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-I, 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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