Correlation between Tests of Running Repeated Sprint Ability and Anaerobic Capacity by Wingate Cycling in Multi-Sprint Sports Athletes

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The 30 s Wingate cycling (cWG) test is a popular test of anaerobic capacity. The test is highly correlated with short, high-intensity performance but may have limitations when assessing intermittent-type activities. A reliable field-based test, the running Repeated Sprint Ability (rRSA) test, is deemed more sport-specific than cWG in determining anaerobic performance of multi-sprint sports athletes. This study examines the relationship of the performance indices of cWG and rRSA (8 × 40 m with 30 s rest in-between) tests in well-trained multi-sprint sports athletes. Twenty-six National-level male field hockey and soccer players took the cWG and rRSA tests on separate occasions in random order. There were only modest correlations between the cWGs mean power (relative) and rRSA total sprinting time (r = -.46, p < .05) and between the two tests fatigue indicators (r = .46, p < .05). The findings of the low-shared variance among the performance variables between the two tests provided limited support for the use of the cWG for assessing the anaerobic performance capability of well-trained multi-sprint sport athletes.

Key words: high-intensity exercise, intermittent sports, field test, laboratory test

Introduction

The 30 s Wingate cycling (cWG) is a popular and reliable test for determining athletes anaerobic performance capabilities in a laboratory setting. The test has been demonstrated to possess strong associations with other estimates of anaerobic potential such as accumulated oxygen deficit, oxygen debt, post-exercise blood lactate, and fast-twitch muscle fibre cross-sectional area (Inbar et al., 1996; Patton & Duggan, 1987; Scott et al., 1991). However, the cycling mode employed in the cWG test limits the transference of results to running activities (Falk et al., 1996). It also measures performance during a single all-out event of 30 s duration that may limit direct application to multi-sprint sports (e.g., soccer, hockey, rugby, and basketball), which require shorter maximal efforts (< 6 s) that are performed repeatedly over time (Williams, 1997). Despite these shortcomings, many studies have used the cWG test to assess the anaerobic performance capabilities of multi-sprint sports athletes, for example, netball (Bell et al., 1994), soccer (Davis et al., 1992; Gomes et al., 1995), and rugby, players (Bell et al., 1996; Rigg & Reilly, 1988). Recently, a field test determining anaerobic performance parameters specific to multi-sprint sports, termed the running Repeated Sprint Ability (rRSA) test, has been gaining acceptance within the sport science community (Dawson et al., 1993; Fitzsimmons et al., 1993). The test involves repeated sprints with

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partial recovery in between efforts to challenge the energy systems in a manner which more closely replicates the game situation and the tests performance indices have been shown to possesses a high test-retest reliability ($r = .85$, $p < .001$) (pp. 82, Fitzsimmons et al., 1993). Thus, the rRSA is more sport-specific and appears to possess a higher face and construct validity than the cWG test in determining anaerobic capacity in multi-sprint sports athletes (Dawson et al., 1993; Fitzsimmons et al., 1993).

Several studies have investigated the relationship between the cWG and a rRSA type of exercise protocol. Nummela et al (1996) compared the cWG with their Maximal Anaerobic Running Test (MART) in male physical education students. The MART consisted of a number of gradually increasing speed of 20 s runs interspersed with 100 s recovery on an inclined treadmill. There were significant correlations between several performance indices of the cWG and MART ($r = .52$ to .59, $p < .05$). But the low correlations values suggested that the cWG and MART could be measuring slightly different aspects of anaerobic performance capability and the authors therefore concluded that neither test should be a substitute for the other. A recently published abstract showed moderate to high correlations between the performance indices ($r = .63$ to .82, $p < .01$) of the cWG and a running-intermittent protocol of 6 × 40 yard repeated sprints with 20 s rest, in college students (Gilbert et al., 1998). In contrast to the previous study, Gilbert et al (1998) proposed that the two tests could be used interchangeably to determine the anaerobic capabilities of athletes in repetitive high power events.

The reasons for the diverse conclusions between the two studies mentioned above could be because the subjects involved were only moderately trained and also that they were not primarily involved in multi-sprint sports (Gilbert et al., 1998; Nummela et al., 1996). These two factors are clearly important in establishing validity in comparison analysis because there are marked differences in performances as well as physiological and metabolic responses during the high-intensity exercise between well-trained multi-sprint sports athletes and sprint- and endurance-trained athletes (Cheetham et al., 1985; Hamilton et al., 1991; Johansen & Quistorff, 2003). Thus this study sets out to examine the relationship of performance indices between the cWG and rRSA (consisting of 8 × 40 m repeated sprints), on a group of well-trained multi-sprint sports athletes.

Material and Methods

Subjects

Male members of the National Senior field hockey and Junior soccer teams volunteered for the study. To ensure greater homogeneity of subjects only outfield positioned players were used and goalkeepers results were excluded. This was because the former were more accustomed to repeated sprint type of activities and training. Twenty-six outfielders (Hockey = 17; Soccer = 9) were involved in the study. Their means (SD) for age, height, weight, percentage of body fat and maximal aerobic power were: 21.8 ± 4.8 yrs, 171.1 ± 7.4 cm, 61.3 ± 4.9 kg, 12.4 ± 3.4%, 57.5