TRACKING OF THE RELEVANT FITNESS PARAMETERS IN YOUNG BASKETBALL PLAYERS

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Abstract:

The application of modern technologies has become a critical issue in modern sports, which can be very helpful in improving the performances of athletes. The monitoring of many indicators has been realized by using flexible, wearable sensors. In the current study, we aimed to analyze the performance of young basketball players on four consecutive trial matches using the Kinexon perform mobile system which is one of the global market leaders in the field of real-time recording and processing of sports performance data.

Twelve male members of the Hungarian national U18 basketball team were participants in this study. Measures of the study included internal and external load indicators. Accurate measurements about the total load from the data summarized in Kinexon were decisive for the model that the team had after the last game played. On the first day after the tournament, the team had a break with enough time to sleep and an appropriate dietary regime. On the second day after that, recovery training was done. The following day, the team was able to return to basketball training without great intensity and with a drastically reduced number of jumps as well as accelerations and decelerations. Based on the results of this study, we can conclude that Kinexon perform mobile system is a very useful tool in performance profiling, loads, and injury management.

Keywords:

Fitness indicators, Basketball Players, Team Sports.

INTRODUCTION

Application of modern technologies is well documented in two major fields of physical culture i.e., sports, and physical education [1], [2]. However, using systematic, scientific monitoring systems to monitor performance indicators has become a critical issue in modern sports, which can be very helpful in improving the performances of athletes. The ever-increasing demands in modern sports emphasize the need for adequate training load management i.e., the prescription, monitoring, and adjustment of workload [3]. An inappropriate prescription of training load and recovery, especially in youth sports, can lead to injury, overtraining, or poor performance. Hence, it is of utmost importance to closely observe the external (overall amount of the physical work) and internal (psychophysiological stress derived from the external load) aspects of training load to learn the athlete's level of fatigue, objectively assess recovery time, and detect a decline in performance early.

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DOI: 10.15308/Sinteza-2023-267-271

The ultimate goal is related to individualization of the training load and recovery to optimize performance and reduce the risk of injury [4] - [6].

Some of the best applicable systems are microelectromechanical systems (MEMS) and they constantly improved over the last two decades. Presently they are included in a range of consumer products commonly known as "wearables" and offer various data of sensor systems [7]. Understandably, tracking in team sports, in comparison to individual sports, is far more complex since it tends to quantify two parties who try to outperform one another and win a competitive game [8]. This is more emphasized in modern, highly competitive sports, where the quick actions and reactions of every athlete change in a blink of an eye.

The monitoring of many indicators has been realized by using flexible, wearable sensors. According to a recent systematic review of wearable sensors for sports, these can be categorized as follows: (1) kinematical indicators, including posture, motion, force, and acceleration; (2) physiological indicators, including vital signs (e.g., breath, pulse, ECG, heart beating, blood pressure, temperature, SpO2, etc.) and metabolites during and after exercises (e.g., glucose, pH, electrolytes, lactic acid, etc.) [5] .In the current study we aimed to analyse the performance of young basketball players on four consecutive trial matches using Kinexon perform mobile system [9].

2. MATERIAL AND METHOD

Kinexon is one of the global market leaders in the field of real-time recording and processing of sports performance data. We used some of the internal and external load features of this reliable and accurate [10], [11] tracking system for real-time feedback on athletes' performance.

Twelve male members of the Hungarian national U18 basketball team were participants in this study. Sample characteristics are presented in Table 1.

As shown in Table 1, the sample is the most homogenous in BMI (SD=1.69), with an average value of 22.49. The mean value for BMI indicates that these young athletes, as expected, fall into the category of healthy weight for their age and sex, with BMI cut-off points 18.5-24.99 [12].

Internal and external load indicators used in this study were:

- Maximum and average heart rate (Hr max, Hr av);
- Distance travelled per minute (Tot dist/min) and Trimp (a measure of the amount of internal effort)
- Number of accelerations (Acc) and decelerations (Decc) and the total player load (Acc Acc);
- Maximum speed of accelerations and decelerations (Max acc, Max dec) and the average speed (Speed av.);
- Force broken down by body weight (Power/mass) and the total load on the player in minutes (Acc load/min.);
- The mechanical load broken down into a unit of time (Mech Int) and the number of jumps (Jumps).

3. RESULTS WITH DISCUSSION

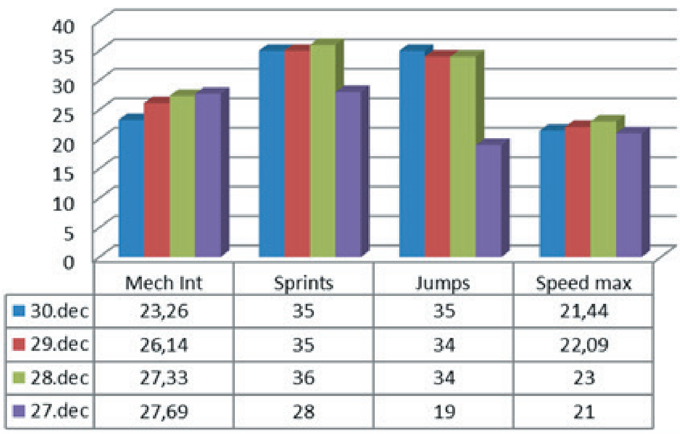
Sport performance indicators of the U18 national basketball team of Hungary were measured during a four-day tournament (one game per day). Figure 1 shows the maximum and average heart rate, the number of accelerations and decelerations, and the total player load during the matches. The biggest cardiovascular and external load was in the match on the 28th of December. The lower load on the match held on the 27th of December can be explained by the number of players (the team played 10 players in this friendly match).

Table 1 - A sample characteristics.

Variable	Minimum	Maximum	Range	Mean	SD
Body height	175.00	206.00	31.00	196.00	9.13
Body weight	70.00	104.00	34.00	86.58	10.70
BMI	18.9	25.2	6.3	22.49	1.69

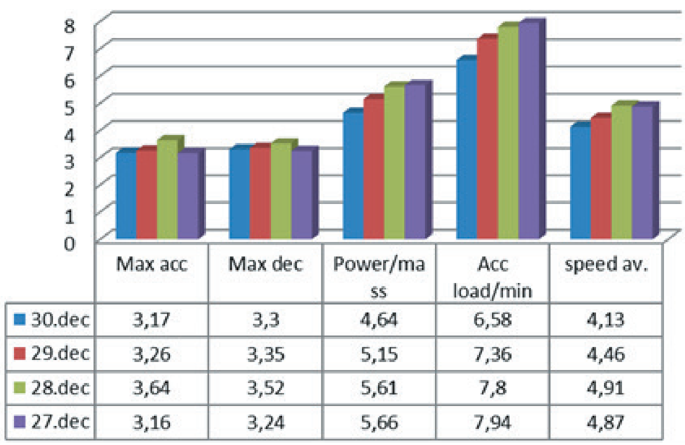
	HR max	HR av.	Acc	Decc	Acc Acc load
30.dec	191,3	130	299	287	299,95
29.dec	193	133	302	294	298,33
28.dec	196	137	298	298	309,5
27.dec	192	130	195	193	198,7

Figure 1 – Maximum, average heart rate, number of accelerations, decelerations and the total player load.



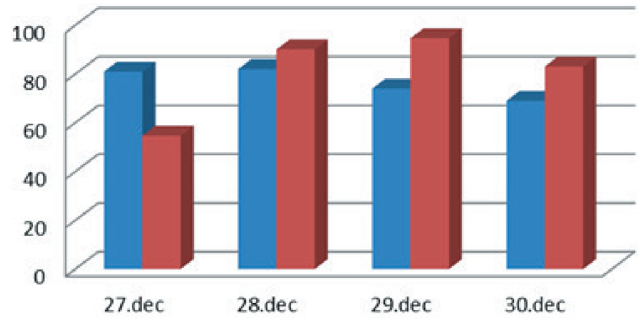
	Mech Int	Sprints	Jumps	Speed max
30.dec	23,26	35	35	21,44
29.dec	26,14	35	34	22,09
28.dec	27,33	36	34	23
27.dec	27,69	28	19	21

Figure 2 – Mechanical load, number of sprints, jumps and maximal speed.



	Max acc	Max dec	Power/mass	Acc load/min	speed av.
30.dec	3,17	3,3	4,64	6,58	4,13
29.dec	3,26	3,35	5,15	7,36	4,46
28.dec	3,64	3,52	5,61	7,8	4,91
27.dec	3,16	3,24	5,66	7,94	4,87

Figure 3 – Maximum speed of accelerations and decelerations, force broken down by body weight, the total load on the player in minutes, and the average speed.



	27.dec	28.dec	29.dec	30.dec
Tot dist/min	69	74	82	81
Trimp	83,05	94,75	90,13	54,7

Figure 4 - Distance travelled per minute and Trimp (a measure of the amount of internal effort).

Figure 2 shows both the number of sprints and the speed, where the 28th of December match proved to be the most stressful one. The mechanical load broken down into a unit of time and the number of jumps are also shown in the figure.

The maximum speed of acceleration and deceleration, and the average speed were also the highest on the 28th of December (Figure 3). The graph also shows the force broken down by body weight and the total load on the player in minutes.

Distance travelled per minute and Trimp (a measure of the amount of internal effort) are shown in Figure 4. It is noticeable that the December 28 match was the biggest strain on the cardiovascular system.

In a tournament system of competition that is played according to this system where 4 games are played every day, the load that is not monitored in this way can only be "assumed" or processed in some less relevant way. As it is about national selection and controlled load conditions in the period after the tournament, it can be clearly concluded that in the first following days, all available means of recovery should be primarily used, followed by recovery training as well as activation for the next microcycle. In this case, the awareness of the age category with the data that we obtained about the total load from the data summarized in Kinexon was decisive for the model that the team had after the last game played. On the first day after the tournament, the team had a break with enough time to sleep and an appropriate dietary regime. On the second day after that, recovery training was done, which included all means of recovery in the gym, such as breathing exercises, massage, dynamic stretching, activation exercises on the floor, a set of exercises without additional load (body weight), and exercises with weights for the whole body without a large workload. The next day, the team was able to return to basketball training without great intensity and with a drastically reduced number of jumps as well as accelerations and decelerations that were available to us from the results (Kinexon).

4. CONCLUSION

In the current study we aimed to analyze the performance of young basketball players on four consecutive trial matches where we used some of the internal and external load features Kinexon tracking system for real-time feedback on athlete performance. With such a monitoring system where you have relevant data with awareness of the psychological pressure for each match as well as the cumulative effects of fatigue, we were able to make adequate decisions about the workload of the players for the next match as well as the means of recovery individually for each player. Of course, the processed data in real-time and then the cumulative data after the competition determine the programming of the next period. Based on the results of this study, we can conclude that Kinexon perform mobile system is a very useful tool in performance profiling, loads, and injury management.

5. ACKNOWLEDGEMENTS

The researchers would like to thank the coaches of the Hungarian Basketball Federation for providing data and cooperation for this study.

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