

Heart rate and heart rate variability in the horse and its rider: different responses to training and a public equestrian performance

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While detailed information exists on the cardiovascular response of horses to racing or endurance, much less is known about cardiovascular function of the rider in equestrian sports. Combined analysis of the horse-rider-team has not been investigated so far. In this study, we have analyzed changes in heart rate and heart variability (HRV) variables SDRR (standard deviation of beat-to-beat interval) and RMSSD (root mean square of successive beat-to-beat intervals) both in well-trained horses (n=9) and their highly experienced riders (n=7) during the airs above the ground (*sauteurs en liberté* of the *Cadre noir de Saumur*) at a public performance and at an identical, but non-public training session, both lasting for exactly 7 min.

Heart rate in the horses and riders increased during the airs above the ground, both in training and in the public performance ($p < 0.001$ over time). In the horses, this increase did not differ between training and public performance (training: from 35 ± 6 in the stable to 97 ± 17 beats/min during riding, performance: from 43 ± 13 to 103 ± 13 beats/min, respectively). In contrast, in the riders, the increase in heart rate was significantly more pronounced ($p < 0.01$) during the public performance (basal value 91 ± 10 , maximum 150 ± 15 beats/min) than during training (basal value 94 ± 10 , maximum 118 ± 12 beats/min).

With regard to HRV in horses, overall SDRR did not change significantly over time and did not differ significantly between training and performance. RMSSD decreased during both training and performance to the same extent, indicating a decrease in parasympathetic (vagal) tone. In the riders, both HRV variables decreased significantly during riding ($p < 0.001$) and for SDRR the decrease was more pronounced ($p < 0.05$) during an equestrian performance compared to a training session. During the performance SDRR decreased from a basal value of 5.0 ± 1.5 to a minimum

of 3.2 ± 0.6 msec while respective values for the training session were 5.3 ± 1.1 and 2.3 ± 1.1 msec.

Both a public performance and an identical training session of the airs above the ground in the ridden horse caused an increase in heart rate and a decrease in HRV variables. While increases in heart rate are mainly caused by physical activity, decreases in HRV also indicate a stress response. The cardiovascular response in the horses did not differ between a training session and a public performance but clear differences could be demonstrated in the riders. During a public performance, the increase in heart rate and decrease in SDRR were more pronounced than during a similar training session. In conclusion, the presence of an audience thus causes more pronounced sympathoadrenal activity in experienced riders than the same equestrian tasks ridden without spectators present. In contrast, the presence of an audience was without effect on sympathoadrenal activity in experienced horses.

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