Slow Breathing Reduces Markers of Stress in Response to a Virtual-Reality Active Shooter Training Drill

COURTNEY C. DILLARD[1], M. HUNTER MARTAINDALE[1], MATTHEW J. MCALLISTER[1]

[1]Metabolic and Applied Physiology Lab; Department of Health and Human Performance; Texas State University, San Marcos, TX, USA

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Advisor / Mentor: McAllister, Matthew (mjm445@txstate.edu)

ABSTRACT

Law enforcement officers are expected to respond to potential life-threatening scenarios in high stress environments. Acute participation in virtual reality (VR) active shooter scenarios has been shown to increase markers of stress. Tactical occupations (i.e., military, law enforcement personnel) are trained to use slow breathing methods to aid in stress reduction, but there is no known evidence supporting the effectiveness of slow breathing in relation to a VR-active shooter training drill (VR-ASD). **PURPOSE:** To determine the effects of slow breathing on markers of stress in response to a VR-ASD. **METHODS**: A parallel between subjects design was used, during which, eighty-one (n=81) subjects performed five minutes of either slow breathing method 1 (SB1), slow breathing method 2 (SB2), or no modified breathing [normal breathing (NB)] immediately pre and post VR-ASD. SB1 (i.e., box breathing) involved a four second inhalation, two second pause, four second exhalation, and a two second pause. SB2 involved a four second inhalation, followed by a two second exhalation. The VR-ASD (~1 minute) included a single gunman and simulated victims. Subjects were fitted with a VR headset and equipped with a Glock 17 training pistol. Salivary samples and heart rate (HR) were collected thirty minutes pre, five minutes pre, five minutes post, and thirty minutes post VR-ASD. Saliva was analyzed for stress markers: α-amylase (AA) and secretory immunoglobulin-A (Sig-A). AA and SIgA were analyzed via 3x4 (treatment x timepoint) factorial ANOVAs. HR was analyzed via 2x4 factorial ANOVA. **RESULTS**: Both methods of slow breathing (SB1 and SB2) resulted in significantly lower AA concentrations at five ($p < 0.001$), and thirty-minutes post VR-ASD (SB1: $p = 0.008$; SB2: $p < 0.001$) compared to NB. In the NB condition, AA concentrations were significantly elevated five minutes post VR-ASD ($p < 0.001$) compared to all other timepoints but did not change across time in SB1 or SB2 ($p > .05$). A significant increase in SIgA concentrations was noted five minutes post VR-ASD compared to all the other time points ($p < 0.001$), and significantly higher SIgA concentrations were found in the NB compared to SB1 and SB2 ($p<0.001$). Finally, slow breathing resulted in a significant decrease in HR from pre to post VR-ASD ($p < 0.05$). **CONCLUSION**: The VR-ASD resulted in a significant increase in stress markers AA and SIgA. Slow breathing (both SB1 and SB2) prevented a significant increase in AA concentrations and resulted in lower concentrations post VR-ASD. Future studies should investigate the effects of longitudinal participation in slow breathing methods on markers of stress in response to a VR-ASD.