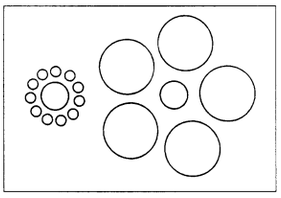
Lying eyes, insightful hands

What you see is not always what you get. Consider the images flickering across a television screen. Those flat arrays of tiny colored dots draw viewers into what looks like a three-dimensional world of drama, comedy, and commercial pitches. The relative size and placement of objects in a televised image imbue scenes with a sense of depth and realism.

Nonetheless, TV watchers have no problem dashing into the kitchen and snatching a bag of corn chips off the counter. Snackers easily determine a treat's absolute size and the distance they must cover to reach it.

A new study suggests that feats like these reflect the operation of separate visual pathways in the brain. One neural system perceives the defining qualities of objects and establishes how they relate to each other in a scene, while the other directs visual control of skilled actions, say Angela M. Haffenden and Melvyn A. Goodale, both psychologists at the University of Western Ontario in London.



Neuroscientists know that after undergoing initial processing near the back of a primate's brain, visual information travels along two distinct cerebral routes. Haffenden and Goodale hope to untangle the precise functions of these pathways.

They studied the responses of nine men and nine women, age 18 to 29, to a visual illusion. Two target circles of equal size, each surrounded by an array of either larger or smaller circles, appear side by side. As the illustration shows, the circle enclosed by smaller circles looks larger than the one enclosed by larger circles.

In another version of the illusion, the target circles appear to be the same size, although the one in an array of larger circles is physically larger.

In a series of trials, volunteers briefly examined examples of these illusions, with different-sized poker chips serving as target circles. Sometimes they were asked to spread their thumb and index finger to indicate the target's size. On other occasions, they picked up the left or right target disk, depending on whether the disks looked the same or different in size.

Participants wore infrared light–emitting diodes on their right index finger, thumb, and wrist. Infrared-sensitive cameras recorded their hand movements. The room became dark as soon as the volunteers moved their hands, thus preventing them from referring continuously to hand and target positions.

Visual illusions distorted the participants' thumb-and-finger estimates of disk size, the researchers report in the January JOURNAL OF COGNITIVE NEUROSCIENCE. Nevertheless, volunteers could accurately extend their hands to chosen targets and form grips suitable for picking them up.

Just as people do when reaching for an item under normal circumstances, the volunteers opened their hands wider than necessary for a poker chip of each size as they began to reach out and then clamped down as they neared the target.

Visual perception typically supplies context-specific information that guides movements, Haffenden and Goodale note. For instance, hand position when reaching for a fork to put in the drawer differs markedly from hand posture when picking up a fork with which to eat.

Separate visual mechanisms evolved to specialize in perception and skilled actions, Haffenden and Goodale say. "The parallel operation of these two systems lies at the heart of the paradox that what we think we 'see' is not always what guides our actions," the scientists conclude. —*B.B.*