A CORRELATION ANALYSIS OF THE COORDINATION TESTING OF STUDENTS OF THE FACULTY OF PHYSICAL EDUCATION AND SPORTS IN GALATI

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Abstract
The coordination capacity has an important role in the system of motor aptitudes, determining the capacity of movement at all ages and the quality and mastery of the acquired skills. As coordination elements are extremely varied, this study aims at pinpointing the quality of the connections between them, by calculating the correlations of the tests which measure the coordination capacity under its different manifestations. The results help better plan the process of coordination education, taking into consideration the scientific research and also the the distinctive features of the group under investigation.
Key words: *interaction, reciprocal conditioning, coordination skills, motor potential, specific tests, adjusting and adapting movements*

INTRODUCTION

The content of the practical assignments of different tests and sports at the Faculty of Physical Education and Sports for 1st year undergraduates differentiates the coordination processes, according to the diversity and the difficulty of the technical elements, to the quantity and the quality of the skills already acquired by each individual and to their motor experience.

Most of the specialists at this faculty consider the coordination capacity a notion of great complexity and importance, because of the large number of elements that make it up, because of the variety of factors that condition it and due to the diversified methodology of improving it. The coordination capacity has an influence on the superior quality of the motor skills and implicitly on the efficiency of motor activities, deciding the movements and reducing the consumption of energy. The knowledge and the scientific research of a general development methodology will be characterised according to each sport, which require only certain elements of coordination to be highly developed, together with conditional skills - strength, speed, resistance - and combinations of these. Because of this, the role of the coordination capacity elements in improving and valuing other motor skills is unquestionable [1, 2, 3, 10, 15].

The coordination capacity is influenced by genetics and is deeply involved in all the stages of learning motor skills, from the step of initiation, through their consolidation and perfection. Deciding on the level of developing these skills involves a careful study and evaluation of all the elements - general and segmental coordination, static and dynamic equilibrium, space-time orientation, ambidexterity, movement precision, agility, sense of rhythm, the capacity to transform movements, kinaesthetic discrimination, the capacity to combine movements, etc. - for an analysis as objective as possible and a complete general perspective [4, 5, 6, 9, 11, 12].

PROBLEM STATEMENT

Problem statement is made up of the insufficient investigations on the main elements of the coordination capacity on Physical Education and Sports female students, considering that a poor coordination leads to limited performances and a poor general and specific motricity, irrespective of the sports involved.

PURPOSE OF STUDY

The purpose of the present study is determined by an analysis of the development level of the coordination capacity of Physical Education and Sport female students, involved in practising different sports, and focuses especially on the connection between the tests. The results of this study will help improving the future motor activity of both groups, by finding the main weaknesses and strengths, and by creating some training programs correlated with the current state of the performances.

Working hypothesis: It has been assumed that there are strong and significant associations/bonds between the elements of the coordination capacity, which are reflected by the correlation value of coordination tests included in the range of the tests given.

METHODS

The scientific research has used the following methods, as per the instructions presented in the specialised literature [7, 8, 13, 14, 16, 17, 18]:

- analysis of the specialised scientific-methodical literature – the works selected and analysed facilitated the understanding of the researched subject.
- questionnaire-based investigation and interview – the answers helped drawing a realistic

picture of the importance, weight and role of physical activities in students' lives.

- classroom observation – helped analysing the reactions to the test, the degree of difficulty they were rated with and finding solutions to improve future motor activities.
- testing and measuring – the 31 students from the Faculty of Physical Education and Sports were submitted to 9 tests during the 2011/2012 academic year, using the materials and instruments in the university, in order to determine the level of the elements of coordinative skills:

1. **the motor coordination structure** (explained and demonstrated twice). Evaluates the capacity to understand and learn new movements, the sense of rhythm and the quality of the intersegmental coordination for movement made on different levels and directions, the capacity to combine movements. The initial standing position: T1 – jumping to a standing frontal position with legs spread and the left/right arm simultaneously raised ahead; T2 – come back; T3 – idem T1 with arms raised in different directions T4 – come back; T5 – jumping to a standing position with the left/right foot ahead simultaneously with raising the arm corresponding to the foot stretched ahead and with the other arm raised laterally; T6 – come back; T7 – jumping to a standing position with legs open and the opposite foot ahead than the one used in T5- arms raised in different directions; T8 – come back to the initial position. Grading the motor coordination structure: for each uneven time (T1, T3, T5, T7) performed correctly, one point is assigned- maximum of 4 points.

2. **the psycho-motor coordination test**. This is done with a control test on distance appreciation and space orientation. The student has the eyes covered with an opaque strip and is placed at one end of a 7 meter long line, drawn on the ground. The test is to walk the entire length of the line with the eyes covered. The student stops when s/he considers to have reached the end of the line. An X sign is marked on the place where the student stopped and the rest is measured up to the end of the line. The results are evaluated as follows: if the individual has bypassed the line or did not reach the end of the line, then the difference is measured up. The values are then interpreted: 0-10 cm very well, 11-30 cm well, 31-50 cm satisfying, more than 50 cm not satisfying. When the calculations are made, plus values + (the one that go beyond the end of the line) and minus values - (the one that do not reach the end of the line) are considered the same. The less is the value, the better the performance.

3. **the Matorin test** evaluates general coordination and is made up of a standing jump, followed by as many spins turning along the axis of the body as possible and landing in the same place. The individual faces North, with her legs on a 35cm line drawn on North-South direction. Spins to the left, then to the right need to be done and then the values on both directions are registered. The measurements are done for each jump and are calculated with the help of a compass or with a set square and are expressed in degrees: <1800 – insufficient; 180-2700 – sufficient; 271-3600 – well >3600 – very well.

4. **the touch the plates test** is represented in Figure 2 and measures the coordination from the point of view of speed and precision of the upper limbs. The individual is in a standing spread position, in front of a table with plates on and has to put a hand in the centre of the rectangular plate (20 x 10 cm). The other hand (the skilful hand) needs to go quickly and alternatively from one plate to another (the 20 cm plates- placed 40cm away from the table centre). The move needs to be done above the hand placed on the rectangular plate and the skilful hand has to touch the other two plates with the entire hand, 25 times (therefore 50 successive contacts). It is important that the table is not higher than the umbilical region and that the individual does some tests before deciding on the skilful hand. It is recommended that two persons do the examination (one measures the time and the other counts the contacts). If a plate has not been touched, then an additional execution is required. There are two tries and only the better one is registered. The test can begin by touching any plate. (be it A or B) (Eurofit Test). The less time spent on the exercise, the better the performance.

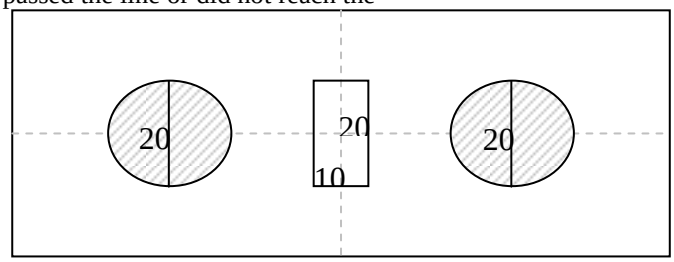

Figure 2. The Touch the Plates Test

5. **the square test** (used for dynamic balance, agility, kinaesthetic discrimination and spatial-temporal orientation). Nine 50 cm squares are drawn within a 150 cm square while two other 50 cm squares are drawn on the opposite sides. The subjects, placed within square 0, will perform two-legged jumps on counting; they are required to jump as fast as they can within the squares, without bypassing or stepping on the lines. The time used for performing the exercise is recorded, each error being penalised by 2 points. Subjects are allowed to practise several times before the official timing so

as to remember the track. The less time spent on the exercise, the better the performance.

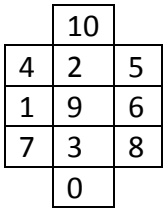

Figure 3. The square test

6. **the single-leg test** is a psychomotor test which evaluates static balance. The subject stands on one leg while the other is bent at knee level touching with the heel the knee of the leg on the ground; the arms are extended forward, fingers opened, eyes closed (blind-folded). Time is kept for the number of seconds that the subjects manages to maintain balance (she keeps the squat leg off the ground and does not lose balance); this is done for the left leg first and then for the right one.

7. **the small ball test** looks at movement precision, eye-hand coordination, ambilaterality and repetition speed. The subject stands at a distance of 2,5m from a perfectly flat wall, holding a tennis ball; she successively throws the ball at the wall (5 times with each hand), catching it with the same hand used for throwing it and without letting the ball touching the ground. One records the time necessary for the execution of 10 correct tosses. A shorter amount of time indicates a better performance.

8. **throwing a ball at a target** while staying with the back at it. This test evaluates spatial orientation, the precision and the capacity to adjust movements. Materials: measuring tape, 6 tennis balls, a free hip circle with an 80cm diameter, a gymnastics ball (1kg), a gymnastics mattress. The subject stays at the throwing line with the back at the target (this is the mattress in the middle of which there is the circle while the medicine ball is placed in the centre of the circle). The task is to throw the tennis balls over the head (or the shoulder) and to hit the 2m far target (the mattress). After the exercise has been explained and demonstrated, subjects are allowed to try throwing once; 6 successive control tosses then follow. After each throw, the student is informed on the points obtained so that she could adjust her movements for the next throw. The result is evaluated as follows: ball within the mattress – 1 point; ball on the bar of the hip circle – 2 points; between the circle and the medicine ball – 3 points; on the medicine ball – 4 points. The final result is the sum of the points taken after each of the 6 throws.

9. **Barrow's motor skill test** focuses on agility, spatial and temporal orientation, precision, dynamic balance and kinaesthetic discrimination. The subject covers a track framed by a 10/15m rectangle which has signal cones in its corners and in its centre. The starting position coincides with the finishing one (which is one of the corners). The track is covered against the clock, first bypassing the cone in the centre by running diagonally, then the 2 cones in one of the short side, then the cone in the centre again, then the 2 cones in the other short side of the rectangle. If a cone is not bypassed or if it is touched, the subject is charged with 1 second. So as to have a good score, the subject has to cover the track as fast as she can.

Statistical and mathematical methods of representing and interpreting the results. They facilitated the statistical processing of the registered data using the computer program SPSS [statistical package for the social sciences], in order to calculate and interpret the values, the significance and the signals of the correlation coefficients.

RESULTS PRESENTATION AND INTERPRETATION, CONCLUSIONS AND RECOMMENDATIONS

Some tests for establishing the normal value of distribution have been given, in order to set up the type of correlation between examinations, by taking into consideration the values from the Shapiro-Wilk test. Pearson's style has been used for calculating the correlation value between the tests with normal distribution, whereas for all the other types of correlation, Spearman's style has been applied.

Table 1. Tests of normality

	Kolmogorov-Smirnov			Shapiro-Wilk		
Test	Statistic	df	Sig.	Statistic	df	Sig.
Coordination structure	.246	31	.000	.856	31	.001
Evaluating distance	.174	31	.018	.848	31	.000
Left Matorin	.178	31	.014	.960	31	.287
Right Matorin	.190	31	.006	.927	31	.037
Touch the plates	.130	31	.196	.981	31	.853
Square test	.117	31	.200(*)	.965	31	.384

Left one-leg test	.373	31	.000	.347	31	.000
Right one-leg test	.297	31	.000	.680	31	.000
Small ball test	.122	31	.200(*)	.914	31	.017
Throwing at target test	.170	31	.023	.941	31	.085
Barrow test	.093	31	.200(*)	.971	31	.554

- The calculations on the correlation factors emphasize the connection/associations between the elements of coordination capacities, which have been tested, with the help of a range of tests. In many situations, the results value show weak, very weak and insignificant correlations. The tests which have the most significant positive and negative correlations with the rest of the tests are: Barrow and Matorin tests right with 4 strong associations, Matorin left with 3 strong connections, Small ball test and Touch the plates with 2 associations, Right and left unipod, Distance approximation, Darts with a strong connection.

-***Positive correlations*** a strong connection between tests has been noticed between: 1-Matorin right and Matorin left, at a materiality threshold < 0,01, both tests involving general coordination, equilibrium, space orientation and movement precision; 2-Approximating distance with Unipod left, at a threshold < 0,05, with the sense of equilibrium as the main element; 3- Unipod right and Unipod left, at a threshold < 0,01; 4- Touch the plates with Barrow Test, at a threshold < 0,05, focused on the transfer of some common elements, such as: the capacity of quickly changing the direction when doing the movement, high movement frequency.

-***Negative correlations*** bad influences and associations between tests have been met in the following combinations: 1- Touch the plates with Matorin right, at a threshold < 0,01 and Matorin left, at a threshold < 0,05, which focus on different elements: coordinating the uppers limbs with speed, respectively space orientation and general coordination with action on lower limbs; 2- Small ball Test with Matorin right, at a threshold < 0,05 and Matorin left at a threshold < 0,01, the first tests focusing on distance approximation, movements speed and eye-hand coordination, elements which are not to be found in the second test 3- Barrow with Matorin right Test, at a threshold < 0,01 and Matorin left, at a threshold < 0,05, the first one involving agility, accelerating and slowing down ability, straining different lower limb muscles throughout the test; these elements are not present in the second test; 4- Barrow Test with Darts, at a threshold < 0,05, the second test focusing mainly on the upper limbs, involving precision and adjusting the execution technique, eye-hand coordination and a permanent approximation of the distance and the best position to throw; 5- Darts with Small ball Test at a threshold < 0,05, the second test involving the quality og the throwing-catching technique, ambidexterity and eye-hand coordination for speedy movements.

The results show that the coordination capacity elements form a system, some of them having a positive influence during the transfer, whereas others having a negative impact because of the interference. This is why it is recommended to develop simultaneously the elements that create positive connections and to avoid the combination of elements that create negative correlations. It is worth mentioning that these tests applied to other group of students, from faculties with different profile, who are not constantly practising sports, scored different values for the correlation factors. Within the tested group, there have been different results, depending on the practised sport: the female students who practise sports had higher scores at agility, space orientation, precision of throwing tests and lower scores at static equilibrium evaluation.

It is recommended for future analyses to focus on the impact of other motor skills on the coordination capacity performance. The explosive force, the execution or repetition speed at Square test, Matorin or Barrow tests are deeply involved in gathering the results and manifesting the elements of coordination capacity at the best level possible.

The values, their signs and the materiality threshold are presented in Table 2.

Table 2. Value of correlation factors of coordination tests, the materiality threshold and the number of cases

	Coordination structure	Evaluating distance	Left Matorin	Right Matorin	Touch the plates	Square test	Left one-leg test	Right one-leg test	Small ball test	Throwing at target	Barrow test
Coordination structure	-	Sprm -.146 Sig. .217 N=31	Sprm .103 Sig. .290 N=31	Sprm -.128 Sig. .246 N=31	Sprm .011 Sig. .477 N=31	Sprm .-021 Sig. .456 N=31	Sprm. 293 Sig. .055 N=31	Sprm .206 Sig. .133 N=31	Sprm .240 Sig. .096 N=31	Sprm.017 Sig. .464 N=31	Sprm -.041 Sig. .412 N=31
Evaluating distance		-	Sprm -.294 Sig. .054 N=31	Sprm .116 Sig. .267 N=31	Sprm .193 Sig. .149 N=31	Sprm -.189 Sig. .155 N=31	**Sprm .334* Sig. .033** N=31	Sprm .136 Sig. .232 N=31	Sprm -.113 Sig. .273 N=31	Sprm -.045 Sig. .404 N=31	Sprm .205 Sig. .134 N=31
Left Matorin			-	Sprm **.605**** **Sig. .000** N=31	Prs **-.427**** **Sig. .008** N=31	Prs -.113 Sig. .272 N=31	Sprm .199 Sig. .142 N=31	Sprm .271 Sig. .070 N=31	**Sprm -.338* Sig. .031** N=31	Prs .149 Sig. .212 N=31	Prs **-.498**** **Sig. .002** N=31
Right Matorin				-	**Sprm -.347* Sig. .028** N=31	Sprm -.124 Sig. .254 N=31	Sprm .283 Sig. .061 N=31	Sprm.113 Sig. .272 N=31	**Sprm -.480**** **Sig. .003** N=31	Sprm.223 Sig. .114 N=31	**Sprm -.312* Sig. .044** N=31
Touch the plates					-	Prs .088 Sig. .318 N=31	Sprm -.152 Sig. .413 N=31	Sprm .054 Sig. .772 N=31	Sprm .035 Sig. .853 N=31	Prs -.162 Sig. .192 N=31	Prs **.405*** **Sig. .012** N=31
Square test						-	Sprm -.136 Sig. .234 N=31	Sprm .244 Sig. .093 N=31	Sprm -.176 Sig. .171 N=31	Prs .102 Sig. .292 N=31	Prs -.065 Sig. .304 N=31
Left one-leg test							-	Sprm **.467**** **Sig. .004** N=31	Sprm .010 Sig. .478 N=31	Sprm .009 Sig. .481 N=31	Sprm -.116 Sig. .267 N=31
Right one-leg test								-	Sprm .102 Sig. .293 N=31	Sprm.001 Sig. .498 N=31	Sprm -.147 Sig. .431 N=31
Small ball test									-	**Sprm -.389* Sig. .015** N=31	Sprm .281 Sig. .063 N=31
Throwing at target										-	Prs **-.371* Sig. .020** N=31
Barrow test											-

Note: * Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).
Sprm – Spearman Correlation Coefficient
Prs – Pearson Correlation Coefficient

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