Postdiction and the Speed of Consciousness

A commentary on: Stephen M. Fleming & Matthias Michel: Sensory Horizons and the Functions of Conscious Vision

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Abstract:

A central plank of Fleming and Michel's thought-provoking paper is that postdiction reveals a lower bound for the speed of consciousness, showing that perceptual awareness is slow and motivating their perceptual reality monitoring theory of consciousness. The plank cannot bear the weight: Postdiction neither demonstrates a lower bound for the speed of consciousness nor shows that awareness is slow.

Main Text:

In postdiction, perceptual experience of an initial, target stimulus is seemingly altered or eliminated by a second stimulus, despite presentation after target onset. In metacontrast masking, a mask presented 70ms after a target apparently renders the target invisible (Breitmeyer & Öğmen, 2006). In other cases, the second stimulus does not eliminate but modulates target awareness: colinear lines may appear misaligned due to a rectangle presented 200ms after line onset (Sugita et al., 2018); and a stream of verniers may appear as fused, contingent on the presentation of an anti-vernier within 450ms (Drissi-Daoudi et al., 2019). Fleming and Michel also discuss attentional effects, such as 'retro-perception' in which, as they see it, an attentional post-cue presented within 400ms, "postdictively determines [a] target's conscious or unconscious fate" (Sergent et al., 2013; Thibault et al., 2016). Here though, Thibault et al.'s mixture-model modelling approach rests on faulty assumptions (Schurgin et al., 2020) and retro-cueing is better understood in terms of a decaying memory trace consolidated by a valid cue (Cohen et al., 2023).

According to Fleming and Michel, postdictive effects show that "conscious perception does not generally occur before 350ms after stimulus onset". Given such sluggishness, they infer that its purpose cannot be online action-guidance. Are they right? Does postdiction show that consciousness is slow? In arguing their case, Fleming and Michel make two implicit assumptions. First, that we can ascribe a single speed to the conscious perception of a target (once context, eccentricity and attention are fixed). Second, that there is a single, determinate moment when signals reach consciousness (a Cartesian 'finish line'; Dennett & Kinsbourne, 1992). Both assumptions should be rejected. There is extensive evidence that target – and especially motion –

detection unfolds faster than feature discrimination, and that different features are discriminable at different speeds. Moreover, just as signal detection theorists have long discarded the idea of a threshold above which signals are perceived and below which not, we should equally give up the idea that there is some privileged moment at which perceptual processing delivers its first and final report to consciousness.

Dispensing with these assumptions, there is no inconsistency between postdiction and a model on which conscious perception is rapid but initially partial and unsettled—prone to subsequent enrichment and revision. Such a model secures the best of both worlds: "a continuous and dynamic process of perception and planning" in which information is continuously integrated over time and yet results are made rapidly available for perceptual action guidance.

Does this account make an objectionable 'overflow gambit', allowing for the rapid conscious perception of targets only at the price of denying their cognitive inaccessibility? I do not think so.

First, it is unclear that overflow is objectionable. Fleming and Michel claim that overflow is contradicted by data from Cowan and Greenspahn (1995). Cowan and Greenspahn presented subjects with displays comprising either two successive targets on the left (50% trials), or a target on the left and then a target on the right—generating a percept of continuous motion. Subjects were cued to respond rapidly either when the target reached the endpoint or when it passed the midpoint. According to Fleming and Michel: "The overflow gambit predicts that subjects should respond faster in the end point condition [since] subjects should first perceive the target at the end point, and then perceive the apparent motion only after this." Reaction times, however, were the same across conditions. But the overflow theorist is not committed to the falsified prediction. An alternative possibility is discussed by Cowan and Greenspahn (1995: 548). On this, information about motion becomes available at the very same time as information about the location of the second target. This leads to rapid awareness of the second target and also to a pure (i.e., location independent) motion percept (Nakayama, 1985). In the endpoint condition, subjects respond as soon as they see the second target; in the midpoint condition, they respond on the basis of the pure motion percept—with no significant difference in reaction times. Once further motion processing has taken place, this partial experience is updated to include continuous motion from left to right.

Second, Fleming and Michel do not consider the possibility that subjects might be rapidly conscious of unmodulated targets *and briefly cognitively able to access them*. Yet, there is evidence of exactly this. Lachter and colleagues found that a subject's ability to discriminate target-mask from mask-mask pairs in a metacontrast paradigm was dependent on how rapidly they responded (Lachter et al., 2000; Lachter & Durgin, 1999). When making speeded responses, subjects performed much better than when responding slowly, suggesting that information was briefly cognitively available before being lost. In general, then, a model on which postdiction revises our awareness does not mean that early editions are not fleetingly accessible.

Fleming and Michel will doubtless claim that such speeded responses are driven by unconscious perception. But this cannot be assumed at this stage in the dialectic. We are told that "a wealth of evidence supports the view that online action control can be achieved unconsciously". However, this view should not be regarded as settled science. Significant controversy rightly continues to attend alleged unconscious action guidance in visual form agnosia (e.g., Schenk, 2012; Rossetti et al., 2017), dissociations between action and perception in visual illusions (e.g., Kopiske et al., 2016), performance/awareness dissociations in blindsight (e.g., Overgaard, 2011; Phillips, 2021), and other influential cases. The upshot is that the hypothesis that the perceptual information used to guide rapid actions is conscious remains very much on the table—and with it the idea that one central function of consciousness is online action guidance.

Competing Interests

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