MIDDLE CEREBRAL ARTERY BLOOD FLOW VELOCITY IS REDUCED WITH HYPERTHERMIA DURING PROLONGED EXERCISE IN HUMANS
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The present study examined the effect of hyperthermia on the middle cerebral artery mean blood velocity (MCA $V_{\text{mean}}$) during prolonged exercise. We hypothesized that the cerebral circulation would be impaired when hyperthermia is superimposed during exercise and assumed that this could be observed as a reduced MCA $V_{\text{mean}}$. Eight endurance trained men [$V_{\text{O}_2\text{max}}$ 70±1 ml min$^{-1}$ kg$^{-1}$ (mean ± SE)] performed two exercise trials at 57% of $V_{\text{O}_2\text{max}}$ on a cycle ergometer in a hot (40°C; hyperthermic trial) and in a thermoneutral environment (18°C; control trial). In the hyperthermic trial, the oesophageal temperature increased throughout the exercise period reaching a peak value of 40.0±0.1°C at exhaustion after 53±4 min of exercise. In the control trial, exercise was maintained for 1 h without any signs of fatigue and with core temperature stabilized at 37.8±0.1°C after ~15 min of exercise. Concomitant with the development of hyperthermia, MCA $V_{\text{mean}}$ declined by 26±3% from 73±4 cm s$^{-1}$ at the beginning of exercise to 54±4 cm s$^{-1}$ at exhaustion ($P<0.001$). In contrast, MCA $V_{\text{mean}}$ remained unchanged at 70-72 cm s$^{-1}$ throughout the 1 h control trial (see the figure). When individually determined regression lines for MCA $V_{\text{mean}}$ and arterial $P_{\text{CO}_2}$ obtained during preliminary exercise tests were used to ascribe for the differences in arterial $P_{\text{CO}_2}$ between the hyperthermic and control trial, it appeared that more than half of the reduction in MCA $V_{\text{mean}}$ (56±8%; see the figure) was related to a hyperventilation-induced drop in arterial carbon dioxide pressure. Declining cardiac output and arterial blood pressure during the hyperthermic trial presumably accounted for the last part of the reduction in MCA $V_{\text{mean}}$. The present results clearly demonstrate that the development of hyperthermia during prolonged exercise is associated with a marked reduction in middle cerebral artery mean blood velocity.

![Graph showing MCA $V_{\text{mean}}$ over time](http://www.appsl.org.au/Proceedings/32(2)/Suppl.1/115P)
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