RECIPROCAL RELATIONSHIP BETWEEN THE GAME AND TRAINING PATTERNS IN PERFORMANCE VOLLEYBALL

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Abstract*. There are many types of research in the literature on modelling the game preparation in professional volleyball, but very few have highlighted the relationship between the training pattern and the game pattern, based on the analysis of the performance behaviour of the teams in the official sports competitions. This study aims to highlight the reciprocal relationship between the training pattern and the game pattern in the female performance volleyball for the Știința Bacău team depending on the opponent's level. This research proceeded from the hypothesis according to which the technical-tactical training during the competition period has a positive influence on the game action efficiency markers, in other words, it influences the game pattern. From this interaction we can debate on the reciprocal relationship between the game pattern and the training pattern. The 14 players of the Știința Bacău women's volleyball team in the 2017-2018 competitive season took part in the study. As a result of this research, significant differences were recorded in the matches with the level 1 teams for the blocking and taking over game action efficiency indices, and in the matches with the level 2 teams, significant differences in the serve taking over and taking over from the attack as the game action efficiency indices, which confirms the hypothesis of our research.*

Keywords: *reciprocal relationship, efficiency indices, volleyball, performance, opponent's level.*

Introduction

Professional sports are about the athletes proving during competitions their capabilities in agreement with the rules and methods of the competition in a certain event (Triboi & Păcuraru, 2013, p. 60), while a competition between two individuals or multiple groups of individuals is only apparently free-form, actually having rules that give it legitimacy and due to which one side can be declared the winner (Meyer, 1976, cited by Teodorescu, 2010, pp. 17-20). Training in professional sports is performed according to certain patterns. The efficiency of the pattern, defined as the ability to reproduce the essential characteristics of the original (Bontaș, 1994, p. 143) depends on the way in which it is used, the way in which markers of the competition pattern (the official game) are converted in objectives of the training pattern.

The literature concerning the modelling of training in volleyball is vast, but very few studies have proven that there is a relationship between the game and the training pattern, based on the analysis of the players' efficiency markers during official competitions. The modern volleyball training is based on the analysis of the relationship between the training and the game pattern, a relationship proven by highlighting the performance behaviour of the volleyball players.

This relationship is often mentioned abstractly in a debate in regard to the unity that must exist between training and competition. One of the first coaches to succeed in putting this concept into the practice of basketball was Colibaba-Evuleț (1976). He identified and applied the methodological operations of this concept.

The reciprocal relationship between the game pattern and training aims to closely observe the dynamics of the performance behaviour of the team and each player individually, using the observable components of the pattern and statistical markers. They are also common elements for both of the patterns that are discussed – the game pattern and the training pattern. Many sports (track and field, rowing, skiing, swimming, etc.) use this concept, but they call it "goal-thinking" and not "reciprocal relationship" as it is called in this paper.

According to Mârza-Dănilă (2006, p. 24), the efficiency analysis during competitions is primary and must reflect faithfully the realities of the competition game. Knowing the efficiency is an objective need of top performance and can have an essential contribution to proving the reciprocal relationship between the training pattern and the game pattern in sports. The evaluation of the general efficiency of the game is done based on the effectiveness of each game action.

This reciprocal relationship between the training and the game pattern was proven in basketball, a relationship that must be used for the benefit of the continuous progress of the players' capabilities and the team's performance capacity (Colibaba-Evuleț & Șarlă, 2007).

The aim of this study is to highlight the reciprocal relationship between the training pattern and the game pattern in female performance volleyball from the Știința Bacău team depending on the opponent's level.

The game pattern used in the training program between two competitions is influenced by the game pattern of the opposing team, which supports the reciprocal relationship between the game and the training pattern. The objectives were to highlight the level of technical-tactical training in the competition period, by analysing the game-action efficiency markers, and to emphasise the reciprocal relationship between the game and the training pattern.

This research has started from the hypothesis according to which the technical-tactical training during the competition period has a positive influence on the game action efficiency markers, in other words, it influences the game pattern. From this interaction, we can debate on the reciprocal relationship between the game pattern and the training pattern.

Material and methods

The research methods were: the bibliographical documentation method, the pedagogical observation method, the modelling method, the statistical-mathematical method, the analytical method and the graphical representation method.

Subjects and place of research

The participants of this study were 14 female players of the Știința Bacău women's volleyball team in the 2017-2018 competition season; the team participated in the National Championship, Division A1.

The research was conducted in the Bacău Sports Hall, where the Știința Bacău women's volleyball team trained and played its official matches, and in other Romanian halls where the women's volleyball teams participating in the National Championship, Division A1 conducted their activity during the 2017-2018 season. The Bacău Sports Hall is equipped with everything needed for conducting this study under good conditions. The research was conducted between October 2017, when the competition period started, and February 2018, when the official games of the Phase I of the National Championship, Division A1 ended.

Assessment protocol

The evaluation of the technical-tactical performance of the female players during the official games was done using the Data Volley 2007 Professional software. The information gathered during the official games with the software was introduced into Microsoft Excel, which was used to calculate the efficiency of the game actions on a scale of six levels (for serve, serve takeover, and attack takeover) and of five levels (for attack and blocking).

The scaling and encoding on six levels, used for the serve game action, is as follows: [0 =" =" = Wrong (in the net, outside the court, stepping over the end line); 1 ="-" = Negative (serve takeover of the opponent is" #" or" +" and can attack with all options); 2 ="!" = Neutral (serve takeover is"!" and the ball is taken over on the 3-meter line); 3 =" +" = Positive (serve takeover is "-" and the attack can only be performed from a high pass); 4 ="/" = Semi-ace (the serve takeover is weak; the ball is sent directly to the opponent's court); 5 =" #" = Direct point (the takeover is wrong "=")].

In order to calculate the efficiency of the serve, the following formula was used:

$$E = \frac{A+B*0,8+C*0,6+D*0,4+E*0,2}{A+B+C+D+E+F}, \text{ where:}$$

A – serve ending with a scored point, of 5 points – whose value is 1; B – semi-ace serve, of 4 points – whose value is 0.80; C – positive serve, of 3 points – whose value is 0.60; D – neutral serve, of 2 points – whose value is 0.40; E – negative serve, of 1 point – whose value is 0.20; F – wrong serve, of 0 points – with no value.

The scaling and encoding on six levels, used for the serve takeover and attack takeover game actions, is as follows: [0 = "=" = Wrong (direct point for the opponent); 1 = "/" = semi-mistake (the serve and attack takeovers are directly in the opponent's court and the attack cannot be performed); 2 = "-" = Negative (after the serve and attack takeovers, the attack can only be performed from a high step); 3 = "!" = Neutral (the serve and attack takeover is within the 3-meter line area); 4 = "+" = Positive (the attack can be performed from the serve and attack takeover, but not from all combinations); 5 = "#" = Perfect (the attack can be performed from the serve and attack takeover, from all combinations)].

In order to calculate the efficiency of the serve takeover and attack takeover, the following formula was used:

$$E = \frac{A+B*0,8+C*0,6+D*0,4+E*0,2}{A+B+C+D+E+F}, \text{ where:}$$

A – perfectly played actions, of 5 points – whose value is 1; B – positive played actions, of 4 points – whose value is 0.80; C – neutral played actions, of 3 points – whose value is 0.60; D – negative played actions, of 2 points – whose value is 0.40; E – semi-wrong actions, of 1 point – whose value is 0.20; F – lost actions, of 0 points – with no value.

The scaling and encoding on five levels, used for the attack and blocking game actions, is as follows: [0 = "= and/" = Wrong (direct point for the opponent); 1 = "-" = Negative (playing unfavourably for one's own team); 2 = "!" = Neutral (playing the ball through indecisive actions); 3 = "+" = Positive (playing the ball favourably to one's own team); 4 = "#" = Point (winning attack or blocking)].

In order to calculate the efficiency of the attack and blocking, the following formula was used:

$$E = \frac{A+B*0,75+C*0,50+D*0,25}{A+B+C+D+E}, \text{ where:}$$

A – actions ended with a win, of 4 points – whose value is 1; B – positive played actions, of 3 points – whose value is 0.75; C – neutral played actions, of 2 points – whose value is 0.50; D – negative played actions, of 1 points – whose value is 0.25; E – lost actions, of 0 points – with no value.

Results

In order to prove the reciprocal relationship between the training and the game model, a comparative analysis between the game models from the 2016-2017 and the 2017-2018 season was conducted, on the level-1 teams, for 10 games per season.

In regard to the level-2 teams, the paired samples Student's t-test was used for analysis 8 of the 12 games in the season 2016-2017. The selection was done taking into account the final ranking of the season, eliminating the relegated teams.

By constantly monitoring the parameters of the proposed game models during the Știința Bacău's official games, the authors managed to conduct a comparative analysis of the results based on the efficiency coefficients recorded during the two seasons, according to the opponent's level.

By analysing the data from the final game model and the data from the initial one, the authors could evaluate and highlight the behaviour of Știința Bacău, based on its training and the performance during the official games of the efficiency markers on each game action of the team.

The data in Table 1 represents average values of the game model, for each action composing this model for the level-1 teams, reflecting their average efficiency during the official competitions, recorded by Știința Bacău during Phase I of the National Championship, Division A1, in the two seasons.

Table 1. *Results of the Student's t-test for paired samples (* = $p < 0.05$)*

Efficiency	2016-2017		2017-2018		t	p
	Average	Std. dev.	Average	Std. dev.		
Serve	0.420	0.03	0.405	0.02	1.502	0.167
Serve takeover	0.610	0.04	0.618	0.05	-0.311	0.763
Offense	0.578	0.05	0.576	0.06	0.092	0.929
Blocking	0.415	0.04	0.482	0.08	-2.345	0.044*
Attack takeover	0.325	0.09	0.401	0.03	-2.279	0.049*

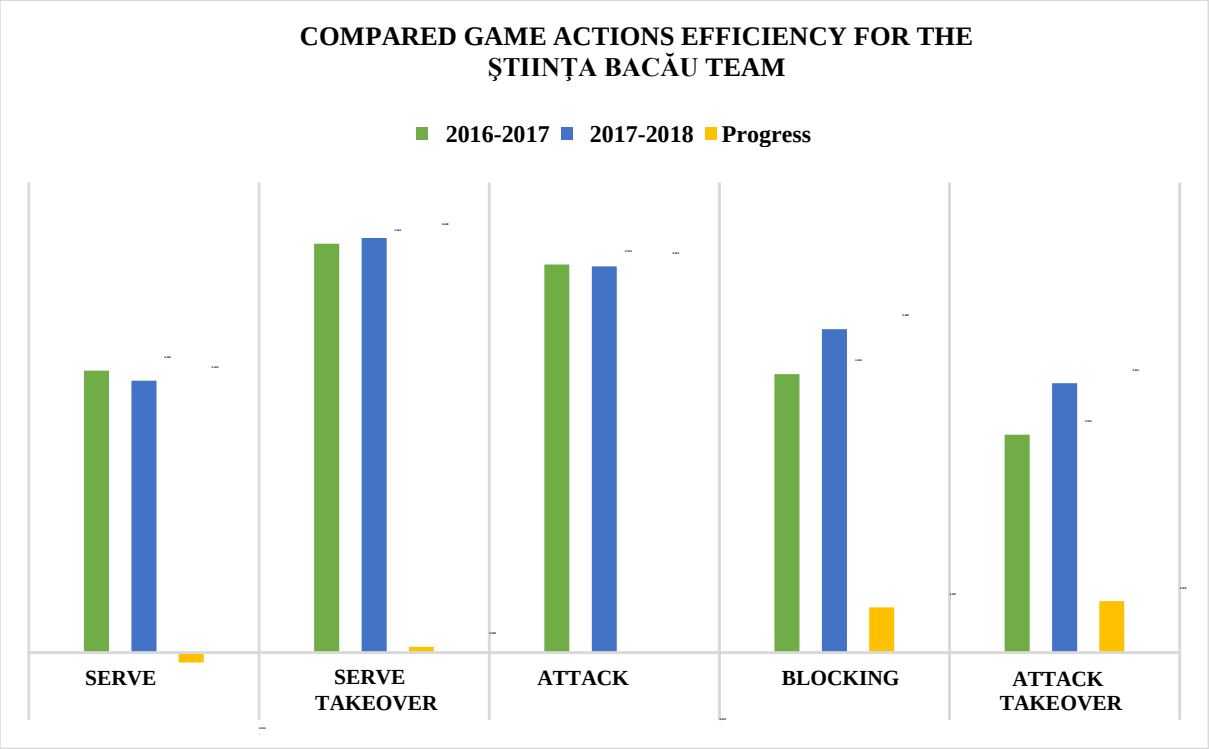

Figure 1. Compared efficiency on game actions of the Știința Bacău team

Table 1 and Figure 1 highlight the following:

- the average efficiency of the serve was smaller in season 2017-2018, with a value of 0.405, than in season 2016-2017, when it recorded a value of 0.420;
- the average efficiency of the serve takeover was higher in season 2017-2018, with a value of 0.618, than in season 2016-2017, when it recorded a value of 0.610, with a progress of 0.008;
- the average efficiency of the attack was smaller in season 2017-2018, with a value of 0.576, than in season 2016-2017, when it recorded a value of 0.578;
- the average efficiency of blocking was higher in season 2017-2018, with a value of 0.482, than in season 2016-2017, when it recorded a value of 0.415, with a progress of 0.067;
- the average efficiency of the attack takeover was higher in season 2017-2018, with a value of 0.401, than in season 2016-2017, when it recorded a value of 0.325, with a progress of 0.076.

The Student's t-test for paired samples was used to emphasise the significance of both the progress and results. The null hypothesis was that the technical-tactical training of professional teams during the competition period does not influence the efficiency markers of the game actions (from a mathematical standpoint, there are no significant statistical differences between the average values of the groups in the two seasons).

After analysing the results in Table 1 regarding the average differences between the two seasons of the game action efficiency, we can state the following:

- there are no significant statistical differences between the average values recorded during the two seasons, regarding the efficiency of the serve, serve and attack takeover ($p > 0.05$);
- in regard to the efficiency of blocking, the test reveals a significant difference between the average values recorded during the two seasons ($p < 0.05$); it can be said with a probability of 95% that the results are not random, and are influenced by the training - the null hypothesis is rejected;
- in regard to the efficiency of the attack takeover, the test reveals a significant difference between the average values recorded during the two seasons ($p < 0.05$); we can say that the results are not random, and are influenced by the training (null hypothesis is rejected).

The data in Table 2 represents average values of the game model for each action composing this model for the level 2 teams, reflecting their average efficiency during the official competitions, recorded by Știința Bacău during Phase I of the National Championship, Division A1, in the two seasons.

Table 2. *Results of the Student's t-test for paired samples – level-2 teams (* = p < 0.05)*

Efficiency	2016-2017		2017-2018		t	p
	Average	Std. dev.	Average	Std. dev.		
Serve	0.436	0.05	0.443	0.05	-0.327	0.753
Serve takeover	0.553	0.02	0.599	0.04	-2.870	0.024*
Offense	0.619	0.04	0.641	0.04	-1.089	0.312
Blocking	0.451	0.09	0.499	0.08	-0.879	0.409
Attack takeover	0.392	0.06	0.489	0.07	-2.446	0.044*

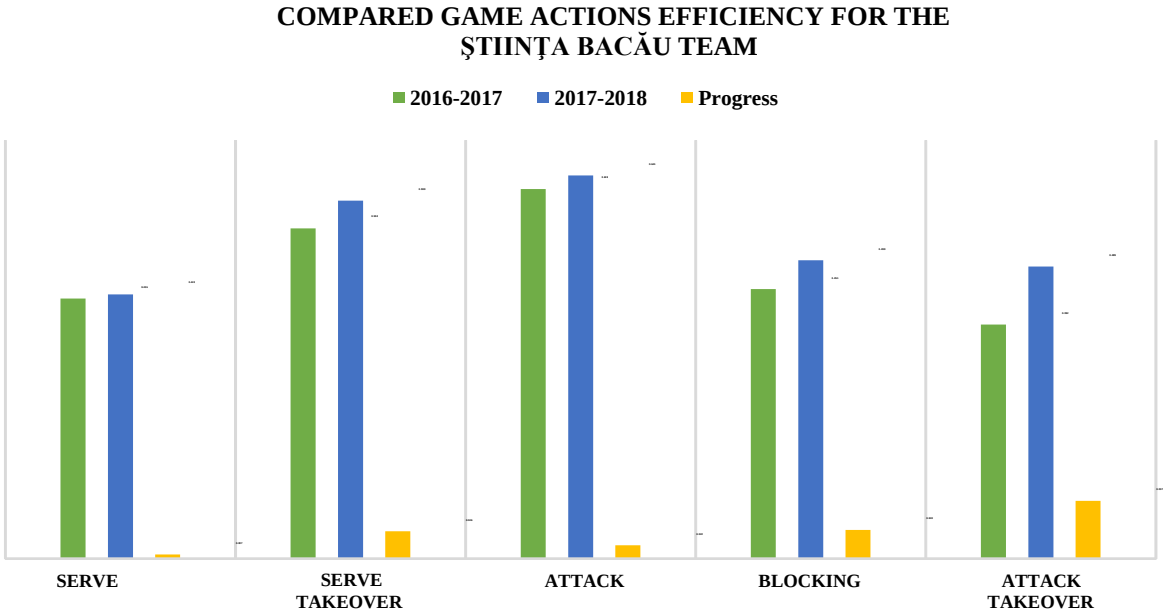

Figure 2. Compared efficiency on game actions of the Știința Bacău team - level 2 teams

Table 2 and Figure 2 highlight the following:

- the average efficiency of the serve was higher in season 2017-2018, with a value of 0.443, than in season 2016-2017, when it recorded a value of 0.436;
- the average efficiency of the serve takeover was higher in season 2017-2018, with a value of 0.599, than in season 2016-2017, when it recorded a value of 0.553, with a progress of 0.046;
- the average efficiency of the attack was higher in season 2017-2018, with a value of 0.641, than in season 2016-2017, when it recorded a value of 0.619;
- the average efficiency of blocking was higher in season 2017-2018, with a value of 0.499, than in season 2016-2017, when it recorded a value of 0.451, with a progress of 0.067;
- the average efficiency of the attack takeover was higher in season 2017-2018, with a value of 0.489, than in season 2016-2017, when it recorded a value of 0.392, with a progress of 0.097.

After analysing the results in Table 2, regarding the average differences between the two seasons of the game action efficiency, we can state the following:

- there are no significant statistical differences between the average values recorded during the two seasons, regarding the efficiency of the serve, attack, and blocking ($p > 0.05$);
- in regard to the efficiency of the serve takeover, the test reveals a significant difference between the average values recorded during the two seasons ($p < 0.05$); we can say with a probability of 95% that the results are not random, and are influenced by the training - the null hypothesis is rejected;
- in regard to the efficiency of the attack takeover, the test reveals a significant difference between the average values recorded during the two seasons ($p < 0.05$); it can be said that the results are not random, and are influenced by the training (the null hypothesis is rejected).

The results presented in this study show that during the 2017-2018 season the average value of the efficiency markers recorded a progress in the level 1 matches, for the following: serve takeover, blocking, and attack takeover; and in the level 2 matches, for all the five game actions.

Conclusions

At the end of the comparative analysis of the results recorded during the two seasons for the Știința Bacău team, the following can be said:

- significant differences were recorded in the matches with the level-1 teams in the two seasons for the blocking and attack takeover game actions efficiency markers;
- significant differences were recorded in the matches with the level-2 teams in the two seasons for the serve takeover and attack takeover game actions efficiency markers.

In conclusion, it can be said that the hypothesis according to which the technical-tactical training during the competition period has a positive influence on the game action efficiency markers, in other words, it influences the game pattern was confirmed. This highlights the relationship between the training and the game pattern in the Știința Bacău women's volleyball team, based on the analysis of the efficiency markers that compose the game pattern. These efficiency markers influence the training pattern, which in its turn will influence the game pattern in the following match, according to the level of the opposing team. This relationship between the game and training pattern can be said to be reciprocal, because they influence each other, meaning the game pattern influences the training pattern, and the training pattern influences the game pattern.

References

Bontaş, I. (1994). *Pedagogie*. București: ALL.

Colibaba-Evuleț, D. (1976). *Model de joc și de pregătire pentru echipele reprezentative de baschet*. București: INEFS.

Colibaba-Evuleţ, D., & Şarlă, G.C. (2007). Relaţia biunivocă dintre modelul de joc şi modelul de pregătire. *Conferinţa ştiinţifică naţională „Învăţare şi creaţie în domeniul activităţilor corporale", ediţia XVI*, Institutul National pentru Cercetări în Sport, Bucureşti, 117-121.

Mârza-Dănilă, D. (2006). *Optimizarea și dirijarea pe baze informatice a pregătirii și competiției în jocurile sportive (aspecte teoretice)*. Iași: PIM.

Teodorescu, S. (2010). *Teoria și metodica antrenamentului sportiv la copii și juniori*. București: Discobolul.

Triboi, V., & Păcuraru, A. (2013). *Teoria și metodologia antrenamentului sportiv*. Iași: PIM.