U.S. GOLFTV *presents*

SCIENCE OF THE SLICE

TOUR DRAW

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Learn how to hit the draw!

The Slice is Hated

The slice is among the most frustrating shots in golf.

Sure, the slice has friends. The unfriendly shank, the woeful top, the cowardly missed three-footer, the embarrassing whiff, the unappealing hosel blast, and the snarf hook are all horrible to experience on the golf course. They are completely unwelcome!

But the slice firmly holds its place.

And unlike all of those shots, the slice is perhaps the most widespread in terms of epidemics.

Estimates within the industry vary, but some experts report that up to 80% of all golfers struggle with anything from a mild-fade, to a dreaded banana slice.

Now a mild-fade is quite desirable for many. It's controllable and consistent. The great Lee Trevino is famous for saying, "you can talk to a fade..."

But that slice, oh... that slice. Very rarely is there ANYONE who wants him around.

But how does the slice happen?

In this e-book, we're going to dive into the slice itself. We're going to explore what causes it and how we can diagnose it. It's simple to see, visually. It's ugly. Even the beginners and non-golfers know it when they see it. The average golfer knows it all too well.

But though you may know it by sight, do you know what is happening when the ball is slicing?

Do you know 'The Science of the Slice'?

Let's learn it together.

Spin: Spinning You Out of Control

The origin of a slice starts exactly where you'd think it would—with the spin.

> Have you ever seen the slow motion cameras while watching golf on TV? Notice how the ball spins after impact is made.

The spin of a slice has often been referred to by golfers as 'sidespin.' We've heard it before. Thousands of times. You need to "reduce the sidespin," they say. Or "look at that sidespin," at a shot gone wrong.

But the truth of the matter is that **there is no such thing as 'sidespin.'** *It's true.*

All golf shots have, indeed, some form of spin. But no golf shot has sidespin. The spin imparted on a golf ball comes from the combination of two things: the angle at which the club face strikes the ball at impact (1) and the dynamic loft of the golf club at impact (2).

Spin loft is approximately the angle between the dynamic loft and attack angle.

If we want to get really technical (strap on your helmet here...), we could define it as the following:

> *Spin loft is the three-dimensional angle between the direction the club head is moving (both club path and angle attack) and the direction the club face is pointing (both face angle and dynamic loft).*

In simple terms, subtracting the angle of attack from the dynamic loft of the club will give an approximation of spin loft. But this is only true if the path value is equal to zero. Otherwise, numbers will vary. That's why we like to use technology to do this tough math for us.

Before we get too far, here are a few qualifiers and definitions:

Angle of Attack: The vertical angle the center of the club head (the sweet spot) has at the moment of impact with the golf ball.

Dynamic Loft: The amount of loft on the club face at the moment of impact, measured relative to the horizon line.

(More on those below...)

But with this, all shots actually have backspin.

Have you ever seen the slow motion cameras while watching golf on TV? Notice how the ball spins after impact is made. It's backspin every time.

Spin is measured in a term called RPMs. RPM stands for revolutions per minute, essentially measuring the number of times an object will make a full revolution (or rotation) over the course of a minute. In golf, the higher the number of RPMs, obviously, the more spin a golf ball possesses.

In today's game, technology has gone to such extreme lengths that we have equipment that can read a golf shots RPMs down to the single revolution. The average full wedge shot by a PGA Tour professional will hold roughly 10,000 RPMs. Technology in the form of launch monitors can read that number down to identify whether a shot had 10,810 or 10,811 RPMs.

It's incredible!

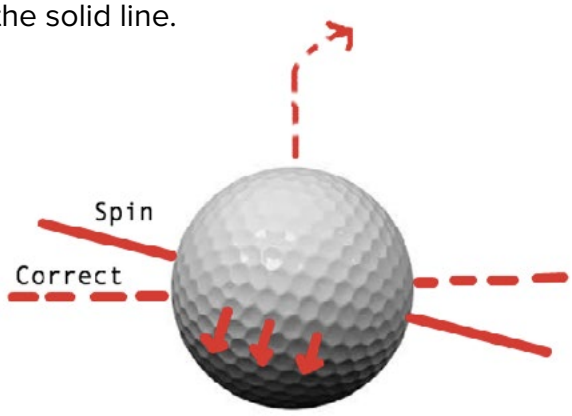
CLUB SPEED (MPH)	BALL SPEED (MPH)	SMASH FACTOR	LAUNCH ANGLE (DEG)	HEIGHT (FEET)	SPIN (RPM)	CARRY (YARDS)	TOTAL (YARDS)
74.1	81.6	1.10	29.9	70.3	10811	98.5	98.5

We can now read the spin of a golf ball so accurately. We know the ball spins backwards during every shot. And we know spin is measured in RPMs.

So then, what causes the slice?

The slice is caused by the angle of the object's axis. This is also called by some in the industry as "spin axis."

This simple illustration below is an attempt to show you what is happening when a golf ball is slicing. A perfectly straight shot will be spinning along the dotted line. A slice will be spinning with its axis tilted, along the solid line.



This causes crooked golf shots.

Here's an analogy to help. Think about the way an airplane takes off when you're flying to a vacation. When the plane is about to leave the ground, the wings are set flat and parallel to the ground. However, as the plane climbs in altitude, the plane needs to turn. They do this by tilting their axis to either the right, or the left. The same things happen to the spin of a golf ball.

The slice then comes from the combination of two things:

1. The angle of the spin axis.
2. The amount of spin the ball holds.

The more severely tilted this axis, the more the ball will slice. A severely tilted spin axis and high spin is the worst of combinations. This leads to a big old slice.

> Professionals are doing all they can with their equipment and their swing, to optimize their spin rates.

Now let's look at the radar numbers of a professional.

On the PGA Tour, the average player spins his driver at 2600 RPMs.

	Club Speed (mph)	Attack Angle (deg)	Ball Speed (mph)	Smash Factor	Launch Ang. (deg)	Spin Rate (rpm)	Max Height (yds)	Land Angle (deg)	Carry (yds)
Driver	113	-1.3°	167	1.48	10.9°	2686	32	38°	275
3-wood	107	-2.9°	158	1.48	9.2°	3655	30	43°	243
5-wood	103	-3.3°	152	1.47	9.4°	4350	31	47°	230

*numbers pulled from Trackman data covering the PGA Tour

Jason Day, the 2015 PGA Champion and world #1, is one of the longest players on the Tour. He also manages to spin his driver at one of the lowest rates on the PGA Tour.

In 2016, Day averaged less than 2200 RPMs per drive over 76 rounds. Dustin Johnson, another one of the longest on Tour, averaged 2600 RPMs. Rory McIlroy averaged a shade under 2500 RPMs. All of the top players keep a keen eye on their spin rates during practice sessions.

So let's compare that to the average golfer.

The average golfer, one who maintains a 14.5 handicap, will spin the ball at 3200 RPMs.

Professionals are doing all they can with their equipment and their swing, to optimize their spin rates. They know that high spin—given their club head speeds—will cause errant shots and a loss of distance, all because of their swing speeds. High spin shots are ineffective in the wind.

They are looking to bring spin down well-under 3000 RPMs with their driver. However, optimum spin varies based on the golfer's swing speed.

A touring professional playing on our televisions would benefit greatly from a spin rate around 2500 RPMs with their driver. But an average weekend golfer swinging the club with 95 MPH swing speeds will need more spin to optimize their carry and distance.

The average golfer isn't doing this. They are not optimizing their spin to help themselves. They're spinning it at a much higher rate with the driver.

Now before we get too far ahead of ourselves, we need to appreciate spin, too. It's spin that causes the golf ball to fly. A golf ball needs spin to move through the air.

The key is ***not*** the elimination of spin. For golfers of all skill levels, ***it's the optimization of spin***.

When looking at the spin of the average golfer, the key exists in pairing an optimum launch angle and spin rate with the golfer. This can best be done with a PGA teaching professional who uses a launch monitor during lessons.

But for the sake of conversation regarding the slice, optimizing spin plays a huge role.

A few keys for taking note of our spin without technology...

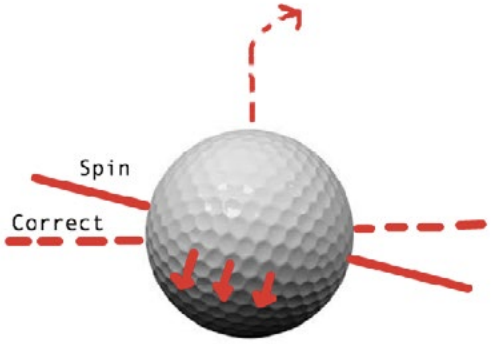
If you notice your golf ball is in the air for a long time with your slice, there's a good chance your spin is high. If you're golf ball lacks roll out and seems to stop immediately when it lands, you're probably playing with high spin. If it seems like the ball lands soft and reacts immediately when it hits, there's a strong indication you have high spin.

And understanding how spin works and where your spin needs to be is the first step in fixing that slice.

The Clubface Angle: Where You Pointed?

We've just spent so much time talking about ball spin, our own heads are spinning... we understand.

But where the spin of the golf ball is what causes the slice to occur mid-flight, another question remains. *What causes that axis to be tilted?*



The golf industry has continued to push forward and better understand the ball's flight. Golf instruction has developed, and new, industry-changing information has been learned. And as this information has been discovered, the knowledge we had before has been completely disproven!

There are new rules—*new laws*—that golf instructors are trusting.

With this, golf instructors know two things reign supreme in grasping the science behind the slice.

Golf instructors now know the ever-important relationship between two critical things—**the club's face angle and the club's swing path.** They know this is the key to understanding a slice.

The direction the clubface is pointed relative to the target line can also be referred to as the 'face angle.' It is a measurement golf instructors measure in degrees.

The face angle is a piece of the swing that is present from address, through impact.

In **a video posted to USGolfTV**, teaching professional Grant Waite offered some insights into the direction of the clubface at impact. He says this about it:

> "Basically we know that where the clubface is pointed is the initial start line of any ball you hit."

Well that's somewhat relieving...

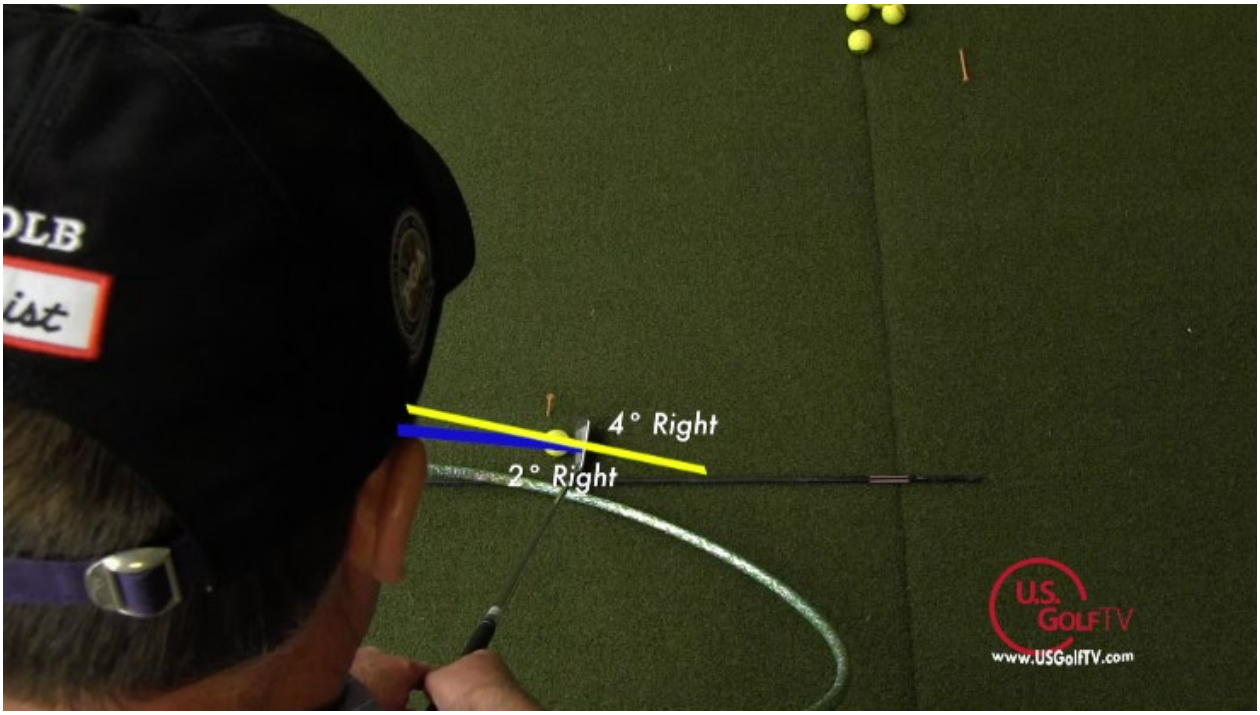
You can learn this just by watching your own shots. You don't even need any technology.

For example, we know if the clubface is pointed a few degrees to the left at impact, this is going to start the ball a few yards to the left of our initial target line. This is big!

We know this is true—it's a fact.

The clubface is primarily responsible for the direction the ball starts.

Here's an image to help:



*in this image, the ball will start on the blue line, 2 degrees right of the target

The technical definition of face angle is as follows:

The horizontal clubface orientation at the center-point of contact between club face and golf ball at the maximum compression of the golf ball.

See the image above? For the sake of conversation, that golf ball is being compressed. The degree of which the face was pointed at this exact moment would be the face angle recorded. (P.S. In the image above, the face angle looks pretty darn good!)

In simple terms, we like knowing whether the clubface is generally open, square (neutral), or closed.

And this discovery debunks one of the most widespread “cures” to the slice.

Have you ever heard this quote when trying to cure your slice?

“Oh, just close the clubface and strengthen the grip!”

If you’re a serious golfer who struggles with the slice, you’ve undoubtedly heard the advice about a strong grip before. You can admit it, you’ve probably even tried it before...

And the results were underwhelming, weren’t they? They didn’t help. They probably made things worse!

Every golf instructor we work with at USGolfTV can attest to that fact. Closing the clubface will not in itself cure the slice over the long-term.

Closing the clubface will not in itself cure the slice over the long-term.

Sure, you may see the occasional “fixed slice,” but these corrections are not permanent.

Knowing what we know about the clubface at impact, the laws tell us closing the clubface will start the ball even further left and away from the slice’s flight. If the axis is tilted, the ball may even slice more than before.

Also, if the clubface is closed, the ball may do the opposite of a slice. It may be a pull far off line, or a nasty hook. If you’re aiming for your common slice, this will be very, VERY problematic.

Once you start doing that, you might want to bring back the slice.

When golf instructors look to measure the face angle, they do so using some of the industry changing technology. Using doppler radar technology, instructors know within 1/100th of a degree which direction the face was pointed relative to the target line.

The difference between slicing the ball with a face pointed to the right (a positive degree) and a face pointed to the left (a negative degree) means that you could have a different solution for fixing your slice.

Commonly, only a few degrees will make a MASSIVE difference. Even a fraction of a degree will have an implication on ball flight.
Some of the best players in the world will average 0.1 to 0.9 degrees of face angle variance—positive or negative.

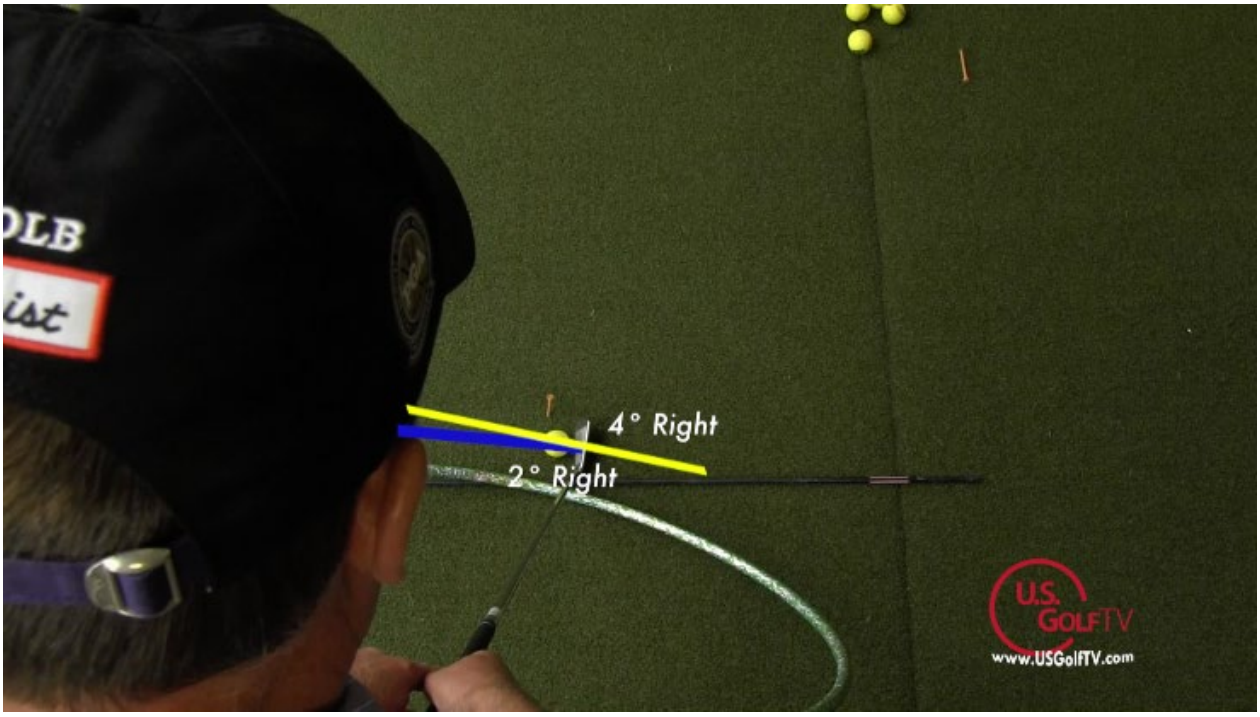
A club face angle of 0 will start the ball directly on the target line, but it is hard to achieve this. And even if you are able to achieve this, it's nearly impossible to repeat.

Our resident teaching professional Todd Kolb likes to see the following formula:

Club Path: 2-4 degrees out (right for a right-handed golfer)
Face Angle: 1-3 degrees open (pointed right of the target line, left of the path)

This combination seems to produce a repeatable and desired shot pattern. Not to mention, it will surely fix that slice.

Again, this image from above:



The Direction of the Path: It Decides the Destination

We all know how important path is in life.

Quotes about path are common in our current world.

“Which path will you take in life?”
“The path you take will decide your fate…”

There are hundreds.

We’ve probably all seen one of these quotes on a plaque in someone’s living room, or just outside their house engraved on a rock. The path we take plays a huge factor in where our lives meander and the success we have.

In fact, the path we take dicates our destination.

It’s funny—the same is true for the path of our club face through the golf swing.

The path of the club dictates the destination of the golf ball.

Every golf shot we hit has an optimal path. That gorgeous escape slice from the trees…it has an optimum path. How about that chasing draw down the hill that scurries onto the green? Yep, that shot has an optimum path, too.

Every single shot we want to hit on the golf course has an optimum path.

This is also true for every shot we don’t want to hit. There are certain club paths that are ideal breeding grounds for a horrible slice. With the use of technology, we know how to identify them.

The path of the club through impact has more influence on the ball flight than probably any other aspect of the swing. Without a path moving to the left or to the right at a reasonable and consistent pattern, a golfer will have no control over the direction the ball flies.

To understand path, here's a simple graphic to illustrate:

The *path* is defined as the direction the sweet spot of the clubhead is moving *through the golf ball at the moment of impact*.

In golf terminology, path is typically described as "in-to-out" or "out-to-in." We've heard that before. "I swing it out-to-in," or "I need to swing it in-to-out."

With the technology available to us, we can measure the path in degrees, the same way we measure face angle. It's invisible to the naked eye.

Similar to the face, a path measured positively means that it is moving to the right, and a path measured negatively means it is moving to the left. A straight ball flight would have a path and a face that are in perfect harmony, assuming a center strike.

Now keep in mind, trying to repeat your golf swing with a 0 degree Face Angle and a 0 degree club path is nearly impossible to achieve.

If you're a right-handed golfer struggling with a slice, odds are you have a negative swing path, and you're combining it with a square club face. This means the path is moving to the left (the inside) through impact. By having a path that moves left, with the square club face, the ball will move away from the target line and fall off to the right. We all know what that's called—a slice!

With that, it helps us understand one of the core rules in the ball flight laws.

The curve of the golf ball is based on the relationship between the club's face angle and the club's path.

After what we learned about the club face angle, we know the ball starts where the face is pointed. From there, the ball curves *away* from the path in relation to the target line.

So quiz time.

If the **path** is moving *4 degrees to the left* (picture it in your mind), but the **clubface** is pointed *2 degrees to the right of the path*, guess what the ball will do...

Go on... guess.

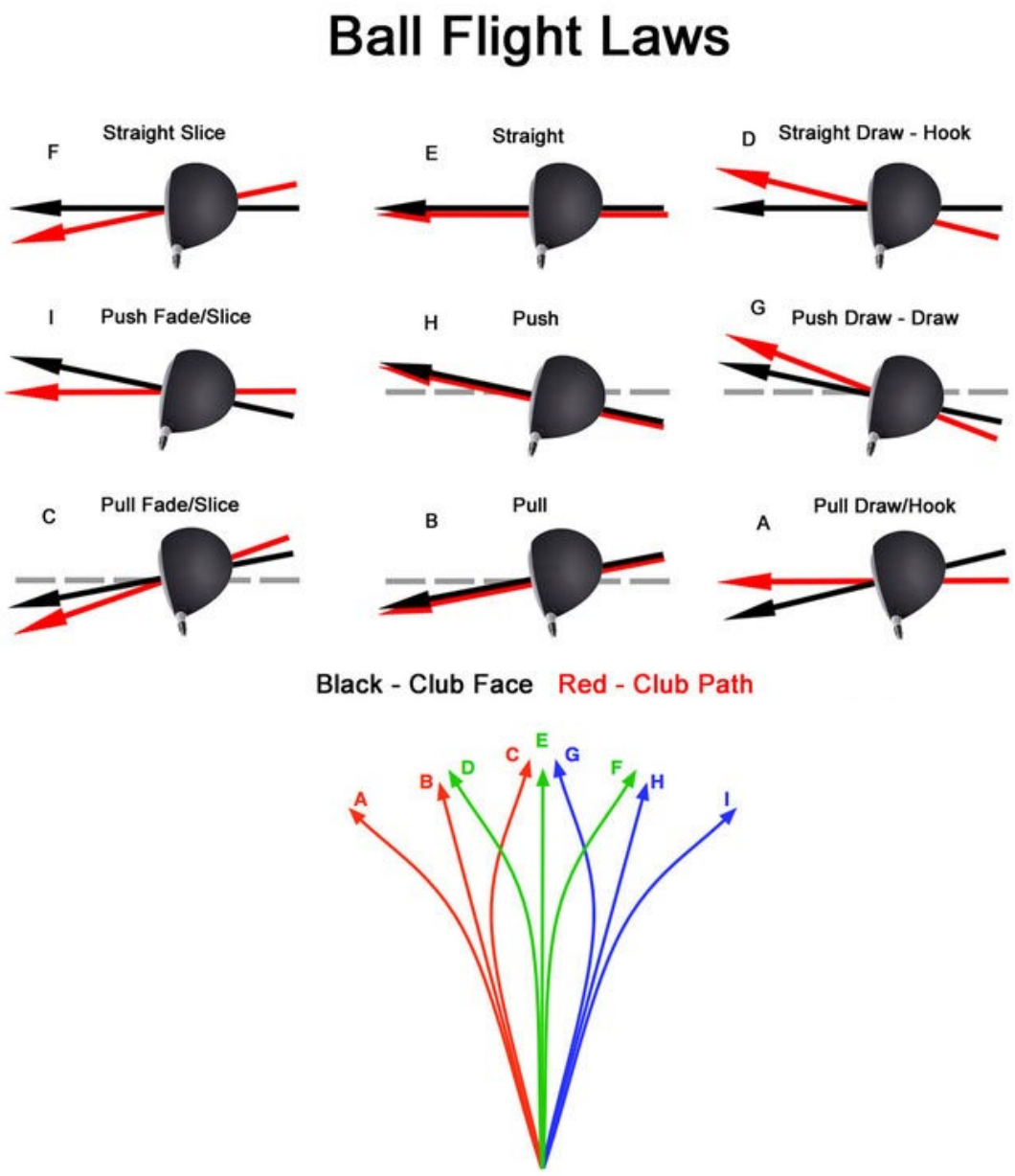
You're right, it will start just to the left of the target, and slice across the target.

Those are the conditions we were talking about before. Ideal breeding grounds for a slice.

If the club is moving to the left through impact, but the club's face angle is pointed to the right, the axis will be tilted in a way that will cause the ball to move to the right. It is more common to find high handicap golfers with a path moving left, than right.

This is why slices are such a common sight.

Here's a chart to help you understand the combinations between face-and-path:



If you want to work the golf ball with a beautiful draw, you need to understand your path. There is a **video on the USGolfTV YouTube page** that explains this relationship very simply to understand a draw.

The right-handed golfer who hits a beautiful draw will typically have a path that is moving anywhere from 2-to-5 degrees to the right of the target line. But in order to get that draw, they will need to combine that with a face that is perhaps 1-to-3 degrees right of the target line at impact.

This combination starts the ball to the right, and moves the ball back toward the desired target line.

It's a beautiful draw!

Let's go back to the image above:

This image showed a face angle that is fairly neutral (roughly 0 degrees), with a path that is moving significantly to the right. This illustration is the picture of a draw. Or maybe if one wants to be picky, a little bit of a hook. But we know this; the ball is moving to the left.

So when you're wanting to move the golf ball one way or the other, understanding the path that your club is traveling is key. It plays such a critical role in the "Science of the Slice."

Angle of Attack: Things Are Looking Up

Now the elements mentioned thus far in this e-book are at the core in understanding the slice.

The path's relationship to the face and understanding spin are key. Many of these have been generally understood over the years. Even without visual proof. And with the help of technology, we now know their effect on a golf ball's flight.

But here's a concept that is virtually impossible to distinguish without the help of technology.

This concept of angle of attack.

Do you know what the angle of attack is in reference to hitting a golf ball?

While there are many golf terms out there that seem designed to confuse (e.g. dynamic loft, smash factor, swing plane, spin axis), angle of attack is a fairly simple one by nature.

Angle of attack can be defined as we defined it above. It's the vertical angle the center of the club head (the sweet spot) has at the moment of impact (maximum compression) with the golf ball.

This is measured in either a positive number (hitting up on the ball) or a negative number (hitting down on the ball). It is also measured in relation to the horizon. One can even hit a great golf shot with a neutral number (0) AOA.

To make things simple, it's hitting up or hitting down on the golf ball.

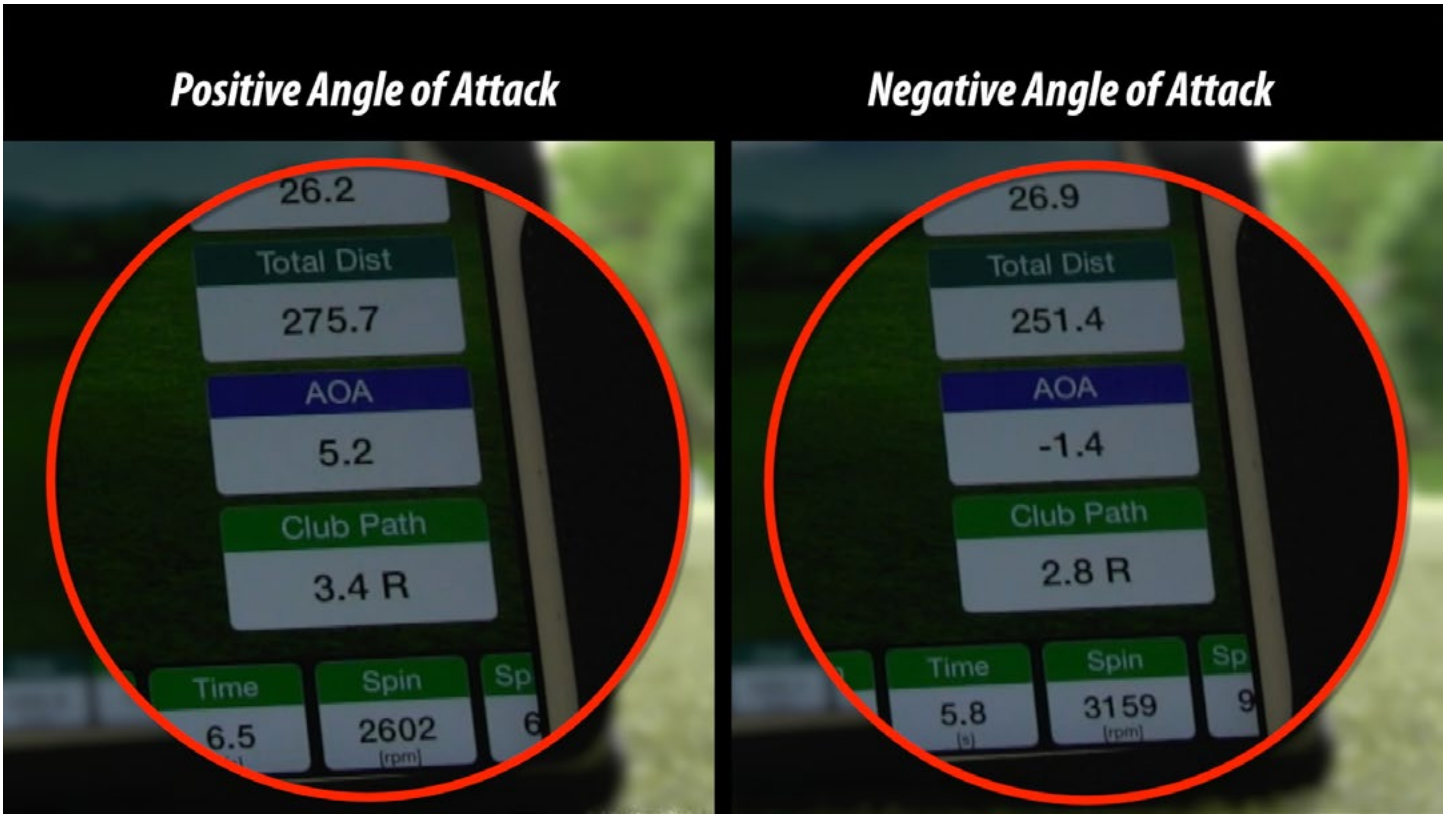
And with the naked eye, seeing a golfer's angle of attack is impossible.

Sure, with presence of a flying divot, we can identify a golfer was clearly "hitting down" with his 7-iron (assuming the bottom of the arc doesn't come way behind the golf ball, resulting in a chunk). But if he hit the ball solidly, he very clearly had a negative angle of attack. But without the ground's explosive reaction, we wouldn't be able to identify this with our naked eye.

So when the ball is teed up in the air when hitting a driver, we must understand the angle of attack and how these numbers affect the flight of the golf ball. This is where technology comes in awful handy.

After all, the driver is the ONLY club in the bag where one can hit solid shots with either positive, negative, or neutral angle of attacks (AOA).

For many years, some of the great instructors of the game taught that every golf ball be struck with a golf club that travels down—with all clubs. This would be called hitting down with a negative angle of attack on the golf ball.



The thought was that a negative angle of attack would increase the golf ball's compression at impact, helping golfers to hit it further than ever before. A compressed golf ball would travel further, as it typically meant it was hit harder.

This was taught for decades.

In fact, the debate continues on to this day. Many people within the industry still claim the optimal attack angle is a negative one. The claim is for more accuracy and an increased ability to control impact.

After all, the PGA Tour's average for angle of attack is -1 degree.

This negative attack angle on the PGA Tour is attributed to a few factors.

First, PGA Tour players possess the clubhead speed necessary to support a negative angle of attack. They swing the club faster and with more stability.

Secondarily, many PGA Tour players are seeking accuracy. To win tournaments on the PGA Tour, players need to find the fairway. According to some in the industry, this leads to professionals hitting down on their drivers.

Lastly, there are many skeptics as to how this data is recorded on the PGA Tour. There is a theory, that as the club primarily is moving up, the data is reading the back of the clubhead, which is traveling down. Now, this isn't verifiable, but it's another theory to explain the numbers on the PGA Tour.

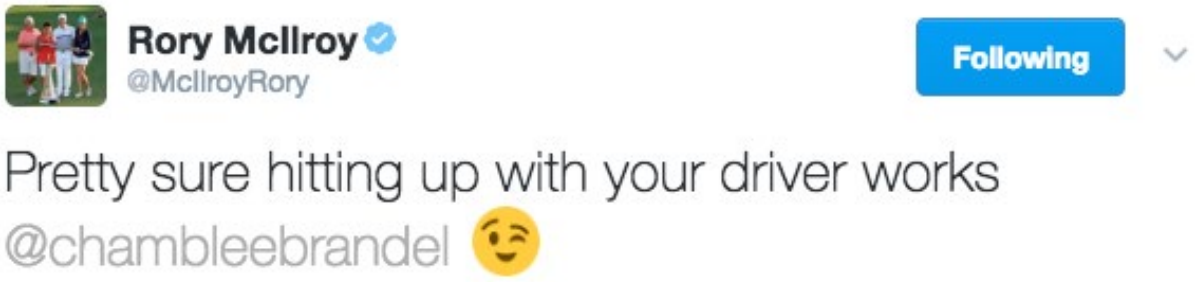
> "To get the most out of modern equipment you need to hit up on the driver."

Despite the statistics on average though, let's look at the numbers among the best drivers in the world. Their statistics tell the story. Hitting up on the driver will help golfers to start hitting a beautiful draw—and add yardage to our drives.

Top-ranked golfer and major champion Rory McIlroy took this information to Twitter in January of 2016, tweeting the following set of tweets:

"To get the most out of modern equipment you need to hit up on the driver."

“Pretty sure hitting up with your driver works” [to Brandel Chamblee with a photo of his PGA Tour leading driving statistics.}



McIlroy is among the greatest drivers in the history of the game. He remains adamant that hitting up on the ball is best for all golfers.

We received the Trackman data from a top-tier Division I golf tournament from the fall of 2016. A total of 63 Division I golfers were measured. Among them, 2 of the 3 longest golfers in the field in terms of total driving distance maintained positive angles of attack.

In looking at the female professionals on the LPGA Tour, their averages on angle of attack tell a different story. **The average LPGA Tour golfer hits up on her driver 3 degrees**.

For the average golfer, this is much more helpful, as their clubhead speed is more likely to match a golfer on the LPGA Tour.

But as technology changed golf equipment, we learned that a negative angle of attack for the average golfer with the driver wasn’t the optimum solution for great driving, especially for the average golfer.

As technology has developed though, we understand the science affecting the golf ball at impact.

Many of the best instructors in the industry would claim that *“far too many of their students hit down too much on the ball, as opposed to hitting up.”*

Hitting up on the golf ball plays a key role in maximizing distance.

As it relates to the path, many great instructors won’t even look at the path without also looking at the angle of attack. They want to make sure both of those numbers are working together in a suitable way. With the driver, this means there needs to be a positive angle of attack.

But what's the science here?

Look at the "AOA" (Angle of Attack) and the height of the shot

The angle of attack plays the major role in deciding two key elements in a ball flight: the launch angle and the spin rate. We already know, from discussing above, how the spin can affect a slice. Angle of attack (AOA) plays a role here.

Hitting down on the golf ball generally increases the spin. Spin, as increases beyond the average, only hurts distance.

AOA also plays a role in the launch angle of the ball. An optimum launch angle is going to lead to an optimum golf shot.

Now let's discuss how the Angle of Attack will dictate the path of the club.

Here's a great rule of thumb regarding Angle of Attack that will help many of you.

For every degree down you hit on the ball (negative AOA), you will gain roughly one (1) degree of "out" on the path.

Therefore, if a right-handed golfer has an AOA of -5 with the 7-iron, if all things are equal, this will produce a rightward path of 5 degrees.

The reverse is also true. For every one (1) degree you hit up on the ball (positive AOA), you will get one (1) degree of "in" on the path.

The best example of this is with the driver. A player with an AOA of 3 degrees up (+3), all things being equal again, will have a path that is 3 degrees left at impact. Now this golfer wants to hit a draw. In order to achieve this, we need to make a compensation to have a rightward path with the club.

A great suggestion for this right-handed golfer achieving this is with the aim. Aiming to the right, will promote a rightward ("out") club path. That, coupled with hitting up on the ball with the proper face angle, will yield that wonderful high draw.

Aiming straight

Aiming to the right

When the ball launches high (at 10 to 16 degrees) with low to moderate spin (2500-3500 RPMs) with a positive angle of attack (perhaps 2 to 3 degrees), a golfer will generally be very pleased with the shot as a result.

If you can learn to manage your angle of attack, you can learn to manage your ball flight.

See what an increased launch angle can do? (in green)

Center of Contact: Smash That Thing!

One of the final key aspects in understanding the “Science of the Slice” is understanding the moment of truth. The point of no return. Impact.

> “Therefore, we needed to fix his contact before anything else mattered.”

Have you ever hit that shot that you barely felt? That one with the sharp, piercing sound and the soaring ball flight. The one that when you look at the club face, you see a few faint marks of a dimple right on the center of the clubface. The one that made the fellas in your group pause and stare, keeping them away from their typical ridicule.

Sure, the spin, the face, the path, and the angle of attack all played a role in that strike, but without the ball being hit square in the center of the club face, the result would be somewhat, a moot point.

Hitting the ball in the center of the face is the key to any great golf shot.

Modern day radar machines tell us that the ball is connected with the face for roughly 1/2000 of a second during impact with the driver. This means, during an entire round of golf, we don’t even hit the ball for 1 second.

Impact happens *that fast.*

But the effect impact has on the ball’s flight is insurmountable.

After learning every element of this E-book in-depth, here’s a story from a PGA teaching professional to show how important hitting the center of the face is.

> *“Last summer, one of our students was working with us on our practice range. We were using our launch monitor and taking tabs of the numbers he was producing after each shot.*
>
> *The numbers showed that his face was a bit open, only a few degrees. At the same time, his path was coming back across the golf ball, a few degrees back to the left. He was a right-handed golfer, so do you think he was hitting big slices with his driver?*

If you thought that, you'd actually be wrong. He was hitting duck hooks!

After further examination, we learned a fatal fault to his striking of the golf ball. He was hitting his driver consistently off the toe. Therefore, we needed to fix his contact before anything else mattered. We started working drills to hit the center of the club face more often."

It's amazing how impact influences the ball so much.

If this student were to take lessons from someone who only saw the launch monitor numbers, they would suggest he starts moving the path more to the right of his target line.

But this would only make matters worse!

He needed to get impact with the ball figured out before any of that played a factor at all.

All of the laws we're talking about where the path and the face all work together to create ball flight, are all only true if the student is hitting the ball on the center of the club face.

Impact represents the moment of truth.

Now you might be asking yourself—how is this true? How does hitting the ball off the toe matter at all?

Well, the answer lies in a term called **"gear effect."**

Gear effect is the term used to describe the behavior of the club through impact. It's not a simple concept to explain without a Phd in physics, but we'll explain our understandings as it relates to the golf club.

Let's go back to the student in the above example.

Since he was hitting the ball severely off the toe, the impact was causing the face to shift during impact. As it shifted, imagine the heel of the club opening more, as the weight of the golf ball impacted the toe of the driver.

This behavior caused the ball's axis to tilt in toward the face, causing the axis to change. This produced that ball's hook spin, as opposed to a fade. This is gear effect in action.

Gear effect doesn't only play a role during toe strikes though. **Gear effect plays a role in all shots that miss the center of the club face.**

Let's go through a few more examples.

Hitting the ball high on the face (toward the crown of the driver), will change both the launch angle and the spin rates. The launch angle will be high, and the spin will be low. We know this through understanding the physics, while also testing it out on launch monitors.

As far as launch conditions go for a mishit, hitting the ball high on the face may be the healthiest of the mishits, assuming you don't leave the top of your driver with a dreaded scuff mark!

Hitting the ball on the heel will cause the ball to launch as though it was pulled, but the ball will move back toward the target line in the form of a slice.

Hitting the ball low on the face brings the spin up and the launch down, not optimal for driving the golf ball. This will greatly reduce distance. And added spin will accentuate any slice a golfer may already have on his golf ball.

All of these numbers are impacted by gear effect.

Gear effect is also at its greatest effect on larger headed clubs (i.e. your driver). In testing, PGA professionals including our own at USGolfTV, have found that clubs with a bigger head are more affected by gear effect. This is caused by their center of gravity in relation to other clubs.

So know this: **gear effect will have the greatest impact on your ball flight with your largest club head in the bag.**

So to make sure you're hitting the center of the face. There are a number of ways you can do this, including impact tape, or a can of Dr. Scholls foot spray sprayed on the clubface. Send **that smash factor** through the roof with perfect center strikes!

Conclusion

In conclusion, the science behind the slice is both difficult and comprehensive, while also being simple and easy to understand. It's all about taking the information and finding an easy way to digest it.

We know so much more with modern technology than we did even 30 years ago.

With this information, we're now applying some of the best minds in the game to studying it and breaking it down. It's leading to a revolution of learning.

In that though, the information is only as useful as it can be taught. If an average golfer can't learn from the data being studied, then it has no use to us. We need to see golfers improve.

A great way to improve the game of golf, or anything for that matter, is to learn about it.

Pat yourself on the back for taking the time to learn the Science of the Slice.

Your golf game is thanking you already.