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Show jumping horses' adaption to the training over the racing season

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Abstract

Equestrian sports are in connection, firstly with the physical stress that can induce mental horse's stress. Horse training is not easy to define. It is achieving concentration and fitness for a certain type of equestrian sport where a preservation of health, psychological condition, physical condition and longevity is a necessity. In equestrian sport, the better result is needed over the long period of time. Many authors describe the lactate concentrations as a parameter of fitness of the horse, which means, in equestrian sports, a result. A horse with a lower lactate level is fitter, which means that the muscle tissue produces less lactic acid which is converted in blood into the lactate ion. Researches have been made on Holstein studs and a Croatian sports horse breeding type that have been trained and bred in the same conditions. There were two groups of jumping horses in training. Younger horses gain uniformity throughout the competition season and come closer to the older group of horses in results. Younger horses gain experience through training and physical work understand as a routine; their body gains better fitness demanded by show jumping sports.

Keywords: jumping horses, stress, training

Introduction

Equestrian sports are in connection, firstly with the physical stress that can induce mental horse's stress (Schmidt et al., 2010; Ille et al., 2014; Gregić, 2016; Gregić et al., 2017a; Waran and Randle, 2017). Equestrian sport (dressage, show jumping and eventing) is an Olympic discipline under the Federation Equeste International. An adequate horse and a good training is sought to gain results in the equestrian sports. Horse training is not easy to define. It is achieving concentration and fitness for a certain type of equestrian sport where a preservation of health, psychological condition, physical condition and longevity is a necessity (Waran and Randle, 2017). In equestrian sport, the better result is needed over the long period of time. In 1936

Hans Selye described stress (English stress = tension, pressure; Latin stringere = tense) as a „ nonspecific reaction of the body to any response “. Stress is a consequence of the pleasant or unpleasant straining of the organism. Stress of the horses is hard to measure but can be evaluated by observing and analysis of the physiology and, also, the concentrations of substances in the organism (Ille et al., 2014). A desirable horse in show jumping is the one with a great tolerance to stress and quick adaptation to it. In equestrian sports, stress is often mentioned but it is hard to understand the psychological stress of the horses and, therefore, objectively measure it (Gregić, 2016; Gregić et al., 2017b). Ricard and Fournet-Hanocq (1997) have analysed the factors conditioning the sport age of a jumping horse. They have concluded that the bad training enhances the probability of excluding a horse from sports for 1.6 times.

Materials and methods

Researches have been made on Holstein studs and a Croatian sports horse breeding type that have been trained and bred in the same conditions. There were two groups of jumping horses in training (n = 14): seven young horses, aged four to five years and seven older horses, aged eight to nine years. The experimental group had two groups: young horses entering the show jumping sports and the older group that should achieve total development of the motoric movements in show jumping by adequate breeding and training. Samples and measurements were taken in 60th, 30th, 15th and zero minutes before the training and over the training; also, in zero, the 5th, 15th, 30th, 60th, 90th, 120th and 180th minute at the ending of each training. The analysis was made in the competition period over the three periods of repetition in May and September. To avoid the microclimatic environmental influence, the training area and accommodation area were measured with USB PCE – HT71. Heartbeat measurements were made by Polar equipment under the name RS800CX N G3 device, equine electrode set for H2 sensor, equine health-check FT1 and polar equine software. Saliva samples in horses were taken by a cotton tampon (Salivette Cortisol, code blue) that was fixed by the paean, pushed into the oral cavity, held there about one minute and stored adequately. To determine the lactate concentration levels in the horse saliva were made parallel with Laktat FMPB, and glucose levels in the horse saliva by standard methods. Statistical programme SAS/STAT [37] was used for a statistic data processing. Evaluation of the impact of the training on the indicator parameters of stress (heartbeats, cortisol, glucose, lactate) was done by PROC GLM procedure (SAS Institute Inc., 2009) with the following statistical linear model: $y_{ijklm} = \mu + T_i + M_j + D_k + V_l + e_{ijklm}$

where y_{ijklm} = estimated value of the dependent variable (heartbeats, cortisol, glucose, lactate, temperature of the back);

μ = the mean model;

T_i = fixed effect of the training (i = lunge, track, parkour);

M_j = the fixed effect of the month of the measurement (May, July, September);

D_k = fixed effect of the horse's age (k = old, young);

V_l = fixed weather effect (l = -60, -30, -15, -0, 0, +0, +5, +15, +30, +60, +90, +120 and +180); e_{ijklm} = the residual.

Results

The difference in stress physiologic parameters between younger and older jumping horse is presented in the Table 1. Statistically highly significant (P<0.0001) effect of age on saliva traits (cortisol, glucose and lactate concentration) was determined. The highest difference between younger and older jumping horse was observed in glucose concentration in saliva (about 44% higher in younger horses). Higher concentration of lactate in saliva determined in younger horses indicate lower fitness condition of the horse's muscles. The differences in experience in equestrian sports between younger and older horses also was noticeable through differences in cortisol concentration in saliva. Older, more experienced horses had 25% lower cortisol concentration in saliva than younger unexperienced horses. The younger unexperienced horses experienced training with a 25% larger positive stress compared to experienced horses.

Table 1. Effect of age on stress physiologic parameters

Age group horse	Younger	Older	P
Heart (beat/min)	58	51.64	**
Cortisol (ng/ml)	1.16	0.87	***
Glucose(mg/dl)	56.08	31.26	***
Lactate (mmol/l)	1.1	0.65	***

*P<0.005; **P<0.001; ***P<0.0001

The difference in stress physiologic parameters regarding the competition season (May, July, and September) of jumping horses is presented in the Table 2.

Table 2. Effect of the competition period on stress physiologic parameters

Period	May	July	September	P
Heart (beat/min)	55.47	55.44	53.54	NS
Cortisol (ng/ml)	0.98[a]	1.14[b]	0.93[a]	***
Glucose(mg/dl)	42.03	48	40.98	NS
Lactate (mmol/l)	0.86[a]	0.96[b]	0.81[a]	*; **

*P<0.05; **P<0.001; ***P<0.0001

The competition period, that is months May, July and September statistically significant affect cortisol and lactate concentration in saliva. The highest concentration of cortisol and lactate in saliva were determined in July, while the lowest concentration of both parameters was determined in September.

Table 3. Effect of the training type on stress physiologic parameters

Training	Lunge	Parkour	Track	p
Heart (beat/min)	50.15a	67.25b	47.06a	***
Cortisol (ng/ml)	0.96a	1.18b	0.91a	***
Glucose(mg/dl)	43.1	47.55	40.37	NS
Lactate (mmol/l)	0.88a	0.95a	0.79b	***

***P<0.0001

The training type statistically highly significant (P<0.0001) affect heart beat and cortisol and lactate concentration in saliva. The highest heart rate was determined during the training in parkour, while the lowest heart beat was in training on track. The cortisol and lactate concentration in saliva were also highest in training in parkour, with lowest values determined during training on track (Table 3). The differences in glucose concentration in saliva were not statistically significant.

Discussion

Comparing the research results in older and younger horses in trainings and months, the higher values are evident in younger horses. Mean value of heart beats per minute is higher in younger horse group in trainings and months for 6.36 beats per minute than in older horses. Many authors (Klimke and Klimke, 2012) have proven that the heart beats per minute is always higher in younger horses, whether in a relaxation state or in physical action. Standard deviation in heartbeats is also higher in younger group of horses and that group is more dispersed. The older group of horses has become more standardized in heartbeats over the years of training repetitions, with a similar fitness condition. The same results have been shown by Ille et al. (2014) with experienced and unexperienced show jumping horses' groups. Certain mean values monitored in horse saliva are higher in cortisol for 0.3 ng/ml, glucose for 24.82 mg/dl and lactate for 0.45 mmol/l. The difference in salivary cortisol in younger groups of horses is 25% higher than the group of older horses. Due to the higher level of salivary cortisol, the younger horses' reaction to the training was more stressful. The result is compatible with (Waran and Randle, 2017) that showed similar results on a similar group of horses, showing that the inexperienced horses have the highest plasma cortisol, according to Queyras and Carosi (2004); from these values 15% is in saliva. Ille et al. (2014) have determined more cortisol values in saliva, especially in inexperienced horses with additional unknown environment

surroundings. Younger group had a greater standard deviation for 29% in comparison to the old group. Horses react individually to stress but with years of the same work, they achieve a routine in trainings and become more uniformed. The greatest differences are in glucose levels between the younger and the older group for 44% and almost 50% difference in a standard deviation. Metabolic glucose could be the reason for such a big span (Waran and Randle, 2017) that could not be present in sampling. Differences between glucose levels in younger and older horses are in connection with their fitness and adaptability to stress. Differences in salivary lactate show the muscle condition, the body resistance to physical stress in horse training. The results in show lower lactate level in older horses that have been adjusted over the years to the physical stress in jumping horses' training. Lewinski et al. (2013) have determined the lowest values of plasma lactate in the most experienced horses. Maximum lactate values have not reached the point of overtraining, according to Hamlin et al. (2002). According to Lewinski et al. (2013) A significant correlation between lactate and cortisol in horse saliva has been determined. Uniformity in trainings has been detected in researches leading to stressful situations for horses.

Conclusions

Horses' reaction to stress is individual, but with years of the same work they achieve a training routine and become more uniformed. The younger unexperienced horses experienced training with a 25% larger positive stress compared to experienced horses. The competition period, that is months May, July and September statistically significant affect cortisol and lactate concentration in saliva.

Date label

The results came from the dissertation Maja Gregić “Stress adaption ability of jumping horses after varying intensity trainings” (9.12.2016.).

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