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Neural responses to social evaluative threat in the absence of negative investigator feedback and provoked performance failure

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Social stress, elicited by as diverse experiences as childhood maltreatment and urban living, is a crucial risk factor for a broad range of mental disorders, including major depressive disorder, anxiety disorders, and schizophrenia. Numerous studies in animals and humans suggest that social stress experiences increase the risk for psychopathology through maladaptive changes in brain regions involved in emotion and stress regulation, especially in the perigenual anterior cingulate cortex (pACC) and the amygdala. Functional magnetic resonance imaging (fMRI) during social stress induction has been instrumental in elucidating the neural basis of stress-related mental disorders. However, existing fMRI social stress paradigms include methodological limitations. In recent operationalizations, the subject typically is to solve a cognitively challenging task while being observed and evaluated by a panel of putative experts, and task difficulty is automatically adjusted to provoke failures, which often culminates in harsh negative feedback by the evaluator panel. Although such tasks are effective in eliciting a stress response, their application in a wide range of study designs is limited. Forced failure and false feedback by fake experts require thorough debriefing after the experiment, and thereby hamper repeated application in longitudinal study designs. The provided intense negative feedback can result in strong physiological and emotional responses of the participants, which limit application in psychiatric patient populations. In addition, in existing paradigms, stress and control conditions often differ in more than social evaluation, for example, also in time pressure or task difficulty, which restricts internal validity. Within the framework of this thesis, we introduce a less intense and arguably more internally and ecologically valid fMRI social stress paradigm (IMaging Paradigm for Evaluative Social Stress, IMPRESS) in which subjects anticipate, prepare, and give speeches. Task conditions differ only in the presence or absence of simulated social evaluation. Investigator feedback or forced performance failures are not implemented. We validated IMPRESS by replicating benchmark effects of social stress induction. IMPRESS significantly increased perceived arousal as well as adrenergic (heart rate, pupil diameter, and blood pressure) and hormonal (cortisol) stress measures. On the brain level, we observed increased activity in brain regions known to be involved in stress processing, including pACC and amygdala. Social evaluative threat-associated activation of the pACC correlated positively with measures of adrenergic arousal (heart rate and pupil diameter). Further, social evaluative threat-associated activation of the pACC and amygdala correlated positively with measures of established social environmental risk factors for psychopathology (adverse childhood experiences and urban living, respectively). Hence, IMPRESS induces psychological and physiological arousal responses to social evaluative threat, engages brain regions relevant for social stress processing and mental health, and is promising for application in psychiatric patients and in longitudinal study designs.