Why do mOFC patients discount the future steeply?

Elisa Ciaramelli, Manuela Sellitto, Giuseppe di Pellegrino
Centro di studi e ricerche in Neuroscienze Cognitive and Dipartimento di Psicologia,
Università di Bologna, Italy

In a the comment to our paper "Myopic discounting of future rewards after mOFC damage in humans" (Sellitto et al., 2010), Peters elaborates two candidate processes through which mOFC may exert its influence on intertemporal choice: prospection and valuation. We concur with his assessment. A crucial question, now, is whether mOFC patients are incapable of envisioning future outcomes, or rather of factoring the value of competing options during decision-making.

We have proposed recently that poor self-projection, the ability to pre-experience future events (Buckner and Carroll, 2007), may underlie shortsighted behavior in patients with ventromedial prefrontal damage (Ciaramelli and Di Pellegrino, 2011). Shortsighted behavior is not confined to economic decision-making in mOFC patients. Consider, for example, moral decision-making. If required to decide whether or not to push a person onto the tracks to stop an oncoming train that would otherwise kill five people (the footbridge dilemma), mOFC patients are more likely to respond affirmatively than healthy subjects and patients with brain lesions outside the frontal lobe (Ciaramelli and Di Pellegrino, 2011). This suggests that mOFC patients value the immediate gain of saving five lives disproportionately more than the future consequences of their choice, which includes feelings of guilt and remorse, and punishment, for having killed a man. mOFC patients may not be able to envision detailed future outcomes, capable of competing with present outcomes during (economic as well as moral) decision-making.

Consistent with this view, self-projection relies on a network of brain regions along the midline, including mOFC, strongly activated during imagination of future events (Buckner and Carroll, 2007). mOFC is functionally connected to the medial temporal lobe when individuals imagine themselves in the future, and may support the construction of mental models of hypothetical scenarios (Andrews-Hanna et al., 2010) for intertemporal choice (Peters and Buchel, 2010). Accordingly, healthy individuals can reduce impulsive discounting by imagining future events (Peters and Buchel, 2010). Interestingly though, an amnesic patient was recently described with impaired self-projection but spared temporal discounting (Kwan et al., 2010). Further work is therefore needed to reveal the relation between self-projection, temporal discounting, and the operations of mOFC.

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