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Conscious and preconscious selective attention to social threat: different neuroendocrine response patterns

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Abstract

This study was designed to investigate the relationship between selective attention to social threat and neuroendocrine activity. Selective attention to social threat was measured using a supraliminal (unmasked) and a subliminal (masked) version of a pictorial emotional Stroop task, comparing color-naming latencies of neutral and angry faces. Neuroendocrine activity was assessed as (pre-task to post-task) increases in salivary cortisol and testosterone. Forty subjects were randomly assigned to the unmasked or masked version of the task. Analyses for the unmasked task revealed that post-task cortisol levels were significantly increased in subjects showing selective attention to angry faces. Results for the masked task indicated that post-task cortisol and testosterone levels were significantly increased in subjects showing preconscious selective attention to angry faces. The difference in neuroendocrine activity between tasks is suggested to depend on cortical (i.e. prefrontal) control in the unmasked task. Thus, psychological affective regulatory processes were involved in the unmasked task,

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whereas the neuroendocrine response patterns in the masked task indicates a biologically prepared mechanism. © 2000 Elsevier Science Ltd. All rights reserved.

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1. Introduction

End products of the hypothalamic pituitary adrenal (HPA) and the hypothalamic pituitary gonadal (HPG) axes have been associated with social status. In a variety of species, including humans, high basal levels of the adrenal hormone cortisol are related to socially avoidant, submissive behavior (Kagan et al., 1988; Sapolsky, 1992; Shulkin et al., 1998), whereas high basal levels of the gonadal hormone testosterone are related to social exploration and interpersonal dominance (Zuckerman, 1991; Mazur and Booth, 1998). Furthermore, the latter relations are reciprocal; a rise in social status causes an increase in testosterone (Rose et al., 1975; Rahe et al., 1990), while status loss makes testosterone levels drop (e.g. Kreuz et al., 1972; Thompson et al., 1990). In addition, the HPA and the HPG axes can also work concordantly. Research in humans indicates that, when facing social competition or social threat, individuals show (short term) increases in testosterone, while cortisol often goes up as well (Elias, 1981; Booth et al., 1989; Gladue et al., 1989). This is especially seen in those having a history of victory (Salvador et al., 1987), or inclined to defend their status (Cohen et al., 1996).

In most primates, a more evolved form of group survival has transformed aggressive dominance interactions to challenges based on ritualized gestures and displays. In these, the angry facial expression plays a pivotal role. Status can be established and maintained through a series of short face-to-face competitions between group members (Mazur, 1985). Striding with a threatening gaze, while keeping direct eye contact is a sign of dominance (Mazur and Booth, 1998), while eye or gaze aversion towards threatening individuals displaying anger symbolizes submission and prevents aggression (Öhman, 1986). The “decision” whether the threatening opponent should — in this symbolic manner — be approached or avoided depends on the motivational (i.e. dominant or submissive) stance of the individual (see Lang et al., 1997).

Motivational stances towards threat have abundantly been demonstrated using the emotional Stroop task. In this task subjects name the color of the ink in which words are printed while ignoring the meaning. Performance, in terms of slowing down or speeding up in color naming, depends on the motivational state of the subject and the emotional content of the word. Subjects are said to show selective attention or an attentional bias for threat when color-naming latencies for threat words are significantly greater than color-naming latencies for neutral words. Attention is suggested to be automatically allocated towards the threat value of the word (for a review, see Williams et al., 1996). When subjects are faster in color-naming threat words (compared to neutral words), it is suggested that they avoid the processing

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