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I've seen since the original."

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# SCORECASTING

HOME



GUESTS



DOWN



MISCALLS



QTR



THE HIDDEN INFLUENCES BEHIND  
HOW SPORTS ARE PLAYED  
AND GAMES ARE WON

TOBIAS J. MOSKOWITZ *and* L. JON WERTHEIM

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# SCORECASTING

*The Hidden Influences  
Behind How Sports Are Played  
and Games Are Won*

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Tobias J. Moskowitz and L. Jon Wertheim



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To our wives, to our kids ... and to our parents for driving us between West Lafayette and Bloomington all those years

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# CONTENTS

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*Cover*

*Title Page*

*Copyright*

*Dedication*

**Introduction**

## **Whistle Swallowing**

Why fans and leagues want officials to miss calls

## **Go for It**

Why coaches make decisions that reduce their team's chances of winning

## **How Competitive Are Competitive Sports?**

Why are the Pittsburgh Steelers so successful and the Pittsburgh Pirates so unsuccessful?

## **Tiger Woods Is Human (and Not for the Reason You Think)**

How Tiger Woods is just like the rest of us, even when it comes to playing golf

## **Offense Wins Championships, Too**

Is defense really more important than offense?

## **The Value of a Blocked Shot**

Why Dwight Howard's 232 blocked shots are worth less than Tim Duncan's 149

## **Rounding First**

Why .299 hitters are so much more rare (and maybe more valuable) than .300 hitters

## **Thanks, Mr. Rooney**

Why black NFL coaches are doing worse than ever—and why this is a good thing

## **Comforts of Home**

How do conventional explanations for the home field advantage stack up?

## **So, What Is Driving the Home Field Advantage?**

Hint: Vocal fans matter, but not in the way you might think

## **There's No *I* in *Team***

But there is an *m* and an *e*

## Off the Chart

---

How Mike McCoy came to dominate the NFL draft

### **How a Coin Toss Trumps All**

Why *American Idol* is a fairer contest than an NFL overtime

### **What *Isn't* in the Mitchell Report?**

Why Dominican baseball players are more likely to use steroids—and American players are more likely to smoke weed

### **Do Athletes Really Melt When Iced?**

Does calling a time-out before a play actually work?

### **The Myth of the Hot Hand**

Do players and teams ride the wave of momentum?

Or are we (and they) fooled into thinking they do?

### **Damned Statistics**

Why “four out of his last five” almost surely means four of six

### **Are the Chicago Cubs Cursed?**

If not, then why are the Cubs so futile?

Epilogue

Acknowledgments

Bibliography

*About the Authors*

# INTRODUCTION

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It was the summer of 1984 in Ortonville, Michigan, a lakeside blip on the map somewhere between Detroit and Flint. The second session of Camp Young Judaea—province to a few hundred kids from the American heartland—was under way, and Bunk Seven fielded a formidable softball team.

There was one problem. In keeping with the camp's themes of community and democracy and egalitarianism and the like, the rules dictated that every member of the bunk was required to bat and play the field. Although eight members of Bunk Seven ranged from capable to exceptional softball players, the ninth was, in a word, tragic. One poor kid from Iowa whose gangly body resembled a map of Chile—we'll call him Ari, thus sparing anyone potential embarrassment—was a thoroughly pleasant bunkmate, armed with a vast repertoire of dirty jokes and a cache of contraband candy. Unfortunately, Ari was sensationally nonathletic. Forget catching a ball. Asking him to drink his "bug juice" from a straw would mean confronting the outer limits of his physical coordination. Robert Redford was starring in *The Natural* that summer, and here, on another baseball diamond, was the Unnatural.

Not surprisingly, when Bunk Seven took the field, Ari was dispatched to the hinterlands of right field, on the fringes of the volleyball court, the position where, the conventional thinking went, he was least likely to interface with a batted ball. The games took on a familiar rhythm. Bunk Seven would seize an early lead. Eventually, Ari would come to the plate. He would stand awkwardly, grip the bat improperly, and hit nothing but air molecules with three swings. Glimpsing Ari's ineptitude, the opposing team would quickly deduce that he was the weak link. When it was their turn to bat, they would direct every ball to right field. Without fail, balls hit to that area would land over, under, or next to Ari—anywhere but in the webbing of his borrowed glove. Eventually he'd gather the ball and, with all those ungovernable limbs going in opposite directions, make a directionless toss. The other team would score many runs. Bunk Seven would lose.

A few weeks into the summer, the Bunk Seven brain trust seized on an idea: If Ari played catcher instead of right field, he might be less of a liability. On its face, the plan was counterintuitive. With Ari behind home plate, his clumsiness would be on full display starting with the first pitch, and he'd figure prominently in the game, touching the ball on almost every play.

But there was no base stealing allowed, so Ari's woeful throwing wasn't a factor. He might drop the odd pop-up, but at least the ball would be in foul territory and the batter wouldn't advance around the bases the way he did when Ari dropped balls in right field. With the eight capable players in the field, Bunk Seven didn't let too many runners reach base. On the rare occasions when a runner might try to score, there was usually sufficient time for the pitcher or first baseman to cover the plate, gently relieving Ari of his duties—something that couldn't be done as easily on a ball batted to right field.

There was a more subtle, unforeseen benefit as well. On pitches that weren't hit, it took Ari an unholy amount of time to gather the ball and throw it back to the pitcher. This slowed the game's pace considerably. The pre-bar-mitzvah-aged attention span being what it is, the

opposing team began swinging at bad pitches, if only to bypass the agony of waiting for A to retrieve the ball. And Bunk Seven's pitcher started tossing worse pitches as a result.

Ari never perfected the fine art of hitting, and eventually he ran out of contraband Skittles. But once he was positioned behind home plate, Bunk Seven didn't lose another softball game the rest of the summer.

■ ■ ■

For two members of Bunk Seven—a pair of sports-crazed 12-year-olds from Indiana, one named Moskowitz and the other Wertheim—this was instructive. The textbook strategy was to conceal your least competent player in right field and then hope to hell no balls were hit his way. But says who? By challenging the prevailing wisdom and experimenting with an alternative, we were able to improve the team and win more games.

We've been friends ever since, bound in no small part by a mutual love of sports. Now, a quarter century later—with one of us a University of Chicago finance professor and the other a writer at *Sports Illustrated*—we're trying to confront conventional sports wisdom again. The concepts might be slightly more advanced and the underlying analysis more complex, but in the forthcoming pages of *Scorecasting*, we're essentially replicating what we did on the campus softball field. Is it really preferable to punt on fourth down rather than go for it? To keep feeding the teammate with the hot hand? To try to achieve the highest available spot in the draft? Is there an *I* in *team*? Does defense truly win championships?

As for the sports truisms we accept as articles of faith, what's driving them? We *know*, for instance, that home teams in sports—in all sports, at any level, at any time in history—win the majority of the games. But is it simply because of rabid crowd support? Or is something else going on? As lifelong Cubs fans, we know all too well that without putting too fine a point on it, our team sucks. But is it simply because the Cubs are unlucky, somehow cursed by the baseball deities and/or an aggrieved goat? Or is there a more rational explanation?

Even though sports are treated as a diversion and ignored by highbrow types, they are imbued with tremendous power to explain human behavior more generally. The notion that “sports are a metaphor for life” has hardened into a cliché. We try to “be like Mike,” to “go for the gold,” to “just do it,” to “cross the goal line,” to “hit the home run.”

The inverse is true, too, though. Life, one might say, is a microcosm for sports. Athletes and coaches may perform superhuman feats, but they're subject to standard rules of human behavior and economics just like the rest of us. We'll contend that an NFL coach's decision to punt on fourth down is not unlike a mutual fund manager's decision to buy or sell a stock or your decision to order meatloaf rather than the special of the day off a diner menu. We'll try to demonstrate that Tiger Woods assesses his putts the same way effective dieters persuade themselves to lose weight—and makes the same golfing mistakes you and I do. We'll explain how referees' decision-making resembles parents deciding whether to vaccinate their kids and why this means that officials don't always follow the rule book. We'll find out how we, as fans, view our favorite teams much the same way we look at our retirement portfolios suffering from the same cognitive biases. As in life, much of what goes on in sports can be explained by incentives, fears, and a desire for approval. You just have to know where to look ... and it helps if you have data to prove it.

Many of the issues we explore might seem unrelated and, in many cases, reach far beyond sports, but they are all held together by a common thread of insight that remains hidden from



our immediate view. Exploring the hidden side of sports reveals the following:

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- *That which is recognizable or apparent is often given too much credit, whereas the real answer often lies concealed.*
- *Incentives are powerful motivators and predictors of how athletes, coaches, owners, and fans behave—sometimes with undesirable consequences.*
- *Human biases and behavior play a pivotal role in almost every aspect of life, and sports are no exception.*
- *The role of luck is underappreciated and often misunderstood.*

These themes are present in *every* sport. The hidden influences in the National Football League are equally present in the National Basketball Association, or Major League Baseball, or soccer worldwide. The presence of these factors across many sports highlights how powerful and influential their effects are.

We're expecting that many of the statements and claims we'll make in the following chapters will be debated and challenged. If so, we have done our job. The goal of *Scorecasting* is not to tell you *what* to think about sports but rather *how* to think about sports a little differently. Ambitiously, we hope this book will be the equivalent of a 60-inch LCD, enabling you to see the next game a little more clearly than you might have before.

We may even settle a few bar fights. With any luck, we'll start a few, too.

## Why fans and leagues want officials to miss calls

If you don't have at least *some* sympathy for sports officials, consult your cardiologist immediately. It's not just that refs, umps, and linesmen take heaps of abuse. It's the myths and misconceptions. Fans are rarely so deluded as to suggest that they could match the throwing arm of Peyton Manning or defend Kobe Bryant or return Roger Federer's serve, but somehow every fan with a ticket or a flat-screen television is convinced he could call a game as well as the schmo (or worse) wearing the zebra-striped shirt.

This ignores the reality that officials are accurate—uncannily so—in their calls. It ignores the reality that much like the best athletes, they've devoted years of training to their craft, developed a vast range of skills and experiences, and made it through a seemingly endless winnowing process to get to the highest level. It also ignores the reality that most referees aren't lucky sports fans who were handed a whistle; they tend to be driven, and smart, and successful in their other careers as well.

Consider, for instance, Mike Carey. The son of a San Diego doctor, Carey was a college football player of some distinction until his senior year, when he injured his foot in a game. Any ambitions of playing in the NFL were shot, but that was okay. He graduated with a degree in biology from Santa Clara University and, an incurable tinkerer, founded a company, Seirus Innovation, that manufactures skiing and snowboarding accessories. Carey even owns a number of patents, including Cat Tracks, a device that slips over a ski boot to increase traction.

In his first year out of college, though, Carey realized that he had a knack for overseeing football games. Part of it was an ability to make the right call, but he also had a referee's intuition, a sixth sense for the rhythm and timing of a game. Plus, he cut a natural authoritative figure. Just as a pro football player would, he showed devotion to the craft, working his way up from local Pop Warner games to high school to Division I college games to the NFL, where his older brother, Don, was already working as a back judge. Carey reached the pinnacle of his officiating career when he was selected as referee for Super Bowl XLII, the first African-American referee assigned to work the biggest event on the American sports calendar. (Don Carey worked as a back judge for Super Bowl XXXVII.)

Played on February 3, 2008, Super Bowl XLII was a football game that doubled as a four-quarter passion play. Heavily favored and undefeated on the season, the New England Patriots clung to a 14–10 lead over the New York Giants late in the fourth quarter. A defensive stop and the Patriots would become the first NFL team since the 1972 Miami Dolphins to go through an entire season undefeated—and the first team to go 19–0.

As the Giants executed their final drive, with barely more than a minute remaining, they were consigned to third down and five from their own 44-yard line. Eli Manning, the Giants' quarterback, took the snap and scrambled and slalomed in the face of a fierce Patriots pass rush, as if inventing a new dance step. He ducked, jived, spun, and barely escaped the clutches of New England's defensive line, displaying the footwork of Arthur Murray and the cool of Arthur Fonzarelli.

Finally, in one fluid motion, Manning adjusted, planted a foot, squared himself, and slung the ball to the middle of the field. His target was David Tyree. It was surprising to many that Tyree was even on the field. Usually a special teams player, he had caught only four passes all season and dropped a half dozen balls during the Friday practice before the game. (“Forgive me about it,” Manning had said to him consolingly. “You’re a gamer.”) Compounding matters, Tyree was defended by Rodney Harrison, New England’s superb All-Pro strong safety.

As Manning scrambled, Tyree, who had run a post pattern, stopped, and then loitered in the middle of the field, realizing that his quarterback was still looking for an open receiver. As the ball approached, Tyree jumped, reaching back until he was nearly parallel to the field. With one hand, he snatched the ball and pinned it against his helmet. Somehow, he held on to it for a 32-yard gain. Instead of a sack and a fourth down, Tyree and Manning had combined for an impossible “Velcro catch” that put the Giants on the Patriots’ 24-yard line. Tyree would never catch another pass in the NFL, but it was a hell of a curtain call.

Four plays later, Manning would throw a short touchdown pass to Plaxico Burress and the Giants would pull off one of the great sports upsets, winning Super Bowl XLII, 17–14. It was “the Tyree pass” that everyone remembers. No less than Steve Sabol, the president of NFL Films and the sport’s preeminent historian, called it “the greatest play in Super Bowl history.”

The play was extraordinary, no doubt about it, but the officiating on it was quite ordinary. That is, the men in the striped uniforms and white caps did what they usually do at a crucial juncture: They declined to make what, to some, seemed like an obvious call. Spark us on YouTube and watch “the Tyree play” again, paying close attention to what happens in the backfield. Before Manning makes his great escape, he is all but bear-hugged by a cluster of Patriots defenders—Richard Seymour and Adalius Thomas in particular—who had grasped the fistfuls of the right side of his number 10 jersey. Manning’s progress appeared to be stopped. Quarterbacks in far less peril have been determined to be “in the grasp,” a determination made to protect quarterbacks that awards the defense with a sack when players grab—opposed to actually tackle—the quarterback.

To that point, Mike Carey was having the game of his life. Everything had broken right. He had worked the Patriots-Giants game in the final week of the regular season (several weeks earlier), and so he had an especially well-honed sense for the two teams. “Just like athletes and teams, we were in the zone that night,” he says, “both individually and as a crew.”

More than two years later, Carey recalls the Tyree play vividly. He remembers being surprised that Manning hadn’t used a hard count in an attempt to draw New England officials—that’s how locked into the game he was. When the ball was snapped, Carey started on the left side of the field but then backpedaled and found an unobstructed view behind Manning. A few feet away from the play, alert and well positioned as usual, eyes lasering on the players, Carey appeared poised to declare that Manning was sacked. And then ... nothing. It was a judgment call, and Carey’s judgment was not to judge.

“Half a second longer and I would’ve had to [call him in the grasp],” says Carey. “If I had stayed in my original position, I would have whistled it. Fortunately, I was mobile enough to see that he wasn’t completely in the grasp. Yeah, I had a sense of ‘Oh boy, I hope I made the right call.’ And I think I did.... I’m glad I didn’t blow it dead. I’d make the same call again whether it was the last [drive] of the Super Bowl or the first play of the preseason.”

Others aren’t so sure. Reconsidering the play a year later, Tony Dungy, the former

Indianapolis Colts coach and now an NBC commentator, remarked: “It should’ve been a sac. And, I’d never noticed this before, but if you watch Mike Carey, he almost blows the whistle. ... With the game on the line, Mike gives the QB a chance to make a play in a Super Bowl. I think in a regular season game he probably makes the call.”\* In other words, at least according to Dungy, the most famous play in Super Bowl history might never have happened if the official had followed the rule book to the letter and made the call he would have made during the regular season.

It might have been a correct call. It might have been an incorrect call. But was it the *wrong* call? It sure didn’t come off that way. Carey was not chided for “situational ethics” or “selective officiating” or “swallowing the whistle.” Quite the contrary. He was widely hailed for his restraint, so much so that he was given a grade of A+ by his superiors. In the aftermath of the game, he appeared on talk shows and was even permitted by the NFL to grant interviews—including one to us as well as one to *Playboy*—about the play, a rarity for officials in most major sports leagues. It’s hard to recall the NFL reacting more favorably to a single piece of officiating.



If this is surprising, it shouldn’t be. It conforms to a sort of default mode of human behavior. People view acts of *omission*—the absence of an act—as far less intrusive or harmful than acts of *commission*—the committing of an act—even if the outcomes are the same or worse. Psychologists call this *omission bias*, and it expresses itself in a broad range of contexts.

In a well-known psychological experiment, the subjects were posed the following question: Imagine there have been several epidemics of a certain kind of flu that everyone contracts and that can be fatal to children under three years of age. About 10 out of every 10,000 children with this flu will die from it. A vaccine for the flu, which eliminates the chance of getting it, causes death in 5 out of every 10,000 children. Would you vaccinate your child?

On its face, it seems an easy call, right? You’d choose to do it because not vaccinating has twice the mortality rate as the vaccination. However, most parents in the survey opted *not* to vaccinate their children. Why? Because it *caused* 5 deaths per 10,000; never mind that without the vaccine, their children faced twice the risk of death from the flu. Those who would not permit vaccinations indicated that they would “feel responsible if anything happened because of [the] vaccine.” The same parents tended to dismiss the notion that they would “feel responsible if anything had happened because I failed to vaccinate.” In other words, many parents felt more responsible for a bad outcome if it followed their own action than if it simply resulted from lack of action.

In other studies, subjects consistently view various actions *taken* as less moral than actions *not taken*—even when the results are the same or worse. Subjects, for instance, were asked to assess the following situation: John, a tennis player, has to face a tough opponent tomorrow in a decisive match. John knows his opponent is allergic to a particular food. In the first scenario, John recommends the food containing the allergen to hurt his unknowing opponent’s performance. In the second, the opponent mistakenly orders the allergenic food and John, knowing his opponent might get sick, says nothing. A majority of people judge that John’s *action* of recommending the allergenic food was far more immoral than John’s *inaction* of not informing the opponent of the allergenic substance. But are they really different?

Think about how we act in our daily lives. Most of us probably would contend that telling a direct lie is worse than withholding the truth. Missing the opportunity to pick the right spouse is bad but not nearly as bad as actively choosing the wrong one. Declining to eat healthy food may be a poor choice; eating junk food is worse. You might feel a small stab of regret over not raising your hand in class to give the correct answer, but raise your hand and provide the wrong answer and you feel much worse.

Psychologists have found that people view inaction as less causal, less blameworthy, and less harmful than action even when the outcomes are the same or worse. Doctors subscribe to this philosophy. The first principle imparted to all medical students is “Do no harm.” It’s not pointedly, “Do some good.” Our legal system draws a similar distinction, seldom assigning an affirmative *duty* to rescue. Submerge someone in water and you’re in trouble. Stand idly by while someone flails in the pool before drowning and—unless you’re the lifeguard or a doctor—you won’t be charged with failing to rescue that person.

In business, we see the same omission bias. When is a stockbroker in bigger trouble? When she neglects to buy a winning stock and, say, misses getting in on the Google IPO? Or when she invests in a dog, buying shares of Lehman Brothers with your retirement nest egg? As hedge fund managers and, at least in private, they’ll confess that losing a client’s money on a wrong pick gets them fired far more easily than missing out on the year’s big winner. And they act accordingly.

In most large companies, managers are obsessed with avoiding actual errors rather than with missing opportunities. Errors of commission are often attributed to an individual, and responsibility is assigned. People rarely are held accountable for failing to act, though those errors can be just as costly. As Jeff Bezos, the founder of Amazon, put it during a 2000 management conference: “People overfocus on errors of commission. Companies overemphasize how expensive failure’s going to be. Failure’s not that expensive.... The biggest cost that most companies incur is much harder to notice, and those are errors of omission.”

This same thinking extends to sports officials. When referees are trained and evaluated in the NBA, they are told that there are four basic kinds of calls: correct calls, incorrect calls, correct noncalls, and incorrect noncalls. The goal, of course, is to be correct on every call and noncall. But if you make a call, you’d better be right. “It’s late in the game and, let’s say, there’s goaltending and you miss it. That’s an incorrect noncall and that’s bad,” says Gary Benson, an NBA ref for 17 years. “But let’s say it’s late in the game and you call goaltending on a play and the replay shows it was an incorrect call. That’s when you’re in a *really* deep mess.”\*

Especially during crucial intervals, officials often take pains not to insinuate themselves into the game. In the NBA, there’s an unwritten directive: “When the game steps up, you step down.” “As much as possible, you gotta let the players determine who wins and loses,” says Ted Bernhardt, another longtime NBA ref. “It’s one of the first things you learn on the job. The fans didn’t come to see you. They came to see the athletes.”

It’s a noble objective, but it expresses an unmistakable *bias*, and one could argue that it’s worse than the normal, random mistakes officials make during a game. Random referee errors, though annoying, can’t be predicted and tend to balance out over time, not favoring one team over the other. With random errors, the system can’t be gamed. A systematic *bias* is different, conferring a clear advantage (or disadvantage) on one type of player or team over

another and enabling us—to say nothing of savvy teams, players, coaches, executives, and yes, gamblers—to predict who will benefit from the officiating in which circumstances. As fans, sure, we want games to be officiated accurately, but what we should *really* want is for games to be officiated without bias. Yet that's not the case.

■ ■ ■

Start with baseball. In 2007, Major League Baseball's website, [mlb.com](http://mlb.com), installed cameras in ballparks to track the location of every pitch, accurate to within a centimeter, so that fans could follow games on their handhelds, pitch by pitch. The data—called Pitch f/x—track not only the location but also the speed, movement, and type of pitch. We used the data containing nearly 2 million pitches and 1.15 million *called* pitches, for a different purpose: to evaluate the accuracy of umpires. First, the data reveal that umpires are staggeringly accurate. On average, umpires make erroneous calls only 14.4 percent of the time. That's impressive, especially considering that the average pitch starts out at 92 mph, crosses the plate at more than 85 mph, and usually has been garnished with all sorts of spin and movement.

But those numbers change dramatically depending on the situation. Suppose a batter is facing a two-strike count; one more called strike and he's out. Looking at all called pitches in baseball over the last three years that are actually within the strike zone on two-strike counts (and removing full counts where there are two strikes and three balls on the batter), we observed that umpires make the correct call only 61 percent of the time. That is, umpires erroneously call these pitches balls 39 percent of the time. So on a two-strike count, umpires have more than twice their normal error rate—and in the batters' favor.

What about the reverse situation, when the batter has a three-ball count and the next pitch could result in a walk? Omission bias suggests that umpires will be more reluctant to call the fourth ball, which would give the batter first base. Looking at all pitches that are actually outside the strike zone, the normal error rate for an umpire is 12.2 percent. However, when there are three balls on the batter (excluding full counts), the umpire will erroneously call strikes on the same pitches 20 percent of the time.

In other words, rather than issue a walk or strikeout, umpires seem to want to prolong the at-bat and let the players determine the outcome. They do this even if it means making an incorrect call—or, at the very least, refraining from making a call they would make under less pressured circumstances.

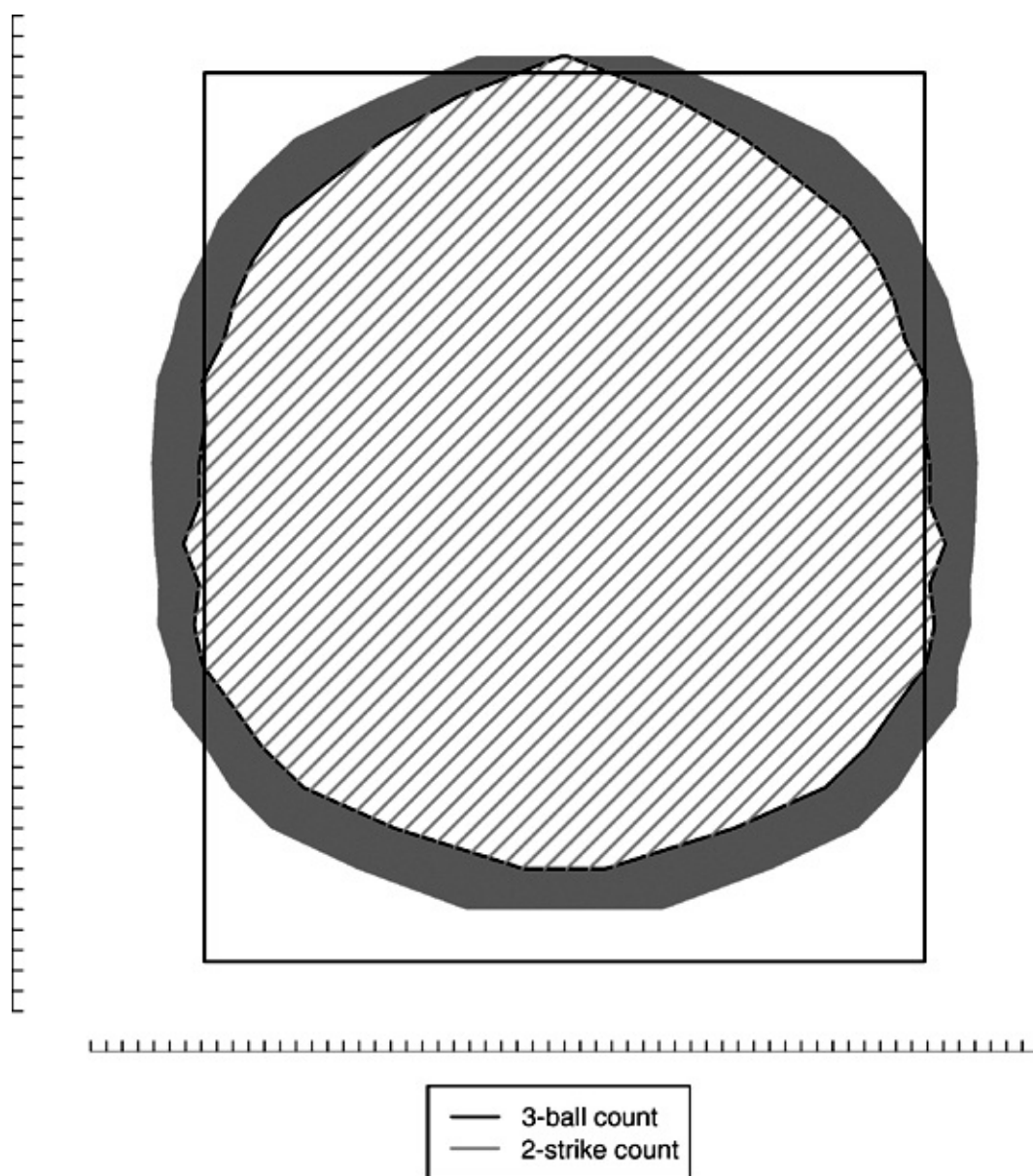
The graph on [this page](#) plots the actual strike zone according to MLB rules, represented by the box outlined in black. Taking all called pitches, we plot the “empirical” strike zone based on calls the umpire is actually making in two-strike and three-ball counts. Using the Pitch f/x data, we track the location of every called pitch and define any pitch that is called a strike more than half the time to be within the empirical strike zone. The strike zone for two-strike counts is represented by the dashed lines, and for three-ball counts it is represented by the darker solid area.

The graph shows that the umpire's strike zone shrinks considerably when there are two strikes on the batter. Many pitches that are technically within the strike zone are not called strikes when that would result in a called third strike. Conversely, the umpire's strike zone expands significantly when there are three balls on the batter, going so far as to include pitches that are more than several inches outside the strike zone. To give a sense of the



difference, the strike zone on three-ball counts is 93 square inches larger than the strike zone on two-strike counts.\*

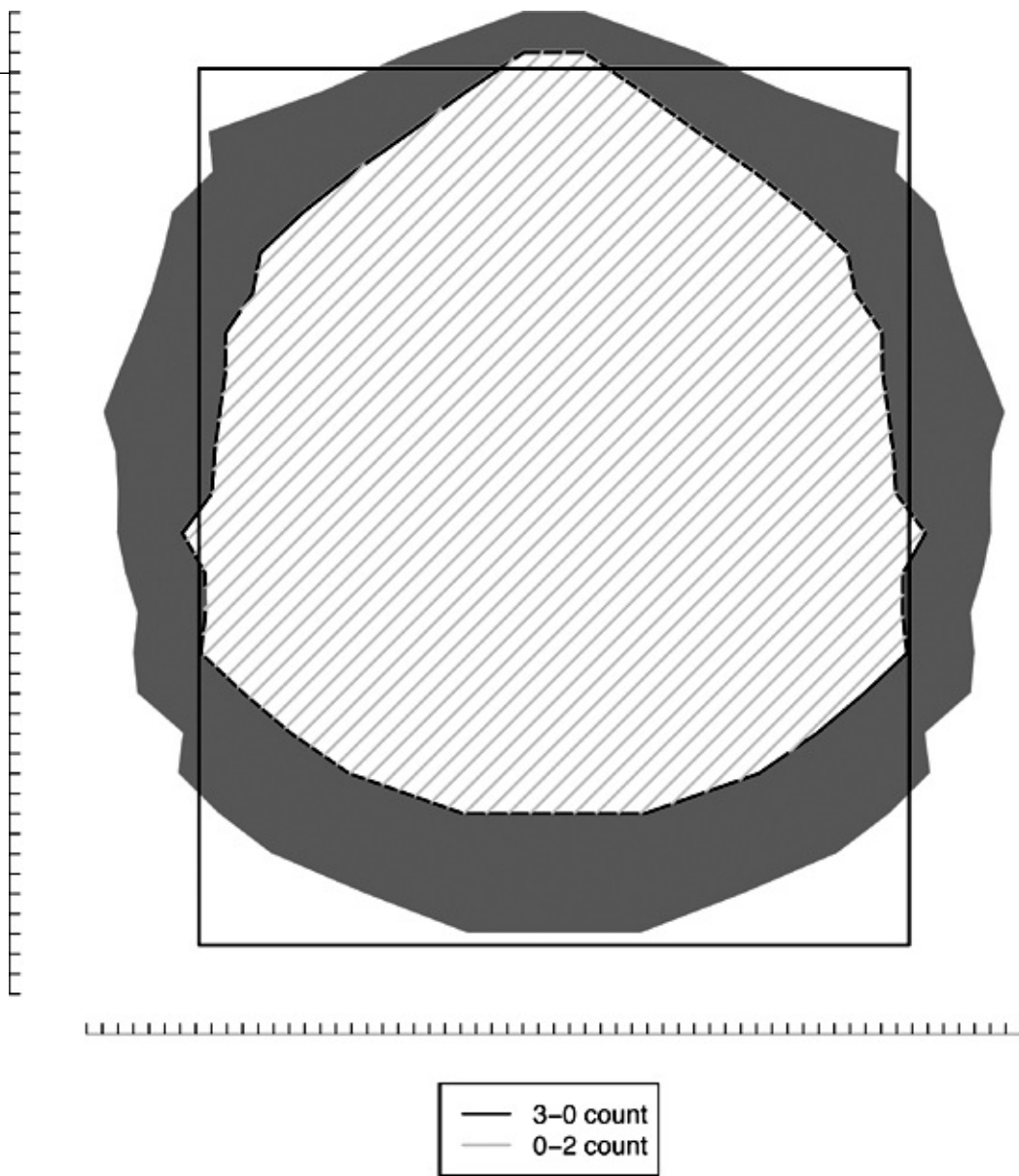
### ACTUAL STRIKE ZONE FOR THREE-BALL VERSUS TWO-STRIKE COUNTS



Box represents the rules-mandated strike zone. Tick marks represent a half inch.

The omission bias should be strongest when making the right call would have a big influence on the game but missing the call would not. (Call what should be a ball a strike on a 3-0 pitch and, big deal, the count is only 3-1.) Keeping that in mind, look at the next graph. The strike zone is smallest when there are two strikes and no balls (count is 0-2) and largest when there are three balls and no strikes (count is 3-0).

### ACTUAL STRIKE ZONE FOR 0-2 AND 3-0 COUNTS



Box represents the rules-mandated strike zone. Tick marks represent a half inch.

The strike zone on 3-0 pitches is 188 square inches larger than it is on 0-2 counts. That's an astonishing difference, and it can't be a random error.

We also can look at the specific location of pitches. Even for obvious pitches, such as those in the dead center of the plate or those *waaay* outside the strike zone—which umpires rarely miss—the pitch will be called differently depending on the strike count. The umpire will make a bad call to prolong the at-bat even when the pitch is obvious. So what happens with the less obvious pitches? On the most ambiguous pitches, those just on or off the corners of the strike zone that are not clearly balls or strikes, umpires have the most discretion. And here, not surprisingly, omission bias is the most extreme. The table below shows how strike ball calls vary considerably depending on the situation.

## PERCENTAGE OF CORRECT CALLS OF MLB HOME PLATE UMPIRES BY SITUATION



## PERCENT OF CALLS THAT ARE CORRECT

PITCH IS ACTUALLY:	PERCENT OF CALLS THAT ARE CORRECT				PERCENT OF STRIKES CALLED ON THE CORNERS
	In strike zone	Outside strike zone	Dead center of strike zone	Way outside strike zone	
All counts	80.2%	87.8%	98.4%	92.1%	49.9%
2-strike counts	61.3%	93.5%	88.7%	97.0%	38.2%
3-ball counts	89.0%	84.0%	99.9%	86.5%	60.0%
0-2 counts	57.7%	93.8%	85.0%	98.4%	31.5%
3-0 counts	93.1%	80.0%	100.0%	82.0%	67.6%
<b>First pitch (0-0 count)</b>	<b>84.9%</b>	<b>90.1%</b>	<b>98.9%</b>	<b>83.4%</b>	<b>51.2%</b>

A shrewd batter armed with this information could—and should—use it to his advantage. Facing an 0-2 count and knowing that the chances of a pitch being called a strike are much lower, he would be smart to be conservative in his decision to swing. Conversely, on a 3-0 count, the umpire is much more likely to call a strike, so the batter may be better off swinging more freely.

From Little League all the way up to the Major Leagues, managers, coaches, and hitting experts all encourage players to “take the pitch” on 3-0. The thinking, presumably, is that the batter is so close to a walk, why blow it? But considering the home plate umpire’s omission bias, statistics suggest that batters might be better off swinging, because they’re probably conceding a strike otherwise. And typically, a pitcher facing a 3-0 count conservatively throws a fastball down the middle of the plate to avoid a walk. (Of course, if the pitcher also knows these numbers, he might throw a more aggressive pitch instead.)

There are other indications that umpires don’t want to insert themselves into the game. For as long as sports have existed, fans have accused officials of favoring star players, giving them the benefit of the calls they make. As it turns out, there is validity to the charges of a star system. Star players *are* treated differently by the officials, but not necessarily because officials want to coddle and protect the best (and most marketable) athletes. It happens because the officials don’t want to influence the game.

If Albert Pujols, the St. Louis Cardinals’ slugger—for our money, the best hitter in baseball today—is up to bat, an umpire calling him out on a third strike is likely to get an earful from the crowd. Fans want to see stars in action; they certainly don’t want the officials to determine a star’s influence on the game. Almost by definition, stars have an outsized impact on the game, so umpires are more reluctant to make decisions against them than, say, against unknown rookies. Sure enough, we find that on two-strike counts, star hitters—identified by their all-star status, career hitting statistics, awards, and career and current salaries—are much less likely to get a called third strike than are nonstar hitters for the exact same pitch location. This is consistent with omission bias and also with simple star favoritism.

But here’s where our findings get really interesting. On three-ball counts, star hitters are *less* likely to get a called ball, controlling again for pitch location. In other words, umpires—already reluctant to walk players—are even more reluctant to walk star hitters. This is the opposite of what you would expect if umps were simply favoring star athletes, but it is consistent with trying *not* to influence the game. The result of both effects is that umpires prolong the at-bats of star hitters—they are more reluctant to call a third strike but also more

reluctant to call the fourth ball. In effect, the strike zone for star hitters shrinks when they have two strikes on them but expands when they have three balls in the count. Umpires watch star hitters in particular to determine their own fate and as a result give them more chances to swing at the ball.

As fans, we want that, too. Even if you root for the St. Louis Cardinals, you'd probably rather see Pujols hit the ball than walk. As an opposing fan, you'd like him to strike out, but isn't it sweeter when he swings and misses than when he takes a called third strike that might be ambiguous? We essentially want the umpire taken out of the play. Fans convey a clear message—*Let Pujols and the other team's ace duel it out*—and umpires appear to be obliging.

The umpire's omission bias affects star pitchers in a similar way. Aces are given slightly bigger strike zones, particularly on three-ball counts, consistent with a reluctance to influence the game by prolonging an outing. The more walks a pitcher throws, the more likely he is to be replaced, and that obviously has a sizable impact on the game and the fans.



In the NBA, home to many referee conspiracy theories, skeptical fans (and Dallas Mavericks owner Mark Cuban) have long asserted the existence of a "star system." The contention is that there is one set of rules for LeBron James, Kobe Bryant, and their ilk and a separate set for players on the order of Chris Duhon, Martell Webster, and Malik Allen. But confirming that star players receive deferential treatment from the refs is difficult, at least empirically. Stars have the ball more often, especially in a tight game as time winds down, and so looking at the number of fouls or turnovers on star versus nonstar athletes isn't a fair comparison. Unlike in baseball, where we have the Pitch f/x data, we can't actually tell whether a foul or violation *should* have been called. Did Michael Jordan push off against Bryon Russell before hitting the game-winning shot in the 1998 NBA finals? That's a judgment call, not a call that current technology can answer precisely and decisively.

The closest thing to a fair comparison between stars and nonstars we've found is what happens when two players go after a loose ball. A loose ball is a ball that is in play but is not in the possession of either team (think of a ball rolling along the floor or one high in the air). Typically, there is a mad scramble between two (or more) opposing players that often results in the referee calling a foul. We examined all loose ball situations involving a star and nonstar player and analyzed how likely it is that a foul will be called on either one.\* For a nonstar player will be assessed a loose ball foul about 57.4 percent of the time, a star player only 42.6 percent of the time. If the star player is in foul trouble—three or more fouls in the first half, four or more fouls in the second half—the likelihood that he will be assessed a loose ball foul drops further, to 26.9 percent versus 73.1 percent for the nonstar. But what if the nonstar player is in foul trouble but the star isn't? It evens out, tilting slightly against the star player, who receives a foul 50.5 percent of the time, whereas his foul-ridden counterpart receives a foul 49.5 percent of the time. These results are consistent with the omission bias and the officials' reluctance to affect the outcome. Fouling out a player has a big impact on the game, and fouling out a star has an even bigger impact. Much like the called balls and strikes in MLB for star players, it is omission bias, not star favoritism, that drives this trend. Star players aren't necessarily being given better calls, just calls that keep them in the game longer.

## MAKE-UP CALLS

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Another long-standing fan accusation against referees is the use of the make-up call. When an obviously bad call is made, the thinking goes, the officials soon compensate by making an equally bad call that favors the other team. Or, in the next ambiguous situation, the refs will side with the team that was wronged previously. A few years ago there was a commercial for Subway that featured a football ref standing at midfield and saying: “I totally blew that call. In fact, it wasn’t even close. But don’t worry. I’ll penalize the other team—for no good reason—in the second half. To even things up.”

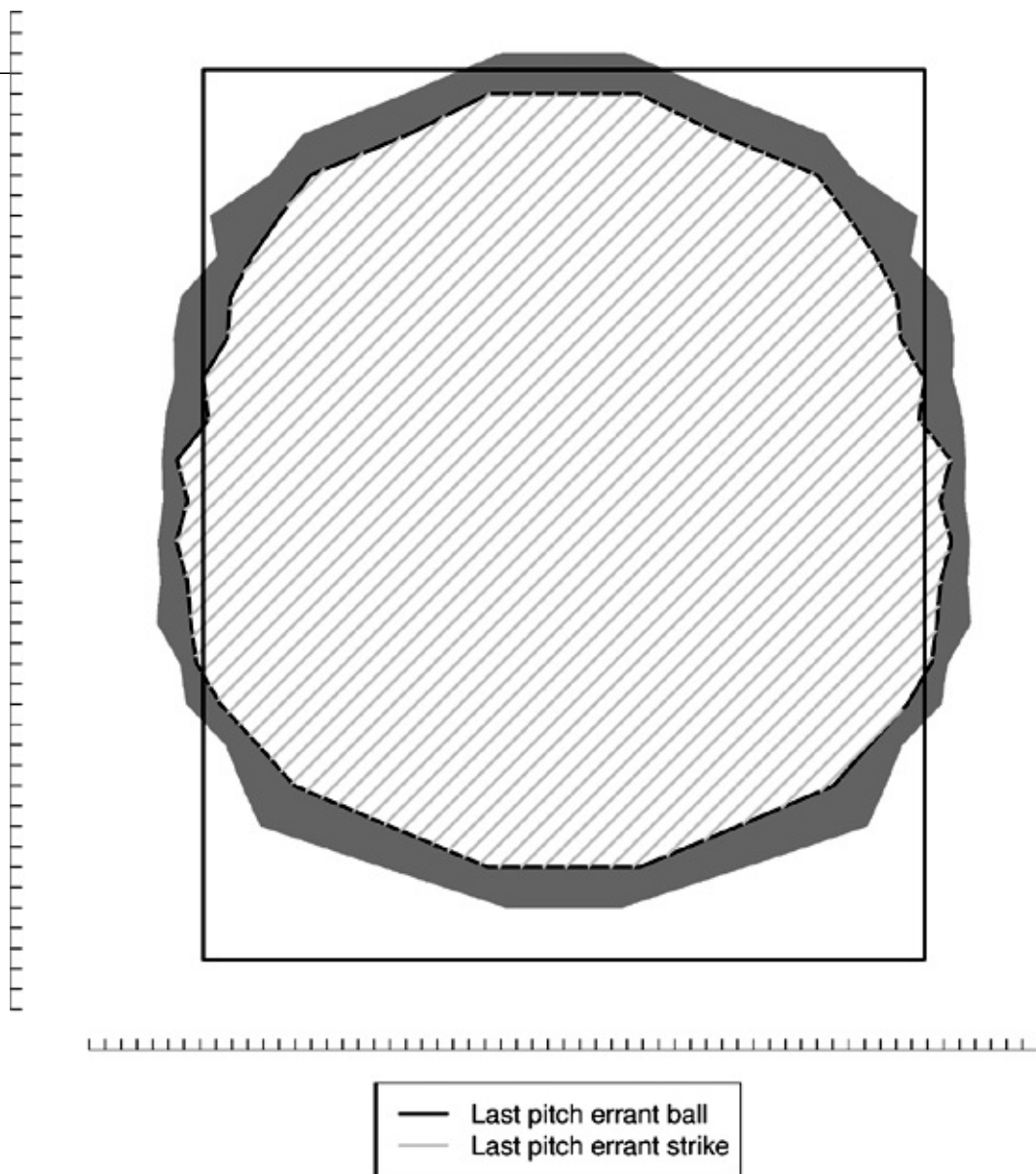
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The stats do seem to confirm the reality of make-up calls, but again, this stems from officials not wanting to inject themselves into the game. If you know you’ve made a bad call that influenced the game, you may be inclined to make a bad call in the other direction to balance it out. The hope is that “two wrongs make it right,” but of course this means referees are consciously not always calling things by the rule book.

In baseball, we can look at make-up calls by the home plate umpire. If the umpire misses a strike call, how likely is it that the next pitch will be called a strike? It turns out that if the previous pitch was a strike but the umpire missed it and erroneously called a ball, the next pitch is much more likely to be called a strike even if it is out of the strike zone. If the previous pitch should have been called a ball but was mistakenly called a strike, the umpire is much more likely to call a ball on the next pitch even if the ball is in the strike zone. When umpires miss a called strike, they tend to expand their strike zone on the next pitch, and when they miss a called ball, they tend to shrink the strike zone on the next pitch.

The following graph shows the difference between the strike zones for pitches *immediately following* errant strike calls and errant ball calls. After an errant ball call, the strike zone magically grows by 70 square inches. This pattern holds even for the first two pitches of the at-bat.

### ACTUAL STRIKE ZONE AFTER ERRANT STRIKE AND BALL CALLS



Also, the more obvious the mistake, the more umpires try to make up for it on the next pitch. If the pitch was dead center down the plate and the ump failed to call a strike, he or she *really* expands the strike zone on the next throw. If the ball is way outside and the ump doesn't call a ball, he or she *really* tightens the strike zone the next time. Again, this is consistent with trying not to affect the game. Umpires are trying to balance out any mistakes they make, and the more obvious those mistakes are, the more they try to balance things out.

■ ■ ■

It's not just in MLB and the NBA that officials try to avoid determining the outcome. It also occurs in the NFL, the NHL, and soccer. The omission bias suggests that the rate of official calls will decrease as the game nears its conclusion and the score gets closer.

In the NBA there is some evidence that fouls are called less frequently near the end of tight games, especially in overtime. (That includes the intentional foul fest that usually attends close games.) However, by looking deeper into the *types* of fouls called, or not called, late in the game, we get a more striking picture. Fouls more at the discretion of the referee—such as offensive fouls, which any NBA ref will tell you are the hardest to call—are the least likely to be called when the game is on the line. For some perspective, on a per-minute basis, an offensive foul is 40 percent less likely to be called in overtime than during any other part of

the game. Certain “judgment call” turnovers, too, disappear when the game is tight. Double dribbling, palming, and every NBA fan’s favorite gripe, traveling, are all called half as often near the end of tight games and overtime as they are in earlier parts of the game. Remember the credo: When the game steps up, the refs step down.

But is this omission bias, or is it just that players are committing fewer fouls, turnovers and mistakes when the game gets tight, and so referees have fewer calls to make? If we look at calls for which officials don’t have much discretion, such as lost balls out of bounds (they have to call *something*), kicked balls, and shot clock violations, they occur at the same rate in the fourth quarter and overtime as they do throughout the game. In other words, players seem to be playing no more conservatively when the game is close and near the end.

One of our favorite examples of ref omission bias occurred in the championship game of the 1993 NCAA tournament, when Michigan’s renowned Fab Five team played North Carolina. With 18 seconds to play and North Carolina leading by two points, Michigan star Chris Webber grabbed a defensive rebound and took three loping steps without dribbling. It was the kind of flagrant traveling violation that would have been cited in a church league game, but a referee standing just a few feet from Webber ... did nothing. It was a classic case of swallowing the whistle. A traveling call would have doused the drama in the game. By overlooking Webber’s transgression and declining to make a subjective call, the ref enabled the game to build to a dramatic climax. The no-call enraged Dean Smith, Carolina’s venerable coach, who stormed down the court in protest. Billy Packer, the CBS commentator, was also apoplectic. “Oh, he walked!” Packer screamed. “[Webber] walked and the referee missed it!”

You might recall what happened next. Webber dribbled the length of the court. Then, inexplicably, he stopped dribbling and called time-out. Alas, Michigan had no time-outs left. Unlike a traveling violation, when a player motions for a time-out and his team has exhausted its ration, well, that’s not a judgment call. That’s a call an official *has* to make even in the waning seconds of an exhilarating championship game. And the officials did: technical foul. North Carolina wins.

In the NFL, more subjective calls (holding, illegal blocks, illegal contact, and unnecessary roughness) fall precipitously as the game nears the end and the score is close. But more objective calls (delay of game or illegal formation, motion, and shifts) are called at the same rate regardless of what the clock or scoreboard shows. The same is true in the NHL. More subjective calls (boarding, cross-checking, holding, hooking, interference) are called far less frequently at the end of tight games, but objective calls (delay of game, too many men on the ice) occur with similar frequency regardless of the game situation. We also find that in the NHL penalty minutes per penalty are lower late in the game. Referees have discretion over whether to call a major or a minor penalty—which dictates the number of minutes a player has to remain in the penalty box—and they are more reluctant to dispense more penalty minutes at the end of a tight game.

A European colleague snickered to us, “You wouldn’t see this in soccer.” But we did. We looked at 15 years of matches in the English Premier, the Spanish La Liga, and the Italian Serie A leagues. European officials are no better at overcoming omission bias than the American counterparts. Fouls, offsides, and free kicks diminish significantly as close matches draw to a close.

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But refs aren't entirely to blame. As fans, we've come to expect a certain degree of omission or bias, so much so that even the *right* call can be what the rules would suggest is the wrong call. Walt Coleman is the sixth-generation owner of Arkansas's Coleman Dairy, the largest dairy west of the Mississippi River. He is also an NFL official. (We told you these guys were exceptional.) Late in a 2002 playoff game between the Patriots and the Raiders, New England quarterback Tom Brady was sacked and appeared to fumble. After reviewing the play, Coleman, as referee, overturned the call and declared the pass incomplete, invoking the obscure "tuck rule" (NFL Rule 3, Section 21, Article 2, Note 2), which states:

When [an offensive] player is holding the ball to pass it forward, any intentional forward movement of his arm starts a forward pass, even if the player loses possession of the ball as he is attempting to tuck it back toward his body. Also, if the player has tucked the ball into his body and then loses possession, it is a fumble.

The Patriots retained possession, scored a field goal on the final play of regulation, and won in overtime. Technically, Coleman appears to have made the correct call, but to many fans it didn't feel right to have an official insinuating himself into the game and going deep into an obscure part of the rule book at such a critical time. A decade later, the "tuck rule" game" persists as one of the most controversial moments in NFL history. The "Tyree Catch" on the other hand, is hardly famous for its controversy. And the NFL's reaction was telling too. The league did not offer Coleman up for a media tour the way they did Mike Carey.

For an even more vivid illustration of how fans and athletes expect officials to remove themselves during the key moments of sports contests, consider what happened at the 2006 U.S. Open tennis tournament. In the women's semifinal, Serena Williams, the 2008 defending champion, faced Kim Clijsters, a former top-ranked player from Belgium who'd retired from tennis to get married and start a family but had recently returned to make a spirited comeback. Although the draw sheet indicated that this was a semifinal match, the fans knew that it was the de facto final, pitting the two best players left in the tournament against each other. That Clijsters had beaten Serena's sister, Venus, a few rounds earlier infused the match with an additional layer of drama.

This was the rare sporting event that lived up to the considerable buildup. Points were hard fought. Momentum swung back and forth. As powerful as she was accurate, Clijsters won the first set 6–4. At 5–6 in the second set, Williams was serving to stay in the match. It was, as the cliché-prone might say, "crunch time." Clijsters won the first point. Williams won the next. Then Clijsters won a point to go up 15–30.

Two points from defeat, Williams rocked back and belted a first serve that landed a foot or so wide of the service box. The nervous crowd sighed. Williams bounced the ball in frustration and prepared to serve. After she struck her second serve but before the ball had landed, the voice of a compactly built Japanese lineswoman, Shino Tsurubuchi, pierced the air: "*Foot fault!*"

Come again? A foot fault is a fairly obscure tennis rule dictating that no part of the server's foot touch—or trespass—the baseline before the ball is struck. (Imagine a basketball player stepping on the baseline while inbounding the ball.) Players can go weeks or even months without being cited for a foot fault violation. In this case, the violation was hardly blatant, but replays would confirm that it was legitimately a foot fault.

Williams lost the point as a result. The score was now 15–40, with Clijsters only a point

from winning the game—and the match. As the crowd groaned, Williams paused to collect herself. Or so it seemed. Instead, she stalked over to Tsurubuchi, who was seated to the side of the court in, ironically, a director's chair. Then, in a ten-second monologue, Serena splintered whatever remained of tennis's facade as a prissy, genteel country club pursuit. Glowering and raising her racket with one hand and pointing a finger with the other, Serena barked: "You better be f—ing right! You don't f—ing know me! ... If I could, I would take this f—ing ball and shove it down your f—ing throat!"

Having already been assessed a penalty for smashing her racket earlier in the match, Williams was docked a point. Since the foot fault had made the score 15–40, with the docked point the game and match were over. Bedlam ensued. Confused fans, shocked by the sudden end to the match, jeered and booed. Williams marched to the net, where officials were summing, and protested. Slamming her racket, she walked over to Clijsters's side of the net, shook hands with her opponent, and then left the court. The blogosphere exploded. The "terrible tennis tirade" became a lead segment on CNN and front-page news internationally, the defining moment of the entire tournament.

Part of what made the episode so memorable was the kind of outrageous tirade one associates less with tennis than with, say, cage fighting. But it was also jarring to see an official essentially decide what had been a close, hard-fought contest between two worthy competitors. And in many corners, fans' outrage was directed at the official. How could the match be decided this way? We've come to expect omission bias in close contests. *Swallow the whistle!*

But wait, you say; the official didn't determine the outcome. Serena Williams did by her tirade, violating the rules. The lineswoman was simply doing her job. And if she had turned a blind eye to the violation, wouldn't she have been robbing Clijsters? Try telling that to John McEnroe. Commentating from the CBS broadcast booth that night, he remarked immediately, "You can't call that there! Not at that point in the match." One former NBA ref had the same reaction as he watched from his home. "Great feel for the match," he sarcastically texted a friend. Bruce Jenkins, a fine columnist for the *San Francisco Chronicle*, wrote, "[Tsurubuchi managed to ruin the tournament ... any sports fan knows you don't call a ticky-tack violation when everything is on the line.]"

A few weeks after Serena's Vesuvian eruption, *Sports Illustrated* readers voted her Female Athlete of the Decade, suggesting that the episode had done little to hurt her image. Tsurubuchi was less fortunate. She was hurriedly escorted from the stadium and flown back to Japan the next day. When we first attempted to interview her, we were told she was off-limits to the media. In fact, tennis officials wouldn't even disclose her name or confirm when we learned it from other sources. (Compare this to the treatment Mike Carey received from the NFL after Super Bowl XLII.) Never mind that she made the correct call and didn't give in to omission bias. In effect, she was shamed for being right.

A full five months later, we finally caught up with Tsurubuchi at a small men's tennis event in Delray Beach, Florida, where she was working in anonymity. She cut a dignified, reserved figure, disappointed to have been recognized but too polite to decline a request to talk. Conversing with this reticent, petite woman—she looks to be about four foot eight—it was hard not to think of what calamity might have ensued if Serena Williams actually had acted on her threat that night. Her voice quivering as if on a vibrate setting as she recalled the

incident that brought her unwanted fame, Tsurubuchi claimed that she'd had no choice. wish—I pray—for players: 'Please don't touch that line!' ” she explained in halting English. “But if players [do], we have to make the call.”

Would she make the same call again? “Yes,” she said, looking dumbfounded. “It's tough and the players might not be happy ... but the rules are the rules, no matter what.”

Her call—her resistance to the omission bias to which we've become accustomed in sports and in life—may have earned her widespread ridicule and disapproval, but she also won fans that night, including Mike Carey: “Making the hard call or the unpopular call, that's where guts are tested, that's the mark of a true official,” he says. “You might have a longer career as an official if you back off. But you won't have a more accurate career.”

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\* It bears mention that Dungy made these remarks on an NBC broadcast while talking to his colleague Rodney Harrison, the defensive back who was covering Tyree on the play.

\* Ironically, Dallas Mavericks owner Mark Cuban earned one of his first (of many) fines when he disputed a late-game goaltending call that Benson refrained from making.

\* Notice that in both situations umpires tend to call high pitches strikes more often and call low pitches strikes far less often than the rules state that they should. This confirms what many baseball insiders have thought for years: Major League umpires have a high strike zone.

\* We define a “star” as any player in the top ten for receiving votes for MVP in any year, covering about 20 players. Star players for the years we examined were: Kobe Bryant, LeBron James, Allen Iverson, Shaquille O'Neal, Jason Kidd, Carmelo Anthony, Dwyane Wade, Vince Carter, Tim Duncan, Kevin Garnett, Yao Ming, Steve Nash, Dirk Nowitzki, Dwight Howard, Elton Brand, Tracy McGrady, Chris Paul, Amar'e Stoudemire, Kevin Durant, and Paul Pierce.



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