Social Status and Threat Reactivity: Neural Mediators of the Relation Between Status and Health

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Researchers across multiple disciplines have identified a consistent relation between socioeconomic status (SES) and health: individuals low in SES are at greater risk for developing a variety of diseases than individuals higher in SES.[1] Moreover, these effects are not confined to those at the extremes of the SES hierarchy; rather, each step up in SES confers additional health benefits. In addition, a related line of research has shown that an individual's *subjective* perception of his or her *social status* (SSS) is actually a better predictor of long term health status than are objective measures of status (e.g., income, education).[2] SSS is thought to measure how esteemed, respected, admired, and valued a person feels they are compared to others; in other words, it represents a persons' perception of his/her place in the social hierarchy.[2] The provocative suggestion behind this finding is that psychological mechanisms might underlie the SSS-health link. However, these potential mechanisms are largely unexplored.

One mechanism that has been suggested to contribute to the SSS-health relationship is variability in threat reactivity. If, for example, individuals view themselves as low on the "social ladder," they may respond more negatively to a socially threatening situation, perhaps because these threats are viewed as having the potential to further diminish social status.[2] Because of the strong links between neural regions that detect social threat and physiological stress responses, repeated activation of threat-sensitive neural regions can have negative health consequences—for example, through the activation of neuroendocrine stress hormones which can suppress the immune system and compromise the body's ability to fight off disease.[3] Thus, threat reactivity may be one mechanism whereby low SSS contributes to negative health.

To date, little empirical work has investigated the hypothesized relation between SSS and threat reactivity. In one of the few studies in this area, individuals low in SSS failed to habituate to a repeated social threat, showing continuously elevated levels of a stress hormone, cortisol, over time, whereas individuals high in SSS no longer showed a significant cortisol response over time.[2] More recently, individuals who rated themselves as lower in SSS responded to viewing negative facial expressions with heightened activity in the amygdala, a brain region known to respond to social threat.[4] Amygdala activity can trigger the body's stress response systems, and may thus impact health. Taken together, these findings provide initial support for the hypothesis that heightened threat reactivity may play a role in mediating the relation between SSS and health. However, it is important to note that previous studies were conducted in cross-sectional samples, and thus studies that employ well-controlled, experimental manipulations of SSS are necessary to specify the directionality of the relation between social status on threat reactivity.

Given the lack of experimental research examining the links between SSS and threat reactivity, the present studies are designed to examine how SSS relates to behavioral and neural responses to social threat. Study 1 will examine the effect of a novel experimental manipulation of SSS on participants' perceptions of threat. Study 2 will then utilize this validated manipulation to examine how SSS affects threat-related neural activity. Both studies will use UCLA undergraduates as participants. To control for potential trait-level differences in SSS that may interact with the manipulation, participants will be pre-tested using a trait measure of SSS and will only be included if they fall within a restricted range on the trait SSS scale.

Study 1. Study 1 will be the first study to experimentally manipulate SSS. This study will: a) validate a novel manipulation aimed at making participants feel higher vs. lower in status, and b) examine whether this manipulation affects subjects' behavioral response to social threat. SSS will be manipulated by using a personal scenario-based approach (validated in the

related literature on social power[5]). Participants will be asked to recall "a time in which you felt especially respected, esteemed, admired and/or valued, compared to other people" (high SSS condition) and "a time in which you felt like you were less respected, esteemed, admired or valued than other people" (low SSS condition). A neutral control condition in which status is not expected to be particularly salient, will also be included ("recall your day yesterday"). Scenario-based manipulations are thought to activate mindsets, so it is expected that, during tasks following the manipulation, participants will behave in ways consistent with the processing rules associated with high or low SSS.[5] The order of the status manipulation will be counterbalanced across participants to control for ordering effects. Following each manipulation, participants will complete questionnaire measures related to feelings of status as well as mood (to control for possible mood differences between status conditions). Participants will also complete a task designed to assess vigilance to social threat. Specifically, individuals will view a neutral face as it morphs into a face displaying a threatening expression through a series of sequential images. Faster detection of a threatening face as it changes from neutral to negative is thought to index greater vigilance to social threat.[6] I hypothesize that individuals will display greater vigilance to social threat during the low SSS condition, relative to the high SSS and neutral conditions.

Study 2: Given the critical role that the amygdala plays in responding to social threat as well as the potential role it may play in health outcomes through its direct innervations to physiological stress response systems, Study 2 will use fMRI to directly measure participants' amygdala reactivity to social threatening stimuli. During the task, participants will view pictures of threatening and non-threatening facial expressions.[7] Using the manipulation validated in Study 1, participants will be scanned while viewing the facial expressions under three different experimental conditions: low SSS, high SSS, and neutral control. I hypothesize that, during the low SSS condition, participants will show heightened amygdala activity in response to viewing threatening faces (vs. non-threatening faces), relative to the high SSS and control conditions. Given that the amygdala plays an important role in stress responses that may influence health, this result would provide initial evidence for a follow-up study that will examine the relation between SSS, threat reactivity, and cortisol responses, which may contribute to ill health.

Results of the proposed basic science studies have the potential for significant impacts on health policy. For example, if SSS is indeed associated with increased threat reactivity, prevention programs could be designed to teach stress-reduction techniques to populations known to be low in SSS. Also, given that minorities may be pre-disposed to feeling low in SSS as a result of the historical social hierarchy in the United States (with Caucasian men at the top), the proposed research is particularly relevant to minority populations.

At UCLA, I am ideally situated to conduct the proposed plan of research. I am fortunate to have the guidance of my faculty advisor, Dr. Naomi Eisenberger, who is an expert in the brain bases of socioemotional behavior, as well as Drs. Shelley Taylor and Tara Gruenewald, seminal figures in the areas of health and social psychology. The resources available to me through the UCLA Brain Mapping Center, which includes a research-dedicated fMRI scanner, will provide necessary equipment to conduct the neuroimaging study. I believe my diverse background of research experience, the tremendous resources available to me at UCLA, and the support of an NSF GRF, will prepare me for a successful career studying the relation between subjective social status and health. This work is original.

1. Adler, NE, et al. (1999) *Ann NY Acad Sci, 896* **2.** Adler, NE, et al. (2000) *Health Psychol, 19*, 586-592 **3.** McEwen, BS (2007) *Physio Review, 87*, 873-894 **4.** Gianaros, PJ, et al. (2007) *Soc Cogn Affect Neurosci, 3*, 91-96 **5.** Galinsky AD, et al. (2003) *J Pers Soc Psychol, 85*, 453-466 **6.** Joorman, J, et al. (2006) *J Abnorm Psychol, 115*, 705-713 **7.** Whalen, PJ et al. (2001) *Emotion, 1*, 70-83