Exercise intensity in tennis: training drills vs simulated match play

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Introduction
Several investigations have examined the physiological demands of single match play in tennis based on oxygen consumption (VO2), heart rate (HR) and blood lactate concentration (LA) measures (Smekal et al., 2001; Ferrauti et al., 2001). Data from these studies have allowed the design of scientifically based training protocols according to sport-specific demands. However, in tennis, the sport specific technical skills are predominant factors (Smekal et al., 2001). Therefore, tennis player devotes a great amount of time to improve their tennis skills throughout technical training. Presently, the physiological load associated to this technical training is not known (Ferrauti et al., 2001). The aim of this study was to assess the workload of a typical drill used by tennis players during their technical training sessions and to compare it to the physiological load associated to a simulated single tennis match play.

Methods
Six tennis players (ATP ranked and nationally ranked) volunteered to participate in this study, which was conducted over two weeks. The experimental design was divided in two parts: a maximal treadmill test and a field test. In the first part subjects completed an incremental treadmill test to exhaustion, including the measurement of maximal oxygen consumption (VO2max), maximum heart rate (HRmax) and blood lactate concentrations (LA). In the second part, subjects performed an outdoor clay court test, consisted in 2 different technical drills (exercise 1 and exercise 2) and a competitive set (SET). Subjects were equipped with a portable metabolic system, which allowed measurement of VO2 and HR. Several blood samples were taken from the earlobe at selected changeovers. The results were expressed as mean ± SD. Student t-test were used to compare mean values of physiological parameters obtained in each test. A value of P < 0.01 was considered as statistically significant.

Results
The mean (± SD) values during the incremental treadmill test to exhaustion for VO2max, HRmax and peak blood lactate concentration (LAmax) were 58.2 ± 2.2 mL.Kg-1.min-1, 191 ± 4 bpm; and 6.6 ± 0.7 mmol.L-1 respectively. Table 2 shows the physiological parameters analysed during field test. The average VO2 of the technical drills used in our study was 60% of VO2max measured on treadmill, and the percentage of HRmax was 80% of measured in laboratory. During the competition set the VO2 registered (26.6 ± 3.3 mL.Kg-1.min-1) and HRmax (181 ± 14 beats.min-1) were 46% and 66%, respectively, of measured in laboratory. During training drills, oxygen consumption (VO2 and %VO2max) and average heart rates (HR and %HRmax) were significantly higher (P < 0.01) than during the simulated competition set. HRmax and LAmax were not statistically different. The higher physiological load associated with this type of work, compared to the load registered during the set, would suggest that these exercises might be also used to train the hitting and ball control skills in specific situations, under conditions of physiological overload. It is reasonable to suggest that certain technical training sessions might assure a sufficiently intense training stimulus at an aerobic system level. Therefore, monitoring the physiological load associated to on-court training drills, and quantifying the workload that the tennis player withstands during the accomplishment of technical exercises would assist in the optimisation of training efficacy (i.e., improved improvement of conditional and technical abilities) in competitive tennis players.

Discussion/Conclusions
During training drills (i.e., exercise 1 and exercise 2), oxygen consumption (i.e., VO2 and %VO2max) and average heart rates (i.e., HRmed and %HRmax) were significantly higher (P < 0.01) than during a simulated competition set. HRmax and LAmax were not statistically different. The higher physiological load associated with this type of work, compared to the load registered during the set, would suggest that these exercises might be also used to train the hitting and ball control skills in specific situations, under conditions of physiological overload. It is reasonable to suggest that certain technical training sessions might assure a sufficiently intense training stimulus at an aerobic system level. Therefore, monitoring the physiological load associated to on-court training drills, and quantifying the workload that the tennis player withstands during the accomplishment of technical exercises would assist in the optimisation of training efficacy (i.e., combined improvement of conditional and technical abilities) in competitive tennis players.

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References