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Tyrosine supplementation mitigates working memory decrements during cold exposure ☆

Caroline R. Mahoney ^a  , John Castellani ^b, F. Matthew Kramer ^a, Andrew Young ^b, Harris R. Lieberman ^b^a U.S. Army Soldier Research, Development and Engineering Center, Kansas Street, Natick, MA 01760-5020, USA^b United States Army Research Institute for Environmental Medicine, Natick, MA 01760, USA

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Abstract

In rats, dietary supplementation with the amino acid tyrosine (TYR) prevents depletion of central catecholamines observed during acute environmental stress. Concomitant changes in the animals' behavioral responses to stress suggest that TYR might have similar effects on central catecholamines and cognition in humans exposed to environmental stress. This study aimed to determine if severe cold exposure impairs human cognition and if dietary supplementation with TYR would ameliorate such deficits. Volunteers ($N = 19$) completed three test sessions on different days (35 °C control/placebo, ~ 10 °C/placebo, ~ 10 °C/TYR) using a double-blind, within subjects design. During each session, volunteers completed two 90-minute water immersions and consumed a food bar (150 mg/kg TYR or placebo) before each immersion (total TYR 300 mg/kg). Cognitive performance, mood, and salivary cortisol were assessed. Cortisol was elevated in the cold ($p < .01$). Volunteers made fewer correct responses on a Match-to-Sample memory measure ($p < .05$) and reaction time (RT) and errors increased on a choice RT test ($p < .01$) in the cold. Self-reported tension ($p < .01$), depression ($p < .05$) and confusion ($p < .01$) also increased in the cold. When volunteers consumed TYR, correct responses increased on a Match-to-Sample memory measure ($p < .05$) and study time for the sample was shorter ($p < .05$), indicative of more rapid and accurate information processing. Finally, RT on the memory measure revealed a similar pattern across immersions for TYR and thermoneutral conditions, but not cold/placebo ($p < .05$). This study demonstrates

cold exposure degrades cognitive performance and supplementation with TYR alleviates working memory decrements.

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