Gravity is a constant force that affects motion in the physical world. This is particularly true for animate motion, since animals try to energetically optimize their gait by shifting energy between different states such as kinetic, potential, and elastic energy. Constant gravity defines a fixed relation between temporal and spatial measures in motions such as pendulum motion and ballistic motion. In a psychophysical experiment, we tested whether the human visual system can retrieve size information mediated by gravity from dynamic point-light displays of animal locomotion.

We used a motion capture system (Vicon 512, Oxford Metrics) to acquire the 3D-trajectories of marker points attached to the major joints of three dogs with different sizes. Biological motion point-light displays were created by animating these data on a computer screen in a sagittal view. Animation was presented for one second on a monitor at five different playback speed. The position of the animation remained in the center of the screen. The retinal sizes for all dog animations were identical (8.5 degrees of visual angle). Subjects had to estimate the absolute size of the dog in terms of its shoulder height in centimeters.

Both the true size of the dog and the playback speed significantly affected the size estimate in the expected direction. Animations from larger dogs were perceived to be larger than animations from smaller dogs (F(1,30)=30.8, p<0.001). Dogs presented in slow motion were perceived to be larger than dogs in fast motion (F(4,60)=37.4, p<0.001).

We conclude that human visual perception is able to use gravitational acceleration as a cue for size perception in biological motion displays. Further research is necessary to find out the exact psychophysical relationship between speed of biological motion and perceived size.

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