RELATIONSHIP BETWEEN PERIPHERAL VISUAL REACTION TIME AND VENTILATION DURING DECREMENTAL EXERCISE

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Visual field may be divided into central and peripheral portions. In sports such as soccer and basketball, much of what happens in front of players’ eyes is not limited to the central visual field. The players use peripheral vision in order to see where other players and objects are, and decide next move. Thus, it is important how to pick up and use visual information in the peripheral visual field as well as the central visual field. Recent study has shown that peripheral visual reaction time (RT) increases at workload above ventilatory threshold (VT) during incremental exercise on a cycle ergometer (Ando et al. 2005). The purpose of this study was to determine whether physiological changes induced by hyperventilation contribute to increase in peripheral visual RT during exercise above VT. We also examined whether RT during exercise is related to gas exchange parameters and/or heart rate (HR). Twelve healthy participants (mean ± S.D., age = 25.4 ± 3.2 yr; height = 175.4 ± 5.9 cm; weight = 69.8 ± 6.1 kg) performed RT tasks at rest and during decremental exercise on a cycle ergometer. We simultaneously recorded minute ventilation (VE), O2 uptake (VO2), CO2 output (VCO2), and HR. After warm-up exercise, the participants cycled the ergometer at workload above VT, at VT, and below VT. They were instructed to respond as quickly as possible to a visual stimulus presented in the peripheral visual field by releasing a response button on the right handlebar. We defined RT as the time from the visual stimulus appearance to the onset of electromyographic activity recorded from the right forearm muscle. Peripheral visual RT transiently increased at workload above VT. Delta RT, which was calculated by subtracting the RT at rest from the RT during exercise, was positively correlated with VE, VO2, and VCO2 during decremental exercise (p < 0.001, p < 0.01, and p < 0.001, respectively). On the contrary, no significant correlation was observed between delta RT and HR. The present findings suggest that physiological changes induced by hyperventilation are, at least in part, associated with the increase in the peripheral visual RT during exercise above VT, and that state of ventilation could predict the ability to respond using peripheral vision during exercise.


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