**EVALUATION OF SEX DIFFERENCES IN PHYSIOLOGIC RESPONSES TO SUBMAXIMAL CYCLING UNDER NORMOXIC AND HYPOXIC CONDITIONS**

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BACKGROUND: During Lunar missions, astronauts may live and operate in conditions where altered atmospheric pressure and oxygen concentrations may result in a mildly hypoxic environment. While the compensatory hemodynamic mechanisms ensuring adequate oxygen delivery to contracting muscles during exercise in hypoxic conditions are well-studied, less research has focused on potential sex differences in the responses to hypoxia exposure during exercise. As female astronauts make up half of the Artemis astronaut corps, understanding whether physiologic responses in a hypoxic environment differ between sexes may inform recommendations for exercising safely in exploration environments.

METHODS: Fourteen subjects (7M/7F) from NASA’s Exploration Atmosphere Study performed two submaximal cycle exercise trials (10 min of exercise at 40% peak aerobic capacity [VO2pk]) ergometer under normobaric normoxic gas (21% O2) and normobaric hypoxic (18% O2 and balanced N2) conditions in randomized order. Linear mixed models with Bonferroni post hoc corrections (fixed effects: condition, sex, VO2pk [covariate], body mass [BM, covariate]; random effects: subject, mission) were performed to evaluate the effect of condition and sex on physiologic responses to exercise (oxygen uptake [VO2], carbon dioxide production [VCO2], ventilation [VE], oxygen saturation [SpO2], and heart rate [HR]).

RESULTS: Males were comparable to females for age (36.6±4.7 vs 36.4±9.3 yrs; p>0.05) but had greater BM (87.3±10.9 vs 64.5±7.4 kg; p<0.001) and absolute VO2pk (3.5±0.6 vs 2.4±4.7 L/min; p<0.001). Additionally, males had higher VO2 (p=0.005), VCO2 (p=0.02), and VE (p=0.01) during exercise trials, independent of condition; however, when VO2pk was added as a covariate, the effect of sex was no longer significant. SpO2 was reduced during hypoxic exercise compared to the normoxic condition (p<0.001), but neither sex nor environmental condition impacted HR.

CONCLUSIONS: Though most physiologic responses to submaximal, short-duration exercise between normoxia and mild hypoxia were similar, females exhibited lower VO2, VCO2, and VE during both conditions, likely driven by lower aerobic capacity. Future research is needed to determine whether similar findings result from multiday hypobaric hypoxia experienced during missions.