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The default self: feeling good or being right?

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The medial prefrontal cortex exhibits a higher resting metabolic rate than many other brain regions. This physiological default mode might support a psychological default state of chronic self-evaluation that helps people consider their strengths and weaknesses when planning future actions. However, a recent imaging study that relates medial prefrontal cortex activity to self-evaluation raises new questions about whether the psychological default mode of self-evaluation is best characterized by accurate self-evaluations or by feeling good about yourself.

Introduction

Neural investigations of self suggest an intriguing relationship between the resting physiology and the psychological function of the medial prefrontal cortex [1–5]. The medial prefrontal cortex has a higher level of baseline metabolism in comparison with many other brain regions [5]. The baseline physiological difference in the medial prefrontal cortex has been theorized to reflect a baseline psychological characteristic of the mind when it is not otherwise engaged in a specific task. The increased resting metabolism of the medial prefrontal cortex might support a generalized, automatic evaluation of self [5]. This default psychological mode promotes the consideration of one's strengths and weaknesses so that future actions can be planned in light of these qualities. The association between self-evaluation and medial prefrontal cortex has been supported primarily by studies that compare judgments about the self with judgments about other social objects or low-level characteristics of stimuli (e.g. a self-reference paradigm) [1–4]. In these studies, self-judgments (e.g. descriptiveness of personality traits) are associated with changes in medial prefrontal activity. A recent fMRI study by Moran *et al.* extends this research by investigating whether medial prefrontal cortex is associated with cognitive aspects or emotional aspects of self-evaluation [6]. In other words, is medial prefrontal cortex recruited for

evaluations of the self because those evaluations draw on a particular cognitive process or because those evaluations involve emotional biases that paint the self in an unrealistically positive manner?

Medial prefrontal cortex: a default mode of cognitive self-evaluation

Moran *et al.* recently examined the neural underpinnings of cognitive and emotional processing in relation to the self by scanning participants while they used a four-point scale (from 1 = not at all like me, to 4 = very much like me) to rate themselves on a series of positive (e.g. sincere) and negative (e.g. liar) personality traits [6]. There were three main findings. First, increases in medial prefrontal cortex and posterior cingulate activity over time were related to increases in self-description ratings. Second, response latencies were not associated with medial prefrontal cortex, which suggests that this region does not simply index time spent on the task. Third, medial prefrontal cortex and posterior cingulate activity were related to cognitive processing (high versus low self-description ratings), whereas activity in the ventral anterior cingulate was related to emotional processing (positive versus negative traits), particularly for highly self-descriptive traits (Figure 1a). These findings refine our understanding of medial prefrontal activity and self-evaluation [1–4]. This area is recruited for cognitive aspects of self-evaluation, such as judging the descriptiveness of personality traits, and is not recruited for emotional aspects of self-evaluation, such as favoring positive information over negative information.

The 'psychological' default mode of self-evaluation

The study by Moran *et al.* [6] furthers our understanding of the default mode of self-evaluation associated with medial prefrontal cortex, but it also presents a puzzle. Is the normative, default mode of self-evaluation characterized by accurate information gathering or by a biased search for flattering information? As stated earlier, the increased resting metabolism of the medial prefrontal cortex is theorized to support a default psychological mode of self-evaluation that provides chronic, generalized updates on

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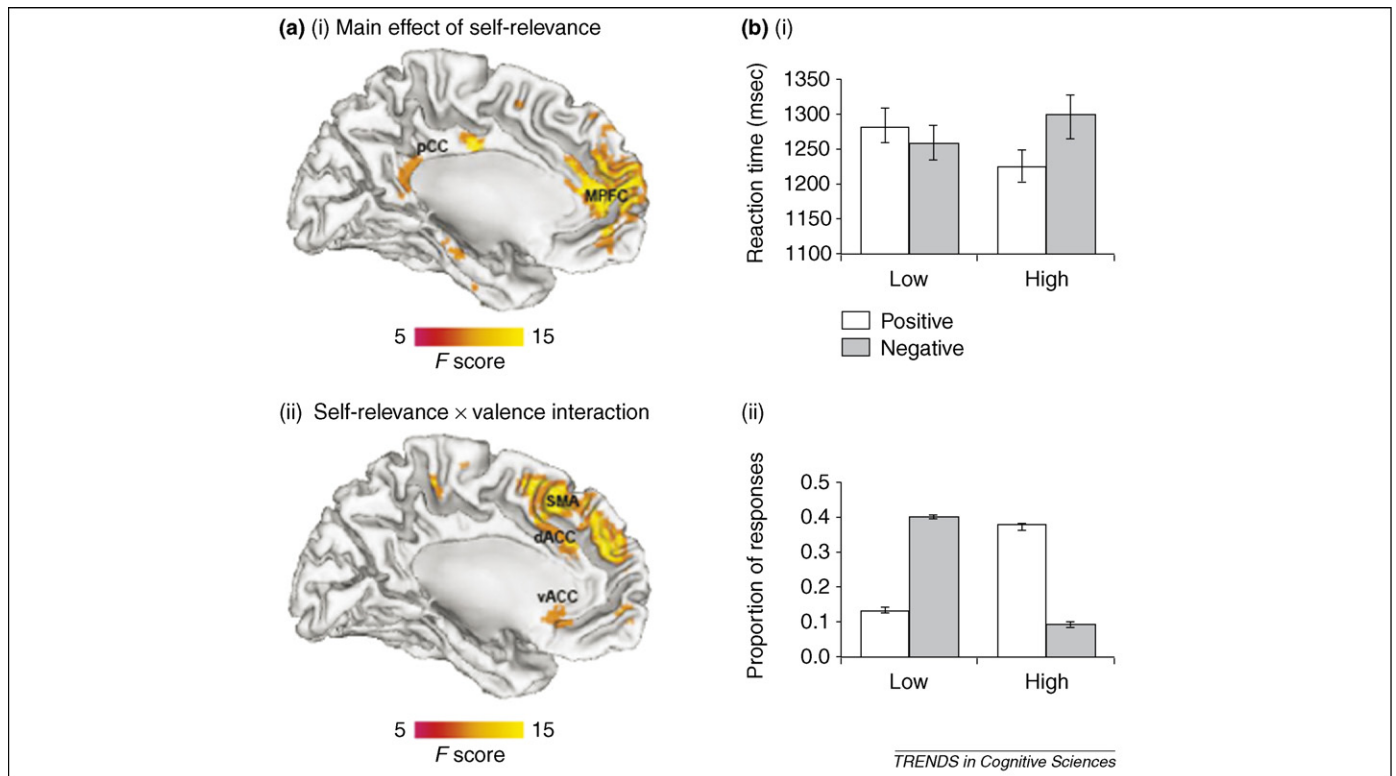


Figure 1. Brain areas associated with self-description and valence. **(a)** (i) The medial prefrontal cortex (MPFC) and posterior cingulate cortex (pCC) were associated with high versus low self-description judgments. (ii) Ventral anterior cingulate cortex (vACC) is recruited for evaluating positive traits in comparison with negative traits, particularly when the traits are highly descriptive. Additionally, the tendency to respond more slowly to highly descriptive negative traits and to non-descriptive positive traits was associated with increased activity in dorsal anterior cingulate (dACC) and the supplementary motor area (SMA) (both pictured), as well as bilateral lateral prefrontal activity. **(b)** (i) Participants' reaction times were arguably more differentiated for positive and negative traits in the high self-description condition. (ii) Participants were more likely to include positive descriptors as highly self-descriptive and dismiss more negative descriptors as not descriptive of the self. These findings were originally reported in Moran *et al.* [6].

the self. These automatic self-evaluations promote adaptive behavior by using 'cognitive downtime' to evaluate one's strengths and weaknesses, which can be taken into account when responding to future situations [5]. If the self-evaluations that are supported by medial prefrontal cortex are adaptive, then they should be accurate and unbiased. However, the pattern of self-relevance judgments found by Moran *et al.* is typically considered to be biased towards the positive; participants include more positive traits in their highly self-descriptive judgments and rate negative traits as less essential to self [6] (Figure 1b). Moran *et al.* examined positivity bias by comparing the positive trait condition with the negative trait condition (main effect of valence), as well as examining the interaction of self-description and valence. What if participants maintain self-esteem by biasing their evaluations of traits that deviate from neutral valence in either a positive or a negative direction? In this case, a common psychological mechanism might lead to the evaluation of positive attributes as important and negative attributes as irrelevant. The behavioral findings from Moran *et al.* [6] suggest that such a mechanism is most activated for highly self-descriptive traits. Positive traits are attributed to the self in the same proportion that negative traits are considered irrelevant, yet the reaction times for positive compared with negative information seem more differentiated in the high self-description condition (when compared with the low-rating condition; Figure 1b). A main effect of

medial prefrontal cortex activity in relation to the self-description condition (rather than an interaction with valence) might still reflect biased self-evaluation because the bias might be exerted on both positive and negative words through a common mechanism that is activated when information is highly self-descriptive. Future studies using the self-reference paradigm might include a neutral personality-trait condition and use the interaction analyses approach from Moran *et al.* to look at the interaction of self-description with positive, neutral and negative personality traits.

Future directions on neural investigations of the self

The inclusion of a neutral trait condition in a self-reference paradigm should shed light on whether positivity bias involves the distortion of positive information or the distortion of both positive and negative information; however, this approach will not address whether participants' tendency to claim positive attributes and dismiss negative attributes reflects their true personalities or unrealistically positive self-views. Another important step for neural investigations of self will be research that adopts paradigms that are better suited for examining the neural systems that support the accuracy and unrealistic inflation of self-views. These findings should not only expand current neural investigations of self but also have implications for a longstanding debate on whether accurate self-evaluations or positive illusions are normative [7–9]. Although

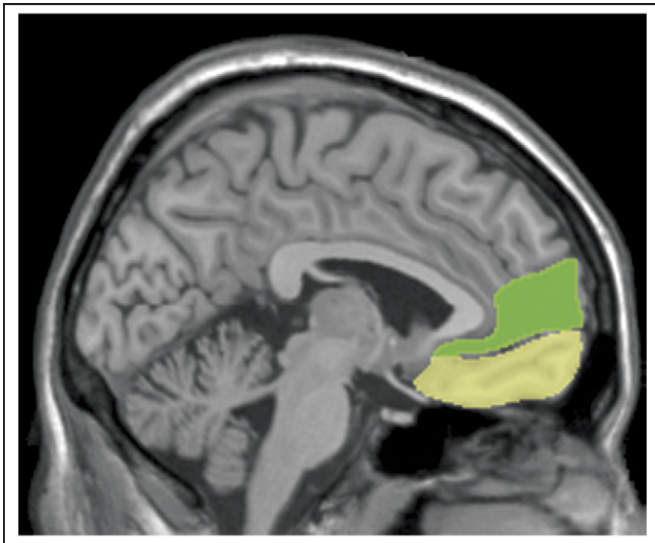


Figure 2. Subregions within the prefrontal cortex that are associated with self-evaluation and self-evaluation accuracy. Medial prefrontal cortex, green; orbitofrontal cortex, yellow.

further research is needed, one study suggests that accuracy is supported by another region of the frontal lobes, the orbitofrontal cortex (for a distinction between medial prefrontal cortex and orbitofrontal cortex, see Figure 2). This study compared patients who had orbitofrontal lesions, patients who had lateral frontal lesions and healthy controls and found that patients who had orbitofrontal-cortex damage reported unrealistically positive self-views of their social skills when their self-reports were compared with expert judges' evaluations of social skill [10]. Therefore, future research that addresses the question of self-evaluation accuracy might begin by investigating the mechanism by which orbitofrontal cortex supports accurate self-views. Why are self-perceptions unrealistically positive when orbitofrontal cortex is not recruited? Do the illusions of the self-perception system arise from bottom-up assumptions made by a default mode of the social-cognition system, just as visual illusions can arise from assumptions in the visual system [11]? In this case, the orbitofrontal cortex might be necessary to attenuate the unrealistically positive default mode of self-perception in relation to contextual constraints. This explanation would be consistent with research that associates monitoring [10] and inhibitory

[12] functions with the orbitofrontal cortex. Or do positive illusions arise when negative information is suppressed by the executive control system? This explanation would be consistent with research that associates the orbitofrontal cortex with the processing of negative information (e.g. Ref. [13]). In this case, self-perceptions filtered through rose-colored glasses might result from top-down processes that do not engage or actively suppress orbitofrontal function.

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