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RESPIRATORY AND POSTURAL-RELATED ACTIVITIES OF ABDOMINAL MUSCLES DURING POST-EXERCISE HYPERVENTILATION

David P¹, Terrien J², Petitjean M¹

¹ Université de Versailles Saint-Quentin en Yvelines, Montigny-le-Bretonneux, France

² Université de Compiègne, Compiègne, France

E-mail: michel.petitjean@apr.aphp.fr

AIM: The present study focused on the roles of the superficial abdominal muscles through electromyographic recordings during the maintenance of a bipedal stance perturbed by post-exercise hyperventilation.

METHODS: Twelve healthy subjects had to perform six 30-second postural tests: one pre-exercise test while breathing gently and then one test every minute for the five minutes immediately following a maximum-intensity, incremental cycling exercise test. Subjects were asked to maintain an upright stance on a force plate for 30 s, with their eyes open. Movement of the centre of pressure in the sagittal plane was monitored in the time domain. Myoelectric activities of the rectus abdominis (RA), external oblique (OE) and internal oblique (OI) muscles were recorded unilaterally using surface electromyography (EMG). Ventilatory parameters were measured with a portable, telemetric device.

RESULTS: The change in ventilatory drive induced by exercise was accompanied by a significant increase in both postural sway parameters and EMG activities. The quantification of EMG activities within the respiratory cycles revealed different EMG patterns (Figure 1). For OE and OI, the increased EMG activities were prominent during expiration. OI was silent during inspiration. OE and RA were activated during both expiration and inspiration.

CONCLUSION: The results suggest that abdominal muscles play a role in regulating the ventilatory response to incremental cycling exercise test, although some of the observed activity may support postural adjustments, presumably to reduce respiratory disturbances.

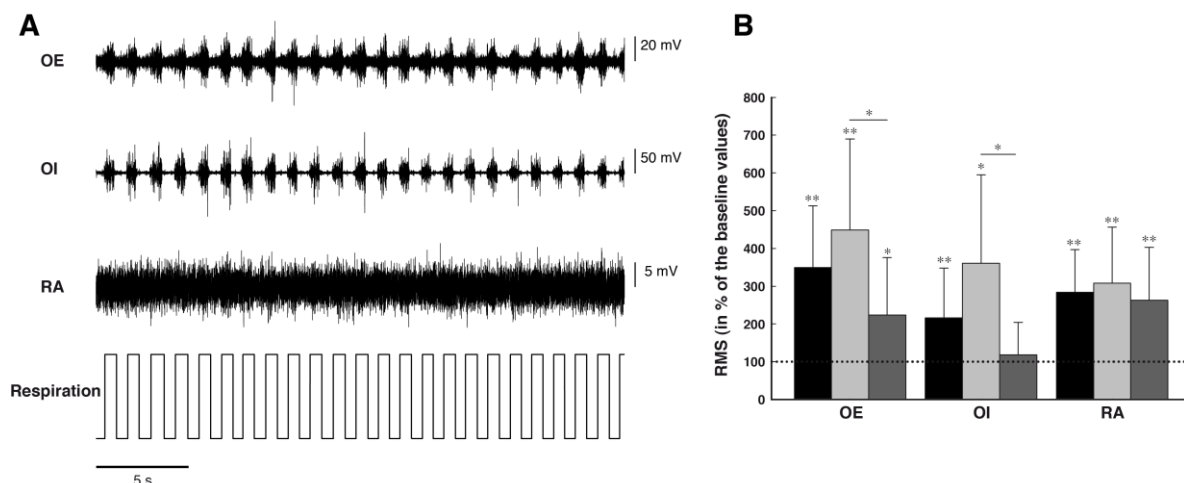


Figure 1: Recordings of respiration and electromyograms of the abdominal muscles in postural test just after an incremental cycling exercise for one subject (A). Myoelectric activities were quantified and expressed as percentages of the baseline values obtained in the pre-effort postural test (dotted line) over the entire respiratory cycle (black bars), over the expiratory phase (light grey bars) and over the inspiratory phase (dark grey bars) of respiration (B). Means plus one standard deviation are represented. * and ** denote significant differences at $P < 0.05$ and $P < 0.01$, respectively.