Effect of Locomotor Respiratory Rhythm on Ventilation and Gas Exchange Responses During Arm Ergometry Exercise

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Purpose: The aim of this study was to determine the possible existence of locomotor respiratory coupling (LRC) and examine the effect of imposing LRC on ventilation and gas exchange responses during arm ergometry exercise.

Methods: Ten healthy subjects performed incremental exercise testing to determine exercise intensity. Arm ergometry exercise with constant work loads was then carried out either under spontaneous breathing or with different entrainment breathings in which respiration/cranking frequency ($f_r/f_c$ ratio) were fixed at 1/1, 2/3, 1/2, 2/5 and 1/3.

Results: During spontaneous breathing, all the subjects exhibited the various $f_r/f_c$, the most commonly observed $f_r/f_c$ was 2/5 under spontaneous breathing. The imposed LRC patterns did not significantly affect the actual LRC rate. Still, dead space ventilation ratio was significantly reduced at ratio of 2/5 and 1/3, respectively.

Conclusions: These results suggest that the entrainment patterns during arm ergometry exercise was similar to that seen in studies of pedaling exercise, but to a much less extent. In addition, the ventilatory efficiency was affected by $f_r/f_c$ independent of actual LRC apparent rate.