Neurological signatures of social influence

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Humans often change their beliefs or behavior due to the behavior or opinions of others. Here we show, using various neuroimaging, that social conformity is based on mechanisms that comply with principles of reinforcement learning. Using functional magnetic resonance imaging we show that conflict with group opinion triggers a neuronal response in the posterior medial frontal cortex and the ventral striatum similar to the ''prediction error'' signal suggested by neuroscientific models of reinforcement learning. We also demonstrate that the transient downregulation of the posterior medial frontal cortex by theta-burst transcranial magnetic stimulation reduces conformity, as indicated by reduced conformal adjustments in line with group opinion. Both the extent and probability of conformal behavioral adjustments decreased significantly relative to a sham and a control stimulation over another brain area. Finally we tested the hypothesis that conflicts with a normative group opinion evoke a feedback-related negativity (FRN) often associated with performance monitoring and subsequent adjustment of behavior. A mismatch between individual and group opinions triggered a frontocentral negative deflection with the maximum at 200 ms, similar to FRN. Overall a conflict with a normative group opinion triggered a cascade of neuronal responses: from an earlier FRN response reflecting a conflict with the normative opinion to a later ERP component (peaking at 380 ms) reflecting a conforming behavioral adjustment. By and large, our findings provide evidence that social group norms evoke conformity via learning mechanisms reflected in the activity of the posterior medial frontal cortex and ventral striatum.