The effect of training method on the condition of horses

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Abstract
Conventional training is applicable to all types of horse competitions, but this type of training could be very demanding and has got stressful effect on the physical condition of horses. As an alternative, training in water could be used for rehabilitation during condition training. Water trainings do not lead to overloading metabolism, they raise sympathicus and decrease parasympathicus activity and cause higher degree of order and stability. The aim of this paper is to compare conventional training with water training and their impact on the condition of horses. Water training has more beneficial effects, compared to conventional training, related to heart rate, hematocrit value, blood lactate concentration and cardiorespiratory rates.

Key words: horse, conventional training, water training, condition

Introduction
“Training” is defined as the intentional modification of the frequency and/or intensity of specific behavioural responses. Such modification can be achieved through different means using positive reinforcement, negative reinforcement and/or punishment (Mills and McDonnell, 2005.).

Traditional training practice change a horse’s behaviour through negative reinforcement, whereby an unpleasant stimulus is applied to the horse until it exhibits a desired response. This approach to training horses is still very much in evidence today.

Conventional training is applied to all type of competition horses. Such training is very demanding and stressful that affects the physical condition of the horse. This system involves horses and riders at the same time. This system greatly affects the occurrence of stress in horses and has a large percentage of injuries that may affect subsequent events and the participation of the horses for a long time.

Swimming is adopted as a method of training and rehabilitation for people and recently to sport horses. Because the training effect on the equine cardio respiratory function is comparable with that of field training deposited of lower load on legs, swimming is applied to sport horses susceptible to locomotorial diseases (Hobo et al., 1998.). Therefore, the aim of this study was to compare conventional and water training, and their impact on the condition of horses.

Discussion
1. Exercise physiology of the horse
1.1. Effect of nutrition on the performance
The effect of nutrition can be difficult to determine. Effects of severe malnutrition can be detected, but subtle yet nevertheless important effects can be difficult to define. Many factors such as body condition, mental state of the horse, training methods, health, track conditions, post position, ability of jockey or driver and level of competition can influence
performance. Therefore, subtle nutritional influences may be overlooked. Furthermore, nutritional influences may go undetected under experimental conditions because of small numbers of subjects (Hintz et al., 1992., Hintz, 1994.).

1.2. Effect of training on the skeleton
The bones of the skeleton determine conformation or balance and structural correctness. The relationships of alignment, lengths, and angles of the bones of the skeleton have tremendous effects on the athletic ability and long – term soundness of horses. The skeletal system also includes tendons, ligaments and cartilage. Each element of the musculoskeletal system must be functioning correctly in order for the horse to travel soundly. A horse galloping at race speed will place three times its body weight as force on the lower limb. But ultimately the strength of the bones of the legs must bear the loads created by exercise and training. Strength of bone is derived from a mineralized cartilaginous matrix. Strength is defined as the amount of force a bone can withstand per unit area (Lawrence, 2003.).

1.3. Effect of training on the skeletal muscle
Skeletal muscle constitutes the largest organ system in the mammalian body and is essential for movement and force generation muscle tissue has the unique ability to adapt and remodel with regular exercise (Leisson et al., 2008.). The ability for athletic performance is partly determined by the combination of adequate contraction speed and power and sufficient resistance against fatigue of the skeletal muscles. To change muscle fiber type percentages in a muscle, exercise must be given at a level of high intensity and for a long time (Dingboom, 2002.). Mammalian skeletal muscles are composed of different fiber types. Five muscle fiber types (I, I/IIA, IIA, IIA/IIX, and IIX) were identified in horses (Grotmol et al., 2002., Leisson et al., 2008.).

1.4. Effect of training on heart rate
The maximum heart rate of an individual horse may vary with age and breed, and, therefore, to estimate the percentage of heart rate maximum achieved during a specific work bout, it is necessary to know the maximal heart rate of an individual horse. However, it is difficult for many equestrians to impose a workload sufficient to elicit maximum heart rate. It is more practical to use heart rate as a guide to oxygen consumption than percentage of heart rate maximum achieved during various exercise bouts. At the very least, heart rate can be used to assess the relative intensity of a work bout for a given horse. Heart rate decreases rapidly (within a few seconds) after most exercise, and thus post – exercise heart rate is not a good indicator of exercising heart rate. Heart rate measurements made when a horse is excited due to new surroundings or another situation may overestimate the effect of the actual work performed.

1.5. Effect of stress in training horse
Stress may be defined as a threat, real or implied, to the psychological or psychological integrity of an individual (McEwen, 1999.). The standard model of stress, developed in the middle of the 20th century, postulates the activation of two neuroendocrinological axes: the sympatho–adrenomedullary axis and the hypothalamo–pituitary–adrenocortical axis. Long–term activation of the sympathetic nervous system as well as chronically elevated or depressed adrenocortical functions were found to be harmful to the organism (Keeling and Jensen, 2002.). Exercise is just such a stressor: enforced circulation, energy mobilization, and maintaining constant body temperature require sensors in a regulatory system to formulate the proper answer (e.g., in the form of lactate or sweat production) (Coenen, 2003.).
2.1. Traits – measurements describing the condition
Reference values are the observations made on an individual or groups of individuals in defined states of health (Lumsden et al., 1980.). If considered for application outside of the laboratory in which the observations were generated the reference values must be accompanied by the following: description of the stated health of the individuals, the specimen collection and handling procedures, the laboratory methods including precision and quality control and the necessary support for assumptions or hypothesis made regarding data distribution if parametric analysis is used to compute reference intervals e.g. 2.5 and 97.5 percentiles. Introduction of this nomenclature as prescribed has been stated to be “an important step toward establishing a scientific basis for clinical interpretation of laboratory data” (Lumsden et al., 1980.).

2.2. Conventional training and its effect on condition
Spooner et al. (2008.) in his study tested the hypothesis that endurance training would not alter bone mineral content as determined through optical density. This study shows endurance training does not increase bone mass above what is seen with pasture-housed animals and negates the current thinking that slow, long-distance training will increase bone strength.
Serrano et al., (2000.) in the study examined the plasticity of myosin heavy chain (MHC) phenotype and the metabolic profile in horse skeletal muscle with long – term endurance – exercise training and detraining. The most significant effects of training and detraining on MHC expression corresponded to the deepest region of the muscle, when compared with both the superficial and middle ones. The most marked variations in both the percentage of fibres showing high-oxidative capacity and capillary density were also found in the deepest region of the muscle.
Piccione et al. (2007.) investigate changes of serum electrolyte and total protein together with their separate fractions and Hct in athletic horses trained at two different workloads. The significant increase in chloride after the exercise (P<0.05) was probably due to the movement of chloride from the erythrocytes back into the plasma.
Eto et al. (2003.) tested hypotheses that high intensity training for Thoroughbred horses that have been subjected to conventional training could further improve the metabolic properties of the middle gluteal muscle. The most important result in this study is that even in well-trained Thoroughbred horses, there is significant trainability for anaerobic capacity. This result indicates that conventional training programme may not be enough for the maximal development of anaerobic capacity of Thoroughbred horses.

2.3. Water-based training and its effect on condition
The objects of the study of Voss et al. (2001.) were to investigate the effect of water training of horses on selected blood parameters. Investigations showed that the SDNN (standard deviations of normal heart beats intervals) of all horses at rest was significantly higher than during exercise. The reason for this high variance at rest was the physiological sinus dysrhythmias, which appeared in each horse with different incidence. They occur because of the very high vagal tone which leads to temporally blockade of the sinus and/or atrioventricular mode. Because of the decrease in vagal tone, these dysrhythmias disappeared as a result of exercise. SDNN during trotting in water above the elbow was somewhat smaller than during trotting in water above the carpus or all other experimental conditions.
Hobo et al. (1998.) showed characterized equine respiratory patterns during swimming by tracing intratracheal pressure curves and determined the respiratory rates, expiratory pressure, inspiratory pressure and duty ratio on these results.
Mishumi et al. (1993) investigate the validity of swimming training, the following matters were considered: changes in the performance capacity, changes in the constitution and frequency of locomotor diseases. Training program including both conventional exercise on a track and swimming. In all groups the blood lactate concentration correlated positively with speed at any time during the training period. Misumi et al. (1995) investigating muscular adaption to swimming training in young horses, 18 two–year–old Thoroughbred horses were trained in a program which included both running and swimming, and the changes in skeletal muscle composition during the training period were evaluated histochemically. The significant increase after 3 months of the training may be related to the training program, in which higher – intensity endurance work was included after 2 months.

Conclussion
Water training, following training protocol represents a medium – sized aerobic work load for horses. The almost unchanged lactate level and the detected changes of the haemoglobin content, as a result of erythrocyte distribution out of the spleen, and the increased heart rate show that this kind of training does not lead to an overload of metabolism. Although the measured heart rates were not maximal, a marked change in HRV was found, demonstrated via an exercise – induced lower variance of NN – intervals around a mean value, rising sympathetic and decreasing parasympathetic activity and a higher degree of order and stability. These changes must be considered as an expression of a higher demand on the performance of the organism rather than as a specialized outcome of water training.

The heart rates and blood lactate concentrations indicated that the swimming load had been aerobic. This deterioration suggested that the water pressure on the horse’s body during swimming had prevented adequate ventilation. The expiratory pressure was nearly equal to the inspiratory pressure during the swimming, which contrasts with the respiratory curves specific to field running where a higher ratio of inspiratory pressure to expiratory observed. This is much different from the typical ratio during field running when that the expiratory time is approximately the same as the inspiratory time. It is possible that a longer expiratory time may limit sudden airway collapse caused by the water pressure during swimming and prevent a radical decrease of air space volume, thus maintain buoyancy.
In short, water training has more beneficial effects, compared to conventional training, related to heart rate, hematocrit value, blood lactate concentration and cardiorespiratory rates.

Remark
The paper is a part of the graduation thesis of Andrea Pastva, which was defended at the Faculty of Agriculture in Osijek. The data necessary for writing this paper have been collected within the Erasmus students’ exchange on the Kaposvár University, Faculty of Animal Science, Department of Animal Nutrition.

References

Učinak metode treniranja na kondiciju konja

Sažetak
Konvencionalni trening primjenjiv je na sve tipove konjičkih natjecanja, no ovaj način treniranja može biti vrlo zahtijevan, te imati stresan učinak na fizičku kondiciju konja. Kao alternativa, trening u vodi može se upotrijebiti za rehabilitaciju u vrijeme kondicijskog treninga. Vodeni treningi ne opterećuju metabolizam, povišuju simpatičku i smanjuju parasimpatičku aktivnost, te doprinose povećanom stupnju stabilnosti. Cilj ovog rada je usporediti konvencionalni trening s vodenim treningom, kao i njihov utjecaj na kondiciju konja. Vodeni trening ima prednost pred konvencionalnim u smislu boljeg učinka na srčani ritam, hematokritske vrijednosti, koncentraciju laktata u krvi, te kardiorespiratornu frekvenciju.

Ključne riječi: konj, konvencionalni trening, vodeni trening, kondicija