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ASSESSMENT OF PERFORMANCE: TREADMILL VERSUS FIELD TECHNIQUES

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The most common cause of poor performance in horses is the unrealistic expectations of owners!
(CS Hayes, 1924-99).

Despite this truism those associated with racing and performance horses often seek methods for assessment of performance potential and causes of poor performance. As part of these types of assessments veterinarians and equine scientists have developed a variety of mechanisms to assess performance generally referred to under the umbrella term 'clinical exercise testing'. Generally there are two broad forms of clinical exercise testing: 1. Procedures conducted in hospital/laboratory based around treadmills and 2. In-field testing techniques.

Treadmill Testing
Treadmills have been used as a means to exercise horses for well over a century. However, it was not until the 1960’s that the use of treadmills for exercise testing became more common. By the 1980’s high speed treadmills were more common and by the 21st century they are being mass produced, such that many stud farms, training establishments and veterinary hospitals have them. As a result methods for the assessment of performance have been developed and the applicability of these to the ‘real’ world have been assessed. From a broad perspective clinical exercise testing in the laboratory/hospital setting usually involves many of the following steps:

- History
- Physical examination
- Lameness evaluation
- Cardiac examination (rest) (including ECG and echocardiography)
- Respiratory examination (rest)
- Exercise test
- Post exercise evaluations

Treadmill acclimation during this period

History: As with any attempt to determine dysfunction an appropriate history is essential. In brief this should review the presenting complaint, its duration and progression. Has the horse been subjected to surgery; what illnesses have occurred; a review of the performance record.

Physical examination: As a rule more mistakes are made by not looking than not knowing. Thus, based on this adage a thorough physical examination is indicated in a horse presented for poor performance.

Lameness evaluation: Many horses with poor performance have concomitant mild-moderate lameness. The impact of the lameness on performance remains contentious, but many skilled practitioners attest that there is mounting evidence of infirmity having a deleterious influence on performance. Thus, much effort is often expended in evaluating, diagnosing and treating lameness in racing and performance horses. To this end any appraisal of poor performance should involve a thorough evaluation for lameness.
**Cardiac examination at rest:** Structural and functional abnormalities of the cardiovascular system are identified as contributors to poor performance. Thus a careful examination involving observation, auscultation, electro- and echo-cardiography are indicated. From these the examiner can determine whether rate, rhythm, sounds, valvular function, dimensions and contractility are within the normal range.

**Respiratory examination at rest:** This should involve a thorough endoscopic evaluation of the airways from the nares to the carina. Alterations such as laryngeal dysfunction (eg., ILH) etc or evidence of previous surgeries may be determined

**Treadmill acclimation:** Horses adapt readily to treadmill exercise. However, as with any new stimulus several acclimating runs on the treadmill are indicated prior to testing.

**Exercise testing:** Depending on the equipment available and outcomes expected from the test a variety of measurements/observations may be made. One of the most useful applications of treadmill testing is constant observation of the larynx/pharynx via endoscope. This may reveal dynamic abnormalities such as laryngeal or pharyngeal collapse etc. Additional useful measurements during exercise may include ECG/HR response, arterial blood gases and blood lactate concentrations. As technology has advanced masks for measuring breath by breath respiratory function have been developed with some of these demonstrating significant efficacy. In general horses are exposed to a standardized treadmill exercise test which requires the horse to run to fatigue. This allows comparison between well and poor performing horses.

**Post-exercise evaluations:** Recently immediate post-exercise echocardiography has been shown to have utility in the determination of abnormal contractility. As many racing and performance horses suffer from environmentally induced lower airway inflammation endoscope guided tracheal washings may be performed for cytological and possibly bacteriological examination. In some cases, bronchoalveolar lavage may be indicated also. Other assessments post-exercise may include determination of a variety of enzymes, etc in serum to assess organ function e.g., muscle disorders.

**Field Testing**
Assessment of performance in the field has been practiced since time immemorial. In more recent times attempts have been made to standardize in-field testing of equine athletes. These assessments have been applied to a variety of equine athletes including Standardbred and Thoroughbred racehorses and eventing horses. In general these tests involve a prescribed exercise stimulus during which heart rate and blood lactate measurements are usually made. These appraisals may provide useful information relating to performance prediction, changes in fitness and may reflect other abnormalities such as respiratory disease and lameness.

For field tests to be readily accepted within the horse industries they need to be easy to perform, relatively non-invasive, repeatable and interpretable without difficulty. To date these issues have limited the applicability of both in-field and treadmill exercise testing.

More recently global positioning technologies have been used to provide precise indications of speed during a test allowing direct correlation with heart rate responses. Also, the progressive development of light weight masks allowing the telemetric measurement of breath by breath respiratory function, without concomitant impediment to air flow.

**Conclusion**
In summary exercise testing has been conducted for many years and is becoming progressively more refined. Although still by no means a complete science these assessments may be useful in providing insights as to why a horse may not be performing at levels previously observed. These techniques may be applicable also for determination of performance potential under certain circumstances.