STRUCTURE OF SITUATIONAL MOTOR ABILITIES IN HANDBALL

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Abstract. Goal work is to determine the structure of situational motor skills in handball, code students of the Faculty of Sports and Physical Education in Leposavić, aged 19 to 21. By applying the method of component factor analysis inthree latent dimensions are isolated in the situational motor space: the first is responsible for the speed of movement without the ball and with the ball and handling the ball; the second for the power of throwing the ball and situational accuracy of shooting from 7 m; The results of the research confirmed the connection between isolated latent situational motor dimensions and that the speed of ballless movement with the ball, ball handling, ball throwing power and situational accuracy depend on the same regulatory mechanisms. The conclusion is that in determining the optimal anthropological model in domain kinesiological education, planning, programming and selection in handball, special attention should be paid to situational motor skills.

Keywords: handball, situational motor skills, students

INTRODUCTION

Today's handball implies a set of fast and extremely complex movements and actions, solving problems in a given situation, which together indicate the level of activity intensity. Such a level of activity intensity requires highly developed basic and specific abilities from players (Andersson et al., 2017). Handball as a contact game is based on natural forms of movement and belongs to the semi-structured sport that has unpredictable dynamics of activities of the cyclic and acyclic type (Bragazzi et al., 2020). It should be emphasized that success in handball depends on a number of different factors, both internal (endogenous) and external (exogenous). Factors that play a significant role in achieving results in handball are morphological characteristics, functional abilities of organs and organ systems (anaerobic and aerobic capacity), motor skills, social characteristics of personality, as well as conative and cognitive characteristics, but also situational motor abilities (Hermassi et al., 2019; Shen et al., 2021).

The influence of basic motor skills is the basis for further upgrading of specific motor skills that are directly responsible for achieving quality results. The existence of five latent situational-motor dimensions in handball has been confirmed

by numerous authors: speed of movement of players without the ball, speed of movement of players with the ball, handling of the ball, power of throwing the ball and situational precision. In accordance with previous research, the special interest of this research is to study situational motor abilities from the total psychomotor space (Lidor et al., 1998; Ruscello, et al., 2021).

Determining the structure of motor skills and knowledge is still insufficiently researched, but a very current theoretical and practical problem that is of great importance, primarily due to the possibility of forming rational procedures for planning, programming, monitoring and evaluation in handball science and for orientation and selection of young athletes (Mascarin, et al., 2017).

The aim of this research is to determine the structure of situational motor abilities in handball students.

METHODS

The population from which the sample was taken is defined as the population of students of the Faculty of Sports and Physical Education in Leposavic, some of which are active in handball clubs of various ranks in Serbia, and compared to top handball players are below average male players. aged 21 to 27 years. The final sample of 110 respondents was selected on the basis of passing the practical part of the handball exam.

The sample of variables consisted of five situational motor abilities (Visnapuu, & Jürimäe, 2009) assessed with two tests: speed without ball (lateral and depth mobility - SRDP, starting speed after ball - SRTL); speed of movement with the ball (starting speed with the ball at 20 m - SR20, guiding the ball in the square - SRKV; handling the ball (playing with 2 balls - SR2L, throwing and catching the ball bounced off the wall with one hand - SR1L; power of throwing the ball (throwing handball balls from a distance from the ground - SRBT, throwing a handball ball from a distance from a jump - SRBS) and situational precision (precision shot from a high position with 7 m - SRP7, precision from a jump shot from 9 m - SRP9).

To determine the structure of the applied variables in this paper, the method of component factor analysis was applied using a system of programs developed by (Trichtinger, & Zhang, 2021), implemented and executed within the statistical packages SPSS 16 (SPSS Inc., Chicago, IL.)

RESULTS

The analysis of intercorrelations of situational motor abilities (Table 1) shows that the correlations between the analyzed situational motor abilities are low, medium and only in some cases high.

The highest coefficient of correlation was determined between situational motor abilities of the ball throwing force, which was assessed tests: throwing a handball into the distance from the ground (SRBT) i throwing a handball into the distance from a jump (SRBS), which is understandable since both tests are similar in their performance technique and the result depends on the ability to give maximum acceleration of the ball.

This factor is related to the factor of speed without movement of the ball (lateral and depth mobility - SRDP, starting speed of running after the ball - SRTL) and the factor of handling the ball (SR2L) and which means that the distance of

throwing the ball does not depend only on arm and shoulder strength belt, but also from: the correct position of the twisted body before throwing the ball (shelter and twist); techniques of moving the hand without the ball (up to the hand) and the hand with the ball (the shortest way through the hand to cause out or with a circular swing of the hand through the engagement to cause out) to the stage of throwing the ball; movements (steps, 1, 2 and 3) or out of place; reflection by long jump or high jump (with one foot opposite the hand with the ball, the same foot and the hand in which the ball or both feet are in the footsteps); activation or non-activation of the abdominal and arm and shoulder girdle muscles in which the ball is to be thrown; timely synchronized activation or non-activation of all muscle groups of the whole body involved in throwing the ball (off the ground or from a jump); and finally, landing on the ground (with one or both legs, one or both legs and arms or arms with a roll on the back, arms and legs with a leg).

Of the analyzed situational motor abilities, lateral and depth mobility (SRDP) show a significant correlation with starting speed behind the ball (SRTL), guiding the square ball (SRKV) and starting speed with the ball at 20 m (SR20). The realization of these motor structures of movement is responsible for specific handball movements without the ball and with the ball with a large share of speed.

Based on the analysis of the interconnectedness, it can be noticed that the applied system of situational motor tests is not homogeneous and that it will be very difficult to isolate and logically define the structure of the obtained dimensions.

There are almost no differences between the matrix of the connection between situational motor abilities and the one obtained in the research of many authors (Lidor et al., 2005; Katić et al., 2007; Cavala et al., 2008; Wagner et al., 2012; Mann et al., 2014; Karcher, & Buchheit, 2017; Viseux et al., 2019; Burdukiewicz et al., 2019; Caballero et al., 2020; Schorer et al., 2020; Popowczak et al., 2021).

Table 1. Matrix of intercorrelation of situational motor abilities

TEST	SRDP	SRTL	SR20	SRKV	SR2L	SR1R	SRBT	SRBS	SRP7	SRP9
SRDP	1.00									
SRTL	.52	1.00								
SR20	.33	.26	1.00							
SRKV	.50	.31	.46	1.00						
SR2L	-.12	-.14	-.08	-.33	1.00					
SR1R	-.11	-.29	-.17	-.16	.17	1.00				
SRBT	-.18	-.14	-.28	-.37	.29	.04	1.00			
SRBS	-.15	-.07	-.25	-.27	.28	.14	.72	1.00		
SRP7	-.18	-.13	-.14	-.19	.12	.00	.25	.19	1.00	
SRP9	-.17	-.08	-.03	-.16	.28	.04	.13	.25	.03	1.00

Legend:lateral and deep mobility (SRDP), starting speed after running the ball (SRTL), starting speed with the ball at 20 m (SR20), guiding the square ball (SRKV), playing with 2 balls (SR2L), throwing and catching the ball bounced off wall with one hand (SR1L), throwing a handball into the distance from the ground (SRBT), throwing a handball into the distance from a jump (SRBS), precision shot from a high position with 7 m (SRP7), precision from a jump shot with 9 m (SRP9).

Three main components were isolated from the matrix of intercorrelations of situational motor tests, using the Kaiser-Guttmann criterion (Table 2).

The amount of variability with which the isolated main components in situational motor space are explained, explains the analyzed space with 56.4%.

Table 2. Main components of situational motor abilities

TEST	FAC1	FAC2	FAC3	h2
SRDP	-.63	.48	.06	.63
SRTL	-.54	.57	-.09	.63
SR20	-.58	.23	.31	.49
SRKV	-.75	.17	.05	.59
SR2L	.49	.28	.50	.56
SR1R	.33	-.29	.39	.34
SRBT	.68	.52	-.24	.78
SRBS	.64	.58	-.08	.74
SRP7	.38	.11	-.43	.34
SRP9	.34	.24	.61	.54
LAMBDA		3.05	1.46	1.13
%		30.5	14.6	11.3
CUMUL.		30.5	45.1	56.4

The first main component with 30.5% variance, which exhausts from the total variability of the whole system of situational motor tests, is defined by situational motor tests to assess the speed of movement without the ball (SRDP) and with the ball (SR20 and SRKV) and ball throwing power (SRBT and SRBS). This factor is the first and main subject of measuring situational motor abilities.

The second major component was explained with 14.6% variance, and was defined by a situational motor test to estimate speed without ball (SRTL).

The third main component is defined by situational motor tests to assess situational accuracy (SRP7 and SRP9) and ball handling (SR2L and SR1R).

The height of the obtained communalities, which represent the explained part of the variance, tells us that the tests for the assessment of situational motor abilities are relatively homogeneous.

It can be seen that tests to assess the situational motor skills of throwing and catching the ball bounced off the wall with one hand (SR1R) and the accuracy of shooting from a high position from seven meters (SRP7) as well as starting speed with the ball at 20 m (SR20) indicate that uniqueness is enough expressed.

The structure of situational motor dimensions was analyzed on the basis of all information provided by oblimin transformations (matrix of assembly, structure and intercorrelation of dimensions).

Oblimin's transformation in situational motor space gave three situational motor dimensions.

Table 3. Matrix of the set of situational motor abilities

TEST	FAC1	FAC2	FAC3
SRDP	-.79	-.04	.03
SRTL	-.80	.16	-.04
SR20	-.57	-.31	-.18
SRKV	-.61	-.32	-.12
SR2L	.06	.21	.69
SR1R	.42	-.22	.35
SRBT	.00	.85	.18
SRBS	-.08	.80	.33
SRP7	.17	.50	-.23
SRP9	-.01	.05	.73

By analyzing the matrix of the structure of situational motor dimensions (Table 4) we see that on the first obtained latent situational motor dimension, the largest projections show situational motor tests to assess speed without ball (SRDP, SRTL), speed with ball (SR20, SRKV) and ball handling (SR1R).

Table 4. Matrix of the structure of situational motor abilities

TEST	FAC1	FAC2	FAC3
SRDP	-.79	-.20	-.09
SRTL	-.78	-.01	.15
SR20	-.61	-.43	.08
SRKV	-.69	-.45	-.23
SR2L	.21	.26	.71
SR1R	.43	-.11	.40
SRBT	.21	.86	.23
SRBS	.14	.80	.36
SRP7	.26	.52	-.18
SRP9	.11	.09	.73

On the second latent situational motor dimension, the highest projections are shown by situational motor tests for estimating the power of throwing the ball (SRBT, SRBS) and the accuracy of shooting from a high position with 7 m (SRP7).

On the third latent situational motor dimension, the highest projections show the situational motor test for the assessment of ball handling (SR2L) and precision from a 9 m jump shot (SRP9).

Based on the projections of situational motor tests, the first latent situational motor dimension can be defined as the latent dimension responsible for the speed of movement without the ball and with the ball and handling the ball.

Situational motor abilities that explain the first latent situational motor dimension are characteristic of handball in general. The speed of movement without the ball is responsible for the speed of movement without the ball in defense and attack in a way characteristic of handball players. The speed of movement with the ball is responsible for the maximum speed of performing specific motor tasks whose basic content is rectilinear and curvilinear guidance of the ball and in which there is control through the external control circuit, ie. one through which feedback arrives via a visual analyzer, which ensures continuous motion corrections. Handling the ball is responsible for performing complex motor tasks (handball techniques) in

which the ball is a prop that needs to be manipulated in place or movement, with or without bouncing off the ground where fine regulation of hand movement is especially important.

The second latent situational motor dimension, based on the projections of situational motor abilities, can be defined as the latent situational motor dimension which is responsible for the ball throwing force and situational precision. The main characteristic of this latent dimension refers to the efficiency of all tasks where the result depends on the ability to give maximum acceleration of the ball in the technique of throwing the ball (passing and shooting) and situational precision with 7 m.Precision is important for the ability to regulate muscle tone in the realization of the optimal trajectory and speed of movement when throwing the ball.

The third latent situational motor dimension, based on the projections of situational motor abilities, can be defined as the latent situational motor dimension which is responsible for handling the ball and for situational shooting accuracy from 9 m.

It is noticed that the obtained structure of latent situational motor dimensions did not justify the assumptions about clear differentiation of the analyzed space.

Table 5. Correlations of situational motor dimensions

	FAC1	FAC2	FAC3
FAC1	1.00		
FAC2	.21	1.00	
FAC3	.15	.05	1.00

The correlation of isolated latent situational motor dimensions is statistically significant (Table 5) only between the dimension responsible for speed with and without the ball, ball handling, ball throwing force and the dimension responsible for situational accuracy of .21. This is understandable considering the "similar" structural, energetic and coordination basis of the applied situational motor movements.

The results obtained in this study, generally observed, confirmed the existing knowledge about the characteristics of situational motor skills in handball.

Characteristic of the handball game is that it is dominated by complex movements, as well as tactical variants whose quality of realization is directly subordinated to the individual's ability to learn, adapt and reproduce these ideas in complex situations during the game. Precisely for that reason a large number of authors state the significance and connection between morphological, conative and sociological characteristics, functional and cognitive abilities, their structures, differences, effects, not forgetting the importance of motor abilities (Hrysomallis et al., 2007; Okuno et al., 2013; Wei, & Ji, 2014; Gharbi et al., 2015; Hermassi et al., 2018; Hermassi et al., 2019; Przednowek et al., 2019; Charron et al., 2020; Katsumata, & Aoki, 2021; Freitas et al., 2022) for achieving high success in handball.

These results call for further research into the relevant characteristics and abilities of handball players, in order to form an objective and valid selection process of young handball players.

CONCLUSION

The analysis of the structure of situational motor skills in handball was performed on a sample of 110 students of the Faculty of Sports and Physical Education in Leposavic, aged 19 to 21 who passed the practical exam in handball and according to the technical and tactical elements of handball are at a slightly lower level. from average handball players.

Three latent dimensions were isolated in the situational motor space:

The first latent situational-motor dimension is defined as the dimension that is responsible for the speed of movement without the ball and with the ball and handling the ball. The second latent situational motor dimension is defined as the dimension responsible for the ball throwing force and situational shooting precision from 7 m. The third latent situational motor dimension is defined as the dimension responsible for ball handling and situational shooting precision from 9 m.

The connection between isolated latent situational motor dimensions indicates that the speed of movement without the ball, with the ball and the handling of the ball as well as the power of the ball throw and situational precision depend on the same regulatory mechanisms. This is understandable given the similar structural, energy, coordination and biomechanical basis of these movements.

The significance of this research is that the obtained results can be usefully applied for selection, improvement and modernization of planning and programming of handball training, as well as intensification and efficiency of directed transformation processes adjusted according to their specific, individual needs, possibilities and preferences.

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