THE EFFECT OF 28 DAYS OF NORMOBARIC SLEEP HIGH-TRAIN LOW REGIME ON CEREBRAL AND MUSCLE OXYGENATION DURING MAXIMAL EXERCISE

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We investigated the effect of a 28-day sleep high-train low (SH-TL) protocol on cerebral and muscle oxygenation during exercise to maximal exertion. We reasoned that SH-TL will might cause an improvement in cerebral and/or muscle oxygenation in normoxia and hypoxia that could potentially influence maximal performance. Nine healthy male subjects participated in the study. They conducted incremental-load exercise to exhaustion on a cycle ergometer before (pre), in the middle (mid) and immediately after (post) SH-TL under normoxic (F\textsubscript{I}O\textsubscript{2}=21%) and hypoxic (F\textsubscript{I}O\textsubscript{2}=12%) conditions. During the SL-TH regimen, they trained 1 hour per day on a cycle ergometer at 50% of normoxic peak power output. They conducted the training 5 times/week for 4 weeks and slept for at least 9 hours in normobaric hypoxia at simulated altitudes ranging from 2800-3200 m. The fraction of oxygen in the rooms was adjusted separately so that the blood oxygen saturation level (SpO\textsubscript{2}) during exposure to the hypoxic environment was about 80% in all subjects. Oxygen consumption (VO\textsubscript{2}), ventilation (V\textsubscript{E}), SpO\textsubscript{2}, changes in cerebral (frontal lobe; Cox) and muscle (vastus lateralis; Mox) oxygenation (near infrared spectroscopy), were analyzed across % of maximal work rate (%W\textsubscript{max}). SH-TL improved W\textsubscript{max} by 11% and 8% in normoxia and hypoxia, respectively, and VO\textsubscript{2} max by 8% in normoxia (p<0.05). This was accompanied by increases in the exercise responses for V\textsubscript{E} (+15 l•min\textsuperscript{-1}) and SpO\textsubscript{2} (+7%) (p<0.01). SH-TL increased (p<0.05) exercise Cox in normoxia and hypoxia by 33 and 32%, respectively, whereas it increased exercise Mox (18%) only in hypoxia. These results suggest that improved performance in normoxia after SH-TL can also be attributed to central adjustments that reduce the exercise-induced impairments in cerebral blood flow and oxygenation.