

Acute Stress Reduces Perceived Trustworthiness of Male Racial Outgroup Faces

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Abstract

Outgroup members are often perceived as threatening and untrustworthy, and this is particularly true for judgments of outgroup males. As race influences perceptions of group membership, male racial outgroup faces (MROFs) are judged as less trustworthy than male racial ingroup faces (MRIFs). Neurologically, this effect is mediated by amygdala activation, a brain region central to the processing of fear-related stimuli, threat detection, vigilance regulation and facial trustworthiness. As acute stress up regulates amygdala activity and promotes hyper-vigilance towards threatening stimuli, we hypothesised that acute stress (relative to baseline stress) would result in increased vigilance and lower trustworthiness judgements towards MROFs. In contrast, we expected that stress would have no effect on MRIFs. Using a within-subjects design, White-Dutch male participants rated the trustworthiness of White males (ingroup) and Arab males (outgroup) under stress and during the absence of stress (baseline). Stress significantly reduced trust towards racial outgroup members, whilst trust towards racial ingroup members was maintained. Understanding the mechanisms by which stress differentially affects social behaviors towards outgroups is of theoretical and practical relevance to our understanding of the biological basis of ethnocentrism and xenophobia.

Keywords: Stress, trust, face, intergroup, tend and befriend, ethnocentrism, cortisol, noradrenaline

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People are highly attuned to group membership status, demonstrating favouritism (e.g., trust, cooperation, loyalty) toward members of their own group relative to outgroup members (Brewer, 1999). In contrast, outgroup members are often perceived as threatening and untrustworthy (Cottrell & Neuberg, 2005; Hugenberg & Bodenhausen, 2003; Payne, 2001), and this is particularly true for judgments of outgroup males. Individuals categorize men on the basis of their coalitional membership more strongly than they do women (Pietraszewski, Cosmides, & Tooby, 2014), and physiological responses towards outgroup males are particularly deeply ingrained (Navarrete et al., 2009). Indeed, the evolutionary literature suggests that out-group bias might be sex-specific, in light of the dangers that outgroup men posed to the survival of ingroups in ancestral human environments (e.g., raids and wars; McDonald, Navarrete, & Van Vugt, 2012; van Vugt, De Cremer, & Janssen, 2007). Such biases are likely to be exaggerated in stressful situations in which increased vigilance towards outgroup males is functional (e.g., resource scarcity, threat of conflict).

Racial facial features such as skin tone and facial structure are unlikely to be automatically encoded as markers of coalitional membership. Rather, ancestral humans are likely to have identified group status on the basis of salient features that reliably tracked coalitional membership, such as dialects and coalitional markings (Kurzban, Tooby, & Cosmides, 2001). Nevertheless race does influence perceptions of group status, and individuals can assign outgroup status to individuals based on race, religion, and other ethnic markers (Pietraszewski et al., 2014). Thus, male racial outgroup faces (MROFs) are judged as less trustworthy than male racial ingroup faces (MRIFs), particularly among perceivers with high levels of implicit racial bias (Cassidy & Krendl, 2016; Kubota, Li, Bar-David, Banaji, & Phelps, 2013; Stanley, Sokol-Hessner, Banaji, & Phelps, 2011). Neurologically, this effect is mediated by amygdala activation (Hart et al., 2000; Phelps et al., 2000; Wheeler & Fiske, 2005), a brain region central to the processing of fear-related stimuli, threat detection, vigilance regulation and facial trustworthiness (Adolphs, Tranel, Damasio, & Damasio, 1994; Phelps & LeDoux, 2005). Research shows that MROFs capture attention faster (Donders, Correll, &

Wittenbrink, 2008) and hold attention for longer (Trawalter, Todd, Baird, & Richeson, 2008), especially when these faces are associated with threat (Maner & Miller, 2013) or when self-protective motives are primed among perceivers – for example when they are made to feel angry (Maner, Miller, Moss, Leo, & Plant, 2012) – resulting in delayed extinction of conditioned fear responses (Navarrete et al., 2009).

Stress and Outgroup Vigilance

In this project we consider whether perceptions of trustworthiness of MROFs are influenced by the physiological state of the perceivers, in particular their acute stress level. The stress response involves an ubiquitous orchestrated hormonal reaction (Charmandari, Tsigos, & Chrousos, 2005), which can have dramatic, and adaptively intentioned effects on physiology, behaviour and cognition (Lupien, McEwen, Gunnar, & Heim, 2009). Acute stress up regulates amygdala activity and promotes hyper-vigilance towards threatening stimuli (van Marle, Hermans, Qin, & Fernández, 2009; van Wingen, Geuze, Vermetten, & ndez, 2011). Such a response is likely to serve the adaptive function of heightening vigilance towards potential dangers when an organism is stressed and vulnerable. Thus, since MROFs are normally perceived as potentially threatening (whether explicitly or not), stress is likely to result in increased vigilance towards them. In turn, they are likely to be judged as less trustworthy relative to when in a non-stressed state. In contrast, stress will have little effect on MRIFs.

In the current study, we tested this hypothesis among a population in a European country experiencing ongoing racial tension, the Netherlands - incidents of conflict between native-Dutch and Arab immigrants appear regularly in the media (Veldhuis & Bakker, 2009). Because Arabs represent a salient racial outgroup in the Netherlands (Velasco González, Verkuyten, Weesie, & Poppe, 2010), we hypothesized that acute stress would reduce the trustworthiness judgements of Male Arab faces (MROFs) relative to Male White faces (MRIFs).

Materials and Methods

Overview

Using a within-subjects design, 39 native-Dutch-White males viewed and rated the trustworthiness of MRIFs (White) and MROFs (Arab) both during stress (induced with the Maastricht Acute Stress Test; Smeets et al., 2012) and in the absence of stress. Our sample consisted of men, only in view of the significance of male-to-male intergroup violence in ancestral and modern environments (McDonald, Navarrete, & Van Vugt, 2012).

Participants

Participants received either €16 or course credit. Exclusion criteria included psychiatric or medical illnesses, smoking, substance abuse, medication use and previous participation in a stress study. Participants refrained from alcohol and exercise the night before and did not eat or drink for two hours before the experiment. Subjects were tested between 12h30 and 18h00 to control for circadian variation in cortisol levels.

The number of participants was comparable to that used in similar studies (Bos, Terburg, & van Honk, 2010; Dawans, Fischbacher, Kirschbaum, Fehr, & Heinrichs, 2012; Terbeck et al., 2012), and was determined in advance by conducting a power analysis with GPower (power 0.8, effect size 0.5, $p < 0.05$). Data collection was terminated when the predefined sample size was reached. Ethical approval was granted by the University of Oxford and the Vrije Universiteit Amsterdam.

Procedure

In the laboratory, native-Dutch-White male participants rated the trustworthiness of MRIF and MROF in one photo set (88 pictures) during a stress-free (baseline) period, and following delay and subsequent stress induction, they rated different individuals in a second set of photographs (88 pictures). Participants were asked: *"How trustworthy do you think this person is?"* on a nine-point scale ranging from (1) *"very untrustworthy"* to (9) *"very trustworthy"*, similar to other studies (e.g., Todorov, Pakrashi & Oosterhof, 2009). Pictures were displayed on a 17-inch LCD screen in a private cubicle. Within-set pictures were presented in random order and sets were counterbalanced with condition order. Stress was induced with the Maastricht Acute Stress Test (Smeets et al., 2012). The order of the stress-free and stressful conditions was counterbalanced to control for potential

priming effects. Participants were randomly assigned to one of two protocols to control the order of the stressful and stress-free conditions (Figure.1).

Stimuli

Pictures of White, Arab, Black, Southeast-Asian faces were retrieved from several databases (Eberhardt, Goff, Purdie, & Davies, 2004; Langner et al., 2010; Minear & Park, 2004; Phillips, Wechsler, Huang, & Rauss, 1998) and selected for quality and neutral expression, resulting in a sample of two-hundred targets. To ensure that the Arab faces were recognizable as Arab, 50 White male Amazon Turk workers were asked to identify their race. Faces for which there was less than 80% agreement regarding Arab ethnicity were excluded. This cut-off was used partly for pragmatic reasons, given the rarity of Arab faces in databases.

Two-hundred male Amazon-Turk workers then rated the individuals in the images for trustworthiness. These responses were used to create two sets of images (88 pictures each: 44 Whites, 28 Arabs, 9 Blacks, 7 Southeast-Asians) that were matched within-race on trustworthiness ratings. Blacks and Southeast-Asians were included to limit the possibility that participants' responses would be shaped by response bias.

Stress Induction

The Maastricht Acute Stress Test (MAST; Smeets et al., 2012) involves unpredictability, uncontrollability, and social evaluation and elicits robust elevations in stress hormones. Participants repeatedly immersed one hand in ice cold water (0-2C) for what they were led to believe were random trial times (maximum 90s), in between which they performed serial subtractions (minimum 45s) and were given negative feedback when they made a mistake. The MAST consists of a 5-minute preparatory/anticipatory phase, 10 minutes of alternate hand-immersion and subtraction trials, and a 2-minute rest phase. Participants were observed and videoed throughout to increase social evaluation stress. The videos were immediately deleted afterwards and not used in any other context.

Cortisol Sampling

Salivary cortisol concentrations, which are predictive of psychosocial stress (Foley & Kirschbaum, 2010), and reported stress levels were both sampled at several time-points pre- and post-stress induction to confirm stress induction and recovery (Figure.1). Saliva was obtained via passive drool, frozen at -20C and analyzed by chemiluminescence immunoassay (CLIA; IBL, Hamburg, Germany). Interassay and intra-assay coefficients of variation were below 8%. As cortisol samples can be subject to skewness we examined the data for this possibility – for all time points dividing skewness by the standard error of skewness produced acceptable values that ranged from .52 - 81. Thus we did not apply any transformation to the raw cortisol data.

Subjective Stress`

Reported stress levels were assessed with the use of visual analogue scales. Participants were asked, on scales ranging from 0 (not at all) to 100 (maximum), the degree to which they felt the following: anxious, tense, relaxed, physical discomfort, in control, and desire to leave. Subjective stress was operationalized as the mean value of these 6 items (with feelings of control and relaxed being reverse-coded) at each time point.

[figure 1]

Results

One participant did not tolerate the MAST and discontinued further participation. Data is therefore present for 38 participants ($M_{age} = 24.82$, $SD_{age} = 5.32$). All p -values are two-tailed. Repeated measures ANOVA using GLM revealed that the MAST elicited statistically significant differences in subjective stress scores across time, $F(1.32, 48.17) = 37.29$, $p < .0005$, partial $\eta^2 = 0.50$, and cortisol across time, $F(1.94, 71.93) = 11.6$, $p < .0005$, partial $\eta^2 = 0.239$. *Post-hoc* analysis revealed that subjective stress increased significantly following the MAST, mean difference = 16.44, 95%CI[10.7, 22.71], $p < .001$, and then decreased significantly in the recovery period, mean difference = -17.68, 95%CI[-24.72, -10.3], $p < .001$. Salivary cortisol showed a similar pattern

increasing significantly following the MAST, mean difference = 5.64, 95% CI[2.6, 8.68], $p < .001$, then decreasing significantly in the recovery period, mean difference = -3.36, 95%CI [- 6.06, - 0.665], $p < 0.01$. There was no significant difference between baseline and pre-stress cortisol levels, nor in reported stress levels, (all p 's>.40), indicating that the participants were not stressed at baseline.

[table 1]

A series of paired sample t-tests revealed that participants rated MROFs lower on trustworthiness at baseline ($M = 4.81$, $SD = 0.81$) than MRIFs ($M = 5.18$, $SD = 0.63$), mean difference = -0.37, $t(37) = -4.49$, $p < .001$, $d = 0.76$. Stress significantly decreased participants' trust-ratings towards MROFs ($M = 4.67$, $SD = 0.72$), mean change = -0.14, $t(37) = -2.04$, $p = .048$, $d = 0.35$ whilst trust towards MRIFs was unchanged, ($M = 5.22$, $SD = 0.69$), mean change = 0.04, $t(37) = .58$, $p = .57$, $d = .12$. Importantly, the expressed difference in trust towards MRIFs and MROFs increased significantly as a result of stress, mean change = 0.17, $t(37) = 2.11$, $p = .042$, $d = 0.35$. As described above, Black and Southeast-Asian faces were also presented to participants before and after stress induction. We found no significant change in trust for either Asians, mean change = .04, $t(37) = .34$, $p = .74$, or Blacks, mean change = -.04, $t(37) = -.33$, $p = .75$. Pooling Arabs, Asians, and Blacks also revealed no effect, mean change = .08, $t(37) = 1.30$, $p = .20$.

There was no correlation between absolute/change in reported stress or cortisol and absolute/change in trust scores (all p 's > .80). The counterbalanced order in which participants were stressed had no effect on changes in cortisol, reported stress, or trust (all p 's > .95).

Discussion

Consistent with our predictions, acute stress reduced trust towards MROFs, whilst trust towards MRIFs was maintained. In terms of underlying biological mechanisms, the amygdala is likely

involved as it plays a role in both threat detection and in mediating facial trustworthiness judgments (Adolphs, Tranel, & Damasio, 1998). The absence of a direct relationship between cortisol and changes in trust suggests the stress response is likely influencing perceived trustworthiness via a more circuitous biological pathway. The amygdala's sensitivity to threat-relevant stimuli is heightened by stress. This effect appears to be mediated via stress-induced elevations in noradrenaline (a stress hormone), and its direct effects on the amygdala (Galvez, Mesches, & McGaugh, 1996; Hermans et al., 2011; Strange & Dolan, 2004; van Marle et al., 2009; van Stegeren et al., 2005). We speculate therefore that stress-associated elevated noradrenaline levels result in hypervigilance towards MROFs, leading to a decrease in trust. This proposed neurobiological mechanism is supported by the fact that propranolol, which inhibits noradrenaline activity, was found in Whites to reduce negative implicit racial bias towards Blacks under baseline conditions (Terbeck et al., 2012). Thus, future studies in which beta-adrenoreceptor blocking drugs are administered prior to stress induction will help unravel to what extent the effect observed in the current study is indeed mediated by noradrenaline.

The extent to which stress changes actual behaviour towards outgroup males remains to be seen. But it is noteworthy that trustworthiness judgments of faces are highly correlated with trusting behaviour (van't Wout & Sanfey, 2008). It also remains to be seen whether stress affects trust or behaviour towards outgroup members when different cues of group membership are salient. However since the amygdala is critical to threat processing in general, and not just specifically facial trustworthiness judgements (Öhman, 2005), it is likely that the effect of stress is generalizable towards judgments of other kinds of male coalitions even when race is irrelevant (e.g., differing sports teams, political parties, gangs etc.).

Our study suggests that the sociobehavioral response to stress, at least when trustworthiness judgements are involved, is contingent on the coalitional status of the target individuals. Several theoretical perspectives on the socio-behavioral response to stress in humans have been proposed that may shed a light on this. Cannon (1939) proposed the prototypic *fight-or-flight* response to

stress, which involves either increased aggression (fight) for the purpose of confronting the stressor, or flight, either physical or psychological, such as in the case of avoidant coping. More recently, Taylor et al., (2000) suggested that, under certain circumstances, neither hostility nor separation represent a functional socio-behavioural response to stress. Rather, Taylor proposed an adaptive *tend-and-befriend* behavioural response to stress, that involves the protective nurturing of oneself and offspring, and the promotion of social networks for the purpose of supportive buffering and risk reduction. Although Taylor's theorising posits the effect is particular to females, recent experimental evidence has lent support to Taylor's *tend-and-befriend* effect in men (Dawans et al., 2012) – acute stress resulted in increased trusting behaviour in an economics game. The group status of participants was not explicitly stated in this study. It would therefore be of interest to replicate this study with racially diverse individuals. In addition, whilst women generally show *tend-and-befriend* responses under stress, we suspect that these are preferentially directed towards coalitional members, especially other women. We would also expect that females would display particularly defensive responses towards outgroup males under stress, given that females also perceive outgroup males as threatening (Navarrete, McDonald, Molina & Sidanius, 2010). These are rich avenues of further study.

Given that historically the social group was key to the survival of the individual (Hill, Barton, & Hurtado, 2009), and given the long history of conflict and competition between ancestral groups (Keeley, 2010; McDonald et al., 2012), it seems unlikely then that a generalized affiliative response to stress would have been selected for during the course of human evolution. Indeed, stressful situations such as crime and intergroup conflict are often associated with increases in in-group altruism, and heightened out-group hostility (Beekman, Cheung, & Levey, 2017; Gneezy & Fessler, 2011; Meier, Pierce, Vaccaro & La Cara, 2016). Building on these theoretical foundations therefore, the results of the current experiment suggest that the coalitional status of potential targets matters – whether they are ingroup or outgroup. Specifically, befriending, if induced, is likely to be selectively directed towards ingroup members, whilst outgroup members are more likely to elicit a

fight-or-flight type behavioural response under stress. We refer to this theoretical perspective as the ‘tend and defend hypothesis’. The antagonistic nature of male intergroup interactions throughout our ancestral past suggests that this is likely to be most pronounced in males.

It is of note that the stress response induced in our study was unrelated to the intergroup context, and consisted of a combination of pain, social evaluation, unpredictability and uncontrollability. Thus, the source of the stressor appears to be irrelevant and the effect may be generally uniform. This suggests that any situation that triggers a stress response, whether it be work-related stress, relationship stress, sporting contests, combat, and so forth may modulate intergroup trust, particularly when determinates of group membership are modulated by gendered facial coalitional cues.

Finally, our finding that stress increases distrust of outgroup members may help to explain how relations between groups can sometimes spiral out of control, even after seemingly minor events and lead to sustained intergroup bias and mutual distrust. Mutual trust is a critical component of peaceful intergroup relations. One can envisage a vicious feedback cycle in which negative events between ethnic (or other) groups produces stress (Bijleveld, Scheepers, & Ellemers, 2012). This then contributes to heightened intergroup distrust and negative attitudes, in turn leading to a higher likelihood of subsequent conflict and associated stressors. Notably, distrust of outgroup members is one of the strongest predictors of subsequent intergroup conflict (C. R. Ember & Ember, 1992). One further area of interest for future research is the extent to which the effect observed in this study extinguishes over time, and whether the effect is moderated by repeated stress exposure and/or by stress elicited in association with outgroup members. It also remains to be seen whether the effects of stress are pronounced in other situations in which outgroup coalitional membership is perhaps less relevant. For example, do individuals under stress perceive physically formidable males (whether ingroup or outgroup) as more threatening, or do they adopt a more vigilant stance towards unhealthy looking faces?

Stress is a pervasive feature of modern life (Smith, Johal, Wadsworth, & Britain, 2000), and understanding whether and how stress modulates and influences intergroup perceptions and behaviors is of relevance given that situations such as conflict, combat, job insecurity, policing, political elections, sporting contexts and social unrest are all invariably associated with stress and elevations in stress hormones (Harvey-Lintz & Tidwell, 1997; Morgan et al., 2000; Schuster et al., 2001; Smith et al., 2000; Stanton, LaBar, Saini, Kuhn, & Beehner, 2010; van der Meij et al., 2012). Such situations frequently promote ethnocentric and xenophobic attitudes and behaviors, sometimes with accompanying acts of extreme violence and hatred against outgroup members (Horowitz, 2001). Clarifying the role of stress and stress hormones in such attitudes and behaviors is therefore of utmost theoretical and practical importance.

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Conflicts of interest

The authors report no conflicts of interest.

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