Specific incremental test in elite squash players

Girard Olivier¹, Sciberras Paul, Habrard Michael, Hot Philippe, Chevalier Renaud, Millet Grégoire ¹ ³

¹ UPRES EA 3759 “Multidisciplinary Approach of Doping”, 34090 Montpellier, France.
² CREOPP, 34090 Montpellier, France.
³ Aspire, Academy for sports excellence, PO Box 2287, Doha, Qatar

Introduction
In racket sports such as squash, success is largely dependent on technical, tactical and coordination motor abilities (Lees 2003). Therefore, in developing a testing protocol to evaluate the fitness in elite racquet-sports players, it is necessary to consider the nature of this game at the elite level including many dynamic leg (i.e. repeated accelerations, decelerations, turns and jumps) and arm (i.e. shoulder internal rotation, forearm pronation, wrist flexion) movements. During treadmill testing, the continuous incremental exercise does not necessarily reflect the specific muscular involvement pattern of the intermittent high-intensity exercise like ball or racquet sports. The laboratory settings cannot simulate the physiological characteristics of the squash activity. Regarding sport-specific fitness test in squash, only limited data are available (Chin et al. 1995; Steininger & Wodick 1987). The aims of this study were to develop a squash-specific graded test in elite performers; and to compare physiological responses recorded during this field test to those observed during an incremental treadmill test.

Methods
Seven elite players (ranked 1 to 25 in their national federation; including World number 1) performed randomly an incremental treadmill test (TT) and a squash-specific graded test (ST) to exhaustion. The ST consisted in repeated displacements replicating the squash game, at an increasing speed on the court. In both tests, ventilatory variables and heart rate (HR) were determined at the ventilatory threshold (VT), respiratory compensation point (RCP) and maximal loads (max). VT was determined using the criteria of an increase in VE/VO₂ with no increase in VE/VCO₂ and the departure from linearity of VE and RCP corresponded to an increase in VE/VO₂ and VE/VCO₂ (Davis 1985).

Results
HR and %VO₂max at VT and RCP were not different between ST and TT. VO₂max (63.6 ± 3.0 vs. 54.9 ± 2.5 ml.kg⁻¹.min⁻¹; p<0.001) was higher in ST than in TT. The time to exhaustion was not different between ST and TT (1056 ± 180 vs. 962 ± 71 s) but was correlated with the ranking of the players only in ST (Figure 1).

Discussion
ST appears as an efficient way to assess squash performance since this test is very specific and was highly related to the ranking of the players; However, incremental treadmill test results (HR and %VO₂max) were similar at submaximal intensities (VT and RCP). So, treadmill test (TT) appears valid for prescribing HR training intensity zones for ‘on court’ squash training. The authors hypothesized that the physiological responses would differ between the squash and the treadmill tests due to the differences in movement patterns between running (continuous) and playing squash (start and stop). It was also hypothesized that these differences would have been very large in these elite subjects, for which specific training represents a major part of their program. However, the values of variables related to VT and RCP as well as the isocapnic buffering (βisocapnic) and hypocapnic hyperventilation (HHV) phases were similar between TT and ST. This is of great practical interest for coaches: one may speculate that the intensity zones defined by HR values measured on treadmill are valid for ‘on court’ squash training.

Conclusion
In summary, ST is an efficient and very specific protocol to assess performance level. However, TT results (HR and %VO₂max) were similar at submaximal intensities. To conclude, field and laboratory tests appear to be complementary and of different use in tracking fitness changes in elite squash players.

References