Conclusions

1. The change in resting HR in two-year-old Thoroughbreds during their first racing season is valuable for the estimation of their state of health and adaptation to training.
2. The heart rate recovery was similar for winning and non-winning horses, but the maximum HR value was significantly higher in the winning horses.

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Comparison of post-race heart rate values in Thoroughbred winning horses and losers

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Abstract

The changes of resting HR values in two-year-old horses during their first racing season are valuable for the estimation of their health status and adaptation to training. Resting HR ought to be measured twice monthly (weekly if possible) and additionally on the day of the race.

Introduction

Exercise testing is a method of accurate evaluation of a horse's physical condition before a race. It consists of determining the relation between a horse's velocity, heart rate (HR) and the amount of lactate produced during the test. An improvement in the fitness of a horse is associated with a reduction in its HR at a specific velocity. Another effect of it is that the heart rate declines more rapidly after the completion of a standard exercise test. These exercise tests can be performed in laboratories using treadmills or in field conditions (Clayton 1991; Courouse 1998, 1999; Sloet et al. 1991).

Exercise testing is not applied at the Warsaw race track. The only method of estimation of horses' fitness is the analysis of winning time over the distance of 800 m. This tends to shorten starting from the opening of the season until it reaches the level of about 50 s. This study was aimed at comparing the:

- resting HR values of two-year-old Thoroughbreds and
- maximum HR values and heart recovery in the first 30 s after the race in winning and non-winning horses.

Material and methods

The study was carried out at the Warsaw race track. It involved 15 Thoroughbreds in the 2000 season and 13 in 2001. All horses were two years old. All of them were stabled under the same conditions and were trained by the same trainer. The measurements of HR were performed using a Polar Vantage heart rate monitor. Electrodes were fixed above the horse's elbow and monitored the pulse rate over 5 s intervals. At rest HR values were taken in the morning, before exercise, every four weeks. Exercise HR values and heart recovery values were measured for 30 s starting from the moment of the peak HR. The heart rate monitor was put on the horse when it was saddling and removed after the race.
The analysis of the line of regression, based on the least-squares method, was applied to determine the mathematical model of HR changes. ANOVA for repeated measures was used to determine the effect of time on resting heart rate.

Results and discussion

The average resting HR values in two-year-old horses decreased during their first season at the race track (Fig. 1).

**Figure 1: Changes of resting HR in two-year-old Thoroughbred race horses (mean ± SD)**

There were significant differences between average resting HR values at the beginning of the season 2001 and at the end of it. These results are consistent with the data obtained by other authors who claimed that a decrease in resting HR value is a reaction of the horse’s organism to training (Clayton 1991; Couroucé et al. 1996; Wickler 1996). Resting HR should be measured twice monthly (weekly if possible) and additionally on the day of the race.

The maximum heart rate values and HR changes during the first 30 seconds of recovery were compared between horses that won the race and those which were classified fifth and lower. Post-race maximum HR values varied from 142 to 229 beats per minute.

The maximum HR values differed markedly between both groups (Fig. 2), which was very surprising. In contrast, there were no differences in heart rate recovery (its lines are parallel). It is a well-known fact that in well-trained, fit horses, V200 increases and average HR value decreases (Clayton 1991; Couroucé et al. 1996; Wickler 1996). One of the training effects is the adaptive change in the heart leading to the development of what is called a "sport heart" meaning a heart adapted to heavy exercise loads (Scott et al. 1991). It seems that such adaptation can be manifested by greater ability to reach maximum heart rate levels when the animal is exposed to extreme effort in a race. Sometimes, a high post race HR value may suggest the overloading of the horse. In one horse, which was very tired after the race, the HR level rose for two minutes after the completion of the run.

This experiment should be considered as a pilot study. It is recommended to validate the obtained data on more individuals trained by several trainers. It would also be very interesting to compare the average HR values for the same horses starting in different periods of a racing season and to ascertain whether there is a correlation between the maximum HR value which could be expected before or after crossing the finish line and the race result. However, it is not an easy task because during the race the jockey will concentrate on the race and not on the monitor while crossing the finish line.

To test the use of the proposed method of fitness estimation the changes of HR during races and control gallops should be monitored in selected horses. The main goal of these studies is to work out an individual HR recovery model for each horse. In future, the proposed model could be used to evaluate the readiness of the horse to run in a race on the basis of a control gallop a few days before the event.

**Figure 2: Mathematical model of HR recovery in two groups of Thoroughbred race horses**