EFFECT OF THE BREATH-HOLDING TO THE RESPIRATORY AND CARDIOVASCULAR SYSTEM DURING MODERATE INTENSITY CYCLING EXERCISE

Németh Hajnalka¹, Saito Hatsue², Kimura Mayuko², Kuboyama Izumi², Ito Susumu², Pavlík Gábor¹, Yoshioka Koichi²
(Faculty of Physical Education and Sport Science, Semmelweis University¹, Hungary, Graduate School of Sport System, Kokushikan University², Japan)

The effect of the breath-holding during cycling exercise was studied. Cardio-vascular activities were monitored with a finger attached type blood pressure measurement system (Portapres model-2) together with ventilation activities and expired gas components measured through a face attached mask. In the moderate intensity exercises (22W-102W), short term breath-holdings (15-20 sec) were performed. After the breath-holding, responses of expired gases (minute $\text{O}_2$ consumption and minute $\text{CO}_2$ expiration, etc) markedly increased compensating absence of ventilation during the breath-holding. These transient increase responses recovered rapidly and returned to the pre-breath-holding values within 10 seconds. Responses of ventilation activities (tidal volume, ventilation frequency and etc.) also showed transient increased response which recovered within 15 seconds, taking a little longer time than the gas responses. The magnitudes of expired gas responses increased with underlying load intensity or duration of the breath-holding. Relaxation time constants of the expired gas responses were shortened by the increase of the load intensity, indicating non-linearity of the system.

Cardiovascular system showed interesting responses. While blood pressure increased greatly by the breath-holding with a latency of about 4 seconds, heart rate and estimated cardiac output showed a transient decreasing response. Estimated total peripheral pressure showed an increasing response, which may explain the blood pressure increase.

$SpO_2$ showed a delayed transient response to breath-holding with the latency of about 35 seconds and duration of about 30 seconds, even during the 2W load intensity light cycling. Drop of the $SpO_2$ increased with the load intensity, concomitant with shortening of the latency.

Time courses of ventilation activities and expired gases to short term breath-holding are different and have intensity dependency. The relatively short latency of cardiovascular responses induced by the breath-holding indicates contributions of neural factors.

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