

**Original scientific paper**

# **THE COGNITIVE ABILITIES OF FOOTBALL PLAYERS IN RELATION TO COMPETITION RANKING**

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**Abstract:** The aim of this research is to examine the differences in the cognitive abilities of football players in higher and lower competition rankings. The research was conducted on a sample of 152 football players. The instruments which were used for measuring cognitive abilities were the following: the test for the evaluation of the input processor efficiency, i.e. perceptive reasoning (IT-1), the test for the evaluation of parallel processor efficiency, i.e. seeing the relations and correlates (S-1) and the test for the evaluation of the serial processor efficiency, i.e. symbolic reasoning (AL-4). Along with the basic statistics, the multivariate analysis of MANOVA variance was applied. The results showed that there was a statistically significant difference between football players of lower and higher competition rankings.

**Key words:** *football, cognitive abilities, competition ranking.*

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## **INTRODUCTION**

A psychological analysis of a sport activity indicates the existing of numerous human inherent psychological functions and different personality

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traits. The data acquired through a psychological research of various sport activities allows the determining of a psychological structure of sport activity (Rudik, 1973, as cited in Lilić, 2007). These characteristics are the following:

1. The social meaning of sports activity. This characteristic manifests itself through the motives that stimulate an individual to be involved with a sport activity. Considering motivational issues, psychology recognizes a contradiction between the social and personal meaning of motivation. Rudik believes that in sport activity, personal motives, in their essence, always have a social dimension as well. Sport activity has a substantial influence on physical development, and due to social significance, it has a capital influence on the athlete's socio-psychological personality traits. Therefore, analyzing the role of physical culture and sport as a personality development factor, Lazarević said: "Every performance of an activity in the domain of physical culture, apart from motor demands, requires consistent cognitive effort and the occurrence of motivational and emotional disposition of a person" (Lazarević, 1983, p. 12).
2. Sport activity demands considerable physical strength, endurance and a high level of physical fitness that is necessary for completing specific physical tasks.
3. Overcoming large technical tasks requires special, systematic, long and hard training sessions, where the athlete acquires and masters certain movement habits, physical qualities (strength, endurance, skills, speed) and will power (courage, persistence, emotional stability etc.).
4. Aspiration toward perfection and focus on the best possible results in a certain sport is also present. Athletes are never satisfied with their results and they permanently strive to achieve better results in their given sport.
5. Sports battle, which gains an edgy character during sport competition, exists as an integral part of a sport activity. It requires athletic skills development for maximal physical and mental efforts. Tactical solutions that are applied in sports battle demand a well-developed ability of observation, adaptability, initiative, sport anticipation etc.

Sport competitions have a great influence on sports activities. That influence is a result of several features of a competition. First of all, sports battle is tough, a result of the fact that every competitor wants to have better results than his opponent, i.e. to win. This intention demands athletic perfection that may be accomplished due to years of hard and monotonous training and physical, technical, tactical and psychological improvement. Without such preparation, which is essential for complex emotional situations that occur during competition, many talented athletes would not be able to reach the

required level of sport perfection, nor significant sport results due to weak psychological preparedness for tough elite sport trainings. Furthermore, sport competitors need to have heightened psychological skills - before all, perception, attention, thinking, swift and energetic expression of willpower.

At the end, competitors are challenged to great emotional engagement, in variety as well as intensity of emotions. Emotional intensity during a competition depends (Rudik, 1976, as cited in Lilić, 2007) from several circumstances, especially the following ones: personal and social significance of a competition, meaning that if the final result has decisive personal or social significance, an athlete experiences success or failure of his performance. Further, composition of participants, meaning that emotional intensity is enhanced if an athlete competes against a better opponent. Frequency of competitions indicates that experienced competitors have better emotional control. The degree of sport preparedness means that hard training sessions have as a consequence the emergence of strong emotions which serve to mobilize athletes for sport performance, depending on personal traits, disposition, willpower, self-control and other characteristics that result from the nervous system and stimulate athlete to sports battle.

Apart from emotional burdens, during competition athletes face many other obstacles, although the psychological ones are the most prominent. The results of the study conducted on athletes from several sports (Geron, 1973, as cited in Lilić, 2007) indicate the presence of psychological difficulties during competition. Athletes were asked about the nature of the difficulties they had during training and competition. The responses show that many difficulties appear throughout the time of training, but they are more intense during competition. The same author gained data which the problems which occur in training and competition. The biggest number responded that psychological difficulties dominate in competitions (68%), then technical ones (14%), and external factors (10%). Most participants stated that during training, technical problems prevail (32%), then psychological (29%), physical (27%) and other factors (12%).

Lazarević (1983) in his analysis of sports activity essence starts from the fact that sport is for the most part socially determined and that motivation is in the centre of any activity, including sports, as is explained by well-known and accepted psychological theories. From the point of view of the psychoanalytical theory of personality, one of the most typical and dynamic features of sports – its competitive character – entails a form of energy release formed due to suppressed instinctive impulses. According to psychoanalysts, such a process causes anxiety that is reflected through various activities. Sports activity, viewed that way, could be a way to display aggressive tendencies, i.e. suppressed instinctive energy is freed through a socially acceptable form of sport battle. However, sports activity features enable people to express their

aggressive tendencies through socially acceptable and positively evaluated activity. The goal of defeating an opponent ensues from the willingness for domination and represents one of the main conditions for sports success. The basis for that explanation lies in the well-known thesis of psychoanalysts that tendencies suppressed by parents at young age, during peer activities such as sport in later life, appear as a need for an active role and domination mainly in sports. Satisfaction in competitive battle is earned by gaining experience which originates from a person's competitiveness or due to approval that comes from others. It means that aggressiveness in sport comes, not only from instinctive impulses, but also from external gratification which represents a basis of the instrumental aggressiveness principle as well. In that case, sports contest as a socialized form of aggressive behavior, is a way to decrease psychological and physiological tension. Sports and physical activity could be considered as an unconscious aspect of motivation, where, according to psychoanalysis, the principle of satisfaction dominates (Floyd, 1973, as cited in Milojević, 1991).

Modern high sports performance is often described as "personality torture", primarily through tough trainings and competitions, and therefore it is hard to use the "principle of satisfaction". Despite that, sport competition enables a fulfillment of competitive impulses suppressed during childhood, and provides an adequate place within the social environment through acceptance, approval and affection. Basically, sports participation according to the psychoanalytical pattern is considered a sublimation of instinctive impulses. Egoistic and non-socialized impulses through sports attain a certain satisfaction which has a socialized form. With the help of psychoanalytical theory, some relations within sport activity could be revealed, identified and explained, but it is not enough to elucidate all the sacrifices and enormous efforts that elite athletes sustain. Further explanations can be found in motivational factors as actuators of different forms of relationships of sport activity participants. The energy for this activity ensues from not only biological sources, but from motivation that originates from the social and psychological area of the personality. As a theoretical basis to explain sports activity, the theory of self-actualization is probably more appropriate, as it emanates from theories that implicate the so-called "integrated unity" of complex entirety and the phenomenological approach, i.e. theories that encompass the phenomenological or gestalt concept in its core. A special influence on this concept is exerted by existentialism, which emanates from humanistic sciences and philosophy. Representatives of this school emphasize the significance of self-fulfillment of man's existence, as the main drive for human activity is the motivation of self-actualization. Therefore, sport as self-actualization means that the expression of its inherent potentials has a healthy core, and in that case the difference between work and play ceases to exist. If an elite athlete

achieves self-actualization through sport, s/he reaches satisfaction by experiencing herself/himself as a complete personality. Participation in high performance sports, where supreme sport creativity is renowned, is considered as the satisfying of the human need for a “higher order”, i.e. man’s wish “to become more and more his own idiosyncrasy, everything that he could be” (Lilić, 2007, p. 36).

## **METHOD**

Football is, first and foremost, a sport that in its essence constitutes the backbone of all sports phenomena. Modern football is characterized by a high degree of physical, psychological and technical preparation; an abundance of tactical combinations, speed and precision of actions. The basic characteristic of this game lies in the coordination of technical-tactical elements that aim at efficient offensive action ending with a maximal cooperation of the team mates.

Success in all sport activities, including football, considerably depends of the quality of the personality’s psychosomatic dimensions. Because of that, it is necessary, based on exact scientifically proven etiology, to recognize the level and quality of the given features in the first sports stage – selection. The identification of these dimensions and relations of training procedures greatly determines the rational and humane path to sports success.

To be more precise, the aim of this study is the identification of differences that exist between players of different competition rankings and the recognition of quantity indicators that differentiate them. The main purpose of this study is to determine whether there are differences in the cognitive abilities between the players of different competition rankings.

## **Sample**

The selection of the sample of participants was conditioned by the organizational and financial possibilities needed for the research procedure. It was necessary to provide a sufficient number of qualified and trained assessors, as well as certain instruments and standardized conditions for realizing the intended research. The study was conducted on a representative sample for the whole of the Republic of Serbia.

Measurements were carried out in the football clubs from the Pomoravska zone and the Rasina county football league.

In order to realize research in a correct manner and to have stable results with the sample, it was necessary to include an adequate number of examinees. The sample size, for this kind of research, depends on the study aims and tasks, population size and the variability degree of the applied parameters.

Based on the chosen statistical-mathematical model, the program and study aims, we decided to include 154 participants in the sample and 77 in each subsample.

### Variables

This study relies on the results of the research on the structure of cognitive dimensions conducted in Serbia (Momirović, Gredelj & Hošek, 1980; Momirović, Bosnar & Horga, 1982), which are highly congruent with the results of the studies conducted in other countries.

These studies have provided unequivocal proof that the structure of cognitive abilities is of a hierarchical type, with a general cognitive factor on the top and three primary factors of cognitive abilities below, which deal with the efficiency of the perceptive processor (perceptive reasoning), the efficiency of the parallel processor (ability to register relations and correlates) and the efficiency of the serial processor (symbolic reasoning).

The factor of perceptive reasoning is defined as a latent dimension that is responsible for input and information processing, as well as for solving problems whose elements are immediate to the field of perception. This factor represents the intelligence of Thurstone's perceptive factors, and is similar to Alexander's practical factor, Cattell's general perceptive factor and to the factor of general function by Horn and Stankov.

The factor of relations and correlate training is defined as a latent dimension responsible for uncovering the relations between the elements of a structure and the requisite characteristics of such structures in solving problems where the processes of determination and restructuring are independent of the previously gathered information. This factor corresponds to Cattell's factor of fluid intelligence.

The factor of symbolic reasoning is defined as a latent dimension that is responsible for processes of abstraction and generalization and for solving problems whose elements are any kind of symbols, especially verbal ones. This factor corresponds to Cattell's factor of crystallized intelligence which is formed in the process of acculturation, and represents an integration of both Thurstone's verbal factors and his numerical factor.

For the assessment of the efficiency of the input processor, or perceptive reasoning, we chose test IT-1: the test of pairing is intended to estimate perceptive identification and discrimination. The test has 30 tasks and the working time is limited to 4 minutes. Test analysis (Džamonja, et al., 1973) shows a difficulty of tasks and its inter-correlations, indicating that this was a typical speed test.

For the assessment of the efficiency of the parallel processor, or registering relations and correlates, we used test S-1: the test has 30 tasks

where one out of 4 optional answers is chosen. The working time is 10 minutes.

For the assessment of the efficiency of the serial processor, or symbolic reasoning, we chose test AL-4: the test of synonyms – antonyms by F. L. Wells, which is intended to estimate the identification of the denotative meaning of verbal symbols. It has 40 tasks of two optional choices. The working time is limited to 2 minutes; hence this test belongs to the category of speed tests. The first main object of the measurement is to be predominantly defined by tasks from the second half of the test and it is interpreted as ability of a quick identification of the denotative meaning of verbal symbols.

### **Statistical analysis**

It is a known fact that the value of research depends not only on the sample of participants and the selected variables, but also from the applied method for data transformation and condensation. A certain scientific problem is possible to be resolved by utilizing a few different and sometimes equally valuable methods. However, with the same basic data, from the results of different methods, different conclusions could be drawn. That is why the problem of selecting the appropriate data analysis method is a very complex one. The data was computed utilizing the appropriate mathematical-statistical procedures. Applied procedures and their order of application have its place in scientific and research work and it is important to take care of the collected data from data loss. The order of applied procedures is of the utmost importance for making conclusions, as well as well-timed elimination and the inclusion of certain characteristics that could provide a better quality of the study. For all variables that are an object of the study, basic descriptive statistic parameters were computed. The applied methods provided gathering of the distributions and parameters of distributions for manifest variables. In this study we used multivariate procedures - multivariate analysis MANOVA and discriminant analysis, and from univariate procedures we applied the ANOVA analysis. To prevent data loss, by finding the finest connections and information on non-parametric values, we did data scaling on contingency tables. This procedure, based on frequency, appointed a real number to each class. The fact that on scaled values it is possible to apply procedures related to the proportion scale indicates that in this way it is possible to learn more by research than by procedures and methods related to non-parametric scales. However, data scaling does not exclude the application of non-parametric tests. Relying on the above stated, it is clear that scaled data allows the application of a multivariate analysis of variance (MANOVA), Roy's test and other parametric procedures and methods. Of univariate procedures

we used Roy's t-test, Pearson's coefficient of contingency (c) and the coefficient of multiple correlation (R).

The purpose of mathematical-statistical analysis is to determine the characteristics of each subsample, the homogeneity and distance between them in relation to the derived characteristics, in order to execute a reliable and precise prognosis.

## RESULTS

This chapter presents the differences and similarities between the two groups of participants (football players of higher and lower competition rankings) in relation to the three variables for assessment of cognitive abilities, in order to prove or dismiss the assumption of significant differences between two competition rankings of football players (higher ranking, lower ranking) referring to the three assessments of cognitive abilities.

Table 1. *Significance of differences between participants in reference to the measured cognitive abilities*

	n	F	p
MANOVA	3	8.720	.000
DISCRIMINANT	3	8.720	.000

In the process of analyzing the cognitive domain using multivariate analysis of variance (MANOVA) and discriminate analysis, we found that the analyzed groups of football players (lower and higher competition rankings) statistically significantly differ (Table 1;  $p=.000$ ) in cognitive abilities with a clearly defined margin between them.

Table 2. *Significance of differences between participants in reference to the specific variables of the cognitive domain calculated by univariate procedures*

	$\chi$	R	F	p
it1	.276	.287	13.320	.000
al4	.284	.297	14.266	.000
sl	.214	.219	7.438	.007

In the process of univariate analysis (Table 2), based on Roy's t-test, Pearson's coefficient of contingency (c) and the coefficient of multiple correlation (R), it is determined that groups of participants (football players from lower and higher competition rankings) statistically significantly differ in cognitive abilities.



Table 3. *Coefficient of discrimination between groups of participants in reference to the assessment of cognitive abilities*

	Coefficient of discrimination
al4	.058
it1	.035
s1	.029

The coefficients of discrimination (Table 3) indicate that the highest contribution to discrimination between the two groups of participants is rendered by variable al4 (efficiency of the serial processor), followed by it1 (efficiency of the perceptive processor) and variable s1 (efficiency of the parallel processor). The values of the obtained coefficients seem logical, bearing in mind that the efficient work of a serial processor means a quick sequential browsing of short-term and long-term memory and an analysis of information transformed into a symbolic code.

Table 4. *Homogeneity of groups of participants in reference to the assessment of cognitive abilities*

	m/n	%
Higher ranking	54/76	71.05
Lower ranking	45/76	59.21

A correct recognition of the group characteristics is presented in Table 4, where the homogeneity indicator shows how similar the participants are within the group.

The defined characteristics of the group – 54 of 76 participants have a higher ranking, the homogeneity is 71.053% (higher), meaning that 22 participants have different features than others from their own group. The defined characteristics of the group – 45 out of 76 participants have a lower ranking, the homogeneity is 59.21% (lower) as 31 participants have other features.

Table 5. *The Mahalanobis distance between competition rankings of football players in reference to the assessment of cognitive abilities*

	higher	lower
Higher ranking	.00	.84
Lower ranking	.84	.00

Calculating the Mahalanobis distance between the two groups of participants, we get yet another indicator of differences or similarities. The distance of different domains can be compared and the results (Table 5) in-

indicate that the distance between groups of football players from lower and higher competition rankings is moderate.

## DISCUSSION

In earlier studies, several authors found that athletes from a higher competition ranking in different sports have better results on tests of perceptive skills, as well as receive more information and process them more efficiently than athletes from a lower competition ranking (Allard, Graham & Paarsalu, 1980; Allard & Starkes, 1980; Starkes, 1987; Ripoll, 1988; Helsen & Pauwels, 1993).

An analysis of discrimination coefficients between the two groups of participants indicated the greatest discrimination in the work of the serial processor, whose more efficient operating implies an acquired knowledge, an ability of verbal and symbolic reasoning, among other things about the motor tasks technique, as well as different tactical variants which are abundant in football.

The results of the present study are to a great extent consistent with the results of previous studies (Ward & Williams, 2003), where authors found that elite football players (from different age groups) significantly differ from the players of lower competition rankings in perceptive and cognitive abilities which enables them to have a more efficient input, processing and integration of contextual information, which is one of the main factors of their success. Based on the mentioned facts, it is realistic to assume that similar reasons cause differences in players from higher and lower competition rankings from our study.

## CONCLUSION

The study is conducted in order to determine the discrimination of pre-defined groups of participants in a certain timeframe and in a number of analyzed cognitive dimensions.

Based on the results of the analysis which tested the differences between participants of two competition rankings, the following conclusions can be drawn:

The results of the study showed a statistically significant difference between the two groups of participants in the domain of cognitive abilities, in favor of the players from a higher competition ranking. Overall, players from higher competition rankings have better results in tests of cognitive abilities, better general intelligence (G), and better results in the tests of perceptive abilities, which is most probably one of the key factors of their sports success.

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