

CLASSIFICATION AND REGISTRATION OF TRAINING LOADS IN BASKETBALL, USING DATA OBTAINED FROM THE 12 DAY TRAINING CAMP

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- registration,
- classification,
- training loads,
- basketball,
- training practice.

Abstract:

Introduction: The recording of training practice results is crucial to the training process. In team sports training the many technical and tactical elements, which often cause a lot of difficulties, should be taken into account. The aim of this study was to classify and record training loads in respect of the cause-and-effect of movement-related activities in based on a 12 day Basketball Training Camp

Material and Methods: Sample registration was carried out during the 12-day training camp. The training sessions were divided into 2 parts. During each part, two three-day-long micro-cycles in a 3 + 3 + 1 system were conducted. This gave a total of 28 training sessions, which accounted for 2.556 minutes (average of 91.3 min per practice session). Registered exercises were assigned to 5 separate groups, in each of which specific motor skills were singled out. The factor determining the size of the training loads was the duration of exercise (min).

Results: On the basis of the registration of training practice sessions and the previously-determined classification it can be assumed that in the first part of the micro-cycle most time was spent on activities with the ball – the tactical effects (793 min). Small-scale games, tactics and control games took place during the second part of the training camp (600 min). Supporting training practice took 1005 minutes.

Conclusions: A simple method can be used to optimize and design training practice sessions. By planning a training session, then registering and classifying the actual duration of applied training the coach may be able to control the training process better. The method presented in this paper allows information about the periodisation of training to be obtained, in order to determine future training loads.

INTRODUCTION

Team sports are disciplines where the final result depends on the attitude of all the competitors, their cooperation, synergy and mutual cooperation, whereas in individual disciplines the athletes themselves are solely responsible for the results they achieve. The differences between the nature of the two disciplines, and hence also of the training practice, require different training goals and methods of registration of training loads to be identified. [Bompa 2010; Del Fresno, Rave 2011]. Team games are multi-level, so registration of the training load becomes multi-dimensional. There are many technical elements, such as: the

way the player moves in both attack and defence; passing the ball; dribbling, and throwing [Lenik *et al.* 2015] and tactics such as pre-planned fast breaks and group and team defence. Hence, it becomes clear that it is necessary to look for a common denominator for recording the training load [Ważny 1997; Borresen, Lambert 2009; Lenik 2013; Spiteri *et al.* 2013].

There are many possible ways to control a training process. The first one defines the training loads (TL) in a subjective manner by means of surveys, questionnaires and athletes' diaries [Borresen, Lambert 2006; Ross *et al.* 2013]. The RPE method (Rate of Perceived Exertion) may serve as an example here. After completing a training session, athletes use a 10-point scale to describe their levels of fatigue [Foster 1998]. The RPE method has been used in many studies [Foster *et al.* 2001; Impellizzeri *et al.* 2004; Scalman *et al.* 2012], but without taking into account the technical and tactical causes and effects which occur in team games. Other methods focus on identifying the parameters of training loads by modelling algorithms [Busso *et al.* 1994; Busso *et al.* 1997]. Other measurement parameters: include the distance covered, the weight lifted, the number of repetitions or the pulse rate [Hopkins, 1991; Sampaio *et al.* 2009]. An example of this is the TRIMP (TRaining IMPulse) method Its characteristic feature is the ability to determine the intensity factor of five heart rate zones, expressed as % of the maximum heart rate. This method allows the difference between the levels of training practice sessions but only to be calculated but only determines the amount (duration) of aerobic training [Stagno *et al.* 2007]. It does not enable activities affecting the development of strength, speed, technique and tactics to be described.

The methods presented in this paper for recording training loads include some aspects but they do not take into account basketball-specific motor activities such as individual, group or team techniques as well as the tactics and causes and effects of technical and tactical activities. An interesting approach has been presented by Foster *et al.*, who, in their studies, have shown that athletes often do not reach a certain intensity of workout which is higher or lower than planned [Foster *et al.* 2001]. These results suggest that many coaches do not monitor the actual course of training practice sessions. This mismatch seems to make it necessary to develop a method of recording and classifying the actual course of training.

The main objective of the research was to develop a simple and non-invasive method to register and classify training loads, which takes into account causes and effects and is based on specific motor activities in basketball. The information obtained will be necessary to identify the training process which in turn should lead to an optimal design for the training process.

MATERIAL

Registration and classification were carried out during the 12-days training camp, which was a preparatory phase for the 2012/2013 season in the Premier League of the Polish Basketball Women League. (PLKK). The competitors (n = 12; aged 25 ± 2.7) (body height 180.6cm ± 6.48cm; weight 74.41 kg ± 6.77 kg) completed a total of 28 training sessions during the 12-day of the training camp, which took 2556 minutes and gave an average of 91.3 minutes per training session. The camp was divided into two parts Tab. 1. In each part, 2 three-day-long micro-cycles were performed in a 3+3+1 system (first day – 3 training units, second day – 3 training units, third day – 1 training unit. [1].

Table 1. Distribution of micro-cycle training

Time	I Part						II Part					
	Micro-cycle			Micro-cycle			Micro-cycle			Micro-cycle		
9:30	Training	Training	Training	Training	Training	Training	Training	Training	Training	Training	Training	Training
15:00	Training	Training		Training	Training		Training	Training		Training	Training	
19:30	Training	Training		Training	Training		Training	Training		Training	Training	

METHODS

The study used a programme of registration and classification of training loads modified by the authors and based on the specific motor activities of a basketball player [Kosendiak, Naglak 2011], including the causes and effects of technical and tactical activities. In total the elements at the training camp were divided into 5 groups. The first group labelled "**A 1 – with the ball (tactical effects)**" included exercises in which the player had to demonstrate the skills critical to achieving an effective individual output position in order to to perform a throw. Tactical results were also evaluated on the basis of passing and dribbling tricks in group and in team systems. The next set of training means was "**A 2 – without the ball – (technical reasons)**". This group included exercises that relate to the ability of an individual basketball player to move during an attack (starts, stops, turns, pivots, changes of pace and direction of run). In addition, elements enabling (screen) or preventing (defence game 1x1) points being scored, were measured, because an individual movement technique affects the results of tactical activities.

The third set of training means was built around the activities of a basketball player "**against an opponent with the ball**". This group included exercises of individual defence: ball interception, blocking, ball collection; and group defence: bounce-landings doubling, P&R (Pick & Roll) defence and team defence such as: assistance and rotation in different systems, match-up and zone. The fourth component under analysis was the "**Game**" in different sequences from 1x1 to 5x5, where the time devoted to regular and special match situations was assessed. The last set of training means labelled "**Supporting training**" was deliberately separated from the other components of the training practice sessions, as motor preparation of the athlete has an indirect influence on techniques and tactics in team games. Each training session was recorded by the second coach who was measuring working time with the electronic stopwatch – CERTAIN 2 Spokey – and after the training he matched the types of exercise with their aims. All the empirical material was presented and graphically illustrated, detailing the basic groups of training means. For every group the times of each activity were analysed.

RESULTS

At the end of the training camp the total time amounted to 2,556 minutes. Research based on the example of a 12-day training camp showed that most time was spent on supporting training (1,005 min). This represents 39% of the whole time, which indicates the circuit training and physical nature of the camp. Another parameter, which was allocated 31% of the time, was devoted to working on tactical effects (activities with the ball, including throwing, passing the ball, gripping and dribbling. This was the second highest parameter during the training camp (Fig. 1).

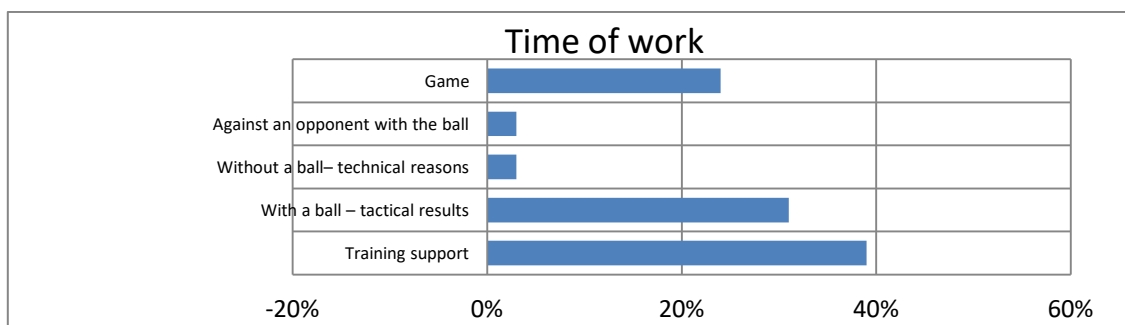


Figure 1. Percentage distribution of specific physical activities in basketball

Evaluation of the data contained in Tab. 2 and 3 revealed that in training sessions related to tactics and elements of team defence (assistance and rotation, match-up and zone) were not implemented the first part of the training camp (days 1 – 4). Neither did the women basketball players take part in either sparring matches or control games. In this part of the micro-cycle training activities mainly involved players using the ball well as individuals, groups and to team tactical effect, were implemented. Another element being analysed was the time designated for throwing and small-scale matches 1x1, 2x2, 3x3, 4x4 5x5. The arithmetic mean of these parameters was 45.0; 43.8, respectively. (Fig. 2). The standard deviation for throwing practice was 25.0 and for small-scale match training 35.4.

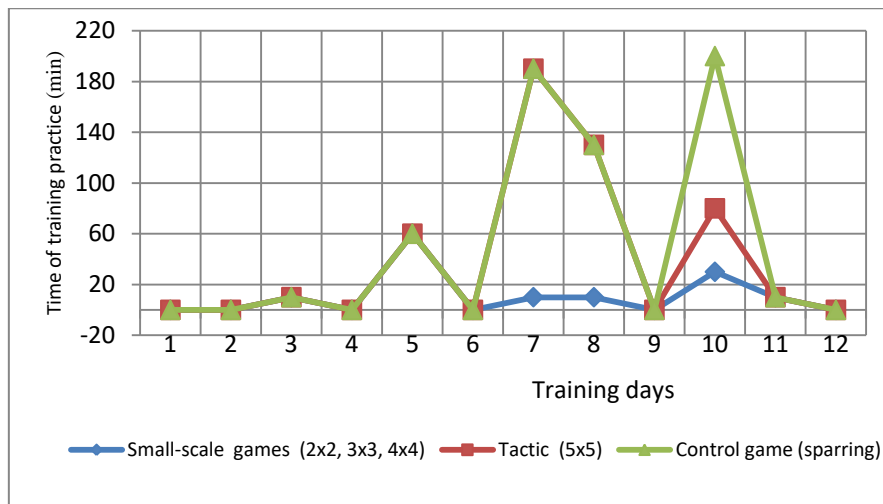


Figure 2. Game

The second part of the camp consisted of matches in different sequences which took up 10 hours over 6 days. Therefore, a specific scheme of to the structure of the training course can be seen. As the training time progressed the total number of minutes allocated to training influencing tactical effects (with the ball) decreased. The arithmetic mean in the first micro-cycle for the parameters of dribbling, passing and catching the ball individually is 45 and in the second 10. (Fig.3). A similar decline can be observed with the parameters for group activities (24.6; 14.4) and in fast break and breaks (17, 6; 10). The arithmetic mean in team activities in both micro-cycles has similar parameters (13.3 and 13). (Table. 3).

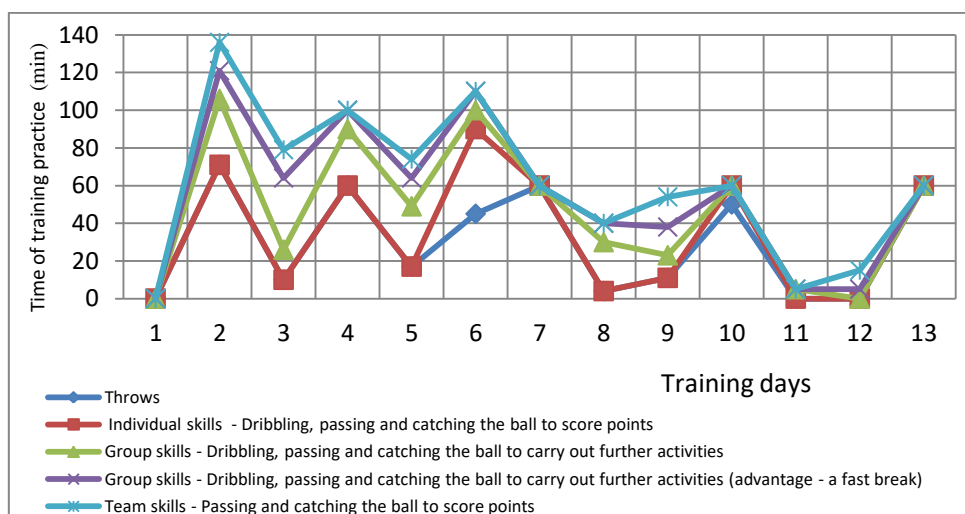
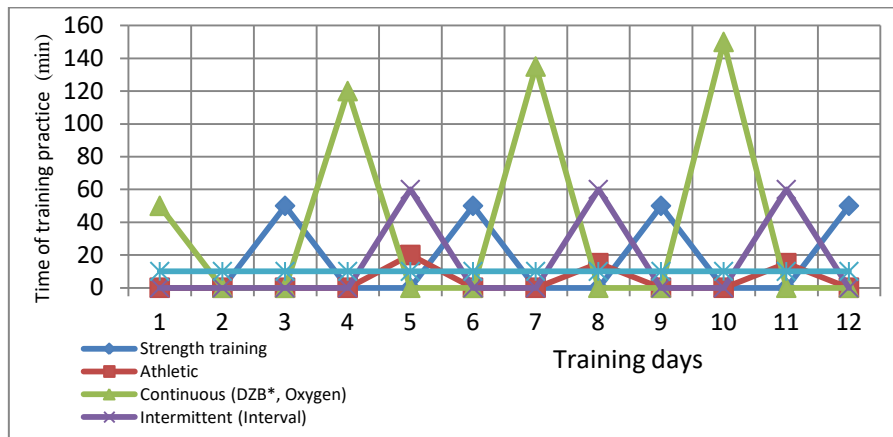


Figure 3. Activities of the athlete with a ball – tactical effects

The second part of the camp did not include training practice which would involve stops and turns, screens, elements of team defence (assistance and rotation) and 1x1 defence games. A lot of time was spent on tactics (5x5) and control games (sparring). The arithmetic mean of these parameters was 116.7 and 120.0, respectively. Standard deviation for the activities in which the tactic was implemented was 65.1. It is notable that athletes spent a lot of time in both the first and second part of the Training Camp practising using continuous methods. The arithmetic mean for this parameter was 85.0 in the first part and 142.5 in the second part. The standard deviation equalled 49.5 in the first part and 10.6 in the second part (Fig. 4).



*Big Running Game

Figure 4. Supporting training

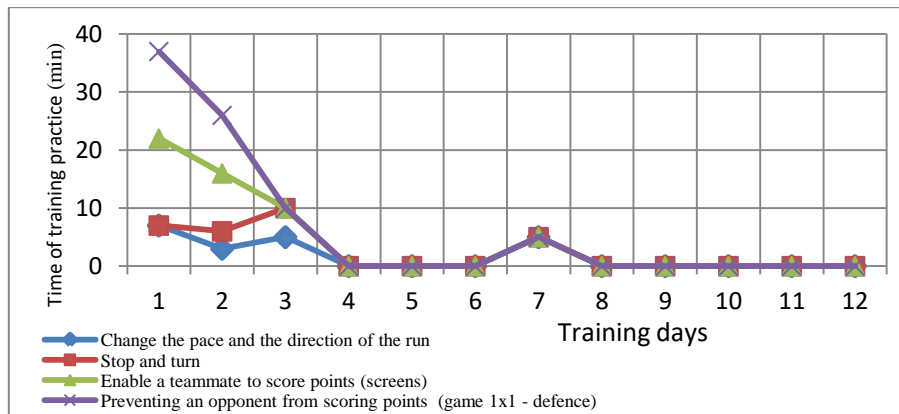


Figure 5. Activities of the athlete without a ball - technical reasons

Following the analysis of the data presented it can be stated that this was a very physical camp because of the amount of time spent on both continuous (455 min) and intermittent (180 min). athletics training A characteristic feature is the fact that in the second period the number of units dedicated to continuous training has doubled. It also may be noticed that regardless of the micro-cycle power training (200 min) and functional training (120 min) throughout the whole period of the sports camp were at a constant level. (Fig. 4). The results of the analysis of training means show how the nature of the training changed on consecutive days of the Camp. (Fig 2-5).

Table 2. The rating of specialised activities in basketball

Motor activities performed by athletes during the multi-entity game	Individual time (min)	Total (min)
A1 With a ball – tactical results		
Individual skills		
1. Throws	388	793
2. Dribbling, passing and catching the ball to score points	55	
Group skills		
1. Dribbling, passing and catching the ball to carry out further activities	166	793
2. Dribbling, passing and catching the ball to carry out further activities (advantage - a fast break)	118	
Team skills		
1. Passing and catching the ball to score points	66	
A 2. Without a ball– technical reasons		
1. Moving in order to	-	78
1.1 Change the pace and the direction of the run	20	
1.2 Stop and turn	8	
2. Moving in order to	-	
2.1 Enable a teammate to score points (screens)	25	
2.2 Preventing an opponent from scoring points (game 1x1 - defence)	25	
A 3. Against the competitor with a ball		
1. Intercepting balls	-	80
2. Blocking balls	-	
3. Collecting the ball from the backboard	-	
3.1 Collecting the ball in defence	-	
3.2 Collecting the ball in attack (follow-up shot)	-	
4. Assisting a teammate through acting against the opponent with the ball (group doubling)	-	
4.1 Group (P&R)	60	
4.2 Team (assistance and rotation, match-up, zone)	20	
B. Game		
1.1 Small-scale games (1x1, 2x2, 3x3, 4x4) (match situations)	130	600
1.2 Tactic (5x5) match situations	350	
1.3 Control game (sparring)	120	
Special situations	-	
Total		1551

Table 3. Training loads

Supporting training	Individual time (min)	Total (min)
1. Strength training	200	1005
2. Athletic	50	
2.1 Continuous (DZB*, Oxygen)	455	
2.2 Intermittent (Interval)	180	
3. Functional	120	
Total		1005

*Big Running Game

DISCUSSION

Basketball like other team sports, is multidimensional in its structure, and requires an appropriate approach to training practice sessions. Due to the wide range of variables that affect the final result organising training in a systematic way becomes quite difficult [Ważny 1997; Bompa 2010; Ross *et al.* 2013]. The goal of every athlete is to achieve such preparation as allows them to obtain optimal results. The route to this goal should be properly planned and executed. Such an approach may be associated with existing methods, which are relatively expensive and complicated [Du *et al.* 2006; Impellizzeri *et al.* 2004; Stagno *et al.* 2007; Manzi *et al.* 2010; Scalman *et al.* 2012; Scalman *et al.* 2014].

Our method is fundamentally different from similar ones presented in the subject literature [Kelly, Coutts 2010; Berdejo, Gonzalez 2011]. First of all, it focuses on specific actions used in basketball, taking into account the duration of the exercise. In this method, an

important role is played by the division of specific motor skills into 5 groups, in which the causes and effects characteristic of the activities of basketball players, are distinguished. On this basis, it can be determined how much time is spent on specific activities, both in one training unit and throughout the micro-cycle, macro-cycle or even the entire season. After a comprehensive analysis, it turns out that technical reasons have been virtually ignored in the implementation of training units. The limitations to or exclusion of this group of activities in the process of training can significantly influence the effectiveness of the game in attack-breaks or in a fast break [Refoyo *et al.* 2009].

Table 4. Summary statistical data of micro-cycle 1 and 2

Kind of training loads	Micro-cycle 1					Micro-cycle 2					d	p
	N	\bar{x}	x_{\min}	x_{\max}	sd	N	\bar{x}	x_{\min}	x_{\max}	sd		
1. Throws (individual)	6	43.8	10.0	71.0	25.0	4	31.3	4.0	60.0	27.9	12.6	0.476
2. Dribbling, passing and catching in order to score points (individual technique)	1	45.0	45.0	45.0		1	10.0	10.0	10.0		35.0	-
1. Dribbling, passing and catching in order to carry on with further activities (group)	5	24.6	10.0	35.0	10.9	3	14.3	5.0	26.0	10.7	10.3	0.25
2. Dribbling, passing and catching in order to carry on with further activities (advantages - fast break)	5	17.6	10.0	38.0	11.7	3	10.0	5.0	15.0	5.0	7.6	0.39
1. Passing and catching in order to score points (team)	3	13.3	10.0	15.0	2.9	2	13.0	10.0	16.0	4.2	0.3	0.8
1.1 Change of pace and direction of run	3	5.0	3.0	7.0	2.0	1	5.0	5.0	5.0		0.0	-
1.2 Stops and turns	2	4.0	3.0	5.0	1.4	0					4.0	-
2.1 Enabling a teammate to score a point (screening)	2	12.5	10.0	15.0	3.5	0					12.5	-
2.2 Preventing an opponent from scoring points (game 1x1 - defence)	2	12.5	10.0	15.0	3.5	0					12.5	-
4.1 Group (P&R)	0					1	60.0	60.0	60.0		-60.0	-
4.2 Team (assistance and rotation, match-up, zone)	1	20.0	20.0	20.0		0					20.0	-
1.1 Small-scale games (1x1, 2x2, 3x3, 4x4, 5x5) (match situations)	2	35.0	10.0	60.0	35.4	4	15.0	10.0	30.0	10.0	20.0	0.533
1.2. Tactics (5x5) match situations	0					3	116.7	50.0	180.0	65.1	-116.7	-
1.3 Control game (sparring)	0					1	120.0	120.0	120.0		-120.0	-
1. Strength	2	50.0	50.0	50.0	0	2	50.0	50.0	50.0	0.0	0.0	-
2. Athletic	1	20.0	20.0	20.0		2	15.0	15.0	15.0	0.0	5.0	-
2.1 Continuous (DZB, Oxygen)	2	85.0	50.0	120.0	49.5	2	142.5	135.0	150.0	10.6	-57.5	0.33
2.2 Intermittent (Interval)	1	60.0	60.0	60.0		2	60.0	60.0	60.0	0.0	0.0	-
3. Functional	6	10.0	10.0	10.0	0	6	10.0	10.0	10.0	0.0	0.0	-

N – number; \bar{x} – arithmetic mean; x_{\min} – minimal arithmetic mean; x_{\max} – maximal arithmetic mean; sd – standard deviation; d – differences between micro-cycle 1 and 2; p – statistical significance

The method of recording, due to its simplicity, does not require any financial input and can bring real results in the periodisation of training in basketball. The method of recording and classifying training loads presented in this paper gives a coach the chance to take full self-control of his/her own work. The coach can analyse errors, correct them and introduce innovative methods. Therefore, the authors hope that this study will inspire many coaches to work towards the recording and classification of training loads in a systemic way.

CONCLUSIONS

The programme presented in this paper allows professionals to:

1. Define the actual time spent performed training practice exercises.
2. Control strictly the training process in basketball.
3. Obtain information on the periodisation of training in order to determine future training loads.

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