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Simulated Military Operational Stress Negatively Impacts Psychomotor Vigilance and Neurocognitive Biomarkers in Men and Women

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Military success requires sustained alertness in the presence of physical fatigue, caloric deprivation, and sleep restriction, stressors that may affect men and women differently. **PURPOSE**: To identify differences in psychomotor vigilance and neurocognitive biomarkers based on sex during simulated military operational stress (SMOS). **METHODS**: Forty-five Soldiers (25±5 years, 175±9 cm, 79 ±14 kg, 20 ± 7 BF%, 9 women) completed a 5-day/night SMOS protocol. Subjects were given 50% of caloric demands on Days 3 and 4. Subjects completed physical and cognitive evaluations from 0900 to 2230. Nights 3 and 4 included restricted sleep from 0100-0300 and 0500-0700, with psychomotor evaluations between 0300-0500. Fasted blood was drawn each morning at 0800, followed by psychomotor vigilance test (PVT). Concentrations of IGF-1, α-Klotho, and BDNF were analyzed using standard immunoassays. PVT performance was based on accuracy and response time correlated to a percentile position within a normative distribution. Two-way mixed ANOVA with Bonferroni correction for multiple comparisons were used appropriately ($p<0.05$). Day 1 PVT was excluded from the analysis to account for learning effect. **RESULTS**: There were no sex*time interaction effects for PVT ($p = 0.855$), BDNF ($p = 0.285$), IGF-I ($p = 0.013$), or α-Klotho ($p = 0.091$). Main effect of time was observed for PVT ($p = 0.008$), IGF-I ($p <0.001$), and α-Klotho ($p <0.001$). PVT performance decreased by 42.9% from D2 to D5, although pairwise comparisons were not significant ($p = 0.084$). IGF-I and α-Klotho decreased from D1 to D5 by 13.1% ($p <0.001$) and 12.0% ($p <0.001$), respectively. There was a main effect of sex for BDNF ($p = 0.020$). On average, BDNF concentrations were 4,368.5 pg/mL higher in women during SMOS. **CONCLUSION**: SMOS has a similar negative impact in men and women on psychomotor vigilance and neurocognitive biomarkers IGF-I and α-Klotho. However, women demonstrate higher concentrations of BDNF in the presence of SMOS.

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