THE IMPORTANCE OF COORDINATION IN THE TECHNICAL TRAINING SPECIFIC TO HANDBALL PLAYERS

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Abstract
The aim of this study was to observe to what extent the results of some coordination tests applied on senior handball players are included in the technical training level. In the study conducted, 30 athletes aged between 19 and 31 participated (M = 24.1, SD = 3.22). There were 16 tests of coordination (predictor variables) and 7 technical tests as dependent variables applied. Of the 112 correlations between these variables, a linear regression was performed on 14 of them (with values of r ≥ 40%). It was found in this study that there is a weak connection between the two groups of the studied variables. The only values for r > 50% were recorded among the tests that had the manual dexterity in common, that is in fact specific to the handball game. The conclusions concern only this group of athletes and the obtained correlations indicate the degree of association between the used variables and not the cause of those connections.
Key words: *handball, technique, coordination, manual dexterity*

INTRODUCTION

Handball, as a performance sport, requires athletes to work intensively for coping with extremely heavy tasks during the game. Coordination is an ordered activity of various organs and systems of the body, conditioned by the excitation and inhibition that occur in the central nervous system (Бернштейн - Bernştein, 1966; Фарфель - Farfeli, 1976; Baştiurea, 2005; Acsinte, 2011). The technique calls for means of training specific for initiation, consolidation and specialization of the athlete. At least at the beginning, the degree of handling the technique makes the difference of value. Over time, with the dynamic stereotypes enhanced and improved, the weight of this factor diminishes in favor of others (Gheorghe, 2005; Rizescu, Georgescu, Ghervan, 2011).

Coordination capabilities depend on a number of factors that could limit performance, for example: the optimal tonus of the cortex, the intra- and inter-muscular coordination, the functional state of the receptors, the motor experience, age, etc. Regarding the technique, it is known that analyzers, short and long term vestigial reactions left by previous excitations (Bota, 2000) motor area, brainstem, etc. ensure the implementation of actions at a superior level.

Given the common issues presented, it can be assumed that there is a close relationship between coordination and the technique specific to handball players.

METHODS AND MEANS

Subjects

There were 30 senior handball players aged between 19 and 31 years old (M = 24.1, SD = 3.22) who participated in this study. Please note that all athletes had good health condition to perform the tests correctly and with maximum efficiency.

Testing procedure

The following sets of tests were applied for all athletes:

- **technical training testing:** 30m dribbling among poles, throwing the ball from distance, throwing the ball towards the wall and recatching it - variants I and II, throwing the ball at a fixed target - variants I and II, slalom dribbling (FRH, 1998; Baştiurea, 2007).
- **coordination of abilities testing**: throwing the ball towards a target standing with the back at it, jumps at the marking, difference of the muscular strain of the hands "the deft arm", balance on the gymnastics bench, turnings on the gymnastics bench - variants I and II, the Romberg test, sprint in a given rhythm, tapping test - variants I and II, running towards the balls, pendulum-throwing-target, the "in square" test, the figurative way, the Denisiuc test, leading the basket-ball "with the deft hand" with the changing of movement direction while running, (Полиевский - Polievskii, 1984; Лях - Leah, 1989; Платонов - Platonov, 1997; Baştiurea, 2005; Chicu, 2006).

Description of technical tests

Only those tests that had significant correlations (r ≥ 40%) with other measured parameters will be described:

30m dribbling among poles

Seven poles are positioned in a straight line along the handball court (the first pole at a distance of 6m from the start line, the last pole at a distance of 6m before the finish line, and between these two poles, at a 18m distance, the other five poles are placed at a distance of 3m from one another) within a

distance of 30m. The athlete must complete this distance driving the ball in a multiple dribbling, among the poles, in slalom. The ball must always be controlled by the athlete, without it being caught or thrown forward. Two runs are executed and the best time is taken into account.

Throwing the ball from distance

The ball (of handball) will be thrown away after executing a three-step dash from behind the line drawn on the ground. This line should not be touched, stepped on or exceeded before the ball is thrown from the pitcher's hand. For the dash, the cross-step or added-step technique will be used. Two attempts are allowed and the best result will be appreciated. The result will be expressed from 50 to 50cm and the obtained values will be more or less rounded.

Throwing the ball towards the wall and recatching it - variant I

At the signal, the athlete who is 3m away from a wall, throws the ball towards the wall and recatches it for 1 minute, without it falling on the ground. When time is up, the timer is stopped and the number of passes made by the athletes is recorded.

Throwing the ball towards the wall and recatching it - variantersion II

At the signal, the athlete who is 3m away from a wall executes against time 20 passes towards the wall, without the ball falling on the ground. After completion of the 20 passes, the timer is stopped and the obtained time is recorded.

Throwing the ball at a fixed target - variant I

On a wall, a handball gate is drawn. This has squares with 30cm sides in the four corners (Figure 1). Three meters away from the wall, there is an athlete, who, at the signal, will throw the ball towards the wall and recatch it (the throwing order is from number 1 to 4). The timer will be stopped when the athlete will complete 16 throws (four throws in every corner). Note that during the test, the ball is not allowed to fall on the ground.

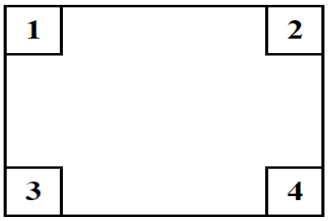

Figure 1. Throwing the ball at a fixed target

Throwing the ball at a fixed target - version II

On a wall, a handball gate is drawn. This has in the four corners, squares with 30cm sides. Three meters away from the wall, there is an athlete, who, at the signal, will throw the ball towards the wall and recatch it for 30 seconds (the throwing order is from number 1 to 4). At the end of the test, the teacher records the number of throws executed.

Slalom dribbling

On the ground, a square with 5m sides is drawn. At its corners, it is marked with poles and in the middle with another pole (Figure 2). A full track of multiple dribbling is executed, bypassing the poles in the indicated direction of the arrows. The timer will be started when the athlete begins the test and will be stopped after he crosses the finish line.

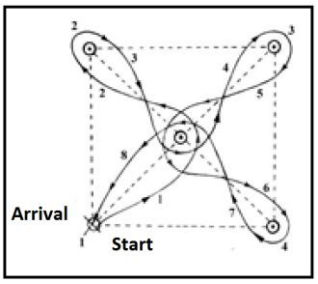

Figure 2. Slalom dribbling

Description of coordination tests

Only those tests that had significant correlations (r ≥ 40%) with other measured parameters will be described:

Tapping test - variant II

Materials: stopwatch, pencil, a sheet of paper. On the paper, three squares with the dimensions of 5×5cm are drawn. The athlete sits at the table with a pencil in his hand and after the "Start" command he draws as many points as possible in the three squares, for 15 seconds. Each athlete silently counts the time and draws points in each square for 5 seconds. Then, all the points are counted and averaged. A calculation of how many points were in each square above or below the average is made.

Running towards the balls

Materials: 5 medicine balls (3kg), a medicine ball (4kg), stopwatch, measurement instrument, chalk. The athlete stands in front of the 4kg ball. Behind him, at a distance of 3m, there are placed five medicine balls (3kg) 1.5m apart from each other, with numbers 1-5 (the distribution of the balls is random). The teacher calls a number, the athlete turns 180°, runs to the corresponding ball, touches

it and returns to the 4kg ball. As soon as he touches the ball (4kg), the teacher calls another number and so on. The exercise ends after the athlete reaches three times each of the 5 balls and then touches the 4kg ball (Figure 3). The result is determined by the time obtained by the athlete during the execution of all the exercise. After explaining and demonstrating, the athlete is given an examination test. Prior to execution by an athlete, the position of the balls is changed.

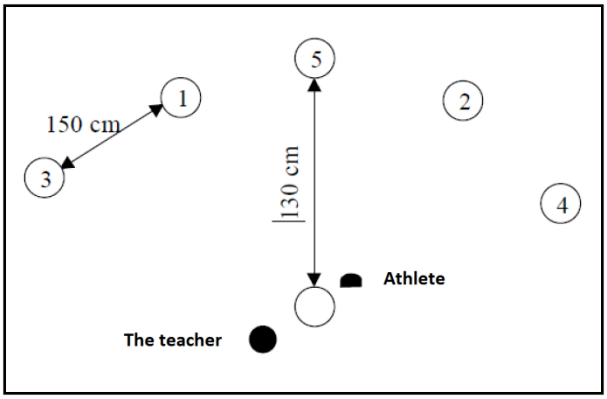

Figure 3. Running towards the balls

Leading the basket-ball (with the deft hand) with changing of movement direction while running

Materials: stopwatch, basket-balls, 10m length track, three supports.

The distance between the supports, from the start line to the first support and from the last support to the finish line is 2.5m. At the "Attention" command the athlete prepares the execution of the high start position (at the start line) with the ball in his hands. At the "Go" command the athlete performs a multiple dribbling with the skilful hand, running fast, going round each of the three supports and striving to complete the test in the shortest time possible (Figure 4). The result is marked by the time registered at the finish line.

The athlete will perform two examination tests. The best time will be taken in consideration. If the athlete loses control of the ball when leading it and the ball deviates with a greater distance than 1m from the support, the athlete is entitled to go round the support again.

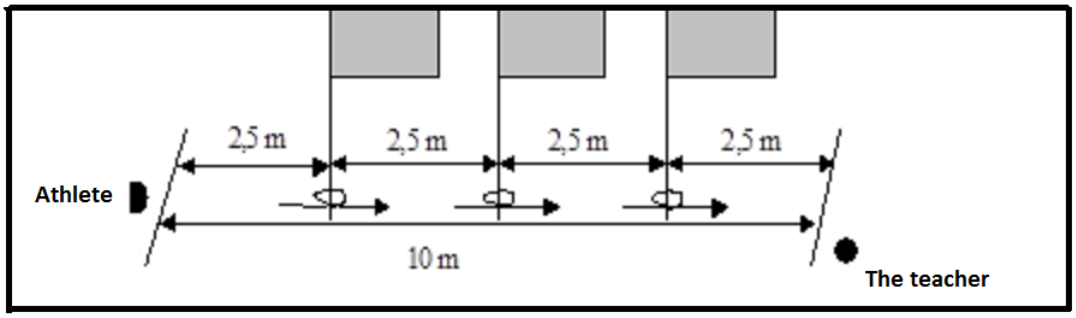

Figure 4 Leading the basket-ball with changing of movement direction while running

RESULTS

The collected data was processed using the SPSS program v. 20 for Windows. A correlation was conducted to examine the relationship between the analyzed variables. Of the 112 correlations between the coordination variables and the technical ones (Table 1), linear regressions were performed only on 14 of them that had values of $r \geq 40\%$ (Table 2). Confidence coefficient for statistical significance is 95%.

Table 1 Correlations obtained between the coordination variables and the technical ones

	30DAP %	TBD %	TBTR1 %	TBTR2 %	TBFT1 %	TBFT2 %	SD %
TBT	-0.11	-0.08	-0.13	-0.01	0	0.13	-0.20
JTM	0.16	-0.28	-0.04	-0.08	0.03	0.20	0.02
DIMM	0.07	0.18	0.03	-0.12	0	0.12	-0.15
BBG	-0.10	-0.07	-0.11	0	-0.24	-0.08	0.02
TGB1	0.32	0	-0.33	0.20	0.62	-0.09	0.14
TGB2	-0.22	0.03	0.13	-0.21	-0.13	0.19	-0.39
SGR	0.08	-0.19	-0.07	0.32	-0.04	-0.15	0.31

TAPPING 1	0.08	0.13	-0.19	-0.03	-0.18	0.01	-0.12
TAPPING 2	-0.57	0.37	0.36	-0.17	-0.33	0.34	-0.45
RTB	0.15	-0.08	-0.43	0.18	0.11	-0.26	0.22
PTT	-0.03	-0.06	-0.11	0	0.22	0.36	-0.23
TST	0.37	-0.17	-0.23	0.21	0.39	-0.28	0.26
TFW	0.26	-0.25	-0.08	-0.01	0.19	-0.23	0.12
DENISIUC	0.41	-0.28	-0.35	0.30	0.43	-0.54	0.56
LB	0.41	-0.10	-0.44	0.40	0.50	-0.21	0.44
ROMBERG	-0.12	-0.14	0.45	-0.36	-0.46	0.18	-0.38

*** TBT** - *Throwing the ball towards a target standing with the back at it*, **JTM** - *Jumps at the marking*, ***DIMM*** - *The difference of the muscular strain of the hands "the deft arm"*, **BGB** - *Balance on the gymnastics bench*, **TGB** - *Turnings on the gymnastics bench - variants I and II*, **ROMBERG** - *The Romberg test*, **SGR** - *Sprint in a given rhythm*, **TAPPING** - *The tapping test - variants I and II*, **RTB** - *Running towards the balls*, **PTT** - *Pendulum-throwing-target*, **TST** - *The "in square" test*, **TFW** - *The figurative way*, **DENISIUC** - *The Denisiuc test*, **LB** - *Leading the basket-ball with "the deft hand" with the changing of movement direction while running*, **30DAP** - *30m dribbling among poles*, **TBD** - *Throwing the ball from distance*, **TBTR** - *Throwing the ball towards the wall and recatching it - variants I and II*, **TBFT** - *Throwing the ball at a fixed target - variants I and II*, **SD** - *Slalom dribbling*

Table 2. Regression analyses for the 14 results with values r ≥ 40%

	Unstandardized Coefficients		**Standardized Coefficients**	**95.00% Confidence Interval for B**	
Predictors	*B*	*St. Error*	*Beta*	*Lower Bound*	*Upper Bound*
			30DAP		
Constant	7.335	0.258	**-0.574**	6.807	7.864
TAPPING2	-0.035	0.009		0.054	-0.015
Constant	4.907	0.614	**0.415**	3.650	6.164
DENISIUC	0.091	0.038		0.014	0.167
Constant	3.867	1.052	**0.413**	1.711	6.022
LB	0.308	0.128		0.045	0.571
			TBTR1		
Constant	58.689	12.692	**-0.439**	32.690	84.687
RTB	-0.917	0.355		-1.643	-0.190
Constant	97.449	27.386	**-0.443**	41.350	153.547
LB	-8.728	3.342		-15.574	-1.882
Constant	22.297	1.632	**0.458**	18.953	25.640
ROMBERG	0.476	0.175		0.118	0.834
			TBTR2		
Constant	-49.203	35.644	**0.409**	-122.216	23.810
LB	10.314	4.350		1.404	19.224
			TBFT1		
Constant	-7.840	14.617	**0.431**	-37.781	22.101
DENISIUC	2.255	0.893		0.425	4.084
Constant	-44.734	23.972	**0.503**	-93.839	4.371
LB	9.003	2.925		3.010	14.995
Constant	32.384	1.476	**-0.465**	21.946	39.805
ROMBERG	-0.440	0.158		-0.763	-0.116
			TBFT2		
Constant	25.923	5.657	**-0.545**	14.335	37.510
DENISIUC	-1.189	0.346		-1.897	-0.481
			SD		
Constant	18.086	1.144	**-0.458**	15.743	20.429
TAPPING2	-0.113	0.041		-0.197	-0.028
Constant	6.722	2.270	**0.568**	2.072	11.371
DENISIUC	0.506	0.139		0.222	0.790
Constant	3.984	4.238	**0.441**	-4.696	12.665
LB	1.344	0.517		0.284	2.403

* **ROMBERG** - *The Romberg test*, **TAPPING** - *Tapping test - variant II*, **RTB** - *Running towards the balls*, **DENISIUC** - *The Denisiuc test*, **LB** - *Leading the basket-ball with "the deft hand" with the changing of movement direction while running*, **30DAP** - *30m dribbling among poles*, **TBTR** - *Throwing the ball towards the*

wall and recatching it - variants I and II, **TBFT** - *Throwing the ball at a fixed target - variants I and II*, **SD** - *Slalom dribbling*.

Four pairs of variables with a coefficient of association where r ≥ 0.50% can be highlighted, after statistical processing. These values were recorded among the tests that had the manual dexterity in common, that is in fact specific to the handball game (30DAP–TAPPING2, r = -0.57; TBFT1–LB, r = 0.50; TBFT2– DENISIUC, r = -0.54; SD–DENISIUC, r = -0.56). All these tests, except Romberg test, have at their basis, holding, catching, throwing and handling the ball and the hand coordination is an important factor in obtaining the values.

DISCUSSIONS AND CONCLUSION

Two phenomena can be found in the process of formation of motor skills: transfer and interference, with implications on the quality of information assimilation. Transfer defines the positive influence exerted by a previous formed skill, concerning the process of forming a new skill (Epuran, Holdevici, 1980; Simion, Mihăilă, Stănculescu, 2011). For example, mastering the technique of executing dribbling at an appropriate level is positively reflected on assimilating the skill of throwing at the gate through dribbling, by shortening the learning time, but especially by the fact that the athlete's attention could be focused, in particular, on the throw time. This type of relationship exists in the correlations outlined above.

The data obtained in this article is fully consistent with the study made by Jacob, Afshin, Klaus, & Pascal in 2011, where the importance of hands in coordination and special relationship with functional and motor tests are highlighted.

Although previous studies show that anatomical size affects muscular strength (Firell, Crain, 1996; Nag A., Nag P., Desai, 2003), but not so much the muscular-articular mobility (Baştiurea, E., Stan, Z., Mihăilă, I., Creţu, N., 2011), only one possibility to study the influence of these dimensions on the technique still remains.

These athletes train, as seniors, according to the improvement requirements and over-learning, so that they exceeded the pubertal stage at which coordination strongly supported technical execution.

The conclusions concern only this group of athletes and the obtained correlations indicate the degree of association between the used variables and not the cause of those connections.

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