EFFECTS OF EXERCISE TRAINING IN THE COLD AND HEAT ON HYPERTHERMIC HYPERPNEA IN HUMANS

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It is known that after exercise training in the heat in humans, plasma volume increases, core temperature during heating is decreased and thermoregulatory responses such as cutaneous vasodilation and sweating elicited by increases in core temperature are enhanced. However, it is unclear whether ventilation and cerebral circulation during heating are changed after exercise training in the heat. Further, it is also unclear whether ventilation and cerebral circulation during heating are changed after exercise training in the cold (heat stress is minimized during the training). We investigated whether 1) ventilation during exercise in the heat is changed after exercise training in the cold and heat. Further, we also investigated whether 2) ventilation and cerebral circulation during passive heating at rest are changed after exercise training in the cold and heat. Subjects performed exercise-heat tests and passive-heat tests before and after 6-day daily activity (C, n = 11) and exercise training in the cold (EC, n = 10) and heat (EH, n = 10). During the training period, subjects performed 4 bouts of 20-min exercise at 50% peak oxygen uptake (VO2peak) separated by 10-min rest in the cold (10 °C) in EC and in the heat (37 °C) in EH for 6 days. In the exercise-heat tests, subjects exercised on a cycle ergometer for 40 to 75 min at 50% VO2peak in the heat (37°C). In the passive-heat tests, hot-water legs-only immersion and a water-perfused suit were used for heating. After training, VO2peak was increased by 5-6% in both EC and EH, and resting plasma volume was increased by 7% in EH. After training, core temperature during exercise-heat test was lowered in both EC and EH, and the rate of increase in core temperature during exercise-heat was also lowered only in EH. Further, minute ventilation during exercise-heat test was also lowered after training in both EC and EH. On the other hand, core temperature during passive-heat test was lowered after training only in EH. Minute ventilation during passive-heat test became higher after daily activity in C and training in EC, while it was not changed after training in EH. Further, cerebral vascular conductance during passive-heat became higher after training only in EH. From those results, we will discuss the effects of exercise training on hyperthermic hypepnea at rest and during exercise in humans.