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Randomized controlled evaluation of the effects of cognitive–behavioral stress management on cortisol responses to acute stress in healthy subjects

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Abstract

Psychosocial stress is a potent activator of the hypothalamus–pituitary–adrenal (HPA) axis. While neuroendocrine stress responses are essential for the maintenance of homeostasis, evidence suggests that excessive activation of the HPA axis constitutes a risk for disease and psychopathology. The purpose of the present study was to assess the effect of cognitive–behavioral stress management training on endocrine stress responses and cognitive appraisal under acute psychosocial stress among healthy young subjects. Forty-eight healthy, non-smoking male students without acute or chronic medical or psychiatric disorder on self report were randomly assigned to receive group-based cognitive–behavioral stress management training either before or after a standardized psychosocial stress test (Trier Social Stress Test, TSST). Endocrine and psychological stress responses were assessed with salivary free cortisol response and cognitive appraisal processes to the TSST. In comparison with the control group, subjects in the treatment group showed an attenuated endocrine response ($F\ (2.55/117.41) = 3.81$; $P = 0.02$; effect size $f^2 = 0.35$) to the TSST. In addition, subjects in the SIT group had lower stress appraisal and higher control expectancies ($F\ (2/45) = 6.56$; $P = 0.003$, effect size $f^2 = 0.29$) compared to controls. Short group-based cognitive–behavioral stress management training reduces the neuroendocrine stress response to an acute stressor in healthy subjects. Therefore, stress management training may prove useful in preventing detrimental effects of stress-induced neuroendocrine activation

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1. Introduction

Psychosocial stress leads to the activation of several physiological stress responses, which in the short term are essential for the maintenance of homeostasis. Being the principal endocrine component of the stress response, the hypothalamus–pituitary–adrenal (HPA) axis mediates a multitude of adaptive physiological and psychological processes. It influences cardiovascular function, fluid volume and hemorrhage, immunity and inflammation, metabolism, neurobiology, and reproductive physiology (Sapolsky et al., 2000). Besides physiological influences (Kirschbaum et al., 1999), the induction of a HPA axis response is regulated by psychological factors. For example, individuals with low self-esteem and negative self-concept failed to habituate to a repeated standardized stressor (Kirschbaum et al., 1995). Furthermore, experimental variation of verbal comments prior to an experimental stressor significantly influenced the subsequent cortisol responses (Rohrmann et al., 1999). Thus, personality factors and cognitive appraisal processes not only play an important part in determining what is stressful (Lazarus and Folkman, 1984), but also modulate the extent and the habituation of the HPA axis response to stress. With regard to possible underlying central nervous system stress circuits involved in the neuroendocrine stress responses, the distinction between 'systemic' and 'processive' stress pathways has been proposed (Herman and Cullinan, 1997). In contrast to 'systemic' stress pathways, which are activated during direct threat of survival, such as hemorrhage and hypoglycemia, and thus do not require integrative processing of higher-order brain structures, psychosocial stressors usually involve the processing of multiple sensory inputs on cortical and limbic levels, including the cerebral cortex, hippocampus, and amygdala. These regions are known to be involved in the cognitive and emotional processing of potentially threatening stimuli and are most likely the primary integrators of the anticipatory stress response, leading to the modulation of neuroendocrine paraventricular output on the hypothalamic level (Herman et al., 2002). The psychological equivalent of these processes could be seen in the stress appraisal processes proposed by Lazarus and Folkman (1984). Consequently, stress-reducing psychosocial interventions aimed at modifying cognitive appraisal are a possible means of influencing HPA axis activity under stress.

A number of studies have demonstrated the effectiveness of cognitive–behavioral stress management in influencing psychological and physiological parameters and health outcomes in health and disease. For example, in symptomatic HIV-positive gay men, ten-week long, group-based cognitive–behavioral stress management training has been shown to reduce symptoms of distress and urinary free cortisol output (Antoni et al., 2000) and to prevent increases in the cortisol/dehydroepiandrosterone-sulfate ratio (Cruess et al., 1999). In women with breast cancer, similar cognitive–