Humans engage in deceptive behavior that negatively affects others. The propensity to deceive is, however, characterized by vast inter-individual heterogeneity that is poorly understood. Attempts to investigate the origins of this heterogeneity have so far mainly relied on subjective measures and have shown little predictive power. Here, we used resting electroencephalography to measure objective and stable individual differences in neural baseline activation in combination with an ecologically valid deception paradigm. Results showed that task-independent baseline activation in the anterior insula, a brain area implicated in mapping internal bodily states and in representing emotional arousal and conscious feelings, predicts individuals’ propensity for deceptive behavior. The higher the neural baseline activation in this area is, the lower individuals’ propensity to deceive. Moreover, results provide evidence that high baseline activation in the anterior insula is associated with negative affect and dispositional tendencies to avoid aversive emotional situations. These results provide converging neural and psychological evidence that individuals might avoid a deceptive act due to a highly active negative emotional system which would make a deceptive act too stressful and bothersome.