Why Even Great Batters Strike Out

Scientists Say Human Brain Hits More Fouls Than Homers

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Scientists are getting closer to understanding one of the deep mysteries of the human brain, and how a great batter can hit a baseball out of the park.

New York Yankees' Alex Rodriguez hits a solo home run off Kansas City Royals pitcher Hideo Nomo during the ninth inning of a baseball game in Kansas City, Mo., Thursday, April 10, 2008. The Yankees beat the Royals 6-1. (Orlin Wagner/AP Photo)

Here's the scene: Alex Rodriquez is in the batter's box and the pitcher fires a fastball over home plate. It takes only about a third of second for the ball, traveling at 100 miles per hour, to travel from the pitcher's mound to home plate. Yet somehow A-Rod manages to swing his bat around and blow the cover off the ball.

But there's a problem. The human brain doesn't work fast enough for even the "best player in baseball" to recognize that it's a fastball, crossing over the outside corner of the plate, in exactly 37 milliseconds. By the time he figures out where the ball is, it will be in the catcher's mitt.

That's probably why even the best batters fail most of the time, hitting only about once every three times they're up.

"The batter can't actually react to what he sees, because [the ball] would be past him" by the time he reacts, said Richard A. Andersen, professor of neuroscience at the California Institute of Technology. The batter's brain may not be fast enough, but Andersen's research suggests it can make up for that by predicting the future.

The batter picks up visual clues, such as how the pitcher is holding the ball, to predict where the ball will be in less than a second, Andersen said in a telephone interview. And of course the batter probably also knows a lot about the pitcher, including his favorite pitches.

That fits neatly with research by neurologist Steven Small of the University of Chicago, who notes that it takes less than the time between heartbeats for the ball to reach the batter, so the batter has to figure out what the pitcher will do even before the ball leaves his hand.

The two scientists are approaching the problem with different tools. Small uses functional magnetic resonance imaging (fMRI) to see what parts of the brain are activated during fiercely competitive events. His research shows that as a player masters a skill, like batting, the athlete requires less and less "brain power" to accomplish the task. A-Rod doesn't need to worry about how to hold the bat. All he has to think about is the pitcher. For us common folk, it's a lot more complicated.

Andersen's research is aimed at understanding how one particular part of the brain processes sensory information, like visual cues, and how it controls the muscular response to that information. Someday, he hopes to be able to plant an electronic device in that part of the brain and let a severely disabled person direct the movements of a prosthesis by just thinking about it.

Andersen and two colleagues, Grant Mulliken of MIT and Sam Musallam of McGill University, used monkeys to shed light on human behavior. They were able to temporarily insert electrodes in the posterior parietal cortex of the brains of two monkeys (it doesn't hurt the monkeys, Andersen said) and monitor the firing of individual neurons. The monkeys had been trained to move a cursor, using a joystick, to a target on a computer screen, and even go around an obstacle placed in the pathway.

"It's amazing to watch them do it," Andersen said. "It's a large obstacle, and they very carefully maneuver around it."

The researchers found that the neurons do two important things. They sense where the cursor is, and they predict where it will be in the future, based on visual cues and feedback from the muscular system as they manipulate the joystick.

So the part of the brain that plans the movement of the cursor also directs the movement and can change the course if clues suggest something is wrong.

In a real sense, that's exactly what A-Rod does standing at home plate. He predicts where the ball will be. He doesn't just react to what his vision is telling him because he doesn't have time. And if something doesn't look right, he can check his swing even if he doesn't know exactly where the ball is.

He has to do that, because the human brain doesn't work as fast as we like to believe.

All this may be a little disconcerting to athletes who think their responses are lightning quick. So here's a game to show just how delayed the response can be.

Hold the end of a dollar bill by your thumb and forefinger, and let it hang toward the floor. Tell a friend to place his or her thumb and forefinger, about two inches apart, on each side of the bottom edge of the bill. See if your friend can catch the bill with his or her fingers, without moving his or her hand, after you release it.

If you lose your buck, sign your friend up for the All-Stars.

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