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Percept strength at the onset of bistable perception

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When presented with a stimulus that allows for two distinct interpretations, observers perceive one interpretation exclusively at any moment, and perception switches between the alternatives. Dynamics of the alternations is governed by the parameters of the stimulus. Varying the parameters, it is possible to affect both absolute and relative amount of time spent perceiving each interpretation ("percept"). Theoretical and experimental studies of bistable perception have been focused on its long term dynamics. We consider the transitional stage of bistable perception, right after the onset of the stimulus for binocular rivalry, ambiguous plaid motion, and bistable depth ordering phenomena. We compare the long term percept strength (relative amount of time spent in this percept), and its strength at the onset of rivalry (probability to be the first to dominate after the stimulus is presented).

We find that the percept strength at the onset of rivalry is a steeper function of the stimulus parameters than the long term percept strength (Fig. 1A). In the case of binocular rivalry and bistable depth ordering, there exist a set of parameters such that the onset and long term percept strengths are the same. For other parameters' values, if one of the stimulus interpretations is more probable to be observed during the course of perception, it is even more probable to be the first one to be observed. In the case of ambiguous plaid motion, we confirm the observation [1] that there exist a range

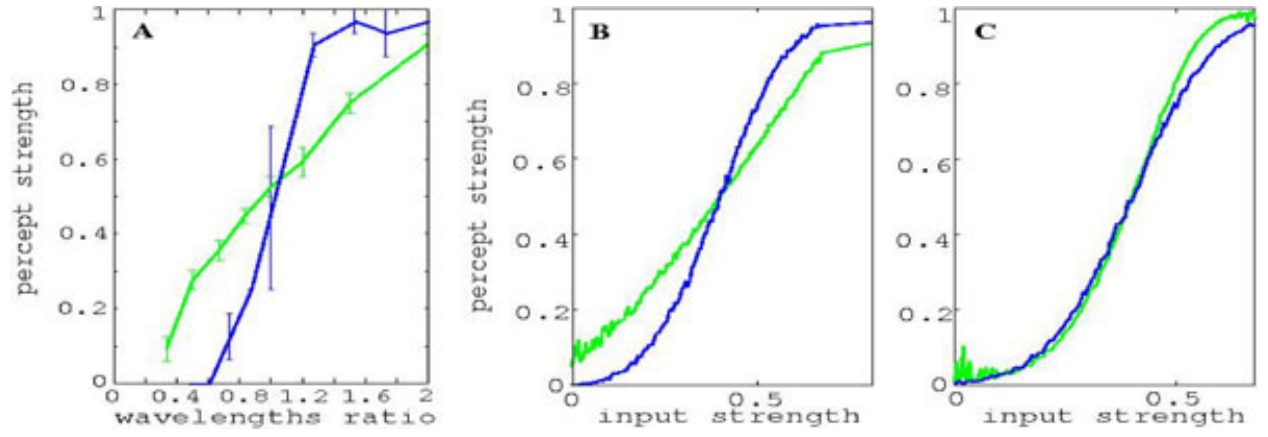

Figure 1 (A) Long-term (green) and onset (blue) percept strength as a function of the ratio of the gratings' wavelengths in bistable depth ordering experiment [3] (preliminary data). (B,C)Simulated long term (green) and onset (blue) percept strength as a function of input strength. B: parameters of the model are in the adaptation-dominated regime of producing alternations; C: parameters of the model are in the noise-dominated regime of producing alternations.

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of the plaid's parameters such that one of the interpretations is stronger at the onset of rivalry even if it is weaker in the long term.

We investigate whether competition models describing bistable perception [2] can account for the difference between the early and long term strength of the percept. Simulations show that adaptation-dominated, rather than noise-dominated regime of producing alternations in the models is better suited to provide agreement with experiments. (Fig.1B,1C) Other features of bistable perception, such as the similar lengths of the first few and long term dominance durations, and the mean and shape of the dominance durations distributions favor noise as a switching mechanism [1,2]. These observations support the conclusion that the models must operate within a balance between the noise and adaptation in order to reproduce experimentally observed statistics of bistable perception. Our results also suggest that the relative contribution of noise and adaptation in producing perceptual alternations may change over time.

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