YAHOO! SPORTS

# Researchers: Brain's to blame for bad calls in tennis

**By Nick Markwith, The California Aggie**
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(CSTV U-WIRE) DAVIS, Calif.—If you ever wanted to stop your tennis match and challenge the referee's last call, you probably should, said UC Davis associate professor David Whitney.

Published in the Oct. 28 issue of the journal Current Biology, UC Davis researchers, led by Whitney, have shown that humans - even professional tennis referees - are hard-wired to misjudge balls when they are hit close to the line.

Also known as perceptual bias, this error occurs because our brain's perception of reality lags a few milliseconds behind what is actually happening.

"It takes visual information in the eyes to reach consciousness in 100 milliseconds," said Whitney, associate professor at the UC Davis Center for Mind and Brain and the Development of Psychology.

In order to compensate for this lag in reality, the brain anticipates the object's location, based on the speed and direction of the object. Most of the time, these guesses are accurate but as in the case of tennis, a bouncing ball is moving too fast and changes direction too quickly to precisely predict where the ball will land.

"The ball can travel 10 to 15 feet before we can be aware of [its] position," Whitney said.

Whitney and his team studied 4,457 random sets of points from the 2007 Wimbledon championship and focused on cases where the ball landed on or near the out-of-bounds line. Three trained observers watched each play to determine if balls were in or out. Instant replays were also included in the study.

Whitney predicted because of the rapid speed of the ball that the Wimbledon referees would more likely assume the ball went out of bounds than in when close to the line. His prediction was correct, as 83 out of the 4,457 calls were wrong. Seventy of those bad calls, 84 percent, were made because the referee had called the ball out when it was actually in.

An additional analysis of the 2008 Wimbledon championship showed similar results - 69 percent of the balls were called out when they were on the line or in.

In order to combat bad calls, the International Tennis Federation put in place the Hawk-Eye ball tracking system in March 2006. The technology uses cameras from different angles to determine the trajectory and ultimately, the exact ball bounce area, according to Hawk-Eye Innovation's website.

However, Whitney pointed out that Hawk-Eye is still in its testing phase and that technology still had to improve before scoring could be perfected in tennis.

The problem with Hawk-Eye is that its manufacturer, Hawk-Eye Innovations, reports that the average error of the machine is 3.6 mm. This essentially means that it could be wrong by more than 3.6 mm, which could possibly be the difference between in and out, according to a Cardiff University study.

If we care about complete accuracy and objectivity in the game, then human judgment should be completely taken out of the equation with a system like Hawk-Eye, Whitney said.

However, since bad calls are typically equally allocated to both players, their effects are limited.

Bad calls sometimes can have an inadvertent outcome on the match, however.

"My mental game gets really thrown off by [bad calls] and sometimes can affect me until the next game," said Lauren Guerdat, a past member of the UC Davis club tennis team and longtime tennis player. "It puts a damper on my game."

What should players do then? Whitney suggests that players challenge more of the "out" calls than the "in" calls to maximize their challenges and the chance to be vindicated.

These results could also be applied to other sports such as football, basketball, soccer or baseball.

"It's very possible that these kinds of effects or very similar effects [can] occur in any sport where the referee, umpire or judge is making a perceptual decision [because] that decision is going to be limited by the visual system and the brain," Whitney said.

Even outside the world of sports, the results of this research shed light on the visual system and how humans perceive the world. This knowledge could lend itself to other applications such as medicine and computer science where the visual system's limitations are important.

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