

Poster presented at the Vision Science Society meeting, Naples, FL

## The local inversion effect in biological motion perception is acceleration-based.

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The ability to discriminate direction from spatially scrambled point-light displays relies on the orientation of the foot dot motions (Troje & Westhoff, 2006). We present two experiments that investigated this local motion-based inversion effect by testing direction discrimination from novel biological motion displays that exaggerate and display solely foot-specific information. In Experiment 1, we isolated the foot motion of a treadmill human walker, human runner, cat, and pigeon and presented observers ( $n = 20$ ) with 1000 ms displays consisting of 10 copies of two foot dots that traced 150 ms segments at counterphase positions of the gait cycle. For each foot type, we derived left and right signalling displays from five such segment pairs that collectively sampled the entire gait cycle and presented them at both upright and inverted orientations. Direction discrimination accuracies varied with foot type, orientation, and segment pair. Significantly, the decrease in accuracies due to inversion was most substantial for the runner stimuli which exhibit the most pronounced vertical velocity changes and smallest for the cat stimuli which carry little vertical motion. In Experiment 2, a new group of observers ( $n = 20$ ) were presented with the natural human walker stimuli of Experiment 1 and with stimuli that were spatiotemporally-matched to the natural stimuli but moved with constant velocities. Here, overall discrimination accuracies did not differ per foot type, decreased with inversion, and varied with segment pair. Critically, performances were higher for upright than for inverted displays for the natural stimuli only. Upright and inverted versions of the constant velocity stimuli did not differ. The results suggest that the local inversion effect in biological motion perception is carried by the velocity gradients of the foot motions. We conjecture that the visual system is sensitive to characteristic velocity changes exhibited by biological movements in a gravity-driven environment.