Self-Efficacy and Salivary Cortisol Responses to Acute Exercise in Physically Active and Less Active Adults

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Self-efficacy, or beliefs in situation-specific capabilities, is postulated to play a role in the regulation of psychobiological functioning (Bandura, 1991), with a number of studies demonstrating efficacy cognitions to be related to endocrine, catecholamine, and endogenous opioid systems (Bandura, Cioffi, Taylor, & Brouillard, 1988; Bandura, Taylor, Williams, Mefford, & Barchas, 1985; Weidenfeld et al., 1990). Self-efficacy theory also acknowledges the physiologically and psychologically strengthening effects of mastery over adversity, and Bandura (1991) has suggested that successful coping leads to increased efficacy cognitions and dampened biological stress reactions. Furthermore, Dienstbier (1989) has proposed a model of arousal and physiological toughness that postulates mastery experiences to impact upon physiological and psychological functioning. Specific to the present study is the postulation that active toughening in the form of regular aerobic exercise results in suppressed cortisol in the face of stress or challenge, which in turn enhances psychological functioning.

Numerous studies have demonstrated that high levels of plasma and salivary cortisol are associated with negative psychological states such as increased depression and dysphoric mood (e.g., Gold et al., 1986; O'Connor, Morgan, Raglin, Barksdale, & Kalin, 1989). However, only one study has demonstrated that high levels of cortisol are related to low self-efficacy. The study, conducted by Weidenfeld et al. (1990), examined the impact on human immune functioning of experimentally varied self-efficacy in coping with a psychological stressor. As it has been demonstrated that cortisol plays a mediating role in immunologic responses to stressors, Weidenfeld and her colleagues hypothesized that increases in self-efficacy during an efficacy-building process would result in decreased cortisol levels in the face of a phobic stressor. They reported that participants who continued to demonstrate elevated cortisol following the efficacy treatments also reported higher levels of stress, and that as a group cortisol levels decreased dramatically from baseline to the early treatment conditions. More important,
perhaps, was the finding that the rate of growth of self-efficacy during the experiment was negatively related to salivary cortisol at the end of the experiment. It has been consistently documented that both acute and chronic exercise produce increases in self-efficacy (e.g., McAuley, Courneya, & Lettunich, 1991) and that self-efficacy plays an important role in adherence to exercise regimens (McAuley, 1992). However, the relationships between changes in self-efficacy and biological stress indicators as a function of exercise participation have yet to be examined. Given that efficacy cognitions are hypothesized to play a role in biological stress reactions (Bandura, 1991) and that physiological mechanisms such as adrenocortical activity are hypothesized to influence psychological functioning (Dienstbier, 1989), it would seem important to investigate physiological mechanisms that are proposed to underlie or be associated with efficacy responses to acute exercise.

Hence, the purpose of the present study was to examine self-efficacy and salivary cortisol responses to an acute bout of treadmill running in active and less active individuals. It was hypothesized that (a) active individuals would possess lower cortisol levels during and following acute exercise compared to their less active counterparts, (b) active individuals would possess higher levels of self-efficacy prior to and following exercise compared to less active individuals, and (c) high levels of pre- and postexercise efficacy would be associated with lower cortisol levels during and following exercise.

Method

Participants

Sixty undergraduate students participated in the study, with 30 (26 males, 4 females) in the active group and 30 (24 males, 6 females) in the less active group.

Measures

Activity Level. Participants were divided into active and less active groups based on their activity history. The minimal activity history requirement for the active group included 30 minutes of aerobic activity three times a week at a moderately hard intensity for the last year. Minimal requirements for the less active group included no regular aerobic exercise over the past year. To further examine participants' training status, anaerobic threshold estimates were computed to substantiate group assignment.

Self-Efficacy. In accordance with Bandura's (1986) suggestion for the measurement of self-efficacy, the Exercise Efficacy Scale employed in the present study was specific to the activity (running) and was comprised of items representing the participant’s confidence in being able to successfully complete successive 10-minute increments at a moderately fast pace.

Cortisol. Salivary cortisol was used to measure activation of the pituitary-adrenal cortical system. Previous research has demonstrated salivary and plasma cortisol to be highly correlated both during exercise ($r = .90$) and at rest ($r = .93$) (O'Connor & Corrigan, 1987). An advantage of salivary cortisol assessment is that the technique is noninvasive, which is of particular concern when examining psychological variables.