UNIVERSITY OF NIŠ
The scientific journal **FACTA UNIVERSITATIS**
Series: **Physical Education** Vol.1, N° 4, 1997, pp. 37 - 44
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SOME MENTAL FACULTIES OF THE TOP SPORTSMEN

UDC: 159.95:796.071.2

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Abstract. *This research of inquisitive character has aimed at examining the level of development of many mental abilities (such as those related to space, perception and others) of the sportsmen who have taken part in the First Federal League competitions. The basic goal has been to determine whether there are differences, regarding the level of development of the above-mentioned abilities, between handball players and football players; in addition, the sex differences have also been examined. The measurement of the abilities has been done by applying the ability tests that most of all register the following psychological operations: visualization, visual transformation, spatial reasoning, conclusion-making by analogy, shaping flexibility, perception of shapes, speed of perceiving identical figures, classification of figures and style of perception (dependence or independence of the field). The analysis done on the results has shown that the level of development of the examined mental abilities differs among the sportsmen depending on their sex and the kind of sport they practice.*

Key words: *mental abilities of perception, mental abilities related to space, mental profile of the sportsman*

INITIAL POSITIONS

In the last few years the sports population has increasingly becoming an object of a great variety of psychological examination. Most of these analyses, both in Yugoslavia and the world at large, are concerned with analyzing structure and dynamics of the sportsman's personality, or with the psychological profiles of the sportsmen regarding their specific traits for particular groups of sports or particular sports disciplines. The results of this research show that sports practice is the choice made by individuals with somewhat characteristic personality's profile; it has also shown that sports practice has an effect upon forming certain psychological characteristics, especially those that are relevant for acceptance and success in a particular sports discipline.

Received March 18, 1996

Though many research projects have confirmed importance of mental abilities in predicting success in sports, the true nature of this relation has not been completely explained as far. The question of the sportsman's mental structure, the question of manifesting one's mental abilities in particular sports situations (training and competition) as well as the question of the intellect's participation in the sports' result of each individual are only some of the issues that require permanent research on the part of psychologist and pedagogue of physical culture. The research done so far concerning the above-mentioned issues can be roughly divided into two following groups. One group comprises those that deal with links between cognitive, conative and motor activities. An impressive number of research projects in this domain has been done by A. H. Ismail with his associates and K. Momirovi} with his associates. The results of this research that comprised various samples (normal and mentally retarded examines, examines of different age, examines involved or not involved in sports) have shown several interesting things; namely, a) they have shown that there is a significant correlation between mental and motor abilities. The correlation increases if motor tasks are more complex, and they are the greatest with the tasks that involve coordination. The correlation between mental and motor abilities decline with age, b) they have also shown that the variables of growth (weight, height) as well as tasks of speed, force, power and precision are not significantly correlated with intelligence and school achievement.

The second group of projects comprises a really scarce number of those that are focused upon mental profiles of sportsmen and non-sportsmen. As for our country, an impressive project concerning this has been carried out by the psychologist O. Stojanovi}. By analyzing sportsmen's abilities she has come to the conclusion that a successful sportsman should possess the ability to register one or more configurations in the perception field among many other irrelevant sensations; moreover, he should have the ability for orientation in space, that is, the ability to perceive space relations between objects and their distribution, as well as the ability to predict possible changes induced by their motion. He should also possess the ability of fast visualization (perception speed) of a complex perception field, as well as of its coordination with the motor realization of a task; then, he should be able to manipulate objects in space and transform imagined space relations just as he should be able to analyze and restructure a complex perception field and make a synthesis of a new object of perception.

RESEARCH PROBLEM AND HYPOTHESES

Having in view the fact that in this domain there has been a much greater number of research projects concerning the coordination between diverse mental and motor abilities than those dealing with the determination of the sportsman's profile, our choice of this preliminary research has been to search for an answer to the question referring to the degree to which sportsmen competing in various sports disciplines of the top league possess some of the mental abilities that are assumed to be relevant for success in sports. More concretely, this research has compared the level of development of some significant mental abilities of the sportsmen practicing handball and football. Regarding the fact that both the sexes are practicing the above-mentioned sports (both male and female) we have also searched for differences in these mental abilities regarding the sex.

Regarding the above-mentioned research problems the following hypotheses have been made:

1. Differences are expected in the level of development of perception-mental and space-mental abilities between handball players and football players, and,
2. Differences are expected concerning the level of development of mental abilities between male and female players.

INSTRUMENTS

The following tests have been used for measuring mental abilities:

Unfolding the Rolls (T1)

This test is popularly called the "rolls" and it contains 24 tasks. The examine is required to determine which of the four offered pictures is obtained when the roll is unfolded. Each properly solved tasks brings about 1 point.

Rotation of Figure (T2)

The test comprises 18 tasks and the examine should find all the figures that are identical with the offered one regardless of his position. The test is graded by subtracting the number of the wrong answers from that of the right answers on the condition that the overall score must not be less than zero.

Spatial reasoning (T3)

This test is popularly called "small bricks". It has 30 tasks. The examine should give the number of the small bricks that the marked small brick is touching with any of its sides. This is one of the well known general intelligence tests. Each right answer brings about one point.

Figure Analogies (T4)

This test comprises 30 tasks. Each task consists of a given pair of figures in a certain correlation and a new figure for which another figure that should be in the same relation with it as the given pair is sought for. This is one of the well known tests of general intelligence.

Hidden Figures (T5)

The tests consist of 30 complex geometric compositions and five simple standard figures. The examine is to find which of these figures is hidden in each of the given compositions. This test is not only that of abilities but it is the one of a special style of observation which is known in psychology as dependence-independence of the field. Each correct answer brings about one point.

Completion of the Square (T6)

This test contains 20 tasks. The examine is offered five parts in order to find the one which, when added to the offered part, forms the square. This is also a general intelligence test. Each correct answer is worth one point.

Perception of Shape (T7)

The test has 60 tasks. The examine should find as soon as possible the figures identical to the given ones. Each correct solution brings about one point.

Identical Elements (T8)

The test has 48 tasks. The examine is supposed to choose for each given picture - among several offered ones - the one which is identical to it. Each correct answer is worth

one point.

Figure Classification (T9)

It comprises 28 tasks. In each of them the examine should find, among five offered pictures, the one which is in some respect different from others. Each correct answer is given one point.

All the above-mentioned tests are of the paper-pencil type and are assigned as those of speed. Most of them are not standardized, but they have all been applied in numerous research projects (primarily, those of A. Bukvi}, B. Ne{i}, and others) in which their metric characteristics have been checked (validity, reliability, objectiveness and ability to discriminate). Otherwise the tests have been chosen in order to record the following psychological operations: visual conclusion-making, visualization, spatial reasoning, conclusion-making by analogy, style of perception (dependence-independence of the field), shaping flexibility, perception of fine distinctions, of complete identity and classification on the principle "it is not like the others".

DESCRIPTION OF THE EXAMINES' SAMPLE

The research was carried out on the sample of 61 examines. They were sportsmen from four clubs from Niš who took part in the First Federal League competitions. These are: the Handball Club "DIN", Niš, the Handball Club "Železničar", Niš, the Football Club "Radnički", Niš and the Women's Handball Club "Mašinac", Niš.

The players of the Handball Club "DIN" include the girls who are on average 22,2 years of age. Most of them have completed high school, two of them have University grade and one is a student. Their parents are workers or clerks with the completed high school expect for one whose parents are teachers.

The Football Club "Mašinac" has female players whose average age is 19,1 years. The majority of them attend high school, while two of them have a University grade. Their parents are mostly workers and clerks. The mothers of five girls are housewives.

The Handball Club "Železničar" comprises the players whose average age is 22,3 years. Not more than five of them have only completed high school; all the others are students. One player has completed the Faculty of Medicine, while five of them attend the Faculty of Mechanical Engineering. Comparing to the other clubs, the social status is somewhat more favorable regarding the fact that there is a number of dentists, economists, teachers and others among the parents.

The Football Club "Radnički" has the players whose average age is 22,7 years. One player is a student, two of them attend high school while the others have completed high school. Except for two cases, the players are from workers' families.

STATISTICAL DATA PROCESSING

Regarding a rather small number of examines (15 in each group) we have decided to use several statistical techniques for this research: arithmetical mean, standard deviation, standard error of arithmetic mean and standard error of the difference between arithmetic means. As a test for checking up the importance of the differences between arithmetic means we have applied T-test on the abilities testing.

RESULTS OF THE RESEARCH

Average values and standard deviations of the examined groups subdued to the mental abilities′ tests are shown in Table 1.

Table 1. Arithmetic Means (M) and Standard Deviations (Sd) of the Examines Subdued to the Mental Abilities' Tests

	Handball- male		Handball-female		Football- male		Football-female	
Test	M	Sd	M	Sd	M	Sd	M	Sd
T1	11.8	5.1	5.0	2.2	6.0	1.7	9.1	3.9
T2	11.8	2.5	9.2	3.1	8.6	3.0	14.0	5.2
T3	18.8	7.4	10.3	7.8	13.5	6.0	12.6	6.8
T4	14.7	3.1	8.7	4.5	10.4	2.8	8.1	4.1
T5	13.3	3.5	7.8	2.2	8.5	2.2	10.6	2.9
T6	12.8	3.6	7.4	3.9	7.7	2.4	7.7	3.0
T7	29.6	8.5	24.1	7.9	26.4	6.1	27.1	7.9
T8	31.1	5.0	28.2	5.1	29.6	7.6	30.2	3.9
T9	19.5	2.7	14.1	6.3	14.4	4.7	17.1	3.5

The given Table show that the examined groups of sportsmen achieved various results on the tests of abilities. By checking upon the importance of the differences between the average achievements of the examined groups we have reached the following conclusions:

1. By comparing the results of the handball and the football players we have found that the handball players have achieved better results in all the tests (Table 2).

Table 2. Test of the Importance of the Differences Between the Arithmetic Means of the Sportsmen (Handball and Football Players) Obtained by the Mental Abilities' Tests

	T1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9
Dm	5.8*	3.2*	5.3*	4.3*	4.8*	5.2*	3.2*	1.5*	5.1*
p	0.01	0.01	0.05	0.01	0.01	0.01	-	-	0.01

* differences advantageous for the handball players

Having in view the fact that these differences are advantageous for the handball players, and that they are even statistically significant in seven of the given tests while they are insignificant only in the two of them, we believe that the level of development of the psychological operations recorded by the applied tests (such as visualization, perception of identical rotating figures, visual conclusion-making, conclusion-making by analogy, flexibility of shaping figures and style of perception - dependence or independence of the field) is much greater than that for the football players. Starting from the fact that all the applied tests (especially those of figure analogies, figure classification and completion of the squares) show the level of intelligence we can say that the handball players are at a higher mental level than the football players. The Table further shows that the differences in the two tests recording the simplest abilities of perception between the handball and the football players are not important. Therefore, these abilities, especially speed of perception, are equally important for both the sports.

The recorded differences in achievements on the tests of mental abilities which are in favor of the handball players can primarily be explained by a higher level of schooling of the handball players (there are 5 students of the Mechanical Engineering Faculty, two students of the Physical Culture, one doctor of medicine and one dentist among the handball players), since among the football players only one of them is a student whereas the others have only completed a primary or high school. Having in view the fact that the average age of both the teams is approximately the same and that the teams have approximately the same experience in sports practice, then the hypothesis that particular branches of sports develop some abilities more significantly than others seems very probable.

2. The opposite conclusion has been reached after comparing the achievements of the female handball players with those of the female football players (Table 3).

Table 3. Test of the Importance of the Differences Between the Arithmetic Means of the Players (Female Football and Handball Players) Obtained by the Mental Abilities' Tests

	T_1	T_2	T_3	T4	T_5	T_6	TF_7	T_8	T_9
Dm	4.18*	4.7*	2.2*	0.6*	2.8*	0.3*	2.9*	1.9*	2.9*
p	0.01	0.01	-	-	0.01	-	-	0.05	-

* differences advantageous for the female football players

Namely, the female football players have shown a significantly better success than the handball players in some tests. In the rest of the tests no significant difference has been noticed. If we consider the fact that the female handball players are somewhat better than the female football players regarding their schooling and that they practice sports longer than it is more reasonable to expect them to show a better result in the tests of the examined abilities. However, their test results are worse than those of the football players. Why? Unlike the female handball which has a longer tradition, the female football is a sport that has been developing just now (at least in the team being examined) and thus it is more attractive (arousing sports curiosity) than the handball. It seems that this is one of the essential reasons why this sport attracts more capable girls than the handball.

3. The handball players (male) have shown in all the tests (expect for one) considerably better results than the female handball players (Table 4). These differences can be explained primarily due to a higher educational level of the handball players as well as due to their greater experience in this sport.

Table 4. Test of the Importance of the Differences Between the Arithmetic Means of the Players (Female Handball and Male Handball Players) Obtained by the Mental Abilities' Tests

	T_1	T_2	T_3	T_5	T_6	T_7	T_9	T_{10}	T_{11}
Dm	6.8*	2.5*	8.4*	6.0*	5.5*	5.5*	5.5*	2.9*	5.4*
p	0.01	0.05	0.05	0.01	0.01	0.01	-	0.05	0.05

* differences advantageous for the male handball players

4. There are some differences between the male and female football players; in some

tests these differences are advantageous for the football players (for instance, conclusion-making by analogy), while in the others they are advantageous for the female football players (for instance, test of visualization, rotation of figures, and style of perception). This is shown in Table 5.

Table 5. Test of the Importance of the Differences Between the Arithmetic Means of the Players (Female and Male Football Players) Obtained by the Mental Abilities' Tests

	T_1	T_2	T_3	T_5	T_6	T_7	T_9	T_{10}	T_{11}
Dm	3.05*	5.4*	1.07	2.31	2.12*	0.04	0.65*	0.59*	2.64*
p	0.01	0.01	-	0.05	0.05	-	-	-	-

* differences advantageous for the female football players

Though in most of the tests the differences are not significant, a certain advantage on the part of the female football players can be explained by a higher level of education comparing to the male football players.

Let's sum up: The results' analysis shows the following:

1) The best results in almost all the applied tests of abilities have been achieved by the handball players. Their test results are significantly better than those achieved by the other three groups of sportsmen (male football players, female football players and female handball players),

2) The female football players' results in most of the tests are better than those of the female handball players and of the male football players, and,

3) The achievement of the female handball players is in most of the tests lower than that of the other groups with which it has been compared.

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NEKE MENTALNE SPOSOBNOSTI VRHUNSKIH SPORTISTA

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U istraživanju koje je eksplorativnog tipa ispitivan je nivo razvijenosti nekoliko primarnih

intelektualnih sposobnosti sportista koji se bave rukometom i fudbalom. Obuhvaćene su četiri ekilpe koje su se takmičile u Prvoj saveznoj ligi i to: rukomet - muškarci, rukomet - žene, fudbal - muškarci i fudbal - žene. Testovi sposobnosti izabrani su tako da registruju sledeće psihološke operacije: vizuelno zamišljanje, vizuelnu transformaciju, prostorno rezonova nje, zaključivanje po analogiji, fleksibilonost uobličavanja, zapažanje finih razlika u oblicima i dimenzijama likova, brzinu uočavanja identičnih figura i stil opaža nja (zavisnost - nezavisnost od pola). Preliminarna analiza ranga uspeha na testovima sposobnosti je pokazala sledeće: Najbolje rezultate u skoro svim prime njenim testovima postigli su rukometaši. Njihovi testovni rezultati su bili bolji od rezultata koje su postigle ostale tri grupe sportista (fudbaleri, fudbalerke i rukometašice). Postignuća fudbalerki su u većini testova bolja od postignuća rukometašica i fudbalera. Na kraju, uspeh rukometašica je u većini testova slabiji od ostalih grupa koje su upoređivane. Prema tome, rezultati pokazuju da je nivo razvijenosti različitih intelektualnih sposobnosti različit kod različite grupe sportista što može doprineti uspešnijoj selekciji mladih za razne vrste sportova.

Ključne reči: *mentalne sposobnosti percepcije, mentalne sposobnosti u odnosu na prostor, mentalni profil sportiste*