Effects of the level of experience of horses and their riders on cortisol release, heart rate and heart-rate variability during a jumping course

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Abstract

Equestrian sports require the co-operation of two species, horses and humans, but it is unknown to what extent stress responses in the rider affect the horse. In this study, the stress response of experienced and less-experienced horses and riders at showjumping was analysed. Sixteen sport horses were divided into two groups (n = 8 each) by experience and were ridden by highly experienced professionals (n = 8) and less-experienced riders (n = 8). Riders jumped a course of obstacles with an experienced and a less-experienced horse and horses took part with an experienced and less-experienced rider. Salivary cortisol, heart rate and heart-rate variability (HRV) variables, standard deviation of RR interval (SDRR) and root mean square of successive RR differences (RMSSD) were analysed. Cortisol and heart rate increased and HRV decreased in all riders and horses. In less-experienced riders, cortisol release was higher on a less-experienced versus an experienced horse but the horses’ cortisol release was not affected by experience of their riders. Heart rate did not differ between groups of horses and was not affected by experience of the rider but was higher in less-experienced versus experienced riders. The HRV decreased in horses and riders and SDRR was lower in less-experienced versus experienced riders. Thus, lower experience of riders appears not to affect physiological stress parameters in their horses during a showjumping course.

Keywords: animal welfare, cortisol, heart rate, horse, rider, stress

Introduction

Equestrian sports are not only associated with physical demands but may also induce a physiological stress response in horses (Schmidt et al 2010a; Becker-Birck et al 2012b) and their riders (Westerling 1983; Trowbridge et al 1995; von Lewinski et al 2013). Stimuli which are perceived as stressful initiate a hypothalamo-pituitary-adrenocortical and an adrenomedullary and sympathetic nervous system response. During short-term stress, as usually occurs in competitions, increasing cortisol release may improve fitness by energy mobilisation (Raynaert et al 1976) and changes in behaviour (Korte 2001). Non-protein-bound cortisol rapidly diffuses into saliva and salivary cortisol concentrations thus mirroring changes of free cortisol in blood plasma (Peeters et al 2011). Acute stress, as well as physical demand, elicits an immediate release of adrenaline and subsequent increase in heart rate. In exercising equine and human athletes, heart rate is influenced mainly by physical effort but also by emotional factors. Heart-rate variability (HRV), ie short-term fluctuations in heart rate, reflects the oscillatory antagonistic influence of the sympathetic and parasympathetic (vagal) branch of the autonomous nervous system on the sinus node of the heart (von Borell et al 2007). Heart-rate variability decreases to a certain degree with increasing heart rate (Hottenrott et al 2006) but because it reflects the vago-sympathetic balance, HRV also indicates the response of the autonomic nervous system to stress (von Borell et al 2007).

Equestrian sports require the close co-operation of two different species, humans and horses, which have to interact efficiently to achieve success in competitions. As in other sports, training and competitions elicit an acute stress response in horses (Schmidt et al 2010a; Becker-Birck et al 2012a,b) and riders (Westerling 1983; Trowbridge et al 1995; Devienne & Guzenne 2000). Only few studies have addressed the combined response of horses and humans to potentially stressful situations. In a preliminary study (Keeling et al 2009), anticipation of a flight response in horses to a not yet visible object led to increases in heart rate not only of the person leading the animal but also in the horses themselves. In contrast, riders, but not horses, in a public performance of classical dressage showed a more pronounced physiological stress response than in a training situation but the stress response of the riders was not trans-