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THE TEMPORAL STRUCTURE OF THE GAME - A MODELING ASPECT IN PREPARING BASKETBALL TEAMS

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Abstract: In our country, the basketball activity at all levels fails to produce the long-awaited revival, as the results of internationally representative teams in recent years are modest. Children and junior domestic competitions are of a low quality, which is reflected in the quality of international performances. In seniors' competitions, the value level is higher due to the presence of many foreign players in the competition. Unfortunately, official regulations, which allow the presence of four foreign players on the court, drastically reduce the selection area for national batches of players. The quality of the training process, volume and intensity of training lie below the requirements of the international game model. In this context, raising the quality of training by increasing the coaches' professional level becomes a mandatory requirement. The use of modeling as a training method fits into this context of continuous improvement of the training process and responds to the requirements of increasing sports performance.

Key words: basketball, effort, model, modeling, duration of the game

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INTRODUCTION

The basketball game field is the object of studies and researches materialized in scientific analysis, based on objective data, the team's and the players' evolution, in a continuous improvement of training methodology and the generalization of the results of these researches through specialized articles and studies.

The game content, the complexity of the training results transfer in the players and the team's performance behavior, are continually improving due to the "players and coaches' creative ability who have adapted and made the most of the results of fundamental and applied research in the field of the most important exact sciences and humanities" resulting in the continuous improvement of basketball game training process (Ionescu and Dîrjan, 1997).

The analyzes made at the level of the Romanian Basketball Federation (F.R. Baschet - CCA, 2007) reveal that in terms of players' stature (height), we fit into the international model both as an average value per team as well as per position. It is all the more necessary to raise the coaches' professional level, to connect them to the field's novelties and to use them in the process of programming, planning and conducting the athletes' training. "Any improvement, any novelty in the advanced practice of the game or as a result of scientific research, entails investigations for the discovery of individual and collective anti-dote tactical and technical solutions, in order to find the appropriate means and methods for training and the appropriate technical-tactical and physical training" (Teodorescu, 1979).

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Jordane and Martin (1999) believe that a new conception of the game implies a new conception for "building up" the basketball training. It is necessary to review and rethink the training methodological milestones, determined by the new dimensions of the basketball effort distribution: the total duration of the game, the actual playing time, the percentage of effort periods and time outs, the number of consecutive team actions.

Many of the papers studied, tackle the problem of preparing the groups of children and juniors in basketball with particular emphasis on the technical-tactical aspect of training, without focusing enough on the need to apply modern methods for optimizing training at this level. There are few authors in the specialized literature studied who have offered approach strategies for training optimization through modeling. In modeling, almost identical drills regarding the motor and temporal movement structure of specific actions and the specific psycho-physical regime of the game are used, setting the movement parameters (power, speed, endurance, skill) that are to be developed. According to this principle, for each sports game, only those drills with direct and positive transfer to the game technique execution (Colibaba and Șufariu, 2005) will be used during physical training.

PURPOSE

The purpose of this paper is to provide young coaches and teachers with objective data on the duration of game actions, data established following high precision measurements. Consequently, we hope to come to their aid for a better approach to planning and scheduling training, in order to optimize the training and implicitly, increase the team's performance capacity.

MODELING IN THE BASKETBALL GAME

The current methodological guidance in sports games aims to bring the training effort closer to the physiological requirements of the game. The level of these requirements is reflected in the data provided by the specialized studies and by the collection, processing and interpretation of statistical data during the training and comparing them with those collected during the competition. The supporters of this methodological line in preparation assume that the training effort, especially for juniors, is below the level of the match and as such, it should be raised to higher physiological levels and appropriate to the specificity of the basketball game. This correction attitude, permanently adjusting to the "physical reality" on the basketball court, will be a determining factor for a constant progress (Feflea, 2011).

Modeling the training of young basketball players can be a valuable milestone in this approach, only in the context of linking to the current features and trends of international game development as well as aspects related to age, gender and athletes' training level. In the basketball game, the model is the expression of the highest possible use of players' ability in close dependence to the game-specific driving structures and which determines a certain effort particularity. Colibaba and Bota (1998), appreciates that the authentic modeling source is the actual game as practiced by the team, whose players can be classified into a certain age category with a certain level of training and performance capability.

In team sports, developing operational models is more difficult. A permanent review is needed to review drill system parameters to check the degree of correlation and take the necessary steps to optimize the model. The training method for athletes practicing in the basketball game must always take into account both the evolution of the game (the international game model) and the latest conquests of related sciences, in order to develop the most effective means and use the most impactful training methods on the objectives pursued.

Modeling as an operational tool may take the form of an operational model consisting of drills or drill systems having a decisive effect in increasing the performance capacity in the sporting industry for which they have been developed.

What can be subjected to the modeling action?

- effort characteristics (duration, intensity, complexity) and of time outs between two effort sequences;
- the characteristics of cooperation relationships between 2-3 players;
- the opponent's play characteristics (offence movements, defense systems, etc.);
- the environmental model (hall, hostile gallery, hall brightness);
- stress caused by hostile arbitration;
- practice modeling of certain game situations (game endings in which the team is led or is leading with very tight differences);
- the execution of technical elements (free throws, throws in the last second of game, etc.) on an increased background of psycho-physical strain and the examples can continue.

All these steps aim to improve the performance of the game (individual and team's), which leads to a continuous increase in performance.

TEMPORAL GAME STRUCTURE

Along with the basic structure of the basketball game, the temporal game structure is one of the major pillars in training modeling. Knowing the succession, duration, frequency, alternation, degree of complexity, and type of action specific to the game is an essential element in modeling basketball training. The features of the temporal structure derive from the very characteristics of the game: this is a 40-minute effort, divided into four quarters of 10 minutes of actual game with a 2 minute time out, between quarters 1 and 2, 3 and 4 and 15 min. between quarters 2 and 3. The effort can last for 90 minutes, including both periods of effort and multiple time outs during the game, which are critical for the characterization of the game.

On a predominantly aerobic strain, short, but high-intensity anaerobic strain (jumps, sudden speed-ups, defense actions, etc.) may occur. Shifting from one form to another is made according to the intensity and duration of successive actions (play sequences). Bosc and Grosgeorge (1994) show that while in the 40-minute actual time play (ATP) of basketball intense efforts are 21.27 min., in football, in 90 min. they represent 8.11 min, and at rugby they represent 8.39 min. of the total 80 minutes.

The rules of the game are one of the fundamental elements that in turn determine the formal and functional structure of the game. The rules impose some temporal limitations (24 sec. duration of an offense, 8 seconds for passing the ball into the offense court, 3 seconds for staying in the restricted area, etc.), which gives the game a fast pace, being a very spectacular game.

At the same time, the rules of the game provide the coach with the opportunity to restore players' ability to recover from increased fatigue. Making several changes (some of them tactical, others due to the accumulation of personal fouls), the coach can give players some time off, allowing them a partial time out, but enough to return to the game. Urbach (Bompa quote, 2003) shows that the actual time spent by a player on the court during a game and recorded as such on a timer, averages 26.3 minutes.

The percentage share of effort periods and time outs is, according to Colli and Faina (quoted by Colibaba and Şufariu, 2005):

Regarding the temporal structure of the modern basketball, game specialist research shows the following values:

- actual Playing Time (APT) is 40 minutes;
- the total duration of the game (TDG) is increasing (81 min.), the changes to the regulation (the introduction of the four 10-minute periods, related time outs, TOs, etc.) causing this increase;
- with regard to the ratio between the two parameters (APT/TDG, the video analysis revealed the following:

Table 1. The percentage share of effort periods and time outs
(Source: Colli and Faina, 1985)

Effort (sec)	%	Time out %
1 - 10	5.4	5.1
11 - 40	52.0	51.7
41 - 60	14	20.1
61 - 90	14.7	13.8
91 - 120	8.7	4.3
Over 120 seconds		2 - 3 times per game

Average action duration is, according to the same authors, the following:

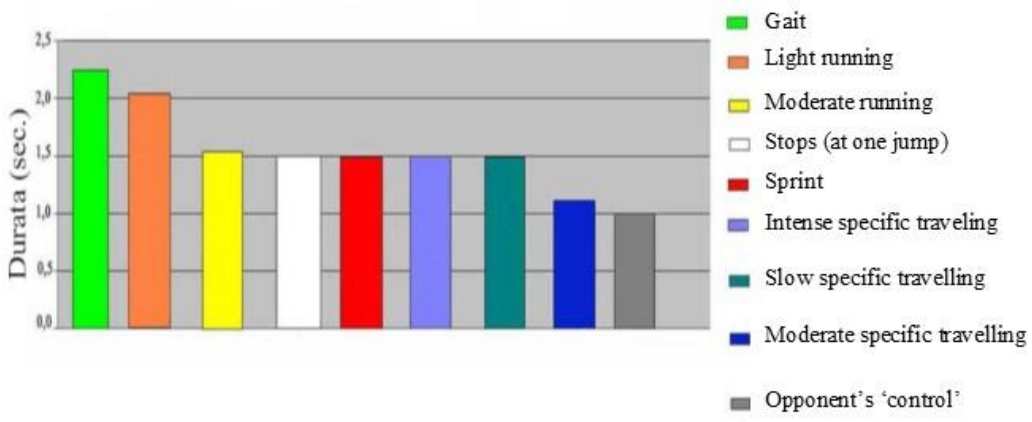

Figure 1. Average action duration during a game
(source: Travaillant and Cometti, 2003)

Game interruptions (under normal conditions) are:

- 20-30 sec. to execute a free throw (x 1, 2, 3, ... n free throws);
- 20 sec. for change (x 1, 2, 3, ... n changes);
- 11- 40 sec. for misconduct and foul;
- 60 sec. for each time-out requested;
- 2 min. time-outs between quarters 1-2 and 3-4;
- 15 minutes time out between rounds.

The number of interruptions and their total duration during a game is approx. 150 interruptions totalizing approx. 23-30 min. (without time outs between quarters and halves), according to data presented by Colli and Faina (1985).

Travaillant and Cometti (2005) accounted, following a video analysis for a number of 60 ± 10 **playing sequences,** with an average duration of 36 ± 2 sec, followed by interruptions with an average duration of 32 ± 4 sec. (excluding time outs between periods and rounds). This finding illustrates the intermittent nature of the activity and suggests an incomplete recovery. A game sequence corresponds to a succession of actions having the same intensity, its duration being equal to the sum of durations of each action (table 2).

Table 2. Evolution of the number and the average duration of game sequences and game stops
(Data sources: Travaillant and Cometti, 2003)

	Game Sequences		Game Stops	
Period	**Number**	**Duration (sec.)**	**Number**	**Duration (sec.)**
1	14 ± 2	40 ± 1	13 ± 2	29 ± 2
2	15 ± 4	33 ± 7	14 ± 4	31 ± 6
3	18 ± 3	35 ± 4	17 ± 3	30 ± 7
4	13 ± 8	42 ± 11	12 ± 8	42 ± 17
Total/ game	60 ± 10	36 ±2	56 ± 10	32 ± 4

With regard to the number of **consecutive team actions** and their **average duration,** Jordane and Martin (1999) show the following:

Table 3. Number of consecutive team actions
(Data sources: Jordane and Martin, 1999)

Number of actions	**No./ match**	**Average (sec)**	**Duration (s)**	**% of total time**
1	16.33	19	310	13.0
2	10.33	34	350	14.0
3	7.00	49	343	14.4
4	5.33	58	307	12.9
5	5.00	85	425	17.8
6	2.33	90	207	8.7
7	4.00	110	444	18.4

Travaillant and Cometti (2003), have studied **the percentage distribution** of specific actions and actions not specific to the game, (table 4), reaching the following conclusions:

Table 4. Percentage distribution of non-specific actions of the game
(Data sources: Travaillant and Cometti, 2003)

Non-specific actions		**% APT**	**%TDG**
Low efforts (for recovery)	Stops	7.8	3.5
	Gait	24.8	11.0
Light efforts	Light running	10.0	4.4
Moderate efforts	Moderate running	6.0	2.7
Strong efforts	Sprints	2.7	1.2
Total		51.3	22.8

As a conclusion on these data, it results that 51,3% of the actual playing time (APT) there are performed actions that are not specific for the basketball game and 48,7% are specific actions, of which 42% specific movements and 6,7% dribble actions (of which 1% in high speed). Starting from data presented, we can deduce the guidelines in formulating training objectives. In reality, each team's playing style can influence these values.

Referring to the **frequency of actions** during the game, Colli R. and Faina M. (quoted by Colibaba and Şufariu, 2005) show the following values:

Table 5. Frequency of actions during the game
(Data sources: Colli and Faina, 1985)

Type of action	Quarterback	Forward	Centre
Ball defense	14.5 s *	13.0 s	7.5 s
Defense without ball	18.0 s *	11.2 s	14.5 s *
Defense of weak side	8.2 s	14.7 s	18.2 s *
Slow transition	11.7 s	13.0 s	3.5 s
Moderate speed passage	11.2 s	20.0 s *	17.0 s *
Quick transition	12.0 s	11.7 s	7.2 s
Jumps throws	5.5 s	4.7 s	2.2 s
Jumps following	1.2 s	3.2 s	5.7 s
1x1 without ball	11.0 s	9.5 s	5.2 s
1x1 with ball	3.0 s	4.7 s	2.5 s
Ball blocking	-	-	6.2 s
Criss Crosses	-	+	1.7 s
Stops	3.2 s	8.2 s	8.2 s

* the highest indicators

Research conducted by Colli and Faina (1985) on **distribution of efforts and time out** (table 6), shows that approximately 52% of the player's active time is concentrated in periods between 11 and 40 seconds (for example, intense defense 10-15 seconds, followed by a 20-24 second set offense). Actions that take longer than 1 minute, they represent 28.7% and are quite rare.

Table 6. Distribution of efforts and time outs
(Data sources: Colli and Faina, 1985)

Play			**Time out**	
Duration (sec.)	**Frequency**	**Percentage (%)**	**Frequency**	**Percentage (%)**
1-10	34	5.4	36	5.7
11-20	141	22.5	153	24.4
21-30	108	17.2	114	18.2
31-40	76	12.1	57	9,1
41-50	43	6,8	66	10,5
51-60	45	7,1	60	9,6
61-70	37	5,9	45	7,1
71-80	25	4,0	36	5.7

In the authors' opinion, there is a direct link between the duration of the action and the time out that follows. If the first increases, the duration of the time out also increases.

We notice the gradual decrease of percentages towards the end of the game, the return period being the main beneficiary of this trend. This phenomenon suggests fatigue and the need for a longer recovery period in order to continue with effective and high-intensity actions.

The different physiological strains mentioned above, allow, in Jordan and Martin (1999) opinion, a classification of a player's actions into four categories of effort, depending on the intensity and duration of the effort:

- very short actions (1-3 sec.), performed at maximum intensity (98-100%): 1-2 isolated dish actions, jumps, sudden stops, direction or pace changes, run and gun sudden movements;
- short actions (up to 10 seconds), with an intensity of 95-98%, corresponding to two or three consecutive actions (defense aid - panel recovery - fast break running, etc.);

- actions with a relatively short duration (less than 1 minute), carried out with a fairly important effort intensity (90-95%). They meet during some consecutive actions (at least four), such as: defense of the dribble shooter - steal (removing the ball from dribble) - fast break - fast return in defense. Statistical data shows that this type of actions is rare during a game;

- actions with a variable duration, conducted at medium intensity. Usually these are interposed between the actions of the first two categories during the same stages of play (e.g. transition from a fast break to a set offense).

During training lessons and also of micro-cycle, the coach, depending on the objectives pursued, must alternate the intensity of the effort and implicitly the energy channel, by using data from the temporal structure analysis of the game in order to determine the duration of the effort sequences and their consecutive time outs. This way of working requires a very good knowledge of the potential for each method used, of its degree of correlation with the physical, technical-tactical and psychic strain model, in accordance with the principle of standardization and rationalization of methods.

CONCLUSIONS

Along with knowledge regarding the nature of the effort, knowledge regarding the distribution of efforts and time outs during play is an essential condition in planning physical training specific to players. The modeling of the training structures used in training in terms of effort duration and the successive time outs gives the effort similar characteristics to a competition, creating the prerequisites for fulfilling the basic objective of children and juniors' training: setting the basic technique and tactics of the game under conditions of psycho-physical tension, specific to official competitions. Knowing the temporal characteristics (temporal structure) of the game increases the efficiency of drills used during training, generating both the optimization of the training and the increase of the performance capacity.

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