Investigation into ten different 'Ping Anser style' putters and the effect they have on the golf ball launch, speed, spin and roll.

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Purpose

Many of today's putters are still based on the original 'Ping Anser', designed originally by Karsten Solheim, a Norwegian-born engineer who worked on jet fighters and missile guidance systems after World War II. In March 1967, Solheim was granted a patent for what would become perhaps the most iconic putter design the game has ever known.

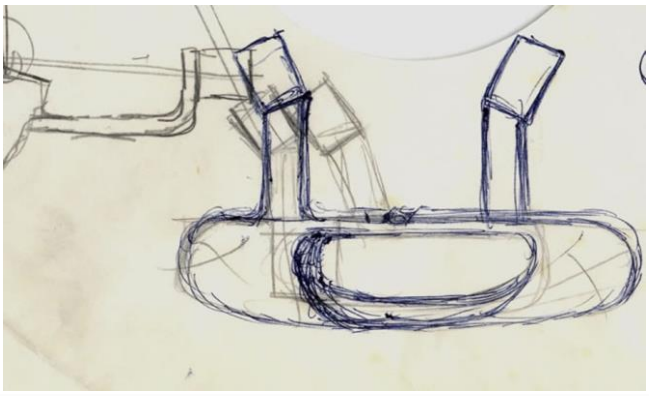

Figure 1: Karsten Solheim's original drawings of the Ping Anser putter.

Solheim's patent expired in 1984, leading to a number of copycat designs from different manufacturers that continue to this day. The Ping Anser-style putter is utilised by tour professionals the world over, along with millions of everyday golfers. The following study investigates the difference on the ball impact parameters when comparing ten 'Ping Anser' style putters, each from a different manufacturer. All ten putters used for the study are available today for purchase from any major golf retailer. Using a repeatable putting stroke on a robot, how does the different materials, overall weight, centre of gravity location, insert technology, moment of interia, head weight, swing weight and shaft affect the golf ball and club head during impact? Even though the basic design is the same to the 'lay person,' how differently do the putters perform?

Figure 2: George Archer became the first golfer to win a major using the above Ping Anser putter when he was victorious at the 1969 Masters.

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Methods.

The Quintic Ball Roll v4.4 Research system (Quintic, 2019) uses a high-speed camera (1080 fps) to measure factors such as ball speed, club speed, side spin and face angle at impact, without any attachments to the club. The ten different putters were set to 2 degrees static loft (using a digital 'Mitchell' Loft and Lie Machine) and the shaft was clamped vertically in the robot. Twenty putts were recorded per putter condition with an impact ball speed of 6 mph ± 0.1. All putters had the grip removed (metal shaft clamped into the robot). Each ball was aligned with the manufacturer's mark for the centre of the putter face for the horizontal axis (heel / toe) and in the middle for the vertical axis (top / bottom). The same ball was used for all tests. All putts were analysed using a straight back and straight through putting stroke. The robot was released using an electromagnetic release at the top of the backswing to control swing length and therefore impact speed. Any oscillations of the club head caused by the shaft were damped prior to release of the putter.

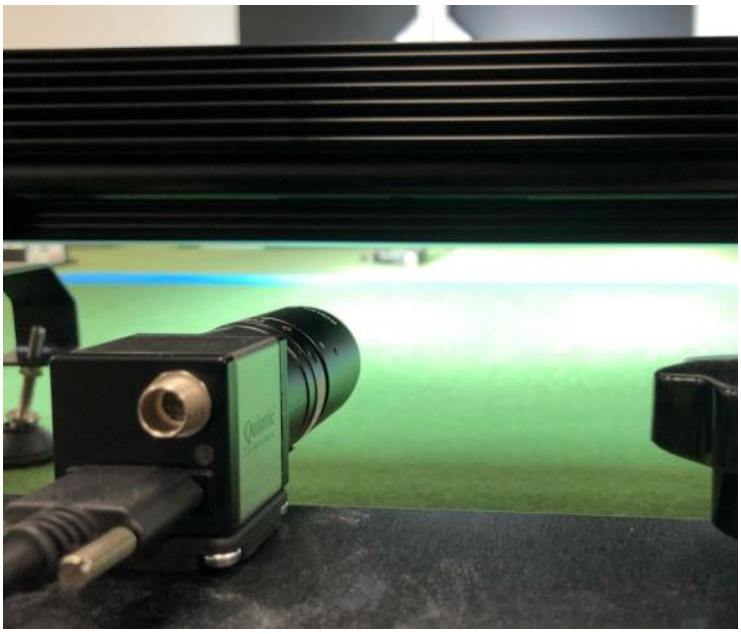

Figure 3. Quintic Ball Roll v4.4 Research Edition (1080 fps)

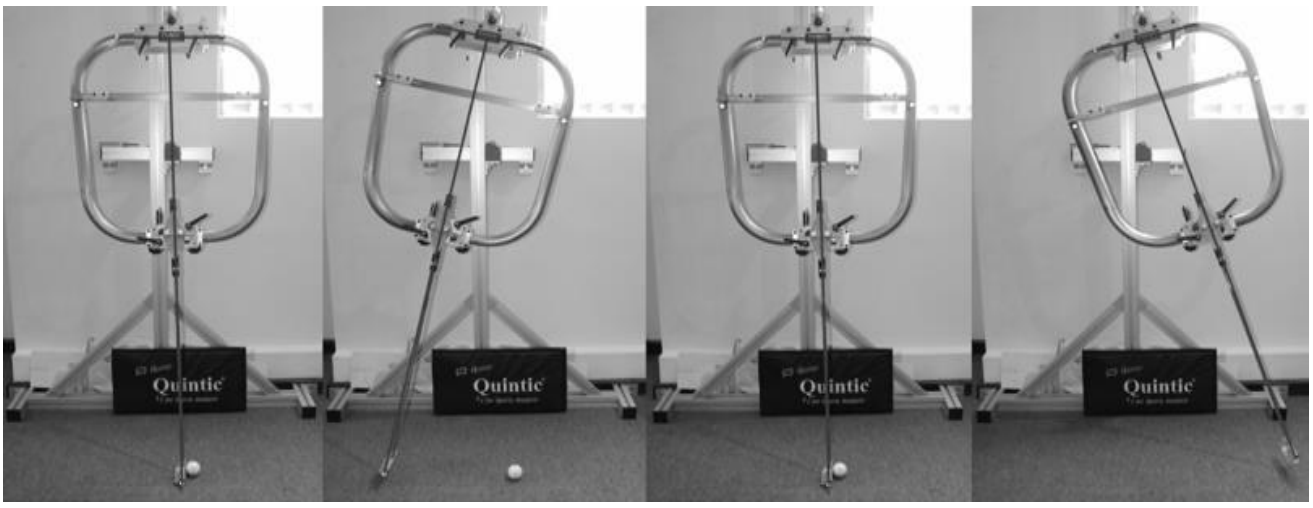

Figure 4. Putting robot in use.

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Results

Static Loft Putter n=20	Face Angle (deg)	Pre-Impact Face Rotation (deg/sec)	Twist At Impact (deg)	Path Impact (deg)	Impact Ball Speed (mph)	Impact Club Speed (mph)	Pre-Impact Club Accel (mph/s)	Post-Impact Club Accel (mph/s)	Impact Ratio	Shaft Angle (deg)	Lie Angle (deg)	Attack Angle (deg)	Low Point (ins)
A	0.11	9	0.01	0.2	5.97	3.81	-1.6	4.2	1.55	0.23	0.13	0.84	0.73
B	0.03	1	0.16	0.6	5.94	3.44	-1.0	6.8	1.73	0.12	0.08	0.96	0.89
C	0.07	1	-0.03	-0.5	6.01	3.55	-0.1	6.3	1.69	0.28	0.17	1.03	1.04
D	0.04	4	0.11	0.3	5.94	3.59	-0.6	3.7	1.66	0.06	0.20	1.02	0.75
E	0.03	2	0.12	0.1	6.13	3.78	-0.3	4.3	1.62	0.06	0.11	0.89	0.73
F	0.01	-2	0.02	0.8	5.89	3.64	-0.6	3.4	1.62	0.16	0.07	1.05	1.09
G	0.08	-3	-0.06	-0.2	6.10	3.89	-0.9	3.3	1.57	0.10	0.18	0.89	0.88
H	0.04	8	0.18	0.4	6.04	3.71	-1.2	3.1	1.65	0.19	0.10	0.87	0.92
I	-0.01	8	0.17	0.7	6.03	3.56	-0.5	5.5	1.70	0.11	0.07	1.10	0.69
J	0.08	5	0.28	0.5	6.00	3.49	-0.4	3.3	1.72	0.08	0.21	0.89	0.75
Range	**0.12**	**12**	**0.34**	**1.3**	**0.16**	**0.45**	**1.5**	**3.7**	**0.18**	**0.22**	**0.14**	**0.26**	**0.40**

Static Loft Putter n=20	Zero Skid (ins)	Forward Rotation (ins)	Forward/ Back Spin (rpm)	Side Spin (rpm)	Launch Angle (deg)
A	32	2.74	-21	-7	2.29
B	24	0.00	23	-21	0.64
C	26	2.87	-22	1	0.47
D	20	0.00	17	-19	1.60
E	36	4.44	-44	-14	2.82
F	29	1.54	-10	-5	1.41
G	24	0.00	42	5	1.24
H	35	4.72	-44	-16	3.12
I	32	3.59	-47	-10	2.75
J	28	0.00	15	-25	2.22
Range	**16**	**4.72**	**89**	**30**	**2.65**

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Summary / Findings:

- **Robot testing shows a very small range in the clubhead parameters, for example Face Angle, Face Rotation, Path, Shaft Angle, Lie Angle, Attack Angle and Low Point. As you would expect the robot delivers each of the ten clubs in a very consistent manner.**
- **6 of the 10 putters twisted open >0.1° as a result of impact.**
- **4 of the 10 putters had minimal face twist <0.1° as a result of impact.**
- **Putter J had the largest face twist 0.28° opening as a result of impact despite being struck in the manufacturers centre line.**
- **The Putter's 'Face to Path Angle' was effectively zero throughout the putting stroke given the putter was clamped into the robot. The resulting side spin ranged from +5 to -25 (30rpm) is due to 'gear effect' and the clubhead twist at impact.**
- **Impact Ratio (Ball Speed divided by Clubhead Speed) had a range of 0.18 (1.73 – 1.55)**
- **Therefore, in order to achieve a 6mph ball speed the clubhead speed ranged from 3.44mph to 3.89mph (A range of 0.45mph Clubhead Speed).**
- **Forward / Backspin had a range of 89rpm (-47rpm Back spin to +42rpm Forward spin)**
- **6 of the 10 putters imparted backspin. The highest value is for Putter I with -47rpm.**
- **4 of the 10 putters created forward spin. The highest value is for Putter G with +42rpm**
- **The point of forward rotation ranged from 0 to 4.72 inches.**
- **Despite all ten putters having 2 degree static loft and the same shaft angle (robot clamped vertically), the ball Launch Angle ranged from 0.47° to 3.12° (2.65°)**
- **As a result of inconsistent launch and spin, the distance to True Roll / Zero Skid ranged from 20 to 36 inches**
- **All ten 'Ping Answer' style putters had the same club parameters at impact (swing path, speed and acceleration profile) but the different putters produced significantly different ball impact parameters.**

Practical applications

The best example of the above results are seen when a professional golfer changes manufacturer contracts. In many cases, the golfer loves and is used to playing with Manufacturer's A model of putter. Despite Manufacturer B making an exact copy (dimensions, weight, colour, alignment guides, grip), the putter from Manufacturer B never performs the same. It is normally only a matter of time before the player reverts to the original model from Manufacturer A!

This is unsurprising, given the results of this study. The specifications of the putter, such as Total Weight, Swing Weight, Head Weight, Shaft as well as putter style will have an effect of the performance of the golf ball. This is due to the fact that ball speed, impact ratio, launch angle and spin can significantly change due to the different putter and shaft specifications. These parameters all affect the point of true roll, which then in turn effects ball speed and in particular how the ball breaks over the same 2 percent slope. Despite the player hitting identical putts (ball speed) the lines are different and they can't explain why! The putter may look and feel the same but the golf ball reacts differently. The ball no longer matches what they are accustomed to seeing. The performance of the golf ball (which, at the end of the day, is what matters) can change significantly despite the same putter impact parameters.

When fitting a putter, the length, lie, loft and style may be the same, but unless you are measuring the ball speed, launch and spin, are you really fitting a putter correctly? I would always encourage a player to have their current 'gamer' measured using all the parameters within Quintic Ball Roll (both club and ball). Before any new putter is chosen, you must compare the two sets of numbers. You may well have you improved

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centre contact and putter face alignment, but by changing impact ratio, roll or launch angle for example you will alter the point of true roll.

You can't predict what is going to happen at impact.
Quintic measures the golf ball.
Ball Speed, Launch and Spin are key!

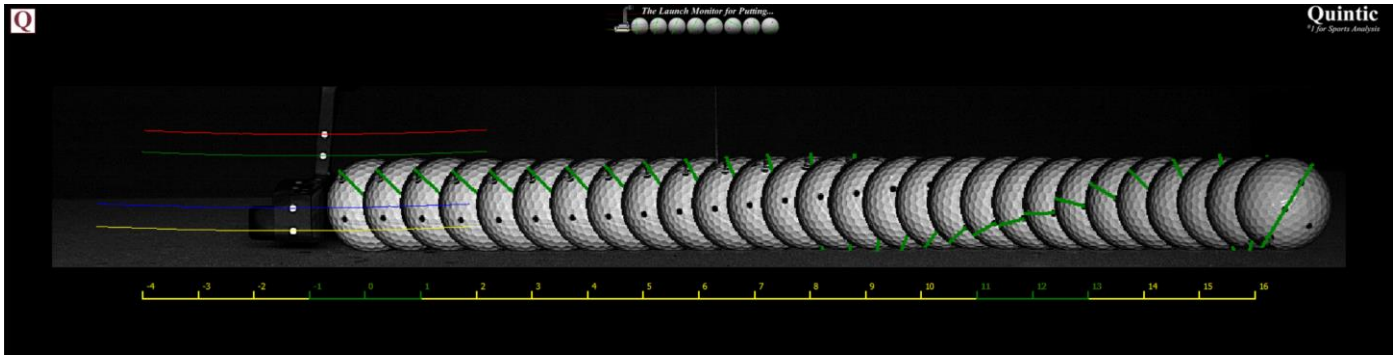

Figure 5. Quintic Ball Roll v4.4 Research Edition – Composite Image (1080 fps)

Reference

Quintic (2019). Quintic Consultancy Limited, Unit 8, The Courtyard, Roman Way, Coleshill, Birmingham, B46 1HQ (UK) (www.quinticballroll.com)

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