



Presubmission Inquiry

Dear Dr. North,

We are writing to inquire if our manuscript, titled “Dynamic Predictive Templates in Perception,” would be suitable for submission to Current Biology.

Our study investigates the computational mechanisms of false alarms. False alarms occur when participants perceive stimuli that are not present. They share this feature with hallucinations, where have vivid conscious experiences that unfold in the absence of a corresponding stimulus. Because of these parallels, false alarms are one of the most influential experimental models for studying the symptoms of psychotic disorders such as schizophrenia. So far, however, two key questions have remained unanswered: First, to serve as a valid proxy for hallucinations, false alarms need to be more than just erroneous reports of a signal; they must reflect perceptual experiences that have identifiable *content*. Second, false alarms should occur at a timescale that is compatible with the *temporal dynamics* of hallucinations¹.

In this work, we address and resolve these questions in a novel analytical paradigm that combines Hidden Markov Models^{2,3} with a classification image approach⁴. We demonstrate that false alarms are more likely to occur during an internal mode of perception—a state where the content of perception is heavily biased by previous experiences. Our findings reveal that:

1. False alarms are driven by predictive templates, which are formed based on prior experiences, reflect specific identifiable content, and distort the perception of noisy inputs into apparent signals.
2. These predictive templates fluctuate over time, mirroring the dynamic nature of hallucinatory experiences. Our study shows that the internal mode, which is associated with a higher rate of false alarms, alternates with the external mode at a timescale compatible with the duration of hallucinations.

We believe our work will be of significant interest to the readers of Current Biology, as it provides a novel mechanistic understanding of how perceptual experiences are shaped by past stimuli and how this process relates to hallucinations in psychosis. Our findings suggest new avenues for therapeutic strategies aimed at mitigating hallucinatory experiences by targeting the neural mechanisms underlying the internal mode of perception. We propose this manuscript as a Report, but one that could easily fit within the space confines of a Correspondence, if needed. As potential reviewers, we suggest the following experts: Anissa Abi-Dargham, David Burr, Karl Friston, and Megan Peters.

Thank you for considering our inquiry. We look forward to your response.

Sincerely,

Veith Weinhhammer, Yuki Murai, and David Whitney

1 Horga, G. et al. An integrative framework for perceptual disturbances in psychosis. Nature Reviews Neuroscience **20**, 763–778 (2019)

2 Ashwood, Z. C. et al. Mice alternate between discrete strategies during perceptual decision-making. Nature Neuroscience **25**, 201–212 (2022)

3 Weinhhammer, V. et al. N-Methyl-D-aspartate receptor hypofunction causes recurrent and transient failures of perceptual inference. BioRxiv 10.1101/2024.05.24.595590 (2024)

4 Murai, Y. et al. Serial dependence revealed in history-dependent perceptual templates. Current Biology **31**, 3185–3191.e3 (2021)