Do we see what we expect to see?

- Prior information can influence sensory processing and decision making (1,2).
- Based on prior information, the brain is thought to generate predictions of forthcoming sensory information (3).

**Question:** Does predictive information influence perceptual selection?

- Here, we test effects of predictive signals on perceptual selection using binocular rivalry.
- Since binocular rivalry between orthogonal orientations is thought to be resolved at early stages of visual processing, this approach probes predictive signals at low levels of the visual system.

**Predictive context:** Sensory events that contain information about what future sensory events are likely to occur.

**Bayesian formulation:** 2 competing perceptions

\[ P(H|S) = P(S|H)P(H) \]

- \( P(H|S) \): Perceptual hypothesis
- \( P(S|H) \): Stimulus likelihood
- \( P(H) \): Prior

- An optimal way of combining prior information (here, predictions) with current information (here, sensory evidence)
- In this framework, the percept is the hypothesis with the highest posterior probability (5).

**Methods**

**Binocular rivalry**

- Conflicting images presented to the two eyes result in a perceptual alternation between the two images.
- To assess prediction effects, we measure the initial percept—an effect that we define next, following predictive context.

**Stimuli**

- Displayed on two halves of a NEC MultiSync FE992 CRT monitor with 60 Hz refresh rate.
- Stimulus displays were generated on a 640 × 480 computer monitor.

**Exp. 1: Rotation rivalry**

- Rotation and scrambled trials were used, with a 100 ms blank annulus separating each frame.
- In 45 degree increments, with each “rotation frame” lasting 300 ms.

- Collectively report percept

**Exp. 2: Recent or distant past?**

- In Experiment 1, the rotation matching effect was seen with as few as two rotation frames.
- Does the presence of a consistent rotation direction prior to two rotation frames enhance the rotation matching effect?

**Exp. 3: Adaptation control**

- Could the rotation matching effect be explained by adaptation to the second-to-last rotation frame? Such adaptation could bias perceptual selection against the non-matching stimulus.

**Conclusions**

1. Predictive context can influence perceptual selection during binocular rivalry, with above-chance selection of predicted stimuli.
2. This effect depends on only very recent stimulus history.
3. With the rivalry rotation stimulus, the motion direction matching effect is partially but not entirely due to adaptation. Low stream contrasts allow the prediction effect to be measured in the presence of minimal adaptation.
4. Predictive context also speeds perceptual selection as measured by the response latency for the initial percept.
5. These results suggest that predictive signals exist at neural sites that contribute to perceptual selection during binocular rivalry.

**References**