

The higher-order view does not require consciously self-directed introspection: response to Malach

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Malach [1] quotes us as defining higher-order representations as “mental states that represent oneself ...”. His ellipsis in this quotation is unfortunate because it creates the misleading impression that higher-order representations are mainly focused on representing the self. Instead, we defined higher-order representations as mental states that “represent oneself as being in particular perceptual states”, and emphasized that such higher-order representations need not be themselves conscious [2]. On the view we put forward [2], a perception is conscious only if there is a higher-order representation that one has that perception, but that higher-order representation is itself rarely conscious (Figure 1a). Our view does not imply that conscious perception requires consciously self-directed introspection (Figure 1b). Ordinary conscious awareness is not attentively focused introspection and our view concerns primarily this kind of non-introspective conscious awareness. This confusion about the higher-order view lies at the heart of Malach’s critique.

It is therefore no problem for the higher-order view that frontal regions associated with consciously self-directed introspection [3] were less activated when subjects engaged in processing external stimuli in the Goldberg *et al.* study [1,4]. As our review made clear [2], these are not the brain regions that we hypothesized to be critical for perception to occur consciously (Figure 1). Distinct prefrontal areas require delineation no less than the various visual areas (e.g.[3]).

But even if one inappropriately lumps these distinct regions together loosely as “frontal regions”, it is unclear what the Goldberg *et al.* [4] results tell us. For all we know, even when not actively processing external stimuli, subjects may have stimulus-irrelevant but nonetheless vivid conscious visual imagery – about lunch, holidays, etc. The uncontrolled nature of these resting-state studies leads us to agree with Malach that “these observations are certainly not decisive in favoring one theory over the others” [1].

The other part of Malach’s argument is that when subjects are intensely ‘absorbed’ in processing visual input,

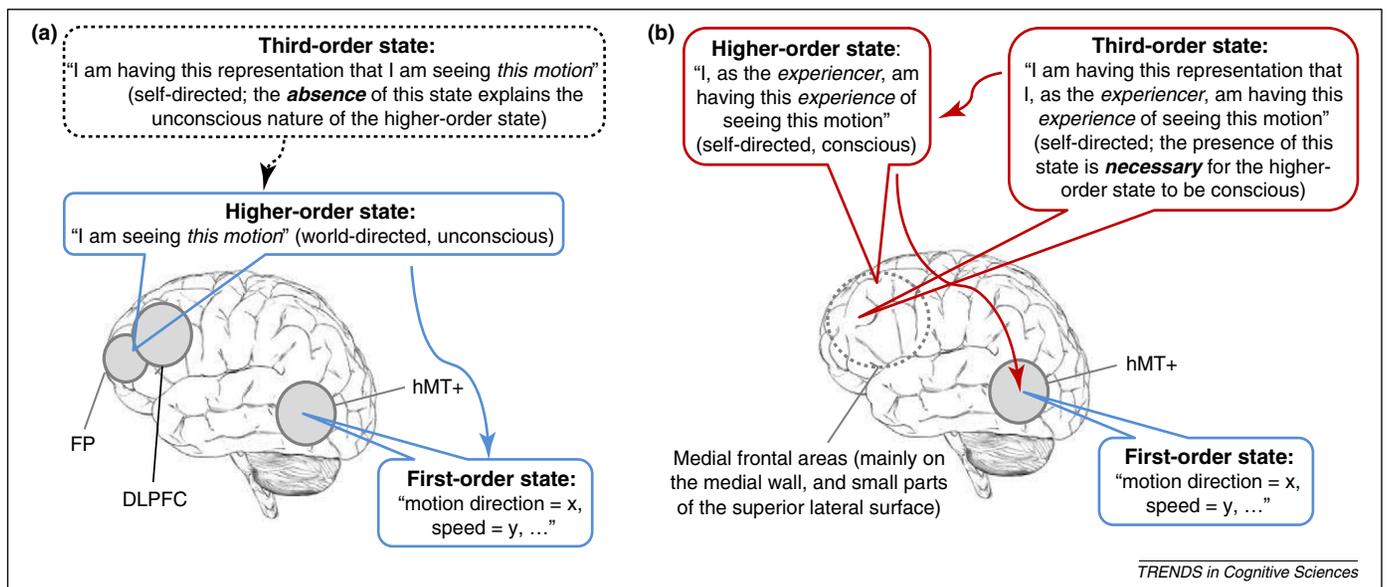


Figure 1. Schematic diagrams of (a) an interpretation of the higher-order view of typical conscious perception, and (b) a common misinterpretation, which elides the difference between ordinary non-introspective conscious awareness and consciously self-directed introspection.

this may leave little room for metacognition – perhaps even implicit metacognition [1]. To the extent that dorsolateral prefrontal cortex (not the medial regions relevant for consciously self-directed introspection [3]) deactivates under these circumstances, one may indeed expect conscious awareness of perceptions to be less detailed. As stated in our review [2], however, the Goldberg et al. [4] findings are compatible with this prediction, even if we wrongly elide the difference between the previously reported region and dorsolateral prefrontal cortex.

We do agree with Malach on the point that current evidence contradicts the view that (feedback to) V1 is necessary for conscious perception [5]. Along with others [6,7], Malach has taken exception to this view, and he holds that it is activity in ‘non-retinotopic’ extrastriate visual areas that are critical [1]. This variant of the first-order view is indeed immune to some of our arguments against V1-based first-order views. However, it does not follow that this view is “compatible with available experimental data derived from the human brain” [1]: we have provided in our recent work other evidence against it [8,9], by showing, for instance, that stimulation of the human prefrontal cortex impairs conscious perception [10].

Certainly, more data are still needed. However, it is also crucial to be clear about what the different theories entail.

Letters

Gender and social environment modulate the effects of testosterone on social behavior: comment on Eisenegger *et al.*

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Eisenegger and colleagues [1] recently published in this journal an important review on the role of testosterone (T) in social interaction. We agree with the main premise of the article that T is related to status-seeking (see [2] for a previous review that drew a similar conclusion). The authors, however, overlooked the important roles of gender and social environment in moderating testosterone-behavior associations. Also, some of the references were incorrectly cited, and correcting these in fact bolsters the authors’ theoretical position.

Testosterone and human aggression

In their review, the authors concluded there is “no evidence for a direct causal link between testosterone administration and laboratory measures of non-physical aggression in humans” ([1], p. 264). This conclusion, however, is based exclusively on studies conducted in women-only samples and is therefore misleading. Studies that support a causal

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link between T and aggression (assessed using validated behavioral tasks) in men were not included in the review [3,4]. Although more carefully controlled pharmacological challenge experiments are certainly needed, a more appropriate conclusion based on the available literature is that T may play a more prominent role in reactive aggression among men.

Testosterone’s influence on behavior depends on the social environment

We believe that recent studies of the relationship between circulating T and status [5–10] have been instrumental in laying the theoretical and conceptual groundwork for studies on the effects of T administration on social behaviors, yet the key insights from these studies are not discussed in [1]. Even though many of these articles are cited in the review, they are cited incorrectly or inappropriately. For example, some studies are cited as supportive of an effect of competition outcome on changes in T, when in fact none of these studies measured changes in T

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