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Letter to the Editor

Differences in Electromyograms during Horseback Riding between Professional and Amateur Korean Horse Riders

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Dear Editor-in-Chief

Hippotherapy, such as horseback riding, combines gait, balance, motor behavior, pelvic movements, muscle symmetry, emotional, and psychosocial parameters (1-2). Recently, horseback riding exercises have been found to be an effective therapy for patients with cerebral palsy and autism spectrum disorders (3-4).

Previous studies have shown that horseback riding can be a form of therapeutic sport because it improves physical and psychological functionality, along with increasing quality of life and happiness (5-6). However, there is no evidence of documented differences in electromyograms (EMGs) between professional and amateur horse riders. Therefore, the aim of this study was to identify differences in the EMG of the leg and erector spinae muscles of these two types of riders.

Participants were Korean male horse riders, who were classified into an amateur group (n = 10, mean ± standard deviation, age: 26.20 ± 2.35 yr, height: 176.90 ± 5.17 cm, weight: 77.70 ± 9.92 kg, body mass index: 24.77 ± 2.42 kg/m^2, duration of practice: less than 3 months) and a professional group (n = 11, age: 24.73 ± 2.83 yr, height: 175.82 ± 4.94 cm, weight: 72.45 ± 7.08 kg, body mass index: 23.52 ± 2.93 kg/m^2, duration of practice: 10.23 ± 5.02 years).

Ag-AgCl electrocardiogram electrodes (30 × 24 mm; Kendall H124SG) were attached to each subject, and surface EMGs (WaveEMG, Cometa, Italy) of both vastus lateralis and vastus medialis muscles and left and right erector spinae were recorded (sampling frequency, 2 kHz).

The results were stored on a personal computer. Each subject was instructed to exert maximal voluntary contraction (MVC) of each muscle while horseback riding to regulate muscular activity. Each subject progressively increased torque exertion from baseline to MVC; then they maintained this exertion level for about 2 seconds.

Data analysis software (Visual3D; C-motion, Rockville, MD, USA) was used to calculate the root-mean-square (RMS) from the EMG amplitudes of each muscle during MVC and horseback riding. The resulting RMS was normalized to EMG_{MVC}, and it is expressed as $\%EMG_{MVC}$.

All data are presented as a mean ± standard deviation. The independent *t*-test was used to analyze differences between the two groups. All analyses were performed using SPSS, version 18.0 (SPSS, Chicago, IL, USA). Statistical significance was set at $P < 0.05$.

The $\%EMG_{MVC}$ for horseback riding of professional and amateur Korean horse riders are summarized in Table 1. There were significant

differences in the $\%EMG_{MVC}$ of both the right and left legs between the groups ($P < 0.05$). However, there was no significant difference in the $\%EMG_{MVC}$ between the erector spinae on the right and left sides. Although both groups had similar use of the erector spinae muscles, professional horse riders had less activation of the leg muscles than amateur horse riders.

Table 1: The $\%EMG_{MVC}$ for horseback riding between professional and amateur Korean horse riders

Muscle	*Group*	*$\%EMG_{MVC}$*	*t*	P-*value*
Vastus medialis (right leg)	Amateur (n = 10)	12.53 ± 3.66	5.995	<0.001***
	Professional (n = 11)	4.58 ± 2.33		
Vastus lateralis (right leg)	Amateur (n = 10)	11.31 ± 4.53	4.632	<0.001***
	Professional (n = 11)	4.17 ± 2.27		
Vastus medialis (left leg)	Amateur (n = 10)	8.01 ± 3.52	2.806	0.011*
	Professional (n = 11)	4.49 ± 2.12		
Vastus lateralis (left leg)	Amateur (n = 10)	10.33 ± 5.95	3.460	0.003**
	Professional (n = 11)	3.77 ± 2.00		
Erector spinae (right)	Amateur (n = 10)	9.92 ± 4.24	-0.646	0.526
	Professional (n = 11)	11.63 ± 7.31		
Erector spinae (left)	Amateur (n = 10)	11.96 ± 5.01	0.012	0.990
	Professional (n = 11)	11.93 ± 6.97		

Data are presented as a mean ± standard deviation.
$\%EMG_{MVC}$, percent electromyogram$_{\text{maximal voluntary contraction}}$
*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$; tested by the independent *t*-test

In conclusion, although horseback riding has a positive effect on physical function, activation of the leg muscles is lower in professional horse riders than in amateur horse riders. In the future, well-designed studies are necessary to determine why professional horse riders had less activation of the leg muscles than amateur horse riders, although the increase in physical function may be due to the increased activation of the muscles of the lower limbs and its effect on gait, balance, and fall prevention. Perhaps other mechanisms or factors affect increasing physical function, although there was less activation of the leg muscles in expert horse riders.

Conflict of interest

The authors declare that there is no conflict of interest.

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