'Sport Specific' Testing by Mark Pinkerton BSc (Hons), MSc (Distinction), BACR and Jamie Carruthers BSc, MSc, PGCE, CSCS (*D), NSCA-CPT (*D)

***'If we want to be masters of our future, we must fundamentally pose the question of what today is.'* (Michael Foucault)**

Exceptional achievement of today's athletes is a result of an integration of many factors such as, training, genetics, health status, psychology, physiology, biomechanics and skills (Warren, 1999). Certain performance variables, such as genetic endowment are, at least for the present time, beyond legal, external manipulation (Maud, 1995). Nevertheless, increasing demand of sports justifies the application of exercise science and systematic training, as they are vital for prowess; traditional training methods and skill alone are insufficient (Siff, 2002).

Sport specific testing can function as an integral part in maximising athletic performance (MacDougall & Wenger, 1991). In view of the multiple components that are often essential to produce a high level athletic performance (Warren, 1999), it is not surprising that the rationale for utilising physiological, psychological and biomechanical assessments, is multi-dimensional. Indeed, testing is cited as having several key functions related to both the athlete and coach, which include (Baechle and Earle, 2000; Gore, 2000; MacDougall *et al.*, 1991):

1. Tests are administrated in order to establish where an individual's strength and weaknesses lie; this requires identification of the key critical physiological components of the chosen sport or exercise activity and then selecting the appropriate test which measures these key components (Muller *et al.*, 2000). Once such specific data has been collated, this information can be evaluated, and appropriate interventions/strategies can be developed to improve identified weaknesses (Altug *et al.*, 1987; Kontor *et al.*, 1981; Muller *et al.*, 1999).

2. The tests can be used to confirm if a training programme is working efficiently and effectively whereby one is able to monitor the progress of the athlete. Periodical monitoring of the successfulness of any interventions implemented is critical if athletic performance is to be optimised (Richards, 1999). According to Graham (1994) the actual monitoring of the programme is the main purpose of testing, for example, in order to establish the success of a training programme it is necessary to evaluate test scores for the level of improvement. If at

least 50% of the team does not show improvement the training programme should be re-evaluated to establish the reason for the lack of efficacy (Bridgman, 1991).

3. A testing program can be also used as an educational tool for all the parties concerned such as the sport scientist, the coach and the athlete. The athlete learns to understand more competently his / her body and the demands of the sport (MacDougall *et al.*, 1991). A trainer / coach can inform athletes of their present level in relation to those who excel in the same sport, providing an indication of an athlete's status in comparison to local, county and national norms (Gore, 2000). Knowing that one has accomplished something is one thing; seeing what one has accomplished is another. In Russian sport the athlete and coach are aware of all processes involved in acquiring sporting proficiency (Siff, 2002).

4. Testing has been used and continues to be used to predict performance potential (e.g., talent identification) (Chu and Vermeil, 1983; Aján and Baroga, 1988). It has been noted that many nations have been successful in using physiological and anthropometric tests in identifying suitable athletes for certain sports (Balyi, 1998).

5. Testing can provide information on the health status of the athlete. Performing at high levels places severe demands upon the body's physiological systems (McArdle *et al.*, 1996) which in itself can predispose the athlete to health problems (Backus & Reid, 1991). Physiological assessments in this context can therefore be utilised to evaluate the health status of the athlete, allowing the coach to manipulate the training programme if necessary (Richards, 1999). Furthermore, results can highlight both acute, training induced disturbances and also potentially serious genetic conditions (e.g. cardiac arrhythmia's - Seeley *et al.*, 2000), which may otherwise go unnoticed.

Other reasons for using physiological testing in elite populations are (BASES, 1997):

- assessment of individuals returning form injury. An athlete may become injured during the season and be undergoing some type of rehabilitation. Without any previous testing it is difficult to determine quantitatively how far an athlete's rehabilitation has progressed.

- data generation for investigative research

What characteristics constitute an effective testing program?

The indications are that for a testing programme to be both constructive and effective, the following guidelines should be considered (Warren, 1999; MacDougall *et al.*, 1991):

- variables being tested should be relevant to the sport
- tests used should be valid, reliable and reproducible
- tests are as sport specific as possible
- the testing situation must be rigidly controlled
- testing is repeated at regular intervals
- results are interpreted to the coach and athlete directly
- all testing procedures must respect the athlete's human rights (health and safety, confidentiality, ethics)

Problems with testing

Although much of the available evidence advocates that testing should form an integral part of the high performance athlete's preparation (Warren, 1999), the indications are that coaches and sport scientists select inappropriate tests and use the data generated from the tests inadequately (Brown, 2004).

Unfortunately, in numerous sports there is little information which physical parameters are central to optimal performance (i.e., general endurance, speed, strength-speed, strength-flexibility) and how they should be measured (Vick, 2002). Many sports have tests that have become "gold standard." Selection of tests is usually determined by tradition, fashion and previous playing / coaching experiences (Vick, 2002). One cannot live in the past or justify one's actions on the basis of traditions and fashion.

Conversely, the scientist often carries out highly lab based testing that bear little relationship to what happens "in the real world." Steininger & Wodick, (1987) state that many of the standardised, laboratory-based ergometry protocols are unreliable in predicting success in sport. In fact, the preponderance of testing measures in the West rely on the use of expensive devices, for instance, isokinetic dynamometers, force plates and gas analysers. However, many Eastern bloc countries frequently test under sporting conditions utilising basic field tests. The latter methods are considered far more useful to the average coach (Siff, 2002).

A laboratory test is an assessment that is conducted in a controlled environment and that uses protocols and equipment that simulate the sport or activity. A field test is a measurement that is conducted while the athlete is performing their sport in a simulated competitive situation (Warren, 1999). In view of the fact that laboratory testing satisfies the reliability and validity criteria, but possibly not the factor of sport specificity, emphasis continues to shift towards the development of valid field tests which may be used to complement any work undertaken in the laboratory (Daniels & Foster, 1995; MacDougall & Wenger, 1991).

Maximum oxygen uptake $\dot{V}O_2$ max was and is still, in some cases, considered by exercise and work physiologists to be synonymous with aerobic fitness (Bangsbo and Reilly, 1999). $\dot{V}O_2$ max is to a large degree dependent on the size of the left ventricle and the left ventricle does not change in volume after one has been training for a number of years (Anderson, 1998). On average, maximal oxygen uptake is reported to be 5-10% higher on a treadmill than on a cycle ergometer (Weisman and Zeballos, 2002). $\dot{V}O_2$ max on its own is no guarantee of outstanding performance and, fortunately, the limitations of $\dot{V}O_2$ max for fitness assessment are now being recognised (Bangsbo and Reilly, 1999). The sit and reach test is regarded as a test of flexibility or suppleness despite the fact that it is well known that flexibility is joint specific (Siff, 2002). Flexibility differs from joint to joint, displays different properties under dynamic versus static conditions (Siff, 2002).

Interpretation and feedback of tests results is often hindered due to breakdown in communication. Scientists rarely speak or write in a language that the athlete and / or coach can comprehend (Alley, 1996) and coaches may not be schooled in science (Stone *et al.*, 2004).

> *"Test results must be reported promptly to the athlete and interpreted in language that he / she and the coach understand. Training programs must then be altered or designed on the basis of this information to incorporate appropriate training strategies. If this final application is not made, the whole testing procedure serves no purpose."*

(MacDougall *et al.*, 1991).

Suspicion of science in sport may also be conceived from the belief that scientists are simply interested in generating knowledge for personal advancement, with little interest in the potential benefits/needs of such information (Goldsmith & Sweetenham, 1999). Indeed, Winter (2002) questions whether we have overplayed the athletes-for-data-only card?

Frequency of testing is often 'hit and miss.' The 'one-shot' testing session provides little advantage to either the coach, the sports scientist or the athlete and is strongly opposed (Gore, 2000). On the other hand, if testing is too frequent it becomes a practised skill (Vick, 2002). Time scarified for testing does not improve performance as well as training (Bridgman, 1991). It is no surprise that some coaches believe that testing is unnecessary (Bridgman, 1991).

Certainly, coaches and sport scientists should not get sucked into the vacuum of relying totally upon test results to predict performance (Billat, 1996). Results achieved in competition must be used in conjunction with tests results to ensure that optimal conclusions are obtained (Harre, 1982). In fact, the ultimate measure of successful training and testing is observable improvement in the athlete's performance (Siff, 1994).

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