

Assigning Value to People - Role of Posterior Cingulate Cortex and Amygdala

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The valuation system in the brain has been a central target of neuroeconomics research in recent years. A basic premise in economic theories is that the value assigned to rewards is essentially subjective and reflects personal preferences. In addition, a predominant feature of a social economic exchange is the representations of others' mental states, required, for example, for social agency assignment and outcome credit. However, another key feature that has been relatively neglected is the underlying evaluation of another human being. Such evaluation is a prerequisite for any decision or action in a social context and is often being performed rapidly and based on very few and at times conflicting pieces of information.

The present study sought to look beyond evaluations of inanimate reinforcers (e.g. monetary rewards) or others' actions (e.g. monetary investments), and investigate the process of evaluating others in a social context. To this end, we measured BOLD signals during exposure to different person profiles. Each profile consisted of varying degrees of positive and negative information. In each profile presentation, there was a gradual transition from positive to negative information or vice versa. Subjects were requested to form an impression of each person using an evaluation scale. These responses were used to determine which information was subjectively significant, influencing their impressions (evaluation-relevant), and which was disregarded (evaluation-irrelevant). We then looked for brain areas responding differentially to these different types of information.

We found that the posterior cingulate cortex (PCC) was selectively engaged during the presentation of the information that was consistent with subsequent impression (evaluation-relevant). Importantly, this activation corresponded only to information that was subjectively meaningful and not to its objective (positive or negative) valence as pre-defined in a pretest. For example, stronger responses in PCC were seen during the presentation of a positive segment of a person profile, as opposed to the negative segment, only when the subsequent evaluation was positive as well. Another area showing a similar pattern of results was the amygdala, an area that has long been implicated in assigning value to neutral stimuli predictive of motivationally significant outcomes.

Further analysis revealed that amygdala responses scaled with the level of evaluation, i.e., the higher the evaluation, the higher the responses to the corresponding segment of information (either positive or negative). Interestingly, such correlation was seen in the PCC only for positive evaluations. Activation in PCC has been previously shown to scale with the subjective value of immediate and delayed rewards as well as with other people's actions in a social exchange. The present result is consistent with

these findings and further suggests that the PCC encodes primarily positive subjective value of social information subsequently used for evaluations of social others.

Taken together, it appears that evaluations of others is done by way of assigning subjective value to the segments of information they socially exhibit. This integrated activity, carried out predominantly by the amygdala and PCC, might provide critical information on the social context for decision making in economic exchanges.