CANONICAL RELATIONS OF BASIC-MOTOR AND SITUATIONAL- MOTOR ABILITIES IN SOCCER PLAY

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Abstract
Research has been applied on 155 students – 1st and 2nd year of Faculty of sport and physical education in Tuzla, age 19-22. We used a system of 15 variables of basic-motor abilities which represents predictor system and 9 situation motor abilities in soccer which represents criterion system. Primary goal of this research is to establish relation between some of motor and situation-motor abilities in soccer, that while be established by treatment of this special point by canonical correlation analysis. Pursuant to obtained data we expect better results in situational-motor abilities at participants with better coordination abilities and higher level of explosive force and repetitive force.

Key words: *students, situation motor abilities, canonical correlation analysis.*

INTRODUCTION

Awareness of trends in the science and scientific achievements contribute to the development of man's psycho-motor qualities. To know how the relations of numerous factors progress and change, depending on time requirements and achievements in specific sports activities, and in football as well presents an exceptionally essential problem.

The need to know regularities and relations of basic-motor and situational - motor abilities of football players is especially outstanding because situational – motor abilities are possible to be manifested only through the things that characterise entity's basic-motor structure. Consequently, efficiency of situational –motor dimensions directly depends on basic-motor dimensions, as it has been shown in numerous previous researches. Some of the authors that addressed this issue are Smajić,M. Molnar, S. (2007)[(7)], in their work they researched relations between basic-motor abilities and specific precision of the soccer player age 10 – 12 years old. Janković, A. Leontijević, B. (2006) [(2)], in their work they researched relations between motor abilities with situational-motor abilities running football player. Šabotić, B. Dobrnjak, D. (2007) [(9)] in their work they researched relations of basic-motor abilities with situational-motor abilities in soccer. Nožinović, F. (1990) [(5)] in his doctoral dissertation researched influence of anthropometrical characteristics (analysis) and motor abilities of efficiency results in situational tests. Modern method soccer technique requires high level of adopted motor structures due to determination of specific assignments (examples) that occurs during the play in defence stage (mode) and offense. The player has to be able to express his motor abilities in maximal level (readiness, explosive strength, coordination, etc.). Football player technical preparation is basic prerequisite for effective motion performance, apropos, technical preparation allows that players motor potential reach full expression. In a soccer play, it can come to a different styles of dribbling the ball, like straight-route dribbling, dribbling with route and rate (pace) change, whereat kinaesthetic sensitivity of handling (managing) the ball can be very important factor (element) that can restrain or anticipate running speed and dribbling the ball.

METHODS

Participants

Students that have been subjected to the research have completed all exercises in a subject football. All students from the sample were without expressed morphological, motor and psychological aberration and were able to attend the classes regularly on first and second year of the university.

All examinees were given base notations before the test started, towards carrying out the best quality of testing where the number of possible errors will be minimized. All exams (tests) are performed at Tuzla University sports hall.
Examinees in this research are first and second year students of the Faculty for Physical Education and Sport of the University in Tuzla. The research encompassed a sample of 155 testees aged 19 - 22 years.

Instruments
Fifteen (15) tests have been applied for the assessment of basic- motor abilities 15 (predictive union of variables), which belong to some segments of basic-motor area, as follows:

Following tests have been used for the assessment of the frequency movement factor (segmental speed):

- MBFTAR – hand tapping
- MBFTAN – foot tapping
- MBFTNZ – foot tapping against the wall

Following tests have been applied for the assessment of the flexibility factor:

- MFLBOS – side splits
- MFLPRK – forward bend on the bench
- MFLISK – body twist with rod

Following tests have been used for the assessment of the coordination factor:

- MKOOSS – eight with bending
- MKOKUS – long steps aside
- MKOONT - magont /rolling on the ground/

Following tests have been used for the assessment of the explosive force factor:

- MESSVM – high jump with both feet (from a standing start)
- MESSDM – long jump from a standing start
- MESBML – throwing a medicine ball from a lying position

Following tests have been used for the assessment of the repetitive force factor:

- MRSSKL – push ups with burden
- MRSPTL – lifting a torso from a lying position
- MRSZTL – side movements of a torso in a lying position

Nine (9) measuring instruments have been used for the assessment of the situational-motor abilities in the football:
Following measuring instruments have been used for the assessment of the situational preciseness:

- SPPNVM – foot preciseness in a straight line – vertical goal (ball at standstill)
- SPPNVK – foot preciseness in a straight line – vertical goal (ball in a movement)
- SPENVM – elevating foot preciseness– vertical goal (ball at standstill)

Following measuring instruments have been used for the assessment of the ball handling ability

- SBLHOZ – horizontal bouncing of a ball from the wall for 20 seconds
- SBLUPO – hitting against the wall after a ball has bounced from the base
- SBLVSL – guiding a ball in a slalom

Following measuring instruments have been used for the assessment the speed of guiding a ball:

- SBRVPO – fast guiding a ball in a semicircle
- SBRV20 – fast guiding a ball for 20 meters from a standing start
- SBRVPU – fast guiding a ball with the change of the direction at an acute angle

A basic starting point for writing this research was to establish mutual relations or areas that have been the subject of the research, i.e. to establish a maximal connection of unions of variables, so that a number of pairs equals a number of variables, within a smaller number of variables, which will be obtained by the data processing by means of a canonical correlative analysis. In accordance with this method, a normalisation of variables has been done and a connection of variables established within and among analysed groups of variables. Canonical correlations between pairs of canonical factors have been calculated and their significance has been tested by the Bartlett X^2 – test.

RESULTS AND DISCUSSION

By calculating a characteristic equation of non-symmetrical matrix (Table 1) and by applying Bartlett Lambda Test and its testing by means of respective (h2) hi –square of the test, results have indicated existence of two canonical connections that are at the significance level $p = .01$.
A mutual connection of the first pair of isolated canonical factors is high (Canonical R) .71. A mutual relation of the second pair of isolated canonical factors (Canonical R) is .56. These two pairs of isolated canonical factors explain (Canonical R-sqr.) 50 % of the mutual variability. A significance of researched area is (Chi-sqr.) 259. 49.

Table 1. Matrix of characteristic roots and coefficients of canonical correlation

	Canonical	Canonical				Lambda
	R	R-sqr.	Chi-sqr.	df	p	Prime
0	0.71	0.50	259.49	135	0.00	0.16
1	0.56	0.32	161.02	112	0.00	0.32
2	0.45	0.20	106.72	91	0.12	0.47
3	0.40	0.16	75.49	72	0.37	0.59

By analysing a matrix of structure of an isolated canonical factor in the area of variables for the assessment of basic-motor abilities (Table 2), it can be observed that this canonical factor is of a bipolar character.

On the basis of presented data we see that not only some regulatory mechanisms affect the first isolated canonical dimension, but also that this canonical dimension has been formed as a consequence of interaction of a larger number of mechanisms, therefore this canonical factor can be defined as mixed factor of mechanisms for the movement structuring, mechanisms of synergic automatism and a muscle tonus regulation, mechanism of excitation duration regulation.

Šabotić,B. Drobnjak, D. (2007)[9] have got similar research results in their paper. In this research available canonical factor (element) is define as factor (element) of general motor ability, therefore is the coordination factor impact (effect) is the most expressed.

By analysing a matrix of structure of the first isolated canonical factor in the area of variables for the assessment of situational-motor abilities - (Table 3), SPPNVM variable – foot preciseness in a straight line – vertical goal (ball at standstill) (.82), variable SPPNVK – foot preciseness in a straight line – vertical goal (ball in a movement) (.84), variable SPENVM – elevating foot preciseness – vertical goal (ball at standstill) (.44) - have significant projections of manifest vector variables on this isolated canonical factor.

Likewise, from the area of variables for the assessment of an ability to handle a ball, a variable SBLUPO - hitting against the wall after a ball has bounced from the base (.48) - has a significant projection of vectors of manifest variables on this isolated canonical factor. A reason for such high projections of this variable on second isolated latent dimension probably lies in a fact that also preciseness is needed for the performance of this situational-motor test because a ball has to be directed to a defined space on the wall. Therefore we are going to define this as a situational preciseness factor.

By analysing a matrix of structure of the second isolated canonical factor in an area of variables for the assessment of basic-motor abilities (Table 2), [it is seen] that this canonical factor has a bipolar character.

It has to be noted here as well that variables for coordination assessment has a logically negative sign, because these are time tests where in the time and space a distance in meters has to be covered, where a smaller result means a better result. When we have a look at the structure of this isolated factor, the structure of the second isolated canonical factor is also specific. However, in relation to the first isolated factor in the other canonical factor, we have two variables in coordination, which have significant projection on this factor.

Since the other canonical factor has been defined by variables from the area of segmental speed, flexibility, coordination, explosive and repetitive force, and these variables have been defined by excitation speed in nerve centres. Therefore, the second isolated canonical factor can be defined as a factor of excitation process in the movement regulation. Raičković, N. Rašović, D. (2004)[6] have got similar research results in their paper.

By analysing a structure of matrix of the second isolated canonical factor (Table 3) in the area of situational-motor abilities, we see that on this isolated canonical factor variables for the assessment of the ability of the speed to guide a ball have the most important projection of vectors of manifest variables. Somewhat smaller, but still significant projections of vectors of manifest variables on the second isolated canonical factor also have variables for the assessment of the ability to handle a ball.

Pursuant to achieved results and variables that determine this factor, it can be defined as a factor of a general movement ability of player with a ball.

Nožinović, F. (1990) [5] in his doctoral dissertation came up with similar results that indicate importance of coordination and explosive strength against improving results of testing situational – motor abilities.

Table 2. Matrix of canonical factors structure in the area of basic-motor abilities variables

	KF 1	KF 2
MBFTAR	- 0.18	0.17
MBFTAN	- 0.83	0.02
MBFTNZ	0.01	0.22
MFLBOS	0.12	- 0.40
MFLPRK	- 0.17	0.16
MFLISK	- 0.40	- 0.19
MKOONT	- 0.00	- 0.40
MKOOSS	- 0.03	- 0.69
MKOKUS	- 0.62	- 0.11
MESSVM	0.01	0.32
MESSDM	0.04	0.40
MESBML	0.11	- 0.00
MRSSKL	- 0.08	0.16
MRSPTL	- 0.44	0.40
MRSZTL	- 0.50	0.15

Table 3. Matrix of canonical factors structure in the area of situational-motor abilities variables

	KF 1	KF 2
SPPNVM	0.82	0.26
SPPNVK	0.84	0.27
SPENVM	0.44	0.13
SBLHOZ	- 0.31	0.30
SBLUPO	0.48	0.22
SBLVSL	0.13	- 0.55
SBRVPO	- 0.06	- 0.56
SBRV20	0.46	- 0.62
SBRVPU	0.06	- 0.91

CONCLUSION

Pursuant to obtained data we expect that the better results in situational-motor abilities is conditioned by optimally developed basic-motor abilities.

By analysing relations of the first pair or canonical factors, we see that estimating agility variable MKOKUS-long steps aside (.62) has the greatest effect on the situational preciseness, as we have defined the first isolated canonical factor; coordination has the greatest effect and it is the only one that has realised positive connections with this canonical factor. Coordination also presents a basics of the loco-motor system, and we know that without coordination it is not possible to perform any moving structures, so this is probably one of the reasons why such relations have been realised within areas of the research, that is to say, this pair of canonical factors. Since with variables for the preciseness assessment we have preparatory movements that make it possible for favourable conditions to be created for adequate performance of these tests, coordinated work of arms and legs is probably one of essential factors that affect achievement of better results in tests or situational preciseness, therefore, this also can be one the reasons why the relations of the first pair canonical factors have been realised. When we have a look at the relations of other variables having statistically significant coefficients, we see that segmental speed, flexibility and repetitive force have negative relations with the situational preciseness. Šabotić, B. Drobnjak, D.(2007)[8] in their paper researched relations basic-motor abilities with situational-motor abilities in soccer. Final data inside this research refer to suggest that all motor abilities are in direct proportionality with results of testing situational-motor abilities of examinees. Although, authors came up with conclusion that all examinees with better coordination, as well as bigger explosive and repetitive strength will have much better results in testing of specific motor in soccer. By analysing the relations of the second pair of isolated canonical factor we see that positive relations have been realised. When the relation of this pair of canonical factor is analysed, we see that variables for the coordination assessment have a dominant positions, since two variables from this area have a significant projection on the isolated canonical factor. Likewise, the MKOOSS – eight with bending, has the greatest projection of vectors, which amounts to (-.69). We see that a segmental speed is also significant for a general ability of the movement of a player with the ball, which with the coordination presents the basics of loco-motor system. Explosive force, in particular its horizontal and vertical component and a repetitive force also have a significant influence on the improvement results in tests that present a general ability of a player to move with a ball. In his research Raičković, N. (2005)[6], came up with some indicators that shows impact of the legs coordination and explosive musculature in soccer success. Thus, author realizes much better results will have examinees with expressed (registered) specified coordination abilities. Also, in their paper Smajić, M. Molnar, S.(2007)[7], , from the gained results authors came up with the conclusion that examinees with less levelled explosive and repetitive strength accomplished inferior results in testing of specific preciseness hitting horizontal and vertical target. Since we have defined the second isolated canonical factor in the area of situational-motor abilities as a factor of a general ability of a player to move with a ball, these tests that define this factor in its structure contain a movement with a ball, fast changes of the direction of movement, which means those forms of movement that by its structure mostly resemble situations that appear during a football game. Coordination is absolutely essential when a player with a ball moves, in particular work of arms and legs. A speed of curved running, fast changes of the direction of movement, as well as a speed of guiding a ball to a great extend depend on segmental speed and explosive and repetitive force.

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KANONIČKA POVEZANOST BAZIČNIH I SITUACIONO MOTORIČKIH SPOSOBNOSTI U FUDBALU

Originalni naučni rad

Sažetak

Istraživanje u ovom radu je provedeno na uzorku od 155 studenata I i II godine studija Fakulteta za tjelesni odgoj i sport u Tuzli, starosne dobi od 19-22 godine. Korišteni su skupovi od 15 varijabli bazično-motoričkih sposobnosti koje predstavljaju prediktorski sistem i skup od 9 varijabli situaciono-motoričkih sposobnosti u nogometu koji predstavlja kriterijski sistem.Osnovni cilj ovog rada jeste utvrđivanje relacija između bazično-motoričkihi situaciono-motoričkih sposobnosti u nogometu, a što će se dobiti obradom podataka pomoću kanoničke korelacione analize. Na osnovu dobijenih podataka može za očekivati je da će bolje rezultate u situaciono-motoričkim sposobnostima postizati ispitanici sa boljim koordinativnim sposobnostima kao i sa većim nivoom eksplozivne i repetitivne snage.

Ključne riječi: student, situaciono motoričke sposobnosti, kanonička korelaciona analiza

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