

Bio – Mechanics of Putting

The common golf biomechanics principles necessary to understand golf technique are stability, Newton's laws of motion (inertia, acceleration, action reaction), lever arms, conservation of angular momentum, projectiles, the kinetic link principle and the stretch-shorten cycle.

Paul Hurrion is a Biomechanics expert from England that specialises in putting, he is Pdraig Harrington's long time putting coach as well as coaching Rory Macilroy for a number of years and many other tour players.

In 2008 I took a course in the biomechanics of putting and spent two days with him learning his thoughts on putting. Even though today I would teach a slightly different style to what I learnt that day he had a vast knowledge on the subject and many thoughts that would certainly help any player improve their putting.

In this blog I am going to share with you the key points from my notes which I still use today when assessing and helping a player to improve their putting. I haven't listed all the requirements but hopefully the points I have decided to highlight will give you a few new ideas on what the best putters work on in their stroke.

Setup Position Down the Line

If you can get in the right position to start with putting becomes a lot easier. In the image below Paul Hurrion explains some of his key thoughts regarding setup.

Neck Angle

In order for the shoulders to rotate on the correct plane it is important that the top of the shoulders and neck create a straight line. This will promote the shoulders to work more up and down and less around creating a simple slightly arcing stroke.

Linked to this your face should be near to parallel with the ground and the nose pointing straight down. This allows the putt to be viewed correctly from above and to aim the putter accurately.

Should the eyes be directly over the ball?

It is commonly taught that the lead or front eye should be directly over the ball. I don't think this is far off the mark but there is just a little bit more to it than that. All players are actually a little different the key is to find where your ideal position is. Some will putt better with the ball a little inside the eye line and other a little outside. In order to test where the best position for you is place 6 balls in a straight line with a few cm gap in between each ball. Now setup to the first ball in your normal putting position and look up the line of balls. You may be surprised when you look up the line of balls that they create a slight curve. This means that you need to adjust your eye line to either more inside the ball or more outside. Once you have found the correct position the balls will create a straight line allowing for better perception and balance.

How to find the correct grip pressure when putting

Hold the putter with your usual putting grip and then lift it so it is now parallel with ground. Slowly relax your grip until the toe or end of the club starts to drop at the point the putter head starts to fall this is the ideal grip pressure.

Take the putter back and through the same distance

It is important to take the putter back and through the same distance according to Hurrion. If we take the putter back too far in the backswing and then shorten the follow through we will tend to decelerate through putt. If the follow through gets much longer than the backswing we will then end up accelerating too much through

the putt. A balanced stroke in terms of length allows the acceleration of the putter to be controlled making centre contact, speed and face control more consistent.

“I’ll tell you why putts go in,” said 1959 US PGA champion Bob Rosburg. “Because the old National Open Champion in the sky puts ’em in.”

Dr Paul Hurrion would beg to differ. Since 1997 – when he found time between getting down to scratch to complete a PhD in sports biomechanics – the 42-year-old has dedicated his life to proving there is a bit more to holing a putt than divine intervention. His application of science to a subject matter often associated with luck and superstition has led to golf’s most sophisticated putting analysis software, Quintic Ball Roll Technology, and a better understanding of what makes a putt run true. It has seen him lecture the game’s foremost minds on what actually happens when putter meets ball. Hurrion’s work and approach has also helped some of the biggest names on the planet, including Rory McIlroy, Henrik Stenson and Padraig Harrington.

“My underlying philosophy is that I want to give the players I work with – pro or amateur – the ability to become their own coach,” Hurrion explains. “With putting, that’s not straightforward. If you slice a drive it is relatively easy to pinpoint why; but if a putt misses right it could be through anything from strike point, sidespin, misperception of line to a misread or a spike mark. If we can grow the player’s awareness of why it misses, they can start to become their own coach.”

This principle is at the core of the Sutton Coldfield putting studio Hurrion has created. At its centre is a dead flat putting mat, designed to eliminate as many variables as possible. It is also very quick, stimping at around 16, “to tighten the margin for error,” says Hurrion. As the player strikes the putt, Hurrion’s Quintic software captures the action at 360 frames per second. The putter face is monitored just before and after impact, with the ball’s roll tracked for 16 inches after the collision. Six other cameras, positioned around the room, film the golfer, ready to expose any sinister sway or pernicious peeking. Force plates are available to check stability.

“In this environment we can get to the heart of why a player misses a putt,” Hurrion continues. “The parameters captured by the system tell us exactly what went wrong. With time and application, we get the player to the point where their awareness of which parameter caused the putt to miss grows. One putt may miss left because of a slight heel strike, the next from the creation of a little hookspin. Eventually the player will be able to sense the differences between the two... and know what they need to work on.”

Hurrion agrees Quintic Ball Roll Technology is basically a launch monitor for putts. “I think what Quintic has done is given us a very good understanding of the optimal launch characteristics of the putted golf ball, and what it needs to do to achieve true roll as soon as possible,” he argues. “We know a degree of face loft at impact, giving a 1.5-degree launch angle into the ball, is about ideal, giving true roll within about 10 per cent of the ball’s journey. We know the face contributes 92 per cent of the ball’s

starting line, and a face angle one-degree off square at impact is enough to miss from eight feet.”

Of course, in the real world putts are holed under pressure and on top of grass; in some respects, the sterile feel of the studio appears to bear little relation to the reality of putting. It’s a point Hurrion both accepts and refutes. “Of course golfers need to be mentally tough. But in my opinion, confidence in your technique is going to put you in your best mental state, and give you your best possible chance to execute. I think any psychologist would agree with that. Look at the England cricket team; they worked for years on being mentally tough, but if you’re playing across the line when Brett Lee is hurling it down at 90mph, what chance do you have?”

“After all, if you can only hole four out of 10 eight-footers in these perfect conditions, how would you expect to hole that putt when it matters?”

The physicality of putting

Hurrion’s background in biomechanics ensures his focus is as much on the golfer as the putter and ball. “I like the putting stroke to be as natural as can be, with no manipulation,” he asserts. “Probably 95 per cent of that is down to the quality of your set-up. Get that right and you can promote instinct and flow. Addressing the ball well means no need for manipulation during the stroke, which permits consistent quality.”

For Hurrion, this starts with stability, and this is why he uses underfoot force plates to scrutinise the golfer’s balance during the stroke. “We have some footage of Crenshaw, shot from overhead, and he just didn’t move. Tiger, in his pomp and even now, looks physically impressive, so robust; good luck trying to push him over as he addresses a putt. If you start moving around, up-and-down, back-forward or left-to-right, it’s so much harder to return the club to a consistently correct impact position.”

Hurrion uses balance training aids like force plates and ProStance, but insists this is something any golfer can work on, any time. “You need strength to stay still,” he argues. “Walking in bare feet – getting all those foot muscles working – is a good start. So are daft exercises like standing on one leg, eyes closed, for 20 seconds. “Why not stand on one leg for a couple of minutes while you brush your teeth? Sounds silly, but these things help.”

There are hallmarks of Hurrion’s favoured address – seen in alumni like Stenson and Harrington. A wide stance gives a stable base; the putter shaft and forearms form a line. Hands fall below the pivot point, basically the rib cage. But there are a couple of

areas where he feels flexibility is acceptable, or even desirable. “I still believe in these rules, but over the years I’ve become a little less dogmatic about applying them,” Hurrion accepts. “Take face loft at impact. We know one degree provides the ideal ball roll. Phil Mickelson, Pádraig Harrington and Zach Johnson all achieve that, but Phil does it with a forward-leaning shaft, Pádraig with a neutral shaft and Zach with a backward-leaning shaft – he has – 1 degree of loft on his putter. So long as their set-ups let them achieve consistency, I can accept it.

“Then there is probably the worst piece of putting advice – ‘eyes over the ball’. Golfers see a straight line from different head positions. Justin Leonard, for example, sees straight from inside the ball-hole line. Rory sees it from outside. Nicklaus was dead on top. Everyone is different, and this perception of square should govern your head position.” Today, Hurrion is considered one of the game’s true putting experts. He gives regular putting clinics for the PGA and is a member of the Titleist Performance Institute’s Advisory Panel. That a host of tour stars have sought his opinion has also lent his approach much credibility – none moreso than the first big name he worked with – Pádraig Harrington.

“I began working with Paul in 2002,” the triple major champion recalls. “I was already a good putter but I wanted to know more about what I was doing to make myself more robust. I realised straight away he was scientific, thorough and methodical in everything he did, and that’s what attracted me to him. “Originally, I’d create different feels in my stroke and he would calibrate them, telling me which worked and which didn’t. From there, we have basically kept identifying and refining what works for me. I like the fact he is flexible; he doesn’t preach a method, so much as focus on what makes a player line up the best and get their best roll. My own stroke is unorthodox – I hang back a bit because I see the line better that way, and use a relatively delofted putter. But when Paul’s science says the function is good, it’s easy to believe in it.” Harrington has just returned to the winner’s circle for the first time in four years after triumph at the Indonesian Open – a victory he believes is testimony to this approach. “I’ve actually struggled with my putting this year. But during the Dutch Open I went to see Paul and all my measurements were very good. It showed me my problems were not technical. The only place it could be going wrong was my mental processes. So I rededicated myself to those, and it’s paid dividends.”

Add to Physics section

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Ball Roll v2.4 (Ball Only)

Ball Roll v3.4

Ball Roll v4.4

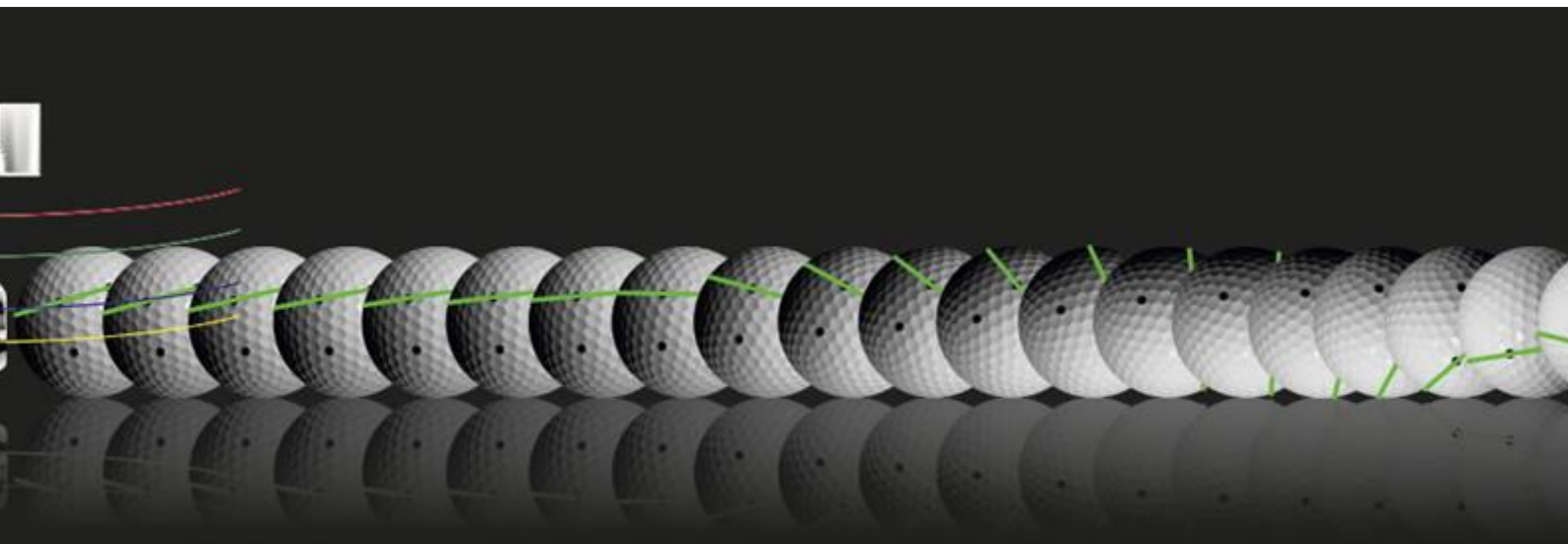
Ball Roll v4.4 Research System

Ball Roll Overhead Putt Tracker

Ball Roll Product Table

and Facility Requirements - Quintic Ball Roll

and Facility Requirements - Overhead Putt Tracker



ing Analysis Systems

Quintic Ball Roll Systems have been designed to meet the analytical needs of our worldwide clients. Quintic Ball Roll uses a 360-degree Camera (360 - 1080 frames per second) to track the putter* and golf ball throughout the impact zone, of either a right hander or left hander.

Each system includes the latest Quintic Ball Roll software and all the hardware a client requires and comprehensive user support is provided. Quintic Ball Roll Accreditation Programme. Every system can be used easily indoor (minimum 3 meters by 4 metres required) or outdoors on any putting surface.

Quintic Ball Roll is used worldwide for golf instruction, club fitting and club recommendation as well as for research and development. A large number of golf stores around the world use the Quintic Ball Roll System to offer superior custom putter fittings.

Professionals also use the system for coaching and custom putter fitting - not just from a lie, loft, length perspective but also to measure swing weight, grip options, alignment lines, colours and different head shapes, including blade vs. mallet, centre shaft vs. heel shaft, toe heavy...

Quintic Ball Roll is also used as a golf training aid for personal practice by tour professionals and amateur golfers alike. Quintic is very simple, giving tangible results instantly for the player. Quintic is simple to calibrate and set-up... upon hitting a putt, as soon as the ball is struck, all the required information appears instantly on screen. It's that simple! Quintic measures the effect of impact dynamics on the ball and club, which at the end of the day is what truly matters...

[Quintic Ball Roll v2.4 \(Ball Only\) System](#)

[Quintic Ball Roll v3.4 System](#)

[Quintic Ball Roll v4.4 System](#)

[Quintic Ball Roll v4.4 Research System](#)

Quintic Ball Roll Overhead Putt Tracker

What causes the golf ball to leave the putter face with too much loft?

Is it the attack angle, shaft angle or too much static loft on the club at address or even a change in dynamic lie angle?

What effect does the club head rotation have on start direction, side spin, ball rotation?

What is the effect of an off centre strike on ball performance, how much does a putter twist at impact?

Roll v3.4, v4.4 and 4.4 Research only

Quintic Ball Roll examples below help explain how the software can be used for club fitting, coaching and research and development.

Dynamic Lie Angle

Dynamic Rotation

Dynamic Twist - Toe and Heel Strike

Clubhead Speed / Impact Ratio

Dynamic Hunch Angle

Dynamic Back Angle

Dynamic Loft Angle

Dynamic Lie Angle

Dynamic Roll / Spin

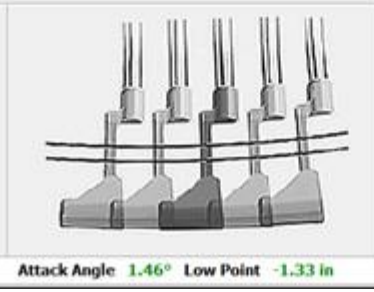
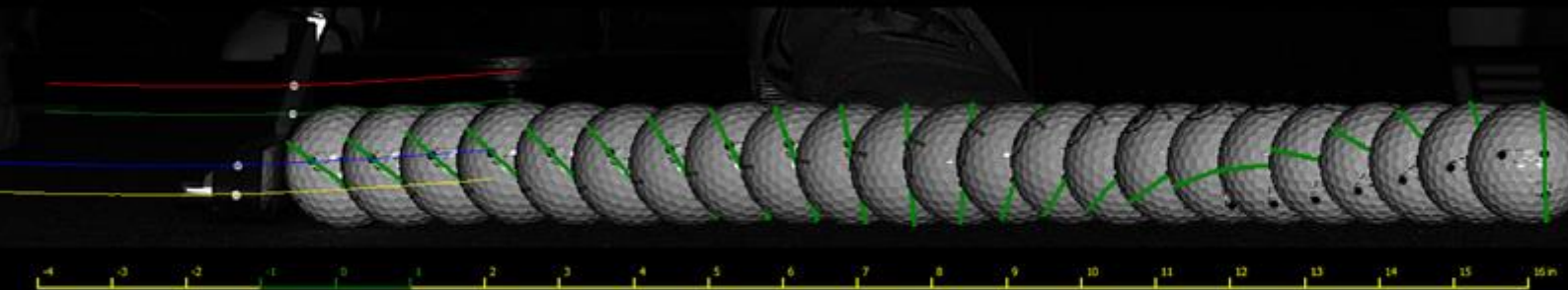
Dynamic Hitting Summary

Add To
○ Add
○ Remove
File will be saved as:-

Impact Club Speed	3.16 mph
Pre-Impact Acceleration	Accelerating (2.1 mph/s)
Shaft Angle	0.06°
Attack Angle	1.46°
Face Angle	-0.24°
Face Rotation (Closing)	-30° /sec
Path (In-To-Out)	1.1°

Impact Ball Speed	5.32 mph
Impact Ratio	1.69
Launch Angle	0.66°
Forward (+) Back (-) Spin	+35 rpm
Cut (+) Hook (-) Spin	-29 rpm
Start of Forward Rotation	0.00 in
Zero Skid after	26.0 in

The Launch Monitor for Putting...



Lie Angle 0.38° 0.75° (-0.37°) Shaft Angle 0.06° -0.30° (+0.36°) Attack Angle 1.46° Low Point -1.33 in Club Twist 0.01° Opening