Monitoring workload in women's basketball based on player tracking device

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ABSTRACT

Knowing how the efforts are distributed during the sports competition is necessary to plan the training loads. However, in the field of women's basketball there is not enough information. So, the objective of this study was to characterize the competition load of women's basketball. The participants were forty-eight U18 women's basketball players belonged to four teams classified for the final four junior championship, a total of forty-eight U18 women's basketball players. Twelve matches were registered. The variables analysed were: Total distance, explosive distance, distance and percentage of time in each intensity group (walking, jogging, running and sprinting), number of accelerations, decelerations, impacts, jumps and player load. Accumulative measurement and intensity measurement were used. Each player was equipped with a WIMUPROTM inertial device Ultra-Wide Band (UWB) systems on the court. The main results were that the players can perform 5000 meters during a match but only 15% explosively. A greater number of accelerations than decelerations are performed. The jumping actions are superior to what was found in other studies. Finally, the load supported by the players differs greatly depending on the minutes played. In conclusion, the training load should be modulated in microcycles determined by the matches. In this way, it allows prescribing to specific training, preventing injuries and, therefore, increasing the performance of athletes. **Keywords**: Basketball; Women; External load; Tracking devices; Competition.

INTRODUCTION

The monitoring of the training and competition load in collective sports is booming. There are many studies that support this topic and, as scientific knowledge advances, the measurement systems are more precise and the data they provide increases considerably (Fox et al., 2018). However, in the field of women's basketball, the most investigated object of study are injuries (Boles and Ferguson, 2010). Therefore, the analysis of the load caused by training and competition would have to assume a more important role, in order to comprehensively study women's basketball. For that reason, the objective of this study was to characterize the competition load of a final four of women's basketball U'18.

MATERIAL AND METHODS

Participants
The participants belonged to four teams, classified for the final four junior women's championship, a total of forty-eight U18 women's basketball players. Each team played three matches; therefore, twelve competition matches were analysed.

Measures
The variables used to describe the external load (EL) were:
- Distance (D): Volume of meters made by the player while on the field. It also includes the distance travelled explosively (ED), > 15 km / h and percentage of time in each intensity group (walking, jogging, running and sprinting);
- Acceleration (ACC) and deceleration (DEC): Speed changes made during the match, total and per minute. It's are specific movements of basketball, including starts, braking and changes of direction;
- Jumps (J): Movement that consists in elevating oneself from the court with an impulse that implies more than 400ms of flight time before landing again, in the same or another place. The manufacturer's software (SPROTM) reference measurements have been used;
- Player Load (PL): Neuromuscular load that the player receives during the activity per minute. It is an objective load measurement, validated and calculated from accelerometer signal in the 3 axes.

Procedures
Data related to EL were recorded using a position-tracking and Ultra-Wide Band (UWB) systems on the court. Each player was equipped with a WIMUPROTM inertial device that was placed into a specific custom-made vest fitted tightly onto the back of the upper torso. The UWB system was adjusted to the reference field before the start of the investigation, by going around the perimeter of the field so that it would be recognized as the reference system. This system is composed of six antennas placed in a hexagon around the playing field.

Analysis
Data were normalised in two different ways: Accumulative measurement (sum of all actions performed in the total game time) and intensity measurement (actions per minute of play). A descriptive analysis was performed using means and standard deviations. The statistical analysis was performed with SPSS (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY:IBM Corp.).

RESULTS

These data allow to have a first view of the demand generated by the competition in women's basketball (Table 1). It is observed how the players travel a maximum distance of around 5000 meters per game, of

which not even 15% is covered at the maximum intensity. The players spend most of the game in speeds between 5 and 7 km / h (jogging), exceeding in very few occasions the 14 km / h (Figure 1). They perform around 10-20 accelerations per minute, and can perform up to 6 jumps per minute. A match can assume a load measured in Player Load of 84 arbitrary units. By establishing this value as the maximum load, fatigue caused by competition in the other players can be established.

Table 1. Load of competition in women's basketball U'18

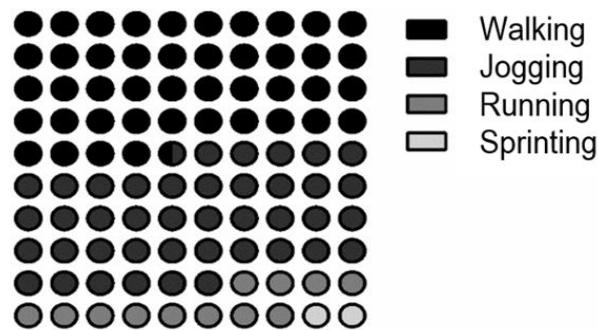|	D	D/min	ED	ACC	ACC/min	DEC	DEC/min	J	J/min	PL	PL/min
MAX	5097	104	712	1144	20	475	10	237	6	84	2
AVG	2305	72	296	343	11	205	6	62	2	36	1
SD	1412	19	176	290	6	123	2	50	1	23	0

Figure 1. Meters performed by speed zones

DISCUSSION

This information is of vital importance because it allows prescribing a specific training, preventing injuries and, therefore, increasing the performance of athletes (Fox et al., 2017). According to Vargas et al., (2015), the training load should be modulated in microcycles determined by the matches, reducing fatigue and preparing the necessary effects for facing the competition in the best possible condition.

CONCLUSIONS

According to the results obtained, it can be considered important: work in a high-intensity race without forgetting the aerobic work done during most of the game; the competition gives rise to a greater number of accelerations, so it would be convenient to pay more attention; abdominal and lumbar work is considered necessary to combat the load and impact caused by the jumping action; it would be important to regulate the training load depending on the minutes played since the fatigue value differs.

REFERENCES

Boles, C. A., & Ferguson, C. (2010). The female athlete. Radiologic Clinics, 48(6), 1249-1266. https://doi.org/10.1016/j.rcl.2010.07.015

Fox, J., Scanlan, A., & Stanton, R. (2017). A review of player monitoring approaches in basketball: Current trends and future directions. J Strength Cond Res, 31(7), 2021-2029. https://doi.org/10.1519/jsc.0000000000001964

Fox, J., Stanton, R., & Scanlan, A. (2018). A Comparison of Training and Competition Demands in Semiprofessional Male Basketball Players. Res Q Exerc Sport, 89(1), 103-111. https://doi.org/10.1080/02701367.2017.1410693

Vargas, A., Urkiza, I., & Orozko, S. (2015). Efecto de los partidos de pretemporada en la planificación deportiva: Variabilidad en las sesiones de entrenamiento. Retos, (27), 45-51.