The Woods Effect: The Use of Data Analytics in Golf Training

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Introduction:

Over the past twenty years, the sports world has become more and more attached to the idea of predictive analytics. Since then, statistics have spread like wildfire across the sports landscape, as teams took another look at their methods of evaluating players in an effort to gain a competitive edge on the competition. One of the last frontiers of this statistical revolution is in a sport that is very steeped in tradition and resistant to change - golf.

As technology and analytic thinking has advanced, the number of ways in which a golfer can measure their performance has greatly increased. Someone can go onto the PGA Tour website and find plenty of stats to measure each aspect of a golfer's game. Every golfer on tour has his own strengths and weaknesses. For example, Rory McIlroy excels at hitting the ball far and historically has been a weak putter (Bleacher Report). On the other hand, Kevin Kisner is a fantastic putter, but cannot hit the ball very far relative to other tour players (Golf Digest). Each of these players likely has a different strategy for playing the same golf course. Furthermore, there are some courses that will favor McIlroy's distance, and others that are more beneficial for Kisner and his putter.

PGA Tour players do not just play in tournaments; they also spend a lot of time practicing. During these training sessions, golfers typically focus on different aspects of their game in order to keep pace with and/or gain ground on the rest of the field. Players have different strategies on how to improve their games; the most logical idea would be to improve the areas of their game that are the most lacking, as there is much more room to get better. In order to do this, golfers must identify their weaknesses; an obvious way to do this would be to use the plethora of advanced statistics to see where on the course they are using strokes. These metrics could help a

player identify the specific areas of their game that need work, as opposed to just guessing based on how they think they play.

This paper will be addressing whether or not the rise of analytics and metrics in golf has affected how players train and prepare at the top level. In order to accomplish this, some of the top players on tour will be examined to see if they have made any drastic changes to their golf game in recent years, and if so, if it lines up with what advanced metrics say is most important for success on the professional level. This question is important because if the golfers are not improving in the areas statistics say they should, then they are not maximizing their potential and the sport is not at the peak it could be reaching. This question will be examined under the framework of technological momentum in order to see if the technology of new metrics and analytics was enough to break the inertia of the existing sociotechnical system of golf training.

Context:

Even within the sports world, golf is particularly staid, tradition-oriented, and resistant to change. Ask any golfer, and they will tell you that things like etiquette take much more priority in golf than in sports like football. One reason for this is that golf can be played by basically anyone at any age. It is much easier for a 65 year old man to be competitive with a 30 year old man in golf than it is in more "athletic" sports like football or hockey. The average age of an amateur golfer is around 42 years old (NGF), which is much older than the average age of players in your typical pickup basketball game. In 2021, Phil Mickelson won the PGA Championship at the age of 50; no player 50 or older has ever taken a snap in the NFL (Sporting News). All this is to say that since there is an inherently larger population of older people

actively playing golf, traditions are much more important than in other sports. Golf is much more resistant to change, which makes the process of adopting metrics much longer.

This paper will analyze the elite few golfers who are talented enough to play on the PGA Tour. There are about 200 players each year who get their "PGA Tour Card," which gives them membership on the PGA Tour and the opportunity to play in its events for the next year (Golf Span). In addition, there are hundreds more who play on the Korn Ferry Tour (the "minor leagues" of golf), the European Tour, the Champions Tour (for senior players over the age of 50), and elsewhere. These players are at the top of their game; there are very narrow margins between a PGA Tour player and a Korn Ferry player. In order to maximize their potential and the opportunity to win, these players should attempt to practice the parts of their game that will best help them to win. We will see in this paper if the current practices among professional golfers are doing that.

Literature Review

The most important work relevant to this project is the 2012 paper "Assessing Golfer Performance on the PGA Tour" by Mark Broadie. In it, Broadie introduces the statistic of "strokes gained," around which this analysis is based. In 2009, the PGA Tour introduced the ShotLink system. This allowed them to track the exact distance and location of every shot taken during one of their tournaments by a PGA Tour player. This opened the door for more and more advanced and accurate statistics. Before this introduction, it was difficult to pinpoint the exact values such as average driving distance, or green in regulation percentage on shots between 175 and 200 yards away. This innovation in shot tracking allowed strokes gained, arguably the most important sabermetric in modern golf, to be introduced. The baseline for strokes gained is that

using the ShotLink data, one can calculate the number of strokes it takes an average PGA Tour

player to get it into the hole from every yardage on the golf course. After a player takes a shot,

you see the expected strokes from their starting position and finishing position to see if they have

gained or lost ground on an average player. This allows players to be evaluated on a

stroke-by-stroke basis, which is a stark departure from a hole-by-hole and even round-by-round

basis. This is the statistic around which this paper is framed; a player could/should be using this

statistic to see what they are already excelling at and what they should be looking to improve

upon.

  For example, let's say a player, Player A, is starting with a tee shot on a 480-yard par 4.

On average, it would take 4.28 shots for a typical pro to make it in the hole from that starting

position. This means that if a player played this hole 4 times, he could roughly expect to get the

ball in the hole in 4 strokes (par) three times, and get a bogey (5 strokes) once; this is a relatively

tough hole. This player hits a 300-yard drive onto the fairway and has 180 yards left. The

average PGA Tour player would make it in the hole from 180 yards on the fairway in 3.08

strokes. There is a difference of 1.2 expected strokes between the locations of the player's tee

shot (4.28) and the location of the second shot (3.08). Since it took this player one stroke to go

from the first location to the second, we would say he gained 0.2 strokes on the field from this

tee shot. This shot was better than what you would expect an average pro to do; he got it in an

ideal spot to hit his next shot at the green. This drive gave him an advantage on the rest of the

players in the tournament.

  Using the ShotLink data, Broadie was able to calculate the average strokes for all

conceivable distances while taking into account the ball's lie (is it on the tee? The fairway? The

sand trap?); this data makes up the baseline values we use to calculate strokes gained. We can

use this method to evaluate a player's acumen on all sorts of shots; you can see if they are good at driving, iron play, putting, chipping, and so on.

Theory

In order to properly evaluate this system, we will use the theory of technological momentum (Hughes, 1994). This idea highlights the faults of the social construction and technological determinism theories and merges them together into something new. Society does not solely drive technological enhancements, and new innovations do not singlehandedly change the way people think. Instead, society and technology evolve together, hand-in-hand, over time. Furthermore, once a sociotechnical system begins to move in a certain direction, it moves faster and faster and becomes harder and harder to derail. The use of this system becomes so ingrained into society that a new system that may be better overall is discarded in favor of the familiar.

I want to explore the second part of this theory with the idea of strokes gained. Currently in golf, there is a growing focus on improving driving distance. Players in the modern PGA strive to be able to hit the ball as far as they possibly can. This is a sociotechnical trend brought along by the emergence of Tiger Woods. Woods was one of the first professional golfers to treat his body like he was a professional athlete. When he emerged in the late 1990s as one of the most dominant athletes in professional sports history, it "forced the world to rethink how to build and develop a golfer" (Hennessy, 2016). Driving distance has always been an important factor in golf, but Woods's outright dominance made it the sole focus of many professional golfers. It set into motion a school of thought that the best golfers had to be focused on physical fitness and, more specifically, driving distance if they wanted any chance to compete at the top level. In the

1990s, Woods stood out for his build when compared to golfers like John Daly; now, it is almost more common to see a muscular, in-shape golfer than it is to see one who is not.

This paper's argument with the technological momentum theory is that the trend of focusing on driving distance has built up steam since it began in the late 1990s. When strokes gained was introduced in 2009, this focus had become the driving force, and the idea of using statistics like strokes gained to analyze a golfer's performance has not been able to break this momentum. This is due to the success of Tiger-esque golfers like Rory McIlroy, Brooks Koepka, and Bryson DeChambeau, all of whom focus on their physique and hitting the ball as far as they possibly can. Golfers are single-mindedly focused on chasing distance, as they believe it is the single most important factor for their games. However, using metrics such as strokes gained to analyze an individual's game and the field of professionals as a whole could be a better way to target aspects of one's game to practice and improve.

Methods

The research within this paper takes on two separate factors: what players are currently doing to practice, and what statistics say they "should" be doing. The analysis for current player goals consists mostly of player interviews through media outlets, as well as general sentiment within the golfing community. We will look at the biggest examples of player training and practice within popular media to show how they currently prepare for the week-in, week-out grind of the PGA Tour. By looking at these, we will be able to see the general trend of what players are most focused on improving within their current game. In addition, we will consider PGA Tour trends over the past thirty years, to see whether Woods has made an impact on the methods and practice for PGA Tour golfers.

To see what players "should" be focusing on most, we will be looking at academic research concerning the strokes gained statistic and what is most important to a player's success on Tour. There have been a couple regressions run on player results on the PGA Tour in order to see what aspect of a player's ability is most important for doing well as a professional; the best of these regressions use strokes gained. We will be able to use these analyses to determine whether the player's approach matches the best possible choice in terms of what is most important to focus on.

Statistics - What Should Players Be Focusing On?

There are numerous studies showing that improving your putting is the best way to increase your earnings and placement on the PGA Tour, even predating the strokes gained statistic. In 1999, Scott Berry did a simple regression of Tour player scoring with six different statistics that outlined important aspects of a player's overall skill. He found that putting skill (adjusted average putts/hole) had by far the highest correlation with overall score, far outpacing the rest of the statistics. He found that driving distance was, in fact, the least significant factor. This is, however, not a great sole measure of putting skill. The statistic used within this paper to measure putting is also very reliant on iron play; if you consistently hit shots to within 5 feet of the hole, you will naturally have less putts than a player who always hits it 30 feet away. In addition, statistics like these are not truly optimized to the same scale as metrics like strokes gained are. These statistics needed further clarification and reduced collinearity before we can come to this definite conclusion.

A later paper by Michael F. Lutes in 2012 incorporates the strokes gained statistic into a similar analysis. This paper has a similar regression to that performed by Berry, but with two

updates. First, Lutes uses the statistic of strokes gained-putting in order to more accurately reflect a player's putting aptitude. This is a better way to evaluate the player's skill on the green; it removes the impact of a player's previous shots and isolates solely how good they are at putting when compared to an average Tour player. In addition, Lutes changes the dependent variable of his regression to be the player's yearly earnings, instead of average score. This is a good change; different courses can be harder/easier, and this change helps normalize a player's performance relative to the field. In addition, it inherently puts higher emphasis on the more important tournaments such as the four majors (Masters, US Open, British Open, PGA Championship). These tournaments have higher purses and (typically) more challenging fields, and are thus more important when judging a player's relative performance.

Lutes finds that "for a one standard deviation improvement in putting skill, the average PGA TOUR golfer would gain 27 percent in earnings. Meanwhile the same magnitude of improvement in driving distance renders only an additional 14 percent in earnings" (2012). This further cements the idea that putting is the most important factor in a PGA Tour player's relative success. If a golfer had the opportunity to have an equal improvement in either putting or driving distance, they should go for putting every time.

Current Practices - What Are Players Focusing On?

Most PGA Tour players think that the most important aspect of their game is their ability off the tee. Their lean towards driving can be seen both quantitatively and qualitatively. In terms of physical prowess, players are extensively focused on lifting weights and their level of strength. In an interview, a personal trainer for many pros said that "Tiger (Woods)... brought fitness to the forefront of golf" (Wacker, 2014). This aligns with the technological momentum

theory; since Woods was such a dominant performer and was also very focused on his physical strength, golfers since his debut have sought to replicate his play by becoming equally in shape. Today's top golfers have taken this focus to the next level; players like Brooks Koepka have been known to have intense workouts even before major championships, the most important tournaments of the year. For these golfers, the gain from these exercises is worth the risk of excessive fatigue during one of their four most important golfing weekends for that season.

An extreme example of this focus would be the golfer Bryson DeChambeau, who became a lightning rod throughout the golf world in 2020. During the PGA Tour's COVID-necessitated break in the spring, DeChambeau completely reshaped his body and the way he played golf, focusing entirely on mass and swinging the club as quickly as humanly possible (McCabe, 2020). After three months, DeChambeau had gained at least thirty pounds, and was easily the longest driver on Tour. This is further proof that even to this day, Woods' influence is still prevalent, as DeChambeau essentially revamped his entire style of golf in order to skew closer to the way Tiger dominated 20 years prior.
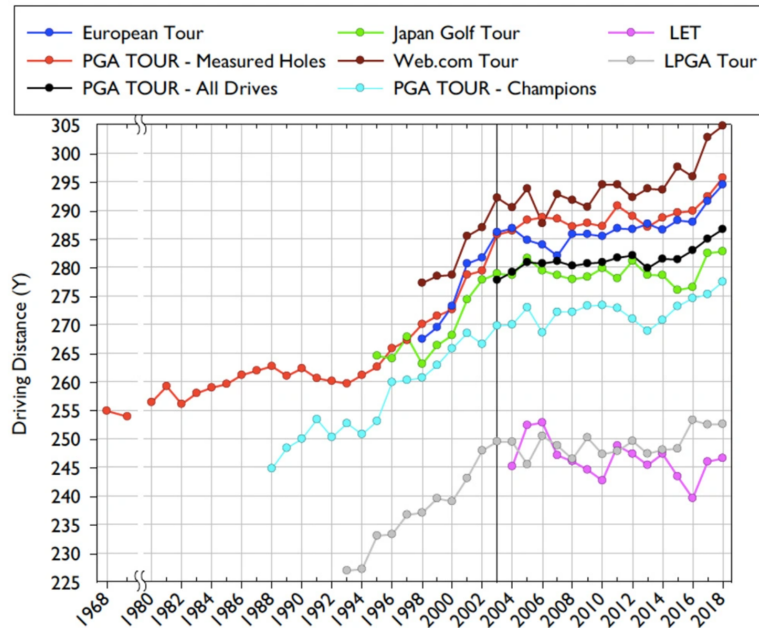
Figure 1: Driving Distance (*2019 Distance Report*) - This diagram shows the advancements in driving distance over the past forty years throughout all professional tours. Driving distance has been steadily increasing for the past 40 years across all tours; especially on the PGA Tour. Some of the increase can be attributed to technological advancements in golf clubs and balls. However, the PGA Tour average distance still increases faster than on tours such as the Japan Golf Tour or Champions Tour. This can be attributed to the effect of Tiger Woods; golfers on the other two tours do not have to compare themselves to him, whereas players on the PGA Tour post-2000 are chasing Woods's success and, thus, trying to emulate his methods for success.

In addition, we can quantitatively show the inherent focus on driving distance over the past forty years. Figure 1 shows that PGA Tour golfers have been more focused on improving their driving distance than golfers from other tours since the debut of Tiger Woods. However, the point is not simply that golfers hit it farther now than they used to. Instead, what we want to focus on here is that in order for this improvement to be made, players had to spend an inordinate amount of time working out and focusing on swinging the club faster in order to maximize their distance. Billy Horschel is a golfer who wanted to concentrate his improvements on driving distance; after 2 years of work, he was able to hit his driver three yards further (Wacker, 2014). That is a small, but significant jump. However, if he had taken the hundreds and hundreds of

hours spent working out and used it to practice his putting skill instead, he could have made an even greater improvement.

Discussion of Results

As we can see, players have continued to fixate on driving distance as the most important aspect of their game, even as it has become more and more apparent through statistics that putting is the most important attribute of a great PGA Tour player. There are a myriad of reasons why this technological momentum of distance focus has continued and metrics have not broken the trend. One potential explanation is that the PGA has a rather staid population of golfers; age not being as important as it is in other sports leads to the same golfers with the same mindsets being around for much longer. Thus, it takes a longer time in golf for concrete changes to take hold. It was already a struggle in sports like baseball and football for advanced metrics to be widely accepted; it would not be surprising for it to take even longer in golf. Another potential explanation is the difference in measured results between the two different goals. It is easy to tell if you hit the ball farther than you did before, as it is a number value. Distance is more focused on if you are physically capable of doing something. In contrast, putting is much more of a skill that golfers must hone. The level of putting skill is not easily measured outside of tournaments, so it is more difficult for golfers to see concrete results.

Conclusion

The easiest way to see the difference between driving and putting is to look at the best individual seasons ever recorded in each area using the strokes gained statistic. The best season ever in strokes gained putting was set in 2016 by Jason Day. His strokes gained putting that year

was 1.13 ("Yearly PGA Tour putting leaders"); he gave himself an advantage of more than a stroke a round over his peers through his putting prowess. That season, Day won three tournaments, including the Players Championship, which is the most prestigious non-major tournament. Day won no majors that year, but finished in the top ten in three and tied for 22nd in the fourth; he would end the year ranked as the no. 1 golfer in the world. (Culpeper, 2020)

The greatest driving season in history since strokes gained was introduced belongs to Bubba Watson in 2012 ("Yearly PGA Tour strokes gained off the tee leaders", 2021); he gained over 1.4 strokes per round from his driving acumen. Watson's season was more inconsistent than Day's, with higher highs and lower lows. Watson won the Masters that year, which is the most prestigious major tournament. However, he finished his three other majors outside the top ten, including missing the cut entirely at the US Open. Watson won no other tournaments that year, and would end the season ranked no. 8 in the world (*Official World Golf Ranking - Week 52 2012*). It would be tough to say that either Day or Watson had a "bad" season; they both were consistently fairly competitive and won a few tournaments. Watson had the best individual tournament of the two seasons. However, it would be difficult to argue with Day's consistency and group of wins over the season. If given the choice, most golfers would choose Day's season as the more impressive and dominant feat.

It's a common phrase in golf that you "drive for show and putt for dough"; that is, hitting the ball a long way gets you attention, but putting the ball is the most important thing to do in order to get a low score. In recent years, the PGA has seemed to get away from that mindset, as the influence of Woods and other golfers have continued to impact the way golfers think about their skill sets and what they need to improve. From the analysis presented here, one could

clearly see that, despite the continuous focus on the long ball, putting is still king on the PGA

Tour.

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