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## That Shot Was Out? A Clue on When to Challenge a Call



Alessia Pierdomenico/Reuters

Novak Djokovic questioned a call during his 2008 Wimbledon match against Marat Safin.

By ALAN SCHWARZ  
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When a line judge at Wimbledon rules on a hair-splittingly close call and says the ball is out, the inevitably disgruntled player should not only consider challenging the call for review by digital replay system.

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He should consult a recent issue of Current Biology.

A vast majority of near-the-line shots called incorrectly by Wimbledon line judges have come on balls ruled out that were actually in, according to [a study published in October](#) by researchers at the University of California-Davis. To a vision scientist, the finding added to the growing knowledge of how the human eye and brain misperceive objects moving at high speed. To a tennis

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player, it strongly suggests which calls are worth challenging and which are best left alone.

The researchers identified 83 missed calls during the 2007 Wimbledon tournament. (Some were challenged by players and overruled; others were later identified as unquestionably wrong through frame-by-frame video.) Seventy of those 83 calls, or 84 percent, were on balls ruled out — essentially, shots that line judges believed had traveled farther than they actually did.

Called perceptual mislocalization by vision scientists, this subconscious bias is known less formally to Wimbledon fans as “You cannot be serious!” — [John McEnroe](#)’s famous dissent when, yes, [a 1981 shot was ruled out](#). Now that players can resort to a more evolved appeal procedure, the researchers’ discovery suggests that players should generally use their limited number of challenges on questionable out calls rather those that are called in, because the out calls have a far better chance of being discovered as mistaken on review, then overturned.

“What we’re really interested in is how visual information is processed, and how it can be used to a player’s advantage,” said David Whitney, an associate professor at U.C.-Davis’s Center for Mind and Brain, who is the paper’s lead author. “There is a delay of roughly 80 to 150 milliseconds from the first moment of perception to our processing it, and that’s a long time. That’s one reason why it’s so hard to catch a fly — the fly’s ability to dance around is faster than our ability to determine where it is.”

This is the third Wimbledon in which players can challenge questionable calls for review by the Hawk-Eye system, which uses high-speed video cameras to record balls’ flight. (About 25 percent of all challenges result in overturned calls.) There is no penalty for an unsuccessful challenge, but after three such episodes in a set, a player may not challenge again. Whether through strategy or residual tennis etiquette, most players leave many challenges unused.

Theoretically, line judges should be equally likely to call an out ball in as they are an “in” ball out. But when objects travel faster than humans’ eyes and brains can precisely track them — for example, [Andy Roddick](#)’s 150-mile-per-hour serves — they are left having to fill in the gaps in their perception. In doing so, they tend to overshoot the object’s actual location and think it traveled slightly farther than it truly did.

Successful challenge calls and the overlooked mistakes that the researchers later identified were several times more likely to come on “long” calls than “in” calls. (The same pattern existed at Wimbledon last year, Whitney said, although the paper did not present that data.) So players are better off using as many challenges as possible on balls called out, because those are the calls most likely to be wrong; if a player thinks an “in” call was wrong, chances are his own eyes were as fooled as line judges’ sometimes are.

Without knowing it, tennis officials are already told to try to compensate for this mislocalization effect. Published instructions for United States Tennis Association line judges tell them to “focus your eyes on the portion of the line where the ball will land,” rather than attempt to track the ball in flight. “Get to the spot well before the ball arrives,” they are advised.

Rich Kaufman, the association’s director of officials who was a linesman and chair umpire from 1976 to 1997, said that “one of the hardest things to teach new linesmen is to take their eye off the ball.”

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“I once asked an eye doctor, Then what am I seeing on a bounce?” Kaufman said. “The doctor said, That’s your brain working — you think you see the initial point of impact, but it’s the blur of the entry and exit of the ball.”

A player using knowledge of this effect in challenging calls could receive a benefit of about one or two overturned points per match, Whitney said, and any psychological boost from feeling vindicated rather than robbed. But Whitney added that understanding how the brain misperceives visual stimuli could help in more real-life matters, as with the design and placement of high-speed safety equipment, automobile brake lights and warning signs.

As for Wimbledon, it appears as if the new information can only help players, not the judges who vex them. Kaufman said: “You have to call what you see. Or what you think you see.”

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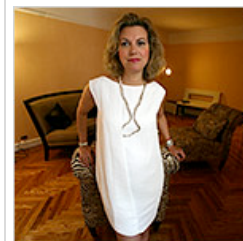
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