DRIVER TEST STUDY

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IN SUPPORT OF MASTERS PROGRAM

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INTRODUCTION

Having done many hundreds of driver fittings over the years, I have always had a sense that most golfers would do better with drivers that were a bit shorter. The introduction of the Trackman Launch Monitor into my shop in early 2011 has enabled me to gain even greater amounts of reliable datA for every fitting. I decided to do a driver length study based on the data which I am able to capture thanks to Trackman technology.

The main objective of the study was to evaluate the accuracy and distance of golfers in different handicap groups using different length drivers. The driver lengths chosen for testing were 43", 44", 45" and 46". The same driver head was used for each shaft length and the head weights were adjusted at each length (see chart) This was done to maintain a D-0 – D-1 swing weight. Participants in the study were given the option of R-flex shafts (245 cpm with a 5" clamp) or S-flex (265 cpm with a 5" clamp) Participants were divided into four handicap groups: 0-8, 9-15, 16-23 and 24-32.

Each participant was given the different length drivers in random order and hit 8 shots with each driver length.

The shafts used were Accra AC 55 gram for the R-flex and Accra AC 65 gram for the S-flex. The head used was a KZG GF460 (10.5 degree) Golfers with swing speeds 92 mph and under were tested with Bridgestone E6 balls and those with higher swing speeds used Bridgestone B330-RX balls.

In situations where a test golfer hit a bad shot that was such an outlier relative to his other shots, this shot was discarded. To maintain a level playing field and to keep the test as consistent as possible, the worst shot from the three other driver lengths was also discarded.

Parameters of Testing:

- 8 shots each with 43", 44" 45" and 46" drivers
- Various lengths given to participants randomly
- Two shaft stiffnesses were used – R flex and S flex, based on club head speed of each participant
- Head weight screws were changed for each driver length to maintain consistent swing weight for each driver length. SW's of D zero – D one were maintained. A difference of 1 Swing Weight was not considered significant
- Dispersion and distance were key factors
- Participants were divided into 4 handicap categories: 0-8; 9-15; 16-23; and 24-32 (15 or more participants in each group)

DEFINITIONS FOR DRIVER STUDY

Best Dispersion:

Best dispersion is based on the visual grouping of the eight shots for each driver shaft length, as displayed by Trackman Software. Any group of shots closest to each other as well as closest to center of the fairway is deemed to be best dispersion.

Best Distance:

This figure is the overall total distance as given by Trackman data of the four Test shaft lengths.

Best Face Impact:

Centeredness of impact was recorded using numerical values. The face of the driver head was divided into a grid where the center of the face was valued at 10. The grid used was divided into ½" x ½" units with values assigned to each unit. As the impact was further from the center, shots were assigned lower values. For each hit the face was sprayed with a product called "Markit" This is a white powder that clearly shows the impact of the ball on the face, but has no effect on ball flight/spin rate. The impact location was checked after each hit and the numerical value of the impact recorded. The maximum attainable value for the test for each driver length, based on 8 shots was 80 (8 shots times 10). *See figure one.*

Best Smash Factor:

Smash Factor as calculated through Trackman Technology.

Best Overall:

This is a combination of accuracy and total distance with greater value placed on accuracy.

(Note: The majority of the high handicap golfers (24-32) showed very close results with all the drivers. Often the best was only by a slim margin. In this group almost all expressed a definite discomfort with the extra length.

Yardage Differential:

This is determined by subtracting the total distance of the test club which hit the longest minus the total distance of the club, which had the best dispersion.

Yardage Gain:

This number is the average difference in the distance between the 46" driver and the 43" driver. A "plus" number indicates a gain with a 46" driver and a "minus" number is a distance loss with a 46" driver versus a 43" driver.

DRIVER TEST SUMMARY

Before beginning the driver length study there were several questions the answers to which I hoped would become clear. The main questions were:

1. What is the effect of club length on clubhead speed?
2. What is the effect of club length on smash factor?
3. What is the effect of club length on distance?
4. What is the effect of club lengths on dispersion/accuracy?

The results of the study have led to the following conclusions:

Question 1 -- What is the effect of club length on clubhead speed?

Using the 43" driver as a baseline there was an increase in clubhead speed as the lengths increased. The 44" driver, on average, across the four handicap groups showed an increase of 0.74 mph. The 45" driver showed an average increase of 2.09 mph and with the 46" driver there was an average increase of 3.5 mph.

Question 2 -- What is the effect of club length on smash factor?

For this category, I looked at the results from a perspective of the shorter drivers (43/44"), average length drivers (45") and long drivers (46"). The results showed with the shorter drivers 80-93.3% of participants had the best Smash Factor across the four handicap groups. With the average driver length of 45" it ranged from 5.6% to 20%. For the 46" driver it was zero per cent for all handicap groups, except the 16-23 groups, where it was 11.1%.

Without a doubt the majority of the test participants had better contact with shorter drivers.

Question 3 -- What is the effect of club length on distance?

From the Summary Tables for each of the four categories, we can see that some handicap groups gained distance with a 46" driver over a 43" driver, while others lost distance. While some individual golfers had very significant gains with a longer driver there were others that had significant losses with a 46" driver versus a 43" driver. On average the highest net yardage gain among the four handicap groups was in the 16-23 handicap group with an increase of 8.85 yards for 55.6% of the group.

Among the four handicap groups, the most distance lost was an average of 13.95 yards. This too was in the 16-23 handicap group.

From the data collected, I would conclude that although longer drivers tend to produce more clubhead speed, they do not produce significantly longer drives.

Question 4 -- What is the effect of club lengths on dispersion/accuracy?

To simplify the results, I grouped the driver lengths into short (43”/44”) average (45”) and long (46”).

Across the four handicap groups, the short drivers showed the best dispersion patterns. From 56-76% of participants had the best dispersion patterns with the short drivers, while 22-33% were best with a 45” driver and from 0-22% did best with a 46” driver.

The 0-15 handicap golfers (a combination of the 0-8 and 9-15 groups) had better dispersion patterns with the shorter drivers. In this range zero per cent did best with a 46” driver. In the 16-32 (a combination of the 16-23 and 24-32 groups) handicap range most did better with a short driver, but there were a few participants who did better with a 46” driver.

One piece of data that I found very interesting from the study was angle of attack. In all four handicap groups the ratio of golfers with a positive angle of attack to those with a negative angle of attack was quite consistent. It was roughly a 60/40 split. In the lower handicap group the negative angle of attack was quite low while higher handicappers showed steeper angles of attack. Along with the steeper angle of attack came higher spin rates that would not be considered optimum for the launch angle. I think those golfers looking to add a few yards to their drives would benefit from a more positive angle of attack but I suspect that this critical element is not being keyed in on because of a lack of awareness of this critical factor or the absence of the tools to measure it.

CONCLUSION:

If we look at a combination of driver distance compared to dispersion, I would conclude that when fitting for driver length, the number one priority should be dispersion. There was simply not enough distance loss using shorter drivers to warrant fitting someone to a longer driver simply to pick up a few extra yards. The difference in distance between a shorter driver and a longer driver is often not that great. The study clearly indicates that each golfer is unique and should be uniquely fitted for driver length and that a thorough driver length fitting is an absolute must. From a fitting perspective, the fitter should not be afraid to go shorter with drivers. Fit the golfer firstly to the length that gives him or her the most control, secondly fit the golfer to a length at which he or she is comfortable and confident. The distance will take care of itself.

RESULTS COMPARED TO MATHEMATICAL MODEL

For every 1 mph increase in clubhead speed, we should see approximately a 2.5 yard increase in distance, assuming good launch conditions. If we examine the four handicap groups, we can easily calculate the expected increase in clubhead speed and distance, for a 46" driver vs. a 43". By using the formula v = rw the increase in clubhead speed from a 43" driver to a 46" driver should be close to 7%. Based on these calculations, the table below reflects those values in comparison to actual results.

HCP	Average Clubhead Speed	Expected Clubhead Speed Increase	Actual Increase	Expected Distance Increase (Yds.)	Actual Increase (Yds.)
0-8	93.7	6.56	**3.86**	16.4	**5.6**
9-15	90.3	6.32	**3.94**	15.8	**7.56**
16-23	85.07	5.59	**2.98**	14.88	**8.85**
24-32	76.40	5.35	**3.2**	13.38	**8.68**

Every participant across the four handicap groups showed an increase in clubhead speed with a 46" driver vs. a 43" driver. However, the amount of increased clubhead speed fell well short of the anticipated increase based on a mathematical formula. The closest any group came to achieving the mathematical increase was the 9-15 HCP group which achieved 62% of the expected increase. The 16-23 HCP group achieved the lowest increase at 50% of expected.

In terms of increase in distance, the 24-32 HCP group had the best increase in distance, achieving almost 65% of expected increase while the 0-8 HCP group had the lowest, achieving only 34% of expected increase.

The test results indicated that golfers across all four handicap groups were not able to achieve projected clubhead speed increase or projected distance increase:

Once the golfer has a club length that goes beyond his/her ability to produce effective clubhead speed the golfer's ability to control the club head is greatly diminished. The golfer has trouble first of all with maintaining center impact but also is not able to deliver the club face to the ball that is optimum relative to his club path.

Smash factor was also higher with shorter clubs. In fact, the results showed that across all four HCP groups, 86.7% of participants had higher smash factors with 43" and 44" drivers. This indicates that at shorter lengths the average golfer has better control of his/her club. If the golfer cannot achieve a quality impact with a longer driver, then they cannot take advantage of a higher clubhead speed to produce the distance expected.

Some individuals are able to take advantage of a longer driver, but most are not. They simply cannot create good launch conditions with a longer driver. In some cases, there is even a loss of distance. Driver distance comes down to properly fitting each individual with the longest club he/she can effectively control that yields the most distance with good dispersion.

Recommendation: If Trackman were able to develop software that would rate the dispersion of any given driver by taking into account dispersion relative to center of fairway and the relative proximity of one ball to another in any given group of balls, it would be very useful as a teaching and fitting tool. I believe it would be much more effective than the average side total. Something similar to the Trackman Combine System, where distance and dispersion are factored in would be a beneficial tool.