

CHANGES OF EQUINE LOCOMOTION INDUCED BY FATIGUE ON VET-GATES IN ENDURANCE EVENTS

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INTRODUCTION

Equine endurance is a kind of "horse marathon" and the longest events require running 160km in a day. Although horses do not run at their top speed during the whole trail, changes of their locomotor patterns induced by fatigue are found in any horse even if it kept good conditions after finishing the long distance run. At least every 40km of competition, it is required a veterinary commission checks horses' fitness to continue the event through their locomotion and metabolic status. Locomotion assessment consists of scoring propulsion, general attitude and regularity of gait.

The present study was to assess the changes of locomotion in the gait test on vet-gates with the following parameters: stride length (SL), stride frequency (SF), stance/swing phase duration (StD/SwD) and mean gait velocity (V).

MATERIALS and METHODS

Twenty-four horses were investigated in this study, comprised of 14 geldings and 8 mares and 2 stallions, ages 7-16 years. Most of them were Arabian or Arabian crossbreed. All were experienced endurance horses having participated in 80km rides or longer distance rides for at least 2 years.

This study was derived from three 80km endurance events held around Shining Moon Lake, Gumma Pref. in Japan, between July and October 2008. Two events in three were consisted of 3 phases and the other 4 phases, after each phase horses must undergo physical and medical check by veterinarians.

Before (P0) and after each phase (P1-4) of the events, horses were trotting led by and run with a man in a straight line in the sandy track as gait test on the vet-gates. The images of the gait test were recorded with three digital video camcorders from both sides and in front of the track. The images were analyzed with ImageJ (National Institute of Health, USA) and SiliconCOACH Pro (SiliconCOACH, New Zealand) at 30 or 60Hz on frame-by-frame basis. The parameters of locomotor patterns, such as SL, SF, and StD/SwD, were assessed in each limb. Stride duration (SD), the elapsed time between successive ground contacts, was defined as starting when the hoof first contacted the surface and ending when the same hoof made second contact. It was consisted of StD and SwD and used to investigate the effect of the modifications in velocity during the whole events. SwD was defined as the period elapsing from lift-off to the next ground contact of the same hoof.

Horses were divided into 2 groups, Grade A/B performers by the ratio of V of P0 to P3/P4 (after the last phase). The horses for V of P3/P4 decreased less than 10% of initial values were ranked Grade A (GA).

RESULTS AND DISCUSSION

General changes of locomotor pattern were decreasing trotting V and increasing StD.

V, SL and SF of GAs were almost stable during the whole event, whereas V of P3/P4 of GBs decreased more than 10% because of shorter SL, not SF. Moreover, StD of GBs increased gradually and SwD was decreasing in spite of decreasing V. It is consistent with the study about fatigued endurance horse [1], even though inconsistent on the treadmill in point of increasing SL with fatigue [2]. Whereas, in studies of fatigued human, SF was decreased [3], increased [4] or not changed [5]. It might be affected whether the gait performed on the ground or the treadmill and related to the capability of changing SL against fatigue. Therefore more primitive reaction might be derived in the horse performance.

Trot is a symmetric gait, that is, a forelimb (FL) and a paired hindlimb (HL) contacts and leaves the surface at the same time. When asymmetry of trotting was elicited or increasing on the gait test, it might suggest lameness or excessive fatigue. In general, asymmetric gait appeared as delay of a FL to a HL, which was more conspicuous in GBs than in GAs with fatigue.

CONCLUSIONS

Changes of V on vet-gates were associated with shorter SF, reduction of SwD and more conspicuous asymmetry. Horses with stabler V during the whole events could be considered as those kept their good conditions during the endurance event.

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