Your brain on baseball: How hitters see a 95-mph fastball

A 2008 pitch by then-Dodgers reliever Jonathan Broxton and the batter's response are examined in a brain study. (Kirby Lee / US Presswire)

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Swing, batter, batter! In less time than it takes to say that phrase, Major League Baseball sluggers have their bat across the plate, and the best of them are golfing the shot over the outfield wall.

How does the brain "know" when to swing? Researchers at UC Berkeley believe they've found the internal architecture that lets a batter get ahead of the fastball, and allows the rest of us to pour a beer and find our seat in the stands. They pinpointed a region of the brain's middle temporal complex that can "predict" spatial position ahead of its actual location in the real world.

For example, in a 2008 game, a baseball is just leaving the right hand of Los Angeles Dodgers reliever Jonathan Broxton, at 95 mph. The eye of Philadelphia Phillies hitter Matt Stairs can't send signals to his brain fast enough. But Stairs' brain is already one step ahead, moving perception of the ball forward and "predicting" where it will cross home plate.

Neurons twitch, the left-handed hitter's well-honed motor skills are activated, and -- *crack!* -- Stairs sends the ball deep into the right-field pavilion, and the Phillies go on to win Game 4 of the 2008 National League Championship Series, and eventually the series itself.

(Broxton now pitches for the Cincinnati Reds, and Stairs has retired.)

The UC Berkeley researchers who found this visual prediction center probably would still strike out, like the rest of us. But knowing this bit of brain architecture may lead to important clues to how we navigate the everyday world.

"What you see is not what's in your eye," said Gerrit Maus, a postdoctoral fellow in psychology at UC Berkeley and lead author of the paper published in the latest edition of the journal Neuron. "It's not only in the case of a fast-moving object, but it's really something that happens in everyday life -- even if you cross a street and see a car coming, or you pour a cup of coffee and need to know when to stop."

In each of those cases, the brain "starts pushing the object forward to compensate" for a lag of as much as a tenth of a second in processing visual stimuli, Maus said. By then, Broxton's 139-feet-per-second fastball has traveled nearly 14 feet, almost a quarter of the distance to the plate.

That brain function probably was fundamental to knowing when to dodge a leaping tiger or spear a woolly mammoth, helping hominids survive the slings and arrows along the path of evolution.

The researchers used functional magnetic resonance imaging (fMRI) to record brain activity under various laboratory situations, including while watching a video that prompts an optical illusion known as the "flash-drag effect." (See video, below.) Flashes presented near motion are perceived in the brain as being "dragged" toward the motion. The fMRI patterns produced by a perceptually shifted image matched those of an image actually shifted in reality.

The researchers have previously interfered with the same section of the brain, using magnetic stimulation, and found that spatial prediction was interrupted. In rare cases of brain damage to the same area, some people become "motion blind," Maus said.

"To them, the world is a series of still images," he said. "They cannot see where things are going and they cannot predict motion."

Stairs would not have been able to get in the batter's box, let alone spoil the Dodgers' season.