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Cognitive Bias in Interpretation of Ambiguity

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Biased interpretation of ambiguous situations has been supposed to contribute to the development and maintenance of affective disorders and the modification of cognitive biases is incorporated in prominent therapeutic approaches. But, experimental evidence for a mood-congruent negative bias in interpretation and the neural mechanisms leading to such a bias are not clear.
To indirectly assess interpretation biases we used the ambiguous-cue conditioning paradigm and first, tested 6 congenitally non-helpless (cNLH) and helpless (cLH) rats, an animal model of depression, in a spatial version of the paradigm (study 1). Second, we translated the paradigm to human research testing healthy participants: 21 in study 2, where we additionally investigated event-related potentials that are involved in conflict, valence and salience processing by using electroencephalography (EEG); and 24 participants in study 3, where we explored the neural correlates of decision-making under ambiguity using functional magnetic resonance imaging (fMRI) and psycho-physiologic interaction (PPI) analyses. Furthermore, we assessed current mood, state and trait anxiety, depression and rumination via questionnaires.
In the spatial version of the ambiguous-cue conditioning paradigm cLH animals showed a negative bias which corresponds to previous literature and underlines their depression-like phenotype. The studies with healthy human participants revealed an association of interpretation bias and rumination. Participants displaying high reflective coping style responded more negatively to ambiguous cues (study 2). A hierarchical regression (study 3) revealed that trait anxiety and rumination predicted interpretation bias while current affect and depression did not account for additional variance in healthy participants. The EEG results revealing smaller amplitudes of the late positive potentials for ambiguous vs. learned stimuli suggested less emotional salience ascribed to ambiguous compared to the reward- and punishment-related stimuli. In the fMRI data, we observed increased activity in anterior insula, midfrontal cortex and supplementory motor area for ambiguous vs. learned stimuli. Connectivity between anterior insula and anterior cingulate cortex was modulated by ambiguity with strengthened coupling for high ambiguous stimuli.
These studies provide evidence that the ambiguous cue-conditioning paradigm is a valid procedure for assessing the influence of affective state on decision-making under ambiguity (interpretation bias) in animals and humans. Both, the EEG and the fMRI results point to a relevance of the salience network in decision-making under ambiguity.