

TENNIS FUTURE LAB · MONOGRAPH



The Art of Modern Tennis

Mechanics, shots and thinking in tennis today

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CHAPTER 1

The field creates strength

1.1 The stroke starts at the sole of the foot

New players often think the stroke starts from the arms. Hold the racket, rotate your shoulders, swing. But if you slowly film Alcaraz's forehand, the first thing that moves is not the racket, nor the shoulder. That's the back foot twisting into the turf, the knee dropping, then the hips opening up. The whole body seemed to be pushed off the ground, and the racket was

just the last place to receive that momentum.

When you push your foot down on the court, the court pushes back. That force has its own name in physics, but for football players, just remember one thing: you don't create the force, you borrow it from the field. This is the reason why small players still play heavy. They are not stronger than other people in their arms. They are better at knowing how to put their weight down in the right place and at the right time.

Everyone has felt this before, just didn't pay attention. Stand on one leg, lean forward, then push hard into the ground—you feel your whole body spring up. That's exactly what happens in a good serve, except it's divided into eight stages and ends at a contact point higher than the head.

1.2 What happens when you compress it?

If you want to borrow a lot, you must first deposit. Loading means lowering the center of gravity: bend the knees, bend the hips, letting the large muscle groups in the thighs and buttocks stretch like a compressed spring. The depth of the compression determines the size of the rebound. That's the whole reason why a forehand shot from a standing position, with legs almost extended, is much lighter than a shot from a sitting position.

But compression does not mean kneeling. Many club players hear that they have to "get low" so they sit down, knees over their toes, and back bent. They charge a little but lose their balance, and the shot becomes slow because it takes more time to get up. Useful depth is around where you can still pop within a tenth of a second. Deeper than that is deep for beauty, not for shine.

One detail that's easy to overlook: when compressing, the foot must grip. If your heel lifts off too soon or your whole foot slips, the force you create will escape into the court in a direction you don't control. Professional

tennis players keep the front of the foot pressed tightly, the heel can lift but the ball of the foot does not leave. That's where the force passes through.

1.3 The direction of the force is more important than the magnitude

Not all downforce is equal. The same compressive force, depending on the direction, turns into a jump, a lunge, or a hip rotation.

Up is what you use on serves and on high contact ground shots. When you push straight up and slightly forward, the body leaves the ground at a certain point, and the contact point is a few centimeters higher. At 200 kilometers per hour, those few centimeters are a completely different trajectory.

The horizontal direction is what you use for most base shots. You don't jump, you slide your weight from your back foot to your front foot. This momentum passes through the hips, through the shoulders, and finally through the racket face. That's why people say to "go through the ball" and not "hit the ball".

The direction of rotation is the most interesting part, and also the least taught. When you angle your back foot out and rotate it in while pushing, the force not only goes up or forward, it also creates a torque around the body's axis. This torque is what turns a flat shot into a shot with spin. It is also the reason why players who play heavy spin often have different shoe wear marks on the forefoot of the back foot.

1.4 Three mistakes that cause loss of power, encountered by most club players

The first mistake is standing too straight. The legs are almost extended when the ball arrives, so there's nothing to compress. The shot still enters the court, but the ball goes as if caressed rather than hit. The best way to

fix it is to practice hitting with your knees always slightly bent, even when waiting for the ball.

The second mistake is compressing too late. The player lands just as the ball is approaching, so the force that bounces off doesn't have time to go through the chain. The compression point must occur when the ball is about two feet away from you, so that when the ball arrives, the force is ready to go up.

The third mistake is using your hands to compensate. When the legs cannot create force, the body automatically compensates with the shoulders and arms. The blow still seems strong, but it comes from small muscle groups, and that's the shortest path to elbow and shoulder pain. If you find yourself having to strain your arms to hit the ball deep, the problem is almost certainly in your feet.

1.5 Feeling exercises

Place a folded towel at baseline. Stand with one foot on the towel, the other leg bent, and play slow forehands. You'll be forced to find your balance instead of leaning on your feet, and you'll clearly feel the balls of your feet working. Do twenty times on each side, three sets.

The second exercise is simpler: stand still, feet shoulder-width apart, and jump straight up by pushing hard against the ground while your arms relax. Record the height you reach when bending your knees deeply and when standing almost upright. The difference between the two times is the amount of force you are wasting every time you hit the ball with your extended leg.

CHAPTER 2

Kinetic chain and why there is a delay

2.1 Power flows from big places to small places

The human body does not transmit force like a water pipe. It transmits force like a chain, and that chain has a fixed order: legs, hips, torso, shoulders, arms, hands, racket. Each link is larger and slower than the link after it. Legs can generate the greatest force but cannot move the fastest. The racket head moves the fastest but cannot generate force on its own.

This is not a coaching advice, but an anatomical constraint. The muscles in the thighs and buttocks have large cross-sectional areas and are attached to short levers, so they produce large torques at low angular speeds. The muscles in the forearm have a small cross-sectional area but are attached to long levers, so they produce high speeds with small torques. The kinetic chain is how the body converts one into the other.

So when someone says “hitting with the hips,” they don’t mean that the hips create racket head speed. What they mean is that the hips create torque, and that torque is transferred upward through each link, each time amplified in speed until it reaches the racket head. If you skip a link — usually the hip — the links above still work, but they have to generate the missing energy themselves. That’s when the right arm does the work of the hip, and that’s when the injury begins.

2.2 Delay in rhythm: what the phrase “turn your hips and shoulders at the same time” destroys

This is where many old textbooks go wrong. The saying “turn your hips and shoulders at the same time” sounds reasonable, easy to teach, and easy to see on the field. But it turns the string into a hard block. If the hips

and shoulders rotate simultaneously, there is no relative motion between them, and relative motion is what creates acceleration.

Looking back at Alcaraz's forehand shot at slow speed. His hips opened about thirty degrees before his shoulders began to rotate. The shoulders begin to move before the arms leave the body. The arm shot away before the shoulder stopped completely. Each time, a portion of the speed is added to the existing portion.

They call it sequential transfer. The key point is not faster motion, but out-of-phase motion. Two objects rotating at the same time shows you the speed of one object. The two objects rotate out of phase, the latter absorbs the momentum of the former and then adds its own, giving you the combined speed of both.

In reality, you don't need to think about the deviation in degrees. You just need to think about the order. Hips first, shoulders back, arms last. If your hips and shoulders feel like they're tied together with an iron bar, that's a sign you're rotating the whole block.

2.3 Why is a whip faster than a stick?

Imagine you want to knock an object off the tip. With a hard stick, the tip only travels as far as your hand rotates. With a whip, each segment of the whip lags a little more than the previous segment, and that lag puts energy toward the tip until the tip reaches a speed that far exceeds the speed of your hand.

The arm and racket work on the same principle, the only difference is that it is not completely soft. The elbow is a lag joint, the wrist is an even more lag joint, and the racket neck is an elastic segment with its own lag. When these three delays resonate at the right time, the racket head reaches speed without any muscle group actually contracting with the corresponding force.

That's also why shots that look "light" are heavy. Outsiders saw the relaxed arm and concluded that the tennis player did not use force. Yes, they don't use strength in their arms. The power is generated below and only passes through the arms on the way to the racket head.

2.4 Count the beats instead of feeling them

The feel of the string can be very deceiving, especially when you're trying to hit it hard. One way to fix it is to count out loud while practicing. Four beats for a forehand: one, back foot feed; two, open hips; three, shoulder and arm walking; four, the racket ends. Count slowly, much slower than the actual beat, so your ears can hear the order.

Once you have the count, try deliberately reversing the order — rotating your shoulders in front of your hips — and notice how the ball moves differently. The feeling will be clear: the ball can still enter the court, but it lacks weight, and you have to use your hands more to compensate. That is a lesson that no explanation can replace.

2.5 Exercises

Lesson one: stand three meters away from the net, hit the ball lightly with your wrists while your feet are still. Record the feeling. Then hit the same shot again but let the hips open first, then the hands. With the same hand force, the ball will go significantly farther. That difference is the contributing chain part.

Lesson two: practice throwing a medicine ball or basketball with both hands from a standing position, paying attention to keeping your hips in front of your shoulders. This is the closest movement to serve without a racket, so you can focus entirely on the sequence.

Lesson three: video yourself from behind at 120 frames per second. Count how many frames your hips open in front of your shoulders. If the number is close to zero, you've found the biggest leak in your shot.

CHAPTER 3

Rubber bands in the body

3.1 Three stages of a rope

In each explosive shot there is a biological rubber band. It's not a separate structure, but rather the way the soft tissues in the body — tendons, connective tissue, muscle sheaths — work together to store and release energy. Biomechanists divide it into three stages, and each stage has a different type of error.

The first stage is stretching. Tissues are elongated under load: the racket goes back in the forehand, the shoulders rotate back in serve, the hips roll before launching. At this time, the muscle does not relax, but it also does not contract. It is accumulating elastic energy just like a rubber band being pulled.

The second stage is transition. Between the time the racket goes back and the time it begins to go forward, there is a very short interval — a few tens of milliseconds — in which most club players lose a huge amount of energy. Any pause, any hesitation, any sudden clenching within this range converts elastic energy into heat instead of speed.

The third stage is discharge. Tissues contract, while returning the stored energy and adding its own muscle contraction. The result is racket head speed that far exceeds what muscle contraction alone can produce. This is why an eighty-pound javelin thrower can throw nearly a hundred meters, and a tennis player can serve at a speed that his arm cannot throw a soccer ball as far.

3.2 Silence between two movements

If you can only keep one detail in this chapter, keep it about the silence. Top tennis players guard that silence almost obsessively: the racket moves back neatly, changes direction seamlessly, and moves forward decisively, with nothing wasted in between.

Amateur players are the opposite. They often have a very long backstroke — longer than necessary — then pause for a beat, then move forward. It is that stopping that kills energy. Or conversely, they go back too short because they are afraid of being late for the ball, so they don't have time to accumulate anything.

A simple test: place the racket at the bottom of the backstroke and ask someone to gently push the racket face. If your arm is as stiff as a stick of wood, you are bracing, not tensing. If it has a little elasticity but still retains structure, you're in the right shape.

3.3 Four things destroy the rope

The first is tightening the racket too tight. A strong squeeze strains the entire chain from the hands up to the shoulders and turns the joints into hard points. You don't need to relax so much that the racket leaves your hand, but if your knuckles turn white while waiting for the ball, you're locking yourself out.

Second, the step is too late. If you come to address the ball while running, the legs never load, and the chain starts from the hips, not the ground.

Third is breathing. Many players hold their breath while playing. Holding your breath increases total body tension, and total body tension is the enemy of elasticity. Exhale as the racket comes forward; That sound also helps you keep the beat.

Fourth is trying to hit faster than you can. When you exceed the speed the

chain can handle, the body will bypass the large links and jump straight to the arms. That's why the strongest shots are often the ones that feel slow in the first half.

3.4 Stretch without straining

Distinguishing these two things is the turning point for many players. Flexion is using muscles to maintain a position. Strain is the stretching of tissue under load without resistance. You can have an arm that looks very relaxed but is still tense in all the right places, and conversely, an arm that looks strong but is actually tense and has lost all elasticity.

How to feel: stand straight, both hands down. Ask someone to gently pull one of your arms back and then release it. Your hand will spring forward a little. Now tighten your shoulders and do it again — your arms will barely bounce. That difference is what you need to bring to your shot.

3.5 Exercises

Lesson one: hit the ball with the racket held with three fingers, the grip is just enough to keep the racket from flying off. You will miss a few shots, then your body will find a way to use your legs and hips to compensate. That's the purpose.

Exercise two: throw the tennis ball against the wall from a distance of three meters, using only the movement of the forearm and wrist, not the shoulder. You will clearly feel the elastic bounce in your wrist when done correctly.

Lesson three: count your breaths. Inhale when the racket goes back, exhale when the racket goes forward. Do twenty times in a row and notice if you forget to breathe at any time. Forgetting to breathe is a sign that you are straining.

CHAPTER 4

Core region and rotational energy

4.1 The core is not the abdomen

When people say “must have a strong core,” the image that comes up is usually a six-pack stomach. But in tennis, the core is not a muscle group to show off, but a framework to transmit force. It includes the abdominal muscles, back muscles, pelvic muscles, diaphragm and the connective tissues that connect those parts together. Its function is not to bend, but to keep the upper and lower body from rotating too far apart while still allowing them to rotate quickly enough.

If the core is weak, the force from the legs cannot reach the shoulders. It is absorbed in the midsection, and the body has to compensate by using the lower back and shoulders. That is the mechanism behind most cases of lower back pain in amateur tennis players, and is also the reason why people who do a lot of abdominal exercises still have back pain when hitting the ball.

4.2 Torque: what actually creates speed

Imagine a door. Pushing close to the hinge makes it heavy, pushing away from the hinge makes it light. Same force, but distance from the axis of rotation determines the efficiency. That's torque, and your body uses it constantly.

In a forehand, the approximate axis of rotation is the spine. The shoulders are farther from the axis than the hips, and the racket head is much farther from the axis than the shoulders. So when the same torque is created, the racket head goes faster than the shoulders, and the shoulders go faster than the hips. You don't have to try to make the racket head fast; geometry does it for you, as long as you don't break it by

curling your arms.

This is also the reason why players with long arms often have a speed advantage. Not because they are stronger, but because their racket head is further away from the shaft.

4.3 The distance between the shoulders and its price

During the ground stroke, the upper body and lower body rotate in opposite directions at a certain time. The hips open forward while the shoulders stay back — a condition trainers call shoulder separation. The angular distance between the shoulders and hips is the largest source of rotational energy in the swing.

But it comes at a price. The spine is not designed to twist repeatedly with high loads. If you separate your shoulders by rotating your lower back instead of rotating your hips and chest, you are putting all the torque into the lumbar vertebrae. That is the shortest path to disc herniation.

The way to distinguish is very simple: stand in front of the mirror, arms spread horizontally, turn your body to the right as far as possible. If your hips stay forward and only your shoulders rotate, you're twisting your spine. If the hips also rotate about half way, you are in correct alignment.

4.4 Torsion resistance: a little talked about part

A shot not only needs to rotate, but also needs to stop rotating. Once the racket has passed the ball, the body must brake, and it is at that moment that the last bit of energy is released into the ball. Great players have the ability to accelerate and slow down in the same motion, and that ability comes from the core, not the hands.

This is why anti-torsion exercises — keeping the trunk still while applying lateral traction — are more useful than crunches. You need a frame that can withstand torque, not a belly that can fold many times.

4.5 Exercises

Exercise one: stand in an inclined push-up position on your hands, keep your body straight, and alternately lift one leg for three seconds. The goal is not to get tired, but to not let your hips tilt. Do three sets, each set eight times on each side.

Exercise two: sit on the floor, legs bent, hold a light medicine ball in front of your chest, turn your body to the sides slowly. Note that the hips must rotate together, not just the shoulders. Ten times on each side.

Exercise three: hit the ball with a rubber band tied around the waist and fixed to the pole, pulling across the body. You will have to keep your body stable while still being able to rotate. This is the closest lesson to the real situation on the field.

Exercise four: lie on your back, legs bent, one hand on your lower abdomen and one hand on your chest. Breathe with the diaphragm for two minutes, moving only the hands on the abdomen. It may sound off topic, but the diaphragm is part of the power transmission frame, and most players breathe through their chest without knowing it.

PART TWO

Six hits

CHAPTER 5

Serve, eight stages

5.1 The only shot you can set yourself

Of the eleven possible shots in a point, only serve is in your complete control: you choose the timing, choose the position, choose the type of spin, choose the speed. No one fights back before you. No one forces you to run. And because of that, the serve is the shot most broken under pressure — because it's the only shot where you can't blame your opponent.

What's interesting is that its structure is very fixed. A good serve goes through eight stages, and those eight stages are the same at every level. New players skip the first four stages and only do the last four stages. Good players do all eight but put different amounts of time into each stage.

5.2 Eight stages

Phase one is preparation. You stand at baseline, left foot facing the vertical post, right foot placed behind. Ball in left hand, racket in right hand, and both shoulders are relaxed. It sounds simple, but this is where anxiety first appears: shaky players often tighten the racket right from this step.

The second stage is releasing the ball. The left hand opens but does not throw. The ball is dropped from forehead height and falls in an almost vertical line, slightly inward. If you throw the ball out first, serve will always be late. If you throw back, you will have to lean back to reach, and that is the source of most back pain when serving.

Phase three is loading. The knees are bent, the hips are lowered, the shoulders are rotated back, and the whole body is curled up. There is a

detail here that very few people pay attention to: the shoulders rotate first, then the hips. Many textbooks teach the opposite, but when looking at serve at 200 kilometers per hour, the upper body always warms up first.

Stage four is toss the racket. The elbow goes forward, the racket head falls behind the back. This is what people call the winning stance — racket head low, elbows high, chest open. The name sounds exciting, but it actually just describes a mechanical position: the racket head is down and back to have the longest distance before meeting the ball.

Phase five is acceleration. From that low position, the racket goes up in a narrow arc. The elbows are extended, the forearms are pronated, and the racket head shoots up at top speed throughout the entire movement.

Stage six is the point of contact. The racket meets the ball at a height that you can still reach with an almost fully extended arm. This varies from person to person, and it is what determines what your serve looks like. Serving slightly above the head is the style of people with flexible shoulders; A slightly lower serve is a safer style for beginners.

Stage seven is the end. The racket continues down and sideways, across the other side of the body. If you stop your racket immediately after hitting the ball, you've braked yourself and will feel pain in your shoulder.

Stage eight is grounding and recovery. You land on your left foot (for right-handers), then take a step or two onto the court. This phase is often overlooked in practice, and it's why many people serve very well in practice but completely lose that serve in competition: they never practice their next shot after serving.

5.3 Two types of standing

Pinch pattern: your feet are close together, your back foot next to your front foot, and you bounce from almost a single point. The advantages are concentrated thrust, greater contact height, and compact motion. The

downside is that it's difficult to maintain balance, especially for people who don't have a good core.

Split style: your feet are shoulder-width apart, and you spring up by shifting your weight from your back foot to your front foot. The advantage is stability and ease of learning. The downside is the loss of some altitude.

Most amateur players should start with a split style, then move to a pinch style once they have enough balance. What you shouldn't do is mix the two styles: stand apart but try to bounce like standing together. As a result, the back leg can't push anything and all the force has to come from the back.

5.4 Touchpoints decide everything

If only one thing can be fixed in serve, fix the contact point. A contact point five centimeters higher gives you a wider entry angle, a safer trajectory across the net, and a higher entry rate without the need for increased power.

How to find the right contact point: stand at baseline, raise the racket as high as possible without standing on tiptoes. That's your upper limit. Your actual point of contact should be about ten centimeters below that limit, because you need to leave room for the ball to fall.

A common mistake is reaching for the ball with your back tilted. It feels like you're reaching higher, but you're actually lowering the point of contact and compressing the lumbar vertebrae. If you often feel back strain after serving, check to see if you're tilting your back instead of bending your knees.

5.5 Exercises

Lesson one: serve from a kneeling position, using only the upper body. You will lose leg strength and be forced to find the right racket path. Twenty times.

Lesson two: place a towel at baseline, about thirty centimeters inwards from the line. Serve the ball so that the left foot lands behind the line and steps into the towel. This lesson teaches stage eight, which almost no one practices.

Lesson three: serve with the target being a hoop placed in the middle of the service box, but only allowed to serve at seventy percent force. The goal is to find a stable height and spin before accelerating. Don't increase your power until you've gotten ten of the twelve into the ring.

CHAPTER 6

Return of serve

6.1 You don't have time to think

A serve at 180 kilometers per hour travels from baseline to the service line in about four-tenths of a second. During that time, you must recognize the direction of the ball, decide how to play, move to position, and make the shot. The time for conscious thought is almost zero.

That's why return of serve cannot learn by thinking. It must be built into reflexes, and reflexes only form when you practice the steps in the correct order. Return of serve is poor not because the hands are slow, but because the feet are never in the right place at the right time.

6.2 Separation step

Before your opponent touches the ball, you stand in a waiting position with your weight on your toes. When your opponent starts to raise the racket, you take a small step: jump slightly and land with your feet shoulder-width apart, right at the moment the opponent's racket touches the ball.

This step does two things at once. First, it recharges the tissues in your legs, turning your legs into a newly compressed spring. Second, it creates a moment where both feet are in the air — meaning when you land, you can go in any direction without having to shift your weight first.

What matters is the timing, not the altitude. Jumping high doesn't help; Jumping at the right time helps. If you land before your opponent touches the ball, you've lost your effectiveness. If you land later, you're late.

A common mistake is that the separation step is too large. Taking wide steps makes you lose your balance and can't move quickly. The correct step is just a little wider than hip width.

6.3 Read the direction of the ball from your opponent's hand

No one could read the ball's trajectory in the first three-tenths of a second. But anyone can read the server's arms and hips. The three most useful signals:

First, the direction of the racket face at contact. When the racket surface opens outward, the ball often goes diagonally outward; When the racket surface closes inwards, the ball goes into the body. This is the clearest signal and also the easiest to read.

Second, the direction of shoulder rotation. If the shoulders rotate too much, the ball tends to go diagonally; Shoulders are almost straight and the ball goes straight or into the body.

Third, ball release location. The ball released first and to the right (for right-handers) is usually an outspin serve; The ball dropped back and to the left is usually a serve that spins to the body.

These three signals are not guaranteed to be accurate, but they are enough to get you leaning in the right direction half a beat early. And that half beat is the entire difference between an active return of serve and a defensive return of serve.

6.4 Four payment types, and when to use them

Return attack: you step into the court and hit the ball while it is still high. This style can only be used with weak serves or when you have already guessed the direction. High risk, high benefit.

Deep return: you step back a bit and hit the ball with high spin so that it falls deep towards your opponent's end of the court. This is the safest style and is the foundation for all levels.

Short return: you cut the ball or hit it lightly so that the ball falls into the service box, forcing the opponent to step in. Should only be used when

the opponent is too far away from baseline.

Block return: you just put the racket out and let the ball bounce off the racket. This style is used when you are served too quickly and cannot swing in time. It's not pretty but it keeps you in point.

For most players below level 4.0, the correct answer is to pay deep, almost every time. You don't need to win points with return of serve; you just don't lose it.

6.5 Exercises

Lesson one: ask someone to stand at the service line and throw the ball towards you at medium speed. Focus solely on the timely separation step. No polishing, just split and stop steps. Twenty times.

Lesson two: return of serve with the target being a circle placed in the middle of the other field. You get points when the ball falls into the ring, not when the ball goes through. This lesson teaches you that return of serve is a targeted shot, not a reflex.

Lesson three: stand at baseline with closed eyes, ask someone to shout "hour" when the ball leaves your hand. You open your eyes and try to walk away. This lesson teaches you exactly what you really need: reacting to the moment, not the image.

CHAPTER 7

Modern forehand

7.1 The left hand is not an extra hand

If you slow-motion a Sinner forehand, what's impressive is not the right arm hitting the ball, but the left arm. It stretched out, pointing in the direction, then suddenly pulled in close to the hips just as the shoulders opened. That movement is not for balance. It creates an opposite torque, and that torque helps the upper body rotate much faster than when only one hand was working.

Amateur players often consider the left hand to be the hand holding the ball. They bring it back, then let it hang as the racket comes forward. As a result, the upper body loses half of its momentum, and the arm has to compensate by swinging harder.

7.2 First swing

The modern forehand doesn't start with bringing the racket back. It begins with a swing: the shoulders turn as one, the hands follow, and the racquet is pulled back as a consequence, not as a separate action.

This sounds small, but it completely changes the timing of the shot. When you rotate your shoulders, the racket automatically moves back without you thinking about it. You save a step, and that step is the step that most players miss.

A sign to check for yourself: if when waiting for the ball you find your shoulders still facing the net and only your hand is holding the racket back, you are skipping the swing. If your shoulders have rotated about forty-five degrees before the ball arrives, you're doing it right.

7.3 Wrist lag

In the modern forehand, the racket head does not go before the arm. It goes behind. When the forearm begins to move forward, the racquet head is still behind, and that lag creates an arc at the end of which the racquet head reaches its highest speed.

Beginners often do the opposite: they bring the racket head up to shoulder level and then move forward, making the racket and hand almost perpendicular throughout the movement. The shot can still enter the court but it is flat, lacks spin, and is easily broken when the ball is fast.

To feel the lag, try hitting the ball with your wrist completely relaxed and just thinking about pulling your arm through. The racket head will fall back on its own. If you find yourself having to use your wrists to keep the racket straight, that's a sign you're straining.

7.4 Three grips and what they determine

Hammer grip: the racket face is almost vertical when you hold your hands forward, palms facing the ground. This is a neutral grip, suitable for cuts, volley, and serves. With the forehand, it sends the ball flat and low.

Eastern style grip: turn the hand about a quarter of a turn, placing it behind the racket face. This is the grip of the previous generation, allowing the ball to go flat and through. It is still effective for players who have good footwork and want to hit early.

Semi-Western grip: the hand rotates half a turn compared to the hammer style, lying below the racket surface. This is the grip of almost all modern players. It allows for a heavy topspin with the same force, and it opens up attack angles that the other two grips do not.

The thing to understand is that grip is not an aesthetic choice. It determines the height of your natural contact point, the maximum amount

of spin, and the type of ball you can hit. If you change your grip, you must change both the contact point and the racket path. That's why self-taught people often get stuck with the old grip for so long: changing the grip means playing poorly for two months.

7.5 Racket line

With the semi-Western grip, the racket path goes from low and back to high and front, in a slightly inclined arc. The lowest point of the arc is below the knee, and the highest point is above the shoulder. The ball is hit about two-thirds of the way, not at its highest point.

If you hit the ball at the highest point of the arc, the ball will go flat and long. If you hit lower, the ball will have more spin but be shorter. Both are correct, depending on the situation. The wrong thing is to hit at the lowest point, when the racket is still rising slowly.

7.6 Exercises

Lesson one: stand still, don't hit the ball, do ten shoulder rotations and then stop. Just check to see if the racket goes back on its own. Do not use your hands to put the racket.

Lesson two: hit the ball with a goal of two circles in two corners of the court, but the ball must be at least one meter high over the net. This exercise forces you to create spin instead of hitting flat.

Lesson three: hit the ball with a ball that is lighter than the real ball, or a ball that is flat. You will have to use the string instead of your arms, because the ball is light and doesn't give you a reaction force to lean on.

CHAPTER 8

Backhand: two-handed and one-handed

8.1 Two hands: shoulder strike

The two-handed backhand is the easiest shot to teach in modern tennis, and also the most misunderstood. People say it resembles a left-handed forehand, but that's only true in form. Mechanically, it is a swing of both shoulders rotating around an axis, with both hands holding the racket together as a single lever.

Its greatest advantage is not strength, but endurance. Because of two hands, the shot is more stable against high spin balls and heavy balls. That's why nearly all high-level players use a two-handed backhand to return of serve.

The downside is reach. Two arms lock the shoulders, and you lose about thirty centimeters of reach compared to one arm. With the balls going far, you are forced to take more steps.

8.2 One-handed: the stroke of time

The one-handed backhand is not stronger, but it comes sooner. Because there is only one hand, the shoulders are not locked, and you can bring the racket back faster. That means you can hit the ball earlier, and hitting early is the best way to deal with a fast opponent.

It also allows for opening angles that the hands don't have: you can cut the ball very low, pull the ball across the court with backspin, or hit a small drop shot from a nearly impossible position. That's why one-handed tennis players are often remembered, even though statistically they are not dominant.

The price is stability. With one hand, any errors at the point of contact are

amplified. High spin balls are a nightmare, as you have to hit them at shoulder level or higher with an extended arm. And when you're tired, this shot fails first.

8.3 Backhand cut

The slice is a separate skill, not a weaker version of spin. It uses an open racket face, the racket path goes from high to low, and the goal is to make the ball bounce low and miss.

For one-handed players, cutting is a real weapon: it keeps the ball low, slows down the tempo, and opens up net play opportunities. For two-handed players, cutting the ball is often only used for defense, because it is difficult for two hands to create a wide enough racket face angle.

The most important thing in cutting is not to cut the ball too high. A high slice is the easiest ball to hit on the court: it's slow, it's floaty, and it's unhinged. Cutting the ball is only valuable when it is below the opponent's hip level.

8.4 Which one to choose?

If you're just starting out, learn two-handed. It's easier, more consistent, and gives you a foundation to play at a 4.5 level without having to completely rework your stroke.

If you can play and have a natural hand, don't change. The price of switching is two years of bad play, and the reward is uncertain.

If you have shoulder or elbow problems with the two-handed shot, try one-handed. Many people find one arm much more comfortable because it doesn't force the shoulder to lock at a fixed angle.

And if you choose one-handed, learn to cut the ball from the beginning. A hand without a silhouette is a hand missing half of it.

8.5 Exercises

Lesson one: play a two-handed backhand with the ball thrown from the side, not in front. You will be forced to rotate your shoulders instead of reaching out.

Lesson two: hit a one-handed backhand with the goal of the ball passing over the net at a height of less than one meter. This lesson teaches you that one hand doesn't need to be hit hard, just low and early.

Exercise three: stand at baseline, slice the ball ten times in a row into the same quarter of the court on the other side. Count the number of times the ball bounces below your opponent's hip level. That's the actual measure of the cut, not the number of times the ball crosses the net.

PART THREE

At the net and in the point

CHAPTER 9

Net

9.1 Volley is not a shot

Newbies net play often try to swing the racket. They carry the habit of the base shot: bring the racket back, then hit forward. But at the net, there is not enough time for one swing. It only takes about three-tenths of a second for the ball to travel from your opponent's racket to your racket. In that range, a complete swing is impossible.

So volley should be understood as a block, not a hit. You don't create the speed; You redirect the speed you already have. The ball comes with momentum, and your job is to put a plane in the right place so that momentum bounces in the direction you want.

This is why good volley players look like they are pushing the ball rather than hitting it. They don't swing. They set the racket, and the ball goes by itself.

9.2 Static walls

Imagine you put a wall in front of you and let a tennis ball bounce against it. The ball will bounce off at approximately the same speed as the incoming speed, at a reflex angle. If the wall is tilted, the ball goes in the other direction.

Good Volley works on the same principle. The wrist and forearm maintain a fixed angle, forming a rigid surface. The shoulders and hips adjust the angle of that plane. The ball comes, touches, and bounces away. There is nothing in the right arm that is elastic.

The difficulty is to maintain that stiffness without straining. If you tighten it too much, the racket vibrates and the ball goes uncontrolled. If you are too

loose, the racket face will be pushed back and the ball will fall short. The correct state is stiffness in the joints, tenderness in the muscles.

9.3 The racket surface decides everything

At net, you don't have time to adjust your racket. You only have time to set the racket face. Therefore, the angle of the racket face as soon as the ball arrives is your entire shot.

When the racket surface opens, the ball goes high and short. When the racket surface closes, the ball goes low and long. If the racket surface is vertical, the ball goes straight. These three states correspond to three different situations, and you have to decide before the ball arrives, not after.

A very common mistake is opening the racket face too much for fear of the ball falling into the net. As a result, the ball goes high, giving the opponent enough time to hit a shot over your head. At the net, a low ball is much more uncomfortable than a pleasant high ball.

9.4 Three types volley

Volley block: used when the ball is coming quickly and you just need to get it back on the field. The racket face is slightly open, the arms are almost extended, and you are only moving your shoulders. This is volley basic defense.

Volley hit: used when the ball comes high and slow. You bring the racket from the top down with a little spin, and the ball goes cross-court with speed. This requires a little swing, but still not a full swing.

Volley omitted: used when you are very close to the net and your opponent is far away. You open the racket wide, absorb force instead of transmitting force, and let the ball land right on the other side of the net. This is the most difficult of the three shots, because it requires very good

hand feeling.

9.5 Where to stand

The correct position at the net is not the middle of the field. It is the point that bisects the angle that the opponent can hit. If your opponent is in the left corner of the field, stand a little to the left, but still close enough to the middle to cover the cross-court shot.

Distance to the net is also important. Standing too close to the net makes it difficult to block the ball over your head. Stand too far away and you'll lose your angle. A good distance is about two to three meters from the net, enough for you to both block low balls and retreat when needed.

And remember: when your opponent is about to hit, you must stand low with your knees bent. If you stand straight at the net, volley will enter the net first.

9.6 Exercises

Lesson one: stand two meters away from the net, ask someone to throw the ball at your racket from four meters away. Don't swing, just place the racket face. Twenty times each side.

Exercise two: practice volley with the ball thrown in three positions: low, hip level, and high. You must change the racket face angle for each position. Count how many adjustments you make in ten times.

Lesson three: stand at the net, ask someone to hit the ball alternately to both sides. You can only move horizontally, not diagonally. This exercise trains the most important thing at the net: the ability to keep the racket surface stable while the body is moving.

CHAPTER 10

Cut the shadows, cut them down and break the beat

10.1 Slicing is a tool, not a stroke

In Vietnamese, "cutting the ball" sounds like a technical move. But at a high level, it is a tactical tool, and every tool has situations where it should be used and situations where it shouldn't be used.

The cut causes the ball to bounce low and miss. That means it takes away your opponent's time. A player hitting topspin needs a higher point of contact and a longer set-up. Cutting the ball destroys both of those things at the same time.

It also slows the ball down. And this is where a lot of players get it wrong: slow does not mean easy. A ball that is slow, low, and has no momentum is the hardest ball to power. That's why the slice still exists at the professional level, even though it's theoretically less effective than the topspin.

10.2 Discard

The small drop is not a weaker cut. It is a shot with a different purpose: to drop the ball right behind the net, forcing the opponent to run in.

The two conditions for dropping small are meaningful. First, the opponent must be far away from baseline. Second, you must be on the court, close enough to the net so that the drop shot cannot be read. If either is missing, the small drop becomes an easy-to-hit short ball.

The technique is simple: the racket face is open, the racket stroke is from high to low, and the hands absorb force instead of transmitting it. The ball leaves the racket with very little speed and a lot of backspin, so it bounces

very little after hitting the court.

The difficulty is hiding the intention. If you change your preparation, your opponent will know. The best way is to keep the preparation of the normal shot the same and only change it at the last moment.

10.3 Breaking rhythm

Most amateur players lose because of rhythm, not because of technique. They hit at the same speed, at the same height, at the same drop throughout the match. It's enough for the opponent to find that rhythm.

There are three simple ways to break the beat. The first way is to change the height: a low ball, then a high ball, then low again. The second way is to change the speed: one fast ball, then one slow ball, then one fast ball. The third way is to change the spin: one topspin, then one slice.

These three ways do not require new techniques. They just need you to decide before hitting, instead of hitting based on inertia. And that's something that very few players at level 3.5 can do.

10.4 When not to use

Don't cut the ball when you are in the field and have a high ball. You are in an attack position; cutting the ball there is making yourself a defender.

Don't give up when your opponent is close to the net. You will lose points immediately.

Don't break the rhythm with a shot you can't control. A bad cut is not a break; That's one point for the opponent.

And don't use the cut as a way to avoid learning topspin. At a level below 4.0, the cut is often a sign of lack of confidence rather than a tactical choice.

10.5 Exercises

Lesson one: alternately hit ten topspin and ten cutting balls at the same target. You will clearly see the difference in height and length. Record the height the ball passes through the net in each category.

Lesson two: set a goal two meters across the field from the net. Drop ten balls in a row, counting the number that fall on the target. Below five, you need to practice more hand feeling.

Lesson three: play a point with its own rules — each shot must differ from the previous one in height or speed. You will find yourself having to think more, and your opponent will find it much more frustrating than in an even fight.

CHAPTER 11

Foot set

11.1 Footwork is not running speed

When people say a tennis player has good footwork, they are not talking about sprinting speed. Most players with the best footwork are not the fastest runners. They are the ones who get to the right spot first, and it depends on three things: the first step, the number of steps, and the last step.

The first step decides whether you make it or not. It should be a short, quick step in the direction you're going. Many players skip this step: they wait until the ball passes the net before starting to run. As a result, they are always half a beat late, and they make up for it by reaching out.

The number of steps determines whether you are balanced or not. Go from baseline to a short ball in three long strides and you'll end up where you're rushing forward, and the shot will be off balance. Take five short steps and you will reach a stable place.

The final step determines your shot. It's about taking small steps, making adjustments, placing your feet in the right position so your hips can rotate. If the last step is too long, the hips lock and you lose the entire chain.

11.2 Horizontal and diagonal steps

Side stepping is used when the ball is close and you need to keep your face towards the net. That is the step of volley and of fast defense situations. It's not the fastest, but it keeps the shoulders in the right direction.

Diagonal stepping is used when the ball is far away and you need to go quickly. The outside foot steps in front of the inside foot, and you move

about thirty percent faster than with a side step. The downside is that the shoulder rotates, so after stepping diagonally you have to rotate again before hitting.

Most players use the diagonal step for all situations, even when the ball is close. That's why they often hit the ball with their body rotating in the wrong direction. Simple rule: if the ball is within two feet, use a side step. If it's farther, use diagonal steps and then horizontal steps to adjust.

11.3 Adjustment step

This is the most overlooked step in practice, and is also the step that separates good players from good players. Once you get close to the ball, you need one or two very small steps to put yourself at the correct hitting distance.

These steps are so short that they are difficult to see with the naked eye. They are only a few centimeters long. But they are what allow you to hit the ball at the right point of contact instead of reaching.

If you frequently find yourself hitting the ball at full reach, or frequently getting hit by the ball, the problem is almost certainly a lack of correction.

11.4 Recovery

After each shot, you have two options: stand and look at the ball, or step back into position. Amateur players choose the first option more often than they think. They hit the ball, then stop to see where the ball goes, and only start moving when the ball has passed the net.

Correct recovery is a series: take a step sideways to regain balance, then jog diagonally back to position. Not running straight to the middle of the field, but to the point where the opponent can hit the corner that bisects the corner.

The start of recovery is not after the ball passes the net, but immediately

after the racket passes through the ball. It's a small change in routine but it saves you almost a whole step on every shot.

11.5 Exercises

Lesson one: place four balls in the four corners of the field. Run to each fruit in an X shape, and at each fruit you must stop, take two small steps, then run again. The goal is to create a habit of adjustment.

Lesson two: play one point with rules — you must touch the center line before your opponent hits the ball. You will find yourself recovering much sooner.

Lesson three: ask someone to randomly hit the ball side to side for three minutes and count the number of times you have to reach. That number is a direct measurement of your foot.

CHAPTER 12

Read the match by numbers

12.1 Numbers don't tell you what to do

Ten years ago, data in tennis was something only big teams had. Now, every sparring session can be recorded with your phone and analyzed with free software. But more data doesn't mean better play. It just means you have more ways to trick yourself.

An amateur tennis player reviews his match and sees that his first serve ratio is fifty percent. He concluded that he had to serve more safely. But if out of that fifty percent, seventy percent of the points he wins, then the correct conclusion is the opposite: he should serve more risky.

That's the whole point of reading numbers. A number has no meaning if you don't know what it correlates to.

12.2 Four beats

In a top point, there is a very stable pattern: serve, return, an establishing shot, and a deciding shot. Four beats. Most points at the professional level end in about four to six beats.

This has two practical consequences. First, the third shot — the first shot after serving — is the most important shot in the game, and it is the shot that amateurs practice the least. Second, if you can't finish the point in four beats, you're playing a different game than you thought you would.

Count the beats during a sparring session. You will discover that most of your scores last eight to ten beats, and most of them end in an unforced error. That number tells you more than any other statistic.

12.3 Plus one serve pattern

This is the simplest and most effective pattern in modern tennis. You choose a type of serve, and you choose in advance where your next shot will hit. Serve the ball spinning outward, then hit the open corner. Serve the ball to the body, then hit the middle.

Its value lies not in its complexity, but in the fact that it eliminates the need to make decisions while the ball is in flight. You have decided in advance. When the ball comes, you just do it.

At levels 3.5 to 4.5, just having such a pattern is enough to win the majority of your serve points. No need for two, no need for three. One pattern practiced to the point of automaticity is better than five thought patterns.

12.4 Allocation, not quantity

A much more useful statistic than the number of errors is the drop point distribution. Divide the opponent's field into three zones: left, center, right. Count how many times you hit the ball in each zone.

Most players will spot a very clear pattern: they hit the middle of the court about sixty percent of the time. That's not an option; it's a habit. And it explains why their opponents are always in the right place.

By simply changing the distribution—reducing the midsection by thirty percent and dividing it equally between the two sides—you become a more difficult opponent without needing to learn new techniques.

12.5 Don't measure what you can't fix

There is a great temptation to measure everything. Racket swing speed, hip rotation speed, contact point height. But if you don't have a way to fix those numbers within a week, they're just entertainment.

Three numbers are worth measuring at the amateur level: first serve percentage, number of unforced errors per set, and winning point percentage when you're the third shot. All three can be improved with practice, and all three directly correlate with match results.

12.6 Exercises

Lesson one: in a practice session, count the beats of each point. Write it down on paper. You'll get a clearer picture than any video.

Lesson two: choose a plus one serving pattern and practice it a hundred times. Unchanged. After a week, measure your serve win rate.

Lesson three: have someone stand on the other side and mark the landing of each ball you hit in a set. Count distribution of three regions. The number will surprise you.

PART FOUR

Body, mind and years to come

CHAPTER 13

Physical strength and recovery spirit period

13.1 Tennis is not an endurance sport

A match lasts two hours, but you don't run for two hours. You run in two to four second intervals, rest ten to twenty seconds, then repeat. The total distance of a single match can be up to three kilometers, but it is divided into hundreds of short segments, each starting from an almost stationary state.

That means your fitness isn't measured by how far you run, but by how fast you sprint for the hundredth time. This is a completely different type of stamina, and it's built in a completely different way.

Amateur players often practice by running long distances. They become cardiovascularly stronger but not faster on the field, and sometimes even slower because they get used to the slow pace. Endurance isn't the enemy, but it's not what you need the most.

13.2 Three energy systems and three training types

The first system provides energy for efforts under ten seconds. It does not require oxygen and does not produce significant muscle fatigue. This is the system you use in every shot, every jump, every serve.

The second system provides for efforts from ten seconds to about two minutes. It creates muscle fatigue, and it's the system you use during a long series or a ten-minute game.

The third system provides for longer efforts, and in tennis it is only really important in matches lasting over three hours.

For amateur players, the first and second systems are everything. That means your workouts should be short bursts of high intensity, rest enough

to recover, then repeat — not long, uninterrupted runs.

13.3 Speed endurance

There is a concept worth knowing the name of: speed endurance. It is the ability to maintain a high speed of movement over many repetitions. A player with good speed endurance can still bounce like the first time at point thirty of the third set.

The most effective training is short, high-intensity exercises, with controlled rest periods. For example: sprint five meters, turn around, sprint five meters, rest twenty seconds. Do it ten times. This is almost like a real ball point, and it trains the exact energy system you need.

A common mistake is resting too long between sessions. If you rest for two minutes, you are working on pure speed, not speed endurance. Twenty to thirty seconds of rest is enough to keep you from burning out, but not enough to fully recover — and it's that state of under-recovery that you need to get used to.

13.4 Recovery of spirit menstruation

This is the most overlooked part, and it explains why many players practice a lot without making progress. The tennis swing is a neurological spirit skill, not a muscular one. It depends on the spirit nervous system sending signals at the right time to the right muscle groups.

The spirit system experiences fatigue in a different way. It's tiring after training sessions that require high concentration, and it takes longer to recover. A three-hundred serve practice session won't strain your shoulders much, but it will tire the nervous spirit system significantly, and your serve quality will decline over the next two days.

Signs of spirit fatigue: you know what you have to do but your hands don't do it right. The stroke becomes slower even though you don't feel tired.

It's time to rest, not time to practice more.

13.5 Sleep is part of the training plan

If you could only choose one thing to improve on the field, choose sleep. During deep sleep, the body synthesizes proteins and the spirit nervous system reinforces learned movement patterns. Lack of sleep reduces both strength and accuracy, and it markedly increases the risk of injury.

For amateur players with jobs, this often means choosing between a late practice session and a full night's sleep. In most cases, getting enough sleep leads to more progress.

13.6 Exercises

Exercise one: sprint five meters, turn around, repeat ten times, resting twenty seconds in between. Three rounds, two minutes rest between rounds.

Exercise two: jump rope for thirty seconds, rest thirty seconds, do ten times. This is the best exercise to improve your ability to jump quickly on the spot, which you need on every shot.

Exercise three: stand at the midfield line, move to the four corners of the field according to random commands for forty seconds. Rest twenty seconds. Do it six times. This is the closest thing to a real game.

Lesson four: record your bedtime and wake time for two weeks. You'll see a connection between days of little sleep and poor practices — a connection that most players never see because they don't record it.

CHAPTER 14

Compete in silence

14.1 What really happens when you stress

When you enter a critical point, the body does three things that you didn't ask for. Heart beats faster. Breathing becomes shallow and moves to the chest. And the small muscle groups in the hands and wrists automatically tense up.

These three reactions have a purpose: they prepare you for danger. But in tennis, they ruin the very thing you need. Shallow breathing reduces oxygen to the muscles. Tight arm muscles cause loss of elasticity. And a fast heart rate makes you feel like time is passing faster than it actually is — which is why you hit the ball late on important points without understanding why.

Understanding this mechanism is important because it tells you where to intervene. You can't tell yourself to calm down; you can only change one specific thing in your body, and let the rest follow.

14.2 Inverted U curve

Arousal and performance levels do not increase in a straight line. At very low levels of arousal, you lack alertness and are slow. At very high levels, you lose control and the shot fails. The best performance lies in the middle, and that middle point differs from person to person and from shot to shot.

The interesting thing is that each shot has its own optimal point. Serve requires a higher level of stimulation than volley, as it is an explosive movement that you control completely. Volley requires a lower level, as it requires reaction and hand feel.

That's why good tennis players often behave strangely before serving: they're adjusting their arousal levels. Bouncing the ball multiple times is a way to increase rhythm. Slow breathing is a way to reduce the rate.

14.3 Midpoint etiquette

The time between two points is twenty seconds, and it is the greatest asset you do not use. Most players use those twenty seconds to think about the missed shot, or to get angry, or to worry about the next point. All three are ways to spend energy without getting anything back.

A simple four-step ritual. Step one: turn your back on your opponent and go to baseline. Step two: exhale deeply once. Step three: choose something specific for the next point — where to serve the ball, or where to return it. Step four: turn around and step into position.

The value of the ritual does not lie in those four steps, but in the fact that it takes the place of unhelpful thoughts. You can't think about that missed shot if you're busy doing four specific things.

14.4 Five-second video

Visualization is a skill that can be practiced, and it is most effective when brief. Don't picture a whole point; imagine five seconds.

Before serving, visualize the ball you want to hit going over the net and landing in a specific area. Don't visualize the outcome, don't visualize your opponent fighting back. Just visualize the path of your ball, from the moment the racket hits the ball to the moment the ball hits the court.

Those five seconds do two things. It takes your attention away from the body and onto the target, and it creates a spirit pattern that the body will follow. It is also a way to reduce arousal without trying to reduce it.

14.5 Attention and the four boxes

Attention has two dimensions: wide or narrow, and directed outward or inward. Four combinations give four states, and each state is appropriate for a situation.

Wide and outward is the state you need when waiting for the ball: see the whole field, the opponent, and the direction of movement. Narrow and outward is the state when the ball is coming: just look at the ball. Wide and inward is the state between the points, when you evaluate and choose tactics. Narrow and inward is the state you need to avoid while playing, because it's where negative self-talk comes in.

Most errors in key points occur because the player gets stuck on the fourth block just as the ball arrives. They are thinking about themselves instead of looking at the ball. The way out is very mechanical: turn your eyes outward. Look at a specific detail on your opponent's body, or look at the ball in his hand.

14.6 Exercises

Lesson one: play ten points and only perform the four-step ritual between each point. Don't care about winning or losing. You will find yourself less tired at the end of the session.

Exercise two: practice visualizing five seconds before each serve fifty times. Count how the field rate changes compared to without visualization.

Lesson three: during a practice session, try naming your state of attention after each point. Just realize which box you're in. Realization is enough to escape.

CHAPTER 15

Tennis in the coming years

15.1 How the data changed the shot

Twenty years ago, a coach taught the forehand by saying “hit from low to high.” Now, one can accurately measure the racket path, racket head speed, spin, and contact height of each shot during a practice session. That information has changed the way teaching is done, but not in the way that many people think.

The biggest change is not the technique, but the understanding of what is important. When everything was measured, it was discovered that many of the details that had been taught carefully over decades actually did not correlate with performance. And some things that are considered secondary are very strongly correlated.

The clearest example is contact point height. For many years, it was considered an individual detail. Data shows it is one of the best predictors of fielding rate, and it can be improved with very specific exercises.

15.2 Sensors and their traps

You can now buy a sensor that attaches to the handle of your racket for the price of one lesson, and it will tell you your swing speed, contact point on the racket face, and the number of shots during the session. It sounds appealing, and it really is helpful — but only if you know what you're looking for.

The trap is this: once you have the data, you start optimizing the number instead of optimizing the shot. A player sees that his swing speed is low and tries to swing faster. But low swing speed is usually not a problem; the problem is that he is swinging with his hands instead of with the string. Increasing swing speed will make the shot worse.

Pragmatic rule: only measure things you have the practice to correct. Without homework, the number is just a reminder that you're not good yet.

15.3 Return of feeling

What's interesting is that as data becomes more available, the best tennis players talk more about feel. They talk about feeling the ball on the racket, about the weight of the shot, about knowing a shot will enter the court before it leaves the racket.

This does not contradict the data. It is a consequence of data having resolved the big questions, leaving behind small questions that only the body can answer. Once you know the correct swing, the next question is what feeling tells you you're doing it right — and that question no sensor can answer.

That's also the reason why tennis players who practice martial arts or tai chi often talk about feeling more than about parameters. They were practicing exactly what the data couldn't measure: the ability to feel forces passing through their bodies.

15.4 Immutability

No matter how the tools and data change, three things remain the same. First, the ball must still pass through the net and land in the court. Second, you still only have twenty seconds between points. Third, the winner is still the one who wins more important points, not the one who plays better.

Those three things sound obvious, but much of an amateur's progress comes from accepting them. A low-looking shot that goes in eighty percent of the time will beat a good-looking shot that goes in fifty percent of the time. This is true at every level, and it will remain true as sensors become ten times more accurate.

15.5 Exercises

Lesson one: in a training session, set a single goal and measure only that goal. For example, the ball must pass over the net at a height of over one meter. Don't measure anything else. You'll find yourself progressing faster when you only track one thing.

Lesson two: play twenty balls and after each ball, say how you feel before seeing the results. Count how many times you guess correctly. This is a feel test, and it's the only test that measures exactly what you need at a high level.

Lesson three: spend a workout session without phones, without sensors, without watches. Just polish and pay attention. You'll be surprised at how much more you pay attention without data.

CHAPTER 16

Appendix: diagnostic exercises

16.1 How to use this appendix

This section is written for reference, not for seamless reading. You find your symptoms, read the most likely cause, and then choose the corresponding exercise. Each entry is kept short because when you're on the course with a missed shot, you don't need an essay.

One thing to say up front: most symptoms have multiple causes, and the cause listed here is the most common cause, not the only cause. If the exercise doesn't help after two weeks, go back and try the second cause.

16.2 Six common symptoms

The ball often flies long beyond the end of the field. The most common cause is not hitting too hard, but too low a contact point combined with an open racket face. When the contact point is low, you are forced to hit the ball up, and the racket face angle must open to compensate. The two errors add up to form a long trajectory. Drill: aim the ball at least one meter over the net, and keep the racket face a little more closed than usual.

The ball often falls short, into the middle of the field. The most common cause is lack of forward movement. You hit the ball with your weight still on your back foot, so the energy doesn't go into the ball. Exercise: place a second ball where you need to step, and step on it before hitting.

Pain in the inside of the elbow after hitting a backhand. The reason is often that you use your forearms to create force instead of using your shoulders. Exercise: hit the backhand with both hands but only rotate your shoulders, do not bend your elbows until the racket has passed the ball.

Pain on the outside of the elbow after hitting forehand. The cause is usually that you hit the ball late and have to compensate by breaking your wrist. Exercise: hit the ball one beat early, and keep your wrists at a fixed angle throughout the movement.

Loss of balance when hitting the ball. The reason is usually that the last step is too long. When the last step is long, you reach the point where you are rushing forward and cannot stop to hit. Exercise: hit the ball with your feet wide apart and must stop completely before the racket goes forward.

Often hitting the ball late. The cause is usually not foot speed, but turning the shoulders too late. You start swinging once the ball has passed the net. Exercise: turn your shoulders as soon as your opponent touches the ball, before even knowing where the ball is going.

16.3 Six background exercises

Lesson one — dead ball: hitting the ball with a deflated ball. The ball doesn't give you any reaction force, so you have to use the string. Twenty times each side.

Two - three finger exercise: hold the racket with three fingers with minimal squeezing force. You will miss a few shots, then your body will find a way to use its legs.

Lesson three — frozen feet: hitting the ball with both feet completely still. You will clearly see how much strength you lose without your legs, and that is a measure of using your arms too much.

Lesson four — one step: the ball is only allowed to take one step before hitting. This lesson trains adjustment steps and the ability to choose positions.

Lesson five — close your eyes: close your eyes when the racket has passed the ball, and guess where the ball lands. This lesson teaches you

a feel for the ball's path, something that data cannot teach.

Lesson six — counting rhythms: count out loud the four beats of the stroke when practicing slowly. This is the only article in this list that corrects the sequence order, and it is the most important.

16.4 A four-week training schedule

Week one: only do the rhythm counting exercise and the three-finger exercise. The goal is the feeling, not the result. Don't care where the ball goes.

Week two: add frozen legs and dead ball. Start paying attention to the difference between a leg shot and a legless shot.

Week three: add one-step exercises and closed-eye exercises. This is the most frustrating week, because you will play worse than last week. That's a sign you're actually changing something.

Week four: go back to playing normally and note how it feels. Compare with the first week. If you see a softer shot and the ball goes farther, you've found the sequence. If not, go back to week one and take it even slower.

Four weeks is not enough to change a blow that has been building for years. But it's enough for you to know where you stand, and knowing that is half the battle.

The Art of Modern Tennis

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