Postdictive suppression of visible stimuli in backward masking: Dissociation between initial and postdictive perception

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Timeline theory of perception (Hogendoorn, 2022) proposes that perceptual mechanisms represent not a single timepoint, but a dynamic timeline updated by prediction and postdiction. Inspired by this view, we investigate whether a masked primer in backward masking—a phenomenon where a briefly presented stimulus becomes invisible due to a subsequent mask—might be initially available to conscious perception and later suppressed postdictively.
We conducted two experiments using a modified apparent motion interference paradigm (n=7, 560 trials). Apparent motion was induced by presenting two briefly flashed squares in succession, the second of which was sometimes followed by a mask that prevented the perception of apparent motion. A target character ('C' or mirror-reversed 'C') was then presented either in the same or opposite direction relative to the apparent motion.
In Experiment 1, participants performed a speeded two-alternative forced choice (2AFC) task to identify the character, regardless of its location. In the no-mask condition, reaction time (RT) was significantly shorter when the target appeared in the same direction as the apparent motion than in the opposite direction ($p = 0.016$, signed-rank test), with an average RT difference of 22 ms. However, in the mask condition, where the mask disrupted perception of the second square and hence the motion, this RT difference was abolished ($p = 0.93$).
In Experiment 2, participants performed a simpler 2AFC task judging only the location (left or right) of the target, irrespective of its identity. The motion-congruent RT advantage was observed in both no-mask and mask conditions (no-mask: $p = 0.016$; mask: $p = 0.016$). In the no-mask condition, RTs were on average 35 ms faster for targets in the same direction as the apparent motion compared to the opposite direction; in the mask condition, an advantage of 26 ms was observed. Overall, character discrimination required longer RTs than location discrimination.
These results suggest that the masked primer was initially perceived and influenced early responses, but was postdictively erased and no longer influenced slower perceptual reports. Our findings provide behavioral evidence for the postdictive revision of perceptual experience and support the concept of a continuously updated perceptual timeline.

Keywords: Backward masking, Postdiction, Perceptual timeline