

Preliminary Research Report

**THE OBJECTIVITY OF SITUATIONAL-MOTOR COORDINATION
MEASURING INSTRUMENTS IN GYMNASTICS**

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Abstract. *On a sample of 112 boys and girls who had previously been selected for gymnastics from six of the elementary schools of Niš, the metric characteristics of 19 situational-motor coordination tests which are known to date and which have been used in the selection process in gymnastics in eight countries in Europe and the former Yugoslav republics have been determined. The authors have classified the aforementioned measuring instruments into five hypothetical areas of coordination including: The performance speed of complex motor tasks (4); Agility (3); Rhythm coordination (4); Precise performance of complex motor tasks (6); The precise management of hand motions in space (2). This paper presents the results of the objectivity of measuring instruments by calculating Pearson's correlation coefficient and by implementing Hotelling's canonical-correlational analysis for each of the tests for the purpose of evaluating the objectivity of the analyzed composite tests. Two sets of variables, between which a canonical correlation was found to exist and therefore the objectivity of the composite test represented the course three measurings which were noted on the part of two measurers in an actual test on involving the same sample of examinees. Bearing in mind that the value of the first pair of canonical factors best explains the connection between the two systems of variables, the first canonical equation root was used as the indicator for the objectivity of the given composite test. The aforementioned results indicate that 18 out of the 19 measuring instruments for the evaluation of situational-motor coordination in gymnastics have significant values when it comes to objectivity and can be recommended for practical use. Only one of the tests for the evaluation of the ability to precisely perform complex motor tasks - the Standing jump accompanied by asymmetrical motions of the extremities (SJSE) was classified among the group of measuring instruments of unacceptable objectivity and requires additional restandardization of the measurement procedure.*

Key words: *gymnastics, objectivity, situational-motor coordination, measuring instruments, canonical-correlational analysis*

1. INTRODUCTION

In modern theory and practice aimed at solving the various problems of how to successfully manage the process of selection in sport as well as in gymnastics, various measuring instruments dealing with all the relevant dimensions of the athletes' personalities are implemented. Meanwhile, measuring motor abilities could be characterized as one of the most complex problems of their interconnection as well as their connection to other anthropological dimensions, due to an insufficient differentiation of their inner structure factors as well as the imperfection of the existing measuring instruments. Seeing how motor abilities are latent in character, it should be mentioned that it is impossible to measure them directly, and it is only done in an "indirect" manner. Information regarding the quality of certain motor abilities is obtained mainly by measuring certain motor reactions – manifestations. The complexity of the measuring process increases through constant development and the changes that happen to humans, as well as the uncertainty and complexity of their motor behavior in various specific situations.

Regarding the problem of evaluating coordination it is important to point out the problem of performing an "objective" measuring. The objectivity of any measuring instruments is especially questionable in the case of a qualitative evaluation of a completed task, or when the test result is not evaluated by means of an objective amount measure, but conditioned units – scores (points) which characterize the performance quality of the task. The extent to which the results depend on the subjective factor in these tests is significantly greater than in the tests which include a quantitative analysis of the results. Bearing in mind the fact that the results in gymnastics are assigned a qualitative value, it is understandable that a large number of coordination measuring instruments of this kind (measuring exclusively the precision and quality of the reproduction of the set motor task), should be present in the process of selecting eligible gymnasts. Any improvement in the objectivity of these measuring instruments is achieved solely by a precise definition of the evaluation criteria as well as the introduction of a large number of measurers who participate in the evaluation (in which case the mean is taken into consideration). Since the measurers can on occasion be unobjective (biased) while evaluating, there are several ways in which to condense the data into a single grade (the criterion variable). While implementing measuring instruments for coordination in gymnastics, apart from the aforementioned metric characteristics, one should also pay attention to task difficulty, or to be more precise, its adequacy in relation to the subjects, as well as the whether or not its implementation is economical. On occasion it is better to implement a test of somewhat lesser but still satisfactory metric characteristics, but one which is simpler and more economical (it requires less space to perform, simpler props available at every school or sports club, a single examiner and the like). It is also important to mention that once the measuring instruments' metric characteristics have been determined they do not have a lasting and universal value, as they have been obtained by means of the overall specific measurement situation and the sum of the characteristics of the entity which carries the information for the corresponding research. That is why it is important to successively check the metric characteristics. While making the choice of candidates who will make gymnasts, the relevant criterion is the level of development of the candidate's motor abilities and his abilities to acquire the specific motor skills of gymnastics as well as the ability to quickly and efficiently increase them in training. It is also necessary to mention that even the best combination of the relevant motor abilities for gymnastics does not

guarantee success in this sport. This kind of success is the consequence of the influence of other, already mentioned factors, which is proof of the complexity of this sport.

Numerous people have dealt with the problem of the metric characteristics of tests in gymnastics: Proje, 1982; Šadura, Čaklec & Živić, 1990; Todorov & Mikov, 1994; Veličković, 1999.

Proje (1982) researched the metric characteristics of the newly-constructed complex polygon of alternate movement test, spatial orientation, the obstacle course, the "boomerang" flexibility test and the complex movement task polygon. On a sample of 81 students, aged 9, all involved in the "school" of gymnastics of the Gymnastics Federation of Slovenia, the metric characteristics of all the tests were determined, with a special emphasis on the reliability of all the measuring instruments.

The author concludes that all the measuring instruments and especially the agility and complex motor skills polygon can be used in gymnastics.

Šadura, Čaklec & Živić (1990) researched the metric characteristics of situational-motor tests used for measuring the effects of gymnastics training. The research was carried out on a sample of 30 female gymnasts ages 6 and 7. The sample of variables consisted of 8 composite situational-motor tests. Taking into consideration that the results are within the normal range, and that the high values of reliability, homogeneity and representability have been found, the author has drawn the conclusion that all the tests have satisfactory metric characteristics.

Mikov & Todorov (1994) researched the discriminative value of the measuring instruments of a set of motor tests of the Bulgarian Gymnastics Federation on a sample of 52 seven year-old boys. The results indicate a weaker sensitivity of the test for the evaluation of repetitive strength – hanging leg raises. The authors concluded that the proposed norms for this test must be determined later by an improvement of the discriminative value of this test or its modified version.

Veličković (1999) researched the value to be gotten from the application of all the implemented coordination tests up to that time (19) which are in use for the selection of gymnasts, on a sample consisting of 228 seven year-old boys. The author determined the metric characteristics of all 19 tests and on the basis of the research results proposed a set of 8 measuring instruments for the determination of coordination skills. On the basis of the obtained results, he proposed a reduced set of 4 instruments used for measuring coordination skill to be used in practice.

The subject matter of this paper is the problem of the objectivity of the restandardized situational-motor coordination tests which have been and which are being used in the selection process in gymnastics in what was formerly the USSR, Bulgaria, the former republic of Czechoslovakia, Romania, Greece, the former Yugoslav republics (Slovenia, Bosna and Herzegovina) and Serbia and Monte Negro.

The aim of the research is to determine whether or not the measurement results of the existing, restandardized measuring instruments are more independent than a measurer, and whether or not, on the basis of that, they could be recommended for actual use for gymnastics selection or whether they require a new restandardization.

2. THE METHOD

The sample of examinees

The sample of examinees used in this research represents in fact just one sub-sample of 112 individuals extracted from a sample consisting of 288 individuals, aged 7 (± 6 months), all first graders in the elementary schools of Niš. The sample encompassed all the first grade students from the following educational institutions: EL "Moša Pijade", EL "Dositej Obradović", EL "Radoje Domanović", EL "21 Maj", EL "Sveti Sava" and EL "Čele Kula" (Table 1). The choice of schools from which the sample was put together was not accidental, and the condition was that all the schools should in their location gravitate toward the primary gymnastics organization (GC "Niš") and the gymnastics base at the "Sveti Sava" EL.

Table 1. The sample of examinees

Elementary school	A sample of the total	The selected sample	%
EL "Moša Pijade"	52	20	38.5
EL "Dositej Obradović"	41	14	31.1
EL "Radoje Domanović"	39	19	48.7
EL "21 Maj"	60	23	38.3
EL "Sveti Sava"	61	23	37.7
EL "Čele Kula"	35	13	37.1
Σ	288	112	38.9

The criteria on the basis of which the sample for this research was defined are the mass selection criteria used on male gymnasts, prescribed by the "Niš" Gymnastics Club – Niš:

- The age of the subjects is determined by their calendar age of 7 (± 6 months);
- The subjects must be clinically healthy and without any possible deformities, primarily regarding their feet (being flat-footed), knees (being bow-legged) and the elbow joint (hyperextension), the spinal column (lordosis, kyphosis and scoliosis);
- The subjects need to have a weight-height index (BW/BH) below 0.190 kg/cm;
- The subjects have to complete the skill polygon in less than 12 sec;
- The subjects need to score at least 3 points in the boldness test;
- The condition that the subjects had not participated in any other sport activities prior to this one was accepted as an additional criterion.

Taking into consideration the proposed criteria enabled the selection of those who were fit enough to do gymnastics, or in other words, made possible the forming of the sample for this research. Out of the total of 288 students (100%) who were subjected to the mass selection process, 112 of them met the set requirements, which is approximately 40% of the total number.

The sample of measuring instruments

The sample of measuring instruments which was used in this research, consisted of 19 situational-motor instruments of coordination, or in other words, all the available measuring instruments of coordination which had up to that point found their application in the selection process for gymnastics:

a) The performance speed of complex motor tasks:

- 1) Cartwheels forward, to the side and backwards - per second (CFSB);
- 2) The skill polygon I - per second (POLI);
- 3) The skill polygon II - per second (POLII);
- 4) The backwards polygon - per second (POLB).

b) Agility:

- 1) 10x lie down, squat, jump - per second. (LSJ);
- 2) Running 2x15m with a lying start - per second. (R2X15);
- 3) "Koverta" test - per second. (KOVV).

c) Rhythm coordination:

- 1) Arrhythmical hand drumming - per second. (AHD);
- 2) Rhythmical hand and foot drumming - per second. (RHFD);
- 3) Striking horizontal pads - per second (SHB);
- 4) Cartwheeling and walking a line while performing asymmetrical hand motions - per second (CWAH).

d) The precise performance of complex motor tasks:

- 1) A movement exercise accompanied by asymmetrical hand motions - per error (EMAH);
- 2) A combination of asymmetrical hand and foot motions performed in a standing position- per error (AHFM);
- 3) A combination of symmetrical motions of the extremities in a seated position - per error (SMES);
- 4) A combination of asymmetrical hand motions and jumps in a standing position - per error (AHJS);
- 5) The standing jump accompanied by symmetrical motions of the extremities - in points (SJSE);
- 6) The standing jump accompanied by asymmetrical motions of the extremities - in points (STAE).

e) The precise management of hand motions in space:

- 1) Performing hand motions in the frontal plain, to a set angle - in degrees (HMFP);
- 2) Performing hand motions in the sagittal plain to a set angle - in degrees (HMSP).

Hošek (1976) carried out research by means of which she determined the instruments which cover the hypothetical area of coordination in our part of the world. The sample of variables consisted of measures of rhythm coordination, hand coordination, leg coordination, the performance speed of complex motor tasks, body coordination, the reorganization of the movement stereotype, agility and the acquisition speed of new motor tasks.

The sample of measuring instruments for the performance speed of complex motor tasks and agility was proposed by a group of soviet authors, Grošenkov, Minaeva & Rozin (1969), one which was used in the selection process for gymnastics in the schools for

sport in the former USSR. The metric characteristics of the tests used for the evaluation of the coordination factor, defined as the ability to correctly and quickly perform complex motor tasks, were for our part of the world defined by Hošek et al. (1974). The measuring instruments for the evaluation of coordination in rhythm and the precise management of hand motions in the sagittal and frontal planes have been appropriated from a group of Bulgarian authors, Mikov & Todorov (1994), who have confirmed their significance by including them in their work regarding the selection of gymnasts.

In our part of the world the metric characteristics of measuring instruments whose object of measurement is rhythm coordination have been determined by Hošek et al. (1973).

Measuring instruments for the evaluation of the performance precision of complex motor tasks have been appropriated from a group of Bulgarian authors, Jordanov, Radulov, Mikov, Milev & Grigorov (1987), and which have been used by the Gymnastics Federation of Bulgaria.

Our local process for the determination of metric characteristics has been the subject matter of Marčelja et al. (1973) in this case it was body coordination in particular, Horga et al. (1973), with hand coordination in particular, Strel & Novak (1979) and the ability to perform complex motor tasks and Strel & Šturm (1981) and the hypothetical factor of coordination.

Considering the idiosyncratic nature of the composite measuring instruments which consist of three identical tasks, it will be necessary to neutralize the possible effects of the stochastic processes, or to keep them under control. Statistical and metric characteristics have been determined separately for composite tests in their entirety, and especially for each particle, or part of the test. Considering the fact that every composite test has been devised so as to consist of the same number of items (particles), the evaluation procedures for statistical and metric characteristics are identical for all the tests.

The statistical method

For the purpose of determining objectivity as a metric characteristic, the following measures and analyses were used:

– to calculate the linear connection of each measurement (item) between two measurers in an actual test, the Pearson means of obtaining the correlation moment product (symbolically represented as "r") was used. The correlation coefficients have supplied an answer to the question regarding the *objectivity* of each measurement (item) in the given test, while their means have been used for the evaluation of the objectivity of the entire composite test.

– The Hotelling canonical-correlational analysis has been used for each test (according to Malacko & Popović), with the purpose of determining the *objectivity* of the analyzed composite tests. Two sets of variables, between which a canonical correlation was proven to exist, represented three measurements, noted by two measurers, in an actual test, for the same sample of examinees. Bearing in mind that the value of the first pair of canonical factors best explains the connection between the two systems of variables, the first root of the canonical equation has served as the indicator of objectivity of the given composite test.

3. THE RESULTS

During the course of this research, the objectivity of all the tests has been determined after three attempts, where two measurers worked independently in each of the attempts. For the purpose of testing objectivity, the measurers were placed in identical positions, as equals, or in other words, were given the same item to measure. In order to fulfill these requirements each of the measurers was given the same detailed instructions, was familiarized with the test standardization, as was enabled to practice the test implementation whose objectivity was being researched. In addition, a maximally isolated influence of the measurer on the test result was enabled, which means that all the other influences were at their minimum, or were constant for both measurers. To calculate the linear connection for each item in the actual test between the two measurers, the Pearson test for obtaining the product correlation moment (symbolically represented as "r") (Table 3) was used. The coefficients of the correlation supplied the answer to the question of the *objectivity* of each item being measured in the given test, while the means was used for the evaluation of the objectivity of the entire composite test.

The Hotelling canonical-correlational analysis (Table 4) was used for each of the tests for the purpose of evaluating the *objectivity* of the analyzed composite tests. Two sets of variables, between which a canonical correlation was found to exist, and therefore the objectivity of the composite test, represented the course of three measurements, noted by the two measurers in the actual test, on the same sample of examinees. Bearing in mind that the value of the first pair of canonical factors is best explained by the connection between the two systems of variables, the first root of the canonical equation served as the objectivity indicator of the given composite test.

The value of objectivity is defined by calculating the correlation coefficients between the results of the two measurers (the used coefficient used this way is called the *test objectivity index*). A completely objective coefficient correlation test (or the average coefficient) has to have a value of 1.00. In this case the evaluators will evaluate the test identically. The more the correlation coefficient moves away from this value, the smaller tests objectivity becomes. "It is a general opinion that the correlation between the two measurers should be at least .90 in order for a motor test to be considered objective".

Table 2. Ranking criteria in terms of objectivity

The objectivity index	$\geq .95$	$\geq .90$	$< .90$
Objectivity	very high	high	unacceptable

If one bears in mind what has already been stated, for the purpose of a more successful ranking of the composite measuring instruments of coordination in regards to objectivity, the borderline objectivity index values have been set (Table 2).

Table 3. The correlation coefficient between the two measurers

TEST	I item	II item	III item	Pros. R
CFSB	.99	.99	.98	.988
POLI	.99	.97	.97	.977
POLII	.99	.97	.98	.980
POLB	.96	.96	.94	.953
LSJ	.98	.99	.98	.988
R2X15	.97	.98	.98	.977
KOVT	.95	.94	.93	.940
AHD	.94	.98	.98	.966
RHFD	.96	.98	.97	.970
SHB	.99	.98	.98	.988
CWAH	.98	.98	.98	.980
EMAH	.94	.95	.95	.947
AHFM	.96	.97	.97	.967
SMES	.97	.97	.96	.967
AHJS	.96	.96	.95	.957
SJSE	.83	.88	.90	.870
STAE	.96	.96	.96	.960
HMFP	.97	.96	.97	.967
HMSP	.93	.96	.96	.950

Table 4. For the canonical correlation, the roots of the canonical equation

C	C ²	χ^2	NDF	P
.990	.980	1001.7	9	0.00
.992	.985	891.49	9	0.00
.989	.978	840.28	9	0.00
.976	.952	711.31	9	0.00
.997	.993	943.15	9	0.00
.989	.979	818.29	9	0.00
.958	.918	622.41	9	0.00
.985	.971	811.20	9	0.00
.979	.958	829.11	9	0.00
.992	.985	906.96	9	0.00
.992	.984	805.25	9	0.00
.972	.946	512.95	9	0.00
.980	.961	580.20	9	0.00
.984	.968	630.88	9	0.00
.973	.947	619.68	9	0.00
.940	.884	304.94	9	0.00
.975	.950	461.62	9	0.00
.983	.966	860.00	9	0.00
.972	.944	742.31	9	0.00

Legend: The first measuring (I item)
 The second measuring (II item)
 The third measuring (III item)
 The average correlation (Pros.R)
 The significance of the relevant roots (P)

Legend: The canonical correlation (C),
 Roots of the canonical equation (C²),
 Bartlett's CHI square test (χ^2)
 Degrees of freedom (NDF)

4. THE DISCUSSION

Objectivity is the basic metric characteristics of motor measuring instruments, but is often neglected in the research dealing with measuring characteristics. This characteristic of the measuring instrument requires independent measuring on the part of the measurer. What this means is that the measuring instrument will be objective only if different measurers, evaluating the same subjects by means of a single motor test arrive at identical or very similar results at the same time. It is necessary to mention that the expression "test objectivity" refers solely to the measuring characteristics which deal with whether the evaluation of the test results is unbiased.

The degree to which two measurers will concur in their evaluation of the coordination test results has been determined by calculating the linear correlation coefficient (R) at each measuring, and then their average values as well. In order to confirm the correctness of the previous procedure for determining objectivity, a canonical-correlational analysis has been used, where two multidimensional systems of variables represented three items in one test, registered on the part of both measurers. The choice of such a multivariate analysis is connected to the fact that this analysis can be used to determine the maximal

connection between two pairs of linear functions so as to make them mutually independent. For the interpretation of the canonical correlation only the value of the correlation for the first pair of canonical factors was used, as it best indicates the connection between these two systems and thus the objectivity of the given test. The objectivity results are shown in Tables 3 and 4. By analyzing the average values of the linear correlation coefficients between the two measurers, a high and satisfactory objectivity can be found to exist for almost all the tests. A very high objectivity at all three measurements can be found for the three Performance speed of motor task tests, except for the Backwards polygon (POLB); the two Agility tests, except the "Koverta" test (KOV); the three Rhythm coordination tests, except Arhythmical hand drumming (AHD); the four Precise performance of complex motor tasks tests, except the Movement exercise accompanied by asymmetrical hand motions and the Standing jump accompanied by asymmetrical motions of the extremities (SJSE) and Performing hand motions in the frontal plain to a set angle for the Correct spatial hand motion management (HMFP).

In tests such as Arhythmical hand drumming (AHD), Movement exercises accompanied by asymmetrical hand motions (EMAH), Performing hand motions in the sagittal plain to a set angle (HMSP), an increase in objectivity has been noted (from high to very high), when observing the correlation coefficients from the first to the third measuring. This can be explained by the fact that the measurers may not have been well prepared for the realization of the test at the first measuring, only to have the quality improve after the second measuring and reach its peak at the third measuring. Bearing in mind the previously set criteria for objectivity, the average correlation between the results noted by the two measurers classifies the tests in a group of tests of very high objectivity - Arhythmical hand drumming and Performing hand motions in the sagittal plain to a set angle (AHD and HMSP) or very near this limit - Movement exercises accompanied by asymmetrical hand motions (EMAH). In addition, a group of tests surfaced whose objectivity decreases from the first to the third measuring. It is the case with the Backwards polygon test (POLB) and the "Koverta" test (KOV), where the measuring results are registered in time units, or to be more precise, by means of a stopwatch in the tenths of a second. In this case it is possible that some exhaustion and loss of concentration occurred (at the second and third measuring) on the part of one or both of the measurers, so that turning the stopwatch on and off was not coordinated. If the average value of the result correlation between the two measurers is taken into consideration, the Backwards polygon (POLB) test can be classified in the group of tests with very high objectivity, and the "Koverta" test (KOV) test in the group of tests with high objectivity. Only in the case of the Jumping in place with symmetrical motions of the extremities test (SJSE) could the objectivity be questionable and below the acceptable level, as the average value of the linear correlation was less than .90. A satisfactory objectivity for this test was achieved only at the third measuring. Most of the previously cited data is confirmed by the results of the canonical-correlational analysis. In fact, the correlation coefficients of the first pairs of canonical factors for all the tests is above .90. These two areas, in almost all the tests, make up over 90% of the common variance, as the value of the first canonical equation roots indicate. This means that the implementation of the mentioned measuring instruments in the form of composite ones will give very high measurement objectivity. Only in the Standing jump accompanied by asymmetrical motions of the extremities (SJSE) test did the first pair of canonical factors take up 88% of the common variance, which leads to the conclusion that this test is not adequately objective, so a modification

with the aim of improving these metric characteristics was carried out. Restandardization is possible in two different ways:

We can give more precise evaluation criteria (bearing in mind that the quality of the performance of the motor task in this test is evaluated by means of the number of obtained points)

We can replace the result evaluation procedure and make it the conditioned measuring unit – the number of points, replaced by the number of mistakes.

The restandardization of tests in the area of Precise hand motion management was the subject matter of the research carried out by Petković (2004) which took place on a sample of 58 female gymnasts ages 7 to 9, who participated in the competitions of the Pioneer League of the Gymnastics Federation of Serbia and Monte Negro. In the Performing hand motions in the frontal and sagittal plains to a set angle tests (HMFP and HMSP) the restandardization was aimed at improving the precision of the angle measurements, as the measuring was performed by a subjective estimation on the part of the measurer. This research increased test objectivity and therefore confirmed their significance in the selection process for gymnastics.

5. CONCLUSION

On the basis of the presented research results the following can be concluded:

1. In regards to objectivity, the cited measuring instruments *do not require any changes to the standardized measuring procedure* (the description of the measuring procedure, the means of implementation, measuring the results) including:

The performance speed of complex motor tasks - Cartwheels forward, to the side and backwards, The skill polygon I, The skill polygon II, The backwards polygon, tests for the evaluation of agility–10x lie down, squat, jump, Running 2x15m with a lying start, "Koverta" test; *Rhythm coordination* - Arhythimcal hand drumming, Rhythmical hand and foot drumming, Striking horizontal boards, Cartwheeling and walking a line while performing asymmetrical hand motions; *The precise performance of complex motor tasks* - Movement exercise accompanied by asymmetrical hand motions, Combination of symmetrical motions of the extremities in a standing position, Combination of symmetrical motions of the extremities in a seated position, Combination of asymmetrical hand motions and jumps in a standing position, Standing jump accompanied by asymmetrical motions of the extremities; *The precise hand motion management in space* - Performing hand motions in the frontal plain to a set angle, Performing hand motions in the sagittal plain to a set angle.

They can be recommended for future practical use in the selection process in gymnastics.

2. The test for the evaluation of the ability to precisely perform complex motor tasks - The standing jump accompanied by asymmetrical motions of the extremities has been classified as belonging to the group of measuring instruments *of unacceptable objectivity* and requires additional restandardization of the measuring process.

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OBJEKTIVNOST MERNIH INSTRUMENATA SITUACIONO - MOTORIČKE KOORDINACIJE U SPORTSKOJ GIMNASTICI

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Na uzorku od sto dvanaest dečaka i devojčica prethodno selekcionisanih za sportsku gimnastiku iz šest osnovnih škola grada Niša utvrđene su metrijske karakteristike za 19 situaciono- motoričkih testova koordinacije koji su do sada poznati i primenjivani u selekciji za sportsku gimnastiku u osam zemalja Evrope i bivšim jugoslavenskim republikama. Autori su pomenute merne instrumente svrstali u pet hipotetskih područja koordinacije i to: Brzina realizacije složenih motoričkih zadataka (4); Agilnost (3); Koordinacija u ritmu (4); Tačno realizovanje složenih motoričkih zadataka (6); Tačno upravljanje pokretima ruku u prostoru (2).

U ovom radu izneti su rezultati objektivnosti mernih instrumenata tako što je izračunat Pirsonov koeficijen korelacije a zatim je primenjena Hotellingova kanoničko-korelaciona analiza za svaki test u cilju procene objektivnosti analiziranih kompozitnih testova. Dva seta varijabli, između kojih je utvrđena kanonička korelacija, a time i objektivnost kompozitnog testa, predstavljala su tri merenja, registrovana od strane dva merioca, u aktuelnom testu, na istom uzorku ispitanika. Imajući u vidu da vrednost prvog para kanoničkih faktora najbolje objašnjava povezanost dva sistema varijabli, prvi koren kanoničke jednačine poslužio je kao pokazatelj objektivnosti datog kompozitnog testa. Pomenuti rezultati ukazuju da 18 od 19 mernih instrumenata za procenu situaciono-motoričke koordinacije u sportskoj gimnastici imaju značajne vrednosti koeficijenata kada je u pitanju objektivnost i mogu se preporučiti za primenu u praksi. Samo jedan test za procenu sposobnosti za tačno realizovanje složenih motoričkih zadataka - Skokovi na mestu sa simetričnim radom ekstremiteta (SMSE) je svrstan u grupu mernih instrumenata neprihvatljive objektivnosti i zahteva dodatnu restandardizaciju mernog postupka.

Ključne reči: Sportska gimnastika, objektivnost, situaciono-motorička koordinacija, merni instrumenti, kanoničko-korelaciona analiza.