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FACTOR STRUCTURE OF BASIC-MOTOR SKILLS, SITUATIONAL-MOTOR SKILLS, AND EXPERT ASSESSMENTS OF PERFORMANCE IN SEGMENTS OF FOOTBALL GAME IN FOOTBALLERS AGE 12-14

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Original research

ABSTRACT

The methodological approach of this cross-sectional confirmatory research was aimed at analyzing the dominant basic motor abilities and situational motor abilities, their general and partial contribution and prediction of the level of success of performance and behaviour in individual components of football as a prerequisite for a more complete explanation and projection of objective indicators of the competence framework of success in the game of football of the researched sample.

The starting point was the assumption that this approach enables confirmation or correction of previous proceedings and procedures in the process of selecting young football players for their top achievements in the mature stage of their football career.

The specific aim of this work is to determine individual and characteristic typical group profiles of basic motor and specific motor abilities based on different levels of success in different components of the game of football.

The research was carried out on a sample of 110 young football players from Sarajevo aged from 12 to 14 years.

Seventeen variables were used to assess basic motor skills, 11 variables for the estimation of situational-motor abilities, and 8 variables for evaluating success in football. The results are a significant incentive for the improvement of selection technology of young football players because they offer an opportunity to model morphological, motor, situational-motoric, diagnostic, prognostic framework with clear indicators requirements and reference values for the ontogeny age of the sample.

Keywords: factor analysis, football, pioneers, football player performance

INTRODUCTION

Football is a sport that belongs to a group poly-structural acyclic movements with the highest degree of complexity. Numerous and diverse features characterize it complex dynamic kinesiology activities in which, in addition to acyclical, there are also cyclical movements, and they are performed in complex and dynamic conditions of the immediate and indirect interference by opposing players and mutual cooperation of players. Today the popularity of football is reflected by millions of football athletes who practice

this exceptional game on different levels of competition. In the football game, one tries to use individual technique, solve with the team and organize tactical competition tasks in the game, i.e. individual action adapt and put into the function of teamwork and set goals of the team as organized and efficient the whole. This synergy is reflected through different modalities individual, group and collective tactical actions which are either predetermined or customized to the corresponding situation in the game. The basis of success in the football game lies in the broadest complex of

anthropological and specific characteristics of player abilities that enable efficient management of the dynamic system of all components of football games, realizing the given concept of the game, managing the pace and rhythm of the game, as well as your own bioenergetic capacity and functional states during the game. Modern football is characterized by highly high game intensity, universalization of players, technical-tactical rationality, which results in a demand for ever-higher level of fitness of football players. For these reasons, when selecting future football players, it is necessary to take into account all aspects essential for top performance in the mature football phase.

All football players' abilities manifest themselves depending on the importance and level of competition, their position in the team and the style and aim of the game. They also vary according to age groups, between genders, and at different stages of the football season. The foundation for top performance in football is the possession of a spectrum of skills, such as tactics, technical reasoning, and creativity, of individual players.

Coaches must encourage the development of tactical knowledge in the profile top players - because the success of the entire team depends on it whether the set of individual abilities of the players will become to be in the function of a compelling and harmonious whole. However, it should respect the fact that when the teams meet of equal technical-tactical competencies, the higher probability for the final result success will have a team with a higher level of motor/conditioning skills and psychological preparedness, which enable each player to play at a higher and more dynamic level.

Goals in a football game are impossible to achieve in individual, i.e. independent action of each individual player without situational cooperation. Because of that the football game is characterized as an activity which stimulates creativity and motor creativity of each participant. It is estimated that around 300 million people play football today, professionally, amateurly or recreationally. Footballers achieve situational success in the game of football by demonstrating a large number of skills and knowledge, as well as their structure and level. According to (Talović, 2001.) There are three groups of success factors in the game of football: -

- The first group consists of factors that are manifested through the basic anthropological characteristics and abilities of the football player, and relate to health status, motor abilities, functional abilities, cognitive and conative factors, as well as morphological characteristics.

- The second group of success factors in football consist of specific theoretical knowledge, technical-tactical abilities, specific motor abilities, etc.

- The third group of success factors consists of situational efficiency and results achieved in the competition.

For the identification and selection process for football gifted persons and procedures of development and creation of future top footballers, it is essential to determine the indicators with which development potentials of complex abilities required by modern football game can be assessed.

Information about levels, structures, interdependencies basic motor skills, situational motor skills and success of young football players in the game of football, especially the determination of individuals and group profiles based on success in football the game should be a significant incentive for improvement the technology of selection of young football players.

Research that is objective and scientifically based identify abilities, skills and features that contribute the most to establishing differences between successful and less successful participants in football suppress the previous practice which it relies on observations, empirical experiences and acceptance success according to the laws of the case.

METHODS

Participants

The population from which the sample was selected were the football players aged 12 to 14 years from FK »ŽELJEZNIČAR« from Sarajevo, FK »RADNIK« from Hadžići, FK »NOVI GRAD« and FK »BOSNIA « from Sarajevo, who, in addition to the training process in the club, are included in regular physical education and health education classes of two lessons a week.

The research was conducted on a sample of 110 young people football player, attendee of the FK football school "ŽELJEZNIČAR" from Sarajevo, FK "RADNIK" from Hadžići, FK "NOVI GRAD" and FK "BOSNA" from Sarajevo, aged 12 to 14.

The sample of respondents for this research fulfilled the following conditions:

- that they are part of the football category of pioneers,
- to actively play football for their clubs on championship and cup matches,
- that they have a medical license to perform at championship and cup matches.

Sample of variables

The sample of respondents was subjected to the following sets of variables testing and evaluation procedures: 17 variables for the assessment of basic motor skills, 11 variables for the assessment of situational motor skills, 8 variables for the assessment of success selected components of the football game as a system of criterion variables.

Variables for assessing basic motor abilities

Variables for assessing explosive power

MSDM - Long jump from a standing position

MTRO - Triple jump from a standing position

MVIS - High jump from a standing position

Variables for assessing speed

MSPR20M - Sprint from a high start 20 m

MTAPNZ - Tapping with a foot on the wall

MTAPN - Tapping with a foot

Variables for assessing coordination

MSLN2L - Slalom with legs with two balls

MKUS - Side steps

MOKRZ - Air agility

Variables for assessing repetitive strength

MSKLEK - Push-ups

MPODTR - Lifting the trunk from a lying position

Variables for assessing flexibility

MPRETK - Forward bend on a bench

MPRETR - Forward bend with a step

MBPAG - Side splits

Variables for assessing balance

MRAVOOU - Standing on two legs lengthwise on a balance bench with eyes open

MRAVZOP - Transverse standing on a low bench with two legs with eyes closed

MRAV1N - Standing on one leg lengthwise on a balance bench

Variables for assessing situational motor abilities

Tests were chosen to assess situational motor abilities, ball shooting accuracy, ball handling, ball dribbling speed, ball hitting power, and curvilinear running speed. All situational motor abilities were tested with two tests except curvilinear running speed, which was tested with three tests. All tests were standardized and published in publications.

Variables for assessing ball shooting accuracy

SPRECV - Rectilinear foot accuracy – vertical target

SPRECGH - Elevation head accuracy – horizontal target

Variables for assessing ball handling

SHODST20 - Horizontal bounce off a rock for 20 seconds

SBRZVSLA – Ball speed dribbling (slalom)

Variables for assessing ball driving speed

SBRZV90 - Ball speed dribbling with right-angle changes

SBRZV20 - Ball speed dribbling d at 20 meters with a standing start

Variables for assessing kick strength

SSNAUNO - Strength of kicking the ball with the leg

SSNAUGL – Strength of kicking the ball with the head

Variables for assessing curvilinear running speed

SBRZTPOL - Running speed in a semicircle

SBRZT90 - Running with right-angle changes

SBRZTSLA - Winding running (slalom)

Variables for assessing success in the game of football

The assessment of success in the game of football was carried out on football fields during championships, friendly matches and CUP matches.

The sample of criterion variables consisted of the referees' ratings expressed in the following components of the game:

OTEH - assessment of technique in the game

ONAP - assessment of attack in the game

OODB - assessment of defence in the game

OSTV - assessment of creativity in the game

OODG - assessment of responsibility in the game

OANG - assessment of engagement in the game

OPON - assessment of behaviour in the game

OSNUSP - success in the game

Statistical analysis

Data obtained by testing basic and specific motor abilities, as well as assessments of success in the football game, were processed using software systems for multivariate data analysis, namely the software package SPSS 23 and Statistica for Windows, ver. 8.0. Latent structure of basic motor skills, situational motor skills and assessment of level success in football is determined by factor by analysis, method of extraction of the main components and by rotating them using the Varimax solution.

RESULTS

Thirty-two overall observed variables from the sets of motor ability variables, situational motor abilities and variables of success ratings in football game segments of football players aged 12 to 14 were subjected to Principal Component Analysis (PCA).

The logarithmized values (LG10) of the total sample of variables were used in the analysis. The suitability of the data values of all variables for factor analysis was previously checked. The factorability of the correlation matrix was confirmed by the values of the Kaiser–Mayer–Olkin indicator, which is higher than the recommended value (0.60) and is .790. The usability of the correlation matrix was also confirmed by the

Table 1. Factorability tests of the correlation matrix of the total sample of variables of motor abilities, situational-motor abilities and variables of performance evaluations in segments of the football game of football players aged 12 to 14

| | |
|---|--------------------|
| Kaiser - Meyer - Olkin measure of sampling adequacy | 0.79 |
| Bartlett's test of sphericity | Chi-Square 2858.45 |
| | df 496 |
| | p <.001 |

Bartlett test of sphericity with a significance level of $p < .001$ (Table 1).

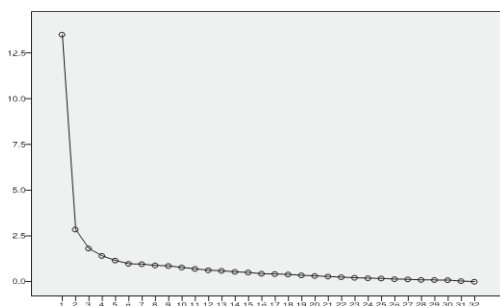
Factor analysis was performed using the extraction method principal components (PCA), orthogonal solution Varimax rotations with Keiser normalization and criterion inclusions greater than 0.50.

Table 2 presents the main analysis elements components related to the display of utilities, total explained variances, Scree plot of eigenvalues values of the separated components (chart 1) and rotated component matrix. (Table 3.)

Table 2. Principal component analysis (PCA) of the total sample of variables

| Factor | Extracted SS loadings | | | Rotated SS loadings | | |
|--------|-----------------------|------------|--------------|---------------------|------------|--------------|
| | λ | % Variance | Cumulative % | λ | % Variance | Cumulative % |
| 1 | 13.51 | 42.23 | 42.23 | 6.24 | 19.52 | 19.52 |
| 2 | 2.86 | 8.94 | 51.17 | 5.69 | 17.79 | 37.31 |
| 3 | 1.82 | 5.68 | 56.8 | 4.23 | 13.22 | 50.54 |
| 4 | 1.41 | 4.42 | 61.29 | 2.76 | 8.64 | 59.19 |
| 5 | 1.16 | 3.63 | 64.92 | 1.83 | 5.73 | 64.92 |
| 6 | 0.986 | 3.08 | 68 | | | |
| 7 | 0.966 | 3.02 | 71.02 | | | |
| 8 | 0.898 | 2.8 | 73.83 | | | |

Graph 1. Scree plot of characteristic values of extracted components of the total sample of variables



Five components with characteristic values over one were determined by analysis of the main components. The first main component has 42.2%, the second 8.9%, and the third 5.6%, fourth 4.4% and fifth 3.6 explained variance.

Table 2. Principal component analysis (PCA) of the total sample of variables

| | 1 | 2 | 3 | 4 | 5 |
|------------|--------|-------|--------|--------|-------|
| LGSRZT90 | -0.731 | | | | |
| LGSRZTSLA | -0.705 | | | | |
| LGSRZPOL | -0.696 | | | | |
| LGSRZVSL | -0.695 | | | | |
| LGSRZV20 | -0.675 | | | | |
| LGMSPR20M | -0.553 | | -0.547 | | |
| LGAPNZ | 0.547 | | | | |
| LGMAPN | 0.522 | | | | |
| LGMSKLEK | | | | | |
| LGMPDTR | | | | | |
| LGMSLN2L | | | | | |
| LGSPRECGH | | | | | |
| LGSUMAUSP | | 0.901 | | | |
| LGOODG | | 0.744 | | | |
| LGOANG | | 0.731 | | | |
| LGOSTV | | 0.719 | | | |
| LGOTEH | | 0.694 | | | |
| LGOODB | | 0.668 | | | |
| LGONAP | | 0.652 | | | |
| LGOPON | | | | | |
| LGSHODST20 | | | | | |
| LGMBSPAG | | | 0.796 | | |
| LGMTRO | | | 0.722 | | |
| LGMSDM | | | 0.707 | | |
| LGMSVIS | | | 0.680 | | |
| LGSSNAUGL | | | | | |
| LGOKRZ | | | | 0.72 | |
| LGMKUS | | | | -0.664 | |
| LGMPRETK | | | | -0.520 | |
| LGMPRETR | | | | | 0.724 |
| LGSPRECNV | | | | | 0.504 |

The total explained variance is 64.93%. Results of orthogonal varimax rotation enable simplification and easier interpretation factor matrix structures. The biggest projections on the first main component have specific variables of motor skills, speed of dribbling the ball with the changing direction at a right angle - SBRZV90 (-.767); running speed with a change of direction at an angle from 90 degrees; SBRZT90 (-.731); slalom running speed - SBRZTSLA (-.705); speed of running in a semicircle - SBRZPOL (-.696); ball dribbling speed in slalom - SBRZVSL (-.695); the speed of dribbling the ball at 20 meters SBRZV20 (-.675). In addition to the variables of specific motor skills with and without the ball, variables that are classified as basic motor skills also have high projections onto the first principal component. These variables are 20-meter sprint - MSPR20M (-.553), foot tapping on wall - MTAPNZ (.547) and foot taping MTAPN (.522).

The first principal component is characterized by a high degree of saturation with tests of maximal speed of locomotion without and with the ball and tests of partial speed of movement of the lower extremities and is called the component of speed of locomotion without and with the ball. All variables related to the ratings of individual segments of the football game, except for the variable of the rating of behaviour in the game (OPON), have high correlation coefficients with the second principal component. The highest projection on the second principal component is the variable total score of success in individual segments of the football game - SUMAUSP (.901). Other variables with significant factor weights on the second principal component are the assessment of responsibility in the football game - OODG (.744); engagement rating in the game - OANG (.731); creativity rating in the game - OSTV (.719); technique rating in the game - OTEH (.694); defensive rating in the game - OODB (.668) and the offensive play rating - ONAP (.652).

The second principal component exclusively includes variables of expert assessment of success in the segments of the football game. This component is called the component of success in the segments of the football game. It was confirmed again that the variable of game behaviour assessment (OPON), which did not have a significant correlation with the variables of motor and situational-motor space, does not fully belong to the assessment of the success of the performance of football segments. games. For these reasons, this variable will not be included in the overall score of the success assessment in the segments of the football game nor in the procedures of further analyses.

The third principal component is saturated with three variables of motor abilities of the type explosive power: triple jump from a standing position - MTRO (.722); long jump from a standing position - MSDM (.707); high jump from a standing position - MSVIS (.680); and one variable that tests flexibility - lateral twine MBSPAG (.796). The third principal component is called the explosive rebound component.

On the fourth principal component, one specific motor ability variable is projected - head kick strength - SSNAUGL (.720); and two basic motor ability variables - aerial agility - MOKRZ (-.664) and side steps MKUS (-.520).

It is named the component of specific coordination.

On the fifth principal component, the factor weight above the set inclusion criterion (.50) is the variable of the flexibility of the muscles of the lower extremities in the bench press - MPRETK (.724) and prebend variously - PRET (.504). It is called the flexibility component.

DISCUSSION

This transversal research, of a confirmatory type, objective, scientifically and methodologically based information were established on the degree of interdependence and influence of basic-motor and specific-motor dimensions for the success of football players of the pioneer age from 12 to 14 years. The research is based on the assumption that for a complete explanation and design of objective indicators of the competence framework of success in the football game of young football players, it is important to determine the dominant basic motor skills and situational motor skills, as well as their general and partial contribution and prediction of the level of success of performance and behaviour in individual components in the football game.

The results of this approach should enable the confirmation or correction of previous approaches and procedures in the selection process of young football players for their top achievements in the mature stage of their football career, and a more scientifically based approach in improving the design of more efficient work in football schools, monitoring transformation processes, and the individualization of approaches in the development of young football players.

The goals of the research set in this way were achieved by determining the level of connection, degree and direction of influence and predictive capacity of manifest basic-motor and situational-motor abilities in relation to the individual evaluations of competent football experts and the overall evaluation of the success of young football players in the relevant components of football.

A special part of the research was related to the determination of group and individual and characteristic type profiles of basic-motor and specific motor abilities based on the summary assessment of success in different components of the football game.

A review of previous research related to the issues of this study has shown that when assessing the potential of football players, the segments of the anthropological status of motor and specific motor abilities were most frequently tested.

Latent structures of elements of basic motor abilities, situational-motor abilities and performance ratings in various components of the football game were determined in two ways: collectively for thirty-two overall observed variables and separately for each set of variables of the investigated areas.

Factor analysis of the total number of research variables, which was performed using the method of principal components extraction (PCA), orthogonal solution of Varimax rotation with Keiser normalization and an inclusion criterion greater than 0.50, revealed five components with characteristic values over 1. First, the main component has 42.2%, the second

8.9%, the third 5.6%, the fourth 4.4%, and the fifth 3.6 explained variances. The total explained variance is 64.93%.

The largest projections on the first principal component, which explained 42.2% of the total variance, have variables of specific motor abilities: speed of dribbling the ball with a change of direction at a right angle, running speed with a change of direction at an angle of 90 degrees, slalom speed running, speed of running in a semicircle, speed of dribbling the ball in slalom, speed of dribbling the ball at 20 meters.

High projections on the first principal component also have variables that are classified as basic motor skills: 20-meter sprint, foot tapping on the wall, and foot tapping. The characteristic of the first main component is a high degree of saturation with tests of maximum locomotion speed without and with a ball and tests of partial movement speed of the lower extremities, and it is called the component of locomotion speed without and with a ball.

This once again confirms the efficient use of different and specific ways of moving with and without the ball, such as the straight-line movements or movements with a change of direction and tempo, where kinesthetic sensitivity for controlling the ball can be an important factor that can limit or accelerate the speed of running and dribbling the ball (Bajramović, 2011). When creating space for themselves or their teammates, in addition to short sprints in a straight line, football players very often change the direction of movement with the aim of quickly entering the end zone and realizing the action. Some studies have shown that midfielders show better results in tests with the ball than other positions in the field, and it is considered that they are more dominant in a technical sense. This can also be explained by the specific role in the game that requires a sense of time and space, taking into account the high concentration of players in the middle of the field. Although this research was not directed in the direction of positional requirements, other researchers state that football players in the middle of the field often organize attacks, are in contact with the ball the most out of all players on the field, and are often in a situation where the ball is during a longer sprint they transfer to the field of opponents, and create chances with precise and long passes (Bajramović, 2011). Attacking players, even though they are less in contact with the ball than the attackers (according to some of the players so far), must be able to quickly sprint after winning the ball and, pull the ball and shoot accurately. However, today's football players are required to have equally well-developed ball manipulation abilities and technique with the left and right foot (Weineck, 1999, 2000).

All variables related to the ratings of individual segments of the football game, except for the variable of the rating of behaviour in the game (OPON), have

high correlation coefficients with the second main component, which is called the component of success in the segments of the football game, which confirms that its content does not fully belong to the assessment of the success of the performance of the segments of the football game and justifies the decision that it will not be included in the overall score of the success assessment in the segments of the football game or in the procedures of further analysis.

It is significant to note that the highest factor weight on this component is the score of responsibility in the game of football, followed by the score of engagement in the game, the score of creativity in the game, the score of technique in the game, the score of defensive play, and finally, the score of offensive play.

According to Bajramović (2007), "success in football is due to a complex of anthropological characteristics and the specific ability of the football player, which governs the game in terms of managing the concept, tempo and rhythm of the game. For the general assessment of a successful football player, the conative dimensions of engagement and responsibility of each individual are certainly important.

The third main component called the explosive reflex power component, is saturated with three variables of motor abilities of the explosive power type: triple jump from a standing position, long jump from a standing position, high jump from a standing position and one variable that tests flexibility – the hamstring.

On the fourth main component, which is called the component of specific coordination, one variable of specific motor ability – head kick strength and two variables of basic motor skills: agility in the air and side steps.

The fifth principal component is called the flexibility component and is saturated with the variables of flexibility of the lower limb muscles: bench bend and multi-leg bend, whose factor weights are above the set inclusion criteria (.50).

Taking into account the results of the factor analysis of the entire sample of variables, it can be stated that the following latent dimensions (components) of the football game of young football players are present:

- locomotion speed component without and with the ball (42% of explained variance)
- component of success in football game segments (8.9%)
- explosive reflective power component (5.6%)
- specific coordination component (4.4%)
- flexibility component (3.6%)

Measuring instruments that have high factor weights on the separated components can be a good basis for detecting children gifted for success in the football game

CONCLUSION

The goal of this transversal research, of a confirmatory type, is reflected in the effort to find objective, scientifically and methodologically based information about the degree of interdependence of various components of anthropological dimensions for success in pioneer football.

In order to achieve the research goal set in this way, an analysis of the dominant basic motor abilities and situational motor abilities, their general and partial contribution and prediction of the level of performance success and behaviour in individual components in the football game was performed. Assumptions for a more complete explanation and design of objective indicators of the competency framework of success in the football game of the researched sample.

It is based on the assumption that the achieved approach enables the confirmation or correction of previous procedures in the selection process of young football players for their top achievements in the mature stage of their football career.

The research was based on a sample of 110 young football players, students of the football school of FK "ŽELJEZNIČAR" from Sarajevo, FK "RADNIK" from Hadžići, FK "NOVI GRAD" and FK "BOSNA" from Sarajevo, aged 12 to 14 years.

Factor analysis of the total sample of variables in the space of basic motor skills, situational motor skills and expert assessments of success in segments of the football game of football players aged 12 to 14 years identified five basic components:

- component of locomotion speed without and with the ball,
- component of success in segments of the football game,
- component of explosive reflex power,
- component of specific coordination
- component of flexibility

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Conflict of Interest

The authors do not have any conflicts of interest to disclose. All co-authors have reviewed and concurred with the manuscript's content, and no financial interests need to be reported.