Error	Beta		
	MKTKK3	.116	.062	.155	1.864	.065
	MKOS3M	.018	.023	.062	.783	.435
	MAGOSS	.067	.037	.150	1.836	.069
	MESBML	.000	.004	.007	.092	.927
	MESSD	.009	.004	.234	2.369	.019
	MBR20MVS	.262	.284	.067	.923	.358
	MBFTAN	-.094	.031	-.284	-3.019	.003
	MBFTAZ	-.061	.020	-.255	-2.979	.003
	MBFTAR	-.012	.021	-.048	-.557	.579
	MRASKR	.004	.013	.032	.339	.735
	MRSPTL	-.007	.011	-.055	-.591	.555
	MRLDCT	.001	.009	.011	.133	.895
	MBAU1Z	.067	.049	.112	1.375	.172
	MBAP1Z	-.078	.122	-.048	-.639	.524
	MBAU1O	-.004	.002	-.203	-2.289	.024
	MPCDŠ	.001	.002	.052	.721	.472
	MPGVCN	-.011	.003	-.245	-3.206	.002
	MPGHCR	-.003	.003	-.073	-.943	.348
	MFLISK	.008	.004	.127	1.760	.081
	MFIZLG	.009	.008	.100	1.210	.229
	MFLDPK	.003	.008	.033	.409	.683
	MBR20MVS	-1.958	.447	-.410	-4.377	.000
	MBR20MLS	.300	.531	.057	.565	.573
	MBR50MVS	.335	.254	.169	1.319	.189

Insight into the regression analysis table in the manifestation area for the criterion variable **Throwing ball into basket – OKBLK** (Table 7.), we notice modest information about the effects of applied motoric variables on the success of performance on the treated criterion variables. This statement stands due to the reason that out of a total of 24 variables, only 3 have a correlation relation of significance. The relation of the predictor area with the criterion variable is R = .57 and 32% of common variability with the criterion is explained. That relation is significant on a level of .00. Analysis of the influence on individual motoric variables (Table 8; Table 9), can be seen that the largest statistically significant effect on the criterion variable includes the variables MBFTAZ – foot tapping against a wall by (.002), followed by MRASKR- push ups on a loom by (.013) and MBR20MLS – running 20M out of a flying start by (.018). Considering that it is about a test whose performance is necessary to possess suitable speed characteristics, along with strength of the upper extremities due to a great number of shots made towards the basket, this arrangement of effects on the predicator variable (examinee stands in front of the basket and from whatever position shoots the ball as many times possible into the basket in a time period of 30 seconds) is expected and understandable. The modest influence of the other regression coefficients suggests that the predication of influences on the criterion variable can only be done with the help of the whole observed system.

Table 7. *OKBLK (Basketball- Throwing ball into basket)*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.570	.325	.197	2.811

Table 8. *ANOVA*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	480.088	24	20.004	2.531	.000
	Residual	995.859	126	7.904		
	Total	1475.947	150			

Table 9. *Coefficients*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
1		B	Std. Error	Beta		
	MKTKK3	.302	.264	.108	1.145	.255
	MKOS3M	-.106	.099	-.096	-1.071	.286
	MAGOSS	-.156	.156	-.093	-1.003	.318
	MESBML	.022	.016	.130	1.412	.160
	MESSD	.000	.015	.003	.030	.976
	MBR20MVS	-.057	1.206	-.004	-.047	.962
	MBFTAN	.067	.133	.054	.505	.614
	MBFTAZ	.270	.086	.303	3.121	.002
	MBFTAR	.070	.089	.076	.780	.437
	MRASKR	.140	.055	.270	2.532	.013
	MRSPTL	.073	.048	.161	1.535	.127
	MRLDCT	-.023	.038	-.057	-.622	.535
	MBAU1Z	-.175	.208	-.078	-.843	.401
	MBAP1Z	-.033	.516	-.006	-.064	.949
	MBAU1O	.011	.008	.148	1.473	.143
	MPCDŠ	.012	.009	.110	1.345	.181
	MPGVCN	.013	.014	.081	.928	.355
	MPGHCR	-.010	.013	-.067	-.763	.447
	MFLISK	.026	.018	.114	1.395	.166
	MFIZLG	-.060	.033	-.170	-1.821	.071
	MFLDPK	.052	.035	.135	1.489	.139
	MBR20MVS	3.039	1.900	.170	1.599	.112
	MBR20MLS	5.414	2.258	.276	2.398	.018
	MBR50MVS	.120	1.079	.016	.111	.912

Review of the regression analysis of the **first main component in the area of basketball** (Table 10) with mutual correlation of .70 shows high multiple correlation and coefficient determinations .49. This relation is significant on a level of .00 (Table 11). Analysis of the influence on individual variables (Table 12) can be concluded that largest statistically significant effect has three variables MBR20MVS –running 20M out of a high start, which represents the area of speed, variable MPGVCN- targeting a vertical target by foot, for the assessment of precision and MBFTAZ- foot tapping against a wall, for the assessment of frequency speed of movement. In the order of significance follows variable MFLZLG- leg lift while laying facedown, for the assessment of flexibility, MBFTAN – foot tapping, for the assessment of frequency speed of movement and as the last variable, however the one that has a statistically significant influence MKOS3M – slalom with three medicine balls, for the assessment of coordination. The above leads us to a conclusion that influence of motorical abilities on the whole system of basketball (represented by three treated elements) exists. Analyzing the relation of variables (predicator-criterion) we can notice that two out of three variables of the represented area of movement frequency correlates with the first main component, and all the other variables belong to each of the predicator areas, which again infers the possibility that students/ examinees with greater frequency speed had a higher possibility of attaining better results in the game of basketball. We remind that the tests out the game of basketball are dynamic and that other variables are confirmed with a statistical correlation to the first main component "the game of basketball" had suitable influences in the acquirement of better results (speed, precision, flexibility and coordination).

Table 10. *First main component in the game of basketball*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.701	.491	.394	.778

Table 11. *ANOVA*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	73.625	24	3.068	5.061	.000
	Residual	76.375	126	.606		
	Total	150.000	150			

Table 12. *Coefficients*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
1		B	Std. Error	Beta		
	MKTKK3	-.031	.073	-.035	-.430	.668
	MKOS3M	-.055	.027	-.155	-1.990	.049
	MAGOSS	-.049	.043	-.090	-1.125	.263
	MESBML	.008	.004	.139	1.738	.085
	MESSD	.000	.004	-.006	-.066	.947
	MBR20MVS	-.251	.334	-.054	-.752	.454
	MBFTAN	.078	.037	.196	2.125	.036
	MBFTAZ	.074	.024	.262	3.102	.002
	MBFTAR	-.003	.025	-.010	-.113	.910
	MRASKR	.025	.015	.150	1.627	.106
	MRSPTL	.012	.013	.081	.887	.377
	MRLDCT	-.001	.010	-.006	-.072	.943
	MBAU1Z	-.042	.058	-.059	-.736	.463
	MBAP1Z	-.100	.143	-.052	-.699	.486
	MBAU1O	.003	.002	.104	1.197	.233
	MPCDŠ	.000	.002	.003	.037	.970
	MPGVCN	.012	.004	.237	3.140	.002
	MPGHCR	.003	.004	.071	.927	.356
	MFLISK	-.009	.005	-.122	-1.711	.089
	MFIZLG	-.022	.009	-.196	-2.416	.017
	MFLDPK	.006	.010	.049	.621	.536
	MBR20MVS	1.644	.526	.288	3.124	.002
	MBR20MLS	.105	.625	.017	.168	.867
	MBR50MVS	-.273	.299	-.115	-.912	.363

Conclusion

The influence of motorical abilities on the performance of situational-motorical elements of basketball was analyzed by application of regression analysis on 151 examinees- students from vocational high schools. On the control sample 24 variables of the predictor area were analyzed and 3 variables of the criterion area. The aim set in the research suggested that an influence of motorical abilities on the performance of situational-motorical elements of basketball existed. Furthermore, application of regression analysis confirmed the effect of motorical areas on every of the situational-motoric variables of basketball (manifested area) like on the three elements attained on the first main component. We can state for the realization of situational-motorical elements, also as success in the game of basketball – which can indirectly estimated using the actual impact on the first main component, are the primarily required characteristics of speed, followed by coordination and precision. With this research it has been determined that the quality of performing situational-motorical tasks is greater when the level of possession of other isolated motorical abilities is greater. With the obtained results of this research, the influence of motorical abilities on performance of situational-motorical elements in basketball is determined and the set aim of the research is confirmed.

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