Validity of the 20-m Multi Stage Shuttle Run Test for the Prediction of VO$_{2\text{max}}$ in Junior Taekwondo Players of India

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Indian scientists have not yet used the 20-m multi stage shuttle run test (20-m MST) and validity of the test has not been studied for use with any of the Indian population. The purpose of the study was to validate the applicability of the 20-m multi stage shuttle run test (20-m MST) in junior Taekwondo players of India. Thirty-three junior Taekwondo players (age range 15 ~ 17 yr.) were recruited for the study. For validity of the results, repeatability was used. Direct measurement of VO$_2$ max comprised treadmill exercise with continuous gas analysis by Oxycon Champion, whereas VO$_2$ max was indirectly predicted by 20-m MST. The difference between the mean VO$_2$ max ($\pm$ SD) values of direct measurement (VO$_2$ max = 44.82 $\pm$ 7.78 ml/kg/min) and the 20-m multi stage shuttle run test (SPVO$_2$ max = 44.49 $\pm$ 7.59 ml/kg/min) was statistically significant ($p<0.05$), although limits of agreement analysis reveal that 20-m MST may be used confidently in place of direct measurement. To produce a better estimation of maximum oxygen uptake, a new equation has been developed based on present data.

**key words:** Maximal oxygen uptake, Aerobic capacity, Taekwondo

Introduction

Maximal aerobic capacity (VO$_{2\text{max}}$), when directly determined after exercise involving a sufficient number of muscle groups, is considered a good index of physical fitness of an individual (Astrand and Rodahl, 1970). But the test of direct measurement is difficult, exhausting and often hazardous to perform regardless of the type of ergometer used (Fox, 1973). This is why scientists often perform this test in indirect protocols to predict the VO$_{2\text{max}}$ (Das et al., 1995). But before applying any indirect protocol for the prediction of VO$_{2\text{max}}$, the validity of the test
should be established in a particular population. The 20-m multistage shuttle run (20-m MST, Leger et al., 1988; Leger et al., 1989) is often used world wide (Wong et al., 2001; Mota et al., 2002; Guerra et al., 2002; Vicente-Rodriguez et al., 2003; Vicente-Rodriguez et al., 2004) for measurement of aerobic capacity, but in India scientists have not yet used this test. Cooper et al. (2005) studied the repeatability and criterion related validity of the 20-m multistage fitness test as a predictor of maximal oxygen uptake in active young men. Suminski et al. (2004) established the validity of the 20-m MST for measuring aerobic fitness of Hispanic youth of 10 to 12 years of age. The validity and suitability of this test have not been studied in any Indian population until now.

The 20-m MST is an excellent performance indicator of aerobic fitness, which requires many changes of direction. Furthermore, recent a study has indicated that there are sport-specific differences when predicting VO$_{2\text{max}}$ from the multistage shuttle run test (Gibson et al., 1998). Taekwondo is becoming an increasingly popular sport in India and a huge number of youngsters undergo Taekwondo training in different sports academies in India. It is therefore desirable to find a simple procedure such as the 20-m MST for such a population to regular monitor their aerobic fitness. Keeping in view all these aspects, we wanted to examine the applicability of the 20-m MST to predict VO$_{2\text{max}}$ in junior Taekwondo players in India.

Methods

Subjects

33 junior Taekwondo players volunteered for the study. The subjects had a mean age of 15.9-yr. (± 0.8), mean body height of 164.77 (± 9.83) cm, and mean body mass of 54.39 (± 8.28) kg. They all have a training background of 2-3 years. The tests were demonstrated to the subjects before actual administration and the subjects agreed to sign a statement of informed consent. All institutional policies concerning the human subjects in research were followed.