



The effects of stress and affiliation on social decision-making: Investigating the tend-and-befriend pattern



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ABSTRACT

The prevalence of psychosocial stress in Western societies is constantly on the rise. Its influence on social decision-making, however, remains poorly understood. Whereas, it is known that stress triggers psychological and physiological defense mechanisms, indications of such patterns in social decisions are ambivalent. We sought to elucidate the underlying mechanisms of stress-induced social decisions. We recruited 145 men, who were individually exposed to either a psychosocial stressor or a control condition, while primed with affiliation by interacting either with members of an in- or an out-group. We found that stressed participants were less trusting and engaged in less costly punishment compared to the non-stressed control group. Interacting with out-group members led to less reciprocity and more spiteful punishment. There was no interaction between stress and the affiliation conditions in any of the used social-decision-making paradigms. Lastly, while stress-reactive cortisol levels had no effect on trust behavior, higher baseline cortisol was correlated with greater trust. Our findings suggest that previous ambiguities in data reported on the influence of stress on social decisions, namely tend-and-befriend behavior may have arisen through critical social confounds in the induction of stress. When controlling for potential social confounds, stress may trigger fight-or-flight behavior as indicated by increased social anxiety. These findings highlight the considerable context-dependence of psychosocial stress and its effects on social behavior.

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1. Introduction

Life is fraught with decisions. Particularly for social creatures like humans, many of these decisions are related to direct or indirect social interaction (Fehr and Fischbacher, 2003). Given that social decisions, such as whether to be cooperative or trusting have potentially far-reaching consequences (Axelrod and Hamilton, 1981), it is important to understand how these decisions can be modulated by environmental influences. Here, we isolate one such variable, namely psychosocial stress. Stress is an omnipresent phenomenon in modern western societies. With more than half the world's population living in urban areas (Dye, 2008), an environment particularly conducive to creating stress (Lederbogen et al., 2011), understanding the consequences of stress on social behavior is timely and critical. With the potential to influence both cognitive and emotional processes involved in decision-making (Mather and

Lighthall, 2012), exploring how exactly stress affects our decisions is highly relevant.

Stress refers to a state of threatened homeostasis in an organism due to internal or external adverse effects (Chrousos, 2009). The compensatory physiological response toward such a threat to homeostasis involves the activation of the sympathetic nervous system and the hypothalamic–pituitary–adrenal (HPA) axis. Cortisol as the final output product of the HPA axis is the most frequently assessed biomarker of stress (Hellhammer et al., 2009). Concomitant with the physiological stress response, rises in arousal, vigilance, attention and aggression enable an adaptive behavioral response, such as escaping or opposing the stressor, referred to as the “fight-or-flight” response (Cannon, 1932). It may thus be argued that social decisions made under the influence of stress ought to bear the marks of anxious and aggressive tendencies. While the effects of stress have been shown to be highly variable and subject to specific moderators such as age, gender, personality (Starcke and Brand, 2012), and content of thought (Engert et al., 2014), there is evidence of increased egotism in moral decisions (Starcke et al., 2011) as well as egocentric perspective-taking following stress (at least in men; Tomova et al., 2014). The view of a fight-or-flight response tendency following psychosocial stress is buttressed by

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findings of the involvement of brain regions implicated in detecting environmental threats and instantiating fearful responses such as the amygdala (Lang et al., 1998) when confronted with psychosocial stressors (Dedovic et al., 2009; Rodrigues et al., 2009). In turn the attenuation of amygdala responsivity through the intranasal administration of oxytocin (Meyer-Lindenberg et al., 2011) has been shown to lead to increased approach behavior as well as decreased cortisol concentration (Ditzen et al., 2009). The involvement of the amygdala in social behavior such as trust (Baumgartner et al., 2008) makes a cogent case for social decisions indicative of a fight-or-flight response tendency following psychosocial stress.

An intriguing alternative hypothesis argues that specifically social behavioral stress responses are not necessarily characterized by aggressive and anxious behavior (i.e., a fight-of-flight response), but are rather of an affiliative nature, characterized by a so-called “tend-and-befriend” pattern (Taylor, 2006; Taylor et al., 2000). By befriending and affiliating with social groups, the individual may obtain the necessary resources to overcome stressful conditions and thus maximize the chance of survival. The tend-and-befriend pattern is suggested to be particularly pronounced in women. A recent study reported such a behavioral tendency in men, however, showing that acute social stress can lead to a subsequent increase in prosocial decisions in the context of social-decision-making tasks (von Dawans et al., 2012). Using a group variant of the Trier Social Stress Test (TSST-G; von Dawans et al., 2011), it was shown that trust, reciprocity and sharing measured by game-theoretical paradigms with monetary incentives increased following the induction of acute social stress in a sample of male participants. At the same time, costly punishment and risk-related behaviors were unaffected. Further, behavior was altogether independent of levels of the stress hormone cortisol. Drawing on literature describing stress-buffering effects of social affiliation in times of threat (Baumeister and Leary, 1995; Taylor, 2006), the authors attributed their findings to approach behavior triggered by stress, and designate it as tend-and-befriend behavior.

Thus, theory and current evidence from one laboratory suggest that humans tend to affiliate with others in the context of stress as a suitable coping strategy. However, we contend that the evidence provided so far in support is far from conclusive. For instance, one intriguing aspect of the experimental design by von Dawans et al. (2012) is the fact that stress was induced in a group setting. Given that several lines of research suggest affiliating with others in times of threat is a common mechanism and effective strategy to reduce the perceived threat (Grieve and Hogg, 1999; Hogg, 2000; Hogg et al., 2007), the group experience may have resulted in increased affiliation with the simultaneously stressed individuals. Typically, affiliation has been defined as a need to belong to a social group and wanting to be liked (Baumeister and Leary, 1995). As a result of such feelings, potentially anxious and aggressive effects on subsequent social behavior may be buffered. This hypothesis would predict precisely the same pattern of behavioral results as found by von Dawans et al. (2012) but as a result of the shared stress experience in which affiliative feelings are primed rather than by the affiliative effects of stress per se.

To shed further light on the effect of stress on social decision-making, we designed an experiment where subjects were exposed to a psychosocial stressor or an appropriate control condition individually (i.e., not in a group setting) before performing several game-theoretical social decision-making paradigms. Participants played a series of social decision-making tasks with a member of either their in-group (affiliation condition) or an out-group as determined by a minimal group paradigm. Previous studies have shown that even being part of a group based on arbitrary social categorization (i.e., minimal groups; Tajfel, 1970) can result in biased allocation of resources favoring members of one's own group, and maximizing the difference between in-group and out-group

(Abbink et al., 2012; Yuki et al., 2005). Such in-group favoritism has been shown to be deeply rooted in the positive feelings associated with one's in-group (Van Bavel et al., 2008; Van Vugt and Hart, 2004). Thus, our factors yielded a 2×2 between-subject factorial design with the factors stress (yes/no) and affiliation (in-group/out-group). To comprehensively test for effects of both pro- and antisocial behavior, we employed several established paradigms derived from economic game theory, known to test for trust and trustworthiness (i.e., the trust game), sharing (i.e., the dictator game), and costly and spiteful punishment (i.e., ultimatum and money burning games, respectively).

We predicted that if the effects of stress per se genuinely lead to an affiliative response, then we ought to replicate von Dawans et al. (2012) findings of increased trust, reciprocity and sharing, as well as unaffected punishment and risk behavior after individual stress induction. If however psychosocial stress actually leads to an increase in social anxiety and aggression, but this might have been masked by the previously used group stressor then we ought to detect social decisions indicative of fight-or-flight. Including an affiliation condition where participants interact with in- or out-group members helps to elucidate the potential contradiction, whereby potential affiliation experienced with in-group interaction, increased social anxiety and aggression produced by the stressor ought to be attenuated when playing with in- as opposed to out-group members.

2. Methods

2.1. Participants

A total of 145 men between 19 and 35 years of age (mean age \pm SD: 26.1 ± 3.40 years) were recruited from the Max-Planck-Institute's participant database, and by posting ads on an electronic billboard of the city of Leipzig. The majority of participants (92%) graduated from academic high school with 29% holding a Bachelor's or higher University degree. The remaining 8% graduated from middle school. Women were excluded from participation to avoid the confounding effects of hormonal status on cortisol levels (Kajantie and Phillips, 2006). Given a potential effect on cortisol activity, regular recreational drug users (consumption within the past six months), smokers (>5 cigarettes/week), individuals reporting chronic illness (including psychological disorders) and individuals taking medication targeting the HPA axis were excluded after an initial telephone interview. Also, participants had to be naïve to both the Trier Social Stress Test (TSST; Kirschbaum et al., 1993; Kudielka et al., 2007) and the economic decision-making paradigms. The study was approved by the Research Ethics Board of Leipzig University (ethics numbers: 219-12, 058-12) and performed in agreement with the Declaration of Helsinki. All participants gave their written informed consent, received financial compensation for their time and effort, and could withdraw from the study at any time.

2.2. Experimental design and procedure

The study had a 2×2 between-subject factorial design with the factors stress (stress vs. no-stress) and affiliation (in-group vs. out-group) (stress/in-group: $n = 37$; stress/out-group: $n = 36$; no stress/in-group: $n = 37$; no stress/out-group: $n = 35$). Assignment to the stress and affiliation groups was organized online one week before the experiment. Since cortisol secretion is characterized by a strong circadian rhythm (Dallman et al., 2000; Fries et al., 2009), the 90-min testing session was performed between 12 pm and 5 pm. To simulate a realistic group interaction situation for the decision-making paradigms, participants were tested in groups of 12–18

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