FACTOR STRUCTURE OF THE TECHNICAL-TACTICAL PREPAREDNESS OF THE ELITE FEMALE GREEK HANDBALL PLAYERS

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ABSTRACT

The aim of the present study is to reveal the factor structure and to identify the main factors of the technical-tactical preparedness of elite female Greek handball players. The subject of the study is sports preparation in handball. The subject of the study are the components of the technical-tactical preparedness. One hundred and one elite handball female players playing in 1st divisions were tested.

The results of the study were assessed with the modern mathematical and statistical methods, mainly factor analysis with VARIMAX rotation. The 6 basic factors were extracted which explain an extremely high percentage of the initial dispersion of the studied phenomenon (93.95%), and the factor structure of the technical-tactical preparedness of the elite female Greek handball players was revealed.

The factors were interpreted as: speed of the shot on goal (27,11 %); skills to moving on the court with dribbling (18,99 %); skills to moving in defence (12,94 %); accuracy of shots on goal (11,74 %); speed of shots on goal (11,69 %); strength abilities and long distance shot technique (11,48 %).

Key words: handball, female players, technical-tactical preparedness, factor structure, factor loading

INTRODUCTION

The study of the literature shows that, in the latest years there has been a marked development of all components of the handball game. This can be applying in higher degree of both - specific physical and specific technical and tactical preparedness. According to I. Varbanov (2019), there are some important trends in the development of the game of top-level handball players, such as:

- dynamic change of the two phases of the game (attack and defense) - the fast transition from attack to defense blocks the fast attacks of the opponent, and the accuracy and timely passing of the goalkeeper is extremely important for the beginning of the team attack;
- the priority of the fast-game, fast-paced counter-attacks and rapid execution of fast center;
- increasing the effectiveness of the shot on the opponent's goal;
- almost equal opportunities of both sexes for successful offensive play.
- The current trends mostly related with the female teams are the following (Varbanov, I., 2015):
- highest efficiency of the 7-meter shots, fast attacks and cuts;
- reduced efficiency of the shots from close

distance (6 m and wings);

- low efficiency of long shots (9 m).

The improvement of training process in different sports modalities (Chaney, S., 2017, 2019) is closely related to the study of the features of different motor activities. In most cases, sports game players (Gavriiski, V., 1993) do not have convenient models of predetermined motor combinations but must build them at the moment of the action. This requires mastering of a large arsenal of motor elements that can be easily assembled in temporary combinations.

According to Y. Verkoshanski (1989), the improvement of the technique is the most important part of the process of long-term adaptation of the organism to the conditions of sports activity. It is an ongoing indicator for the continuous and interminable process of moving from small perfection to a greater one. In this process the individual contribution is very important. The more accurate and refined the movements are, the more they are adapted to the proper mechanics of the technique, the better and faster the technique will be learned and refined.

S. Chaney (2019) in his research on the level of

development of the specific technical and tactical preparedness of 17-19-year-old Bulgarian handball players came to the following conclusions:

- the effectiveness of 7-meter shots and long shots, as well as the ability to moving in defense do not depend on players' age;
- significant changes with increasing the age occur in the ability to move on the court with dribbling and to perform long-distance throws.
- ability to move on the court with dribbling and to perform long distance throws.

According to the same author, improvement of the training process requires periodic research and follow-up of the main factors and trends for the development of handball, which in order are prerequisites for a deeper understanding of the game to improve the process of preparing and increasing the efficiency of the involved training work.

Objective relationships that exist between the technical and tactical preparedness of sportsmen in handball indicate the need to study these indicators together (Ignatieva V.Y et al, 2005; Melnyk, V. et al, 2017).

The *aim* of the present study is to optimize the training process in handball through identifying the main factors of the technical-tactical preparedness of Greek female handball players.

METHODS

This study was conducted from 2018 to 2019.

The *object* of the study is the technical-tactical preparedness of Greek female handball players.

The *subject* of the study is the indicators (components), as well as the main factors of technical-tactical preparedness.

The *sample* of the research consisted of 101 Greek female handball players, taking part in 1-st playing divisions of the country.

In order to find the main components, as well as the main factors of the technical-tactical preparedness of the tested handball players, the following methods were applied: literature review and sports-pedagogical testing.

Sports-pedagogical testing was conducted and based on a total of 9 indicators (Table 1) in order to establish the level of technical-tactical preparedness of Greek female handball players, taking part in the studied group.

The factor analysis was applied by processing mathematical and statistical set of data. For studying factor structure and identifying the main factors of the technical-tactical preparedness, the original correlation matrices were factorized by principle component analysis followed by Varimax orthogonal rotation method (Wainer, Braun, 1988).

The construction of correlation matrices and the factors extraction were made with the means of the so-called R-technique where a certain number of observation units - n (the examined female handball players) were evaluated through a set of indicators - m (in this study 9). This option assumes the condition $n > m$, which was respected.

RESULTS

The applied factor analysis allows to reveal the factor structure of the technical-tactical preparedness of Greek female handball players. As can be seen from Table 2, the structure is determined by 6 main factors, which together explain the extremely high percentage (93.95%) of initial variance of the studied phenomenon.

Table 1. List of the parameters of the technical-tactical preparedness

№	Indicators / Parameters	Measuring units	Measurement accuracy	Direction of growth
1.	Dribbling	s	0,01	-
2.	Index of dribbling	s	0,01	-
3.	Moving in defence	s	0,01	-
4.	Shot on goal – t	s	0,01	-
5.	Shot on goal – goals	number	1,00	+
6.	Shot from 7 m - V	km/h	1,01	+
7.	Shot from 7 m with 3 steps - V	km/h	1,01	+
8.	Jump shot from 7 m after 3 steps - V	km/h	1,01	+
9.	Long distance pass	m	0,10	+

Table 2. Factor structure of the specific technical-tactical preparedness

№	I	II	III	IV	V	VI	h^2	$1 - h^2$
1.	-0,300	0,752	0,419	-0,002	0,215	-0,222	0,926	0,074
2.	-0,291	0,927	0,000	-0,054	0,025	-0,127	0,965	0,035
3.	-0,205	0,138	0,912	-0,177	0,210	-0,133	0,986	0,014
4.	-0,065	0,099	0,183	-0,074	0,972	-0,041	0,999	0,001
5.	0,023	-0,039	-0,138	0,977	-0,072	0,082	0,987	0,013
6.	0,891	-0,158	-0,112	-0,132	-0,056	0,185	0,886	0,114
7.	0,725	-0,314	-0,243	0,064	-0,065	0,399	0,851	0,149
8.	0,859	-0,278	-0,104	0,169	-0,042	0,124	0,872	0,128
9.	0,399	-0,231	-0,150	0,116	-0,051	0,856	0,984	0,016
$\Sigma\alpha$	27,11	18,99	12,94	11,74	11,69	11,48	93,95 %	

When analysing the table, it can be observed that the first resulting factor is the factor with the most complex character. This factor is determined by three main items, which are related to the highest relative proportion of the explained by this factor source variance - 27.11% (Figure 1).

As is clear from the figure, high factor loading for the second factor are observed for the two of the studied parameters and the relative proportion of the explained variance by it is much lower

- 18.99%.

The other four factors all are determined by only one item, demonstrating that they are strictly specific. Figure 1 shows that the relative proportions of the factors from III to VI are very close (occupying values between 12.94% and 11.48%) and at the same time they are much lower than those of the first factor (by over 14%) and the second factor (by over 6%).

Figure 1. Relative proportions of the explained variance of specific technical and tactical preparedness

From the analysis of Figure 1, it is clear that the relative proportion of the unexplained initial variance of the technical and tactical preparedness of the Greek female handball players is only 6.05%. This is the sign of the high informative value of the applied test battery.

DISCUSSION

A detailed understanding of the structure of the first factor (Figure 2) shows that all three items, with high factor loading are related to the speed at which

the ball moves when performing different types of shots on opponent's goal from the same distance - 7 m. Logically, the high speed of movement of the ball creates serious problems for goalkeeper and leads to highest efficiency of the game in attack.

As can be seen from Figure 2, with the highest factor loading (0.891) here is the item No 6, which determines the high significance of the speed at which handball players pass the ball into the opponent's goal from a static initial position (at 7-meter penalty throw).

Very close, concerning the importance, is also item No 8 (Factor loading 0.859), which brings informa-

tion about the speed at which players shoot the ball from 7 m after 3 steps and a subsequent rebound.

Figure 2. Factor structure of the specific technical-tactical preparedness I and II Factor

All of this allows to identify the first extracted factor of the technical and tactical preparedness of the Greek handball players as “the ability to perform various kicks on the goal quickly from the initial positions located on the 7-meter line”. Obviously, it must be accepted, that on the base of this skill is a high level of development of the explosive force of the throwing upper limbs.

The second factor is related to “the ability to moving on the court with dribbling at high speed” (Figure 2). This means that developing this skill and using it during a competition can lead to a higher efficiency

of the play of Greek handball players in attack.

The “skill to moving in defence” occupies the third place in the factor structure of the technical and tactical preparedness of the tested handball players (Figure 3). The variable No 3 (“moving in defence”) is with the highest factor loading (0.912).

An important factor in the factor structure is the “precision of shots on the opponent’s goal”. It is not coincidentally that the defining factor of Factor IV (“shot on the goal - successful hits”) is with the highest factor loading - 0.977.

Figure 3. Factor structure of the specific technical and tactical preparedness

The following (fifth factor) explains 11.69% of the initial variance of the technical and tactical preparedness of the handball players. As noted above, this factor is also determined by only one item - No. 5 (“throw on the goal - t”), which the factor loading

0.972, and carries information about the importance of “the speed of execution of the goal shots of the opponent”. On the one hand, this relates to the speed of the motor reaction response and on the other, with the so-called anticipation - in this case

it is the skill to predict the actions of the goalkeeper. The last factor number sixth with factor loading 11.48% can be identified as "the player's strengths abilities and long-range shooting technique" (Item No 6 - with factor loading of 0.856). As is clear, this factor is also linked to the play in attack.

CONCLUSION

The analysis of the results justifies the following important conclusions:

1. The factor structure of the technical and tactical preparedness of elite Greek female handball players is determined by 6 main factors that explain a very high percentage of the initial variance of the studied phenomenon.
2. The most significant contribution to the technical and tactical preparedness of the players is the ability to quickly perform various shot on the opponent's goal.
3. Five of the extracted factors are related to the play in attack, which defines this phase of the game as more significant at the current stage of the development of female handball in Greece.

However, in the spirit of fairness, it should be noted that most of the components included in the test battery are aimed at establishing the effectiveness of the offensive actions of handball players. Some corrections and additionally inclusion of a number of components revealing the skills of the female

players in defence are necessary.

Future research should essentially focus on the technical and tactical skills during games in relation to specific collective systems of play and individual playing roles.

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