Perception of bidirectional transparent-motion requires a bimodal population response

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It has been proposed (based upon the average tuning bandwidth of V5 cells) that the neural population-activity mediating the perception of bidirectional motion-transparency (two directions of motion in the same region) depends upon the angular separation between the directions: bimodal for separations greater than 90° and broad uni-modal for smaller separations (NatNeurosci 2000, 270-276). If true, this means that uni-modal activity can underlie both uni- and bi-directional motion, as opposed to the perception of transparency always requiring bimodal activity. We directly determined the underlying population response by adapting to transparent motion with various angular separations and establishing the subsequent pattern of elevation in unidirectional motion thresholds. Stimuli consisted of either global-plaid or global-Gabor stimuli (JoV 2009 1-25). The threshold angular separation between the motion directions required to perceive transparency was established and adaptation was conducted at sub-threshold, threshold and supra-threshold (but below 90°) angular separations. To tap activity in area V5, the apertures in the adapting and test stimuli were in different locations. Sub-threshold separations typically resulted in a uni-modal pattern of threshold elevation while threshold and supra-threshold separations always resulted in bimodal patterns. The results indicate that the perception of motion transparency requires bimodal rather than uni-modal activity.