Testing a novel experimental framework for understanding the emergence of bistable perception

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Bistable perception is a phenomenon in which the same stimulus can be interpreted in two mutually exclusive ways. This characteristic makes it a useful tool to investigate how the brain processes sensory information. However, the generic properties of the stimuli that give rise to bistable perception, as opposed to simple perceptual ambiguity, are still unknown. The differences between how they are processed by sensory circuits are also unclear, while the models used to explain each process bear many similarities. One way to disentangle this is through the confidence about perceptual decisions. We hypothesize that perceptual bistability induces an over-confidence in perceptions due to the high coupling between the different features that compose the stimuli. We propose a novel experimental paradigm to test this hypothesis in human subjects by presenting short visual stimuli where the level of coupling between features is controlled experimentally. Subjects provide perceptual confidence judgments (explicit confidence report), while reaction time and phasic pupil dilations are collected (implicit confidence report). We expect to see over-confidence in participants' choice as a marker of bistable perception, specifically in stimuli with strong feature-coupling. Preliminary analysis of confidence reports show that easier stimuli lead to larger confidence. More importantly, strong feature-coupling leads to over-confidence, in line with our hypothesis. Moreover, phasic pupil dilations in response to stimulus presentation reflect the subjective level of confidence. Overall, we hope to provide a new experimental framework to study the emergence of bistable perception.

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