

Top Spin On-The-Court Session

By

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Good afternoon and welcome to this month's on-the-court session. Today we'll focus on Top Spin but we'll also touch upon under spin (slice) and side spin.

Hopefully when this session is over you have learned:

- How and why the ball behaves with top spin or any spin for that matter.
- How we impart top spin
- What are the advantages of top spin
- When top spin should be used

Okay since I'm kind of a science nerd I'd like to talk a little elementary physics.

Gravity near the surface of the earth will cause a ball to drop four feet in a half a second. If I hit the ball with no spin from a height of four feet parallel to the ground it will also hit the ground in a half a second regardless if the ball started out at 40 miles an hour or 60 miles an hour. And as you would expect, the harder I hit the ball the farther it will go before it hits the ground. At 40 mph the ball will travel about 30 feet before gravity wins and the ball hits the ground. At 60 mph it will go about 44 feet which is the length of the pickleball court. Those numbers are little off because they don't into account air resistance. What we want is to hit the ball hard but make it hit the ground sooner than if we just relied on gravity.

People had known the equations for a falling body since the late 14th century from Galileo's work. But the problem was reality didn't behave according to the equations especially when it came to flying cannon balls and musket shot. The British military noticed that often the cannon balls would deviate from their theoretical course and hit the ground too early or fly too far or curve left and right. Finally in 1742 a British mathematician by the name of Benjamin Robins figured out the cause. 100 years later a German physicist by the name of Heinrich Magnus officially described the effect that now bears his name. The 'Magnus Effect' is used to describe how spin causes deviations in the flight of a sphere. So even though Robins had already described it 100 years earlier and 100 years before that, even Newton had correctly described it after observing tennis games at his college in Cambridge. But good ol' Heinrich Magnus just waltzed right in, wrote stuff down, and now he gets all the glory when I rip a top spin backhand down the line that drops in and I yell 'Thank you Magnus for your effect.'

Essentially the Magnus effect says that a spinning sphere in flight will deviate from its path in the direction of the spin. So, if it's spinning forward, it will drop faster than gravity dictates. If it's spinning backward it will tend to fight gravity and stay in the air longer. If it's spinning to the right, it will curve right, a left spin will curve the ball to the left.

Without going into depth on Bernoulli's principle I'll try to give you an intuitive feeling of how that works. Imagine I'm playing pickleball with no wind and you're Antman in his little form and you're standing on the edge of my paddle. Then just as I hit the ball, you jump on top of the ball. If the ball has no spin and going 40 miles an hour then you feel a 40-mph relative wind in your face. And even if you were clinging to the bottom of the ball, you would feel the same wind as you ride the ball for a half of a second. Now imagine you do the same thing when I hit a ball with forward spin. Now when you're standing on top of the ball and rotating forward you're moving even faster in the wind, but once you're past the axis, and standing on the bottom you feel less wind because you're moving in the opposite direction. It's like sticking your hand out the window of a moving car. You move your hand forward and there's more pressure and as you move your hand backward you feel less pressure.

So, a ball spinning forward has more pressure on the top, front of the ball than on the bottom of the ball. More force on the top than the bottom and voila, the ball dips down. And the thing is, the faster the ball rotates, the greater the pressure difference between bottom and top and hence the more dramatically it will drop.

So now that we know how a ball flight is affected by spin. What does that do for our pickleball game? Let's first talk about top spin. Top spin makes the ball drop faster than no spin and even faster than underspin. So, with top spin I can hit the ball harder than I could without top spin and still have the ball land in. I can hit the ball at 60 mph and it won't fly the entire length of the court. But this applies whether I'm driving the ball, trying a drop shot from the baseline, a volley at the net, or even a lob.

You're all probably familiar with the red-yellow-green light concept. **(Briefly describe)** We're all looking for the green light so we can bang the ball. And we all want to only give our opponents balls in their red-light district. (Maybe I should rephrase that). This is where top spin really comes into play. Any ball that your opponent must hit that is below the net is in their red-light zone – meaning he or she cannot attack the ball and must either dink it, lob it, or hit you with it. Any hard shot is going long

When I'm at the base line my top spin will help my drop shots land in the kitchen so I don't have to hit the ball as high to make that happen which gives me a better chance to get my shot in their red-light zone. **(Demonstrate)**

If I drive the ball from the baseline, which a lot of you would rather do than hit a soft shot, then with a lot of top spin, the ball dips down after it crosses the net resulting in shot at their feet and hence unattackable. **(Demonstrate)**

If I'm in a dink battle at the net I can impart a little top spin in a shot that's called the push dink. Even a little top spin helps you keep your shot in the kitchen and in their red-light zone. **(Demonstrate)** And even when I'm at the net and get the green light to attack, I still like to hit top spin rather than a hard flat shot. For one thing if I hit where I'm aiming, at their feet, it will often throw them off when it bounces sooner than they're used to. And if I happen to hit it higher than I intended the dropping action will give me a better margin of error. **(Demonstrate)**

Another advantage to hitting a top spin is that you can lower your green-light zone. You've all probably heard of the term 'roll shot'. It is really just a top spin shot from at or below the level of the net. Using top spin I can still hit an aggressive shot into their red-light zones when the ball is in what players normally consider their yellow-light zone. **(Demonstrate)**

And lastly, you can even hit top spin on a lob so you can hit your shot high enough over their heads and have it drop dramatically in the back court. **(Demonstrate)**

Something, most instructors never mention about spin is how it affects the bounce of the ball. Though not as impactful as the movement in the air, the bounce can be a factor in the ability of your opponent to attack the ball. A top spin will bounce forward faster than a slice, but a slice tends to check up and not bounce as high. And of course, side spin will kick the ball to one side or the other and sometimes catch a player off guard.

So how do you impart spin? Most of you have heard hit from low to high, but what does that really mean? If I hit from low to high like this (**(Demonstrate)** a flat high shot) there is no top spin. And yet when I hit low to high like this (**(Demonstrate)** top spin drive) there is lots of top spin. What's the difference? The difference is something called the 'Gear Effect'. Don't worry I'm not going into the history of this effect.

To give you an intuitive feeling, picture two meshing gears such as in a clock or watch. If the driving gear turns in one direction, the driven gear moves in the opposite direction. When your paddle hits the ball the two surfaces act like gears. The paddle acts like the driving gear and as its surface grips the ball briefly it will turn the ball in the opposite direction of the paddle. The longer the two surfaces are in contact, the stronger is the gear effect and hence more spin. **(Demonstrate)** So, if I hit downward, the ball spins up. If I hit the ball with my paddle going up, the ball will spin downward.

So let's get back to the low to high shot. In my first example there was no spin even though I swung from low to high. Why? Because there was no gear effect. My driving gear, the surface of the paddle, wasn't rotating relative to the surface of the ball.

Some people will tell you that you have to close your paddle face in order to hit top spin and open it to hit a slice. Well, that's not really correct. I can hit top spin with an open face like this **(Demonstrate)**, and in fact that's one way to hit a top spin lob. The reason you're taught to hit a top spin drive with a closed face is because to hit a lot of top spin, you have to hit upward and if you hit the ball hard on the lower part of the ball it'll either fly out or you'll put it up into your opponent's wheel house for a put away because there won't be enough top spin to bring it down quickly enough. So, you've got to hit the ball just above the equator to create a lower trajectory. **(Demonstrate)** The more upward your swing is the higher up on the ball you must hit to compensate. This is why we teach that a top spin drive should be hit with a closed face because you cannot hit below the equator with a closed face. Likewise, it's impossible to hit above the equator with an open face and that is why we slice with an open face.

The trick to top spin is to hit the ball with a balance of forward velocity, rotational velocity, and angle of attack to achieve the desired results. Everybody has to experiment at one time or another what the right combination is for them. And this takes practice. As we've seen, top spin is used differently and thus hit differently depending on what shot you're hitting. The top spin lob is hit much differently than a top spin drive or a roll shot or a dink or an attack at the net. Some players will incorporate the top spin in one or two of their shots and others will use it all over the court. Some players hit a lot of spin with very shallow attack angle while others are content to play it safer with less spin. Push yourselves to learn the techniques if you haven't already. And if you know how to do it with some of your shots, expand your

repertoire to other shots. And if you already can do it with all of your shots then what the heck are you doing here?

So to review:

- A rotating ball will move in the direction of the spin.
- The faster the rotation, the more the ball will move up or down or sideways.
- Top spin will allow you to hit a ball with more pace and still stay in bounds.
- Top spin is effective in keeping the ball down in your opponents' red-light zone
- Top spin can increase your green-light zone
- Top spin can be used in dinks, lobs, drives, net attacks
- Top spin is imparted by hitting up on the ball so the gear effect makes it spin downward
- When hitting up on the ball, a closed face will prevent you from hitting too high
- Improve your play by learning the techniques and incorporating them into your game