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Acceleration carries the local inversion effect in biological motion perception

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The ability to derive the facing direction of a spatially scrambled point-light walker relies on the motions of the feet and is impaired if they are inverted. We exploited this local inversion effect in three experiments that employed novel stimuli derived from only fragments of full foot trajectories. In Experiment 1, observers were presented with stimuli derived from a single fragment or a pair of counterphase fragments of the foot trajectory of a human walker in a direction discrimination task. We show that direction can be retrieved for displays as short as 100 ms and is retrieved in an orientation-dependent manner only for stimuli derived from the paired fragments. In Experiment 2, we investigated direction retrieval from stimuli derived from paired fragments of other foot motions. We show that the inversion effect is correlated with the difference in vertical acceleration between the constituent fragments of each stimulus. In Experiment 3, we compared direction retrieval from the veridical human walker stimuli with stimuli that were identical but had accelerations removed. We show that the inversion effect disappears for the stimuli containing no accelerations. The results suggest that the local inversion effect is carried by accelerations contained in the foot motions.