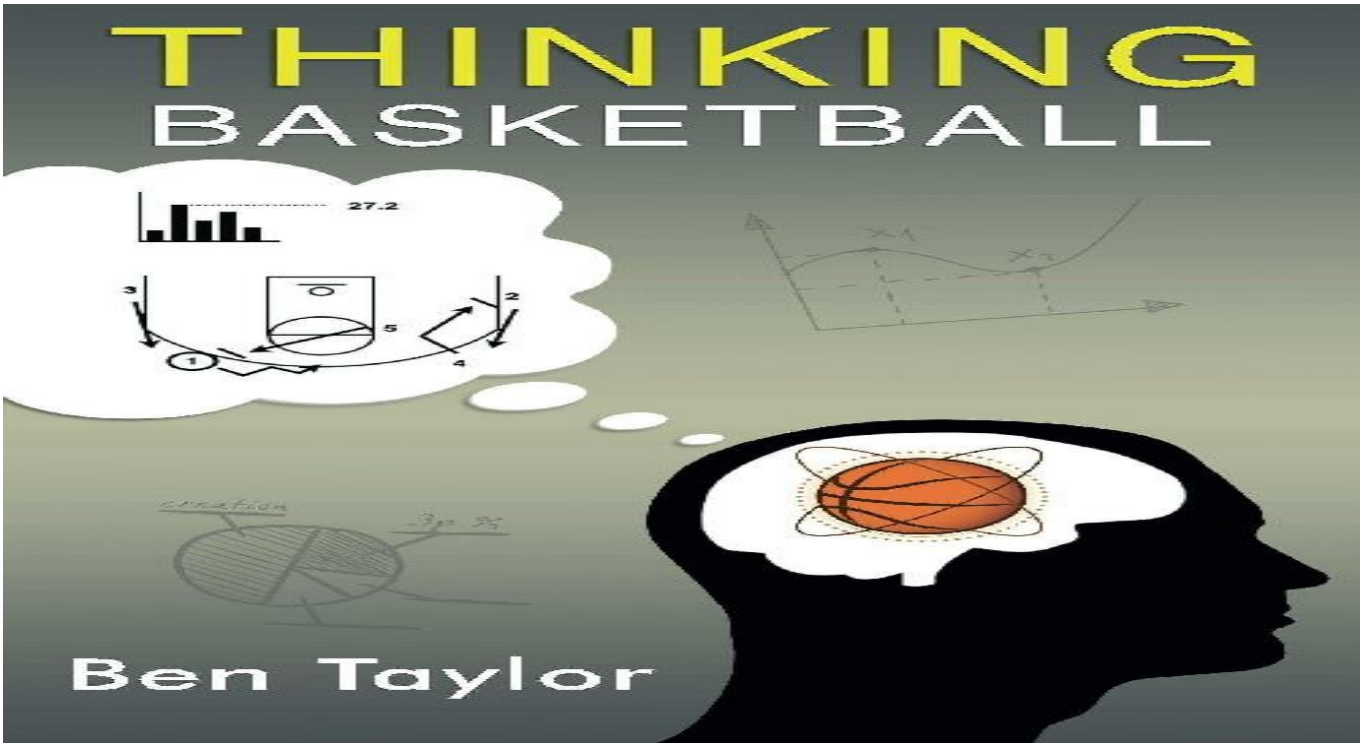
THINKING
BASKETBALL
27.2
Ben Taylor

Thinking Basketball

BEN TAYLOR

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DEDICATION

For Mei Mei.

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A special thanks to my writing mentor for many years, my Uncle Charlie. Also, to Basketball-Reference for their online encyclopedia of basketball information. And to the folks at RealGM for providing the most insightful and thought-provoking basketball discussion on the web.

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Introduction
The Confident Best-Guessing Machine

From December 2009 to March 2010, Kobe Bryant hit an incredible six game-winning shots for the Los Angeles Lakers. During that streak, I ran into a former newspaper colleague who happened to be the biggest Kobe fan I knew.

He was a lifelong Laker fan and per usual, was sporting a gold Bryant (No. 24) jersey when I bumped into him. He immediately started boasting about Kobe's game-winning shots, proclaiming that he was the game's best clutch player.

“When was the last time Kobe even missed a clutch shot?” he asked. He watched nearly every Lakers game. He was a sports journalist. He loved basketball.

“Well, yesterday,” I responded.

His eyes shifted up to the sky, scanning his memory of last night's game. He had watched Los Angeles lose to Dallas, 101-96, in a nail-biting game in Texas.[1] After a moment of reflection, he broke into a smile.

“Oh yeah,” he said.

With 25 seconds remaining and the Lakers trailing by 3, Bryant had missed a potential game-tying jumper. My colleague didn't have a bad memory – he was immediately able to recall the play when I reminded him. Like millions of people who discuss and analyze sports everyday, he was falling into subtle cognitive traps; he subconsciously overlooked a negative piece of information that didn't fit in with his preconceived notion about Kobe Bryant.[2]

In many ways, overlooking that missed shot was the impetus for this book. Basketball glorifies these kinds of heroic, late-game plays and a number of other individualistic concepts. The sport's narratives are often shaped by a few, simplified ideas that do not accurately reflect its players or teams.

After years of studying the mind, I realized these narratives are entirely dependent on the principles of our own cognition. The quirks, nuances and rules that govern our perception of the world also shape our stories about basketball, football and baseball. Basketball, in particular, is heavily influenced by these rules, which helps explain common misconceptions. This book is largely about those misconceptions and where they come from.

“Thinking” itself is a strange subject to study. It can be unsettling to learn that we don't objectively process the world, but instead that the brain interprets everything around us in its own, unique way. For instance, everyone has a blind spot in their vision that the brain simply “fills in” by, quite literally, guessing at what should be there based on the surroundings. When we walk around and look at the world, we aren't aware of this gap in our vision and are unaware that what fills it might not be out there in the real world!

The more you learn about cognition, the more you realize that our perception of the world isn't even reliable. And it doesn't stop with the senses – we have other cognitive blind spots as well. Our memories are faulty – we can actually “remember” things that never happened, but feel like they did. We recall emotional events differently than mundane ones. Our confidence in our memory has little or nothing to do with the accuracy of our recollections. It's all a bit unsettling.

After the dissonance wears off, you learn not to trust everything your brain tells you at face value. It's not that the mind is a liar, it's just that it operates by its own set of rules to overcome its limitations. It has its own version of the truth, but – and this is critical – the brain never lets on that it's winging it. In this sense, it is constantly making confident best-guesses while masquerading them as absolute truth. This prevents us from ever questioning our own reality.

Consider what the “best” move in a chess game would be. In theory, there is a set of step-by-step instructions — called an *algorithm* – that determine the optimal move. However, to search through all the possible outcomes for this ideal move is an endless task for modern computers,[3] let alone the human brain. Instead, we use “rules of thumb” – educated guesses – to avoid sifting through all possibilities for the best answer. This simplification process extends beyond chess into most areas of thinking.

These best-guessing strategies are called *heuristics* and they govern how we analyze the world at large and how we look at sports. First, we make a decision that is good enough, but not necessarily optimal...and then effectively tell ourselves it is completely optimal.[4] Such confidence is a basic survival requirement – if we stopped and kept questioning our answer, we’d never act.

In this sense, evolution has rendered the human brain a kind of *Confident Best-Guessing Machine*. And because we're confident in our best-guesses, we don't stop to question them. When processing our visual field, we don't stop and ask if what we're seeing is real. Similarly, we don't doubt our judgment about Kobe Bryant in the clutch. We rely on our built-in heuristics to paint a picture of the world while assuming that the picture has no blind spots...even when it's rife with them.

Anytime we have to analyze something complex, biases will emerge. Making sense of the thousands of occurrences in a basketball game is no different. We struggle with complexity, when lots of counting is involved (lots of possessions in a game) and lots of pieces are moving at once (there are 10 players on the court). A constant theme is our need to simplify complexity in the world into more manageable, bite-sized pieces. Unfortunately, simplifications aren't always accurate.

Although we are often unaware of it, we are analyzing information all the time. Sports analysis. Political analysis. Social analysis. Survival analysis. It doesn't matter where and when, our analysis switch is stuck on autopilot. We don't need to sit down, organize and make sense of all this information to know a bench seat from an airplane seat, it just happens.

In the same vein, we don't sit down, organize and make sense of a 3-point shot, a reverse dunk or a buzzer-beating jumper. We have developed an intuitive idea of how well someone played in the game we just watched without having to perform any actual conscious “analysis.” (Such automatic analysis is often termed the “Eye Test.”) However, even when we do sit down and review the box score, our automatic analysis is running in the background, influencing how we store and catalogue the information.

The opinions and narratives we weave about players and their teams are all governed by these same rules of thinking.[5] We'll explore

a number of those rules and how they apply at a sensory level, a subconscious level and a conscious level. If NBA games were one possession long – something envisaged in the book – our impressions and narratives would be different, even though the players and teams would be identical; The information that we are exposed to shapes our perception of a player or team. Different information will lead to different conclusions.

Indeed, any *selective stream* of information will bias our conclusions in predictable ways. This is true for statistics that we are exposed to, highlights we watch, or talking points we hear over and over. Being aware of these biases, and being able to spot that certain information is partial and incomplete helps us paint a clearer picture of basketball, and the world.

In sports, processing these information streams is done in three major layers. The first is live, during the contest that we are watching, when our perceptual traits are prone to error. Second, when we look at data after the fact, the type of data that we are shown shapes our impressions. Finally, narratives, or stories about the events – other people's selective opinions and summaries, often found in articles and on talk shows – influence and mold our ideas about the game.

This is, first and foremost, a basketball book. We'll analyze a number of fundamental components of the game that are rarely discussed, having been masked or misrepresented over the years. Our own cognition plays a central role in that story, helping us understand the origins of the game's common narratives and question future ones.

To explain the popularity of a player's "points per game," we need to undress the concept of individual scoring in Chapter 1. The idea of "Global Impact" – affecting multiple players on the court and redistributing possessions – is foundational to understanding team basketball. After that, as a precursor to *Winning Bias* and some of the *Championship Fallacies*, we need to establish that basketball is far more than an individual sport (Chapter 3). Chapter 4's *Sample-Size Insensitivity* is a universal principle that applies to all sports and life, and helps explain how we reach premature conclusions. The examination of clutch play (Chapter 6) is a marriage between behavioral economics and modern NBA game dynamics. Ultimately, we synthesize these concepts and return to Global Impact in a discussion on team-building (Chapter 8), rethinking how players interact, and thus, what gives teams the best opportunity to win championships.

Many of the misconceptions discussed in these pages I once extolled as axioms of the sport. Years of research changed that,[6] as I realized how certain narratives rose to prominence. For the 2010 and 2011 NBA seasons, I even conducted an experiment to extend the box score and answer questions related to defense, shot-creation and open shooting. Some key concepts from that research are discussed here.[7]

The goal of this book is to provide deeper insight into the game, how we analyze it and how we discuss it. We'll challenge long-held beliefs, and to many some of the conclusions will seem completely counter-intuitive. My hope is that these ideas enrich your understanding of the mind and increase your enjoyment of basketball as much as they have mine.

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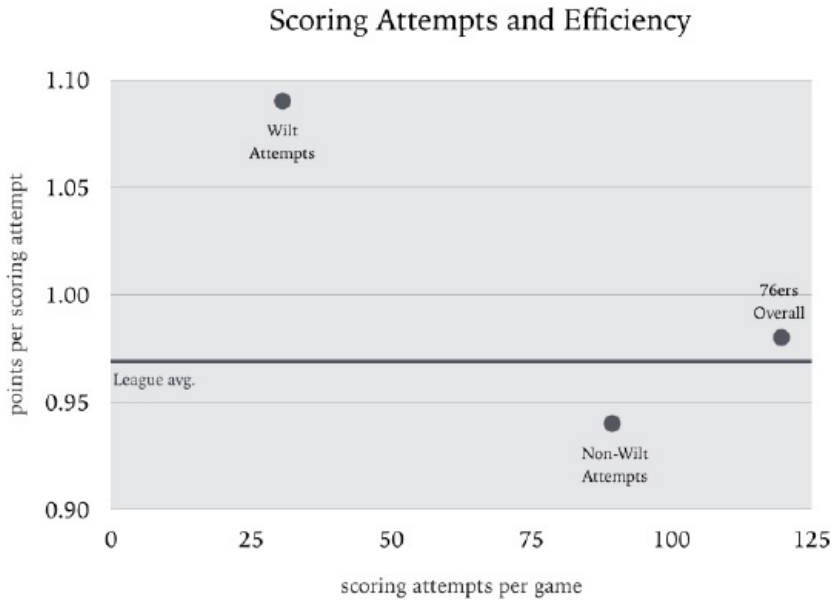
1. On Feb. 24, 2010.
2. This behavior is quite common and is known as *confirmation bias*.
3. Shannon, 1950.
4. According to Simon (1956): "Organisms adapt well enough to 'satisfice': they do not, in general, 'optimize.'"
5. Some people are more susceptible to bias than others, but this is a matter of degree. The rules are still the same across people.
6. All raw data provided by NBA.com or basketball-reference.com, unless noted.
7. The study included nearly 300 games from the regular season and postseason, covering over 50,000 possessions. Details can be found on *Backpicks* at http://tinyurl.com/gobm5fw

Chapter 1
Global Offense

In 1966 Wilt Chamberlain attempted more than 25 shots per game. He was his team's most efficient scorer and fittingly, he shot the ball the most. Why wouldn't he? A team should want its most efficient scorer to shoot constantly. Or should it?

In a 2010 paper, Brian Skinner introduced a traffic paradox to illustrate the pitfalls of one player shooting too frequently.[8] Skinner conceptualized team scoring options as different "paths" to the goal, much in the same way that automobile drivers take different routes home from work. In one scoring path, a point guard might hoist a jump shot. Another path might result in a 3-pointer for a wing player. In Chamberlain's case, his "scoring attempts" – any field goal attempt or two-shot free throw attempt – represented one possible path for his team to score.[9] In 1966, he converted those paths at about 1.09 points per attempt, well above the league average of 0.97. But Philadelphia took other paths to score as well. Sometimes, Chamberlain twisted, turned and dished off to a teammate. Sometimes, he never touched the ball at all. On all of the paths that did *not* end with a Wilt Chamberlain attempt, the 76ers scored at a rate of 0.94 points per attempt.



Given his efficiency advantage over his below-average teammates – 0.15 points per shot is an enormous difference in the NBA – you might conclude that Chamberlain should have shot more. Perhaps if he shot every time, the 76ers overall scoring efficiency would gravitate toward his 1.09 points per attempt? Paradoxically, it wouldn't.

In traffic systems, the fastest commute to work often involves a highway. All things being equal, highway speeds are better than the slower side streets. Only all things aren't equal. When everyone takes the highway, the "team" of drivers suffers as a collective whole; traffic builds up, decreasing the overall efficiency of the system. This is because everyone is trying to jam themselves on the highway, overloading the capacity of the roadway. So what's the solution?

Evenly distributing the cars among the highway *and* the surrounding side streets relieves traffic congestion on the highway. Yes, this means that the individual drivers who take the un-congested side streets will have a slightly longer commute than those who take the un-congested highway. However the average commute time of the entire system improves without everyone overloading the highway.

Amazingly, if the highway were simply closed during rush hour, everyone's average commute home would grow shorter. Known as *Braess's paradox*, this phenomenon has been observed in cities where a major road artery is closed.[10] Without an obviously superior highway option, drivers naturally *distribute* themselves more evenly across surface streets, reducing overall traffic.

In basketball, distributing shots among teammates is like dispersing cars across different roadways. Think of Wilt Chamberlain as a highway. On the commute home, the highway would always be fastest if the traffic were minimal. Similarly, a Chamberlain shot would always be best...*if all NBA shot attempts were the same.* Of course, they aren't.

Just as other cars influence the optimal route home, basketball defenses influence the optimal scoring path. Opponents will send double-teams, switch defenders and implement different schemes to help congest a highway. These defensive reactions not only affect Chamberlain (the highway), but the scoring efficiency of Chamberlain's teammates, much like one person's decision to take the highway affects the driving times of other commuters.

While Chamberlain's 1966 teammates scored at 0.94 points per attempt, they only did so when the team took those exact paths to score. Similarly, Wilt's 1.09 shooting average is a function of him trying to score at opportune times; he doesn't automatically produce 1.09 points per attempt with every path, but only when the conditions are sufficient. Since few players can instantly create a high-percentage scoring opportunity for themselves (like a layup or wide-open jump shot), shooting efficiency typically declines as players manufacture more and more attempts. Defenses often create enough congestion on the highway to force a team into taking a different route.[11]

Counterintuitively, it's possible for Chamberlain, the team's most efficient scorer, to shoot *less* and for the team's overall efficiency to improve. Since the goal of a team is to outscore its opponent, individual success on offense is not dictated by how many points that *individual* scores, but instead by how many points he helps himself *and his teammates* score. This kind of impact – influencing the entire team – can be thought of as "Global Impact."

Global Impact: The effect of a player's actions on his teammates and himself.

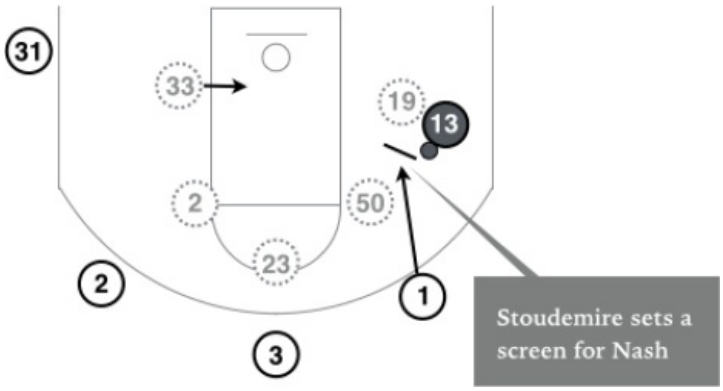
Braess's traffic paradox applies to basketball because the winner is determined by the team score and not an individual's. As commuters, we think “winning” is finding the best possible commute for ourselves – there is no incentive to reduce the commute times of strangers. But in basketball, winning is determined by total team points, analogous to the commute time for the entire city! Having the best road (the leading scorer) is useless if it causes traffic jams.

Creating a Power Play

Just how does a player help himself or his teammates score? The most powerful method is to draw additional defenders away from his teammates. This occurs when a player blows past his defender, causing extra defenders to help cover him, or when the player is such a threat that he commands a double team. To illustrate this effect, let's examine a common pick-and-roll play using a blow-by-blow analysis.[12]

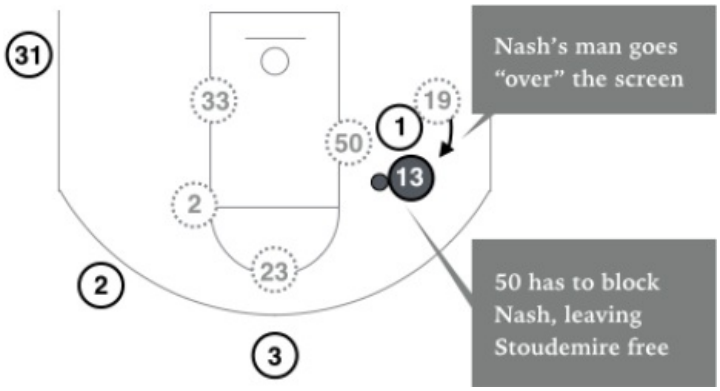
The Play: In a 2005 game between the Phoenix Suns and Portland Trailblazers, Phoenix's Amare Stoudemire set a screen for the ball-handler, Steve Nash. Nash dribbled around the screen and passed to an open Stoudemire who scored on an uncontested dunk.

The sequence took all of three seconds. Screen. Pass. Dunk. Simple enough. But *how* did Stoudemire end up with an uncovered dunk? And did Amare Stoudemire's two points have anything to do with Amare Stoudemire? Let's diagram the play – Phoenix players are dark solid circles, Portland players light dotted ones. Nash (No. 13) starts with the ball on the right wing:

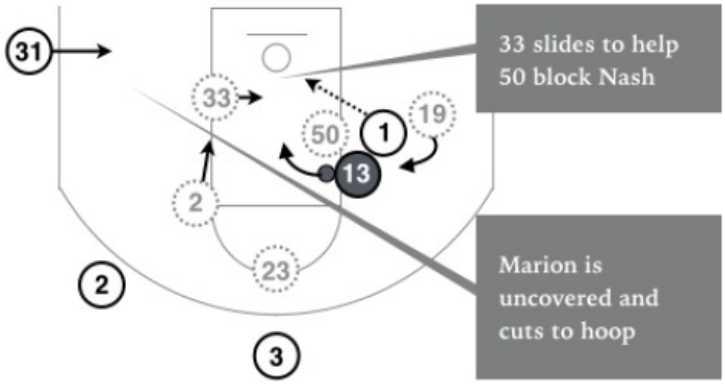


Stoudemire (No. 1) sets a pick for Nash (13), creating a human wall that Nash's defender (No. 19) must circumnavigate. Screening provides an enormous strategic advantage for offenses in basketball, since the rules do not allow defensive players to physically displace screeners the way football permits defensive players to run through blocks.

The defender (19) guarding Nash does not want to “go under” the screen – stay between the screen and the hoop – because Nash is one of the best shooters in NBA history and it would be detrimental to give him an open jumper, so he chases Nash around the screen. As a result of this, Nash's defender is now lagging behind him and is no longer between Nash and the hoop, so Stoudemire's defender (No. 50) must block Nash's path and briefly commit to defending Nash while the original defender (19) recovers. You can see this unfolding in the next diagram:

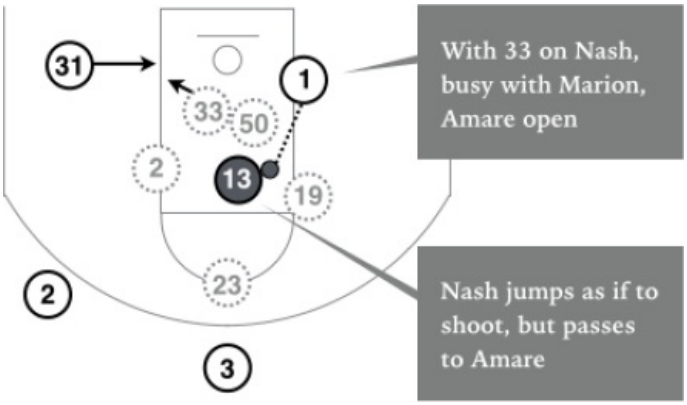


Nash is now matched up against a slower footed big man (50) who has to worry about Nash driving past him. Look at what happens after Nash takes one hard dribble to his left:



The big man (50) on Nash is on his heels, trying to stop Nash's penetration while not giving him too much space for a high-percentage shot. But now someone needs to guard Stoudemire! With Nash's man (19) effectively behind the play, Amare (1) can dive to the hoop unimpeded. The weakside defender (33) does not know whether Nash will drive himself or pass to Amare, so he hedges his bets and slides under the rim, hoping to help in either case. Portland's in this pickle because Nash's defender (19) is behind him and Stoudemire. (Coaches love the adage "stay between the man and the hoop!")

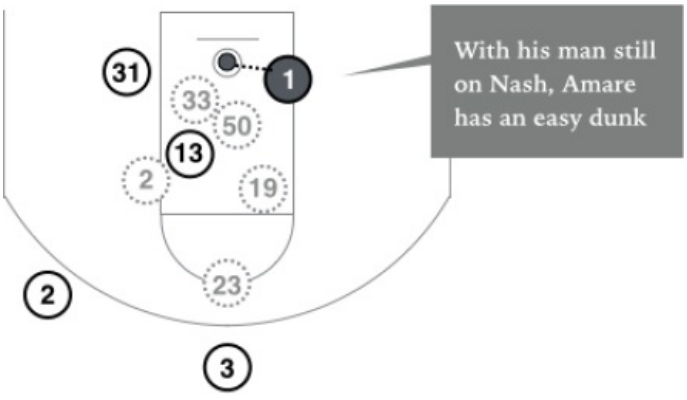
But the help defender in the lane (33) also had to leave *his* man, Shawn Marion (No. 31), who is now wide open in the corner. In essence, Stoudemire's simple screen, combined with Nash's shooting ability, has created a 4-on-3 "power play" for Phoenix – Nash's original defender has been blocked out of the play resulting in a man-advantage for the Suns. Basketball is a game of these quick-burst power plays.[13]



Meanwhile, Marion (31) is bolting from the corner to the basket. In another step or two, Phoenix will have a three-on-two advantage around the hoop. To combat Marion's sprint to the rim, another defender, (No. 2 for Portland) slides down a touch in case he needs to help on Marion or Nash. Ideally, he'd have helped already, but he's reluctant to leave his own man, Joe Johnson (No. 2 for Phoenix), because Johnson shoots 48% on 3-point shots, the 15th-best rate in the history of the current 3-point line.[14]

The hesitation by Johnson's defender (No. 2) forces No. 33 to momentarily worry about covering Marion (31). With Nash driving left, this seems like a good idea – he can help on Marion *and* on Nash if necessary – but by now it's too late; hesitation has destroyed Portland's power play defense.

By driving left, Nash pulled the defense away from Stoudemire (1). Nash then jumps in the air, as if to shoot, causing both No. 50 and No. 33 to react to him, creating a narrow passing window to Amare. Instead of shooting, Nash whips a pass to an uncovered Stoudemire for an easy dunk.



NBA defenses are often described as "being on a string" – the movement of one player should dictate the movement of everyone, tugging on each other in unison like a collective intelligence. Portland failed to react in sync and Nash exploited it. Nash's original defender (19) is still out of the play and essentially useless. Johnson's defender (2) needed to help his teammate in the lane, only he hesitated because of Johnson's shooting ability. Quentin Richardson (No. 3) is also a good three-point shooter and occupied his defender (No. 23) for the entire sequence.

So how much of scoring those points had to do with Stoudemire? Other than his athletic ability and decision to screen (by design)

and roll to the basket (by design), relatively little. Nash collapsed the defense, made the read and the pass, while Marion and Johnson helped occupy (and confuse) other defenders. Stoudemire himself had little to do with the cause, or "creation," of this basket. However, based on the scorekeeping methods in basketball, credit for the basket is primarily given to Stoudemire – he notched the two points. An assist is technically handed to Nash, but assists are measures of passes, not creation.[15]

Redistributed, not Replaced

In 2005, Stoudemire scored 36 points every 100 possessions he played.[16] But when he went to the bench, Phoenix was not 36 points worse per 100 possessions! They were only 13 points worse. Stoudemire's backup, Steven Hunter, scored 17 points every 100 possessions, roughly 19 less than Stoudemire. How did the Phoenix offense "make up" the rest of the points with Stoudemire out of the game?

They took different paths.

Instead of feeding Stoudemire's replacement with the same scoring path, Phoenix took an entirely different one to score.

2005 Shooting	At the Rim	Mid-Range[17]
Amare Stoudemire	69% (440-635)	44% (181-408)
Steven Hunter	69% (119-172)	28% (2-7)

[17]

Hunter and Stoudemire converted at nearly identical rates around the rim based largely on what we saw in the example – Hunter can make open layups just as well as Stoudemire.[18] However, Stoudemire is a dangerous mid-range shooter while Hunter's mid-range shot is non-existent.[19] When Hunter enters the game, he doesn't even *attempt* the same mid-range shots as Stoudemire. Phoenix doesn't take the same route (a 15-foot jumper from their center) simply by hopping in a different car (Hunter shooting it instead of Amare). Instead, they take a completely different road altogether.

In this sense, scoring is rarely ever "replaced" in basketball. When Stoudemire left the game, Phoenix didn't find a way to "replace" his 26 points per game, they simply redistributed the scoring options.

Global Offense Rule of Thumb: Individual scoring is not replaced, it is redistributed.

Unlike baseball teams, who have to send players to bat in a predefined order, basketball teams can choose to take different paths to score. When Stoudemire is in the game, he will choose the open 15-foot shot. When Hunter is in the game, he either passes up an open 15-foot shot (perhaps by sliding closer to the basket), or his teammates pass on him. As a team, Phoenix takes another path entirely, and that path can be *completely unrelated* to how Stoudemire scored. It might be less effective, just as effective, or even more effective (!) than when Stoudemire shoots from mid-range.

Back in 1966, Wilt Chamberlain couldn't help his team by asking someone to "replace" his same scoring attempts. Certainly, no 76er could make the same double-teamed shots in the post with Wilt's efficiency. But what if a new distribution of scoring attempts – one where Wilt shot the ball less – increased his teammates' scoring efficiency?

Consider the following two players:

Facilitator Fred: Averages 11 points per game and 1.00 points per scoring attempt

Isolation Isaiah: Averages 20 points per game and 1.10 points per scoring attempt

One of these players is a so-called "creator" (Fred) -- his value derives from setting up his teammates – and the other a so-called "isolation scorer," or someone who excels at scoring in one-on-one situations. The tendency for most fans is to consider Isolation Isaiah a better offensive player because he scores more. However, this isn't always true; as we saw with the Phoenix pick-and-roll example, the individual points in the box score don't necessarily reflect who *caused* more points to be scored. Remember, it's the *team* points that determine the outcome of the game.

To illustrate this point mathematically, let's say both Isaiah and Fred touch the ball on about 60 offensive possessions per game. On those possessions, they can either (a) shoot, (b) make an idle pass, (c) create an open jumper for a teammate by drawing additional defensive attention or (d) create a layup, like the one that Steve Nash engineered in the earlier example. Each of those actions carries a different value for the team. Imagine Fred and Isaiah play with the exact same hypothetical teammates, so each teammate-related action carries the same value. Idle passes yield the same value. Creating an open jumper for a teammate yields the same value. The only difference between the players is the efficacy of their isolation possessions and the frequency of their different actions. The value and frequency of these possessions is shown in the chart below.

Action Type	Possessions		*Value of action*
	Isaiah	Fred	
Shot	18	11	*1.10/1.00 pts*
Idle Pass	39	39	*1.05 pts*
Create jumper	2	7	*1.25 pts*
Create layup	1	3	*2.0 pts*
Total	60	60	

Remember, Isaiah has a sizable scoring edge over Fred when he shoots – 1.10 points per shot to 1.00. Otherwise, their teammates perform equally, which means on any idle pass, their teams are worse than an Isaiah shot but better than a Fred one. We can calculate the total value of these actions (by multiplying the number of occurrences by the value of the given action) to determine who is responsible for more Global Offense for their team:

Action Type	Possessions		*Value of action*	Team Points	
	Isaiah	Fred		Isaiah	Fred
Shot	18	11	*1.10/1.00 pts*	*20*	*11*
Idle Pass	39	39	*1.05 pts*	*41*	*41*
Create jumper	5	10	*1.25 pts*	*3*	*9*
Create layup	1	5	*2.0 pts*	*2*	*6*
TOTAL	60	60		***65***	***67***

In the above table, both Isaiah and Fred actively participate in 60 offensive possessions with five different actions ranging from shooting to creating an open layup for a teammate. By definition, Isaiah scores at 1.10 points per shot and Fred just 1.00 points. The total points for each action are tallied in the last two columns on the right, for each player respectively, with the overall team totals calculated at the bottom. Values in the table are rounded.

In these 60 possessions, Isaiah's team scores 109 points per 100 possessions. Fred's team scores 112. Looking only at their scoring, it looks like Isaiah is nine points more productive every 100 possessions. But, when their global actions are accounted for, Fred is actually three points more valuable than Isaiah. Fred's superiority is worth about eight extra wins for an average team over the course of a season. Yet Fred is a low volume, low-efficiency scorer while Isaiah is a high-volume, solid-efficiency scorer.

While Isaiah's edge in scoring volume and efficiency is strong, individual scoring is only a part of Global Offense. Yes, when Isaiah creates offense for himself, he crushes Fred in team value. But Fred bridges the gap, and then some, by creating offense for his teammates. Great one-on-one players help one player marginally (themselves) while great creators help *four* other players substantially.[20]

Just how much can a creator help his teammates? Most NBA players cannot consistently generate high-percentage shots for themselves; they have a hard time “creating their own offense.” In 2012, the average isolation play in the NBA resulted in a paltry 0.78 points per attempt.[21] However, many teams are populated with shooters who become capable scorers *if they are open.* From 2010-2011, NBA players averaged 0.84 points on all guarded 2-point shots and 1.14 points on unguarded 2-point shots. Finding an open 3-point shot is even more helpful – players produce 0.78 points on guarded 3-point attempts and 1.14 points when unguarded.[22] Overall, the average NBA power plays yields 1.20 points, far better than the value of all other possessions (about a point per possession) or other half-court possessions (around 0.90 points per possession). This 0.20 to 0.30 point boost from a power play is the difference between an all-time great offense and an all-time bad one. Thus occupying defenders to create open shots, even for less skilled teammates, is *really* valuable; an open shot for a role player is often more efficient than a covered one for a star.

When Coach Alex Hannum went to Chamberlain and asked the greatest scoring machine the game had known to shoot less, he did so with these factors in mind. Global Offense, fueled by the power of creation, explains our original paradox. Wilt Chamberlain, the most efficient scorer on the 1966 Philadelphia 76ers by a landslide, helped his team by shooting the ball less. A *lot* less.[23]

In 1967, Chamberlain shot the ball eleven fewer times per game. This precipitous decline came after several record-setting seasons in which he shot at least 25 times per game.[24] Of the ten regulars in the Philadelphia lineup that season, Wilt was *eighth* in scoring attempts per minute. The result was the league’s best offense by a landslide and the highest rated offense to that point in NBA history.[25]

Wilt's teammates, who scored at 0.94 points per attempt in 1966, now averaged 1.01 points. As an added bonus, Chamberlain's scoring efficiency increased as well because he became more selective about calling his own number. Gone were the difficult, double-teamed shots, replaced with higher-percentage attempts. Despite 44% free throw shooting, Wilt's shooting average still increased from

1.09 to a stunning 1.27 points per shot attempt, making him the first player to eclipse the 1.20 mark.

Even if Chamberlain's scoring efficiency had remained the same, the overall team efficiency would have increased by nearly five points (good enough to jump a team from 41 to 54 wins).[26] As it was, the team's offense reached record heights because of Chamberlain's personal efficiency spike.[27] These radical improvements were not accomplished with different players, but with a different *distribution* of scoring attempts.

Staying off the highway can do wonders for traffic.

Sidebar: Efficiency

Basketball is a per-possession game. By rule, teams alternate possessions – one team's offensive possession is always followed by an opponent's, with the exception of the final play of a quarter. An offensive possession ends in four ways:

1. A made shot
2. A turnover
3. A defensive rebound
4. The end of the quarter

Teams can generate an extra two possessions in a game, maximum, by ending each quarter with the ball, although over the course of a season most teams finish with nearly the identical number of offensive possessions as their opponent.

It does not matter if a team plays fast or slow; a team scoring 80 points can run a more efficient offense than a team scoring 100 points...if the team scoring 100 points needed more possessions. There is absolutely zero correlation between a team's pace and its offensive efficiency.

Because of these alternating possession rules, basketball success is completely determined by per-possession efficiency. There is a near perfect correlation (0.97) between a team's efficiency and wins. In this book we'll discuss offense in terms of points per shot, points per possession, or shooting average (points per field goal attempt and/or free throw attempt). This is also commonly referred to as "offensive efficiency" or "offensive rating," which is points per 100 possessions.

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8. Skinner, 2010.
9. This is the same statistic as True Shooting percentage, or TS%, which estimates total points scored on free throw attempts, 2-point attempts and 3-point shots. TS% itself is an estimate of points per shot in the form of a percentage.
10. Braess's paradox is named after German mathematician Dietrich Braess. Braess stipulated that, in a network, if each acting participant acts "selfishly" (logically in his/her own best interest) then the overall performance of the network can be worse. This has been observed in traffic patterns in major cities like New York and San Francisco, where closing major roads has actually improved traffic flow because drivers more optimally redistribute their routes along varying side streets. (Youn, 2008)
11. This phenomenon explains why it's hard for players to score at great volume and at great efficiency. Indeed, no player in NBA history has scored more than 43% of his team's points while on the court. (Michael Jordan scored 43% of his team's points while on the court during the 1987 season. Jordan scored 37.1 points per game that year, the most by a player since Wilt Chamberlain in 1963.)
12. According to *Synergy Sports*, about one in four NBA "plays" – actions that lead to a shot, turnover or free throws – start with a pick-and-roll action.
13. There are about 25 on average per game today, according to my 2010-11 stat-tracking study. A few more for good teams, a few less for worse.
14. Since 1980, 3-point distance has been 23 feet, 9 inches, not including the corners where the line tapers in. However, for three seasons – 1995 to 1997 – the line was shortened to 22 feet.
15. Assists are commonly associated with play-making but are not always accurate at capturing the causal mechanisms for scoring: An assist is credited to Nash in the example here, but also to the last player who passed the ball to Kobe Bryant before he scored on a difficult fadeaway shot. Many assists have nothing to do with creation.
16. Between 2007 and 2013, the average NBA game had 92 possessions (92 offensive possessions per team).
17. From 2001 to 2013, the league average for mid-range shots was 39%. http://www.hickory-high.com/?page_id=6155
18. Stoudemire did attempt more at the rim per minute, likely due to his athleticism and superior individual post game. Stoudemire averaged a rim attempt every 4.5 minutes, Hunter every 6.1 minutes.
19. Amare shot better in 2005 from 15 to 19 feet (48.5% in 262 attempts) than he did from 10 to 14 feet (41.5%). Hunter, on the other hand, was a combined 5-24 in 2006 and 2007 from 10 to 19 feet.
20. The two real-life inspirations for this example were 1998 Jason Frederick Kidd and 1996 Isaiah Rider. Kidd was an all-star in 1998. Rider crashed out of the league at 30, despite his clear scoring skill. Rider averaged over 19 points per game four times in his first eight seasons, including the 2000 season. In the following season, he played a reserve role for the defending champion Lakers until being waived before the playoffs. The Lakers then won the championship with the most dominant playoff run in NBA history.
21. According to *Synergy Sports* tracking. Henry Abbott, "Hero Ball," *True Hoop.* August 13, 2012. http://tinyurl.com/7bbtchr
22. Based on stat-tracking from 2010-2011. The disparity between open and covered attempts is even more severe for players who cannot shoot well when covered.
23. The '66 to '67 Phily team is a great example of this phenomenon due to little team turnover and retaining the same core group of players. The top six players in minutes in 1966 were the same top six in 1967.
24. Chamberlain's coach, Alex Hannum, met with Wilt before the season and asked him to shift to the role of a decoy and facilitator. Quite a strong stance to take in 1966 after seven record-setting seasons in the sports most glorified category, scoring.
25. Using estimations of offensive rating, Philadelphia was 6.7 points better than league average that year, the best mark in history up to that point. (Cherry, 2004)
26. We can calculate the expected number of wins with precision due to the aforementioned relationship between scoring efficiency and wins, based on Dean Oliver's formula in his book *Basketball on Paper*.
27. If Wilt converted free throws as well as he did the prior season, at 51%, Philadelphia would have tallied an additional 1.4 points per game.

Chapter 2
Scoring Blindness

Global Offense cannot be found in a box score or in a highlight film. As a result, many people have developed a focus on individual points scored, without regard for the context in which they were scored. When Kobe Bryant scores 35 points for the Lakers and Tim Duncan 20 points for the Spurs, many intuitively believe that Bryant contributed more to Los Angeles' offensive success than Duncan did to San Antonio's.

As we saw in chapter 1, this is not necessarily the case – individual scoring doesn't explain *team* scoring. In our earlier example, Facilitator Fred was worth eight more wins than Isolation Isaiah for an average team. Despite Isaiah being a considerably more productive scorer, Fred is a profoundly better offensive player because he helps four other players instead of just himself. Nonetheless, a focus on scoring has developed over the years.

In the pick-and-roll example, the scorer (Stoudemire) had little to do with the production of the basket because his teammate (Nash) broke down the defense and created a power play. Yet the scorekeeping methods in the NBA primarily acknowledge Stoudemire's role in scoring the points, while completely ignoring the main *causal* factors.

What if Nash weren't on the court for that play? What if his replacement weren't a threat to shoot and pass like Nash? In that case, Nash's defender would likely have gone under the screen because the backup wasn't a threat to shoot like Nash. As a result, Stoudemire's defender would not need to leave him. The chain reaction of the help defenders would change because Nash's backup couldn't make pinpoint passes to open shooters or freeze defenders with a jump pass. Suddenly, Stoudemire's easy layup has disappeared because of factors that have nothing to do with him.

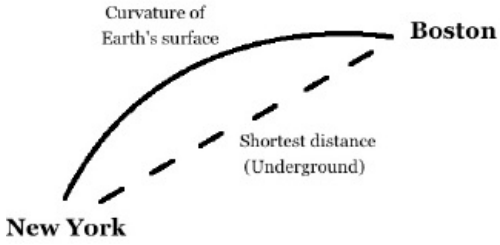
Now let's run the play without Stoudemire on the court. In 2005, he was often replaced by Hunter, a journeyman center who played limited roles for five teams in seven seasons. In that case, Hunter would set the screen for Nash, the defense would still collectively react to Nash, and Hunter would be served up an uncontested layup. Hunter would have the two points, not Stoudemire. Yet the *causal reasons* for the basket are the same. In this case, the player credited with scoring the points had little to do with actually scoring the points.

Traditional scorekeeping is limited: How do we know who is responsible for a team scoring if the players scoring aren't even responsible for their own points? If the purpose of basketball is for a team to score more points than its opponent, why do people focus so heavily on *individual* scoring? Where does this scoring focus originate?

The Brain Craves Simplicity

The human brain requires a starting point. A roadmap. It is not designed to reach perfect conclusions, but instead to make quick and confident best-guesses that are "good enough." But it's much easier for us to render a confident best-guess when we have some guidelines. This is so intuitively obvious that we take it for granted. Ask yourself, "What's the fastest route from Boston to New York City?" Then ask yourself why you didn't even *consider* tunneling through the Earth as a viable travel option. I mean, really, what's wrong with a subterranean commuting option?

A classic problem in the field of Artificial Intelligence is understanding how to limit the "search-space," or all of the possible solutions to a problem. No one has the unlimited time required to weigh the benefits of traveling from Boston to New York via a North Pole nautical route. Why do we *automatically* know that tunneling through the Earth is an unreasonable idea? It is, after all, the shortest distance between Boston and New York.



As humans, we avoid interminable thinking by defaulting to starting points – *heuristics,* or small rules of thumb – that guide us toward reasonable solutions. If we sit around exploring *all* of the possible ways to commute to New York City – options that include crafting new equipment, nautical routes or even drilling through the crust of the planet – starvation will eventually shut down the brain.

To generate quick, pragmatic decisions, we rely on past information. For travel plans, we consider primary modes of transportation (cars, buses, planes, trains, boats) and spatial rules (the shortest distance between two points is a straight line). Instead of a limitless array of options, we can quickly choose two or three options and examine the pros and cons. However, heuristic-based thinking leads to errors. These mental shortcuts are like lighthouses in a dark ocean – they quickly guide us and are designed to save our lives, but they often blind us to the rest of the ocean.

When people think about basketball, one lighthouse has always shined the brightest: an individual's points per game. Volume scorers are seen as *de facto* stars, while low-scorers are regarded as complementary parts. From 2000-2013, there were 350 NBA All-Star game selections. Only 15% of those players were chosen over a higher-scoring teammate.[28] In order to accurately predict the All-Star selections – an accolade bestowed by fans and coaches upon the best NBA players – no knowledge of the sport is required. Instead, someone can simply look up the leading scorers on the best teams.[29]

Our attentional limitations are at the root of this story. Because we can't consciously process everything we see, we have to choose where to focus attention. The easiest way to keep track of scoring is not to focus on a complex trail of picks, passes and rotations, but instead to follow the ball and make note of who scores. Most of us do this naturally, leaving little or no conscious attention to focus on

other actions that impact the score.[30]

This led to the unchallenged adoption of "points per game" as the individual metric of choice in the newspaper. (It was a reasonable starting place given that the winning team needs, well, more points.) Old box scores didn't even offer individual stats beyond points scored. A typical 1960's box might include rebounds, but the number of shots a player attempted was often excluded; 20 points on 20 attempts looked the same as 20 points on 40 attempts. By default, points per game, or scoring volume, became the first piece of information people anchored to when judging a player.

In basketball, there was never a Global Offense box score metric for *how* points were scored, but instead just a tally of *who* scored the points. Scoring became the default measure of a player's contribution to winning.[31]

Order Matters

Anchoring is a powerful and well-established cognitive phenomenon. For instance, when a group of college students are asked how happy they are with life in general, they will answer somewhere along a spectrum from unhappy to happy. If they are then asked how many dates they have been on in the past month, they will provide a completely *unrelated* answer. The first question has absolutely no bearing on the answer to the second question.

However, if we change the order of the questions they suddenly become related. When students are *first* asked about dating and then their general life happiness, there is a (statistically significant) relationship between the first answer and the second answer; the information from the first question subconsciously influences the second. The mere mention of dates shifts cognitive focus on to dating, "anchoring" their feelings of general happiness to their feelings about dating.[32] The *order* in which information is presented matters.

Consider the effect this can have on forming an opinion. Suppose someone thinks Reggie Miller is a pretty good volume scorer (based on his point-per-game numbers). Let's call it a six out of 10. Years later, as people began to realize that scoring efficiency matters – 20 points on 20 attempts is far better than 20 points on 40 attempts – Miller's efficiency stood out among most players and as a result, this same person judged his efficiency as phenomenal. A 10 out of 10.

The chart below conceptualizes how someone's judgment might form with an anchor (points presented first) and without a scoring anchor (points and efficiency presented at the same time):

	No Anchor		Points Anchor
Volume (1-10)	6		6
Efficiency (1-10)	10		10
Cognitive Process	**Weigh** the importance of each		**Adjust** the original piece of information based off
	accordingly	**vs.**	of the new piece of information
Final judgment	8		7

Someone exposed to points per game first, then much later efficiency, will often reach a different conclusion about Reggie Miller, the overall player, than if both scoring and efficiency were presented at the same time.

But what if the same person were exposed to Miller's efficiency first, and then much later to his scoring volume? That person, due to their natural cognitive processes, would reach a different conclusion, simply based on the order of the information they encountered:

	No Anchor		Efficiency Anchor
Volume (1-10)	6		6
Efficiency (1-10)	10		10
Cognitive Process	**Weigh** the importance of each accordingly	**vs.**	**Adjust** the original piece of information based off of the new piece of information
Final judgment	8		9

With an anchor, the judgment is linked to the original information. Inundating someone with points per game first will produce a different judgment than presenting the same person with efficiency first. This happens automatically (subconsciously) and has been observed repeatedly in various settings.

When the mind encounters new information, mental representations of concepts aren't overhauled. Instead, there is a small adjustment of the concept until it feels like the new information has been adequately accounted for. However, these adjustments are

never too large; there is a reluctance to change a long-held belief *too* much.[33] (This cognitive process has been labeled the *Adjustment Heuristic.)* Instead, when given new information, the mind "slides" or "jumps" away from its original position...which is exactly what generates the anchoring phenomenon in the first place. We do not create a new, fresh impression with each factor receiving equal weight.[34] Thus, we are inextricably biased by the anchor.

Anchors are prevalent in all sports. However, in baseball, the anchoring information for batting and hitting is already normalized for efficiency: Earned Run Average (ERA) is a measure of earned runs *per* 9 innings while Batting Average is a measure of hits *per* at bat. Observers aren't biased with information like "hits per game," because Batting Average already considers that players have differing number of at bats in a season. In basketball, points per game ignores the number of shot attempts needed to score those points. The anchor is different in the NBA – it's based on *volume*, not efficiency.

Furthermore, there's little focus in basketball placed on a player's negative actions. Turnovers, fouls and missed shots are the only negative pieces of information in the traditional box score, and turnovers weren't tracked by the NBA until 1974. No box score to date has included metrics for "winding-down the shot clock," "ball-stopping" (not making the extra pass to an open teammate during a power play) or "passing the ball to guarded teammates after using most of the shot clock." As a result, most bad plays don't show up in the box score.

And here's the rub: The mind will automatically integrate what it is exposed to, but heuristic-based thinking is not designed to seek out what it is *not* explicitly exposed to. So most athletes are initially judged by their readily available stats:[35] The information is simply there.

Here is the entire recipe for this bias:

(1) We are given a single, emphasized piece of information (points per game);

(2) This information appears to map to the bottom-line (*impact* on team scoring);

(3) We automatically form judgments based on the information we are given;

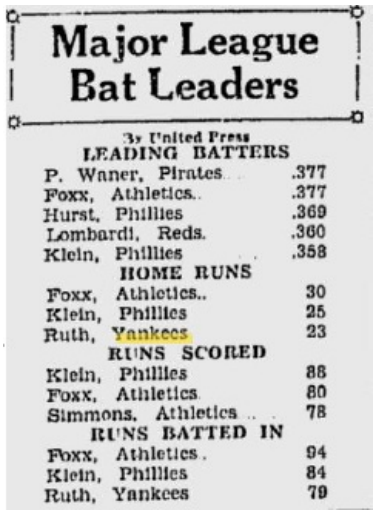
(4) We do not actively seek alternative information (no global information in scorekeeping);

(5) Any new information is anchored to the original information and thus biased by it.

As a result, we become focused on individuals who score, causing blindness to the other salient factors in the game, namely the *reasons* a team scores (Global Impact). After being exposed to scoring information, other factors are downplayed because they are subconsciously anchored to the scoring information. In sports, this phenomenon manifests as a *Scoring Blindness*.

Scoring Blindness: A tendency to focus on an individual's scoring while overlooking his other actions that influence the team score.

Scoring Blindness is primarily determined by scorekeeping method. Historically, baseball published information about *how* points (runs) were scored, basketball did not. Baseball teams win by scoring more as well, but individual runs scored was never emphasized as a statistic in baseball. (See below: A standard 1932 United Press update of baseball's batting leaders.[36]) Baseball fans were regularly flooded with information about *how* teams scored. Basketball fans were simply told *who* scored.



Major League Bat Leaders

By United Press

LEADING BATTERS

P. Waner, Pirates	.377
Foxx, Athletics	.377
Hurst, Phillies	.369
Lombardi, Reds	.360
Klein, Phillies	.358

HOME RUNS

Foxx, Athletics	30
Klein, Phillies	25
Ruth, Yankees	23

RUNS SCORED

Klein, Phillies	88
Foxx, Athletics	80
Simmons, Athletics	78

RUNS BATTED IN

Foxx, Athletics	94
Klein, Phillies	84
Ruth, Yankees	79

As a result of the scorekeeping methods, the most prestigious statistical title in the NBA is the "Scoring Title," given to the league-leader in points per game (who qualified by playing enough games). In baseball, "Runs Title" isn't even part of the vernacular. Instead the traditional measurements in the sport emphasize the *cause* of runs scored: Batting Average (the "Batting Crown"), Runs Batted In and Home Runs, a triumvirate that collectively forms baseball's most celebrated statistical achievement, the "Triple Crown."

In basketball, because scoring volume has long been equated with offensive quality, it's not immediately obvious how a scoring giant like Wilt Chamberlain would help his team by shooting less. *Scoring Blindness* creates the impression that the goal of the game is for an *individual* to score. The effect is so distracting that it took a traffic paradox and a number of other examples to help untangle it in the preceding chapter.

Players themselves commit *Scoring Blindness*, carrying an individual-centric mindset over a global one. In a 1997 interview, sportscaster Bob Costas asked Wilt Chamberlain how he would fare in today's game.[37] Chamberlain answered, "50 points, 60

points...maybe 70 points a game." When asked by an incredulous Costas about averaging 70 points a game, Chamberlain cited (what he thought was) his best scoring stretch of his best scoring season, 1962.[38] He passed over a stretch from the dominant and record-setting 1967 Philadelphia 76ers team, a year in which he won MVP, the championship, and established a new benchmark for individual and team offensive efficiency.[39]

Furthermore, isolation scoring is relatable and impressive. Anyone who has ever played basketball has probably played one-on-one, and can relate to the challenge of scoring without the help of a teammate's pass or screen. Impacting the team offense in an NBA scheme is a foreign and nebulous concept to most people who casually play basketball.

Like most cognitive hiccups, memory and complexity also play a key role in this story, although we'll explore that in a later chapter. For now, let's examine the poster child for *Scoring Blindness.*

The Global Value of Actions

Adrian Dantley's scoring resume is astounding: In his 1977 rookie season with the Buffalo Braves, he averaged 20 points a game on over 1.20 points per scoring attempt. That combination of volume and efficiency had rarely been accomplished before by a rookie. However Dantley was rewarded with a swift trade.[40]

He was also voted the 1977 Rookie of the Year – a standard *Scoring Blindness* displayed by voters throughout the years. The first 14 Rookies of the Year in the shot-clock era (since 1955) were handed to the highest-scoring first-year player, including Tommie Heinsohn's nod over future five-time MVP Bill Russell in 1957.[41] All told, since the shot clock, only 10 of the 61 Rookies of the Year have won when being outscored by at least a point per game by another rookie.[42] As for Dantley, after being traded to the Pacers, he posted nearly 27 points per game with a 1.17 shooting average in his first two months in Indiana. He was then promptly traded.[43]

In Los Angeles, he played two rocky seasons, occupied post space previously reserved for Kareem Abdul-Jabbar and attempted under 13 shots per game. He was then traded again.

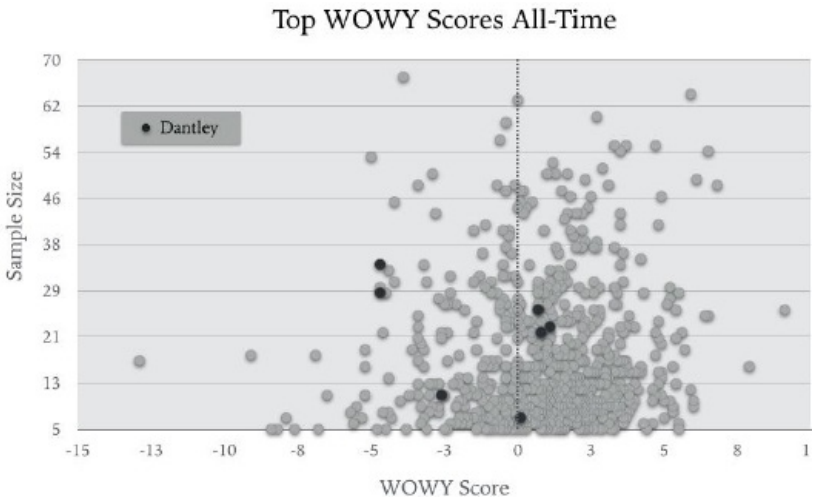
This time Dantley was shipped to Utah, where his scoring exploded. In 1980, he averaged 28 points per game on a whopping 1.26 points per attempt. Only one other player prior to 2013, Charles Barkley (1988), had registered such scoring volume at that efficiency. In Utah, Dantley reeled off seven huge scoring seasons and was rewarded with six all-star selections. After the 1986 season, he was traded to the Detroit Pistons, where his scoring dropped slightly (without any improvement in efficiency) until he was traded in the middle of the 1989 season by Detroit for Mark Aguirre.

Dantley's teams weren't crazy for trading him. Despite his otherworldly scoring numbers, his *impact* numbers were paltry. One way to gauge a player's value in a given circumstance is to compare a team's performance with and without that player in the lineup. This is a way of answering questions like "how valuable is that player to his team?" The method, known as "WOWY" (With or Without You), reveals how a team performed with and without that player.[44]

Below are Dantley's notable WOWY runs. The "wins added" column is the change in wins pace (over an 82-game season) when Dantley was in the lineup. In all seven circumstances he had negligible to negative impact, despite his outstanding scoring statistics:

Year	Team	PPG	Pts/Att	Games Out	Wins Pace In	Wins Added
1979	LAL	17.3	1.18	22	50	2
1980	UTA	28.0	1.27	7	27	1
1983	UTA	30.7	1.32	10	29	4
1985	UTA	26.6	1.21	23	39	4
1988	DET	20.0	1.24	11	56	-7
1989	DET	18.4	1.23	29	51	-12
1989	DAL	20.3	1.09	34	26	-16

Looking at these numbers helps explain why Dantley was traded around the league for a decade. In three of the seven situations, Dantley's teams performed *better* with him out of the lineup, despite having to "replace" his high-volume, high-efficiency scoring. (His teams redistributed his scoring paths, to say nothing of defense.) Overall, from 1979-1988, Dantley's teams performed nearly identically with or without him in the lineup. His 1989 results are from a trade (for Maverick Mark Aguirre) – trades are not "pure" WOWY instances because the comparison is against the traded lineup – but in this case, both the Mavericks and Pistons were far better with Aguirre than with Dantley.[45] Below, you can see where Dantley's WOWY scores rank all time:[46]

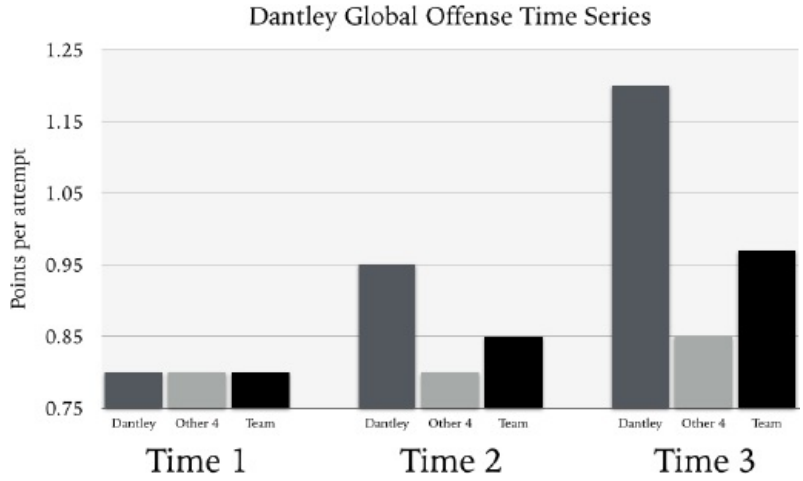


Across multiple circumstances (LA, Utah, Detroit and Dallas), Dantley averaged 22.6 points per game on a splendid 1.22 points per attempt, yet his teams looked no better with him in the lineup. All this is not to pile on Dantley himself, but to illustrate that impressive scoring numbers do not necessarily improve a team's offense, even when those numbers are some of the best in NBA history.

So how did Dantley make those six all-star games in Utah and ultimately the NBA Hall of Fame? *Scoring Blindness*. Regardless of his overall efficacy as a player – something that must include his defensive contributions – Dantley was lauded for his scoring numbers. Yet those numbers are not a perfect proxy of Global Offense.

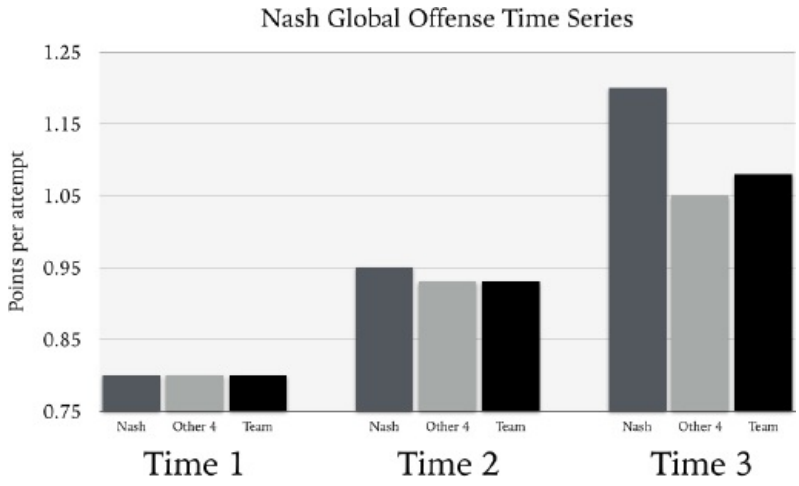
Yes, he was an extraordinarily crafty scorer – he would be in the pick-up-basketball Hall of Fame for his isolation scoring from the mid-post area. But that scoring came with tradeoffs. Dantley was a "ball-stopper" who ate up the shot clock with extremely deliberate moves. Then, if he couldn't find a favorable shot attempt against his defender, he would often loft an idle pass to a teammate. Such a pass rarely puts a teammate in a position to take a higher-percentage attempt, instead impairing a teammate (and his team) by leaving him without an attacking advantage and little time left on the shot clock. In essence, the positives from Dantley's 20-25 scoring attempts are counterbalanced by the relative lack of help he gives to his teammates, and the sometimes negative situations he leaves his teammates in if he uses lots of the shot clock but fails to attempt a shot or make a good pass.

Consider all of the scoring paths that start with Dantley (e.g. a basic half-court possession where Dantley is fed the ball in the mid-post). When he catches the ball, he's not in much better shape to score than any of his teammates. This is "Time = 1" on the next visual. Practically speaking, Dantley hasn't put himself (or his team) in a more advantageous position yet.[47]



A theoretical time series of Adrian Dantley's actions on offense. At time 1, he catches the ball. At time 2 he begins his move. At time 3, he reaches the apex of his move. The model assumes Dantley will shoot 35% of the time and pass to a teammate 65% of the time. The three different bars at each time are: ***Dantley*** *= Dantley's scoring path value;* ***Other 4*** *= His teammates scoring path value (affected by Dantley's actions);* ***Team*** *= The team's overall efficiency combining Dantley and his teammates.*

In the above time series, the large difference between Dantley's bar and the team's bar is the crux of Global Offense and the foundation of *Scoring Blindess*. Once Dantley attacks ("time 2" and "time 3"), he puts *himself* into a better position to score, but he's only helped his *teammates* marginally. Occasionally, defenses will double-team him, in which case the onus is on Dantley to make a pass to keep the power play going so one of his teammates ends up with a higher-percentage shot. (Dantley was not a great passer.) However, on possessions where Dantley isn't double-teamed, he either finds a high-efficient attempt for himself or passes to a teammate without creating much of an advantage for them.



The *degree* of the advantage one creates for teammates is at the core of great Global Offense. Compare Dantley's theoretical Global Offense graph, in which he calls his own number 35 percent of the time, to Steve Nash's theoretical graph, in which Nash only calls his own number 20 percent of the time. It's the very reason the 1967 76ers improved despite their most efficient scorer shooting less. It's also the reason Facilitator Fred can be so much more valuable than Isolation Isaiah.

In the above models, when Nash and Dantley attack, they help themselves equally, but Dantley can do it more often than Nash. Nash can only generate higher percentage looks for himself when he is more selective than Dantley. This makes Dantley better at helping himself, resulting in sexier individual scoring statistics. However, Nash has a far greater (global) impact on the team because his moves *inherently* help all four players on the court more than Dantley's do. (Most of this inherent value is from Nash's superior passing skill.) Even though Nash can't individually score with Dantley, his actions – everything from dribble-drives to pick-and-roll scenarios – improve his team's global efficiency as they unfold. Dantley, on the other hand, helps himself more than Nash does, but this is less valuable than creating opportunities for his teammates.

Of course, there's nothing about Global Impact in a box score or on a *Sportscenter* highlight. Furthermore, global concepts, like creating a power play, are not intuitive if you grew up learning basketball in a one-on-one setting. The mind is always looking for the path of least resistance, and in the history of the NBA that has produced a *Scoring Blindness*.

Sidebar: Global Defense

Scoring Blindness is as much about scorekeeping methods as it is about scoring points. The same principles that apply to offense apply to defense. It's common to use readily available statistics (blocks, steals and defensive rebounds) to gauge defensive worth. Not only is defense overlooked by focusing on an individual's point-per-game as a measure of value, but when people do shift their focus to defense, they often start by looking at how many points someone's man scored against him.

However, individual defensive value is also global. If good offenses create high-percentage scoring opportunities, then good defenses prevent such opportunities. Thus, the measure of a good defensive player is his contribution to this Global Defense, not merely how many points his positional counterpart scores.

Global Defense is exerted in a number of ways, primarily by preventing power plays (quick rotations, staying between the man and the hoop), disrupting or even deterring shot attempts and dribble penetration, and forcing turnovers.

Much like there is no figure for Global Offense in the box score, there is little in the way of defense. People often telescope on steals as a proxy for forcing turnovers, but ignore mistakes, like when a defender loses his assignment, hamstringing his teammates into defending a power play.

Good defenders dampen the other team's efficiency, reducing attempts that would be worth 1.00 points against an average defender by 10 percent or 20 percent. The more active a defender is – the more shots they disrupt and turnovers they force – the larger his impact. This is why many of the all-time great defenders are big men who guard the hoop and can influence a number of high-percentage shots around the rim.

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28. Six were injured players selected by fan vote. Twenty five percent of the players selected in favor of a higher-scoring teammate were within a point per game of their teammates scoring average.
29. From 2000-2013, 94 percent of All-Stars were from teams that won at least half of their games before the All-Star break.
30. This inability to notice important actions that are in our visual field is known as *Inattentional Blindness*. Coincidentally, one famous study on the matter asked subjects to watch a group pass a basketball around for a minute and count the number of passes. Most subjects missed a man in a giant gorilla suit walk right into the center of the frame and dance, because their attentional resources were consumed by counting the passes. Focus creates peripheral blindness. (Simons 2000)
31. Of course, there is an additional layer that amplifies the focus on scoring. When people are learning to play they are often given instruction in one-on-one settings, where global dynamics are not even present.
32. Observed by Strack, et al (1988) and Kahneman et al (2006).
33. Epley, 2001.
34. This has been replicated in various fashions. For example, when asked whether Gandhi died before or after the age of 140, people guessed that he actually lived for 67 years. When asked whether he died before or after age 9, they guessed that he lived for 50 years. (Switzer, 1991)
35. For example, in baseball, BA and ERA. In football, quarterbacks are judged by touchdowns, yards and even the formulaic "QB Rating." which is an arbitrary composite of basic quarterbacking stats. If a QB throws a pass to Barry Sanders, who dodges players and runs 80 yards for a touchdown, the QB will have a perfect rating!
36. From the July 8, 1932 *Berkeley Daily Gazette.*
37. https://www.youtube.com/watch?v=173M7ApCNKw
38. Wilt claims he averaged "about 71 points a game" over a 10-game stretch at the end of the 1962 season. Not quite: he averaged 53.1 points per game in the 10 games before his 100 point game, and including his 100 point game, his best 10-game stretch of scoring was 59.9 points per game.
39. Chamberlain was well known for arguing with scorekeepers about his individual statistics...so was Wilt's *Scoring Blindness* a result of his own focus on points per game, or was it a reaction to everyone else's?
40. Dantley was traded to the Indiana Pacers for Billy Knight, an ABA standout who was traded twice more in the following 15 months.
41. In fairness, Russell missed 24 of 72 games that year.
42. Wes Unseld, Dave Cowens, Buck Williams, Mark Jackson, Chris Webber, Grant Hill, Jason Kidd, Mike Miller, Amare Stoudemire and Derrick Rose.
43. Dantley was traded for James Edwards and Earl Tatum. Tatum was a second-year scoring guard and Edwards was a rookie center averaging 15 points and 7 rebounds per game while replacing an injured Kareem Abdul-Jabbar.
44. This WOWY method controls for players who play at least 25 minutes per game for that given team in the year being examined. In order to isolate a single player, the performance of [the team with its core lineup playing] is then compared to the performance of [the team with its core lineup playing minus the player in question]. Full results found here: http://tinyurl.com/gm9yk8y
45. Aguirre himself was a noted scorer, averaging nearly 22 points per game in 1989 in Dallas, and then 15.5 points per game in Detroit after the trade. However, his efficiency paled in comparison to Dantley's: In Dallas, he averaged 1.02 points per scoring attempt, and in Detroit 1.10.
46. WOWY score is calculated by taking the point differentials with and without a player and adjusting them for strength of team – it is easier to improve weaker teams than stronger ones. Next, the variance of the sample-size is calculated and used as a confidence score to adjust the point differentials; smaller samples are less confident and pull the WOWY score closer to zero. Finally, there is a normalization for point-differential based on a given season – in some years, there is a wide distribution of best to worst teams and some years parity makes it harder to create separation from the pack.
47. A similar concept has been explored using SportsVU camera data by Kirk Goldsberry and can be read about here: http://regressing.deadspin.com/kirk-goldsberrys-new-nba-stat-is-a-huge-step-for-baske-1517481614

Chapter 3
Limitations of Power: How Much Can Someone Improve a Team?

A commonly held belief is that certain NBA players have an incredibly large impact on a game. Relative to other team sports, this might be true. But it begs the question: Exactly how much can one player impact a basketball game? Can he "guarantee" victory? Take any team to the playoffs? Add 40 wins to a team? Before diving into the evidence, let's think about how involved any one player is in a basketball game.

Because teams can choose who to drive their offense through, individual players can touch the ball frequently. However, this does not mean teams are playing one-on-five. There are a number of common scenarios in which a team's key offensive cog is at the whim of his teammates. Namely:

1. **Possessions in which he doesn't shoot**. As we've seen, even the scoring paths that always run through a particular player can end up with different teammates taking the attempt.
2. **Possessions in which he isn't involved**. Sometimes a player has no relevant involvement in a play. This can happen because of a foul, a turnover or because his teammates never included him on their road to an attempt.
3. **When he rests**. Outside of Wilt Chamberlain, who played every minute of the 1962 season, all NBA players rest. When they do, everything in the game is outside of their control. (Unless they are versed in Jedi Mind Tricks.)

So an individual's sphere of influence is limited. The highest "usage" rates – a metric that estimates a player's percentage of (a) team scoring attempts and (b) turnovers while in the game – are south of 40 percent. In other words, among the most highly active shooters in NBA history, no one attempts to score more than 40 percent of the time. However, "usage" doesn't include creating power plays; when expanding the definition to incorporate creation, players can influence more than 40 percent of the possessions. But how much more?

My 2011 study incorporated a creation component to determine a player's overall "Offensive Load."[48] Offensive Load measures the percentage of a team's possessions (when that player is on the court) in which he attempts (1) a shot or free throw (2) commits a turnover or (3) creates an unguarded shot for a teammate by drawing an extra defender toward him. The largest Offensive Load of any player in the NBA in that two-year study was 56%. Meaning, even when we broaden the net to factor in creation, there are a large number of possessions where players have little or no direct involvement.[49]

This is exactly what we'd expect based on non-involved possessions – plays in which a teammate shoots free throws before the ball touches every player or the team fast breaks without its star. Sometimes, the ball never touches the team's most active player before someone else finds a good scoring attempt. And that's only on offense.

Defensively, players are in a slightly different boat; they cannot *choose* to have a possession run through them, as they can on offense. Furthermore, the highest-impact defenders in basketball don't typically guard the other team's best player, they guard the hoop. Since shots closer to the basket are the NBA's best Return on Investment, elite defenders typically roam near the rim, where they can defend the shots of multiple players in addition to their own man's attempts.

The same study looked at a mirror counterpart to Offensive Load, called "Defensive Usage." Defensive Usage is the number of possessions in which a defender (1) guarded a shot attempt or committed a shooting foul, (2) forced a turnover or (3) needed help defensively (allowed a power play). The most involved defensive players in the study had a defensive usage of around 30%.[50] In more than two-thirds of defensive possessions, the "direct" impact of a defender will not be felt. Again, it's important to note that defenders are involved in possessions in other ways by successfully rotating, preventing a shot or pass and, in particular, deterring a shot or pass. Much like screen-setting, defensive players provide value in ways that this study did not capture. With that said, there were two key findings:

1. Highly active **defensive** players have less of a *direct* involvement in scoring attempts and creating turnovers than highly active **offensive** players do in scoring attempts and committing turnovers.
2. Because of the distributed nature of offense and the large geometric area of the court, even the most active defensive players won't be directly involved in a *majority* of scoring attempts.

This asymmetry is critical to understanding the limitations of a defender. As we've noted, most high-volume shooters don't shoot or turn it over more than one-third of the time. The equivalent to these actions defensively – guarding the scoring attempt or creating the turnover – are even *more* dependent on one's teammates than their offensive counterparts. High-volume defenders often post a Defensive Usage of under 30% – meaning they personally defend a shot attempt, commit a shooting foul or force a turnover on less than one in every three possessions that they play.

This is not surprising given that the rules of basketball are slanted toward the offense. (Namely, the advantage provided by screens, which act as immovable barriers that the defense must circumvent.) A team's offensive turnovers influence its defensive performance and are the other major factor that lead to possessions outside of any individual defender's reach: Imagine a turnover in the half-court that leads to a three-on-two fast-break, in effect a pre-made power player. In those situations, the offense will always have an option to take an unguarded shot. Per the definition of "Defensive Usage," about one in five scoring attempts per game is "unguarded." However we choose to define the "direct" influence on a play, it's rare for an NBA star to play a large role in a majority of possessions while in the game. As of the early 2010's, the average game had 184 offensive possessions (92 for each team). In my study, the highest combined Offensive Load *and* Defensive Usage for a single player was under 40%. Meaning that on both offense and defense combined, the most active players (Derrick Rose of the Bulls and Kobe Bryant, in that sample) still did not have a "direct" impact on 60 percent of their teams' total plays. Even if they played the entire game, that leaves 115 possessions without direct influence. Certainly, the factors this methodology excludes, like screening on offense or ball-denial on defense, will increase a highly active player's sphere of influence beyond 40%...but to what degree?

What's evident here is that there are limitations to how much one player can impact an NBA game, and that a large portion of the game is outside of the control of any one player. And we haven't yet accounted for the 15 to 25 percent of the game that players sit on the bench.

Nonetheless, basketball has been seen as, essentially, an individual sport because of how largely one player can impact the game. In reality, individual players merely *help* teams win. And while one player does have a disproportionately large impact relative to say, hockey, baseball or football, this impact is not comparable to anything close to an individual sport.

So, given their sometimes limited involvement, how much do the best players impact the scoreboard?

Michael Jordan's Latest Record

In 2012, Michael Jordan was part of yet another record-setting team. This time, as an owner, Jordan's Charlotte Bobcats tallied the lowest winning percentage in NBA history, claiming seven victories in 66 games.[51] The Bobcats were outscored by nearly 14 points per contest while finishing as the worst offensive team (by a mile) and the worst defensive team (barely) in the league. Adding any star to a team of this quality is going to significantly improve them...but by how much?

Few players on that roster would even play on competitive teams. Corey Maggette, Reggie Williams, Derrick Brown, DJ White and Tyrus Thomas all struggled to play in the NBA, or for the 21-win Bobcats, in the following season. Boris Diaw and DJ Augustin were backups for competitive teams in 2013. It's unlikely that any single player on the 2012 Bobcats would start on a high-quality NBA team.

What would the best players in the world do with such teammates around them? We can approximate this by analyzing 18 years of play-by-play data (publicly available since 1997) and examining a team's performance with a player on the court compared to the team's performance with a player out of the game.[52] Here are the players with the greatest differences in their team performance when on versus off the court between 1997 and 2014:[53]

Player	Season	On per 48 minutes	Off per 48 minutes	Net
Kevin Garnett	2003	6.1	-19.0	**25.1**
LeBron James	2009	13.7	-7.3	**21.0**
Kevin Garnett	2004	9.1	-11.0	**20.1**
Dirk Nowitzki	2003	12.0	-8.0	**20.0**
Dirk Nowitzki	2001	8.2	-10.4	**18.5**
Andre Iguodala	2014	13.3	-4.3	**17.7**
Stephen Curry	2014	9.7	-7.7	**17.3**
Steve Nash	2011	5.5	-11.5	**17.1**
Chris Paul	2009	5.6	-11.2	**16.8**
John Stockton	2001	11.2	-5.4	**16.7**

In 2003, the Minnesota Timberwolves were worse than the 2012 Charlotte Bobcats – ostensibly the worst team ever – when Kevin Garnett was off the court. In 639 disastrous minutes without Garnett, the Timberwolves were outscored by 19 points per 48 minutes, five points worse than the 2012 Bobcats. Such a team would be expected to win *five* games in an 82-game season. When Garnett was on the court, the Timberwolves were six points better than their opponents – a 58-win pace.

On the surface, that looks like an enormous difference. However, not all of the change is necessarily caused by Garnett – he may have gone to the bench with the team's second (and third) best player, leaving the non-Garnett Timberwolves extremely short-handed and exacerbating their weaknesses. If that were the case, then Garnett would also re-enter the game with those players, overstating his individual impact while ignoring potential contributions of the teammates with whom he is subbed in and out of the game. In either case, Garnett is an outlier, and just five times in 18 years has someone posted a net difference of more than 18 points.

One method to account for these lineup entanglements is called “Regularized Adjusted Plus-Minus,” or RAPM. Through a mathematical technique known as Ridge Regression, RAPM attempts to determine just how much these on/off numbers are influenced by the teammates someone was playing with and the opponent quality while the player was on floor.[54] RAPM analysis suggests that Garnett's actual impact that year was on order of 12 points per 100 possessions, or just under nine points per game. This is in line with the best seasons on record in which play-by-play data is available, topped only by players like Shaquille O'Neal (almost 13 points per 100 possessions, or just over nine points per game) and LeBron James (almost 14 points per 100 possessions, or just over 10 points per game).[55] Does this ceiling jibe with what we see historically?

Was It All Kevin Garnett?

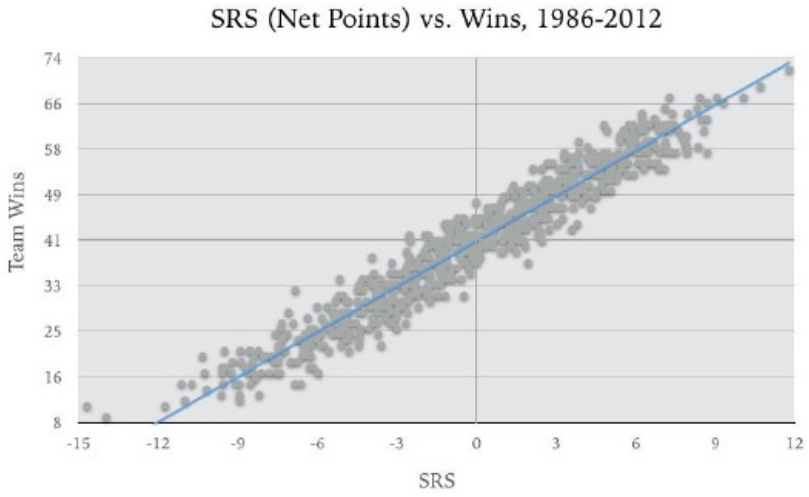
The largest single-season turnaround in NBA history was the 2007 to 2008 Boston Celtics, who reconstructed their entire roster, save for three starters. That team improved by 13 points a game, one of seven teams in history to improve by at least 10 points per game. Below are the largest single-season turnarounds in NBA history by the Simple Rating System, or SRS:[56]

Team	Season	Additional Wins	SRS	SRS Change
Boston	2008	42	9.3	**13.0**
Boston	1980	32	7.4	**12.2**
Phoenix	1989	27	6.8	**11.6**
San Antonio	1998	36	3.3	**11.2**
San Antonio	1990	35	3.6	**11.0**
Phoenix	2005	33	7.1	**10.0**
Oklahoma City	2010	27	3.6	**9.6**
Detroit	1996	18	2.5	**9.5**
Milwaukee	1970	29	4.3	**9.3**
Cleveland	2009	21	8.7	**9.2**

That list covers over 1,200 team-seasons. In that time, no team has ever improved by more than 13 points per game from one NBA season to the next. Additionally, the values in the opposite direction are similar, when teams lose superstar players and grow worse. The biggest single-season declines in NBA history, by SRS, are listed below:[57]

Team	Season	Fewer Wins	SRS	SRS Change
Chicago	1999	41	-8.6	**-15.8**
Cleveland	2011	42	-8.9	**-15.1**
San Antonio	1997	39	-7.9	**-13.9**
Denver	1991	23	-10.3	**-11.9**
Houston	1983	32	-11.1	**-10.7**

While there have been seven double-digit improvements in SRS since the implementation of the shot clock (in 1954-55), there have been only five instances of double-digit decline. Not surprisingly, the height of the negative change is greater than the height of the positive change, likely caused by factors such as "tanking" and injury. (There is no positive inverse for injuries or tanking.)



A comparison of SRS – or schedule-adjusted margin of victory, per game – and team wins. Note the near perfect relationship between wins and SRS.

Were the 2008 Celtics transformed entirely by one player? While they added Kevin Garnett, who finished fourth in the Most Valuable Player voting that year and won the Defensive Player of the Year award, they also added Ray Allen, James Posey and Eddie House. In addition, the incumbent star, Paul Pierce, was injured for much of the previous season. Most of the previous year's roster had departed; the three top-minute players on the 2007 Celtics team were not on the 2008 team. Given the lack of lineup continuity, comparing the 2007 Celtics to the 2008 Celtics is like comparing the 2007 Timberwolves to the 2008 Celtics. All of the top single-season turnarounds suffer from this problem, where multiple variables are swapped instead of the addition of just a single player.

Wow Me with WOWY

Ideally, in order to answer the question "How much can one player impact the game?" we would want to compare a team without a player, and then add *only* said player to see how they performed. As previously noted, this method is called "With or Without You," or WOWY.[58] It allows us to look at a roster with players A-B-C-D-E and see how they performed with player F added. The best WOWY results ever observed for players with a minimum of 18 games played or missed are listed on the chart below.[59]

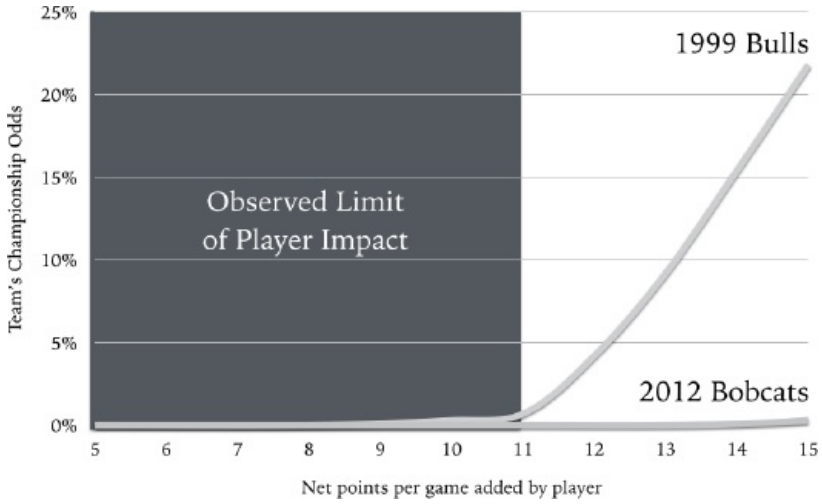
Player	Year	Sample Size	SRS In	SRS Change
Nate Thurmond	1967-68	25	4.4	**10.4**
Bill Walton	1977-78	26	8.5	**9.7**
Larry Bird	1991	19	9.0	**7.9**
Hakeem Olajuwon	1986-87	27	2.5	**7.8**
Jerry West	1968	20	7.7	**7.5**
Jerry West	1963	26	4.9	**7.1**
Patrick Ewing	1998	21	8.0	**7.0**
Tim Duncan	2004-05	22	8.8	**6.9**
Elgin Baylor	1962	30	4.7	**6.4**
Shaquille O'Neal	2002-03	24	6.0	**6.3**
Kareem Abdul-Jabbar	1978	21	4.5	**6.2**

Using the 18-game cutoff, only seven times in NBA history has the same lineup improved by at least seven points with the addition of a single player. The top two instances were across lineups that spanned multiple seasons – Nate Thurmond's Golden State Warriors in 1967 and 1968 (+10.4) and Bill Walton's Portland Trailblazers in 1977 and 1978 (+9.7). Even legends in the heart of their prime like Tim Duncan, Shaquille O'Neal and Kareem Abdul-Jabbar could not add more than seven points per game to a team's differential.

Based on the sample size (the topic of the next chapter), there is a 95 percent chance that Thurmond's 1967 and 1968 Warrior teammates were between a -2.3 SRS and -9.7 SRS team without him. In other words, it's 95 percent likely that Thurmond improved that team by *at least* 7.1 points. And that's the best observable result in NBA history.[60]

Collectively, WOWY data and the year-to-year changes of teams corroborate the limitations observed at the start of the chapter; even the best players in NBA history are limited in how much they can improve a team. It is unclear whether that ceiling is closer to seven points per game or 10, but it is clear that no player could join a team like the 2012 Charlotte Bobcats and make them a viable contender. Improving those Bobcats by 10 points per game would yield only 29 expected wins – not enough to ever win a championship. Even the 1999 Bulls, the team with the sharpest single-season decline in history, would only be a 44-win team by adding such a player.

Below is a graph of the championship odds of these two teams:[61]



In theory, if the worst team in NBA history added the most impactful player ever observed – in the above graph, a liberal improvement of 11 points per game – its odds of winning a championship would still be *zero*. If a slightly better team, the 1999 Bulls, added such a player, its odds of winning a championship would cap at 0.7 percent, or less than one in a hundred. For the 1999 Bulls to compete for a championship, they would either need a player better than anything previously observed, or more than one additional star player.

This mirrors the empirical evidence over the years; when star players leave good teams, the teams become much worse, but they do not turn into the worst teams in NBA history. Similarly when star players join bad (or even mediocre) teams, they do not transform into the best teams in NBA history. Indeed, the 2008 Celtics turnaround involved reconstructing their entire roster, save for three starters. That team improved by 13 points a game. The largest decline ever observed, the 1999 Bulls, stemmed from the loss of Michael Jordan, Scottie Pippen, Dennis Rodman, starting center Luc Longley and coach Phil Jackson. That was a 15-point drop, which still left them six points better than the 2012 Bobcats.

In summary:

1. There are limitations on how much an individual can impact an NBA game.
2. Because of this, no individual can morph any team into a championship contender.
3. It appears unlikely that any player to date has improved a team's scoring differential by more than about 10 points per game.

This has critical implications for judging individual players in a team context. Some of the biggest stars in NBA history, like Michael Jordan, Kareem Abdul-Jabbar and Wilt Chamberlain, have all been unable to elevate floundering teams to championship contenders. It turns out that the old cliché is indeed true: Basketball is a team game.

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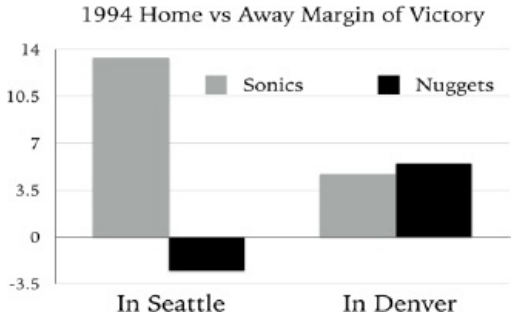
48. Some of the methodology: Creation was measured by "Opportunities Created" (a created power play), credited when a defender stopped guarding his original man in order to provide help defense on an offensive player – much like the Steve Nash power play example – *and* that defensive warping led to an open shot or intentional foul at the rim to save an open layup.
49. This does not prevent players from having a small impact in other ways. They do, by either setting screens or occupying their own defender in a way that makes help defense less possible. However, many of these other factors are not strong or "direct" contributions to the play; these players are not taking the shot or directly creating an open shot for a teammate. Relative to shooting, creating or turning it over, actions like setting screens have little (or no) observable impact for most players.
50. For example, Boston's Jermaine O'Neal had the highest usage in the 2011 playoffs at just under 34%.
51. A labor dispute delayed the start of the 2012 season resulting in an abbreviated, 66-game season.
52. This is a cousin of WOWY, known as "net on/off." On/off is more granular than WOWY, comparing when a player sits or plays *within* a given game. Because of this, it's also more susceptible to confounding errors that we can't account for, such as two players going to the bench together.
53. Minimum 2000 minutes on and 500 minutes off. NBA.com does not provide official play-by-play or plus-minus data before 1997.
54. RAPM does this well, but not perfectly. The mathematical technique produces the most likely explanation for the players who contributed to the team's point differential. It is not a "player ranker," instead providing the most probable answer of the question "if teammate and opponent strength are accounted for, how much does this player impact the game?" The answer is still limited to the situation a player is put in – for example, the role a player plays on a particular team – and subject to some confounders that are hard to disentangle. (e.g. when two players are regularly moved in and out of the game together, it becomes difficult to tell which player is responsible for impacting the game.)
55. The value of RAPM points varies from season to season. To create a standard comparison across seasons, a normalizing analysis was done by Matt Johnson, which can be found here: http://tinyurl.com/j2k7rdl
56. SRS is simply a team's point differential, with a simple adjustment for schedule strength that takes into account the opponent's margin of victory. It is a better predictor of games than a team's win percentage.
57. The 1999 season was 50 games due to a labor dispute. As such, numbers from that year are prorated to an 82-game season.
58. The two biggest confounders using this method are the occasional low-minute players who still have moderate impact, and when multiple low-minute players are injured at the same time, such as two 23 minute-per-game players.
59. Eighteen games is not a random number. Over an 18-game sample, the average NBA team will perform within five points of its season-long SRS value 95% of the time. Thus, all of these samples have somewhere between a three and five point "error" rate.
60. WOWY doesn't include players who never missed time, so the peak seasons of players like Michael Jordan, Wilt Chamberlain, Larry Bird, Magic Johnson and many others aren't necessarily captured. With that said, many revered seasons are represented. Thus, unless one considers some of the most notable peaks in NBA history to be aberrations, many of the great player-seasons in history are represented.
61. Championship Odds were calculated by taking five years of regular season data combined with 12 seasons of playoff data – over 6,000 games. Details and discussion can be found here: http://tinyurl.com/jzo9q94

Chapter 4
The Game Is Long Enough: Sample-size Insensitivity

In May of 1994, the Denver Nuggets shocked the basketball world by defeating the Seattle Supersonics. For the first time in the league's history, a No. 8 seed eliminated a No. 1 seed from the postseason. A week later, in the *Sunday Gazette,* columnist Ken Schott wrote that the Seattle players "should be embarrassed." David Casstevens, in the *Star News*, quipped "the pressure on, the basket appeared to shrink. No one on the SuperSonics stepped forward." Was such harsh criticism fair? Or was the loss as likely as flipping a coin three times and it landing on tails thrice?

Led by blossoming stars Gary Payton and Shawn Kemp, the young Sonics implemented coach George Karl's trapping defense and averaged 59-wins per season from 1993 to 1997. History has remembered that group for its failure in that series more than the 295 regular season wins, a near trip to the 1993 NBA Finals (a Game 7 loss to Phoenix) and its 1996 Western Conference championship. The Sonics were not only lambasted at the time but have been historically labeled as "chokers." And while it is true that the team's offense regularly waned during those postseasons,[62] variance was undoubtedly a key factor in their 1994 demise.

That season, the SuperSonics split their four regular-season games against the Nuggets, winning comfortably at home twice while losing by over 10 points per game in two trips to Denver. This was consistent with Seattle's makeup that year: The Sonics outscored teams by a whopping 13.4 points per game at home, posting a 37-4 record in Seattle,[63] while producing a more pedestrian 4.7 point margin-of-victory (MOV) on the road. On the other hand, the Nuggets outscored opponents by 5.5 points at home and were outscored on the road by 2.5 points per game (see graphic).



Which means in Denver, the Nuggets played like a 57-win team, while away from Seattle, the SuperSonics only played like a 55-win team. By these conventional standards, the Nuggets were actually slightly *better* when the teams played in Denver. So what happened in their postseason series?

In Game 1 of the series, Seattle continued its regular-season home-court rampage by building a 25-point halftime lead and routing the Nuggets. In Game 2, the Sonics sprinted to a 13-point halftime lead, were finally outscored in a quarter (by three points) and coasted to a comfortable win. In Denver, the Nuggets held serve by riding a huge first quarter (41-26) to a victory. In Game 4, each team won two quarters and the Nuggets escaped Colorado with an overtime victory. A single extra Seattle point in the first 48 minutes of Game 4 would have rendered the series an historical afterthought.

Game 5 was the only true "upset" of the series. Historically, a home team with a 16-point home-court advantage will win about 90 percent of the time.[64] These are about the same odds as flipping a coin and landing on tails three times in a row. Does one game – an overtime one, at that – determine a season? Is it enough for outcries of "embarrassment?" Is that 5-game series a sufficient amount of basketball to claim that the 1994 Seattle SuperSonics weren't the best team in the NBA that season?

The Inconsistency of Coin Flips

NBA basketball is like a game of coin flips. Teams score points on roughly half of their possessions. In 2012, the Oklahoma City Thunder flipped the league's most effective coin, scoring 52 percent of the time they possessed the ball. The worst team, Washington, scored on 44 percent of its possessions.[65] Most NBA offenses execute within a narrow band of efficiency, usually somewhere between 1.00 and 1.15 points per possession (PPP).[66] Thus, seemingly small differences have an enormous impact on win percentage: With the same defensive performance, a 1.10 PPP offense will win about 66% of its games, whereas a 1.00 PPP offense will win only 33% of the time. In the NBA, scoring a few extra baskets per game is the difference between a "lottery" team and a championship.

Because basketball is a high-volume sport, these seemingly small differences compound to produce large discrepancies. In a typical NBA game today, each team has nearly 100 offensive possessions. That's a lot of flips to keep track of – so many, indeed, that we would be unable to accurately remember all of the scoring without a scoreboard. Let's break it down into more manageable chunks and examine 10 flips at a time. Below is a random generation of 10 coin flips, run 10 different times (yielding a total of 100 flips):

Simulation Round	Number of Heads (out of 10 flips)
1	3
2	3
3	7
4	5
5	6
6	6
7	7
8	6
9	7
10	6
Total heads:	56

Ten flips can produce some lopsided results – the coin might land on heads 70 or 80 percent of the time. Indeed, in half of the simulation rounds, heads or tails landed seven times. After all 100 coin flips, 56 percent turned up heads and 44 percent tails. This 12 percent difference between heads and tails is *greater* than the difference between the best and worst offenses in the NBA. And yet, by definition, heads and tails are perfectly equal!

If this were a basketball game, pundits would say that Team Heads pounded Team Tails into oblivion. Countless articles would be written about the dominance and superiority of Team Heads.[67] If it were a one-game championship, such as college basketball's NCAA Tournament, no one would even deign to suggest that the teams were equal.

These “teams” – a.k.a the sides of the coin – are indeed perfectly equal. Yet after 100 flips, they appear quite lopsided by NBA standards. How can they be equal and yet the results be so one-sided?

Variance.

Variance is a measure of consistency. Averages themselves do not indicate consistency. An average is the result of a bunch of numbers, but many of those numbers *are not the average* itself. Variance is simply a measure of how much the numbers from the bunch differ from the average. In other words, it is a measure of how large the spread of numbers is around the average.

Inconsistency is synonymous with higher variance and can generate results that might look strange, such as two sides of a coin appearing to be completely mismatched. There is a “true average” rate that the coin will land on heads, which is 50 percent of the time, but in smaller samples, such as flipping the coin “only” 100 times, we won't necessarily observe the true average. So how large does the sample need to be before we do observe the true average? It completely depends on the degree of consistency, or variance, in what we are observing.

Below are the results from our earlier coin-flipping simulation, but this time the 10-flip average (5.6 heads) is shown next to each round's *difference* from that average. Notice that some rounds are closer to the average than others.

No. Heads	10-flip Avg.	Difference from avg.
3	5.6	2.6
3	5.6	2.6
7	5.6	1.4
5	5.6	0.6
6	5.6	0.4
6	5.6	0.4
7	5.6	1.4
6	5.6	0.4
7	5.6	1.4
6	5.6	0.4
56	**5.6**	**1.16**

Look at that left-hand column. Only once does the number of heads flipped actually result in the true average, because a coin is not perfectly consistent. And neither are basketball teams.

Variance Rule of Thumb #1: Low variance is "consistent."

Variance Rule of Thumb #2: High variance is "inconsistent."

The closer the numbers cluster around an average, the lower the variance is. The wider the range is, the higher the variance. Basketball is a high-variance game; a typical NBA game does not come down to the wire, but instead is decided by 11 points, on average.[68] In the NBA, like all high-variance games, it's difficult to differentiate short-term luck from larger trends.

But How Much is Enough?

The 2010 champion Lakers scored 109 points every 100 possessions over the course of the season. But how many possessions would we have to look at to know this?

After the Lakers first 10 possessions that year, their offensive rating was 90. In their next 10 possessions, 110. After two games that year – nearly 200 possessions – their offensive rating was only 95. After 10 games, it was 105 and after 20 games – nearly 2,000 possessions – it was 110...close to their season average.

Because of the high-variance nature of basketball, it takes a larger sample size – a large number of games – to be confident that the numbers are actually reflective of the overall performance. Variance and sample size go hand-in-hand. If there were a Statistics Prom, they'd show up together every year.

Variance Rule of Thumb #3: The greater the variance, the larger the sample needed to make accurate conclusions.

The overall quality of a basketball team (its average performance) isn't necessarily reflected in small samples (such as a seven-game playoff series). This applies to all sports – all *data!* – but is incredibly relevant in basketball, where teams play thousands of possessions in a season and based on the structure of the postseason, can be eliminated in 300 playoff possessions.

Are 300 possessions a large enough sample to determine if the best team truly won? Are 100 possessions? Taken to the extreme, how often would the best team win a one-possession playoff series? Clearly not 100 percent of the time. Even the 2012 Charlotte Bobcats won seven games, and they were unequivocally the worst team in the NBA that season. The winning team doesn't always score first, so we know more than a single possession is needed to determine which is better.

But how long would it take before we could be confident the best team won? It depends on the difference between the two teams in the regular season (the larger sample) and the margin of victory in the series itself. For the majority of matchups, it takes more than a half. More than 48 minutes. More than seven games! A lot more than seven games, actually.

Like a coin, it takes a large sample to ensure that the better team will always win a series, especially when the teams are closely matched. In *The Drunkard's Walk: How Randomness Rules Our Lives*,[69] Leonard Mlodinow calculates that in a matchup where one team would win 66 percent of the games, it would take a best-of-23 series for that better team to win the series at least 95 percent of the time. Such a team would lose a best-of-seven series about 20 percent of the time.

Closely matched teams won't always play a close series either. More than two thirds of the time, two perfectly even teams, playing

on a neutral court, wouldn't reach Game 7 in an NBA series. A quarter of the time, one team would win the series four games to one. Even a lopsided series doesn't necessarily prove that the best team won.

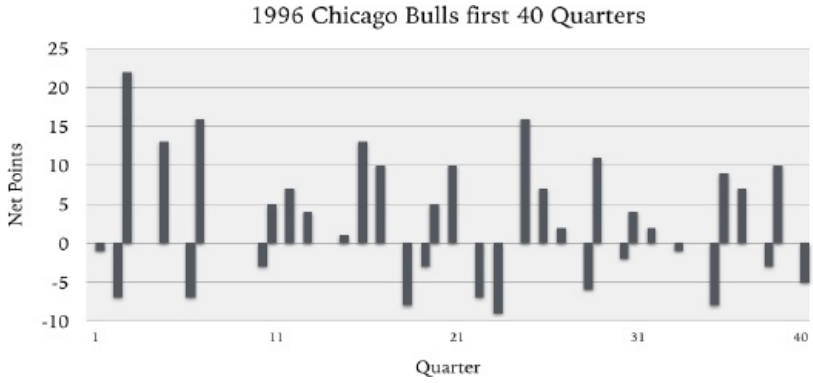
In this sense, most upsets – instances where the winning team is truly a weaker team – are a result of the sample size. (Some underdogs also win because they match up well with their opponent.) Increasing the length of the series would eliminate these kinds of upsets. Since the difference between a good and bad offense is only an extra basket every 20 possessions, small-sampled upsets are quite frequent. In the NBA, after 48 minutes, it is *not* highly likely that the better team won.[70]

Why Did the "Best Team Ever" Ever Lose?

One of Seattle's four home losses in 1994 was to the 20-win Detroit Pistons. Were the Sonics worse than Detroit because of that one game? After all, even the expansion Toronto Raptors defeated the 72-win Chicago Bulls. The better team doesn't *always* win.

The 1996 Chicago Bulls were one of the most dominant teams in NBA history. They notched the all-time record with 72 wins in a season and posted the third-largest margin of victory ever, outscoring teams by 12 points per game. The Bulls started strong that year, outscoring opponents by 10.4 points per game over their first 40 full quarters, or 2.6 points per quarter,[71] Nine times (23 percent of quarters) the Bulls outscored teams by double-digits in a single quarter.

Yet despite this dominance, in the first 10 games of the year, the Bulls were also *outscored* in 14 quarters. The 72-win juggernaut, playing at an historically good level, lost about one in every three periods.[72] Even among the greatest teams ever, undulating performance is the norm.



Instead of steadily outscoring opponents by a few points per quarter, Chicago oscillated between positive and negative quarters, winning no more than three consecutive periods over this stretch.

The 1994 Seattle SuperSonics were "upset" in a single game at home, in overtime no less. They were a single point away from advancing in Game 4. How different are they, in terms of playoff performance, when compared to a team like the 1993 Phoenix Suns, who won a fifth game in overtime against the 8th-seeded Lakers after falling behind 2-0 in their best-of-five series?

Based on their season performance at home, those Suns were 85 percent favorites to win in Phoenix vs. LA and 66 percent favorites to win in Los Angeles. Such a team will win a five-game series 93 percent of the time. Which is nearly identical to the Sonics probability of defeating Denver based on their season performance. Is a 93 percent foul shooter still not a 93 percent foul shooter just because he misses occasionally?

Sample-Size Insensitivity

At the end of the college basketball season, two teams play a single Championship game to determine a winner. At the end of the game, the winner is almost *always* considered better than the loser.

At the end of the NBA season, two teams play each other in a best-of-seven playoff series to determine a winner. At the end of the first game of the series, the winner is almost *never* considered better than the loser.

This is *Sample-Size Insensitivity,* or when we factor in sample size only as much as the sample is *explicitly* stated.[73] In the collegiate format, people aren't explicitly presented with the idea that one game may not be enough to conclude that the better team truly won. Simply presenting the possibility that a team needs to win more than one game to determine superiority alters judgment about the importance of that one game.

***Sample-Size Insensitivity**:* A tendency to consider the given sample as sufficient for reaching a conclusion.

The most prominent cases of *Sample-Size Insensitivity* can be seen when comparing the reactions from the single-elimination NCAA Tournament with the NBA seven-game series format. Here was a newspaper lead in 1990, after UNLV trounced Duke 103-73 to win the National Title:

> "UNLV made its point in an emphatic way, wiping out the final remnants of doubt that the Runnin' Rebels are the finest college basketball team in America."[74]

This is standard for college reactions – a single-game blowout leads to definitive conclusions.[75] Juxtapose that with a comparable blowout from an NBA Finals series, the 1985 "Memorial Day Massacre," in which reigning champion Boston hammered Los Angeles 148-114 in Game 1:

> "The record-setting Celtics were so awesome offensively Monday that Pat Riley thought they resembled the Lakers."[76]

> "This was a start-to-finish tatooing."

In article after article, there wasn't a mention of any definitive superiority. It was seen as only one game, in which journalists described the Lakers struggles, lauded the Celtics amazing offensive performance and anticipated the next game. No one declared the series "over." No one pointed to how a 34-point, record-setting blowout "wipes out doubt that Boston is the world's best team." Indeed, it was the opposite. The AP quoted Celtic coach KC Jones as saying he "knows things won't be easy in Game 2."[77]

Why the different reactions? What is it about explicitly stating the length of a contest that allows people to intuitively keep variance and sample-size in perspective, only as much as the stated length?

In its constant desire for efficiency, the mind will never do more than what is required. This general concept is known as *extension neglect*; unless attention is explicitly diverted to sample size, the size of the sample will be overlooked when considering the strength of the sample. The brain doesn't think about *other* possible games after the events of a 30-point blowout, unless those other games are presented as part of the assessment.

One experiment posed subjects with the following scenario:

> "A certain town is served by two hospitals. In the larger hospital about 45 babies are born each day, and in the smaller hospital about 15 babies are born each day. As you know, about 50 percent of all babies are boys. However, the exact percentage varies from day to day. Sometimes it may be higher than 50 percent, sometimes lower."

Subjects were then asked which hospital had more days on which at least 60 percent of the babies born were boys. Is it the larger hospital, the smaller one, or are they about the same? Think about it for a moment.

The majority of subjects thought that the likelihood would be similar in either hospital. They reasoned that 60 percent is a percentage, thus the sample-size doesn't matter. It will simply occur at a steady rate. (This suggests we have a built-in disregard for variability.) Nearly a quarter of those questioned thought that the larger hospital would produce more days with 60 percent boys.

Neither is correct. Fewer than a quarter of the subjects correctly answered that the smaller hospital is more likely to have higher variance days due to...the smaller sample sizes! It's easy to have a lot of days with more than 60 percent of male births in a hospital with one birth per day, but it's nearly impossible in a hospital with 10,000 births per day.

In sports, this effect creates a cognitive blindness to match length. It's natural to never wonder "what if a game were longer?" or "what if they played more games?" The brain is always trying to simplify the equation, looking for the quickest possible way to conclude that one team is *definitively better*. That's the nature of the mind – it wants to make confident guesses, not toil in uncertainty.

Most NBA fans realize that one game isn't enough to determine the better team. But how many wonder if *seven games* might not be sufficient either? Instead, we are often convinced that a seven-game series "almost always" determines the better team. Yet it doesn't.

For example, the 2011 NBA Finals was the second-closest playoff series since 2003 by in-game scoring measure.[78] In six games, Dallas outscored Miami by just 14 total points. The average difference between the two teams at any point in the series was a mere 3.8 points. Yet after the Finals, Sports Illustrated's Chris Mannix wrote that Dallas "clearly had a better team,"[79] which is like proclaiming that heads is clearly more likely to fall than tails.

All conclusions that ignore sample size are like this. Taking naturally varying events, like scoring in basketball, picking a sample that does not accurately reflect the overall performance (such as the Chicago Bulls losing a few quarters in 1996) and then pounding the table and declaring "this sample describes this team perfectly!" is like flying into Los Angeles on a rainy day and concluding that the weather is like that all the time. That Shaq can shoot better from the free-throw line than Steve Nash for one game does not make Shaq a better free-throw shooter.

Similarly, individuals are victimized when we overlook sample size and reach premature conclusions. For example, 2007 MVP Dirk Nowitzki was widely panned for his playoff series against Golden State, the first time a top seed lost a seven-game series to an eight seed. In three of the series losses, Nowitzki's GameScore was under 16.[80] In one game, it was an abysmal 2.9.

But in one third of his regular-season games Nowtizki didn't eclipse a GameScore of 16. Thus, he had one more subpar game than expected during the six-game loss based on his *average;* a regularly occurring result given the typical inconsistencies of an NBA star.

This is why many coaches describe the NBA as a “make-or-miss” league. Sometimes, a bad shooting game is not caused by amazing defense or psychological distractions, it's rooted in the normal inconsistencies of the sport. All great players have poor games that are caused by nothing more than variance.

Yet despite how critical sample-size is to making definitive conclusions, it's largely ignored in sports (and everyday life). It is typically factored into judgment only as much as it is explicitly stated. In the college championship game, one does not generally conclude that the winner of the first half is “clearly” a better team. But, in theory, if basketball games were 24 minutes long, fans would start to believe that 24 minutes is how long it takes to determine the better team. Similarly, if an NBA playoff series were a best-of-11 affair, then we would no longer think that a team with a 4-3 or 4-2 lead in the series was the better team, because it's *explicitly stated* that there is more basketball to be played to determine superiority.

Short-term luck, even when it doesn't “feel” short-term, is not a good indicator of overall performance. When the coin lands on heads three or four times in row, it does not mean the coin is weighted. Similarly, in sports, while it's true that an occasional underdog is better than they appear, many upsets are simply the result of variance. Many bad nights (or even a bad series) from marquee players are due to normal undulations in performance.

We might even say that upsets and off nights are expected based on variance.

Sidebar: Ballistic Movements in Sports

Where does athletic variance originate? After all, basketball is not a card game that is susceptible to the laws of probability. Yet, athletics are rife with inconsistency.

Psychological factors are one reason, such as emotional distractions or cognitive fatigue. There's also physical variance, primarily caused by the *ballistic movement*, which is at the cornerstone of most athletic movements.

A ballistic movement is an explosive motion that requires a separate stopping process (the antagonistic muscles) from the starting process (the agonistic muscles). To throw or kick a ball requires an explosive release of energy. These kinds of movements are physiologically complex and susceptible to error.

First, the areas of the brain responsible for motor control must accurately output commands based on sensory input (received via relay nuclei) on somatotopic maps – which means people take sensory cues and *guess* at the optimal path to project their muscles in order to shoot a ball. Then the brain stem relays these commands to muscles. Finally, agonist and antagonist muscles must fire together to produce the desired movement. And that's a simplified explanation - no wonder no one can shoot 100 percent from the free throw line.

We "learn" and reevaluate after each movement, which reduces the error over time ("practice"), but unlike fine motor control, these kinds of movements *always* leave a degree of uncertainty.

62. The Sonics offense (relative to their opponent's defensive efficiency) dropped in four of those five seasons by between 3.5 and 5 points (per 100 possessions). Overall, Seattle offenses were 4.6 points better than opposing defenses in the regular season during those five years, but only 2.5 points better in the postseason. Not terrible, but a drop nonetheless.

63. For comparison, one of the greatest home teams ever, the 1986 Celtics, outscored opponents by 13.0 points per game that year en route to a 40-1 regular season record at home. The 72-win Bulls outscored teams at home by 17.1 points per game in the 1996 season.

64. The same 6,000-game pool used to calculate championship odds was used to calculate the odds of winning a given series based on point-differentials.

65. Data provided by http://www.teamrankings.com/nba/stat/floor-percentage

66. Teams are less efficient in half-court possessions than their overall efficiency suggests. In 2016, teams were between 0.12 and 0.20 PPP worse (an average of 0.16), per NBA.com's *Synergy* data. About 15% of plays occur in transition, in addition to technical and loose-ball fouls that aren't "half-court offense."

67. A nod to college statistician Ken Pomeroy, who explored this idea once.

68. Every season from 1985-2012 has produced a per-game average margin of victory (MOV) between 10 and 12 points. Due to this high degree of variance, the average single game itself isn't that close to overall performance.

69. Levitt, 2010.

70. If your inclination is to say, "games don't randomly end," I agree. There is a pseudo-randomness to the end of games, because the coaches and players are aware of the end of the game, and thus adjust their strategies accordingly in the final moments of the game (intentional fouls, more 3-point shots, etc.). However, this has an extremely small impact on the accuracy of full-game statistics. So much so that it is essentially moot when discussing the power of variance across quarters, per this example.

71. This excludes a single overtime period. With a standard deviation of 7.6 points per quarter, the Bulls had a typical level of variability in this sample.

72. Some of this has to do with the fact that dominant teams, like the Bulls, often win early quarters and lose the 4th quarter because the game is no longer in doubt. In this case, the Bulls were +2.5 across 10 4th quarters, with five 4th quarters resulting in -9 total points (-1.8 per quarter). This skews the number slightly because in "competitive" quarters, we'd expect Chicago to produce better results – closer to the +3.2 points per quarter they averaged in the other 35 quarters of the sample. So for a more accurate picture, make a slight mental curve of the numbers in this example.

73. First studied by Nobel Laureates Daniel Kahneman and Amos Tversky, this phenomenon is common to all judgements and likely arises from a kind of "Extension Neglect." This insensitivity is also "belief in small numbers."

74. Phil Axelrod. "UNLV dominates Duke, 103-73, to win NCAA Title," *Pittsburgh Post-Gazette,* April 3, 1990.

75. Griffin and Tversky, in 1992's "The Weighing of Evidence and the Determinants of Confidence," found that people weigh the "strength" of an event while minimizing the sample. For instance, a blowout victory like UNLV's, despite being just one game, "feels" strong and thus makes worrying about the sample-size a non issue.

76. William R. Barnard, "Powerful Celtics shoot out Lakers' lights to grab series lead," *Associated Press,* May 28, 1985.

77. Gary Binford, "Game 2 tonight in Boston may show what Lakers are made of," *Desert News,* May 30, 1985.

78. Dean Oliver & Alok Pattani, "Analyzing the Closeness of the NBA Finals," *True Hoop*. http://espn.go.com/blog/truehoop/post/_/id/30167/analyzing-the-closeness-of-the-nba-finals

79. Chris Mannix, SI.com, June 13, 2011. http://tinyurl.com/3v4rvbj

80. GameScore is a derivative of "Player Efficiency Rating" (PER) that looks at basic box score tallies, assigns values to each and sums them together.

Chapter 5
Winning Bias

In the aftermath of the 2011 NBA Finals, few fans remember Dallas Maverick star Dirk Nowitzki's subpar shooting series. Today, it's nearly impossible to find a basketball fan or analyst who believes that Nowitzki did not severely outplay Miami's LeBron James that June. The media and blogosphere crucified James while deifying Nowitzki. Yet, by detailed analyses, their performances were somewhat comparable.

"You saw how bad I was tonight," one of them remarked after the final game of the series. "I was just having an awful night."[81] Nowitzki, the series Most Valuable Player, uttered those self-critical remarks, not James. Dirk made just nine of 27 shots in the closeout game, capping a series in which he averaged 26 points on a pedestrian 1.07 points per scoring attempt. James, his superstar counterpart, averaged a disappointing 18 points on 1.08 points per scoring attempt, but added seven rebounds and created 8.5 power plays per game to Nowitzki's 4.0.

The primary talking-point during the series became LeBron's lack of aggressiveness and production in the fourth quarter. The Washington Post wrote that "James' disappearing act down the stretch of games has become a trend this series."[82] A Wall Street Journal title jabbed "This is the fourth quarter, paging LeBron."[83] Through the first five games of the series, LeBron tallied 11 fourth-quarter points.

Much of this backlash was simply caused by LeBron's team *losing*. It's not that Miami couldn't have won – the Heat were incredibly close to winning – it's that they didn't. And the outcome fundamentally changes how the teams and the individual players involved are perceived *ex-post facto*.

Remember, the series itself was quite even. *Sample-Size Insensitivity* aside, why would anyone proclaim that Dallas clearly had a superior team when people were on pins and needles as the series unfolded, uncertain of the outcome? What happened *after* the series ended that crystalized their beliefs?

The One-Possession Game

The complexity of the game warps our perspective. The more stuff that happens, the more we miss. Game summaries are limited to only the most notable plays. The box score captures mostly offensive events about who scored, but not how they scored.

But what if basketball games lasted just one possession instead of 48 minutes? Instead of alternating possessions until the clock ran out, each team received only one offensive possession to determine a winner. Any overtimes would also be one possession, in the same mold as college football overtimes or extra innings in baseball.

How would coverage of the sport differ? How would our understanding of basketball change? Would it be sufficient to talk about the result of the final play or would we put the "game" under a microscope? Would pre-game discussion center around scoring strategy – staggered screens, options on different pick-and-roll reads, spacing the court – and the offensive/defensive lineups a coach could deploy depending on the matchup?

Take the final exchange of the 1993 NBA Finals, between Chicago and Phoenix, as a theoretical one-possession game. On the first possession, Chicago runs a play starting with Michael Jordan and ends up with a John Paxson 3-point shot. On Phoenix's possession, they rush an attempt by Kevin Johnson that is blocked. Chicago wins, 3-0! A newspaper headline might read:

> ***Paxson shot propels Bulls. Barkley fails Suns.***

Newspaper articles, instead of reducing an extremely complex game to a few simple anecdotes or statistics, could be more granular in summaries and discussions. Website, radio and TV analysis could consist of a detailed examination of causal factors involved in producing the final score. Here's a hypothetical summary piece after this one-possession game:

> After much anticipation about the Chicago strategy in Game 6 of the NBA finals, the Bulls abandoned their traditional triangle offense and gave Michael Jordan a full head of steam in the backcourt. Coach Phil Jackson, wanting to space the floor with shooters, deployed a "small-ball" lineup of Scottie Pippen, Horace Grant and sharp-shooters B.J. Armstrong (who was sent to his favorite spot, the corner) along with John Paxson.
>
> Phoenix matched Kevin Johnson on the taller Jordan, hoping to use his speed and quickness to contain Jordan's vaunted dribble penetration. Jordan started the possession near Chicago's hoop, guarded by Johnson some 90-feet from the opposing basket. MJ briefly dribbled toward halfcourt before whipping a quick pass to Scottie Pippen above the three-point line. Only Pippen was severely overplayed by Charles Barkley. It's unclear why Sir Charles followed Pippen so far away from the hoop – perhaps his intentions were to gamble for a steal – but nonetheless he was unable to slam on the breaks and flew by Pippen. Barkley's defensive error, in which he essentially left Pippen uncovered, gave him a clear path to the basket.
>
> This created a power play for Chicago. When Mark West reacted to defend Pippen, he left Horace Grant alone. Pippen flipped the ball to Grant near the basket. But a great "help the helper" rotation by Phoenix's Danny Ainge blocked Grant's path, who instantly recognized that Ainge's man must be open. Barkley never rotated to Ainge's man, John Paxson, who was all alone.

Such detailed analysis of a "game" would be commonplace. History would probably remember not just Paxson's shot, but Barkley's

terrible defensive possession, Pippen and Grant's quick reactions and BJ Armstrong inexplicably falling over as Paxon's shot was in the air with 4 seconds remaining.[84]

Adding 100 times the volume of plays results in a loss of information – a *reductionism* – that focuses on simpler, salient factors (like a key shot or the leading scorer) and causes blindness to other plays. There's simply too much going on to try to catalogue *all of it*, so only the most basic, "obvious" actions are recalled. Who remembers BJ Armstrong keeling over on the court? Few, if any, discussed Barkley's two major defensive mishaps that opened the door for Paxson's famous 3-point shot.

Instead of seeing the scorekeeping limitations caused by *Scoring Blindness*, writers and newspaper editors would have probably tracked information beyond points and rebounds, since the classic box score would have been insufficient for a one-possession story. With technological advances, other factors that could be analyzed (player speed, dribble counts, pick effectiveness and on and on) would become mainstream, not reserved as research for the MIT analytics department.

Yet most basketball possessions are this complex! Which is precisely why most possessions are not analyzed in detail. After nearly 200 possessions, it would take hours to review a single game. Simply because this information isn't recorded does not mean it isn't integral to how baskets are made and missed.

Trying to analyze the causality of each make (or miss) from every play in a 48-minute game, and then synthesize that information into a comprehensive analysis is beyond the capacity of a normally functioning human brain. It's impossible for a person to watch a game and accurately remember 18 defensive errors, 25 opportunities created, the shooting percentage on contested shots and so on. As a result, we default to what we perceive as key moments that sufficiently explain why a team won or lost. This reliance on a few, high-leverage moments lays the foundation for *Winning Bias*.

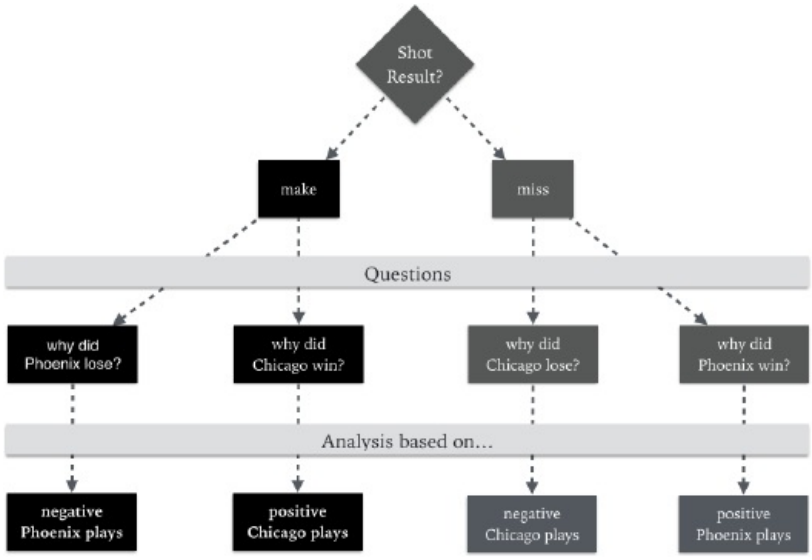
When the Seattle Supersonics were upset by Denver in 1994, the criticisms were scathing. Reactions ranged from "embarrassment" to "no one on the SuperSonics stepped forward." Fans ignored Dikembe Mutombo's key block on Shawn Kemp's potential game-tying layup with 30 seconds remaining in overtime. Nor did anyone highlight that Mutombo swatted a Detlef Schrempf layup attempt two possessions before that. Or that Gary Payton certainly attempted to "step forward," attempting a "hero" shot at the end of regulation over three Denver defenders, only to miss and watch Sonic guard Kendal Gill tie the game.

Until its final possession, Seattle missed only one shot in overtime that was not blocked. Denver committed *four* 24-second shot-clock violations in eight overtime possessions, an incredible feat of defensive intensity and commitment from the Sonics. Yet the Seattle players were criticized for lack of heart. Why this selectivity in our recollections of the game? It's almost as if we have forgotten the positive plays and latched on to all of the negative ones. What's going on here?

Winning Changes People

Pundits and fans weren't suffering from dysfunctional memories in 1994. Instead, they were influenced by the implicit framing of the information. As we saw when discussing Reggie Miller's scoring volume and efficiency (Chapter 2), framing plays a powerful role in how we synthesize information and reach conclusions. In this case, the subconscious post-game analysis we perform – our natural, quick impressions – is framed based on a win or loss: When a team wins, in order to explain *why* they won, we sift through memories of the positive events in the game. When a team loses, we examine the negatives. This phenomenon is at the crux of a *Winning Bias*.

If Paxson missed his shot at the end of the 1993 NBA Finals, the Suns would have won, not the Bulls. Thus, the framing of the post-game questions, and subsequent analysis, hinged on Paxson's shot. If Chicago had lost, the questions about them would be "why did they *lose?"* In turn, any attempts to explain Phoenix's play would be framed as a question of "why did they *win?"* Instead, when Paxson made his shot, people sought explanations for the Bulls win and had little need to access Chicago's negative plays.



A game's outcome subconsciously flips a switch that controls the entire post-game discussion, attempting to answer the implicit question "well, *why* did they win or lose?"

Since our minds crave shortcuts, we intuitively hold both positive and negative actions in a neutral, limbo-like memory space until we need to form an opinion. (This is universally true, extending far beyond the arena of sports.) In this case, the outcome of a game lets our mind know which information to focus on – it helps answer the *why did they win or lose* question – and therefore what information to discard. Then we instantly throw out what we don't need. Compartmentalized "information seeking" like this has been widely observed in psychological experiments.[85]

This cognitive phenomenon – a *Winning bias*, if you will – trickles down to how we perceive individual players on a team.

Winning Bias: A tendency to overrate how well an individual performed because his team won and underrate how well an individual performed because his team lost.

Here's what this might look like based on the outcome of the 1993 Bulls-Suns game:

Chicago wins:
To explain Chicago winning, analysts focus on Pippen and Jordan (56 points, 20 rebounds, 12 assists combined), Scott Williams' key rebounding off the bench (seven in 22 minutes), the key shot by Paxson and the block by Grant to end the game.

Chicago loses:
The post-game explanation focuses on a failure to finish the game well (9 fourth quarter points, all by Jordan), a lack of rebounding (Grant and Williams were insufficient relative to the Suns big men) and atrocious free throw shooting (11 for 20 as a team), namely by Jordan and Pippen (seven for 13 combined).

False Narratives and Winning Bias

Narratives, by nature, are simplistic and often dichotomous. They take big, sweeping points and drive them home with little regard for context or variance, often with the purpose to capture attention. As humans, we love characters to play defined roles, like hero and goat. Player A is a winner! Player B, a loser! We yearn for drama and relatable stories, which is why so many everyday qualities are injected into sports narratives:

You can't win with a player who doesn't want it. That's why Barkley lost!

You can't win if you don't perform under pressure. That's why Barkley lost!

You can't win without great leadership. That's why Barkley lost!

But these are whimsical musings.[86] They are entertaining, and they fulfill our need for dichotomy, but they are often inaccurate. One day Michael Jordan shoots too much. The next day, after his team wins, he “wants it more” than everyone else. (This unpredictability probably makes the story more appealing.) These narratives are often reductionist, entertaining and even controversial. They are not scientific or rigorously analytical.

Winning Bias (or *Losing Bias*) is at the heart of most of these narratives. They are subject to constant flip-flopping and contradiction because they are dependent on circumstantial factors, based largely on the actions of teammates, coaches, the opponent, etc. It was once said that no team could win with a lead guard scoring so much, because in the first 35 years of the shot-clock era, the 13 NBA franchises that claimed championships had done so without one. If that sounds like a small sample size, there were seven franchises up to that point to claim titles after the landmark NBA-ABA merger,[87] and the Lakers, Celtics, 76ers and Pistons the only four teams to win championships in the era of the 3-point shot (introduced in 1980) until 1991. Then Jordan led the Bulls to a title.

That narrative that guards should not score too much not only evaporated, but Jordan's story arc quickly took on the kind of polarizing inversion we saw when our one-possession game hinged on a single shot.[88] Many proclaimed that Jordan simply “wanted it more,” and it was his ferocious competitiveness that defined him as a champion. They juxtaposed this against the teams Chicago defeated: Portland's Clyde Drexler was “too nice,” Charles Barkley didn't “want it as much” as Jordan, as evidenced by his sometime suboptimal physical conditioning.

Once an idea like this crystalizes, people will seek out facts that selectively support the story. This is called *confirmation bias*. A mere two or three data points are sufficient to fuel a narrative (remember, the mind does not take naturally to sample size/variance concepts), and from there a story is told and sold. “Jordan worked hard while Barkley worked the buffet.” And while that might be true – Barkley did battle his weight – none of these factors prohibit Barkley from being significantly better at basketball than Jordan, in the same way that Barkley was better than most in the history of the league that ate more conservatively than he did. Or gambled less.

In 2007, Barkley famously claimed to have lost more than $10 million gambling over the years.[89] People looking for reasons why Barkley didn't “want it” as much as others occasionally cited his gambling habit as evidence for his suboptimal commitment to basketball.

Only Jordan loved to gamble too! Jordan's exploits into gambling landed him in hot water in 1993, when he was spotted the night before a critical playoff game in New York gambling in nearby Atlantic City. “Jordan gambled into the early hours of the morning, spotted as late as 2:30 am at the casino 125 miles from New York City,” wrote The New York Times Dave Anderson.[90] Anderson famously called out Jordan for his gambling issues, writing the following:

“The issue is that arguably the best player in basketball history owes his teammates and coaches more dedication.”

“With more rest, might he have scored more than 11 points in the second half.”

“Jordan's shot also appeared tired in the final minutes of the Bulls' 98-90 loss Sunday afternoon.”

> "Jordan also has been bothered by a sprained ankle and a sprained wrist suffered during the earlier playoff rounds. All the more reason not to wander down to Atlantic City the night before a game."

Anderson and others were seeking negative explanations after Chicago lost that game. But the Bulls went on to win the series, the championship, and three more with Jordan. After that, the questions about Michael's dedication came to a screeching halt because no one needed to seek out negatives after Chicago won. Winning can do that, serving as an antibacterial wipe for the mind, neatly disinfecting all of the negative memories associated with the winning team.

And that's the thing about these narratives – they are often arbitrary.[91] When the mind is not looking for negatives, a gambling issue is washed away. In one case, gambling is used to affirm the story about a player (Barkley). In another case, gambling is overlooked because the player's *team* won.

Jordan, of course, is regarded as the ultimate winner now; someone radically devoted to the competition of basketball. And yet few knock him for leaving the game for almost two full years to play minor league baseball. He also punched his teammate, Steve Kerr, in the face during practice, which again, is all but forgotten because people look for his positives.

And that's what *Winning Bias* does. It creates a selection filter to find evidence that supports a particular conclusion. Our information-seeking behavior reduces a complicated set of events into a few, simple points while negating important, counterbalancing information.

Losing Bias

The flip-side to *Winning Bias* is what happens to the players on the losing team. Barkley is slightly downgraded due to Phoenix's loss, as are many, if not all players in sports history who have been on losing teams. For example, who does history remember as the best player in the 2011 NBA Finals? Dirk Nowitzki, right? After all, he was awarded the Finals MVP award. Only Dirk wasn't the best player on the court in the series. Miami's Dwyane Wade was.

In Game 2 of the Finals, Wade played one of the better playoff games you'll ever see someone play, while Nowitzki was merely mediocre. Arguably, Dirk wasn't even the catalyst in Dallas' big comeback at the end of the game.[92] Yet, history remembers Nowitzki.

Thanks to the Internet, we can now juxtapose people's reactions during a game with their post-game commentary. The Slam Magazine live blog wrote at halftime that "Wade carried Miami in the first half," and with 7:14 remaining in the game declared "Wade is the big-time favorite to win the Finals MVP."[93] New England Sports Network declared "Wade has been the best player on the court, and there isn't a close second,"[94] and that was at halftime, before he poured in 15 more points in the next 17 minutes of game action. Without missing a shot.

However, Dallas then embarked on an amazing comeback, going the rest of the game without missing a shot that wasn't blocked. (One Nowitzki jumper was rejected by LeBron James.) The Mavericks scored on every one of their remaining trips in the final 6:19 of the game, posting an incredible 22 points in 11 possessions for an Offensive Rating of 200, nearly double their expected output in that timeframe. The Mavericks won 95-93 after Wade missed a desperation 3-pointer from 28 feet away at the final buzzer.

Most of the summaries of the games *negatively* focused on Wade, who held an extended pose after making a 3-pointer to put Miami ahead 88-73. At the same time, many lauded Nowitzki's gallant comeback efforts. Sports Illustrated's (SI) Ian Thomsen compared Nowitzki to Larry Bird,[95] only once mentioning teammates Jason Terry and Jason Kidd in a headlining story entitled "Dirk Nowitzki, Mavericks, steal Game 2." Thomsen also wrote "Miami was awful offensively, and Dirk was Larry." Right away, we can see a hyperbolic reaction – Miami's offense was a whole two points worse than Dallas.

The Huffington Post focused on Wade's shot posing, claiming that "Wade angered the Mavs when he held his follow through after his 3-pointer [with 7:14 remaining]."[96] At SI, Thomsen belabored the point, noting that Wade fielded "persistent questions about a display put on by [him] and James midway through the fourth quarter." Chris Mannix (also at SI) wrote that "They preened when they should have put their heads down, roared at the crowd when they should have run back on defense."[97]

Suddenly, missing was any mention of Wade's excellence or of his dominating performance throughout the game. In the Sporting News' summary, there were a mere two mentions of Wade: He missed a shot with 36.9 seconds remaining and he missed the final shot of the game.[98] No one talked about his domination for 41 mesmerizing minutes. It's as if it never happened.

How good was Wade's game exactly? For an offensive-centric measurement, his GameScore was 34.0, which made it the sixth-best playoff game that year and 16th-best Finals game since 1984. He started the night hitting 13 of 17 shots for 36 points, but because his *team* lost, history – next-day history -- chose to remember a little braggadocio and his final miss. No one needed those good plays to explain why Miami lost.

Meanwhile, Dirk Nowitzki was compared to Larry Bird. (Sporting News also took that angle.) This is the power of *Winning Bias*. That final shot literally shaped people's memories, their analytical perceptions and the history they would write and discuss. If Miami had won at the buzzer, Wade would be a hero, and Nowitzki would be a goat due to his poor shooting. It wouldn't have changed the way either played for the previous 99 percent of the game.

Coincidentally, Wade's right hand was also the topic of conversation in the 2010 playoffs. In Game 4 against the Boston Celtics, Wade drilled jumper after jumper. Much like he did against Dallas, Wade begin talking to his shooting hand after making a 3-pointer later in the game. That story was celebrated, not criticized. After the game, journalists exclaimed that Wade was so hot that he started conversing with his hand. *What a show!* What was the difference then?

Miami won that game.

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81. Dirk told this to Hannah Storm postgame: https://www.youtube.com/watch?v=bI1Xax6aOa8

82. Michael Lee, "NBA Finals 2011: LeBron James's fourth-quarter performances are mystifying," *Washington Post,"* June 8, 2011. http://articles.washingtonpost.com/2011-06-08/sports/35234162_1_washington-cleveland-days-lebron-james-nba-finals

83. Nando Di Fino, "This is the Fourth Quarter Paging LeBron," *The Daily* Fix, June 10, 2011. http://blogs.wsj.com/dailyfix/2011/06/10/this-is-the-fourth-quarter-paging-lebron/

84. Find the tape on YouTube if you can – Armstrong collapses, with time remaining on the clock, in anticipation of Paxson's shot.

85. To quote Raymond Nickerson: “The evidence also supports the view that once one has taken a position on an issue, one's primary purpose becomes that of defending or justifying that position.” Nickerson (1998)

86. For example, despite having similar on-court demeanors, Tim Duncan (on a winning team) was often lauded for his quiet leadership while Tracy McGrady (on a losing team) was criticized for being too laid back and sleepy-eyed.

87. The American Basketball Associated merged with the NBA in the 1976-1977 season.

88. This inversion is related to the *peak-end rule*: We remember experiences based largely on peak emotional moments, and then the ending moments. This sums up how we remember these highly emotional, highly interactive sporting events – a few key plays combined with what happened at the end. (Fredrickson, 1993)

89. "Barkley Admits Huge Losses, Bigs Gains While Gambling,” *Associated Press*, February 6, 2007. http://sports.espn.go.com/nba/news/story?id=2755468

90. Dave Anderson, “Sports of The Times; Jordan's Atlantic City Paper,” *The New York Times,* May 27, 1993. http://www.nytimes.com/1993/05/27/sports/sports-of-the-times-jordan-s-atlantic-city-caper.html

91. To illustrate the importance of order in the formation of narratives, consider this piece by blogger Jason Lisk about the narrative of a real NFL Quarterback if his career were simply run in reverse order. The takeaway is that a labeled “clutch winner” would instead carry the label of “can't win the big one.” http://www.thebiglead.com/index.php/2011/01/17/the-twisted-tale-of-paddy-ice/

92. With the score 88-73 Miami, Jason Terry scored six consecutive points. Shawn Marion made a layup, Jason Kidd a 3-pointer and Terry another jumper to make it 90-86 before Nowitzki scored the last nine Dallas points.

93. Lang Whitaker, “NBA Finals Game 2 Live Blog,” *Slam*, June 2, 2011. http://www.slamonline.com/online/blogs/the-links/2011/06/nba-finals-game-2-live-blog-3/

94. Jeff Howe, “NBA Finals Game 2 Live Blog,” *NESN,* June 2, 2011. http://tinyurl.com/hfsrn3s

95. Ian Thomsen, *Sports Illustrated*, June 3, 2011. http://sportsillustrated.cnn.com/2011/writers/ian_thomsen/06/03/heat.mavs2/index.html

96. "NBA Finals 2011 Game 2," *Huffington Post*, June 2, 2011, http://www.huffingtonpost.com/2011/06/02/nba-finals-2011-game-2-mavericks-heat_n_870715.html

97. Chris Mannix, “Heat Revert to early form during critical stretch of Game 2 loss,” *Sports Illustrated*, June 2, 2011. http://www.si.com/more-sports/2011/06/03/fastbreaks-heatmavs2

98. Sean Deveney, “Mavs again prove their resilience in stunning Game 2 comeback,” *Sporting News*, June 3, 2011. http://aol.sportingnews.com/nba/feed/2011-05/nba-finals/story/mavs-again-prove-their-resilience-in-stunning-game-2-comeback

Chapter 6
Clutch Play and Late-Game Bias

The 2002 Western Conference Finals between the Los Angeles Lakers and Sacramento Kings featured one of the most iconic moments in NBA playoff history. With the Kings leading the series two games to one, Los Angeles trailed by two points in the final seconds of Game 4. Kobe Bryant missed a running shot to tie the game with just four seconds left, but the rebound caromed to Shaquille O'Neal. With three seconds to play, Shaq missed a short shot near the hoop. Kings center Vlade Divac then swatted the ball away, hoping it would aimlessly bounce down the court as the final two seconds expired. Instead, like a choreographed pass, the ball bounced right to Laker forward Robert Horry at the 3-point line, who picked it up and released a shot with less than a second left. At the final buzzer, Horry's shot splashed through the net giving the Lakers the game and new life in the series.

Horry's shot is considered to be the most important shot of that series, and perhaps that entire season. If he missed, the Kings likely would have gone on to win the NBA title. Yet, technically speaking, it wasn't the most important shot of that game.

The Lakers actually hit two buzzer-beaters that day, one at the end of each half. Few remember the first one, a desperation heave by Samaki Walker that should not have counted.[99] Why does Horry's shot live in NBA lore and Walker's was quickly forgotten? Why is so much attention given to the shot at the end of the game and not the one from the middle of the game? And are late-game points actually more valuable than early-game points?

Ask basketball fans that last question and they will respond with a resounding yes.[100] To many, it seems crazy to even consider that a last-second shot isn't the most important shot in a game. It's so ingrained in the culture of the sport that many people base their opinions of players entirely on how they perceive the final moments of a game. Laker legend Magic Johnson dubbed these late-game moments "Winning Time."[101]

Counterintuitively, the outcome of a game is no more decided by a play in the last seconds than in the opening seconds. There's actually nothing more important about Horry's famed shot than Walker's forgotten shot. Yet Horry's shot seems more important. What's going on here? How can a last-second shot *not* be the most important play in a game?

As humans, we don't always treat time evenly. Often, the present is valued over the future – for example, as many as 95 percent of all college students procrastinate.[102] After all, it's not a big deal to earn a C on the first quiz of the semester if it only accounts for one percent of the overall class grade. If we make a mistake on that first quiz, finishing with an A in the class is still within our control. There's still time to "make up" the bad mark.

This is how most fans view the game of basketball (and many other sports). Shots in the first quarter don't really matter much – they can't be the shot that "decides" the game. After all, each possession accounts for approximately one percent of the final score. Since there's still time to "correct" the mistake, that missed layup in the first quarter is less harmful than one in the fourth quarter.

Our memories also de-emphasize early-game shots. Emotional events, like Horry's buzzer-beater, are typically remembered more vividly than non-emotional ones.[103] Since the observer knows the outcome of the game based on the result of a final shot like Horry's, the emotions related to winning or losing are tethered to that particular shot, magnifying its place in our minds. No one can say that about *any* other shot in the game as they watch it live. Surely last-second shots are more important.

They are not. Failed possessions, even in the first quarter, will always go in the book as netting zero points, just like bad grades from early in the semester count toward the final average. Similarly, points in the first quarter are equally as important to the outcome as points in the final quarter; Walker's shot was just as critical as Horry's shot in securing the Los Angeles victory that day. The Lakers could not have won without *either*.

Late-Game Math Illusions

At first, it can be difficult to see how a last-second shot isn't better than a first-quarter shot. After all, the last-second shot is swinging the balance of victory. If it goes in, the odds of winning are 100 percent. If it misses, they are zero percent. What could be more important than that?

Imagine that a team is behind by two after each quarter. Below is the probability that a (home) team will win when facing a two point deficit at the end of each period:[104]

Trailing by 2 After...	Odds of Winning
First Quarter	53%
Second Quarter	50%
Third Quarter	45%

Now pretend that, *instead* of hitting a 3-pointer like Horry's at the end of the 4th quarter, they make one at the end of the first. Such a shot only increases the odds of winning by nine percent at that point in time (from 53 percent when trailing by two, up to 62 percent when ahead by one). Isn't a shot with 100 percent leverage more important than a shot with nine percent leverage? Intuitively, it seems like this should be the case and, at first glance, this seems mathematically valid.

However, there is something problematic about our leverage comparisons that isn't easy to spot at first blush. *Time* isn't equal in each calculation. The 1st-quarter shot only increases the odds of winning by nine percent *at that moment only*. By definition, there can only be one event that sways our outcome the most as it's happening, which is a shot taken with all of the other events of the game finalized. A last-second shot like Horry's.

As we've seen earlier, framing is a critical issue in how we process information. When we view the question another way, does the 4th-quarter shot still look as important?

Is it better to have three more points after the first quarter or after the fourth?

Suddenly, it's not so obvious that the 3-pointer at the end of the 4th quarter is any better – if it's better at all – than moving the 3-pointer to the end of the 1st quarter. If the three points are notched at the end of the 1st period instead of the 4th, it just means that the odds of winning are higher *throughout the game*. The three points carry over after the 1st, 2nd, 3rd *and the 4th quarter*. They are equally worth three points, and probably advantageous to have earlier rather than later for strategic reasons. Compare the win probabilities between a three-pointer that takes a team from down two to up one at the end of the first quarter versus the end of the fourth quarter:

1st-Q buzzer-beater			4th-Q buzzer-beater	
Quarter	Score	Odds	Score	Odds
First	Up 1	62%	Down 2	53%
Second	Up 1	61%	Down 2	50%
Third	Up 1	60%	Down 2	45%
Fourth	Win by 1	100%	Win by 1	100%

In our original comparison, the first-quarter buzzer-beater only increased the odds of winning by nine percent and the 4th-quarter shot by 100 percent. However, the 1st-quarter leverage was originally calculated *in the 1st quarter only* – it excluded the information-gain provided by knowing the outcome of the other 75 percent of the game. When we account for this – by calculating the leverage of any shot with no time remaining in the game, making the comparison apples-to-apples – the leverage of the 1st-quarter shot would also be 100 percent! With the first quarter miss, the team has three fewer points and loses.[105]

Like many of our mathematical traps, the brain misses a step in its intuitive calculation. In this case, we fail to look at the *total effect* of the shots and instead weigh them only in their given moments in time. We never go back after the game and update the leverage of the event with the totality of the information from the entire game. In that sense, the allure of the present blinds us to the complete picture.

If anything, one would argue it's *better* to notch the points in the first quarter, since the odds of winning after each quarter are increased – the points that increased the odds of winning after one quarter still increase the odds of winning all the way through the game. In basketball, every point counts at the end of the game, just like quizzes and tests from the beginning of the semester still count when the final grade is tallied. This accounting consistency is what makes a *Late-Game bias* possible.

Late-Game Bias: A tendency to incorrectly weigh events as more important the later they occur in the game.

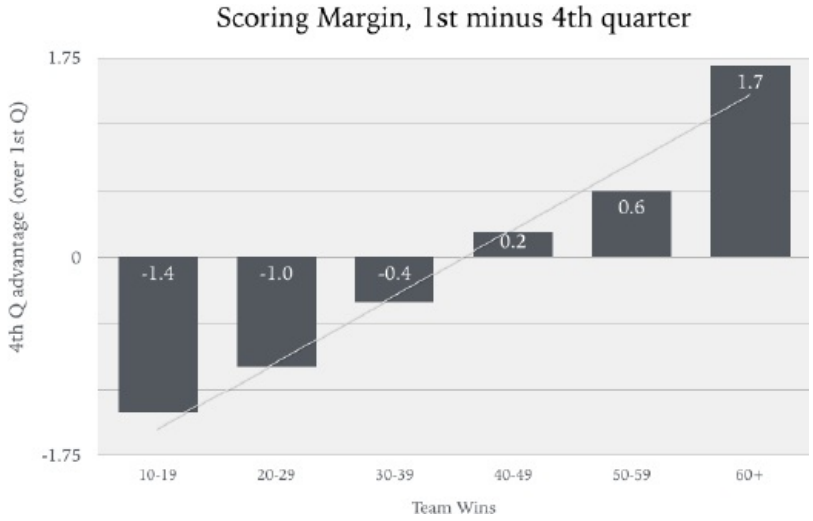
By valuing a 4th-quarter shot over a 1st-quarter shot, we are valuing the path that is *less* likely to produce victory as the game unfolds. After all, a comeback is needed on the final play in the scenario where the 1st-quarter shot is missed.[106]

When Samaki Walker made his shot in Game 4 of the 2002 Western Conference Finals, no one knew that LA needed exactly 100 points to win the game and that the value of all its other possessions would total 97 points. If Walker missed, there was still time left for LA to register a three on another possession later in the game. When Robert Horry‘s shot was in the air, everyone already knew the outcome of the other 100 possessions and that the game hinged on his shot. That doesn’t mean it’s the sole reason that LA won — the Lakers could not have won the game without every other point they scored that day, including Walker’s three — but that final shot feels more important because, as observers, we can immediately identify its impact on the outcome as it happens. No other shot earlier in the game can generate this feeling.

Is “Winning Time” Really in the 4th Quarter?

There is a timeless adage that games are won and lost in the 4th quarter. Ironically, the 4th quarter tends to be the period with the *smallest* scoring differential between teams in NBA games. Much of this has to do with how coaches strategize as the game unfolds: In the first period, teams are *always* competing their hardest because the game is still winnable. By the 4th quarter, so-called “garbage time” can set in – a stretch where neither team exerts tremendous effort or strategy because the lead is so insurmountable.

Surprisingly, the greatest impact on the final score is in the 1st quarter. Good teams build their leads early, not late – a trend that is true year after year. Most of the “differentiating stuff” happens early in an NBA game; ninety-five percent of 50-win teams have a positive 1st-quarter differential, but not a single 30-win team has one. Of all the quarters, the 4th quarter actually features the least amount of differentiation in an NBA game.[107]



As teams improve, they generally do more damage earlier rather than later. The above graph compares 1st-quarter and 4th-quarter differentials for all teams from 1997 to 2012 – a positive number indicates a larger 1st-quarter differential than 4th-quarter differential. More than 87 percent of 50-win teams build larger advantages in the 1st quarter than the fourth, while 85 percent of bad teams (30 wins or less) are outscored by more in the 1st quarter than in the fourth.

Here's another way to view the importance of quarters: If you were trying to predict who will win a game and you could choose the results of only one quarter to look at, asking for the 4th-quarter results would give you the *worst* chance.[108] It is the quarter where, on average, the least amount of separation between teams occurs.[109]

This seems counter-intuitive, as it certainly feels like a lot of NBA games are close and decided in the final minutes. However, between 2008 and 2011, 73 percent of all games were decided by *more* than five points. 43% were decided by double-digits. Only 14 percent of games were decided by three points or less. If so few games are close, why do so many feel close?

The *Availability Heuristic* is one of the most important breakthroughs in cognitive science and explains this phenomenon. When we are asked to perform large-scale calculations of probability, the mind uses a shortcut – people don't store the exact number of games they have watched and the exact number that have been close. Instead, we render a "best-guess" based on the more memorable, "available"-to-recall playoff games.[110] Reading this right now, you might be ticking off all the important games that came down to the wire over the recent seasons. It starts to feel like a lot of playoff games are close and decided at the end, because the information is never counterbalanced by remembering all of those ho-hum playoff games.

Clutch Play and the Playoffs

So if points have the same value in the first quarter and in the final quarter, and more differentiation occurs early in the game, how important is clutch play itself? Do clutch performances become more important in the postseason?[111] Aren't playoff teams winning because of their ability to execute in these late-game moments?

From 1996-1997 the Chicago Bulls dominated the NBA like no other team in a two-year period. All told, they went 141-23 in the regular season and 30-7 in the playoffs.[112] In the Bulls 37 playoff games, they were 24-0 when leading after three quarters, 1-1 when tied after three quarters, and 5-6 when trailing after three quarters. In other words, the most successful team in NBA history changed the outcome of its playoff games 14 percent of the time by playing the 4th quarter.

Chicago is not alone in this phenomenon. The team that is ahead after three quarters frequently wins an NBA game, regular season and playoff alike. In the 249 playoff games from 2009 to 2011, the average margin of victory was 11.3 points per game, right around the number we typically see in a season.[113] The average playoff game was a 10-point game by the end of the third quarter. Less than one in every five playoff games will even have its outcome changed by playing the fourth quarter. More than four out of five times the team winning after three quarters wins the game. Playing the final period was simply an exercise in preserving the lead built in the first three stanzas. In that three-year span, 86 percent of the time the team with the lead after 43 minutes held on to win.[114]

Many fans believe that good clutch offense is a requirement to be a good team. It's not. The difference between a good and bad clutch offense has a negligible impact on a team's overall record and even their playoff success. Some teams go entire playoff series without having a single clutch possession. There is almost no correlation between effective clutch offense and good teams – bad teams are good in the clutch and vice versa.[115]

This makes sense – not much can happen in such a small portion of the game. Many games aren't close, but even in the close ones, clutch possessions comprise a mere 10 percent of the game (the final five minutes). All told, the average NBA team runs just two to three percent of its possessions per season in the clutch. That's the equivalent of about eight quarters of basketball, a sample that is subject to extreme variance. Because of this, even great clutch teams win only a few extra games per season than expected (based on point differential).

Clutch offensive performance simply doesn't matter that much, which explains why it has essentially no relationship to team success.

Basketball Closers

At some point in the 2000's, the term "closer" seeped into the basketball vernacular. A closer – nomenclature borrowed from baseball, used to describe the ultimate shutdown reliever – is a player who can "close out" the game successfully, scoring in key moments down the stretch when a team needs important baskets. Often, the closer needs to be able to score in one-on-one, isolation situations. Throw him the ball, get out of the way, and let the team ride him to the finish line.

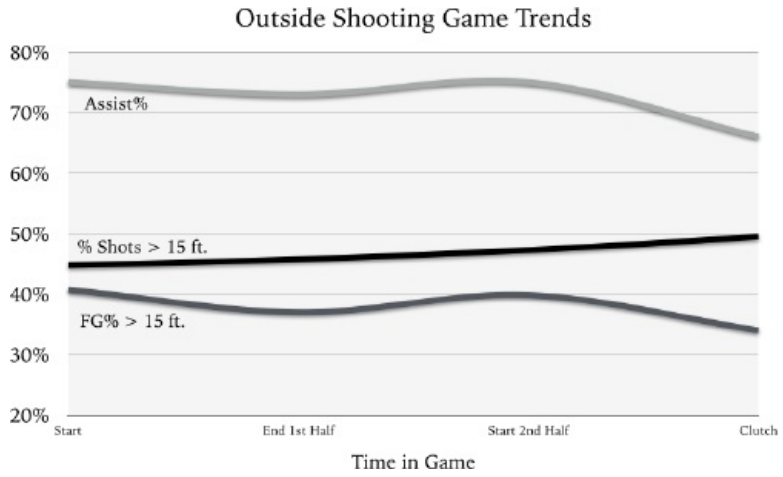
Many NBA title-winners feature these kinds of players. Jordan's Bulls. Kobe Bryant's Lakers. Dwyane Wade, LeBron James, Dirk Nowitzki and more. Their prevalence has led to the belief that teams *need* these stars who deliver in the clutch to win an NBA championship. However, if the idea of a closer is to score key baskets in the late moments of close games, and those moments don't really matter, then closers shouldn't really matter. But if closers don't matter, why do so many title winners seem to have these superstar "go-to" players on offense? Why do so many great teams lean so heavily on their star scorers at the end of close games?

There is a simple explanation: Great teams are not successful on offense because of what they do in the final few minutes of their close games. They are successful because they are scoring efficiently during the other 43 minutes of the game. And most efficient teams have (at least) one or two elite offensive players who can play the role of go-to scorer at the end of the game. This is a subtle, yet simple distinction between causation versus correlation; it's not the "closing" that creates the good offense, it's the rest of the game. This "Hero Ball" strategy, in which closers dominate the ball with isolation scoring attempts at the end of games, is not why teams are winning.

Hero Ball Fallacy: The false belief that teams need a go-to, crunch-time scorer to win.

In the NBA, dynamics are subtly changing throughout the entire game; teams will exhibit slightly different tendencies at the start of the

game than they will by the end of it. Much of this is likely caused by lineup changes, fatigue and strategic reactions based on the score. For instance, look at what happens with outside shooting tendencies throughout the course of the game:[116]



The top line is the percentage of outside field goals assisted by teammates. It falls off a cliff at the end of competitive games. (Shots within 15 feet exhibit the same pattern.) Concurrently, teams take more and more outside shots as the game progresses (the dark line), but they make those shots with less accuracy (the bottom line). This story paints a clear picture that by the end of the game, teams resort to more isolation basketball, settling for outside shots.

At the same time, the 3-point line starts to look more and more inviting. In the opening five minutes of the average NBA game, 17 percent of attempts are 3-pointers. In the clutch, 27 percent are 3-pointers. Accuracy plummets on those shots from 38% down to 31%, dropping from 1.15 points per shot to 0.93 points per shot. This is not a function of desperation 3-pointers or high-variance strategy – teams simply switch their tactics at the end of games. And they probably aren't even aware of this.[117]

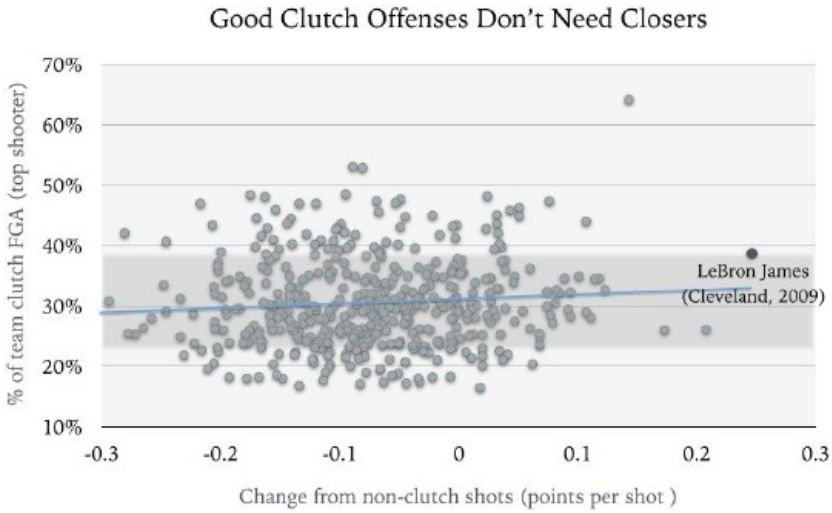
The massive drop in assist percentage suggests more isolation basketball, regardless of whether teams are ahead or behind. The huge spike in 3-point attempts from teams that are trailing tells us players are taking Hero Ball shots when they don't have to.

There is an element of fatigue as well. Fatigue doesn't just impact shooting percentages (as we see on the outside shots that are briefly recharged by halftime), but impacts shot selection; it takes energy to drive to the hoop. The mentally lazy strategy is to "settle" for long looks.

Switching to Hero Ball simplifies the game, making it a lower-risk strategy as fatigue (and tension) mounts. It's not an ideal strategy, but it is an understandable one. Coaches who do not run their offenses primarily through their stars at the end of games are often criticized. It's safer for their image to lose by relying heavily on their star players.

However, this strategy does *not* produce superior results, otherwise teams probably would have been using it in the first three quarters. Perhaps our *Late-Game Bias* and false perception that games are "decided" in the final few minutes fuels this kind of strategic shift from coaches.

What's clear is that teams are certainly not winning *because* of this Hero Ball, bombs-away approach. The effect of excessive outside shooting, coupled with constant timeouts, defensive adjustments and late-game pressure, is that offensive performance sags in the clutch.[118] Most teams experience a dip, and for some the drop-off is severe. Even teams with high profile closers are often less efficient down the stretch than teams without these scoring superstars.



The above plot covers 16 NBA seasons (1997-2012) and shows the relationship between how much a team relies on its leading scorer and that team's overall shooting performance in the clutch. The vertical axis represents the percentage of a team's clutch shots that the leading crunch-time scorer was responsible for.[119] The horizontal axis is the change in the *team's* clutch shooting compared to non-clutch shots.

The plot can be viewed in three tiers: teams relying heavily on one player in the clutch (above the shaded area), teams relying on a medium-volume shooter (the shaded area) and teams that distribute their clutch scoring among the entire club (below the shaded area). LeBron James' 2009 Cavaliers were the best performing team during the period – the Cavs increased their efficiency relative to the league by an awesome 0.25 points per shot and relied on LeBron for the bulk of the shots (39 percent).

The trend line in the graph demonstrates the non-existent correlation (0.09) between a team's primary clutch scorer and its overall change in clutch shooting. In other words, when a typical team asks a player to "close" with a lot of heavy lifting, its offense won't fare much better. Seventy-eight percent of teams that rely heavily on one player (above the shaded region) shoot *worse* in the clutch, negligibly better than the 84 percent of teams that rely on a committee (below the shaded region) and decline. If a team needs a key basket down the stretch, running the same plays they run in the first quarter (for a number of different players) is sufficient.

It should be no surprise that scoring efficiency is dropping off when teams switch to Hero Ball. According to tracking data, we know that isolation plays are the least efficient type of play in basketball. When teams run those clock-killing, clear-the-court isolation plays at the end of quarters (where players dribble the time down and then make a one-on-one move), efficiency is even worse, closer to 0.60 points per possession.[120] This trend holds during the regular season and postseason, as well as early in games and late in games. It's also true for championship teams, who do not need a "closer" to win a title.

Who Needs the Last 5 minutes?

In 2008, the Boston Celtics posted the best point differential since the dynastic Chicago Bulls of the 1990's, claiming 66 wins and an NBA championship. The Celtics "Big Three" of Kevin Garnett, Paul Pierce and Ray Allen — all good scorers — led a team that absolutely fell apart in crunch-time.

All told, the Celtics efficiency dropped 0.16 points per shot in the clutch, the third largest drop in the league that year. Yet they performed almost exactly as predicted based on their point differential alone, falling one win short of their expected 67 victories. Pierce posted an abhorrent 0.54 points per shot in the clutch with Garnett, a former league MVP, shooting a below-average 0.82 points per shot in clutch situations.

In the playoffs they were even worse. The Celtics converted on 22 of 70 clutch shots (32%), hitting two of 18 3-pointers for a woeful efficiency of 0.66 points per shot. Garnett was respectable (making nine of 21 attempts), but all-stars Ray Allen (0.66 points per shot) and Pierce (0.14 points per shot) were orders of magnitude below average. But, the effect was negligible; Boston was 3-4 in postseason games decided by five points or less. (They were 11-9 in such games in the regular season.)

The best shooting clutch team in 2008, San Antonio, averaged 1.12 points per shot. If Boston had converted its clutch playoff shots at league-best efficiency, it would have generated an extra 32 points during the playoffs, or about two extra points in its close games.

How big of a difference can those 32 points make? Boston attempted at least one clutch shot in 15 of its postseason games, finishing 7-8 in those games. If they averaged 1.12 points per clutch shot in every game, the Celtics could have won two additional games and pulled even in two others. Keep in mind that their opponent's strategy would change in the final minute if the game were closer – instead of running out the clock with a safe lead, opposing teams would be trying to score, rendering Boston's upgraded clutch shooting moot.

The Celtics aren't alone in this trend. In 2004, the Pistons shot 29 for 88 (33%) in the playoffs during their championship run, good for 0.69 points per shot.[121] Defensive force Ben Wallace was Detroit's best crunch-time scorer that year! (Wallace boasts a career-high scoring season of 9.7 points per game.)

These case studies exemplify the small impact clutch offense has: Over a long playoff run, the difference between a feeble clutch offense and a top-notch one typically nets about two additional wins. And even if a team improved in the clutch, they'd still need every other point from the rest of the game to secure those wins...which is precisely why the 2008 Boston Celtics – a horrible clutch playoff offense – won the title.

Again, we're playing a math game that the brain is not good at. Those few clutch possessions *feel* like they determine the outcome. Not surprisingly, there is almost no correlation (0.11) between offensive efficiency in the clutch and playoff series victories. Good clutch offenses lose close games and bad clutch offenses win close games, close series and championships.

Since a majority of games aren't close and all possessions have the same value throughout the game, it makes sense that clutch shooting has almost no impact on team quality. There is no "Daily Double" on point values in the final five minutes to overcome the

net scoring of the other 43 minutes. Yet as observers, we tend to think those plays do count more. Instinctively, we feel like games, and even seasons, hinge on clutch moments that count more than the other 95 percent of the plays.

Ultimately, good teams win early. Clutch play matters little. Hero Ball and isolation plays are low-efficiency. Good teams and good offenses don't need to rely on a "closer" while bad clutch teams can be great NBA champions. And all of these beliefs about the importance of crunch-time, for both teams and players, come from a *Late-Game Bias*.

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99. Replays showed Walker's shot was attempted well after time expired, only in 2002, there was no replay-review in the NBA.
100. In a non-scientific poll, 88% of basketball fans believed 4th-quarter plays were more important. http://tinyurl.com/zu27dbs
101. Sam Goldaper, "Funny Things Happen at the Forum," *The New York Times*, January 26, 1989. http://www.nytimes.com/1989/01/26/sports/basketball-funny-thing-happens-at-the-forum.html
102. Steel, 2007.
103. Dolcos et al, 2004.
104. Neil Paine, "Biggest Finals Collapses, 1992-2010," *Basketball-Reference*, May 31, 2011. http://www.basketball-reference.com/blog/?p=9546
105. In a one-point game, changing any of the losing team's misses or winning team's makes will change the outcome, making such shots 100% leverage in retrospect. The leverage is relatively low (9%) when calculated in the first quarter largely because the odds of the contest finishing as a one-point game are relatively low.
106. Some might be quick to point out that if the 3-point shot had been made in the first period, it would change the strategy later in the game with the score being different – and that's precisely the point. Those points still carry the same value on the scoreboard whenever they occur. Having three extra points in the 4th-quarter would mean the team no longer needs a buzzer-beater because they have three extra points and the lead.
107. From 1997-2012, 50-win teams or better outscored opponents by 1.7 points per first quarter and 30-win teams or worse were outscored by 2.0 points per 1st quarter. Data from www.nbaminer.com.
108. From 1997 to 2012, the correlation between 1st-quarter differential and win percentage was the highest of any quarter, at 0.85. The 4th-quarter differential had the lowest correlation, at 0.64. Data from www.nbaminer.com
109. The most plausible explanation for this pattern is that teams are playing their best lineups to start the 1st and 3rd quarters, and that those lineups are rested and using optimal coaching strategies from pregame scouting and halftime adjustments.
110. This memory phenomenon and the *Availability Heuristic* have been widely replicated in studies since Kahneman and Tversky's original findings in 1973.
111. Clutch moments are traditionally defined as five minutes or less where the teams are separated by no more than five points.
112. No other team in NBA history has won 141 regular season games in two years. For perspective on this, the second-most wins over a two-year period in NBA history is 130, achieved by the 1967-68 Philaelphia 76ers and the 1985-86 Boston Celtics.
113. It was 11.1 points per game in the regular season over the same sample.
114. Data from 2009 to 2011, which included the 2011 postseason, a clutch-driven postseason. The 2010 postseason saw 87% of results unchanged by the 4th quarter and 92% of results unchanged by playing the final 5 minutes.
115. The correlation between wins and clutch offensive rating is a very weak 0.16.
116. Data for this section is from the 2010-2011 NBA season.
117. The effect is even more pronounced in the final two minutes of close games when trailing: When behind by 1-3 points in the final two minutes, 33% of attempts are 3-point shots, converted at 23%, or 0.69 points per shot. Teams that are tied or ahead by 1-3 points in the final two minutes revert to the NBA average rate of 3-point attempts (22% of all shots), but nearly 30% of their shots are long two-pointers – more than at any other point in the game – and those shots are converted at a paltry 36%, for 0.72 points per shot. Teams pass even less in these situations – 59% of outside shots are assisted.
118. Teams also shoot significantly more free throws in the clutch. There is a moderate correlation (0.43) between overall clutch offensive efficiency and increasing clutch free throw attempt rates (excluding intentional fouls), suggesting that better offenses get to the line more in the clutch.
119. The league average for team leaders was 31% across this sample. The shaded region of the graph is +/- one standard deviation from the average.
120. According to basketball-reference play-by-play data from 2011.
121. The league-wide average on clutch shooting from 2001-2011 during the regular season was 0.90 points per shot.

Chapter 7
The Championship Fallacies

The 2013 NBA All-Star game fell on Michael Jordan's 50th birthday. As such, a perfunctory media task was to compare Jordan, often considered the greatest player in the history of the game, with the NBA's superstar du jour, LeBron James. On Fox Sports Radio, Andy Furman interrupted his co-host Lincoln Kennedy to say, “Look, one stat matters at the end of the day. One stat. Rings.”[122] Over On ESPN radio, hall-of-famer turned analyst Chris Mullin quipped, “When LeBron's done, then you can sit down and look at rings and stats and then judge who the greatest is.”

Within a matter of moments, the most popular sports radio networks had summarized generations of thought on team sports: judge individuals by their *team* accomplishments. Fans, players and coaches voice the same argument.[123] Jordan himself, when asked about LeBron James, said that Kobe Bryant had been a better player based on team results:[124]

> "Five [rings] beats one every time I look at it," Jordan said. "And not that [James] won't get five. He may get more than that, but five is bigger than one." – Michael Jordan

Across every team sport, we often forget that teams win games, not individuals. When asked to evaluate *individuals*, people start talking about *teams*. Of course, individuals do not win in team sports, teams do. To mistake one for the other is to succumb to one of the most common pitfalls in logic: Correlation does not equal causation. The phenomenon is so widely committed by our Confident Best-Guessing Machine brains that scientists have bestowed it with the honor of latin nomenclature: *cum hoc non propter hoc*. Or “With this, not because of this.”

For example, Tom wakes up when the sun rises every morning, but that does not mean Tom *causes* the sun to rise. Unless Tom's a wizard or a mutant, he plays no part in the sun rising. There's correlation, but no causation. Similarly, a player on a championship team does not mean the player *causes* the team to win the championship...it just means that he played on the winning team. In team sports, the very thing we are trying to tease out when judging players is *how much* that individual influences the team result.

Actually, the team result itself is what makes analyzing players difficult! This is why it's easier to evaluate athletes in individual sports. If Jack Nicklaus shoots the lowest score in a golf tournament and wins, he is also the best golfer for the tournament (barring some strange weather or rules mishap). Golfers all play on a nearly identical playing field; same course, same opponents. But basketball players have different coaches, teammates and opponents. Michael Jordan never had to guard Michael Jordan.

In a team sport, an individual can be the best player in the game and his team might not win. All a player can do is influence *some,* but not 100 percent, of the game's outcome. As we saw in Chapter 3, there is a limit on how much an individual can influence an NBA game. The less he influences, the weaker the correlation will be between best player and the team winning team. After all, the plethora of plays that an individual can't control are what makes it a team sport.

Individual results and team results are so commonly intertwined that they have been engrained in sports vernacular. It is typical to say “Tom Brady won three Super Bowls in four years.” But truly, the *Patriots* won three Super Bowls. Tom Brady was simply part of the team. Kicker Adam Vinatieri was also part of the team, and he no more “won” the Super Bowls than Tom Brady did.

Did Brady win because of the Patriots or did the Patriots win because of Brady? These aren't all-or-nothing answers. It's a multifactorial event – many elements influence the final result. When evaluating players, our task is to figure out *how much* an individual influenced the likelihood of a team winning. After all, that's what makes a player “good.”

The Problem with Rings

Suppose my friend and I have a competition to see who can make a new engine part to increase horsepower in our respective cars. After we install our parts, my car has 390 horsepower and his has 410. Which part increased horsepower more? Who won the competition?

This is the question we implicitly answer when we evaluate individual athletes in a team setting. We can observe the team result (the final horsepower), but what does that actually tell us about a player (the individual part)? We have no idea how much the part contributed to horsepower by simply observing the final result and we don't know how much a player helps his team simply because they won.

Many factors influence the winning percentage of a team beyond its best player. Coaches, role players, injuries and travel (to name a few) are responsible for a large part of a team's final result. When comparing players across teams, it matters not which team ended up being better, but which player contributed the most to winning.

> ***The Rings Fallacy***: The false belief that championship rings in team sports are a relevant determiner of an individual's performance.

The Rings Fallacy is not merely about “ring-counting,” as Mullin and Kennedy were doing when they reduced a player's contributions to the number of championship teams the player was on. It's about using a piece of information (rings) that tells us *nothing* about a player's performance, even when used in context.

The first problem with citing rings emerges when circumstances are grossly uneven. A player with teammates like the 2012 Charlotte Bobcats *cannot* win an NBA championship. A player with teammates like the 1996 Bulls will often win one. In these cases, invoking rings adds no information to the analysis. If we want to know how tall someone is, measuring their elevation-above-sea-level will guarantee people in Los Angeles (at sea level) are all “shorter” than people in Denver (in the mountains). It's a useless metric – if anything, it will misinform us.

Second, even when circumstances are only a bit uneven, rings still tell us nothing. A player on a losing team can be better than anyone on the winning team. (For example, Dwyane Wade's 2011 Finals Game 2 vs. Dallas.) The difference between the two teams could have been caused by circumstantial factors, like an injury, a teammate's bad night or a coaching blunder. Even a few mistakes from an official could be the difference between winning and losing. Again, looking at the final team result would not tell us anything about the star players.

Third is the issue of variance. Sometimes the better team will lose, and there is no easy way to discern that in small samples, especially when the teams are reasonably even. All told, championship rings are no more a measure of a player's performance than his jersey sales. They often *correlate* with good players, but they are about as unrelated to an individual's player on-court performance as his ring count.

All of this is why we attempt to isolate a player's impact on his team, regardless of the quality of teammates. WOWY or RAPM (adjusted plus-minus) are valuable because they gauge the final result with the player *and* the final result without the player.[125]

Finally, the rings data-point is infinitesimally small. RAPM culls play-by-play data and there are over 100,000 NBA possessions in a season. WOWY incorporates thousands of games. These metrics use scales with wide ranges (e.g. offensive efficiency commonly falls between 50 and 150) whereas rings are a simple, binary result (win or lose.) And there's only one title to win per year, so almost no information can be captured. It's one data point per season. Even if rings told us something meaningful about player performance, they would be a microscopic part of his story.

Why Do We Use Rings?

Like most cognitive traps, the decision to use championship rings isn't entirely arbitrary. There *is* a positive correlation between player performance and team results, because, after all, good players make teams better. NBA stars have a relatively large impact on teams when compared to other major team sports, so they are more likely to be on good teams that will occasionally claim championships. This shortcut makes some sense as a basic starting point.

But when the story becomes complicated, our mind defaults to certain rules of thumb. An entire season of basketball – 8,000 possessions, 400 opposing players, 29 different opposing team strategies and 15 teammates! – is unwieldy without access to a tremendous amount of recorded information (research, statistics, video study, etc.). This is the reason that the analytically inclined are paid large chunks of money to decode "Big Data" in economics and now sports – a sea of information will drown the mind. When inundated with information, we seek out those lighthouses to guide us. Rings are a lighthouse.

Variants of ring-counting are popular among fans and journalists. Bill Simmons, author of "The Book of Basketball" – in which he ranks the top 96 players of all-time – constantly cites team performance when comparing individuals.[126] On TV, talking heads regularly argue about individual player rankings while discussing a player's championship rings.[127] Invoking rings in a comparison of lifetime achievement makes sense. But they provide no additional information when comparing individual *performance*.

Hindsight Is 20/20...or not

Suppose Golden State beats the Lakers on opening night. Golden State would have one win and the Lakers would have none. This does not mean the Lakers will win zero games for the season, nor does it predict that the Warriors will finish undefeated. Golden State winning that one game would not make them "winners." The Lakers losing would not mean that they are incapable of winning a game.

Yet we often view championships like this, reducing the season into a binary, all-or-nothing result. In another attempt to simplify matters, we reach this kind of after-the-fact judgment about teams. This stems from a cognitive phenomenon known as *hindsight bias* – when we look back after an event, we consider its outcome much more likely to happen than we did before the event.

After an NBA season, hindsight creates the appearance that only one team is a "championship level" team. There's the team that won, and then everyone else. The season becomes deterministic.

***Championship Hindsight**:* The false belief that after a season ends, only the team that won was a "championship" level team.

This ignores that other teams were equally capable of winning the title if a few chips fell differently, like a missed shot or critical injury. This is, at its core, a variance issue that was discussed in Chapter 4; one season is not always sufficient to guarantee the "best" team will win.

So what would happen if they played the same seasons over and over again? What if we could compress an entire season into a 24-hour period, and teams kept playing each other with the same setups – same coaches, rosters, etc. – for weeks on end, generating dozens or hundreds of "season" championships? If this were possible, it would be almost *impossible* for one team to win the championship all the time. Even dominant teams are only expected to win a championship in two out of every three seasons. Below are a team's title odds based on wins:

Team wins	Title Odds
50	0.5%
53	5.8%
58	24%
63	48%
67	67%

Just as the best team won't win every game, the best team won't win every championship either. Even the 72-win, 1996 Chicago Bulls would fail to claim the title about 10 percent of the time, assuming they remained healthy.

There are also many seasons in which teams that were better than prior (or future) champions fell short of a championship because the competition was stiffer. Some of those Seattle teams of the 1990's are good examples of this. The 1996 Sonics are expected to win a championship about one in every three seasons. Simply because a team never won a title does not mean they *couldn't*, or furthermore, that they aren't *likely* to.[128] And winning a championship does not automatically make that team the "best," or better than, all prior or future teams that failed to win a championship.

Does Defense Win Championships?

Alabama's legendary football coach, Bear Bryant, once famously quipped that "Offense sells tickets, but defense wins championships." Whether Bryant was the first to coin that phrase or not, it's been held as an unassailable sports axiom that defense does indeed win championships. And while it's true that good defensive teams win championships, in the 3-point era, good offensive teams in the NBA are even *more* likely to win a title.

Elite teams create slightly larger differentials on offense than they do on defense: Of the top 200 teams (by SRS) between 1980 and 2011, the average team was 3.4 points ahead of the league on offense and 2.9 points ahead on defense (per 100 possessions). Since 1980, championship teams create separation from opponents on both offense and defense – by about 3.7 points (per 100 possessions) for both, on average. Just over half of the title winners were offensively-stronger teams in the regular season. But the playoffs are when defense really counts, right?

Nope.

Championship teams have created more separation from their opponents in the postseason with *offense*. The average championship team was 6.2 points (per 100 possessions) better than average on offense and only 4.9 points better on defense during the playoffs.[129] Seven title teams that were defensive-leaning in the regular season became offensive-leaning in the postseason. (Only four offensively-stronger teams became defensively-stronger.) Sixty-one percent of championship teams were better on offense than on defense during their postseason runs. (See the table at the end of the chapter for a complete summary.)

Both offense and defense contribute to the holistic value of a team – almost all championship teams exhibit this balance to some degree. Only two teams during the period (1994 Rockets and 2004 Pistons) were below league average on offense during the regular season. Only one team (2001 Lakers) was below league average on defense during the regular season and only two teams (1988 Lakers and 2000 Lakers) performed negatively on defense during a championship run.

So while both offense and defense matter, it turns out the old adage is slightly backwards. If anything, it's good offense that wins championships in the NBA.

Season	Team	Offense	Defense	Better on Offense?	Playoff Offense	Playoff Defense	Better on Offense?
1979-80	LAL	4.2	-1.4	Yes	6.2	-2.0	Yes
1980-81	BOS	2.9	-2.9	No	4.4	-5.6	No
1981-82	LAL	3.3	-1.4	Yes	7.4	-2.6	Yes
1982-83	PHI	3.6	-3.8	No	5.9	-4.8	Yes
1983-84	BOS	3.3	-3.2	Yes	6.4	-0.5	Yes
1984-85	LAL	6.2	-0.9	Yes	9.8	-2.7	Yes
1985-86	BOS	4.6	-4.6	No	8.2	-1.9	Yes
1986-87	LAL	7.3	-1.8	Yes	10.5	-2.3	Yes
1987-88	LAL	5.1	-0.7	Yes	7.8	1.9	Yes
1988-89	DET	3	-3.1	No	5.7	-6.2	No
1989-90	DET	1.8	-4.6	No	1.7	-8.8	No
1990-91	CHI	6.7	-2.7	Yes	11.0	-5.1	Yes
1991-92	CHI	7.3	-3.7	Yes	6.0	-5.2	Yes
1992-93	CHI	4.9	-1.9	Yes	8.9	-3.0	Yes
1993-94	HOU	-0.4	-4.9	No	4.2	-4.5	No
1994-95	HOU	1.4	-0.9	Yes	7.7	-1.6	Yes
1995-96	CHI	7.6	-5.8	Yes	7.7	-9.3	No
1996-97	CHI	7.7	4.3	Yes	5.4	7.7	No
1997-98	CHI	2.7	-5.2	No	5.4	-8.0	No
1998-99	SAS	1.8	-7.2	No	3.5	-7.9	No
1999-00	LAL	3.2	-5.9	No	8.7	0.8	Yes
2000-01	LAL	5.4	1.8	Yes	12.2	-1.5	Yes
2001-02	LAL	4.9	-2.8	Yes	5.5	-4.7	Yes

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122. Audio from Fox Sports Radio, February 13, 2013

123. In an unscientific poll of the basketball forum “Real GM,” 81% of fans said they used championships as part of ranking players: http://tinyurl.com/j6gwenv

124. Anthony Riccobono, “Kobe Bryant vs LeBron James? Michael Jordan Answers Who Is Better,” *International Business Times,* February 15, 2013. http://www.ibtimes.com/kobe-bryant-vs-lebron-james-michael-jordan-answers-who-better-1088370

125. Much of the play-by-play family of metrics are trending in this direction, answering “how much does player A impact stat X?” For instance, how do Nash's teammates shoot with or without him on the court? How do Rodman's teammates rebound with or without him on the court? And so on.

126. For example, here Simmons discusses Dwight Howard's team record: Bill Simmons, “Searching for Dwight Howard,” *Grantland*, May 24, 2013. http://www.grantland.com/story/_/id/9308573/searching-dwight-howard

127. For example, on this February 7, 2012 episode of “First Take,” Skip Bayless declares “since he won his two championships without Shaq, I continue to move [Kobe Bryant] up [in my all-time rankings].” http://www.youtube.com/watch?v=YHWJpyqngAE

128. Other examples of incredibly good teams running into historically good competition: The 2008 Lakers, 2007 Suns, 2002 Kings, '97 Jazz and the '86 Bucks.

129. Relative to opponent regular-season efficiency. For example, a 110 offense against a 103 defense is 7.0 points better.

Chapter 8
The Winning Formula: Portability

Every team has a leading scorer. But the leader scorer on an inefficient offense is rarely a good offensive player, even when his scoring numbers are similar to other NBA All-Stars.[130] Because not all scoring is created the same – scoring paths differ, influenced by teammates and coaches – points cannot be viewed as equal across different teams. Twenty points per game on a weak offense is different than 20 on a good one.

For instance, Antoine Walker led the Boston Celtics in scoring in his first four seasons in the NBA, averaging 20 points per game during those years and earning an All-Star game selection in his second season. Yet Boston's offensive efficiency during those years was marginal at best, and in some seasons bordered on bad. Not so coincidentally, Walker is also the least efficient "volume" scorer since the 3-point shot was instituted in the 1980 season.[131]

In 2005, Walker led the Atlanta Hawks in scoring, again with low efficiency. Even more so than his earlier Celtic teams, those Hawks were woeful on offense, scoring nearly seven points less than the average team every 100 possessions played. In the 29 games he was out of the lineup, the team's offense actually *improved* by five efficiency points. How does a team lose its leading scorer and improve?

Well, scoring is not replaced, it is redistributed (a rule of thumb from Chapter 1). With Walker in the lineup, a number of Atlanta's possessions ended with him attempting to score in isolation. The Hawks eschewed their near-average, non-Walker scoring attempts and replaced them with his ill-advised and inefficient arsenal of shots. His 20 points per game came at the expense of Atlanta trying other, more efficient, ways to score.

Walker's phenomenon is not rare – about one in every three teams is actually more effective on offense without its low-efficiency leading scorer.[132] The same reason the 1967 76ers improved by redistributing Wilt Chamberlain's possessions is the same reason so many teams improve by completely *removing* the leading scorer altogether.

Imagine the following thought experiment: Take the five best isolation players in NBA history and put them on the same offense. Have them take turns on possessions, like at-bats in baseball, standing around watching each other attack the defense one at a time. Assume there is no interaction between the players (no passing), and the defensive strategy is the same on each possession. Suppose that each of these players is an elite isolation scorer, yielding something like 1.00 points per attempt. How efficient would that offense be?

This group of spectacular isolation scorers would produce a combined 1.00 points per attempt...which would be a terrible NBA offense! They cannot be greater than the sum of their parts because they do not help each other. A bunch of isolationists – players who cannot make scoring easier for their teammates – become redundant, taking turns playing marginally-efficient one-on-one basketball.

Anytime someone like Walker employs these kinds of one-on-one tactics, the quality of his teammates is irrelevant. If Walker were on another team and made the same isolation moves, his new team's offensive output would be the same as Atlanta's or Boston's on those particular possessions. It really doesn't matter if four high-school players were playing with Walker or four of the best players in NBA history, Walker's one-on-one possessions will produce the same number of points for his team. In this sense, isolation scoring efficiency is constant from team to team, negligibly affected by a player's teammates.

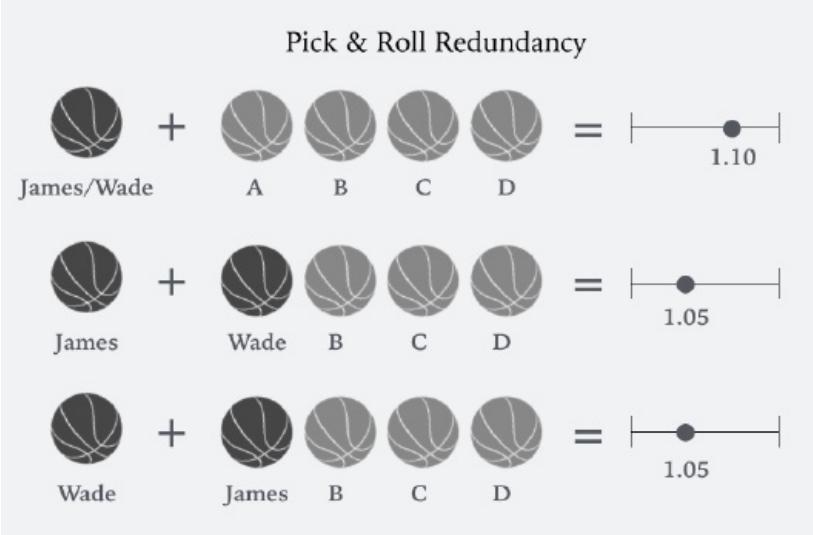
As a result, isolation scoring (without good passing) does not retain its value on better and better teams, or "scale." It's neither interactive nor additive. The other four players on the court could combine to produce above-average possessions, but on true isolation plays, the entire team will be the product of *only* the isolation scorer's efficiency. Sometimes this can improve a bad offense. But it can also hurt an otherwise good one.[133]

There's Only One Ball

In 2011, "redundancy" emerged as a popular buzzword when LeBron James and Dwyane Wade teamed up with the Miami Heat. Along with Chris Bosh, the Heat assembled three of the top-10 scorers in the league and generated an offense 4.4 points (per 100 possessions) better than average and an overall margin of victory of seven points per game. This is plenty good, but nearly identical to James' 2010 Cavaliers, which lacked a second all-star, let alone three top-10 scorers. Why weren't the puzzle pieces in Miami automatically additive?

Let's extend the previous thought about isolation scoring but apply it to "ball-dominant" players instead. James and Wade both provide value by having the basketball in their hands, either in isolation sets or running the kind of pick-and-roll action that we analyzed in the opening chapter. Then, like Steve Nash, they break the defense down and create a power play for their team, capitalizing and scoring themselves or creating an efficient shot for a teammate.

If Wade runs a pick-and-roll at 1.10 points per possession when he has a good shooter on the court, then replacing that shooter with LeBron (who is not a great shooter) can actually downgrade Miami's efficacy on that play. With LeBron in, the play might produce 1.05 points per possession. (Remember, a five point drop every 100 possessions is worth more than 10 wins a season.) Similarly, LeBron can run the same pick-and-roll action at 1.10 efficiency with a good shooter in the game in place of Wade, because Wade isn't a good 3-point shooter either. Thus, Wade's pick-and-roll without James on the court would be worth 1.10 points, James' pick-and-roll without Wade on the court would be worth 1.10 points, and when they were both on the court and ran the same play, the team would be *worse,* at 1.05 points! In this sense, Wade and James are completely redundant on these kinds of offensive sets.[134]



Because ball-dominance can be redundant, it can have diminishing returns. After all, there's only one ball, so only one player on the court can break down the defense at a time. However, because it involves passing (unlike isolationism), ball-dominance does scale to produce elite offenses by creating more efficient looks for the players *without* the ball. This is what we saw in Chapter 1 with Steve Nash.

Nash himself is one of the great ball-dominant players in NBA history, quarterbacking a number of the best offenses ever by combining his incredible shooting and passing to supercharge his pick-and-roll sets. In Phoenix, Nash's peak lineups eclipsed the rarified air of over 1.20 points per possession. Magic Johnson also led prodigious offenses with ball-dominant orchestration.

In this sense, the ceiling on ball-dominance is determined by the finishing quality of the off-ball players. Players who generate value without the ball – by hitting open shots efficiently, making a great cut or crashing the offensive boards – cash in on the value created by a teammate, like James or Wade.

In the play we examined in Chapter 1, Joe Johnson's 48% 3-point shooting will produce an extra point per game more than someone hitting those exact same open shot attempts at 38%. (A percentage difference that is good for a few extra wins over the course of a season.) In theory, the more open shots created for a good shooter like this, and the better the pass to set up such shots, the higher the shooter's percentages will be at the end of the season.

That James and Wade cannot capitalize on the value created by each other makes them redundant; their shooting limitations prevent them from adding value on plays that they aren't dominating the ball, limiting the offensive potential of their lineups. So surrounding a ball-dominator with great finishers is additive, but adding a second ball-dominator to the equation can be redundant. [135]

On the other hand, there is a fairly hard ceiling when throwing the ball to an isolation scorer and watching him play one-on-one, and that ceiling is usually far below what good team offense produces. Thus, removing an isolationist like Antoine Walker from the lineup can improve the lineup, despite the loss of a high scorer. If teams replace low-ceiling isolation possessions with paths that produce open shots for good shooters, the offense can improve. This is why it's possible to take a 25 point-per-game scorer, “replace” him with a 15 point-per-game player who creates open shots for teammates, surround that player with good shooters and watch the team's efficiency soar.

This flies in the face of scoring-centric thinking. Traditionally, adding a 25 point per game All-Star to a team would be seen as an upgrade that could do no harm. But, isolation play like Antoine Walker's can hurt even average offenses. Combining two top-10 scorers will have diminishing returns if they both need the ball. And redistributing efficient team possessions can yield inferior results, regardless of a player's previous scoring numbers.

This happened in 1969, when Chamberlain left the 76ers to join the Lakers and form the league's first “super team” alongside stars Jerry West and Elgin Baylor. In 1968, when the Chamberlain-free Lakers were healthy, they rode the most efficient offense in the league to a 7.7 SRS. The following year, after trading Archie Clark for Wilt's 24 points per game, the offense waned and the Lakers produced a 5.8 SRS when healthy.[136] Wilt's assist rate plummeted back down to its 1966 level.[137] Despite winning the three previous MVP awards, his presence dampened the synergy of the '68 team.

Building Strong Pillars

Indeed, the best offenses in NBA history are largely based on great passing and shooting. Intelligent passing helps extend the value created by a teammate, amplifying power plays and finding the best open shot once the defense is compromised.

There is a healthy correlation between good offenses and teams that pass more; from 1986 to 2011, the correlation between team assists (per possession) and points (per possession) was a moderate 0.43, suggesting that better offenses pass more.

Most great offensive teams do *not* rely on a single player to do most of the scoring, but instead distribute the load, much like the record-setting 1967 Philadelphia 76ers did. Of the top 15 offenses of all-time based on shooting average,[138] only one was led by a top-50 all-time individual scoring season, when Karl Malone netted 40 points per 100 possessions for the 1997 Utah Jazz.[139] Eleven of the top 15 shooting teams in NBA history lacked a top-200 individual scoring season of all-time, opting for more balanced attacks instead.[140]

Good teams don't leave the scoring to one person because such heavy lifting is often limiting, incumbered by the problems we encountered with isolationism. Reaching elite offensive heights requires *additive* skills that scale by creating easier scoring attempts for role players *and* star players alike. This is why Wilt Chamberlain's passing and creation helped Philadelphia far exceed what his own (efficient) isolation scoring could produce.

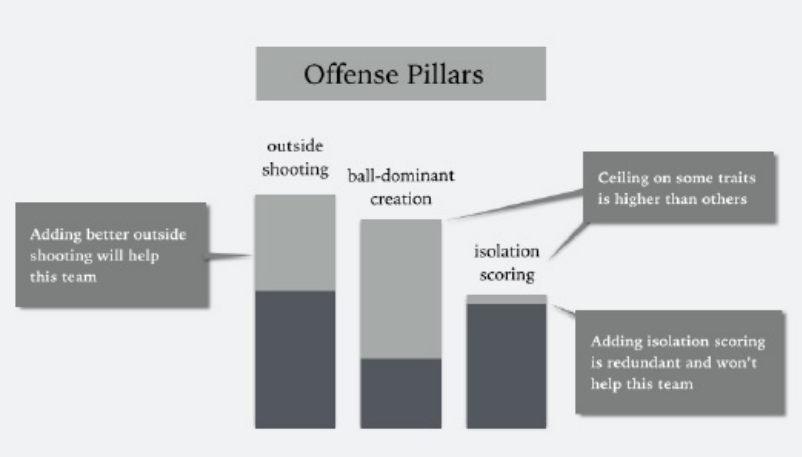
Defensively, the same concept applies. Heck, any primary trait that isn't easily redundant – such as offensive rebounding or the

ability to guard multiple positions effectively – will create a higher ceiling for teams and likely add value in more and more settings, regardless of the current team makeup.

For example, many good defensive teams guard the rim well, a role typically filled by shot-altering big men like Bill Russell, Dikembe Mutombo or David Robinson. Because teams rarely have two good rim protectors, any player that possesses the skill often brings additive global value to his team; the trait is not redundant and does not have diminishing returns. Conversely, the epitome of redundancy is adding David Robinson to a team with two David Robinsons – the third won't make much of a difference because two players playing 40 minutes per game already possess the same skills. But a great shooter can almost always replaces a lesser shooter in the lineup, improving the value of the open shots that his teammates create for him.

Scaling might seem like a small issue, but having a ceiling on traits can be extremely problematic when it comes to building winning teams. NBA clubs win by excelling in a few key areas, such as:

- pick-and-roll defense
- interior defense
- offensive creation
- outside shooting
- isolation scoring



A few offensive pillars (the same concept applies for defense) for a team that has a great isolation scorer, lacks ball-dominant creation and is good, but not great, at outside shooting.

These areas can be thought of as a team's foundational pillars – the stronger the pillar, the better the team will be for it. For example, adding a great shooter to a team that has weak outside shooters will strengthen the “outside shooting” pillar and improve the team. But a team with great outside shooters has already maxed-out that pillar, so adding a great outside shooter will be redundant.

When thinking about how an individual adds value to a team, we must consider how his traits help improve these pillars. Two concepts govern how much he can do this: (1) What is the ceiling on the pillar (how large is it) and (2) Is there any redundancy (has the team already maximized that pillar)?

Take, for example, a few of the foundational offensive pillars we've discussed, such as outside shooting, ball-dominant creation and isolation scoring. Because of isolation scoring's low ceiling, it is not a very large pillar – maxing it out does not provide a lot of value for a good NBA offense relative to other pillars.

Conversely, outside shooting is a large pillar; it's additive and hard to maximize. For a team to reach an “outside shooting” ceiling, it would require a roster that is replete with the best outside shooters in the league at every position. Such a team, shooting 45% or even 50% from 3-point range on open shots, would be downright scary...as long as they had someone to create open shots for them.

On any given team, players provide Global Impact based on how much they can improve a pillar. In the hypothetical example above, adding an isolation scorer, no matter how good, won't do much for this team. (This is redundancy.) Adding an excellent ball-dominant creator will help a lot more. In this sense, certain skills or traits scale better than others.

This kind of scaling is called *portability*, as in, how well a player's skills travel to other, high-quality lineups.

Portability: How well a player's skills retain value on successful teams.

Can a player elevate a lineup of shooters to elite heights? Non-shooters? Can he spearhead excellent global efficiency with a variety of big men and wings?

What's most important about an individual's portability is that his traits help make teams *great*. In the NBA, mediocre teams simply do not win championships. Having low-ceiling traits that take lineups from floundering to OK, or from OK to good, is significantly less valuable than skills that elevate teams to excellence. In team-building jargon this is “finding the right pieces” on championship-level teams.

Traits that diminish in value as teammate-quality improves aren't that valuable. It's hard to build an elite NBA team around a mediocre offense. It's actually easier to build an elite squad around a mediocre defense, because top-shelf offenses often create slightly larger point differentials than top-shelf defenses.[141] So if someone's only contribution to his team is great isolation scoring, he could bring value to a lot of poor offenses but would be redundant on most good offenses, making the trait less likely to produce championships.

Forget mediocre teams – even good teams rarely win titles. There is a clear threshold (seen in the above graph) where teams start winning titles, and the likelihood of winning championships beyond that threshold is drastically different depending on which part of the curve a team lands on. A team that outscores opponents by six points per game is expected to win about two championships every 10 years. But a team that outscores opponents by eight points per game will take home almost five in 10.

That means that a team could win 58 games a year for five consecutive years and, simply due to variance, not win a championship 38 percent of the time. (The 1990's Sonics say hello!) Contrast that with a plus-9 SRS team (65-win quality) that wins a title about 60 percent of the time. Such a team would be expected to take home six championships every 10 years. Those seven extra wins per season, or three extra points per game, make it about *45 times* less likely to suffer a five-year championship drought.

When it comes to team pillars, having a higher ceiling makes an exponential difference. Revisit the above graph – adding three points per game (or more) to average or below-average teams doesn't move the needle. Any team with a ceiling around plus-4 or plus-5 points per game – good for 53-55 wins a year, better than what many franchises achieve for years – stands a slim chance of winning the four best-of-seven NBA playoff series necessary to claim a title.[142]

The Global Impact provided by any basketball trait must scale well to create higher and higher ceilings for teams. Each extra point a team can improve *once it is already good* has a significantly greater impact on championship odds than adding a few points to weak teams. So the skills that translate to excellent teams – great shooting, passing and rim protection, to name a few – are inherently more valuable when constructing a globally-minded NBA team that is trying to win championships.

Sidebar: Shooting and the Spacing Effect

Another critical component of the 3-point era is the so-called "Spacing Effect." The Spacing Effect is the extra space in the lane that a player creates for teammates without the basketball because he is a threat to shoot from outside. A good shooter can hold his defender closer to him, deterring the defender from leaving to help defend another player or clog the lane.

Big men who can shoot are exemplars of this effect. A typical center who lacks outside shooting does not need to be covered far from the hoop when he doesn't have the ball – he simply isn't a threat to score if his teammates pass it to him. This allows his defender to sag off of him and more easily help out on other players or protect the hoop.

However, a good shooting big man is a threat to score when left alone. Defenders are more hesitant to play multiple body-lengths off of such a shooter, because if his teammates were to pass him the ball, he could launch an uncontested, high-percentage shot. By drawing defenders out of the lane and away from the hoop, such offensive shooters open the court, creating more space for players to operate in the lane. This allows big men and guards more room to operate to create higher-percentage shots.

The widespread adoption of the 3-point shot has largely been responsible for this effect. In the last few years, the average long 2-point shot has yielded around 0.80 points (40% accuracy), but just 33% accuracy from 3-point range is equivalent to 1.00 points per attempt, an elite half-court efficiency.

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130. Since 1980, there have been 70 players who have averaged more than 17 points per 36 minutes and less than 1.00 point per scoring attempt. Eighty percent of them have been on teams with below-average offensive efficiency.
131. Of the 159 players with at least 10,000 career field goal attempts.
132. From 1986 to 2011, 127 below-average efficiency players missed at least 10 games. 34% lowered their team's offensive rating. Neil Paine, "Losing Your (Inefficient) Leading Scorer Hurts Your Team," *Basketball-Reference*, May 23, 2011. http://www.basketball-reference.com/blog/?p=9497
133. Good isolation does help in circumstances where teams would otherwise struggle to find efficient attempts, such as at the end of the shot clock. Great isolation will force a double-team and can lead to a power play.
134. In reality, this kind of redundancy rarely has perfect 100% overlap like this. Wade/James provide value without the ball in other ways, finishing on cuts and grabbing offensive rebounds.
135. Off-ball skills, like cutting and sealing for position – where players can offensive rebound or receive high-percentage passes – are secondary complementary skills.
136. Starting center Darrall Imhoff (28 MPG, 9 PPG) and Jerry Chambers (who did not play for the '68 team) were also part of the trade. In addition, the '69 Lakers lost Gail Goodrich (26 MPG, 13 PPG) to the expansion draft but added Keith Erickson (29 MPG, 12 PPG) and Johnny Egan (14 MPG, 7 PPG).
137. Other examples of volume scorers not improving teams: 1992 James Worthy (Lakers), 1993 Clyde Drexler (Blazers), 2002 Vince Carter (Raptors), 2004 Chris Webber (Kings) and 2011 Carmelo Anthony (Nuggets and Knicks).
138. This (True Shooting%) ignores turnovers and offensive rebounding, which can confound a team's offensive rating. The top offensive teams of all-time by this metric average 1.15 to 1.18 points per attempt.
139. This was the 23rd most-frequent scoring rate since the stat became available in 1974. Michael Jordan's 1987 is first, at 46.4 points per 100.
140. The three other instances: Malone, again, in 1995, Larry Bird in 1988 and Amare Stoudemire in 2008. All of those teams were excellent passing teams as well.
141. From 1980-2012, there have been 17 defenses that were 6 points better than league average efficiency and 29 such offenses. The 50-best defenses over that period were a combined 6.0 points better on average than the league, whereas the 50-best offenses were 6.4 points better.
142. One common rebuttal to this idea is that a lesser portable offensive player can help buoy a team of defensive specialists. That formula suggests that overloading a team with good to great defensive specialists creates enough separation that even a mediocre offense yields a championship contender. However, a top-5% defense combined with an average offense still has a ceiling closer to the beginning of the explosive part of the championship curve (approximately five to seven points better per game).

Chapter 9
The Lone Star Illusion

While players like Antoine Walker are rarely heralded, many high-scoring individuals are celebrated for lifting inefficient offenses to average heights. Perhaps nothing exemplifies this more than Allen Iverson's 2001 MVP season in Philadelphia. Iverson led the NBA in scoring that year, averaging more than 31 points per game while guiding a band of defensive-minded players to the NBA Finals. Only one regular in their playoff lineup ever averaged more than 14 points per game in a single season, and that was Dikembe Mutombo's rookie year (1994) at 16.6 per game. No other regular in Philadelphia's playoff lineup shot over 33% from 3-point range during the year.

Iverson averaged nearly *twenty* more points per game than Philadelphia's next leading scorer and tallied a staggering 38 percent of his team's points when on the court. While he occasionally ran around screens until a catch-and-shoot opportunity appeared, Iverson was largely lifting Philly's weak offense with isolation scoring. Only 42% of his field goals were assisted that year, far from the league average of 61% and his teammates' 64% clip.

Despite his mediocre efficiency (1.04 points per scoring attempt), Iverson's enormous isolation scoring appeared to help: In 996 minutes without him, the 76ers averaged nearly four fewer points per 100 possessions on offense. While this kind of single-handed effort looks impressive, it's an approach that doesn't really help teams win championships. That Philadelphia team was not a viable title contender – based on their point differential, the 76ers would win a championship about three percent of the time.

We often assume that this kind of scoring automatically translates to a better team, and that if Iverson had more offensive competence around him, his 31 points per night would have lifted a good team to greatness. But, because Iverson's best skills aren't portable, that is rarely the case. Few strong offenses need a ball-dominant, isolation scorer like him, so he'd either replace their above-average possessions with his average isolation plays, or he'd need to apply *different* skills and traits to fit in and enhance the offense.

This doesn't mean that Iverson would struggle on a good offense – he may be able to help – it just means that he'd have to apply skills other than ball-dominant scoring.[143] His isolationism could still boost the offense at times – when the shot-clock is low or when paired with defensive-minded lineups – but he'd need to create more for others and finish opportunities created by his teammates with high efficiency in order to add value to a good offense.

Because of this recasting, his numbers would change drastically on a quality offensive team, just like Wilt's did from 1966 to 1967. Typically, scoring attempts decline and efficiency improves as new teammates create easier opportunities. But successfully fitting in is governed by how portable the player's skills are; Wilt's volume scoring couldn't scale and that's why his statistical change was so drastic when Philadelphia became a high-performing offense.

Ironically, the weakness of Iverson's team actually made him look better. Much like players in Walker's position (leading scorers on bad offenses) will earn an all-star selection here and there because of their raw scoring numbers, players like Iverson (disproportionately leading scorers on average offenses) will usually draw rave reviews for “carrying” subpar teammates. Mega-scorers in similar positions, like Wilt's 50-point season in 1962, largely live in NBA lore.[144]

When we think a player is elevating a starless cast, we tend to give him extra credit. But that kind of isolation scoring is most valuable to struggling offensive teams that would improve by offloading 40 percent of possessions to one, marginally efficient player. No elite offense would ever improve by shifting to this strategy. Iverson, like others in a similar position, was the beneficiary of circumstance. He rode the weakness of Philadelphia's offense to an MVP award based on the appearance that he was doing something special.

Spur of the Moment

The 2003 Spurs are one of eight NBA champions with a single all-star, and of those eight, one of four with an MVP-level player. Tim Duncan, who won his second consecutive Most Valuable Player award that season, led a group of non-all-star teammates who averaged under 15 points per game in their 24 postseason contests. No one outside of Duncan tallied more than seven rebounds or four assists per game. But averages can be deceiving.

While it is true that, in general, it is easier for the same players to fulfill the same roles every night, this does not prohibit teams from taking a “new day, new star” approach. The collective contribution of Duncan's teammates can be the same whether produced by two all-stars every night or seven different players at different times; there are many ways to build a good team.

Consider the following example based on points scored. The values are hypothetical in order to illustrate the point:

Season Averages		
Spurs	**Points per game**	**Timberwolves**
Duncan	23	Garnett
Parker	12	Szczerbiak
Jackson	11	Hudson
Ginobili	10	Johnson
Rose	8	Hassell

These lineups have the exact same averages by player, but their *distributions* are quite different from game-to-to-game. Here are three hypothetical games for the two teams:

Game 1			
Spurs	Points	Timberwolves	Points
Parker	27	Garnett	23
Duncan	23	Hudson	14
Rose	10	Szczerbiak	11
Ginobili	3	Johnson	10
Jackson	0	Hassell	7

Game 2			
Spurs	Points	Timberwolves	Points
Ginobili	27	Garnett	22
Duncan	23	Hudson	13
Parker	7	Szczerbiak	11
Jackson	6	Johnson	9
Rose	0	Hassell	8

Game 3			
Spurs	Points	Timberwolves	Points
Jackson	27	Garnett	24
Duncan	23	Szczerbiak	14
Rose	14	Johnson	11
Parker	2	Hassell	9
Ginobili	0	Hudson	6

In these three games, despite averaging the most points per game, Tim Duncan was never the leading scorer for his team in a single game. On one night, Tony Parker had a big scoring game, and when he had an off night the following game, Stephen Jackson or Manu Ginobili picked up the slack. Contrast this to a more consistent team; Kevin Garnett never had a teammate score more than 14 points in any given game in this hypothetical, despite his teammates producing the same averages as the Spurs' role players.

This exact same concept applies to Global Impact. A team's best player can steadily improve the team by six points per game, but on any given night never be the team's best player *in that game.* The averages can make it look like one player is performing a solo act every night, when in actuality he has a teammate or two producing like an All-Star in any given game. Duncan can play alongside an All-Star quality player (or two) from game to game, but because the performances come from different players, no one teammate is, *on average*, an All-Star.

Pretend that San Antonio has a player named Emannubruce Parkerobinson who provides perimeter defense, 3-point shooting, creation and offensive rebounding. Because of these talents, Parkerobinson regularly makes the All-star team team alongside Duncan.

In the first series of the playoffs, Parkerobinson averages five 3-pointers a game on 50% shooting, helping San Antonio advance to the second round. In the next series, one of the opposition's strengths is their perimeter scoring from Kobe Bryant, but Parkerobinson's stellar perimeter defense clamps down Bryant and the Spurs win. In the third series, Parkerobinson grabs five offensive rebounds a game and single-handedly makes up enough offense with these extra possessions to turn the tide of the series. In the Finals, Parkerobinson slices up the defense and creates 12 open shots a game for his teammates, spelling the difference between victory and defeat.

Tim Duncan, throughout these playoffs, would be his usual self. He wins the Finals MVP, leading the team in scoring and rebounding. He is not, however, credited by journalists and fans as single-handedly “carrying” the Spurs to a championship. His fellow star and supporting actor, Emannubruce Parkerobinson, becomes a household name, just like sidekicks Scottie Pippen and Kobe Bryant before him.

Yet the above scenario is exactly what happened to the 2003 Spurs. Instead of wrapping up all of those performances into one player named Emmanubruce Parkerobinson, they were *distributed* across a number of players. In essence, the role of Parkerobinson was played by a different Spur every night, yet with the exact same results as if they were packaged into a single player.

Having teammates like this helps; teams are significantly more likely to win games when (at least) one player has an explosive night.[145] Teammates who can provide these game-to-game bursts relieve the star of some heavy lifting while increasing the odds of winning. In the Spurs 16 postseason wins that year, Duncan led the team in scoring 50 percent of the time. By comparison, in Michael Jordan's six championship seasons, he led the Bulls in scoring in 93 percent of playoff games.

Similarly, teammates who can fortify different pillars from game-to-game increase a team's chances against varying opponents. Since there is a basic quality threshold a team must meet in order to contend for a title, the supporting cast of *every* elite team will be strong in a number of areas.[146] Yet as time passes, the tendency is to look back on a lone all-star and think that that he achieved something superhuman to elevate a “starless” group of teammates to championship heights.

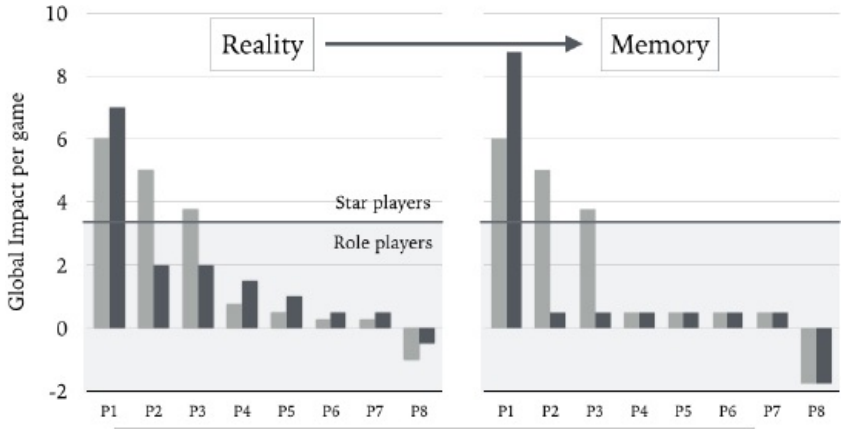
Star Counting

Our minds struggle with averages. The Spurs can have a star alongside Tim Duncan every night, but if it's a different player from game to game it won't be reflected in the final averages. The mind sees that Duncan's teammates aggregated mediocre averages and assumes that Duncan must have played with mediocre teammates. To explain San Antonio's title, we then end up with something like "Duncan's teammates were run of the mill, yet the Spurs won the title, ergo Duncan must have been superhuman."

When value is spread across a number of players like this, it obscures the true contributions of the supporting cast. With lesser quality teams, like Iverson's 76ers, there's an additional oversight – extreme volume scoring wouldn't help if the player's teammates were better.

Thus, a *Lone Star Illusion* occurs when a team has a leading scorer who (1) scores significantly more than the next leading player and (2) possesses no ostensible all-star teammates.

Lone Star Illusion: The tendency to over-credit one player with the majority of a team's success when there are no other all-stars on the team. (Named after the state of Texas, which has had a famous championship illusion for each of its three teams.)



At the core of this illusion is "star-counting." It's too complicated to store subtle information about a dozen players, so we simplify the equation by placing them into different tiers, such as "good role player," "bad role player" or "star." While a team's outcome is the same whether great games come from the same player or five different ones, our minds treat it differently.

Arbitrary delineations like "All-Star" become breadcrumbs for the mind to follow, setting us up to count the "stars" to determine which team is better. If Team A has one star and defeats Team B with two stars, we think that Team A's star must have done something amazing to overcome two elite players. We overly credit one individual for the team result while diminishing the role players, creating the effect that the lone star carried his weaker teammates to amazing heights.

The next graphic demonstrates this effect on our memory, comparing two hypothetical teams based on the quality of all their players. Global Impact runs along the y-axis for eight different players (P1 through P8) while the shaded area represents the arbitrary cutoff the mind uses to reduce individuals to "role players" (unimportant constants) or "star players" (who "really decide" the outcome).

The left graph represents the actual value of the players, but the right graph demonstrates what happens after our memories simplify the rosters into "stars" and "role players." The darker team, which has a better player at every roster slot outside of player 2 (P2) and player 3 (P3), is punished by the mind's reductionism, in which all non-stars are treated as equal role players or equally irrelevant.

However – and this is where the mind creates *Lone Stars* – the brain needs to explain how the darker team won with fewer stars, so it upgrades the team's best player by giving him some of the differential that, in reality, the role players produced on the court.[147] Notice how the darker team's star is upgraded in memory while many good players are reduced to second-tier constants.

A *Lone Star Illusion* helped Allen Iverson snag a runaway MVP award, claiming 75 percent of first-place votes over legends in their prime like Shaquille O'Neal, Tim Duncan and Kevin Garnett. Because our minds reduce Iverson's teammates to non-star role players, we give him a mental boost to explain how Philadelphia won as many games as O'Neal's Lakers, despite O'Neal playing next to another star, Kobe Bryant.

Perhaps the most notable *Lone Star Illusions* in history are found on championship teams like the 2003 Spurs. The following players led title teams without an All-Star teammate:

1. 1975 Rick Barry, Warriors (first team in the Shot Clock era to win with a single All-Star)
2. 1994 Hakeem Olajuwon, Rockets
3. 2003 Tim Duncan, Spurs
4. 2011 Dirk Nowitzki, Mavericks

In 2011, Maverick Peja Stojakovic shot the leather off the ball in the Conference semifinals versus the Lakers. The matchup favored him as a specialist, and sure enough he converted a red-hot 11 of 21 shots from 3-point range (52%) in a Dallas four-game sweep of LA. Two rounds later, in the Finals against a more athletic Miami team, many of Stojakovic's minutes were filled by Deshaun Stevenson. Stevenson was even better, going 13 of 23 from downtown (57%), good for 1.70 points per attempt! Just like the 2003 Spurs, a different player from series to series did damage for Dallas.

The so-called lone star on that 2011 Mavericks championship team was Dirk Nowitzki, who outscored his next teammate, Jason Terry, by over 10 points per game in the postseason. Terry wasn't even a starter. Another key player, Tyson Chandler, contributed with defense and offensive rebounding, both squarely in the blind spot of a scoring-centric analysis.

By the composite metric GameScore, Nowitzki led the team in 12 of 21 games (57 percent), with Marion, Terry, Chandler and Kidd leading the team in the other nine games. While almost no one would argue that Nowitzki wasn't the best player on the Mavericks that year, he wasn't the best performer on his team during a number of key playoff games.

Looking at points – a category in which Dirk led Dallas, averaging 27.7 per game on 1.22 points per scoring attempt throughout the playoffs – reveals the different players who stepped up in different games. If we took the average of the best scoring Maverick other than Dirk from game-to-game, it would produce a starlike player who averaged 20.3 points per game on a whopping 1.31 points per shot. The presence of this one player – another star – would take credit away from Nowitzki. But because these efforts came from multiple players, they are minimized by our memory.

Remember, individual players are limited in their impact. If we dissected the 1994 Rockets or the 1975 Warriors we'd find the same phenomenon: high-quality role players coalescing to form a strong supporting cast. Non-star teammates can generate star-like contributions on any given night in the important facets of the game such as scoring, outside shooting, defense, rebounding and playmaking.

Yet history has a tendency to overstate the value of players who“carried” their teams because players who do not reach our internal thresholds as “stars” are marginalized. And we glorify disproportionately heavy lifting on mediocre teams, like Allen Iverson's 2001 season, regardless of whether that playing style is sustainable on championship-level teams.

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143. Iverson played on slightly better offenses in 2007 and 2008 in Denver and averaged just under 26 points per game on improved efficiency.

144. Other notable examples include Kobe in 2006, Jordan in 1987, Wade in 2009 and Bernard King in 1984.

145. Big individual games correlate heavily with winning. For example, from 1986-2012, a player with a 30-point playoff game and at least 1.35 points per attempt won 70% of the time; 30-point games with 1.45 per attempt won 73% of the time and 30-point games at 1.55 won 79% of the time.

146. On/off data and RAPM say that Duncan had a good team around him in 2003.

147. To say nothing of a team's synergy that makes them more than the sum of their parts.

Chapter 10
Conclusion: The Mind's Scoreboard

Imagine, for a moment, a world where basketball games didn't have scoreboards. No giant Jumbotrons adding up all the points throughout a game. Would we have any idea who won and lost? Would we know who scored the most points for each team? How good would the human mind be at counting if left to its own devices?

A theme of this book is how the brain struggles when faced with large amounts of data. Ask us to memorize a new phone number and we can hold a few digits in our head. Ask us to memorize a hundred new phone numbers and we don't stand a chance. So what would our basketball impressions look like without scorekeepers tallying up the points for us? There's a way to find this out.

Pretend that we had a healthy *Late-Game Bias* and wanted to know how players performed during the clutch. We could create an entire subsection of team standings and statistics based on only "clutch" moments – when the game is within five points in the final five minutes – and from there, conclude who the best clutch players and teams were. The challenge is, there's never been a "clutch scoreboard," so when people discuss clutch play, big moments and Magic Johnson's "Winning Time," they do so with their *mind's scoreboard*.

Because our mental scoreboards are constructed from our heuristics, which assist us with our inability to accurately count large numbers, we are simply guessing at overall trends in crunch-time. As such, we expect people to have a hard time gauging who the best teams or players are in the clutch. But we have an intuition. We confidently guess.

Shaquille O'Neal was an abysmal free throw shooter. Nonetheless, he used to boast that he "made free throws when it counted," at the end of close games. (Shaq also had a *Late-Game Bias*.) Was it true? If you watched Shaq throughout his career, or followed his elite teams in the postseason, did O'Neal make more free throws in the clutch?

Your best-guess largely will be dependent on your exposure to O'Neal. Can you remember big games in which he made key free throws? Did you watch his teams win or lose a lot? (Shaq was on four championship teams but swept out of the playoffs a number of times.) Did you read about his claims that he made them when they counted?

From 1997-2011, Shaq made 52.4% of his free throws. Per his reputation, this is dreadful.

He was even worse in the clutch.

During the same time period, Shaq hit 48.3% of his clutch free throws. If you remembered his boasts that he "made them when they count," and specifically gave more attention to those moments as they happened, then it would start to feel like Shaq did indeed make them when they counted. This is how our mental scoreboard works. It latches on to those guiding lighthouses (heuristics) in a sea of noise (lots of data) to provide simplicity and structure (a confident best-guess).[148] In doing so, we usually veer off course.

Yet we remain confident in our assertions. After all, those who remember Shaq making them "when they count" are not fabricating events, but instead discarding the times he missed. Nuance is mentally challenging – the mind wants to reach a clear conclusion using only a few, salient examples. If Shaq makes two free throws to clinch the championship, those memorable attempts become the reference point to demonstrate that he makes them in the clutch. We are hardwired to overlook contrary events – all the misses – that might counterbalance our conclusion.

Take Karl Malone, the second-leading scorer in NBA history. Malone built a reputation over the years, fueled by *Losing Bias*, that established that he was a "choker." Here's what Bill Simmons said about him in his *Book of Basketball:*

> "[His] 'fatal flaw.' The deer-in-the-headlights routine in big games for Malone. Time and time again, he came up short when it mattered (Game 1 of the 97 Finals and Game 6 of the 98 Finals were the best examples)."

Simmons added that during crunch-time, Malone "routinely and famously shrank from the moment," and called him a member of the "not-so-clutch group."[149] This impression is built not only on the effects of *Losing Bias*, but on the *Late-Game Bias* that emphasizes such clutch moments. Add in a *Rings Fallacy*, some *Championship Hindsight* about the Jazz, and it's no wonder Malone takes a beating. Most people's memories consist of him annually losing and notably failing on two key plays against Michael Jordan.[150]

All of the good Malone did over the years is forgotten, even against Jordan's Bulls. In the 1997 and 1998 Finals, there were a combined 54 minutes of crunch-time. Below is a stat-line comparing the four highest profile players from Chicago and the Utah Jazz:

97-98 Finals clutch	Points	Points per shot	Rebounds	Assists
Michael Jordan	55	1.02	11	5
Karl Malone	27	1.15	15	3
John Stockton	23	1.05	6	13
Scottie Pippen	16	0.72	15	7

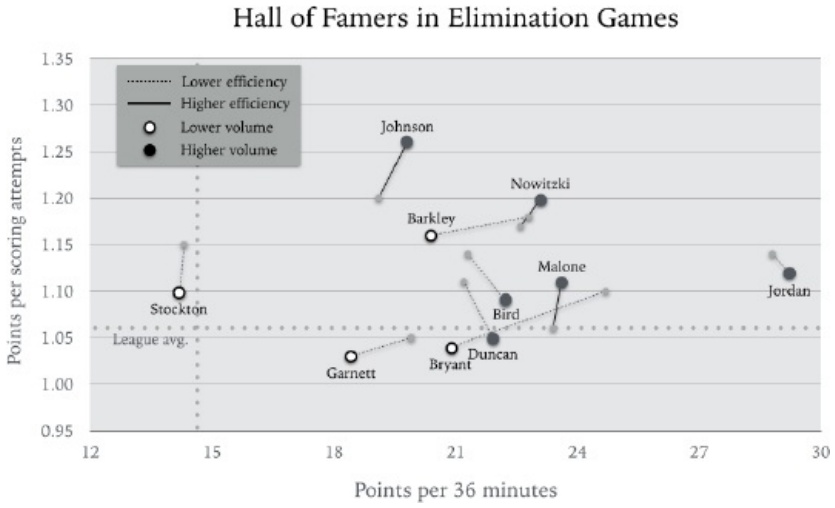
Malone missed three of eight clutch free throws, exactly one more than expected based on his 76% regular season efficiency. However, Jordan missed six of 22 free throws, *two more* than expected based on his 81% regular season rate. Jordan scored at an amazing rate of 36.7 points per 36 minutes, but his efficiency was a subpar 1.02 points per scoring attempt. In other words, Jordan was a clogged highway, producing marginally effective scoring for his team in lieu of other paths the Bulls could have explored. Malone, on the other hand, dropped his scoring rate by about a third from his regular season average, down to 18.0 points per 36 minutes. But

his efficiency was an excellent 1.15 points per attempt against a stellar Chicago defense.

In the last two games of the 1998 Finals, Jordan echoed his crunch-time trend, averaging over 36 scoring attempts per game on just 1.00 points per attempt. This ate up a lot of possessions with inefficient scoring.[151] Meanwhile, Malone was amazing by these standards. In the series last two games, he averaged 35 points on 1.31 points per attempt. So Simmons's first claim around the 1997 and 1998 Finals is vastly overstated, especially compared to other key actors in the series.

When we don't rely on an external scoreboard, we will always be limited by our heuristics. To many people it feels like Karl Malone was a choker and John Stockton was a reliable force in big moments. Stockton, after all, hit a memorable 1997 buzzer-beater to win the Western Conference Finals for Utah.

Another measure of these "big moments" are elimination games – games in which teams would be eliminated from the playoffs with a loss. The next chart depicts the performance of some big-name players who have been mentioned in this book, and their scoring volume and efficiency in elimination games:



Small dots represent a player's performance in non-elimination playoff games. A line is then connected to their elimination game performances. Data are restricted to a player's "prime" years: Bird & Johnson (84-91), Barkley (86-96), Stockton & Malone (88-98), Garnett & Duncan (98-08), Bryant (01-10), Nowitzki (02-11).

Karl Malone is one of the few players who increased his scoring volume *and* efficiency when his team's back was against the wall (indicated by a solid line and dark dot). His running mate, Stockton, regressed in both categories (dotted line and white dot) relative to his other playoff games. While scoring was never his calling card, notice what another legendary distributor, Magic Johnson, did in elimination games, ramping up volume and efficiency.

Meanwhile, Malone has better scoring numbers than every power forward from this group of hall-of-fame players, save for Nowitzki. This is far from a "deer-in-headlights" routine.

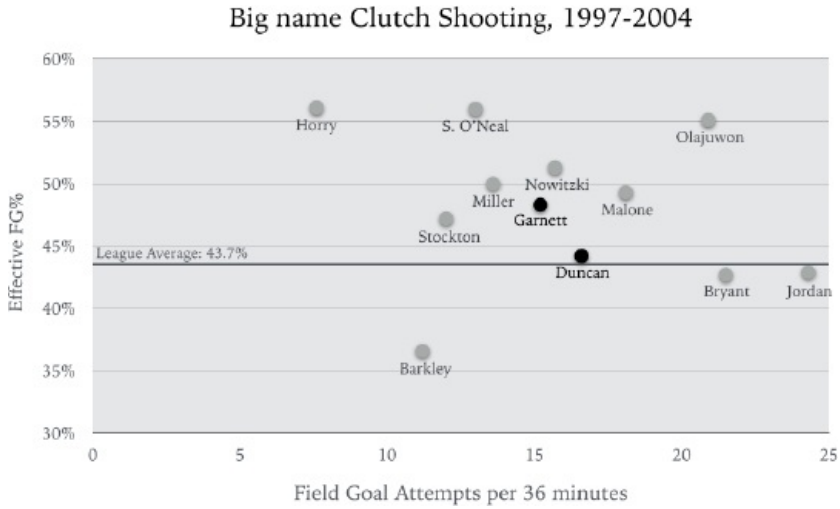
The full season clutch shooting data that we have access to (dating back to the 1996-97 season) tells the same story. Malone, who is well above league average in clutch shooting, looks far better by these standards compared to Jordan (from 97 and 98), Kobe or Duncan (both from 97-04).[152] Bryant's career clutch shooting numbers are similar to Jordan's 98 Finals – large volume with near-average shooting efficiency. Although, unlike Malone, Bryant is often regarded as a great big-moment player, despite falling apart in elimination games. This misconception is no doubt caused by *Winning Bias*.

Such a mismatch between reputation and performance is predictable. Players with a few memorable failures on the biggest stage are rarely described as "coming through in big moments," while those who were on winning teams will earn the opposite reputation. *Losing Bias* downgrades our perception of a player's "big moment" capability. Conversely, we expect to see winning players lauded for being "clutch," "coming through in big moments" and, thanks to *Late-Game Bias*, be generally regarded as better players than contemporaries with less team success.

For instance, if we apply the same clutch experiment to Tim Duncan and Kevin Garnett, the same kind of internal scoreboard glitches emerge. Here's what Simmons had to say about these two in his book:

"What set Duncan apart was his ability to raise his game to another level in big moments. Just as selfless and competitive as Garnett, Duncan channeled his intensity and saved peak performances for when they mattered most...Once Pierce and Allen were flanking [Garnett] in Boston, that freed him to do Garnett things...without dealing with the pressure of making big shots."

This characterization is quite common:[153] The player on the winning team is labeled as a big-shot making, big-moment player, while the player on the losing team is a choker who doesn't step up. Counting up all the plays tells a very different story.



The above graph spans Duncan's first seven regular seasons, in which he and Garnett combined to win three MVP's and make 13 All-NBA teams. Garnett shot nearly as much as Duncan in the clutch, only at a much better rate. Garnett was well above the league-wide average during the time period, producing a point more than Duncan every 12 field goal attempts.[154] Ironically, despite his reputation, Garnett's Timberwolves teams outscored opponents by 6.3 points for every 36 clutch minutes, far better than Duncan's Spurs, who were plus-2.5 per 36 minutes. This, despite the Spurs teams during those years boasting vastly superior records to those Minnesota teams. (Remember, winning teams don't differentiate themselves in the clutch.)

In fairness, many people formed their opinions of Garnett and Duncan by watching the playoffs, when games were often on national television. When adding in Garnett's Boston playoff run in 2008, the postseason clutch numbers do favor Duncan. Barely.

Between 1998 and 2008, the two stars attempted shots at nearly the exact same rate, nullifying the idea that Garnett "shied away" from such moments while Duncan gravitated toward them. Duncan did have a slightly higher efficiency rate on his field goal attempts, adding an extra point for every 26 shot attempts from the floor. Although, he struggled from the line, making a Shaq-like 57% of his free throws in the clutch during the playoffs over this period, 14% less than Garnett.

It should be no surprise that history views Garnett negatively while labeling Duncan with "winning" superlatives. Our heuristics become crutches for our narratives; we think a team wins *because* of the late-game heroics of its star. Ironically, Garnett was the only competent clutch player on his Celtic championship team in 2008, yet the impression of Garnett is that he needed Pierce and Allen to help him in crunch-time, and that's why he finally won.

Over the years, we've developed a tendency to focus on individual scoring at the expense of Global Offense or defensive contributions. We are fundamentally influenced by the scorekeeping methods of the game, equating blocks and steals to defensive quality.[155] These raw stats are not atrocious proxies for player quality, they just aren't very good ones. Points aren't created equally, assists aren't a great measure of creation, and so forth.

Big individual scoring numbers and incredible isolation moves are often revered. Many of us commit the *Hero Ball Fallacy*, believing that difficult, one-on-one scoring is literally a requirement for winning big playoff games. Yet the open shot, regardless of who is shooting, is almost always the best shot. Building teams with non-redundant, additive skills – like great passing, shooting and rim defense – are truly the keys to winning in the NBA.

Winning Bias shapes powerful impressions, automatically altering the information we focus on and remember. Combined with our fixation on the last few minutes of the game, we're left with a rubric that values players on winning teams and then selectively builds the impression that they came through "when it counts," in the clutch. That's a fallacy (*Late-Game Bias*) and without a real scoreboard, our minds will radically warp who is actually doing what, what *caused* points to be scored and just how much success is derived from defensive efficacy.

The first major principle to take away from this book is that our confident best-guesses will never be as good as good old counting. Our mental scoreboards will always be limited, which is precisely why records are kept during scientific research, and the results are not left up to the memories of the researchers. We'd never build a computer or rocket ship without precise record-keeping.

Second, our common reductionist beliefs about the sport are not always accurate – our memories are selective, our mental filters rarely balanced. We tend to ignore sample size, prematurely reaching definitive conclusions. These phenomena happen automatically, and the only way to combat them is to be aware of them, and then try to use as much relevant data as possible to bring balance back to our mental scoreboards – to bring accuracy to our faulty memories.

Third, NBA basketball is an interactive team game. It is a team game in terms of division of labor – one player can only impact the game so much. But it is also a team game in terms of dynamics – a player's value is fundamentally tied to the degree his actions help himself and his teammates. Good teams are built on the backs of complementary skills that scale together and create advantages against their opponents. The whole becomes greater than the sum of its parts. These strong teams win games by creating small advantages, possession by possession, over the entire game. And ultimately, it's not who does the scoring for a team that necessarily counts, it's who

causes the largest changes in efficiency for the entire team.

So the next time a good team comes along, notice how well they perform in the first three quarters. Check their offensive efficiency: If they are good, watch how well they pass and/or shoot together – which players help the *team* to score. If they excel defensively, note which key players disrupt the most shots or stifle power plays. Remember that no good team is a one-man band. Be cautious about who the heroes and the goats are. Be mindful of making definitive conclusions with small samples – a few games aren't reflective of a team or a player.

Oh, and leave closers to baseball.

Based on the topics in this book, these are the 10 biggest changes in how I perceive NBA basketball:

Topic	Old Rubric	New Rubric
finding trends	A few key examples in memory make a trend	Find as much data as possible and question memory's accuracy
player value	Player value = points, rebounds, assists blocks & steals, plus scoring efficiency	Player value = Global impact of actions that help team efficiency
individual defense	Man-to-man defense makes a good defender	Reducing efficiency of opponent's attempts makes a good defender
sample sizes	Best-of-7 series determines the best team	Best-of-7 series are often just part of a sample
best team	The team who won the championship was the best team that year	Many teams are capable of winning. Sometimes, the best ones do not.
best player	The team with the best player wins.	The best team wins – teams can be more than the sum of their parts.
winning bias	Players on winning teams make "winning plays."	Be cautious of selectively looking at the good plays from players on winning teams.
clutch	Good teams win games at the end	Good teams win early and often. Clutch is a small component of winning and often random.
closers	Players who can "close" games with great isolation scoring are most valuable.	"Closers" are not needed and can even be a hindrance.
portability	Carrying bad teams automatically translates to helping good teams.	Building great teams makes it likely to win a title. Thus, skills that don't scale aren't that valuable.

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148. This is mainly Kahneman & Tversky's *Availability Heuristic* at work. It's a guiding force in our lives – anytime there is a lot of information, we latch on to a few readily available examples that quickly come to mind and form a strong conclusion from them.
149. Simmons (2010).
150. In Game 1 of the 1997 NBA Finals, Malone missed two free throws at the end of the game before Jordan sank a shot at the buzzer to give the Bulls the win. In Game 6 of the 1998 NBA Finals, Malone was stripped by Jordan before Michael's final shot as a Bull clinched the championship for Chicago.
151. A lot of this had to do with Scottie Pippen being hobbled with a back injury, giving Chicago one less cog in its offensive machine. Still, high-volume, low-efficiency games hurt most teams: From 2008 to 2012 there were 100 games in which a player had at least 30 scoring attempts and converted at under 1.00 point per attempt. Teams won just 37% of those games.
152. Clutch scoring attempts are heavily confounded by free throws, since teams that are behind will intentionally foul players to regain possession of the ball. To help tease this out of the data, only shooting from the floor is examined here, in the form of "effective field goal percentage," which is akin to "points per shot."
153. For instance, in an April 24, 2012 post on "Bleacher Report," Andrew Wallack calls Garnett one of the biggest chokers of all time, writing that "he will always be compared to one Tim Duncan, who rose to the occasion in the limelight."
154. Garnett's clutch effective Field Goal percentage, or eFG%, was 48.3% during the time period. Duncan's was 44.2%. Duncan averaged 16.6 field goal attempts per 36 minutes in the clutch to Garnett's 15.2.
155. My original name for the phenomenon was *Scorekeeping blindness*, because it extends beyond scoring to the main data points (rebounds, assists, blocks and steals).

Appendix

Principles, Biases & Misconceptions

Foundational Principles

Chapter 1 *Global Impact*: The effect of a player's actions on his teammates and himself.
Global Offense: The effects of a player's actions on his team's offensive efficiency.
Distribution of scoring: Individual scoring is not replaced, it is redistributed.
Power Play: When a team generates a localized, man- advantage, usually caused by an offensive player drawing extra defensive attention.

Chapter 2 *Global Defense*: The effect of a player's actions on his team's defense efficiency.

Chapter 3 *Limitations of Power*: Players seem generally incapable of improving teams by more than 10 points per game in net scoring margin.

Chapter 4 *Variance Rule of Thumb #1*: Low variance is “consistent.”
Variance Rule of Thumb #2: High variance is “inconsistent.”
Variance Rule of Thumb #3: The greater the variance, the larger the sample needed to make accurate conclusions. This means that the more closely matched the teams, the more games are needed to determine the better team.

Chapter 6 *Late-Game Bias*: Clutch performance has little impact on overall team performance. Good teams create most of their separation earlier in the game.

Chapter 8 *Portability*: How well a player's skills retain value on a successful teams.
Redundancy: The degree to which a player's skills overlap with other players on his team, preventing scaling.

Basketball Biases and Misconceptions

Chapter 2 *Scoring Blindness*: A tendency to focus on an individual's scoring while overlooking his other actions that influence the overall team score.

Chapter 4 *Sample-Size Insensitivity*: A tendency to consider the given sample size as sufficient for reaching a conclusion.

Chapter 5 *Winning Bias*: A tendency to overrate how well an individual performed because his team won.
Losing Bias: A tendency to underrate how well an individual performed because his team lost.

Chapter 6 *Late-Game Bias*: A tendency to incorrectly weigh events as more important the later they occur in the game.
Hero Ball Fallacy: The false belief that teams need a go-to, crunch-time scorer to win.

Chapter 7 *The Rings Fallacy*: The false belief that championship rings in team sports are a relevant determiner of an individual's performance.
Championship Hindsight: The false belief that after a season ends, only the team that won was a “championship” level team.

Chapter 9 *Lone Star Illusion*: The tendency to over-credit a player who scores a disproportionately large percentage of his team's points and has no other all-stars on the team.
Star Counting: The practice of reducing rosters to only their ostensible star plays as a way to measure team strength

Cognitive Principles

Adjustment Heuristic	The process by which we move away from “anchored” information. We do not form a fresh opinion once something is anchored, but instead make small mental adjustments away from the original position. We make this adjustment until we reach a plausible new position.
Anchoring	The process by which the information we are shown creates a “starting point” for all related future information to be based off of.
Availability Heuristic	Our tendency to more easily recall readily “available” events and information, and to disproportionately weigh those as being more common that they are.
Confirmation Bias	Our tendency to seek out only the information that supports our current position.
Extension Neglect	Our tendency to be blind to anything that isn't explicitly stated. In the case of *Sample-Size Insensitivity*, it's our tendency to ignore logically relevant factors about sample that aren't stated.
Hindsight Bias	The tendency to overestimate the likelihood of an event occurring – even unlikely ones – in retrospect. Also known as the “knew-it-all-along” effect.
Inattentional Blindness	A failure to cognitively process what is in plain sight due to a conscious focus on other stimuli.
Peak-End Rule	Our tendency to judge experiences based on their peak moments and their endings, instead of an average of the entire experience.
Recency Bias	The tendency to remember what is most recent in a set of events. For instance, in a basketball game, we're more likely to remember the last few minutes that events from the middle part of the game.

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About the Author

Ben Taylor is the founder of backpicks.com, which focuses on the "cognition of sports," primarily through the lens of basketball. His work in sports analytics has been used on basketball-reference.com and on websites like *ESPN*, *Sports Illustrated* and the *Wall Street Journal*. He holds a B.S. in Cognitive Science from UCLA and an M.S. in Human Factors from Bentley University. At UCLA, he covered basketball and football for the *Daily Bruin* and hosted a sports show on *UCLA Radio.* In 2009, he covered the Los Angeles Lakers for the *Los Angeles Times* blog.

He can be found on twitter @ElGee35.

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