Aerobic requirements in volleyball - revisited

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Introduction
The physical effort involved in volleyball was first characterized as a mixed effort without a clear identification of the most important energy pathways. In the late eighties Viitasalo et al. (87) have showed that volleyball is an intermittent aerobic effort. Both in training and competition the players were 77% and 82% of the total effort time under the anaerobic threshold. They were able to identify a relation of 1 to 2, between the duration of the rallies and the breaks. From 1987 until now there were some important changes on the rules of this sport. The main one was the so called rally point scoring, which implies that in every single rally there is a point in dispute. This has changed the duration of each set and of the total effort. The purpose of this study was twofold: (1) revisited the time motion characteristics of the actual volleyball and (2) analyzed the relative contribution of the aerobic and anaerobic energy pathways.

Methods
An international game of the World League and a game from the Portuguese national league were videotaped and analyzed for the following parameters: (1) duration of the sets, rallies and breaks; (2) frequency of the explosive actions (front and back). The two national teams were tested for maximal oxygen uptake, onset blood lactate accumulation (OBLA) and anaerobic threshold (AT) in laboratory conditions. A standardized training practice and a controlled game were used to complete de study. In both conditions the hearth rate of the players were continuously monitored and blood samples were collected for lactate measurements. The results from the time motion parameters were used not only to characterise the effort conditions, but also to allow us to verify if the game of the two Portuguese teams would reflect, for the purpose of this study, the international level. The differences between both conditions were tested using T-Tests for independent samples.

Results
Figure 1 shows that the most frequent rally duration was 7 s with a break of 15 s, which corresponds to an effort pause relation of 1 to 2. The mean rally values were 7.5±4.3 s and 7.1±3.9 s, respectively, for the international and national game. The correspondent values for the breaks were 16.1±5.9 s and 23.1±17.8 s. These differences were not statistically significant, which allows us to conclude that the internal characteristics of the game of these teams were similar. In order to analyze the grouping of high intensity performances, the games were analyzed for each individual player calculating the high intensity performances during the 20 s period immediately following each explosive action. Thirty percent of the high-intensity performances were not followed by any and 45% of the performances were followed by one explosive action during the following 20 s period. Figure 2 shows the most relevant physiological results.

Discussion/Conclusion
The rally point scoring system did not change the main characteristics of the physical effort involved in volleyball. The duration of the rallies and breaks, together with the high intensity performance results, allow us to conclude that volleyball is a sport with intermittent efforts followed by breaks with a double duration. After a high intensity performance, in 45% of the cases, the same player might perform an explosive action in the following 20 s. In training and matches the players stay under de limits of the AT more than 50% of the time and between AT and OBLA around 30% of the time. These observations, together with the relation between the duration of the rallies and breaks, let us to conclude that volleyball, despite the recent changes on the rules of the game, is an aerobic sport, with intermittent explosive actions.

References