Forced Carries on an Island Green, Par 3 Hole

By David Pierce

Summary

Over the course of a full golf season in 2024, Stellar Golf Advisors recorded the shot results of 841 golfers playing an island green par 3 hole. Owing to the hole design of an island green with yellow stakes around the circumference, all golfers must either successfully carry the lagoon surrounding the green and keep their ball on the green, or give up and not complete the hole. Overall, 68% of 841 first tee shots were successful. However, when broken down by gender, almost ¾'s of male golfers had success while less than ½ of female golfers were successful, showing again as in previous studies, that forced carries are disproportionally challenging for women and shorter hitting golfers. The overriding recommendation to golfers to maximize success is to aim for the middle of the green and select a club with comfortable carry distance to the front of the green, regardless of where the hole is located. More granular details about golfer performance on this golf hole are provided in the full report. From an architectural perspective, golf holes should be designed to give similar tee shots for golfers of most-all ability levels that results in similar clubs used to hit over the forced carries. In general, this means installing shorter, more forward tees on many golf holes with forced carries.

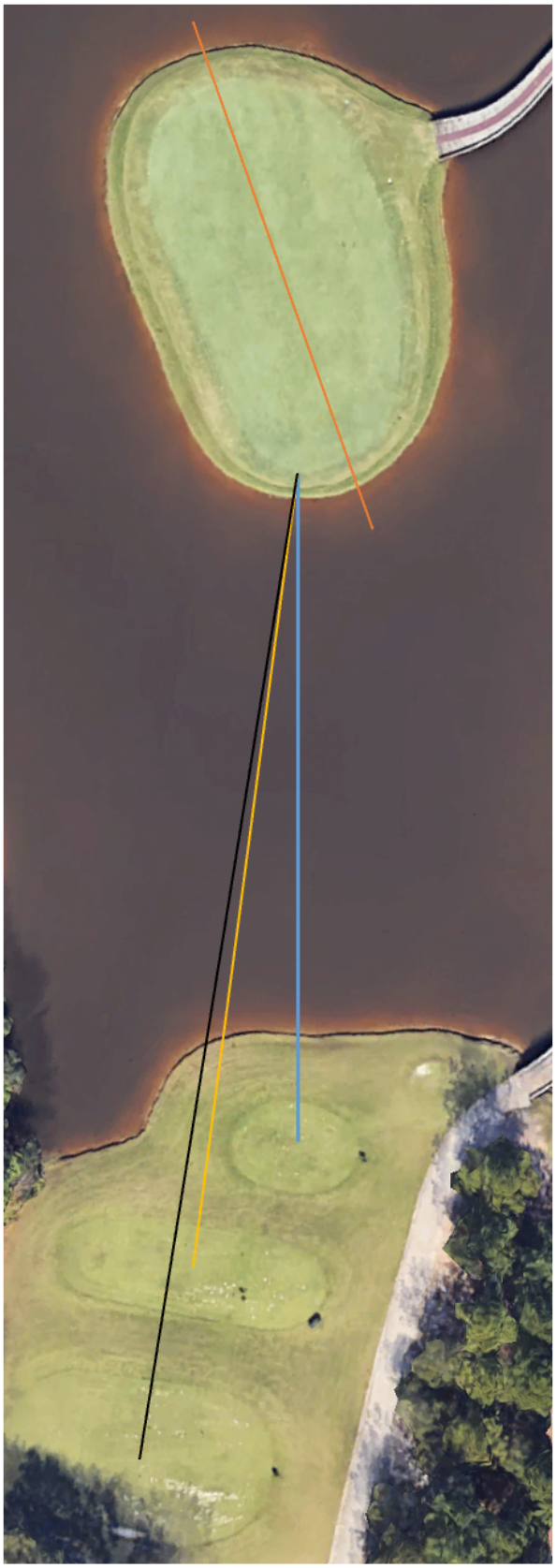
Introduction

Studying forced carries on holes with greens fully or partially defended by water hazards has been an interest of mine going back to my full-time work at the USGA as Director of Research for the Green Section and leading the golfer experience research program. It is also an area of golf course design that there appears to be a lack of high-quality golfer performance data.

The shot on this specific hole is typically executed by most golfers (but certainly not all) using a Pitching Wedge or 9-iron – so except for the intimidation from being an island green with a forced carry, would normally be an "easy" shot for most golfers.

Hole Description

The 15th hole on the Savannah Quarters Country Club (SQCC) in Pooler Georgia, just outside of Savannah, provides an interesting case study on forced carries. By comparison to typical greens, the green is large, measuring about 46 yards long by 25 yards wide with roughly 9,000 - 10,000 square feet of area. The apron plus rough surrounding the green is about 3 – 5 yards wide from the edge of the green to the water, adding additional dry land. The design of the hole, which includes three physical tee boxes on which six tee options are placed, is shown in Exhibit 1.



Savannah Quarters Country Club

Hole 15, Par 3, Island Green

Green dimensions = 46 yards long x 25 yards wide, angled about -15 degrees counterclockwise (for front tee box)

Three physical tee boxes:

Distance from the middle of the tee box

(yards)	Front	Middle	Back
To Land	73	87	108
To Front of Green	77	91	112
To Middle of Green	100	114	135
To Back of Green	123	137	158

Each physical tee box typically has two tees placed for play as follows from shortest to longest:

- Family: ~72 yards to front of green
- Forward: ~78 yards to front of green
- Club: ~89 yards to front of green
- Member: ~94 yards to front of green
- Tournament: ~107 yards to front of green
- Championship: ~115 yards to front of green

Exhibit 1: Savannah Quarters Country Club, Hole #15

Methodology

The observations were made near the 15th tee without any engagement with the golfer. Therefore, the only information about the golfer that is inferred is their gender and type of player. However, the proximity to the tee did allow the type of club to be discerned as well as the decisions the golfer made if they failed to land a ball on dry land with their shot.

For each data point, the following information was recorded:

- date
- presumed golfer gender (male or female)
- type of golfer (elite, member or guest, outing golfer) based on the tee sheet
- type of club used (iron, hybrid/wood, driver)
- tee played (family, front, club, member, tournament, championship - in order of shortest to longest)
- hole location – the green was divided into nine quadrants, using front, middle and back longitudinally as well as left, middle and right laterally
    - the distance to the hole for each tee was measured
    - the distance to the center of the green for each tee was measured
- shot result both longitudinally (distance) and laterally (accuracy)
    - shot categorization as success or failure
        - success is defined as the ball staying on dry land
        - failure is defined as the ball landing or falling into the water and is not playable. It is not defined by the location of the yellow line penalty area on the green (which would not have been easily determined from the vantage point used for the study).

If the first tee shot failed, the following data was also recorded:

- number of re-try attempts
- was the club changed from the initial club used on the first tee shot?
- was the golfer ultimately successful hitting a ball onto dry land?

Demographics of the sample

A total of 841 golfers were observed playing SQCC Hole 15 from February 15 to December 7, 2024. Figure 1 shows the breakdown of this sample by gender which is 81% male and 19% female, which is more heavily proportioned toward male than the golfing population in the United States that is roughly 75% male and 25% female.

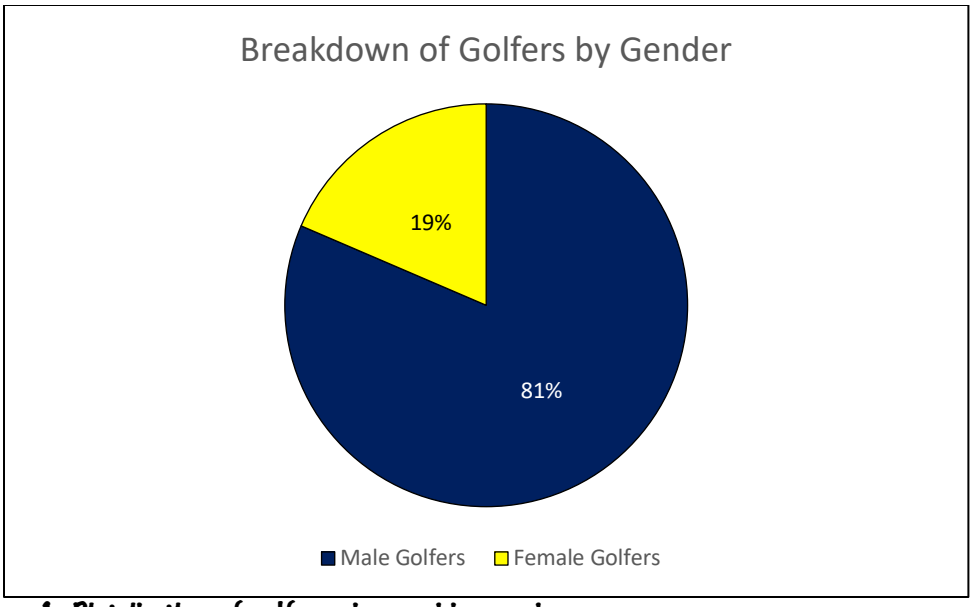


Figure 1: Distribution of golfers observed by gender

Now digging deeper into the sample demographics for female golfers, Figure 2 shows the breakdown of tees played by female golfers. The tees are identified using names and by colors on the scorecard and tee markers as follows (shortest to longest): Family (purple), Forward (green), Club (orange), Member (white), Tournament (gold) and Championship (black)

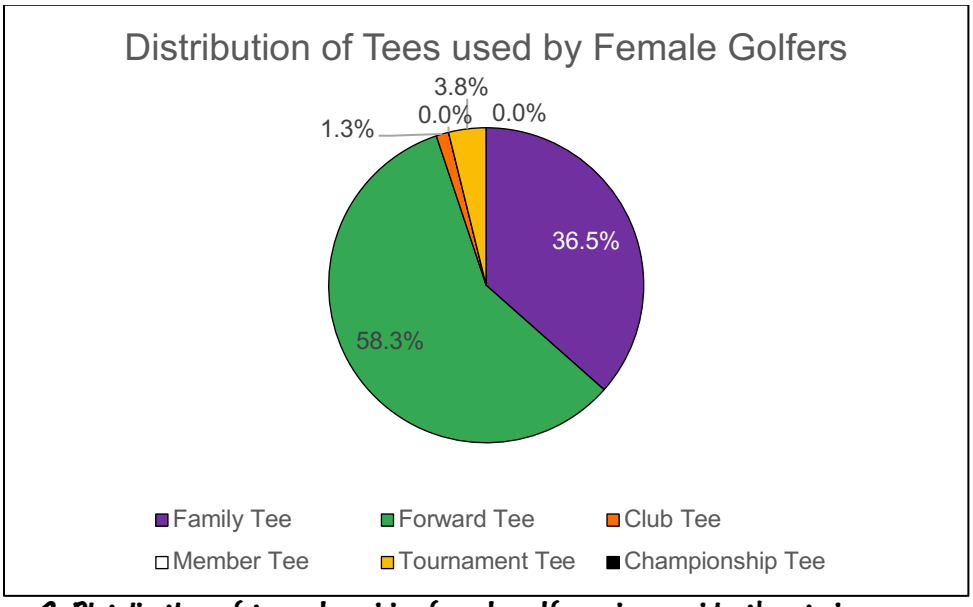


Figure 2: Distribution of tees played by female golfers observed in the study

As shown in the pie chart, nearly 95% of female golfers played one of the two shortest playing length tees with only about 5% playing one of the longer 4 tees available.

Using the same colors in the pie chart that matches the color on the scorecard for each tee, Figure 3 shows the distribution of tees played by male golfers.

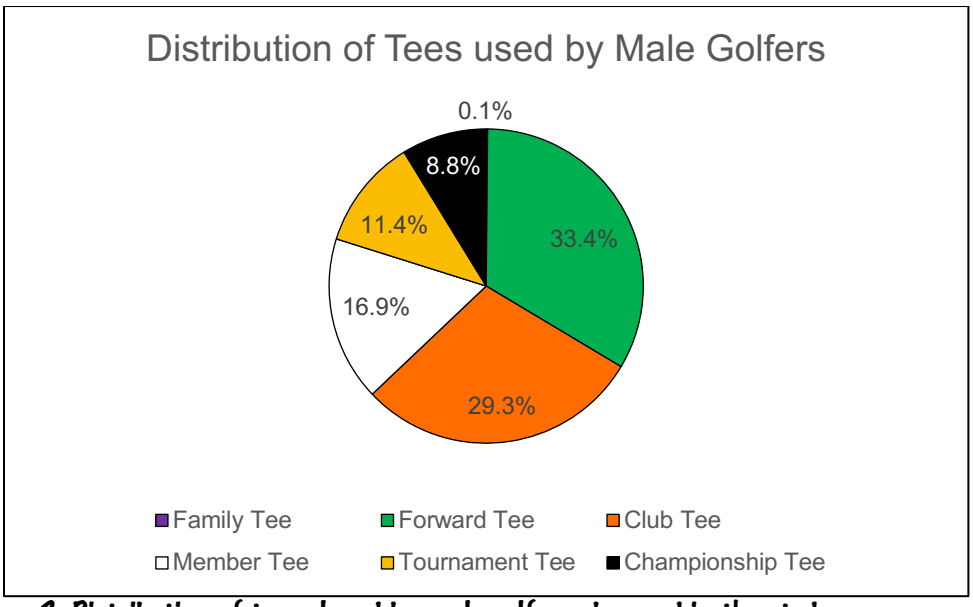


Figure 3: Distribution of tees played by male golfers observed in the study

As shown in Figure 3, while only 1 male golfer played the family (purple) tee, 1/3rd played the forward (green) tee. Another 29% played the next longest tee (club/orange) and then the rest of the golfers (37%) were distributed across the longest three tees in decreasing frequency as the tees got longer.

Now still examining male golfers, Figure 4 shows the club type used by the male golfers observed during the study.

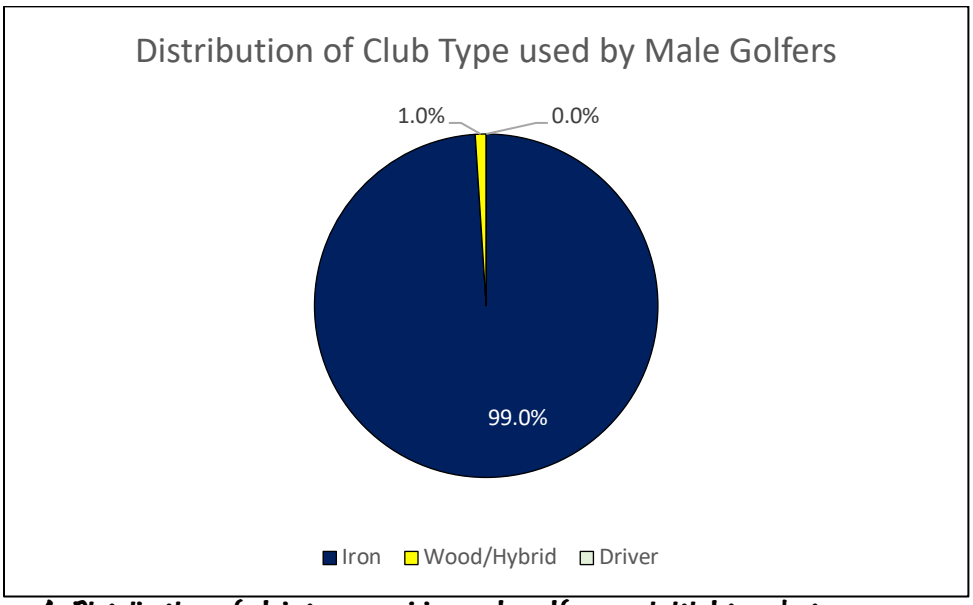


Figure 4: Distribution of club type used by male golfers on initial tee shot

The figure shows that 99% of male golfers used an iron for their initial tee shot, regardless of which tee was played. However, as Figure 5 shows, even though 95% of female golfers played one of the two shortest tees, nearly 1/3rd used a hybrid, wood or driver for their initial tee shot.

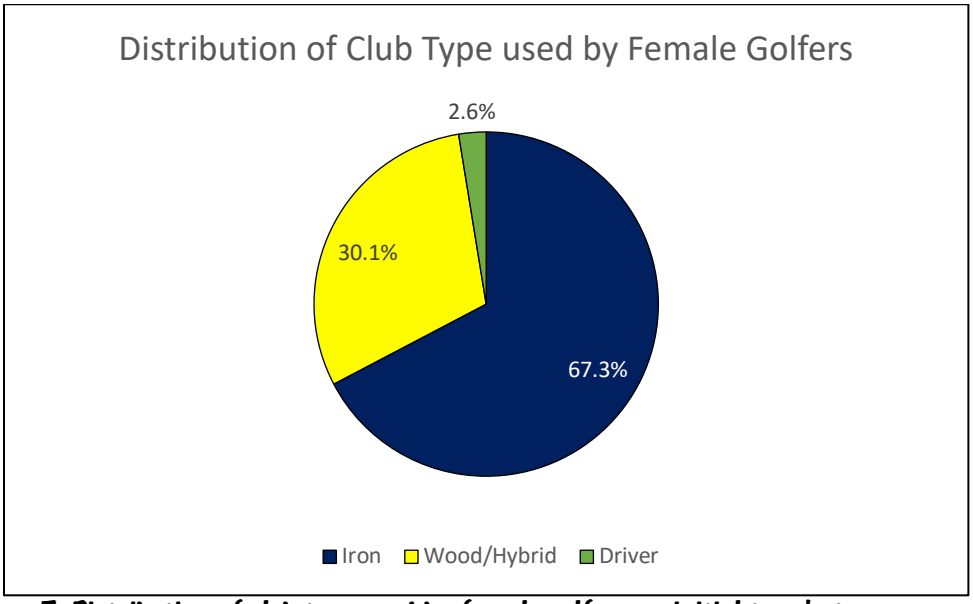


Figure 5: Distribution of club type used by female golfers on initial tee shot

While the data could be further broken down by gender and tee played, it doesn't change the undeniable conclusion that female golfers are often having a different experience playing this hole compared to male golfers.

The 841 golfers were also categorized by type based on examination of the tee sheet. The bulk of the golfers were either members or their guests. There wasn't an easy way to differentiate if a guest was playing from regular member play. We also observed a few elite golfers that were easily identifiable. Unfortunately, the sample of elite golfers is small and it would be good to supplement this database with additional elite golfers. Figure 6 shows the distribution of golfers across these three categories.

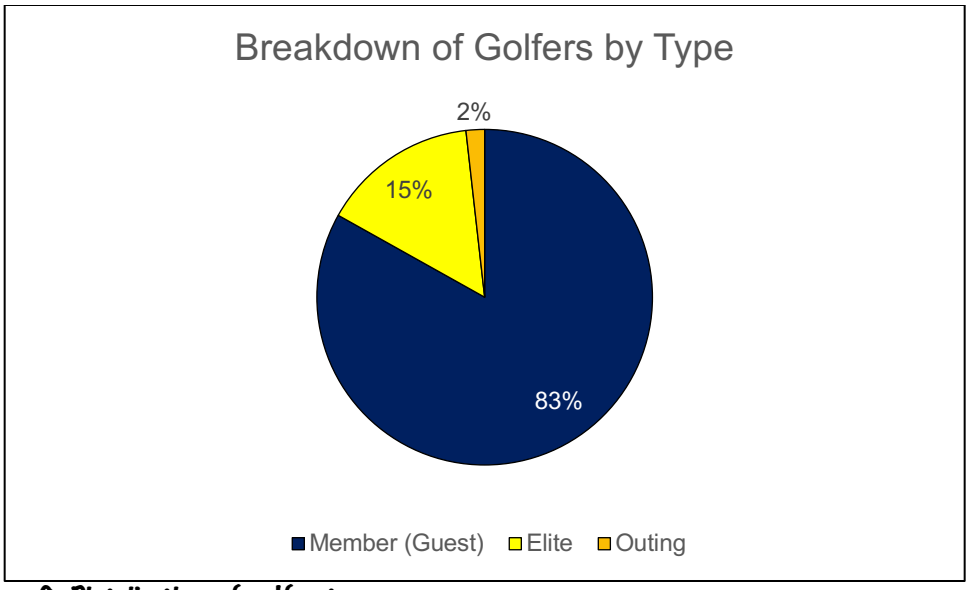


Figure 6: Distribution of golfer types

Results

Initial Tee Shot

The definition of a successful first tee shot for this study was broader than reaching the green and puttable. As described in the hole design section, the large putting surface is surrounded by an apron. Outside of the apron, 3 -5 yards of rough, that drops off to the surface of the lagoon, encircles the apron. For this study, success is hitting a tee shot that remains on dry land (so is presumably playable) and a second tee shot is not required.

The data was collected from mid-February to early December in 2024, so it would be instructive to examine the data by month to see if it appears normally distributed or if it varies month to month. Ideally, success rate should not vary by month if the hole plays similarly in difficulty. Figure 7 shows the overall success rate by month over the seven months that data were collected during the year. Statistically, only December fell outside of the 95% confidence interval. This is not surprising in that the average weather in December is significantly colder than the other months, making the hole more difficult, although only slightly. Success rates for the other 6 months were all 70% +/- 4% and in a narrow range showing normal variability.

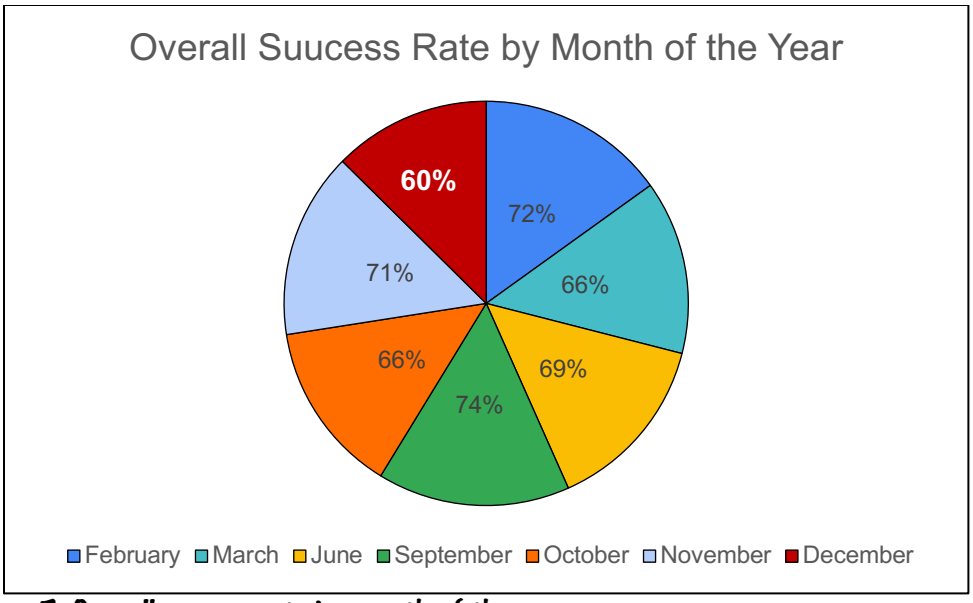


Figure 7: Overall success rate by month of the year

Golfers were categorized as members / guests, elite or outing golfers and the success rate for their initial shot varied significantly. As shown in Figure 8, golfers classified as elite had an 85% success rate, while play by members and guests were successful 66% of the time. Outing guest struggled with only a 33% success rate – not surprising since they are the least familiar with the course and likely have lower skill level.

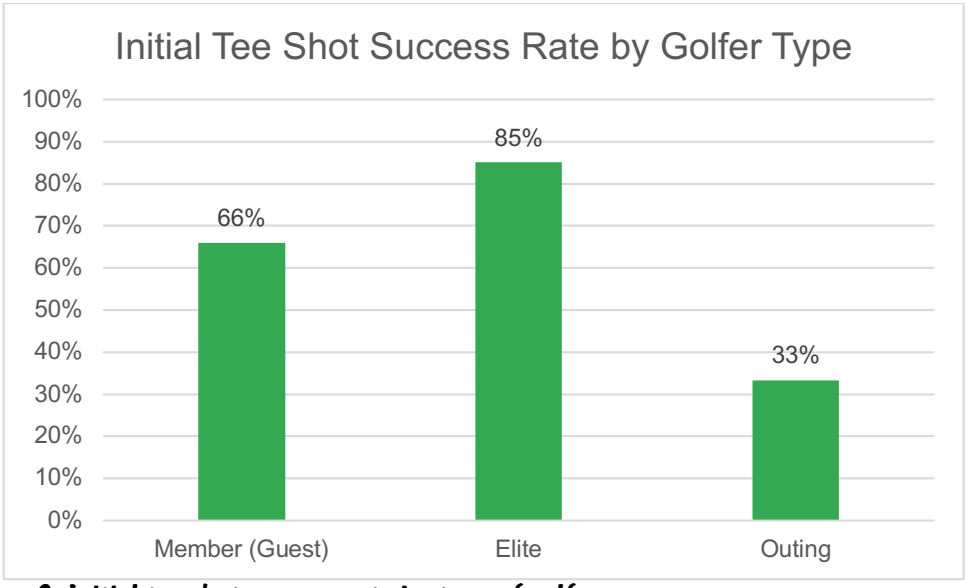


Figure 8: Initial tee shot success rate by type of golfer

The success and failure rates of the initial tee shot varied significantly by gender. As shown in Figure 9, 73% of males initial shots were successful versus only 47% of female golfers.

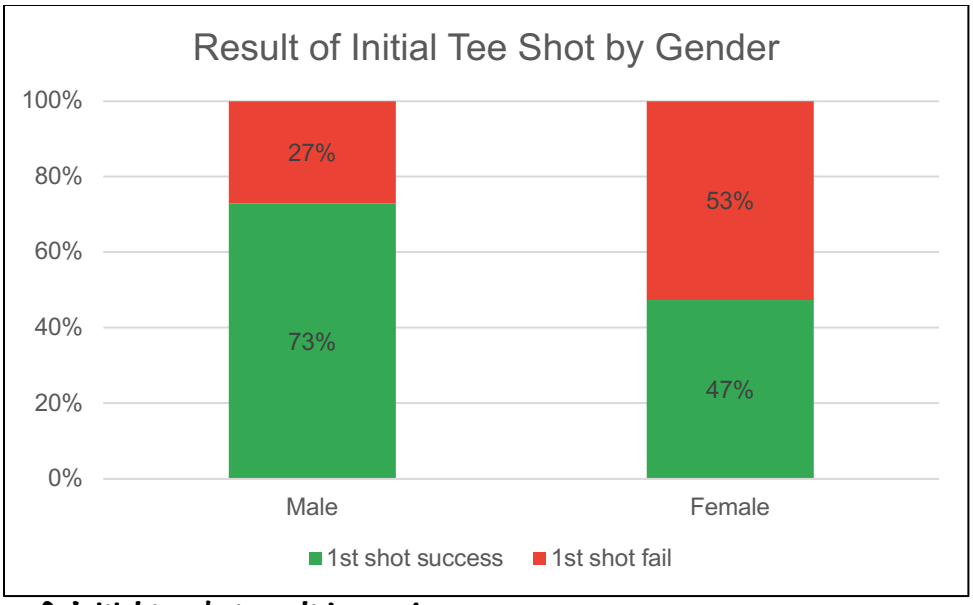


Figure 9: Initial tee shot result by gender

The success rate by gender was further broken down by tee played as shown in Figure 10.

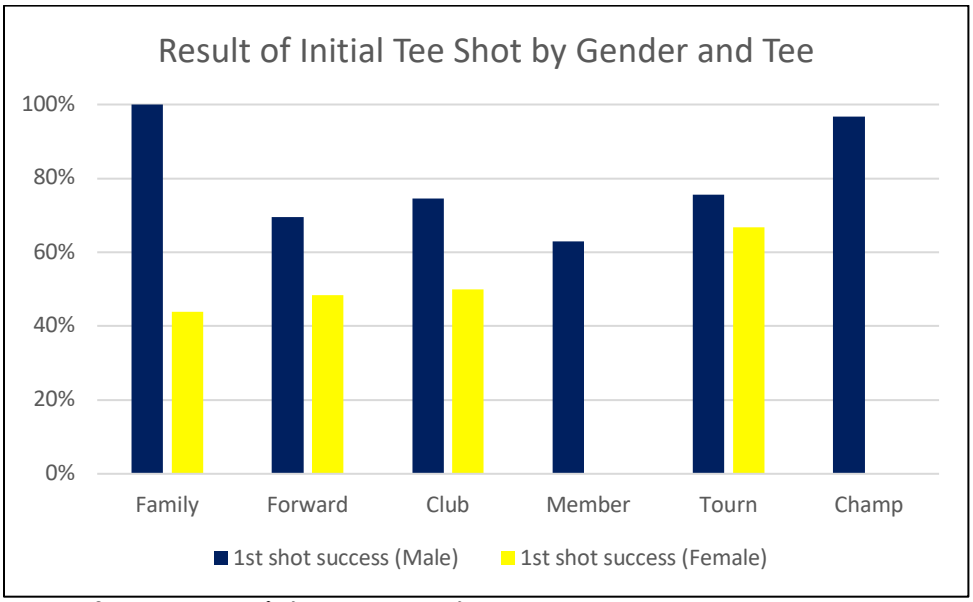


Figure 10: Success rate of the initial tee shot by gender and tee played

Figure 10 shows that for every tee played, male success rates are higher than female success rates. A few observations / results can be discerned from this chart.

- Success rates between male and female golfers are closest on the tournament tees. Presumably only the most accomplished, highest skill level female golfers would select the second longest tee for play and these golfers have the best success rates for female golfers.

- Similarly, only the most skilled male golfers would be expected to play the championship tees and their success rate is the highest for male golfers playing every tee except the family tee, for which there is a very limited sample size.
- There is not a clear correlation of success rate versus tee played for male golfers.
- Even though female golfers move up and play shorter tees, the success rate of female golfers is lowest for the family tees and improves as play on longer tees occurs. This shows that forced carries are hardest for the shortest hitting female golfers.

Figure 11 breaks down the success rate by gender and type of club used for the shot. Observing from a distance, only the type of club can be determined. The exact club used is not known. Figure 11 shows that when a male golfer decides a wood or hybrid is necessary for them to successfully make the forced carry, their resulting success rate plumets from over 70% with an iron to about 15% with a wood or hybrid. The drop-off by female golfers is smaller, but still evident from about 50% to about 43%. Any golfer selecting a driver is doomed and had no success. Even when a golfer using a driver was able to reach the green in the air, they ran off the back because the bounce and roll associated with the velocity and landing angle was too large. It is somewhat surprising that female golfers using a wood or hybrid have as much success as they do! They have mastered the use of those clubs, even though the challenge of hitting and holding the green with those clubs is more difficult than with irons.

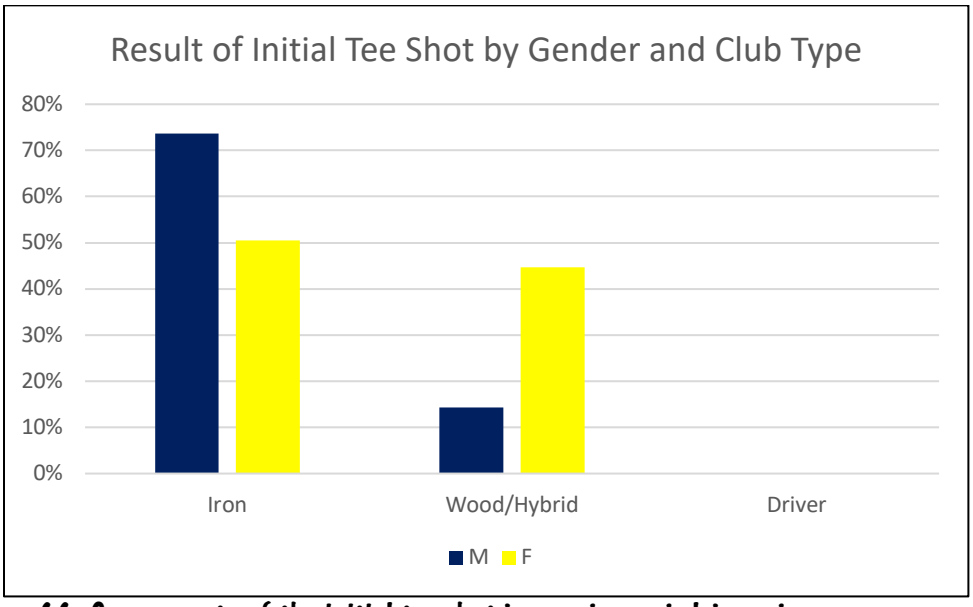


Figure 11: Success rate of the initial tee shot by gender and club used

Figure 12 shows where the failure occurred. Note that if a failure was short, that is what was used as the primary failure mode, even if the shot was also offline. The results show that over 70% of female misses were short while only about half of male misses were short. For both genders, about 12% or 1 of 8 shots that failed were long. Male golfers that were offline tended to miss to the right while females tended to miss to the left by a small margin.

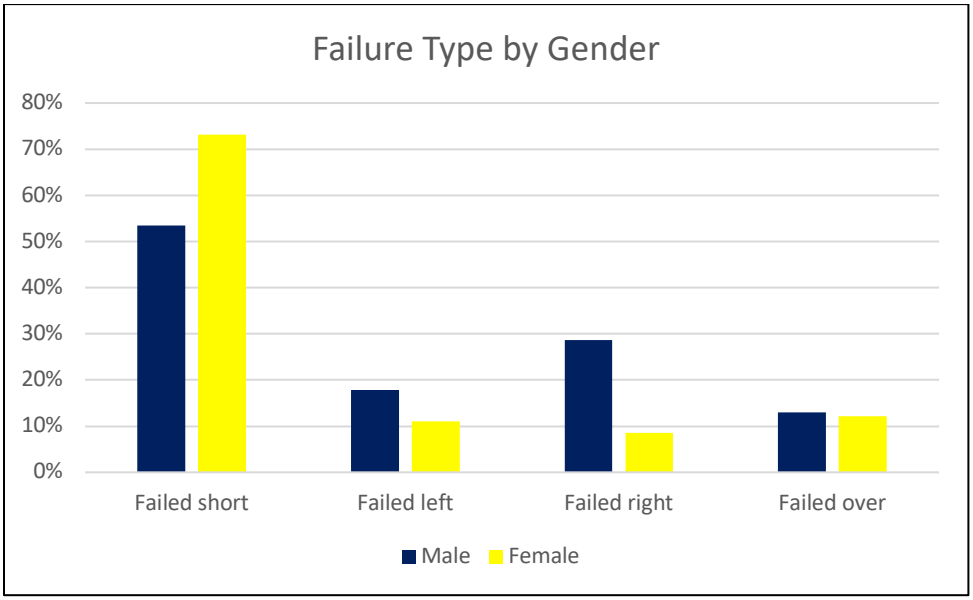


Figure 12: Failure location by gender

Decision Making by Golfers following an initial failed tee shot

The behavior of golfers following a failed tee shot (defined as a shot that ultimately finished in the water) was observed and recorded. Figure 13 shows the decision making for the sample. Overall, 63% decided to try again. Figure 14 shows that when broken down by gender, just over 2/3rds of male golfers attempted again while about half of female golfers re-tried.

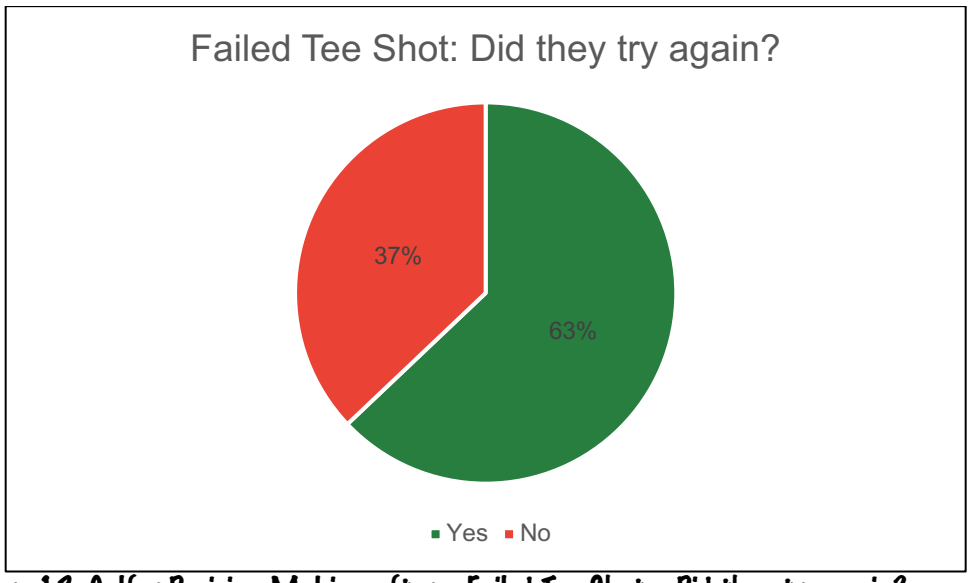


Figure 13: Golfer Decision Making after a Failed Tee Shot – Did they try again?

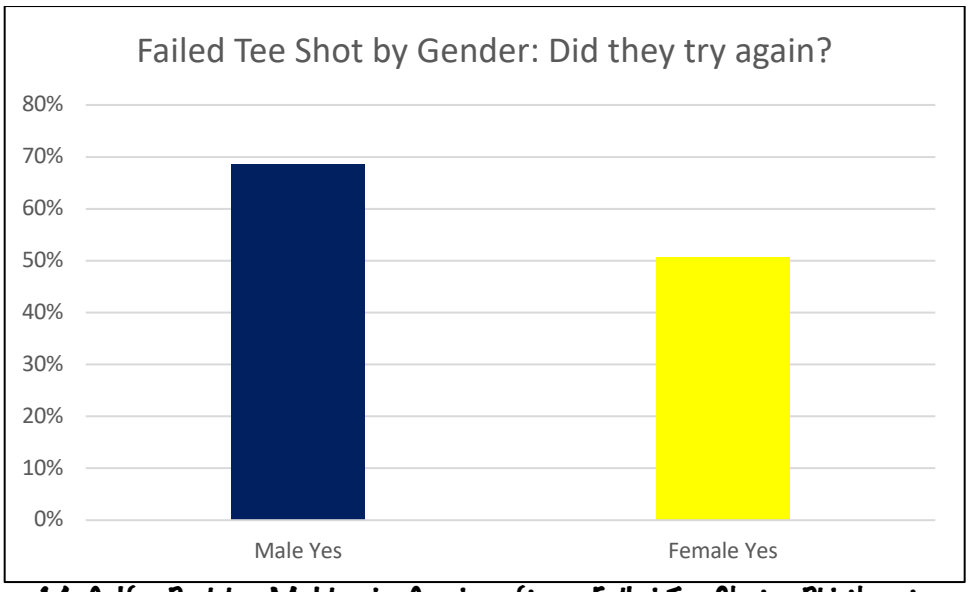


Figure 14: Golfer Decision Making by Gender after a Failed Tee Shot – Did they try again?

For golfers that decided to try again, there were three options for playing location and the club to use. First, they could re-tee from the same teeing ground or they could utilize the drop zone. Note that the drop zone for this hole is in "rough" adjacent to the forward tee box, so is a minimal advantage, if not a disadvantage for the Family and Forward tees. As Figure 15 shows, only 12% of golfers who failed initial decided to use the drop zone, so 88% re-teed. Of the 88% who played from the same tee location, 76% used the same club and 12% changed clubs indicating that the player believed they had selected the right club for the initial tee shot, but mis-hit the shot in some way, resulting in a water ball and a shot that failed to make the forced carry successfully.

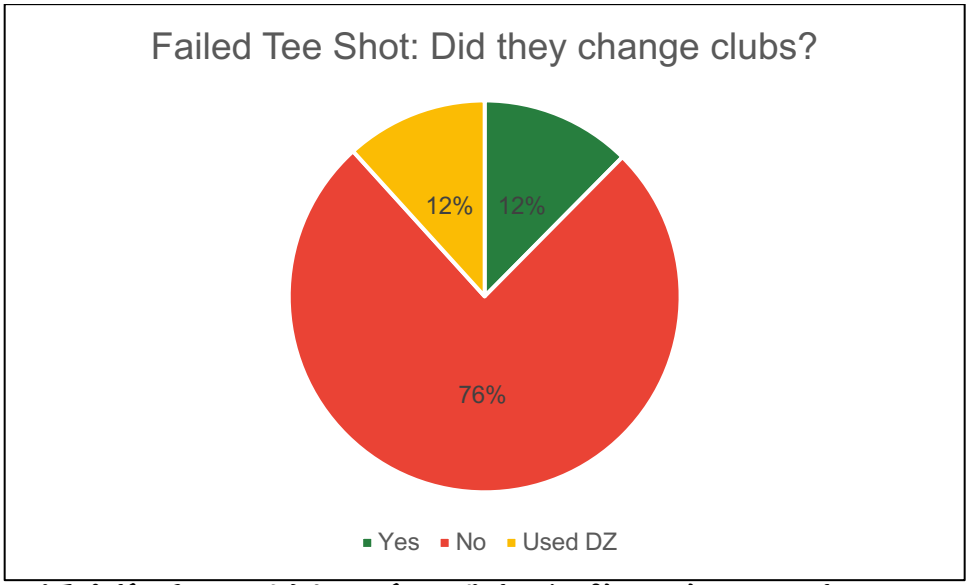


Figure 15: Golfer Decision Making after a Failed Tee Shot – changed tee location or clubs?

Finally, we kept track of how many times it took to be successful and if the golfer was ultimately successful or gave up and did not finish the hole. Of the 168 golfers who initially failed, 14 failed on their first re-try and re-tried a second time. For all 168 golfers who failed initially, Figure 16 shows that 61% were ultimately successful while 39% gave up. Figure 17 shows that male golfers were ultimately successful 62% of the time and female 52% of the time.

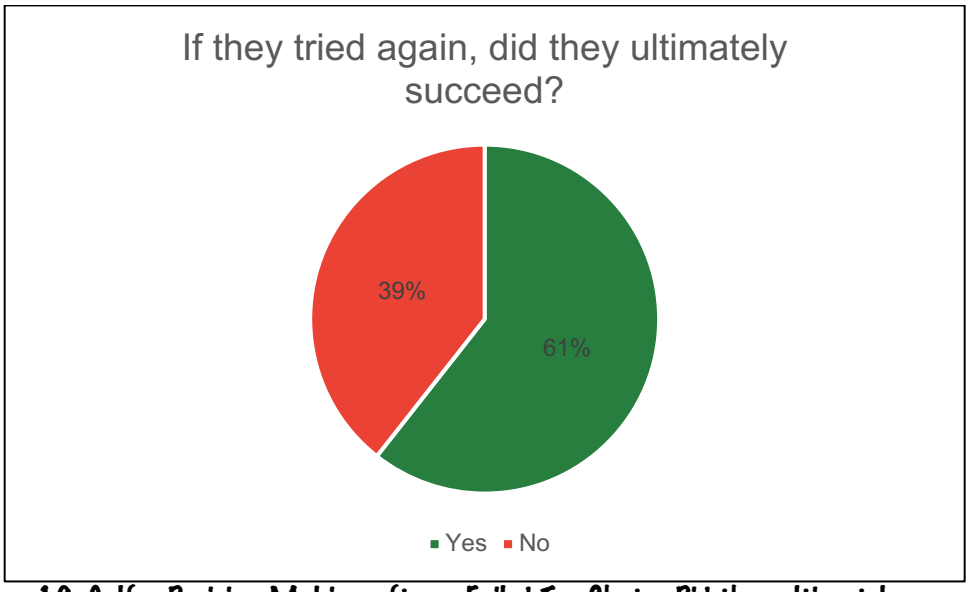


Figure 16: Golfer Decision Making after a Failed Tee Shot – Did they ultimately succeed?

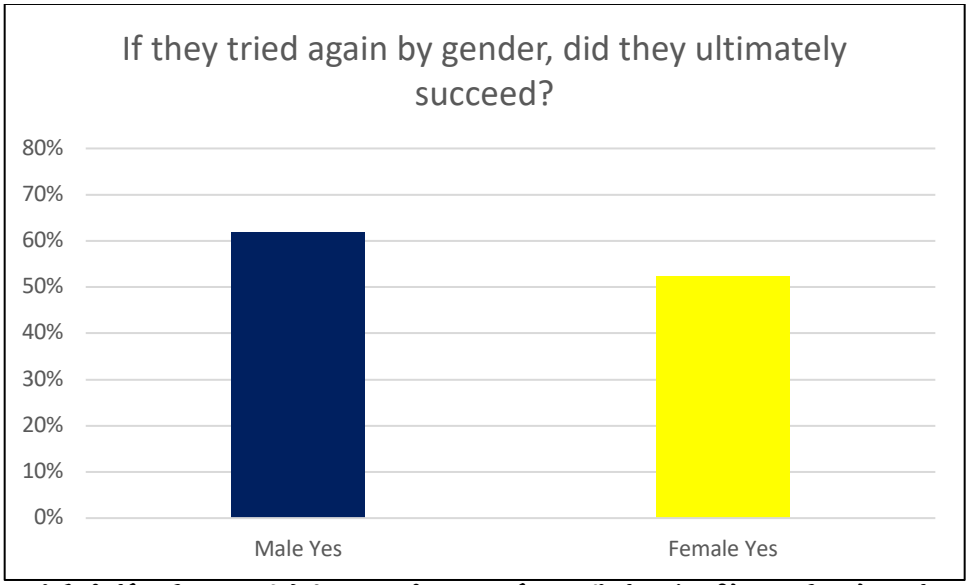


Figure 17: Golfer Decision Making by Gender after a Failed Tee Shot – Did they ultimately succeed?

A final comment about the observations made. There was one tee shot observed (of 841 tee shots) that was well short of the green but skipped up onto the green and was successful! There were several more that skipped and hit into the bank, but fell back into the water and not onto the green.

Hole location effect on failure rate

The data collected permits a detailed dive into how hole location may affect failure rate and failure location. Table 1 presents the data.

Hole Location Effect - Failure Rate vs. Hole Location

		Hole Location - Laterally				
		Left	Middle	Right		
		# of shots in hole location zone				
Hole Location - Longitudinal	Back	88	125	75	288	
	Middle	62	34	126	222	
	Front	106	172	53	331	
		256	331	254	841	
			Failure Rate			
Hole Location - Longitudinal	Back	25%	20%	33%	28%	
	Middle	40%	21%	33%	22%	
	Front	31%	34%	57%	48%	
				Overall	32%	checks
		Std Dev	11%			
	95% C.I. (Low - High)		9%	54%		

Table 1: Failed Tee Shot Rate versus Hole Location Zone

The top part of the table indicates the number of tee shots observed into holes located in the 9 zones of the green. The green was divided laterally into three zones: left, middle and right. These zones were about 8 yards wide. The green was divided longitudinally into three zones, front, middle and back. Each of these zones was about 15 yards in length. The intersection of these dividing lines results in 9 zones covering the whole green of about 8 x 15 yards each. The number of shots into each section varied from a low of 34 shots to middle/middle hole locations to a high of 172 shots to front/middle hole locations.

Failure rate varied significantly from zone to zone. The most dangerous zone, by far, and statistically significantly harder was the front/right zone with a 57% failure rate. The easiest hole locations were middle/middle, back/middle and back/left with failure rates of 20 - 25%.

Interestingly, and standing out somewhat as an outlier, is the 40% failure rate for middle/left. Having personally played this hole many times, the contours of the green result in the appearance of a kidney shaped green with the green disappearing in the middle/left zone, even

though the satellite view shows the shape of the green to be an oval. This optical illusion may confuse and intimidate the golfer, making the tee shot more challenging when the hole is in this zone.

Hole location effect on failure location

The effect of failure location was examined with respect to the hole locations as follows. Table 2 shows that for tee shots that failed left, 63% of the time, the hole location was in the left zone. For tee shots that failed right, the hole location zone was either middle (42%) or right (39%), but not likely left (19%)

	Hole Location - Side to Side			
	Left	Middle	Right	Check
Failed left	24	9	5	38
	63%	24%	13%	
	Golfers more likely to fail left for left hole location			
Failed right	7	15	14	36
	19%	**42%**	**39%**	
	Golfers more likely to fail right for middle or right hole location			

Table 2: Failed Tee Shot Location versus Lateral Hole Location Zone

Analogously, Table 3 shows the shots that failed short versus the longitudinal hole location zone. Over half of the shots failing short occurred when the pin was in the front third of the green.

	Hole Location - Longitudinal			
	Front	Middle	Back	Check
Failed Short	81	43	35	159
	51%	27%	22%	
	Golfers more likely to fail short for front hole			

Table 3: Failed Tee Shot Location versus Longitudinal Hole Location Zone

Combining the results of Tables 1, 2 & 3, it is clear that the average (right-handed) golfer would have greatest success of hitting the green with their tee shot if they aim slightly left of the dead center of the green. This inherently is something many of us already know, but clearly it is not what golfers do, especially for a relatively large green!

There were only 34 shots that failed over the back of the green. All but one shot hit the green and rolled off. Only one shot "flew" the green. There were no discernable trends on how hole location affected shots that were too long.

Analysis using Additional USGA Data

Expected "Success Rates" based on the previous forced carry study

The USGA performed a forced carry study in 2021 that was published in 2023 (reference 1). In that case, 1350 shots were observed on three golf holes with forced carries in front of their greens. For this previous study, the only requirement for achieving success was to successfully carry the penalty area in front of each green.

The "distance to dry land" was calculated for each tee in this study. Also, it is important to note, that for this study, the golfer self-selected the tee to play for their round, which had direct impact on the forced carry they experienced. In the previous study, only the par 3 hole had that same condition. However, the forced carry approach shots for the par 4 and par 5 holes were a result of the previous shots made on the hole before the approach shot. That said, as shown in Table 4, when the results in this study are "reclassified" as "not short" to give the best comparison to the previous study, the female success rates correlation from Reference 1 would have predicted 63% and 55% for the Family and Forward tees versus 58% and 62% that were measured. For male golfers who mostly played the Forward, Club and Member tees, the predicted success rate from Reference 1 was 85% to 82% and the measured "not short" rates in this study were 81%, 89% and 78% respectively, again with quite good agreement.

	By Tee Used					
	Family	Forward	Club	Member	Tourn	Champ
1st shot success	45%	63%	74%	63%	75%	97%
1st shot fail	55%	37%	26%	37%	25%	3%
1st shot success (Male)	100%	69%	75%	63%	76%	97%
1st shot success (Female)	44%	48%	50%		67%	
Distance to "dry land" (yds)	68	74	85	90	103	111
Previous Male Success Rate	87%	85%	83%	82%	80%	79%
Previous Female Success Rate	63%	55%	45%	38%	34%	30%
Success rate not "Short" Male		81%	89%	78%	90%	100%
Success rate not "Short" Female	58%	62%				

Table 4: Comparison of Previous Research Success Rate to "not Short" Rate in this Study

Expected Success Rate based on Golfer Hitting Performance Measurements with TrackMan

During 2021 – 2023, the USGA measured the hitting performance of 627 golfers' driver, 7-iron (7i) and pitching wedge (PW) using a TrackMan4 launch monitor at a variety of private, public and stand-alone driving ranges (Reference 2). The dataset was re-examined and accuracy data was extracted for both 7i and PW.

There are two aspects to successfully hitting the green. The shot laterally needs to be sufficiently accurate. Also longitudinally, the ball needs to carry the water, hit the green and not roll off the back.

This analysis can only be approximated because only PW and 7i were measured with a TrackMan launch monitor while different, and unknown clubs were used by golfers depending on their hitting distance and tee played. However, for the range of likely clubs used for both genders, one standard deviation of lateral accuracy is roughly 8 yards. Therefore, 68% of tee shots would be expected to land within a range of 16 yards or +/- 8 yards from the aimpoint. The width of the green is 24 yards or about 1.5 standard deviations. If a golfer aimed for the center of the green, the likelihood of hitting the green would be 87%. Adding in an average of 4 yards of apron and rough, increases the probability of hitting the green if the golfer aims for the center to 95%.

Carry, bounce and roll distances as well as how much golfers overestimate their average 7i data is available (reference 2). The standard deviation of longitudinal accuracy for carry distance is estimated to be roughly 10 yards. Given that golfers over estimate their 7i by 4% and would need to carry the ball a minimum of 77 yards, the most likely landing point would be 97 yards from the tee. For shots by average women from the middle of the front tee box, their aimpoint should be 110 yards, which is a 6 iron, for a 95% chance of making the carry. The bounce and roll is estimated to be 16 yards, so their ball would most likely stop 113 yards from the tee and well short of the back of the green at 123 yards.

However, the success rates, even for elite golfers are much lower than hitting performance data would indicate. The two potential causes for this difference are that the golfer does not aim for the center of the green, but adjusts their aim point based on the hole location. The section above on success rates versus hole location confirms that this is an important factor that is occurring. The second cause is the “intimidation” factor of the island green. Potentially these factors could be disentangled if the golfers were interviewed and asked where their aimpoint was prior to their tee shot, but that data is not available in this study.

The average male golfer has a much easier shot to execute, even from tees further back, because their expected club is either a PW or 9i. From the middle tee box, the average male golfer should use their 120-yard club, which on average would carry 108 yards with 6 yards of bounce and roll. They would be expected to make the 91-yard carry more than 95% of the time.

Conclusions and Recommendations

1) 99% of male golfers hit an iron off the tee while only 67% of female golfers hit an iron providing immediate evidence that the hole plays differently for many female golfers while it plays similarly for nearly all male golfers.

2) Elite golfers successfully handled the forced carry 85% of the time, while regular member and guest players were successful 66% of the time followed significantly behind by outing golfers, who are likely to be the least skilled and least familiar with the hole, with only a 33% success rate.
3) Male golfers have a 73% success rate while female golfers only have a 47% success rate.
4) Even though female golfers move up and play shorter tees, the success rate of female golfers is lowest for the family tees and improves as play on longer tees occurs. This shows that forced carries are hardest for the shortest hitting female golfers.
5) Golfers that decide to use a wood or hybrid to attempt to successfully make the forced carry see their success rate drop. Golfers selecting a driver had no success.
6) The results show that the predominant failure location was short, with over 70% of female misses and about 50% of male misses.
7) When golfers failed to make the forced carry, just over 2/3's of male golfers attempted again while about half of female golfers tried again.
8) Of the golfers who attempted again, ¾'s re-teed using the same club and male golfers were ultimately successful 62% of the time while female golfers 52% of the time.
9) The most dangerous hole location zone, by far, was the front/right zone with a 57% failure rate. The easiest hole locations were middle/middle, back/middle and back/left with failure rates of 20 - 25%.
10) Failure location was affected by hole location:
    a. For shots that failed left, most of the time, the hole location was in the left zone.
    b. For tee shots that failed right, the hole location zone was mostly middle or right.
    c. Over half of the shots failing short occurred when the pin was in the front third of the green.
11) The average (right-handed) male golfer would have greatest success of hitting the green with their tee shot if they aim slightly left of the dead center of the green. Female golfers should aim similarly but take 1 extra club to help ensure carry distance is sufficient.
12) Predicted success rates of not being short are consistent with a previous USGA forced carry study.
13) Using USGA TrackMan data for recreational golfers, golfer success rates would be expected to be higher if golfers aimed for the middle of the green. However, the success rates, even for elite golfers are much lower indicating that the golfer does not aim for the center of the green or that there is an "intimidation" factor of the island green.

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