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To the Editorial Board of
Nature Human Behaviour

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Dear Sir or Madam,

We would be most grateful if you could consider our planned study "The Role of Inferior Frontal Cortex in Bistable Perception" authored by Veith Weilhhammer, Katrin Reichenbach and Philipp Sterzer for pre-registration in X Y.

One of the most debated topics in the neuroscientific study of consciousness concerns the question whether frontal brain regions are causally involved in conscious experience. Research on the intriguing phenomenon of bistable perception has repeatedly fuelled this controversy. In particular, an on-going debate revolves around the relevance of neural activity in inferior frontal cortex (IFC) for transitions between mutually exclusive perceptual interpretations elicited by ambiguous sensory input. While some authors propose a causal ("top-down") involvement of IFC for the emergence of such transitions during the resolution of perceptual ambiguity, others argue for an interpretation of IFC activity as a "bottom-up" consequence of changes in the content of conscious experience (Brascamp et al., Annu Rev Psychol 2018).

Our present work aims to resolve the apparent conflict between these two views. To this end, we draw on the proposal that the bottom-up and top-down views on the role of IFC in bistable

perception may be reconciled within the theoretical framework of predictive coding (Hohwy et al., Cognition 2008; Brascamp et al., Annu Rev Psychol 2018). Specifically, we suggest that IFC activity reflects prediction-error signals that are evoked by sensory evidence for the currently suppressed percept and drive transitions to the other respective percept during bistable perception. In a recent preliminary study using model-based fMRI, we provided first evidence supporting this idea (Weilnhammer et al., PLoS Comp Biol 2017). Here, we aim to provide direct empirical evidence for the hypothesis that IFC activity reflects prediction-error signals during bistable perception. To this end, we developed a highly original theory-driven approach based on computational modelling and a novel experimental paradigm for fMRI. This pre-registration provides pilot-data as a proof-of-concept of our experimental approach. Furthermore, we derive quantitative predictions for fMRI analyses using data stimulations.

All materials associated with this submission are available on an accompanying GitHub® repository (https://github.com/veithweilnhammer/Prereg_IFC_Bistability).

We believe that this work is suitable for publication in *XY* for the following reasons: Firstly, this study will introduce a novel experimental approach that will pave the way for new developments in the neuroscientific study of conscious perception. Secondly, we will empirically assess previous predictive-coding theorizations regarding the neural processes underlying bistable perception. The expected results will thus help to settle a long-standing debate regarding the role of frontal brain areas in bistable perception, and, more generally, in the inferential processes that give rise to conscious perception. By making an important contribution to a vibrant discussion on the neural underpinnings of consciousness, our study will therefore be of great interest to the broad readership of *XY*.

We look forward to hearing from you,

Sincerely,

Veith Weilnhammer, Katrin Reichenbach, and Philipp Sterzer