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INDICATORS OF SITUATIONAL EFFICIENCY AND FUNCTIONAL ABILITIES OF FOOTBALL PLAYERS

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Abstract: *Football players of Zagreb Football Club were assigned to the test group subjected to the system of measurements, three variables for the estimation of functional abilities on the treadmill and ten indicators of the situational efficiency of football players. The correlation between the variables applied in this research was determined by a correlation analysis; on the other hand, a series of regression analyses determined the correlation between the set of functional abilities as a system of predictor variables in relation to every indicator of the situational efficiency as a criterion variable.*
Key words: *indicators, situational efficiency, functional abilities*

1. INTRODUCTION

The perception of football as a kinesiological activity raises a question: How is the success of an individual football player during a competing activity linked with his characteristics and abilities?, which is the main aim of this paper.
In order to answer this question, it is first necessary to apply diagnostic procedures and establish the football players' real characteristics and abilities. Then instruments for objective measurement should be applied with the aim of gathering as much relevant information as possible on the actual players' performance during the competing activity. The process of gathering information on a competing activity is called a notation analysis. The data thus obtained are called the indicators of situational efficiency.
The majority of team sports face the problem of identifying and intepreting actions and events taking place in the football field. The notation analysis is an effective way of resolving this problem. It primarily focuses on the movement analysis, technical and tactical estimation and statistical content. This is why the notation analysis is a technique of analysis of various performance aspects via the process of continuous event registration . Football coaches are able to monitor only the parts of the football field where the core of the game (a ball game) takes place while the information on the game and movements in the other parts of the football field is not known. Every coach's aim is to improve a player or a team by giving them feedback on their performance. Scientific research has proved that human observation and memory are not sufficiently reliable and can not serve as accurate and objective indicators of an athlete's performance, especially not in a complex sport such as football. It has also been proved that football coaches are less than 45% precise in their analyses of the events taking place within the 45-minute span of a football game. In order to obtain appropriate feedback, instruments of objective measurement are absolutely necessary. They may comprehend various forms of video analyses that rely on data processing during a football game or afterwards, and on biomechanical or computerised notation system. Video recording ensures the most realistic and understandable form of feedback information. In combination with quantitative feedback information it can probably guarantee the best understanding of the information and its use in the modification of later performances Hand and computerised notation systems facilitate the collection of information with the aim of analysing the players' movements, assessing the tactical and technical efficiency and providing statistical compilation. The development of computer and video technology has led to certain changes in the performance analysis and in the use of this analysis in the process of training improvement. The main methods of rendering the mentioned data more objective include the use of video/notation analyses Team sports can achieve significant success by using computerised notation analysis, and thus obtained information can be used for instant feedback, database development, identification of positions in the game that need to be improved.

2. PROBLEM AND AIM

So far there has been a number of scientific studies in the field of football where the authors engaged in the analysis of characteristics and abilities of football players (Casajus, 2001). There have also been studies where the authors focused on the analysis of situational efficiency of football players (Luhtanen, 1993). However, having studied the available literature, we have not been able to idenfity a single study of the correlation between, on the one hand, the indicators of situational efficiency measured by a computerised notation system and, on the other, and functional abilities of players This study tried to resolve the problem of correlation between, on the one hand, the indicators of situational efficiency and on the other functional abilities of the top football players. Thus, the aim of the study was to establish the correlation between all the measured variables and to establish the correlation between.

3. METHODS

The test group consisted of 11 football players of Zagreb Football Club playing in five football matches in the 2008/2009 season of the Croatian First League. The data was gathered at two locations. Firstly, the footballers' basic morphological characteristics were measured: height (cm), weight (kg) and subcutaneous fat tissue (%). Then they were subjected to a test with the aim to assess their energy capacity on the treadmill. The test measured the following variables: average maximum oxygen intake (mL $kg^{-1}min^{-1}$), maximum heart rate frequency (b min^{-1}) and maximum running speed (km h^{-1}).
The second part of the data collection refers to the collection of the indicators of situational efficiency, which was carried out by means of foxus x3, an up-to-date and most objective instrument of measurement of this kind. Foxus x3 is an interactive analysis system developed in accordance with the demands of top football coaches. Numerous studies have proved independently the efficiency of this system in providing accurate and reliable information (Di Salvo et al., 2006).
Ten indicators of situational efficiency were used in this research.

The gathered data were processed by SPSS v11.0, a statistical software product for data management and analysis. Then descriptive parameters and correlation coefficients were calculated, which was followed by the use of regression analyses with the aim of determining the correlation between, functional characteristics and, on the other, the indicators of situational efficiency. Every variable of these indicators was set as a criterion variable while the variables of anthropometric and functional characteristics represented a set of predictive variables. Limitations of this research is that there is a possibility to use much more sophisticated statistics programmess.

4. RESULTS

Criterion variable	ρ^2	$F_{(7,3)}$	P
Maximum running speed (km h^{-1})	0,63	0,73	0,67
Overal number of passed balls	0,84	2,24	0,27
Successfully passed balls	0,81	1,80	0,34
Unsuccessfully passed balls	0,98	24,95	0,01
Average sprint speed	0,83	2,07	0,30
Average sprint length (m)	0,51	0,45	0,83
Number of sprint runs	0,90	3,78	0,15
Covered distance in the first half (m)	0,23	0,13	0,99
Covered distance in the second half (m)	0,94	6,38	0,08
Covered sprint distance (m)	0,84	2,20	0,28

Tab. 1. Results of regression analyses

Statistically significant correlations ($p<0.05$) have been established between the following variables: overall number of passed balls and successfully passed balls (r=0,99), overall number of passed balls and unsuccessfully passed balls (r=0,79), unsuccessfully and successfully passed balls (r=0,71), average sprint length and maximum speed (r=0,83), number of sprint runs and unsuccessfully passed balls (r=0,63), total distance covered during the second half and number of sprint runs (r=0,62), total distance covered in sprint run and unsuccessfully passed balls (r=0,67), total distance covered in sprint run and number of sprint runs (r=0,91), height and weight (r=0,71), average maxium oxygen intake and total distance covered in sprint run (r=0,61), maximum running speed and number of sprint runs (r=0,76).

5. DISCUSSION AND CONCLUSION

The obtained values of the morphological characteristics are in accordance with the research carried out on top football players in some European leagues (Czech, Slovakian, Spanish and Swedish), as well as the average maximum oxygen intake that is insignificantly lower than in the mentioned research (Bunc & Pssota, 2001). The high correlation between the variable of the overal number of passed balls and the variable of successfully passed balls (r=0,99) on the one hand, and the variable of unsuccessfully passed balls on the other (r=0,79) results from presenting the data in absolute values. It is logical to assume that, on average, players with more passed balls also have more successfully and unsuccessfully passed balls. Trainers would especially profit if the future results for successfully and unsuccessfully passed balls per player were expressed in percentage and in relation to the total number of passed balls per game. It is interesting to notice that there is a statistically significant correlation between the variables of unsuccessfully passed balls and number of sprint runs (r=0,63) and the variable of covered distance in sprint run (r=0,67). Certain studies have proved that this is caused by the influence of tiredness on technical performance and accuracy in ball passing during a football match. The correlation of the variable of the number of sprint runs and the variable of distance covered in the second half (r=0,62) and the variable of the covered distance in sprint run (r=0,94) is understandable because the players with more covered distance in general, especially with more covered distance in sprint run, do more sprint runs during a football match. As a football player needs to cover a certain distance in order to reach high running speed, the correlation between the variables of average sprint run and maximum speed (r=0,83) is logical. The correlation of the variable of the number of sprint runs and the variable of maximum running speed (r=0,76) as well as the correlation of the variable of average maximum oxygen intake and covered distance in sprint run (r=0,61) indicate that players with better functional abilities are capable of doing more sprint runs. In other words, they can play in a football match with more intensity and have a shorter period of recovery after such an activity, which only supports the recent research that indicates that the maximum oxygen intake (VO2max) has a positive correlation with the covered distance in a football match

A series of regression analyses provided interesting results and showed that with such top football players the set of predictive variables consisting of several functional abilities (average maximum oxygen intake, maximum heart rate frequency, maximum running speed on the treadmill) are not a statistically significant predictive factor for the variable of the football players' situational efficiency measured by Foxus x3 system. The variable of unsuccessfully passed balls is an exception, which further proves the fact that the set of morphological characteristics and the measurement of functional abilities do not serve as indicators or predictors of high efficiency of top football players during a football match.A correlation between the sprint run number and maximum running speed was also established, as well as that betweeen the covered distance in sprint run during a game and maximum oxygen intake. Thus, we can conclude that football players with better functional abilities cover a greater distance in sprint runs (Smaros, 1980). A greater variety of functional and motoric variables should be applied in future research and their correlation with various indicators of situational efficiency of football players should be analysed as well. Foxus is primarily a tool that provides the detection of the real situational efficiency of an invidual player and the team in concrete situations. This is why it represents an excellent means of determining the concrete *behaviour* in a game. It is also an excellent additional test of morphological, motoric and functional abilities of football players helping to identify the good and bad sides of football training and improvements of sports performance that have to be carried out via the training process. Future researches will be focused on bigger sample of other sport clubs.

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