Influence of the “DAS” sports game experience on the speed and accuracy of decision-making, reaction time, and movement coordination indicators

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Abstract

Purpose: This study is dedicated to scientifically substantiating the effectiveness of developing psychomotor functions (reaction, quick decision-making, and movement accuracy) and situational coordination abilities using the invented “DAS” sports game, exemplified through qualified volleyball student-athletes.

Methods: The “DAS” sports game, invented by us, was used along with its exercises and modified tests as methodological tests and control exercises for the purpose of testing and scientifically substantiating its practical significance.

Results: We not only studied the dynamics of the formation of jumping and running elements in various directions related to motor skills based on current research, but also attempted to determine the possibility of their more intensive development through specialized dynamic exercises and invented sports game exercises during a 10-month pedagogical experiment. In the pedagogical experiment, we examined the speed at which these movements and their coordination characteristics are formed in qualified volleyball student-athletes. In the first opportunity of the third round, 8 players managed to score 18 points out of the expected 24 points by grasping the handles with their right hand while standing 4 meters away as ordered. The maximum score was also set at 24 points. In the second opportunity, 6 players scored 12 points out of the designated 24 points by holding the handles placed 3.5 meters apart with their left hand, as per the instruction. In the third opportunity, a team of 4 players scored only 12 points out of the expected 24 points by running in opposite directions and grasping handles positioned vertically 3 meters apart with both right and left hands. In the fourth opportunity, based on the team's decision, 3 players chose to hold the handles placed 3.5 meters apart with their left hand, resulting in a score of 3 points out of the expected 9 points for this opportunity, or out of the maximum set score of 24 points.

Conlcusion: The difference between the points earned in the game and the expected points was 46.6%. In fact, from the 1-3 opportunities of this game, a maximum of 16 points should have been accumulated, totaling 56 points, which should have been equal to 53.5%. In the 4th opportunity of the 2nd game, the distance between the handles was set at 3-3.5-4 m, and in the 3rd and 4th opportunities, 7 players participated. In these opportunities, they scored 16-17-14 and 9 points, respectively. However, in the 2nd game, it was noted that out of the expected 75 points, 57 points were scored (82.6%). In the 1st-4th opportunities, the maximum should have been 16-24-16-24 points - a total of 80 points (93.7%). In the three opportunities of the 3rd game, the distance between the handles was 3-4-3.5 m, respectively, and the number of players was 8-8-4. In the game, players were instructed to hold the handles with their left hand.

Keywords: “DAS” sports game, skilled volleyball students, coordination ability, directions, movement asymmetry, assessment of movement coordination, effect of rotational movement load, quick decision-making, reaction, movement accuracy.

Introduction

In recent years, special attention has been given to highlighting numerous theoretical ideas about movement coordination and coordination abilities, which play an extremely important role in physical education and sports practice. This includes issues related to their essence, mechanics, structural components, development, and assessment. Although actions based on genetic factors, formed through lifelong upbringing and educational methods and tools, are being subjected to various experimental studies, the exploration of the functional and energetic foundations of this ability remains overlooked. It has been observed that the experience of teaching motor skills in general education schools, professional sports practice, and students' vocational-practical training processes is not based on modern data, interactive methods, and innovative technologies related to movement coordination and coordination abilities. Today, it is advisable to introduce several scientifically and theoretically grounded original recommendations into physical education theory and practice. Firstly, the readiness of the learner (child) for training in special or specialized movement coordination and coordination abilities, and their development. Secondly, the development of movement coordination and coordination abilities that are primarily necessary or highly relevant in training and competitions. Thirdly, when implementing these approaches, initially forming simple movement coordination or coordination abilities in accordance with the type of sport or the task of the movement being taught. Fourthly, in developing complex movement coordination and coordination

abilities, attention should be paid to the procedural and final accuracy of the movement being taught. Such parameters of movement accuracy were first acknowledged by N.A. Bernstein, where procedural accuracy refers to the similarity or correspondence of the performed movement coordination to the model (standard) copy (benchmark). Final accuracy refers to the precise directing of the ultimate (final) goal of the movement (for example, accurately aiming the ball into the basket) towards a specific target.

The highly relevant issues and problems discussed have been revealed on an experimental basis, and their application in physical education or sports clubs conducted in schools from an early age allows for the targeted and effective formation of coordination abilities. These abilities are an integral expression of physical and technical-tactical training, including the coordination of various, even highly complex movements.

In studying the problems of coordination abilities specific to sports practice, their formation and assessment, the role of coordination abilities in physical education and sports activities, their pedagogical foundations, neurophysiological essence, and scientific-practical significance were revealed through the analysis of bibliographic sources published in recent years.

It was found that innovative types of exercises or games that create the possibility of simultaneously forming and objectively assessing situational coordination abilities based on speed have not been implemented in either the system of physical education or sports practice.

Results and discussion

As in all sports, achieving beneficial results in "DAS" sport competitions requires athletes to have highly developed physical, psychofunctional, and technical-tactical preparedness. In the "DAS" sport game, along with such types of training, situational coordination abilities based on maximum speed are of particular importance. These include the number of times athletes can run and grab upright handles left by partners at various distances (3 m, 3.5 m, 4 m) with both right and left hands, the accuracy of these movements, and the stability of these abilities under the influence of various rotational movements.

The results of competitions in this "DAS" sport serve as the most objective and reliable criterion for assessing the specialized integral preparedness of participating athletes.

At the end of the 10-month pedagogical experiment, we held a competition in this "Sports Game" between the CG team, which participated only in traditional training sessions during this experiment, and the EG team, which participated in the recommended experimental training sessions during this process. (Figures 1 and 2 show the teams participating in the competition and scenes from their games). The course of the competition, the game results of the players from the two participating teams, and their effectiveness were subjected to "stenographic" analysis.

The results of a comparative analysis of the teams' play showed that the NG team, which started the game first based on the draw, according to their order, in the first of 4 chances in the 1st game (the game, as per the rules, lasts 3 games, and 4 chances are given in each game) with 8 players at a distance of 3.5 m (3 m - 1 point, 3.5 m - 2 points, 4 m - 3 points) scored 8 points by holding the handles upright with the right hand (holding the handles with the right hand - 1 point, with the left hand - 2 points). In the 2nd chance of the 1st game, they chose to leave the handles standing at a distance of 3 m, and 4 players participated in the game. During this opportunity, the players managed to score 4 points. As can be seen, although the handles were held with the left hand, they scored only 4 points out of the assigned 8 points. In the 3rd chance of the 1st game, the distance for holding the handles was also chosen as 3 m, 3 players participated in the game, and it was decided to hold the handles with the left hand.

Nevertheless, during this opportunity, they scored only 2 out of the designated 6 points. The team was forced to end the game on the 3rd chance of this game because, according to the rules, if only 2 players are left in the team, this game ends. In the 1st game, only 14 out of the expected 30 points were scored. Although the decision to use the left hand was made with the goal of scoring more points, the players scored only 16 points out of the expected 16 in the 1st opportunity. Scoring 16 points out of the expected 60 points in the game equals only 26.6%. The maximum score for the game should have been 80 points (75%). (see Table 1).

The noticeably low sum of points accumulated in the games and designated opportunities is explained, firstly, by the

Fig 2. Results of the competition held between the control and experimental group teams in the "DAS" sports game

Rounds	Opportunities	Attempts		Number of players	I/T points	P/T points	I/K points	P/K points	Difference between P/T and P/K (%)	M points	M points	Difference from M points (%)	
		HHH	DBH (m)									P/T points	P/K points
Control Group													
1.	1.	R/H	3.5-	8	8	14	16	30	46.6	16	56	25	53.5
	2.	L/H	3	4	4		8			16			
	3.	L/H	3	3	2		6			16			
	4.	-	-	2	-		-			8			
2.	1.	L/H	3	8	16	57	16	75	82.6	16	80	75	93.7
	2.	L/H	3.5	8	18		24			24			
	3.	L/H	3	7	14		14			16			
	4.	R/H	4	7	9		21			24			
3.	1.	L/H	3	8	16	16	16	60	26.6	16	80	20	75
	2.	L/H	4	8	0		32			32			
	3.	L/H	3.5	4	0		12			24			
	4.	-	-	2	-		-			8			
Total						**90**		**165**	**54.5**		**216**	**41.6**	**76.3**
Experimental Group													
1.	1.	L/H	3	8	16	63	16	75	84	16	80	78.7	93
	2.	L/H	3.5	8	18		24			24			
	3.	L/H	3.5	7	21		21			24			
	4.	R/H	3.5	7	8		14			16			
2.	1.	L/H	3	8	16	50	16	80	62.5	16	96	52	83.3
	2.	L/H	3.5	8	18		24			24			
	3.	L/H	4	7	4		28			32			
	4.	B	3	4	12		12			24			
3.	1.	R/H	4	8	18	35	24	69	56.5	24	96	40.6	71.8
	2.	L/H	3.5	6	12		24			24			
	3.	B	3	4	6		12			24			
	4.	L/H	3.5	3	3		9			24			
Total						**148**		**224**	**67.8**		**272**	**55.8**	**82.3**
Difference between groups						**58**		**59**	**13.3**		**56**	**14.2**	**6**

Notes: *HHH - hand holding the handle; L/H - left hand; R/H - right hand*
Number of players - number of participants; DBH - distance between handles; M - maximum score
I/T - points scored in opportunities; P/T - points scored in the round
I/K - expected points in opportunities; P/K - expected points in the round

insufficient level of technical and tactical training of the NG team players. Secondly, their lack of technical and tactical skills is primarily due to the underdeveloped special coordination

Fig 2. Control and Experimental Group





abilities based on speed (running speed, accuracy of gripping the handles with the right and left hands). Thirdly, it is determined by the tactical inexpediency of the given instructions regarding the distance between the handles and which hand to hold them with, or in other words, by the fact that the team players made several tactical errors in organizing the game, especially due to non-compliance with certain game rules (the distance between the upright handles, how many points are awarded for holding them with the right or left hand, as well as giving logically incorrect instructions).

Such errors are vividly reflected in the "stenographic" analysis of the game (*see Table 1*). It should be noted that the NG team players also had the necessary information about the content of the "DAS" sports game, the rules of the game, the game results, the intervals between upright handles, the points awarded for holding them with the right and left hands, and penalty points for unsuccessful actions or errors (holding the handle with the left hand and in pairs). They were informed that at the end of the pedagogical experiment, a competition on this game would be held and preparations for it would be made.

However, it can be assumed that engaging in this game alone will not be sufficient for effective participation in such a game. In addition, the "DAS" sports game requires the development of several situational coordination abilities based on speed (shuttle run, gripping upright handles with the right and left hand, maintaining stability in dynamic balance during this process, etc.).

The second team that participated in the competition - the EG team - regularly engaged in experimental exercises recommended by us, the sports game "DAS," and related active games every morning and 3 days a week (on even days) throughout the 10-month pedagogical experiment.

The "stenographic" analysis of the competitive game in which this team's players participated revealed that, as per the team's request, in the first attempt of the first set, the handles were placed 3 m apart, with the condition of holding them with the left hand (2 points). Eight players participated in the game. In the first attempt of the first set, they managed to score all 16 points out of the 16 points allocated for this attempt. The maximum score was also set at 16 points. In the second attempt of the same set, 8 players managed to score 18 points out of the designated 24 points by gripping the handles placed 3.5 m apart with their left hand (3 points). In the third attempt, 7 players (1 player was eliminated) managed to score all 21 points out of the specified 21 points by holding the handles standing vertically at 3.5 m with their left hand. In this attempt, they scored 3 points less than the maximum set score (24 points). In the fourth attempt of the first set, 7 players were assigned, repeating the previous order (the handles were placed 3.5 m apart, but gripped with the right hand).

They scored 8 points out of the designated 14 points. The maximum score for this attempt was set at 18 points. In the four attempts of this set, the TG team managed to score 63 points out of the expected 75 points. The maximum possible score was 84 points, and the difference between these indicators was 84%. In the 1st opportunity of the 2nd game, 8 players who entered the game with the condition of holding the handles left standing at a distance of 3 m with their left hand scored a full 16 points out of the officially established 16 points for this opportunity. In the second opportunity, 8 players scored 18 points out of the designated 24 points by holding the handles

left standing at a distance of 3.5 m (2 points) with their left hand (2 points). In the 3rd opportunity, as per the order, the distance between the handles was set to 4 m (4 points), and based on holding them with the left hand, 7 players participated, scoring only 4 points out of the specified 28 points for this opportunity. The maximum score was set at 32 points. In the 4th opportunity, due to the requirement to play in pairs, partners were instructed to run in opposite directions and hold the handles, one with the right hand and the other with the left. Although the distance between the handles was set at 3 m, the 4 players who participated in the game scored a full 12 points out of the expected 12 points for this opportunity. However, the fact that they were supposed to score a maximum of 24 points in this opportunity indicates that tactical errors were made in the game. In the 4 opportunities of the 2nd game, 50 points out of the expected 80 points were scored, which amounted to 62.4%. However, in reality, this game should have had 96 points available (83.3%).

Nevertheless, the EG team's players demonstrated a higher level of skill compared to the CG team by scoring relatively more points in the 1st-3rd opportunities (16-18-21 points) of the 1st set, the 1st-2nd opportunities (16-18 points) of the 2nd set, and the 1st opportunity (18 points) of the 3rd set. Specifically, in the 1st set, they scored 63 points out of the designated 75 (84%), in the 2nd set, 50 points out of the expected 80 (62.5%), and in the 3rd set, 35 points out of the designated 69 (56.5%), achieving a victory over the CG team with a score of 148:90 points.

As evident from the indicators shown in this figure, during the "DAS" sports game competition, the EG team's players made relatively fewer technical and tactical errors and managed to score 148% according to their tactical plan based on their assignments. This result is 58 points higher than the total score recorded by the CG team (90 points). Therefore, it can be stated that during the 10-month pedagogical experiment, the experimental content exercises recommended by us, along with regular engagement in related active games and the "DAS" sports game, led to the rapid development of physical qualities and stability in maintaining dynamic balance in the EG team. This, coupled with the effective formation of speed-based coordination abilities, created the foundation for increasing the effectiveness of technical and tactical techniques.

Conclusion

Based on the results of the research conducted during the 10-month pedagogical experiment and their comparative analysis, the following conclusions can be drawn:

In the experimental group (EG), which regularly participated in the experimental training sessions recommended by us during the experiment, the team, in accordance with their task, achieved victory over their opponents by grasping the handles left standing at 3.5-4.0 m with their left hand. They scored 63 points out of 75 in the 1st game, 50 points out of 80 in the 2nd game, 35 points out of 69 in the 3rd game, and a total of 148 points out of 224 across all three games. The accumulation of such points in each game, each opportunity, and throughout the match in this group demonstrates the high effectiveness of the experimental exercises, related mobile games, and the sports game "DAS" used in this group for developing psychomotor functions (reaction, quick decision-making, and movement accuracy), as well as situation-based coordination abilities founded on speed.

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