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_{O_2}=21%) and hypoxic (F_{O_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_2) during exposure to the hypoxic environment was about 80% in all subjects. Oxygen consumption (VO_2), ventilation (V_{E}), SpO_2, changes in cerebral (frontal lobe; Cox) and muscle (vastus lateralis; Mox) oxygenation (near infrared spectroscopy), were analyzed across % of maximal work rate (%W_{max}). SH-TL improved W_{max} by 11% and 8% in normoxia and hypoxia, respectively, and VO_2 max by 8% in normoxia (p<0.05). This was accompanied by increases in the exercise responses for V_{E} (+15 l•min^{-1}) and SpO_2^2 (+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.