

# Subjective social status moderates cortisol responses to social threat <sup>☆</sup>

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## Abstract

Research has demonstrated a robust relationship between social status, physiology and health in humans and animals. However, perceptions of social status within a specific social group have rarely been studied in this area and may provide additional relevant information. The current investigation examines subjective perceptions of social status as a moderator of cognitive, emotional and cortisol responses to stressor tasks characterized by social-evaluative threat or its absence. As part of a larger study, 81 college students living in a residential dormitory completed a measure of their subjective perceptions of their social status within their dormitory floor. They were randomly assigned to undergo a standard performance stressor task either with or without social evaluation. It was hypothesized that individuals who perceived that they were of low status within their dorm group would show greater increases in negative self-evaluative emotions (i.e., shame) and cognitions (low social self-esteem) and greater cortisol responses to the stressor under conditions of social-evaluative threat. Subjective social status moderated cortisol responses to the social-evaluative stressor, but in a direction opposite that hypothesized. Individuals who perceived themselves to be of high status showed sizable and significant cortisol increases (both peak and recovery), while those who perceived themselves to be of low status did not mount a significant cortisol response to the stressor. Both groups showed increased negative self-evaluative responses to the tasks. A discussion of the possible health implications of the robust cortisol responses of high status individuals and the hyporesponsive cortisol reactions of low status individuals is provided.

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## 1. Introduction

Social stressors are among the most provocative types of threat that humans and other animals face, with implications for behavior, physiology and health (see [Buwalda et al., 2005](#); [Fuchs and Flügge, 2003](#); [Henry, 1992](#); [Tamashiro et al., 2005](#)). We have argued that threats to

the social self, which we conceptualize as threats to social esteem or status, can be potent elicitors of changes in cognitive, emotional and physiological states, that may affect mental and physical well-being. In humans, social self threats encompass situations or factors that threaten one's social esteem or status, including social rejection, ostracism, exclusion, scorn, or contexts in which one's competencies, abilities, or characteristics upon which a positive social image is based are called into question (e.g., poor performance in social-evaluative contexts). Social self threats in humans may serve as an analog of threats to social status position or social alliances in other social animals (e.g., chimpanzees, baboons). In a theoretical conceptualization which we have entitled the Social Self Preservation Theory ([Dickerson et al., 2004](#); [Gruenewald et al., 2004b](#); [Kemeny et al., 2004](#)), we assert that threats

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to social status or esteem elicit the experience of negative self-evaluative emotions (i.e., shame, humiliation) and cognitions (i.e., lowered social self-esteem), as well as activation of physiological systems that would support adaptive behavioral changes in this context, e.g., activation of the hypothalamic–pituitary–adrenal (HPA) axis and pro-inflammatory immune mediators (see Dickerson et al.). This theory is based on the premise that psychological and physiological responses to threat to the social self evolved and have been maintained because of the centrality of social esteem and status in reproductive and survival success (see Barkow, 1989; Gilbert, 1998; Price et al., 1994).

Our assertion that threats to the social self should elicit the experience of shame and diminish social self-esteem is based upon theoretical perspectives which assert that these emotional and cognitive responses occur in situations in which individuals experience an actual or perceived loss of social value, status or esteem (Cooley, 1902; Gilbert, 1997; James, 1890; Leary, 1995). We focus on activation of the HPA axis and increases in pro-inflammatory immune mediators as physiological responses to social self threat based, in part, on animal research which documents that the level and functioning of biomarkers of these systems are associated with social status level and change in response to social status threats (e.g., Avitsur et al., 2001; Haller et al., 1996; Holst, 1997; Kollack-Walker et al., 1997; Kimura et al., 2000; Pich et al., 1993; Quan et al., 2001; Sapolsky, 1993; Skutella et al., 1994; Shively et al., 1997; Stefanski and Engler, 1998, 1999; Stefanski et al., 2001). In research with human participants, we have documented that laboratory stress paradigms which may threaten the social self are more likely to lead to increases in shame and decreases in social self-esteem (Gruenewald et al., 2004b), increases in cortisol (Dickerson and Kemeny, 2004; Gruenewald et al., 2004a), and increases in proinflammatory cytokines (Dickerson et al., 2005), than paradigms in which this threat is absent.

While we believe that the psychological and physiological responses to social threat we outline are prototypical and possibly adaptive reactions (e.g., these responses may be associated with submissive behavior which is adaptive under conditions of social threat), individual difference factors associated with concerns about the self within social contexts, such as social anxiety or rejection sensitivity, may affect reactions to such threats. We have been particularly interested in individuals' *subjective* perceptions of their social status in social groups as an individual difference factor that may moderate responses to acute social self threats. We have found that individuals with lower subjective perceptions of status within important social groups, such as at school, have lower scores on indicators of mental health, including lower self-esteem, more shame-related emotions and cognitions, and more depressed and anxious mood (Gruenewald et al., 2001), and are also more likely to report feeling shame and

behaving submissively in social situations. These tendencies may also render these individuals to be more psychologically and physiologically reactive to situations which threaten to further diminish their social esteem and status.

There has been little empirical examination of whether individuals with low subjective social status (SSS) are more psychologically and physiologically reactive to acute social stressors than those who perceive themselves to be of high social status. Adler and her associates (2000) demonstrated that individuals who perceived that they were of low status in society failed to show habituation in their cortisol responses to repeated exposure to a laboratory stressor paradigm (speech and mental arithmetic tasks with social evaluation) over a three-day period, as compared to individuals who perceived that they had higher societal status. In contrast, subjective perceptions of status in society did not moderate cortisol responses to a single exposure of performance of a set of challenging cognitive tasks in older adults in an investigation by Steptoe and colleagues (2005). However, performance of the cognitive stressor tasks did not occur in a context of explicit social evaluation as was characteristic of the study by Adler et al.; thus, it is possible that individuals high and low in SSS may be more likely to show divergent cortisol responses to a stressor which may threaten the social self.

Our goal in the present investigation was to further explore the role of subjective perceptions of social status in moderating individuals' cortisol responses to an acute stressor in the laboratory, as well as other psychological (emotional, cognitive) and physiological (blood pressure, heart rate) responses, and to determine whether SSS moderation of these responses was more likely to occur in response to experience of a stressor characterized by threat to the social self or its absence. Participants for this investigation were drawn from a larger study examining the association between social relationships within residential college dormitories and mental health. As part of this larger study, all participants completed measures of their SSS within their dormitories.

Our examination of SSS as a moderator of acute stress reactivity draws upon findings from a previous study which documented that cortisol and shame increases, and social self-esteem decreases, were more likely to occur when challenging speech and mental arithmetic tasks (Trier Social Stress Test) were performed in front of an evaluative social audience, but not when the same tasks were performed in the absence of social-evaluative threat (SET, i.e., without an audience; Gruenewald et al., 2004b). However, the performance of the tasks under both social-evaluative and non-evaluative conditions led to similar cardiovascular responses, indicating that these responses were not as sensitive to the social-evaluative nature of the tasks. Given our previous findings, we expected that the hypothesized moderation of SSS on psychological and cortisol stress responses would be specific to conditions of

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