Motion Detection Behavior Best Explained by Channel Selection Model

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Presentation Abstract Summary Most choice models rely on the assumption that binary decisions are made by integrating the differential of two evidence-encoding units until a threshold is reached. If the evidence supporting one choice is the physical opposite of the evidence supporting the alternative choice, it can, however, not be discerned whether such differential computations result from competitive interactions at the sensory or the accumulation level. To minimize competitive interactions at the sensory level, we designed a novel random dot motion discrimination task in which subjects were asked to detect coherent motion in one of two orthogonal directions (+45 and -45 degrees). Presenting a smaller amount of sensory evidence supporting the incorrect alternative alongside the primary (correct) evidence had minor effects on reaction time, but led to a significant decrease in response accuracy. Behavioral model fits indicate that racing accumulators including competitive interactions at the sensory level cannot explain the overall behavioral patterns. An alternative model in which motion evidence in only one direction is integrated after an initial, probabilistic channel selection, on the other hand, predicted the general trends in the behavioral data as well as a motor-independent signature of evidence accumulation measured in the in subjects' electroencephalogram.

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