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Original Research

Does Music Influence Emotional State in Race Horses?

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ABSTRACT

The aim of the study was to determine the effect of music featured in the barn, on the emotional state of race horses. Seventy 3-year-old Purebred Arabian horses in their first race season were divided into experimental group (EXP) of 40 horses and control group (CNT) of 30 horses and placed in separate barns. The EXP was subject to specifically composed music featured in the barn for 5 hours in the afternoon during the whole study. The emotional state in the horses was assessed at rest, saddling, and warm-up walk under rider. Measurements were taken six times, every 30 to 35 days, starting from the beginning of featuring the music. The horse's emotional state was assessed by cardiac activity variables. The music effect on the emotional state was also considered with regard to the horse's performance estimated by race records. The cardiac activity variables were compared with repeated measures design, whereas race records were analyzed with analysis of variance generalized linear model. The music positively affected the emotional state in race horses. The influence was noticeable already after the first month of featuring the music and increased in the second and third months. Despite the fact that later the variables began to return to initial levels, a positive effect of the music on prizes won by the horses in the EXP compared to the CNT was found ($P < .05$). The results suggest that the music may be featured in the barn, preferably for 2 to 3 months as a means of improving the welfare of race horses.

1. Introduction

Race horses subject to training and races undergo strong stress. The emotional stress is expressed by among others the change of heart rate (HR) and heart rate variability (HRV). The cardiac variables are sensitive indicators of the immediate horse response to external stimuli or indicators of the prolonged emotional state [1]. Heart rate variability parameters enable to analyze the activity of vagal system and sympathetic nervous system [2].

To improve horse welfare, besides training loads on appropriate level, supplements, and so forth [3], a great deal of attention is focused on the possibility of limiting stressors. As in the case of leisure horses and particularly athlete horses, various means are used for this purpose, including natural training methods [4–6] or physiotherapy [7]. The question is whether music may be also used in enrichment of the stable environment.

Physiological and psychological benefits from listening to the music, such as pain relief, lower anxiety, blood pressure, and HR, are known in humans [8]. Musical stimuli can modify autonomic and neurochemical arousal indices as well as synaptic plasticity. The music may elicit emotions which result in enhanced task performance. A comparative psychology approach to the perception of music displays that animals perceive the basic components of music in a similar way as humans [9]. On the other hand, equine maximum high-frequency hearing (over 33 kHz) extends far above that of humans (under 20 kHz) [10]. The ability of

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synchronization of movements to the musical rhythm is the most visible sign of the music influence on many animal species, including horses [11,12]. Studies showed a number of desired effects of music on the animals, for example, reduction in aggression and agitation in chimpanzees, decreased barking and increased resting periods in dogs, increased milk production in cows, and increased growth rates in chickens and carps [13]. The issue of the horse's behavioral response to different music genres was undertaken by Houpt et al [14] and Carter and Greening [15]. The authors reported differentiated reaction to various genres of the music. The purpose of the study was to determine the effect of music featured in the barn on the emotional state in race horses.

2. Materials and Methods

Animal care and experimental procedures were in accordance with the European Committee Regulations on Protection of Experimental Animals and were approved by the Local Ethic Review Committee for Animal Experiments.

2.1. Horses and Training

Purebred Arabian racing horses coming from one stud were included in the study. In the stud, the foals were similarly reared by routine methods. The study was performed at Race Course in Warsaw-Służewiec for 2 years. For 3 months before testing, the horses were routinely trained at the course under the same circumstances. Until the experiment began, neither at the mother stud nor at the race course, the horses were not subject to any kind of music.

The horses were examined during their first racing season: 40 horses in the first year and 30 horses in the second year. At the beginning of testing, the horses were 28 to 31 months old. All the horses were clinically sound and did not show any anomalous behaviors or symptoms of overtraining during the whole testing. In an overtrained horse, the HR at rest notably increases on successive days of training [16].

For the experiment, each year, the horses were randomly divided into experimental group (EXP) of 26 and 20 horses and control group (CNT) of 14 and 10 horses, respectively. Experimental group and CNT were put into two separate barns. The groups included equal numbers of stallions and mares. The horses were kept under similar conditions, managed within one race stable by one trainer and handled by the same caretakers. The diet was standardized according to dietary guidelines for race horses. One group of riders engaged by the trainer exercised the horses. The training was conducted routinely during the whole experiment. The horses under rider were trained on a sand track for 1 hour in the morning with the speed adapted to individual abilities and condition of a horse. After that, the horses walked for 45 minutes in an automatic horse walker 6 days a week. The training distance on 6 days of measurements a year was standardized to 1,800 m of 6.4 m/s speed for each horse. At the end of the third month of the training, the horses began to participate in races routinely, that is, at least once a month, only at the Warsaw-Służewiec Race Course. The races were of 1,600 to 2,000 m distance. A day before and 2 days after the race, the horses were only walked for 60 minutes in the automatic walker, and on those days, the measurements were not conducted.

2.2. Playing Music

Music used in the study was specifically composed and recorded by J. Marlow, a specialist in the music for animals. Ten compositions of movie-like soundtracks of New Age genre were played on a ten-string Guitar. The music was featured in EXP barn through a specific loudspeaker used for animals (My Pet Speaker, Pet Acoustics Inc) which limits sound frequencies into 200 Hz–12 KHz of a soft bass design. The low sound frequency was intended to soothe the horses. Experimental group was subject to the music effect during the whole study for 5 hours a day (13:00 to 18:00).

2.3. Assessment of the Horse's Emotional State

We considered the emotional stress; hence, to avoid the effect of effort on the cardiac activity variables, the three-step measurements were taken in the morning, before the main effort:

- at rest, during 10 minutes when the horse was free in its box;
- at saddling, that is, during 10 minutes when the horse was briefly cleaned before saddling, then bridled and saddled;
- at warm-up walk, that is, during first 10 minutes of the training under rider.

The measurements were performed six times: first time at the beginning of the experiment and then every 30 to 35 days, approximately covering the race season. Before the measurements, an elastic belt with RS800CX Polar Electro Oy transmitter for telemetric HR registration (Kempele, Finland) was put around the horse's chest. The data were downloaded from the transmitter to the computer with an interface. The emotional state in horses was measured with HR (beats per minute[bpm]) and HRV. The following HRV variables were considered [2]:

- beat-to-beat intervals (RRs; ms);
- root mean square of successive beat-to-beat differences (RMSSDs; ms);
- low frequency of the power spectrum (signal)—assigned to the tone of the sympathetic system (LF; ms^2);
- high frequency of the power spectrum—assigned to the tone of the vagal system (HF; ms^2);
- ratio of LF and HF signal (LF/HF; %).

The variables were analyzed using Kubios HRV software [17], as was described by Tarvainen et al [18]. The HR, LF, HF, and LF/HF ratio were obtained from the recordings. The LF