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Neuroendocrine Reactivity During the Naturalistic Stress of an Outward Bound Course

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Research Abstracts (Refereed for Presentation at Symposium)

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Recent studies have found that subjects with high hostility propensity have greater catecholamine (CA) and cortisol (CT) levels during laboratory stressors. The present investigation sought to determine if similar patterns would be found in the naturalistic setting of an Outward Bound experience, and if high versus low aerobic fitness would influence CA and CT levels in this setting. Sixty-six individuals volunteered for the study from participants who had registered for a nine-day 'adult intensive' Outward Bound course. Thirty-one subjects were selected from those who volunteered. The Cook-Medley Hostility Inventory was completed by each subject prior to arriving for their course, and aerobic fitness estimates were completed within the first six hours of the course using the University of Houston Non-Exercise Test. Stress levels were quantified by urinary CA and CT excretion. Three to five hour urine samples were collected for the following activities: rockclimbing/rappelling, whitewater canoeing, ropes course, off-trail backpacking, commuting from airport to base camp and back, and one night-time sleep sample. At the beginning of each activity period, all subjects voided and at the end of the three to five hour period urine was collected, measured for total volume, and a sample was taken and frozen within two hours of collection. The urine was assayed by high-pressure liquid chromatography with electrochemical detection to determine levels of excreted epinephrine (E), norepinephrine (NE), and cortisol (CT). The CA and CT were then quantified by mg of creatinine. Of the 31 subjects (14 females and 17 males), nine were classified as high hostile (HiHo) and 22 as average to low hostile (LoHo). The classifications for aerobic fitness were: 26 average to high fit (HF) with an estimated max VO_2 greater than 39 ml/kg for women and 46 ml/kg for men, and five low fit (LF) subjects with lower estimated VO_2 max. The data were analyzed by the two levels of hostility and two levels of aerobic fitness using univariate ANOVA with repeated measures across activity periods. The analysis of hostility revealed significant CT excretion differences between hostility levels for four of the nine activity periods with the LoHo subjects excreting higher CT levels. The four activities where this was found were: off-trail backpacking, ($F=4.74$, $p<.05$), the first rock climbing experience ($F=8.59$, $p<.01$), ropes course ($F=6.64$, $p<.01$), and the return van ride to the airport at the end of the course ($F=5.60$, $p<.05$). The ANOVA for fitness revealed a significant (fitness x activity) interaction for E, NE, and CT. Plots of the interactions seemed to indicate that the low fit subjects had greater excretion of E during the second climbing/rappelling experience and during the second day of whitewater canoeing, as well as greater NE and CT excretion during the second day of whitewater canoeing. The two most noteworthy findings of this study are: 1) the greater CT levels at four activity periods for LoHo subjects, and 2) the greater E, NE, and CT levels for low fit subjects. Previous studies dealing with plasma CA have found higher levels of CT in HiHo subjects which has contributed to the theory that hostility propensity may be a significant risk factor for cardiovascular disease. The present study's findings of urinary CT being excreted at greater levels in LoHo subjects will need to be further studied. Previous studies of CA response to stress have not clearly demonstrated the relationship of physical fitness to neuroendocrine reactivity. However, the findings of lower reactivity for HF subjects provides support for the theory that aerobic fitness, even at an average level, may be a physiologic advantage under stress. A point of interest for outdoor adventure programs like Outward Bound, is that highly challenging whitewater rapids and rock climbing/rappelling seems to elicit the greatest neuroendocrine response for all subjects, but especially for those with a low aerobic fitness level.

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