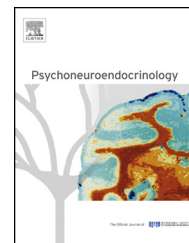




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Is stress affecting our ability to tune into others? Evidence for gender differences in the effects of stress on self-other distinction



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Summary Stress is a ubiquitous challenge in society as we consistently interact with others under the influence of stress. Distinguishing self- from other-related mental representations plays an important role for social interactions, and is a prerequisite for crucial social skills such as action understanding, empathy, and mentalizing. Little is known, however, about the effects of stress on self-other distinction. We assessed how acute stress impacts self-other distinction in the perceptual-motor, the affective, and the cognitive domain, in a male and female sample. In all domains, the results show opposing effects of stress on the two genders: while women showed increases in self-other distinction, men showed decreases. Our findings suggest that women flexibly disambiguate self and other under stress, enabling accurate social responses, while men respond with increased egocentricity and less adaptive regulation. This has crucial implications for explaining gender differences in social skills such as empathy and prosociality.

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Our daily lives are fraught with various stressors and we often need to interact with others while under the influence of stress – both at the workplace and in our private lives. Various cognitive processes – such as strategic reasoning, feedback processing, and reward sensitivity are affected by stressful situations (e.g., [Starcke and Brand, 2012](#)), and this presumably also affects social cognition and behaviour. Self-other distinction – the ability to distinguish self- from other-related mental representations – is a particularly important socio-cognitive skill, in a variety of domains. In the perception-action domain, self-other distinction is required to control automatic imitative tendencies, to enable smooth and flexibly regulated cooperative interactions ([Wang and Hamilton, 2012](#)). In the domain of empathy, failing to maintain the boundaries between one's own and another's emotions can result in personal distress. This self-centred response prevents other-oriented empathic responding and negatively affects prosocial behaviours ([Batson, 1987](#); [Eisenberg et al., 1989](#); [Singer and Lamm, 2009](#)). Self-other distinction is also crucial in more high-level cognitive processes such as perspective taking – as perceiving the world in another's stead requires to be able to disentangle one's own views and intentions from those of the other ([Epley et al., 2004](#)).

Surprisingly little, though, is known about how stress affects self-other distinction and our ability to understand others. Stress is an essential psychobiological mechanism in which additional resources are recruited by the human organism to react to demanding circumstances ([Dickerson and Kemeny, 2004](#)). From this observation, different predictions on how stress might affect self-other distinction can be made. For one, as stress is known to result in a fallback on processes and behaviours that are less resource demanding ([Starcke and Brand, 2012](#)), stressed individuals may default to more self-related or "egocentric" processes, which is less resource demanding than also taking into account the mental states of others (e.g., [Epley et al., 2004](#)). In this case, self-other distinction would be decreased under stress. On the other hand, concepts such as the "tend-and-befriend" hypothesis posit that stress leads to increases in prosocial and affiliative behaviour ([Taylor et al., 2000](#)). Stress might therefore motivate us to act in a more other-oriented manner, using social support as a stress coping strategy. Such a strategy would predict improvements in self-other distinction, as this would facilitate understanding of others and increase accurate social responding and behaviour.

While there is no specific experimental evidence on how stress modulates self-other distinction, prior evidence on the effects of stress on social cognition and emotion has been rather inconsistent. For instance, social cognitive abilities have been shown to either improve or decrease under stress, and that this depends on an individual's magnitude of their cortisol response. Notably, these effects were also modulated by gender ([Smeets et al., 2009](#)). From attention research, though, there is evidence that perceptual self-other distinction is reduced under threat ([Ma and Han, 2010](#)). In contrast, the tend-and-befriend hypothesis suggests that prosocial and affiliative behaviour increases in stressful situations ([Taylor et al., 2000](#)). Originally only stated for women, a more recent finding by our group indicates that men also show stress responses that can be interpreted in line with a tend-and-befriend pattern ([von Dawans et al., 2012](#)). In the domain of social emotion research, experimen-

tal evidence is very scarce – with only one recent study showing that higher anxiety is associated with reduced empathic abilities ([Negd et al., 2011](#)).

To close that gap of knowledge, we therefore used a standardized laboratory stressor task to assess how acutely induced psychosocial stress affects self-other distinction (Trier Social Stress Test for Groups (TSST-G); [von Dawans et al., 2011](#)). Self-other distinction was investigated using tailored experimental tasks tapping into this ability on three different levels. These levels ranged from low-level perceptual-motor processes as the control of imitative response tendencies, to higher-level cognitive perspective taking. To tap into self-other distinction in the affective domain, we used a task recently developed by our group which enabled us to measure overcoming emotional egocentricity bias during empathic judgments. The choice of these tasks built up on recent developments in social cognitive neuroscience, pinpointing a common mechanism subserved by neural networks at the interface of the right inferior parietal and posterior superior temporal cortex enabling self-other discrimination in these different domains (e.g., [Decety and Lamm, 2007](#); [Santesteban et al., 2012](#); [Silani et al., 2013](#)). Because of previously documented gender differences in response to social stressors ([Smeets et al., 2009](#); [Seidel et al., 2013](#)), we explored the effects of stress on self-other distinction in a male and a female subsample, which had been matched for socio-cognitive skills. Based on prior research showing that higher anxiety is associated with reduced empathic abilities ([Negd et al., 2011](#)), we hypothesized that stress would lead to decreased self-other distinction in participants.

Furthermore, based on a lack of direct comparisons of genders in previous research in the same task paradigm (including in our own work; [von Dawans et al., 2012](#)), we aimed to explore whether men and women would show differences in the effects of stress on self-other distinction.

1. Methods

1.1. Participants

80 healthy participants (40 females) between 18 and 40 years were included in the study. Screening questionnaires were used to exclude participants who reported acute or chronic psychiatric illness, high social anxiety, taking prescription medication, abuse psychoactive drugs or alcohol, or smoked on a daily basis. Socio-cognitive abilities were determined, using the perspective taking scale and the empathic concern scale from the Interpersonal Reactivity Index (IRI; [Davis, 1983](#)), the Emotion Contagion Scale (EC; [Doherty, 1997](#)), and the Reading the Mind in the Eyes Test (RMET; [Baron-Cohen et al., 2001](#)). In order to assure similar basic socio-cognitive abilities in the sample, participants who showed scores above or below two standard deviations from the group mean in any of those assessments were excluded from participation. We chose the strict exclusion criterion of two standard deviations, in order to guarantee that participant' socio-cognitive abilities were closely matched. The Trier Inventory for the Assessment of Chronic Stress (TICS; [Schulz and Schlotz, 1999](#)) was used to control for individual differences in chronic stress as a possible confound. Female participants were not using hormonal contraceptives and participated in the experiment during their luteal phase of the menstrual cycle, as it has been shown that cortisol responses

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