Quantitative Analysis of 2021 Survey Data on Golfer Experience related to Distance, Playing Length and Tee Selection

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1. Summary

Sports Marketing Surveys (SMS) was contracted to perform a recreational golfer survey as part of the Distance Insights Phase 2 project. A quantitative analysis of the 20,001 responses was completed by the USGA. Golfer preferences for hole length to club hitting distance ratios were calculated to bracket hole lengths for golfers. These ratios can be used to estimate desired overall course lengths to improve the golfer experience. The analysis also examines the performance of golfers of different skill levels.

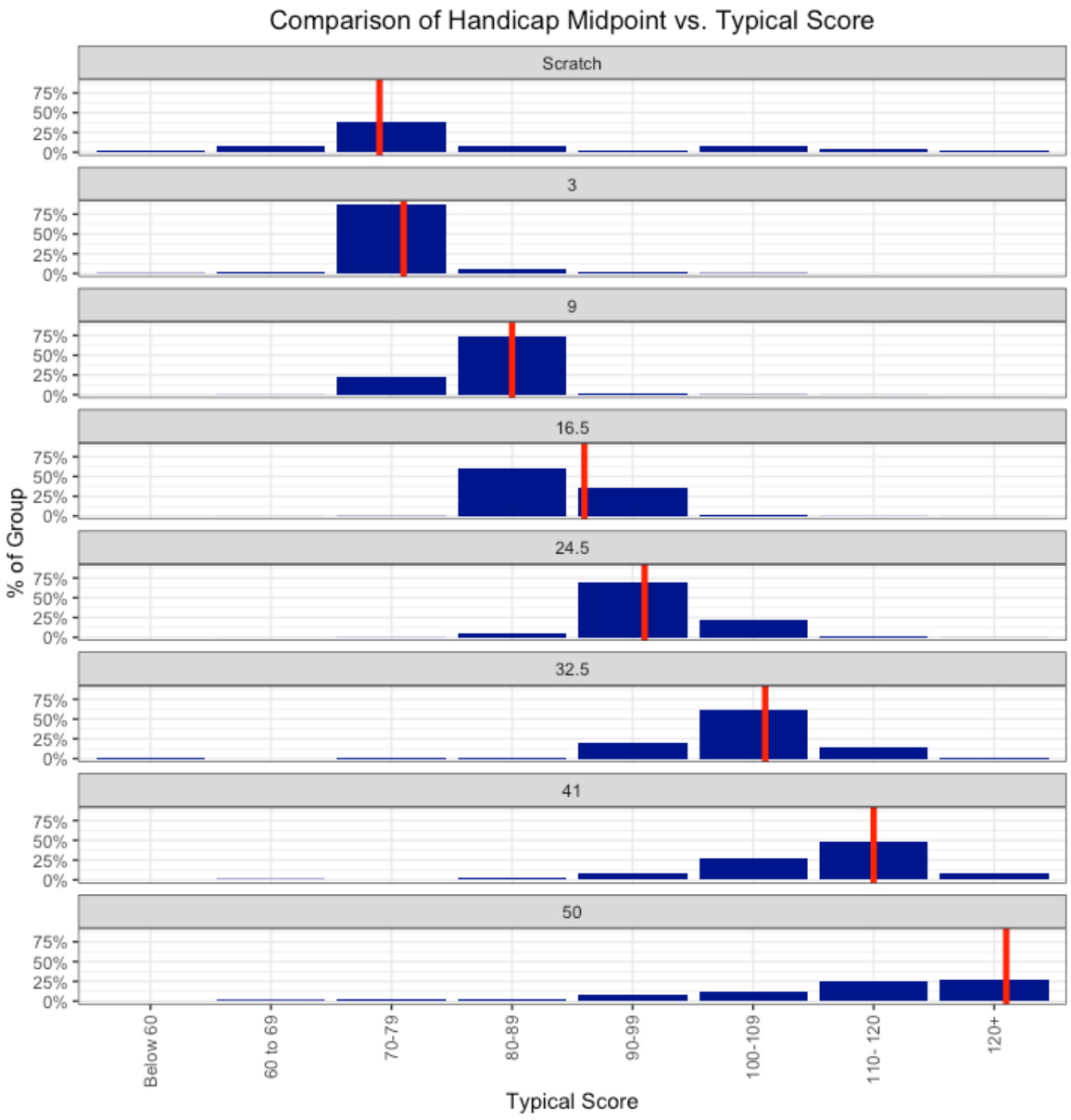
2. Introduction

In the Spring of 2021, the USGA administered a comprehensive survey to inquire about recreational golfers' abilities and preferences on the golf course through SMS, a golf survey vendor based in the United Kingdom. The survey had just over 20,000 responses from golfers of various demographics, abilities, and locations around the United States. The goal of this detailed study was to analyze the survey responses to identify various trends in the quantitative data reported by recreational golfers.

3. Handicap vs. Performance

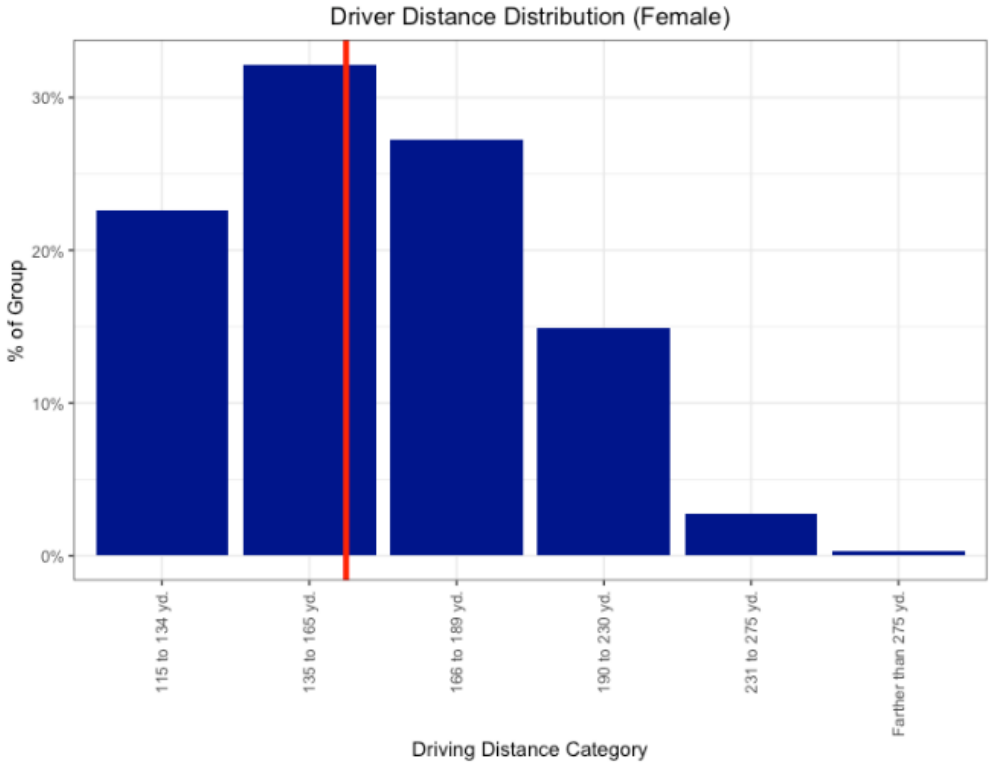
Handicap Index bins were established in the survey [midpoints in brackets were used for analysis and the charts] as follows: scratch or better [scratch], 1 – 5 [3], 6 – 12 [9], 13 – 20 [16.5], 21- 28 [24.5], 29 – 36 [32.5], 37 – 45 [41], 46 – 54 [50] and no handicap. All handicap index groupings were represented in the survey data. Figure 1 compares the reported handicap index to the typical score reported by each golfer to examine consistency. Because bins are used for both, some variation is expected. The red line indicates the expected typical score based on handicap bin. For every handicap bin, the red line is within or close to the tallest bar indicating that in general, golfers report a typical score that aligns with their handicap. Better handicap groupings from the data have better typical round scores on average. Additionally, worse handicap groups have more variation in their typical scores suggesting lack of consistency compared to better handicap groups or a misunderstanding of their handicap. Lastly scratch golfers had a long tail which may indicate a misunderstanding of what "scratch" means by some of the respondents.

Figure 1: SMS Survey Handicap vs. Typical Score



Furthermore, the survey asked golfers to estimate their club hitting distances. Figures 2 through 4 show the ***self-reported*** hitting distances for Driver, 7-Iron, and Pitching Wedge respectively by gender. It is important to note that these distance responses are ***estimates*** by the golfer and not actual recorded distances via a launch monitor. Future work should compare self-reported hitting distances to measured hitting distances for these clubs. The red line represents the median (50th percentile in each bar chart).

Figure 2: Self-reported Driving Distance Distribution (By Gender)



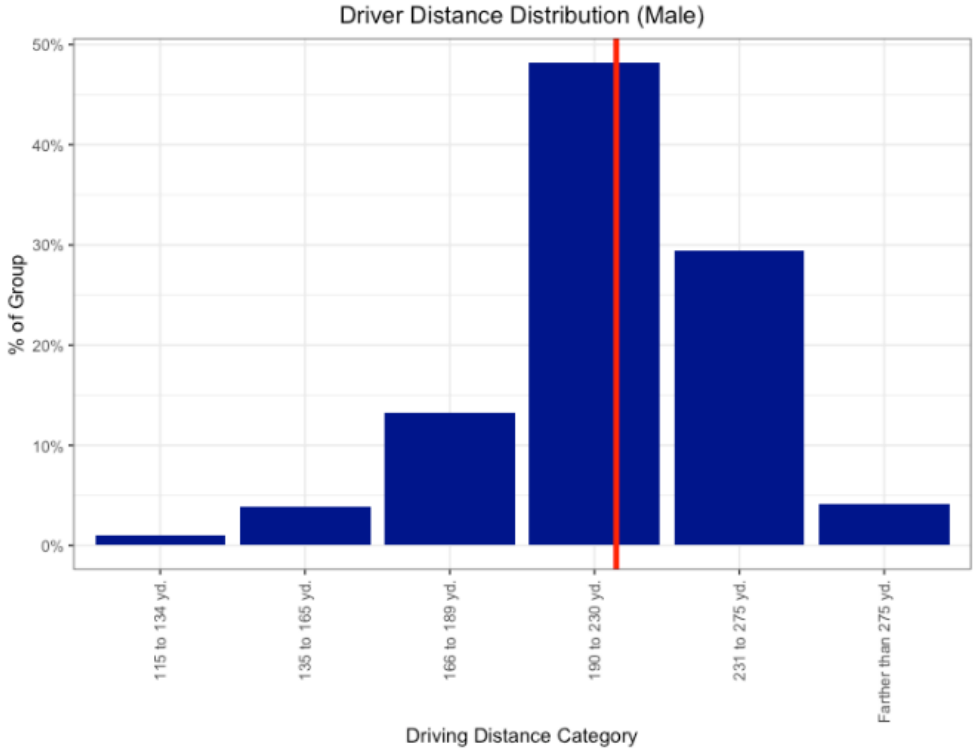


Figure 3: Self-reported 7-Iron Distance Distribution (By Gender)

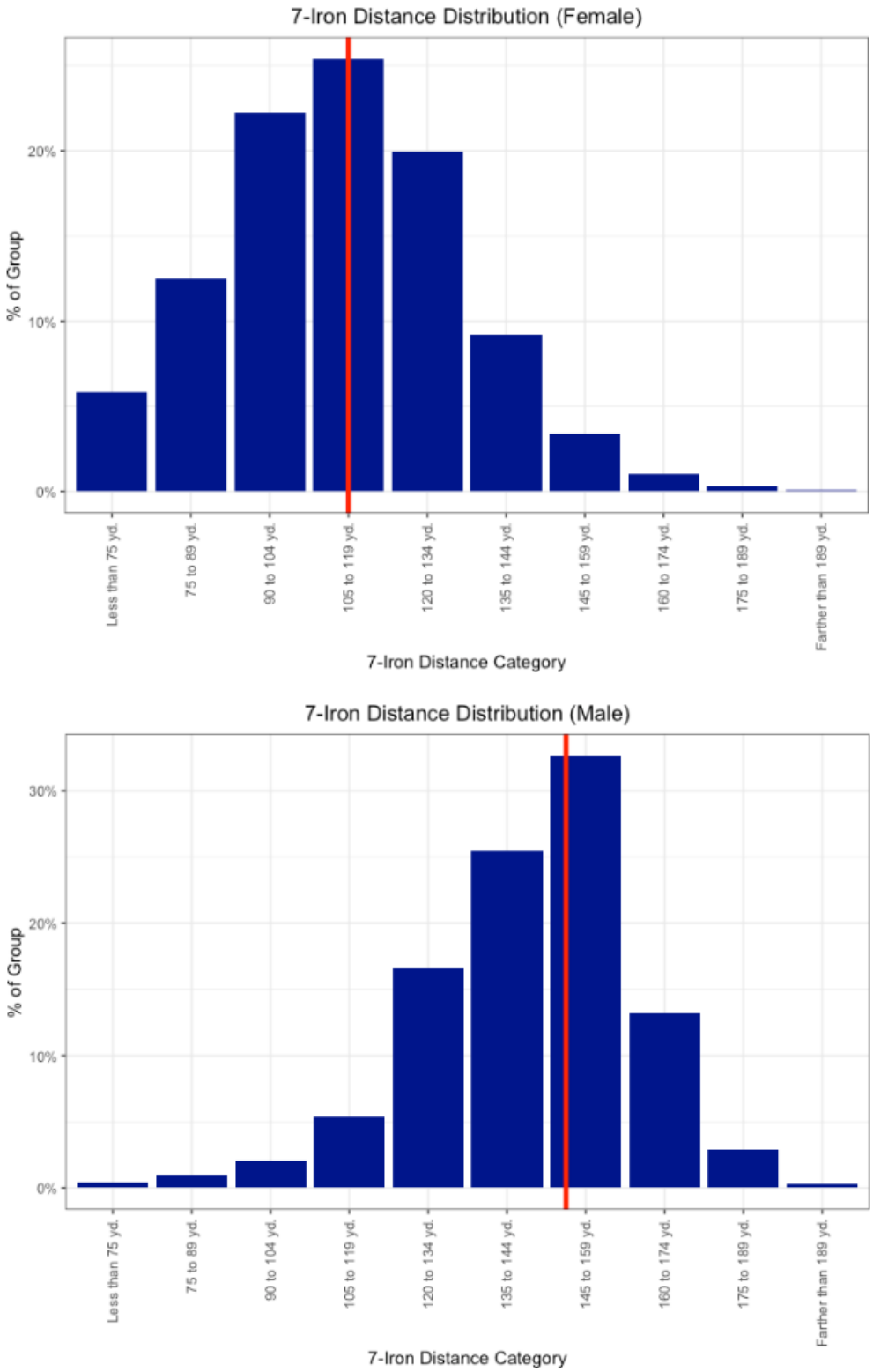
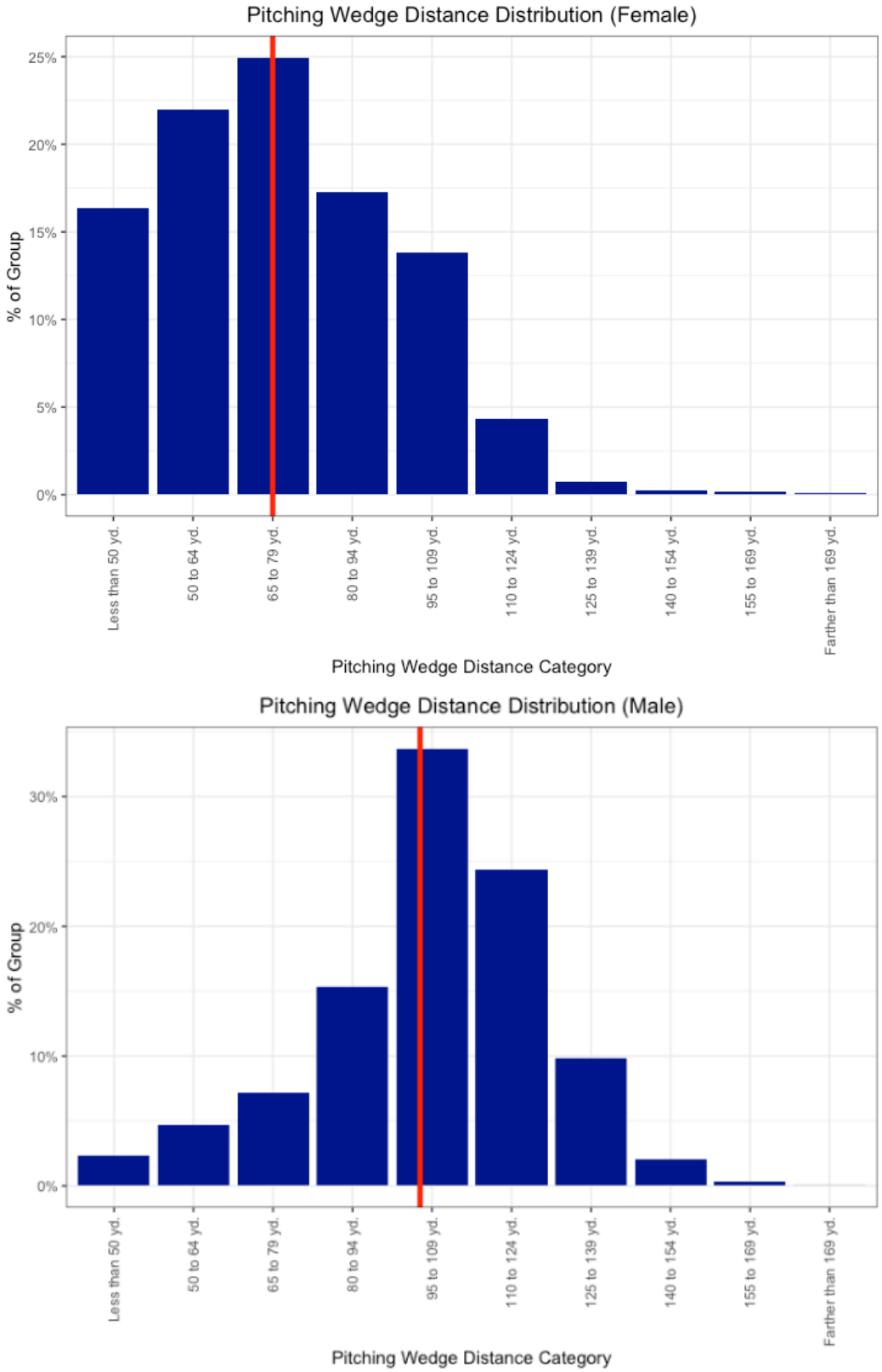


Figure 4: Self-reported Pitching Wedge Distance Distribution (By Gender)



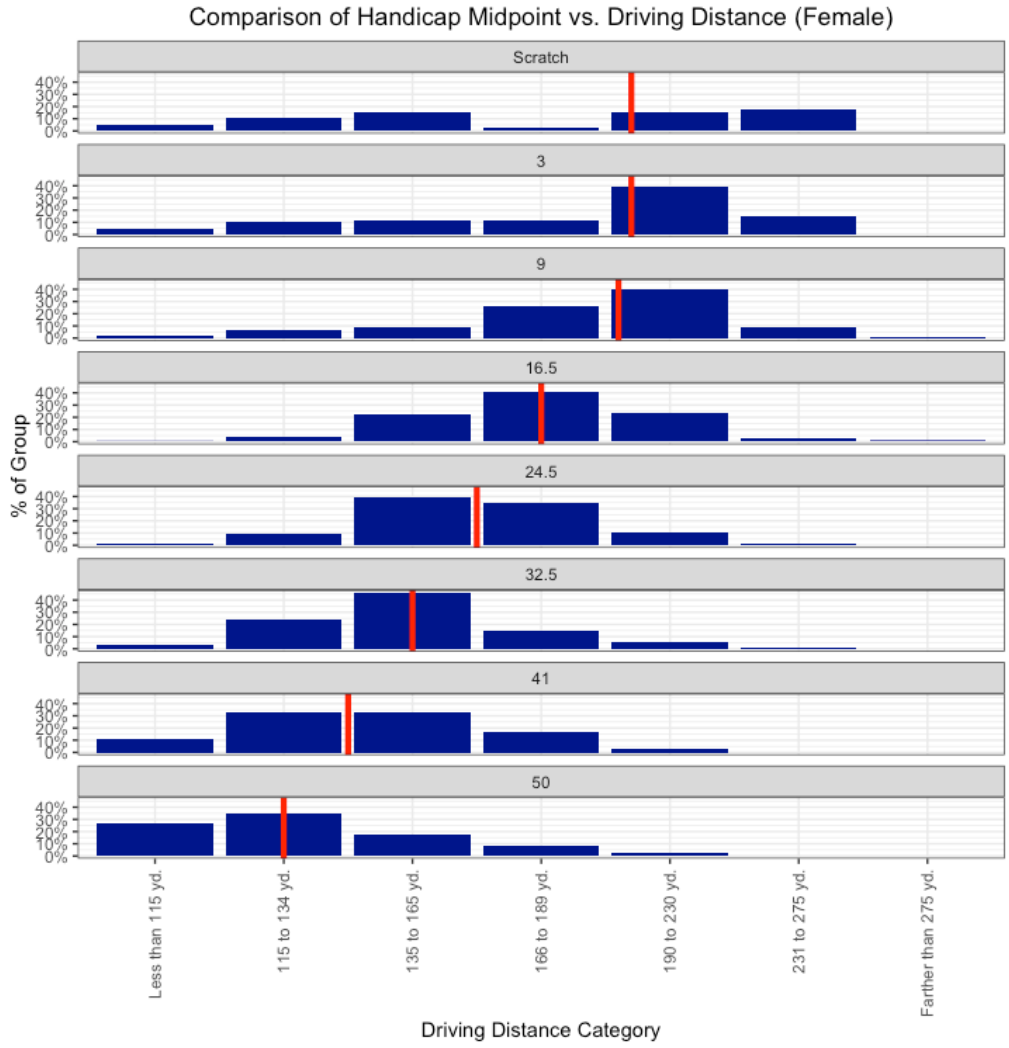
Each club length distribution has a wide range as shown in the plots above. Table 1 shows the female 5th and male 95th percentiles in club length for each club is shown. This range provides coverage of nearly all golfers.

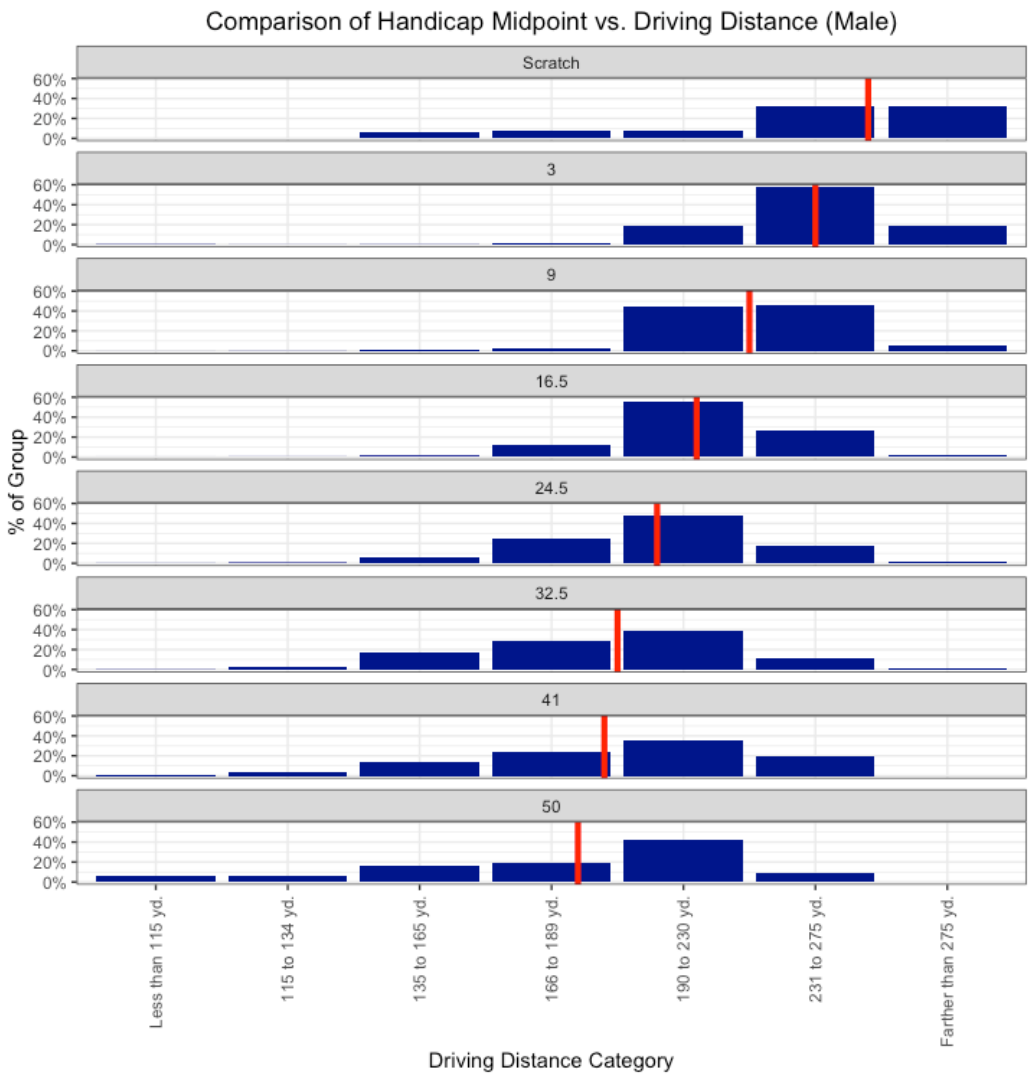
Table 1: Self-reported Club Length Ranges (Yards) Considering Gender Differences

Club	5th Percentile of Female	95th Percentile of Male
Driver	124	285
7-Iron	82	182
Pitching Wedge	43	147

Upon examining the distributions of the selected club lengths for each gender, the analysis was extended to club lengths by Gender and Handicap groupings. Driver distance estimates are shown Figure 5 below for both male and female golfers with the red line again indicating the median. Across both genders, better handicap groups have longer distance drives than worse handicap groups.

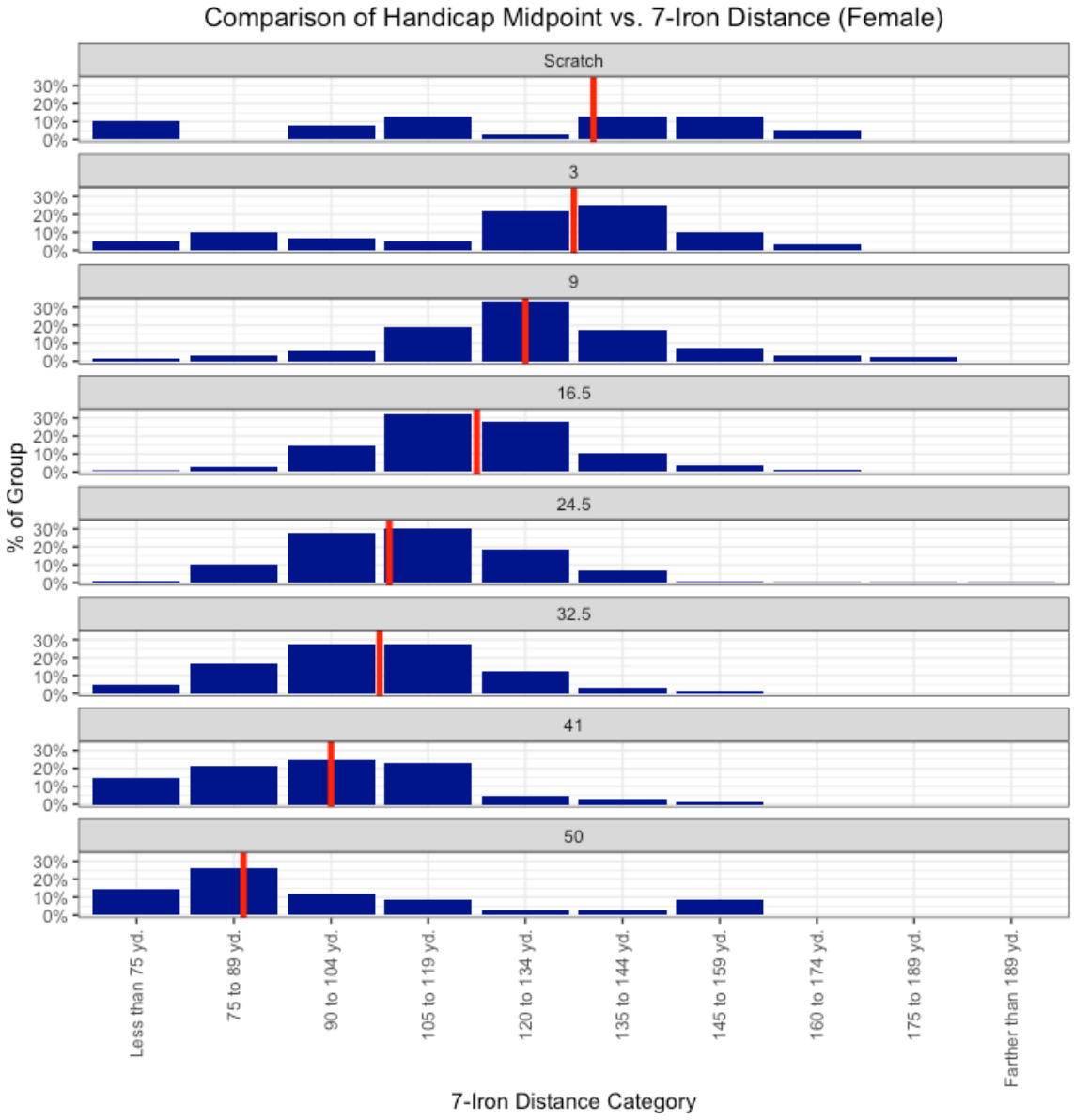
Figure 5: Self-reported Driving Distance vs. Handicap (By Gender)





These same trends can be seen across all club types recorded in the survey. Both 7-iron [Figure 6] and Pitching Wedge [Figure 7] distances are plotted below for each handicap grouping. On average, better golfers hit longer distances for both 7-Irons and Pitching Wedges.

Figure 6: Self-reported 7-Iron Distance vs. Handicap (By Gender)



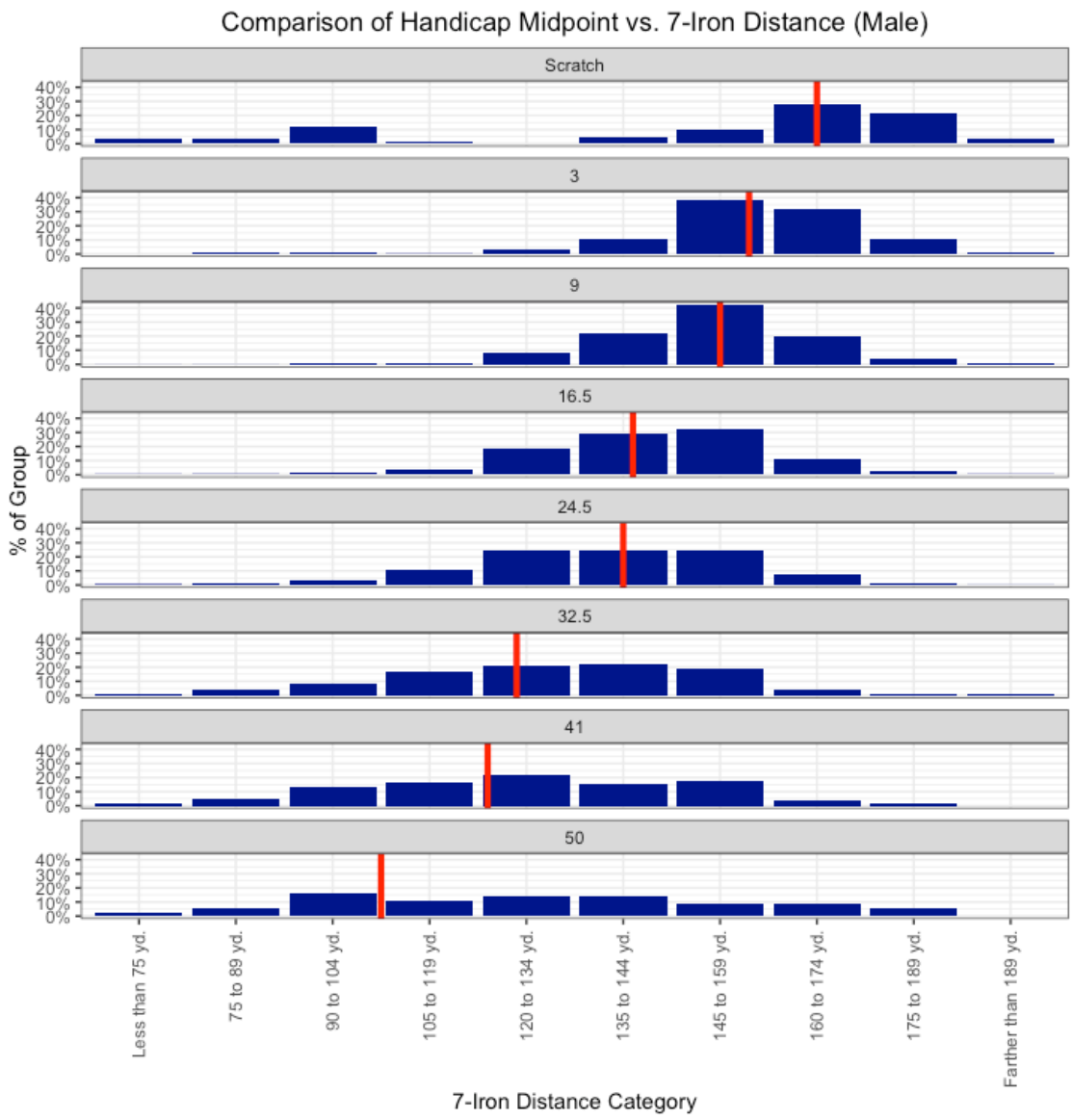
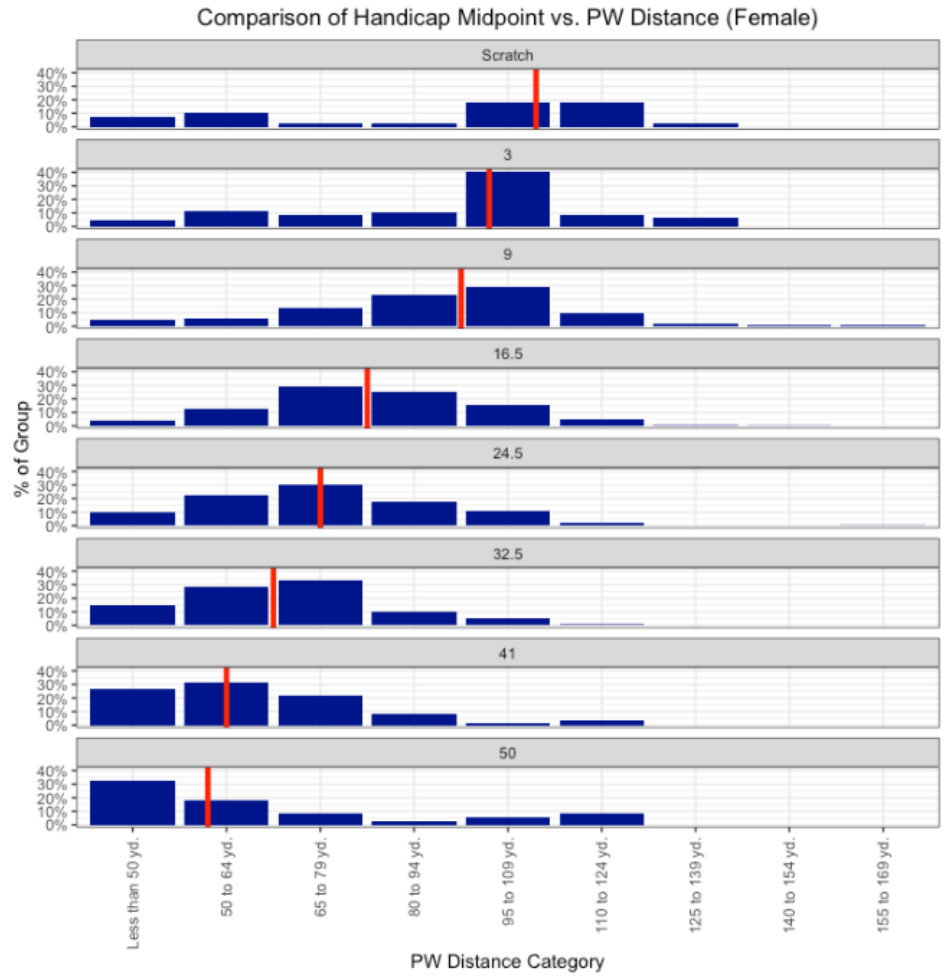
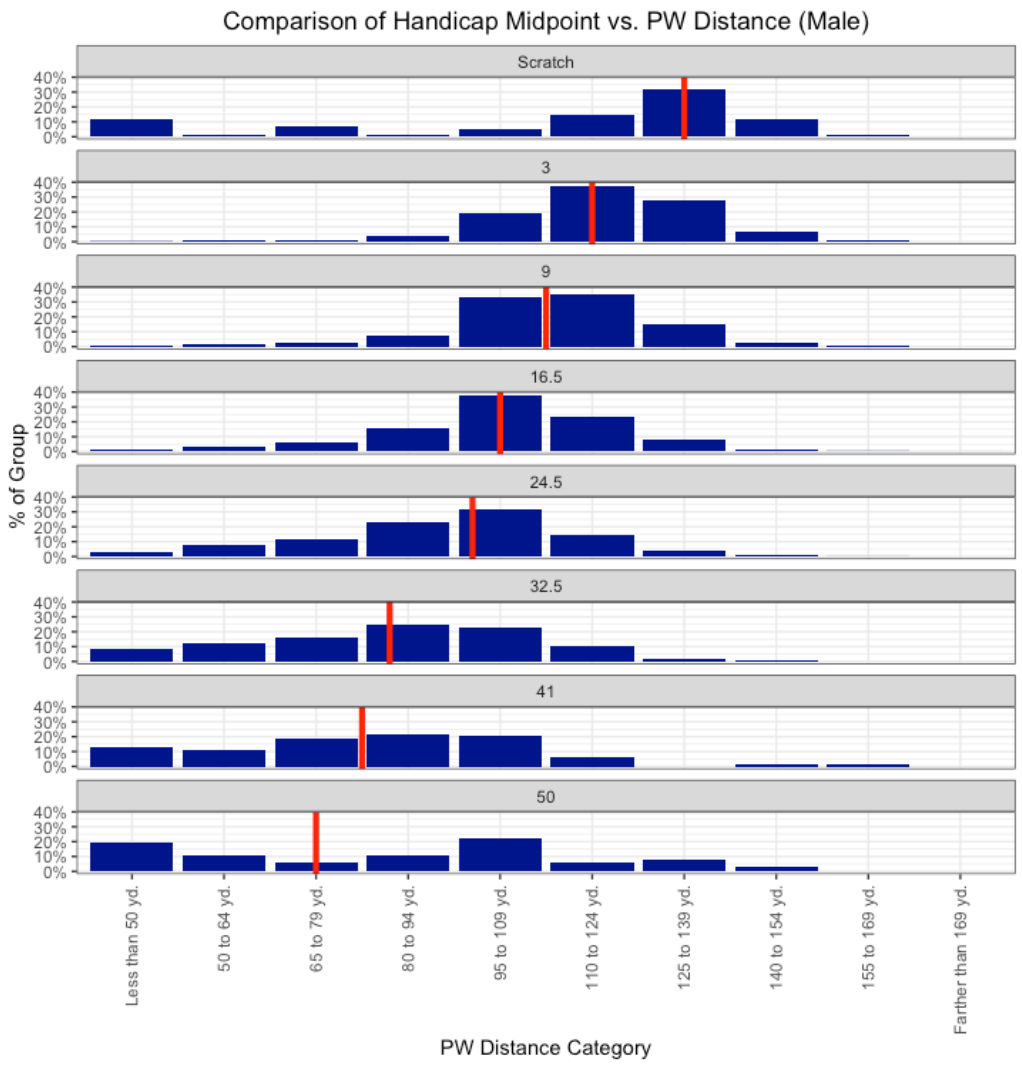

Comparison of Handicap Midpoint vs. 7-Iron Distance (Male)
Scratch
3
9
16.5
24.5
32.5
41
50
% of Group
40%
30%
20%
10%
0%
Less than 75 yd.
75 to 89 yd.
90 to 104 yd.
105 to 119 yd.
120 to 134 yd.
135 to 144 yd.
145 to 159 yd.
160 to 174 yd.
175 to 189 yd.
Farther than 189 yd.
7-Iron Distance Category

Figure 7: Self-reported Pitching Wedge Distance vs. Handicap (By Gender)





4. Handicap, Club Distance and Accuracy Analyses

4.1 Relationship between handicap and self-reported driving distance

The previous section showed that better golfers estimate their hitting distances to be longer on average. A linear regression was used to determine whether the relationships in the plots were *statistically significant* across the golfer survey data. Model coefficient estimates shown in Table 2 demonstrate that driver distance does have a statistically significant impact on handicap index. For every 1-yard increase in driver distance, Handicap Index decreases by 0.093 on average. This model was statistically significant and accounted for 24% of the variation in the data – a relatively weaker relationship. On average, when driving distance for men and women are equal, a women's handicap is lower by 0.6 units.

Table 2: Handicap Index vs. Self-reported Driver Distance Model Estimates

Males: *Handicap Index Midpoint = B0 + B1*(Driving Distance) + B2 + ε*

Females: *Handicap Index Midpoint = B0 + B1*(Driving Distance) + ε*

Variable Name	Estimate	P-Value
B0	36.88	<0.001
B1	-0.093	<0.001
B2	-0.572	0.01

4.2 Relationship between estimated club distances

The following models explore how one club distance relates to another club distance for players. Table 3 shows the relationship between Driver and 7-iron. The model shows that for every 1-yard increase in 7-iron distance, Driver distance increases by 1.31 yards on average. This model was statistically significant and accounted for 61% of the variation in the data – a moderately strong relationship. As examples on how to use the model:

- A golfer who hits a 7-iron 150 yards would be expected to hit their driver 227 yards
- A golfer who hits a 7-iron 100 yards would be expected to hit their driver 161 yards

Table 3: Self-reported Driver Distance vs. 7-Iron Distance Model Estimates

Driving Distance = B0 + B1(7-Iron Distance) + ε*

Variable Name	Estimate	P-Value
B0	30.42	<0.001
B1	1.31	<0.001

An analogous relationship can be seen when comparing Driver distance and Pitching Wedge distance of the survey respondents. The model in Table 4 shows that for every 1-yard increase in Pitching Wedge distance, Driver distance increases by 1.06 yards on average. The results of the model were statistically significant and accounted for 46% of the variation in the data – a moderate relationship. As examples on how to use the model:

- A golfer who hits a PW 120 yards would be expected to hit their driver 237 yards
- A golfer who hits a PW 75 yards would be expected to hit their driver 189 yards

Table 4: Self-reported Driver Distance vs. Pitching Wedge Distance Model Estimates

Driving Distance = B0 + B1(PW Distance) + ε*

Variable Name	Estimate	P-Value
B0	109.44	<0.001
B1	1.06	<0.001

Finally, Table 5 shows the relationship between Pitching Wedge and 7-Iron distance among the survey responses. Every 1-yard increase in Pitching Wedge distance increases 7-Iron distance by 0.73 yards on average. The model was statistically significant and accounted for 62% of the variability in the data – a moderately strong relationship. As examples on how to use the model:

- A golfer who hits a PW 120 yards would be expected to hit their 7-iron 155 yards
- A golfer who hits a PW 75 yards would be expected to hit their 7-iron 123 yards

Table 5: Self-reported 7-Iron Distance vs. Pitching Wedge Distance Model Estimates

7 Iron Distance = B0 + B1(PW Distance) + ε*

Variable Name	Estimate	P-Value
B0	67.76	<0.001
B1	0.73	<0.001

4.3 Relationship between handicap and estimated driving accuracy

The survey data also provided self-reported drive accuracy of the survey respondents. Table 6 displays a driver accuracy breakdown across handicap groupings. The "red" cells in the table indicate the higher accuracy percentages in each column showing that golfers from better handicap groups generally have higher drive accuracies compared to golfers from worse handicaps groups.

Table 6: Self-reported Driver Accuracy by Handicap Group

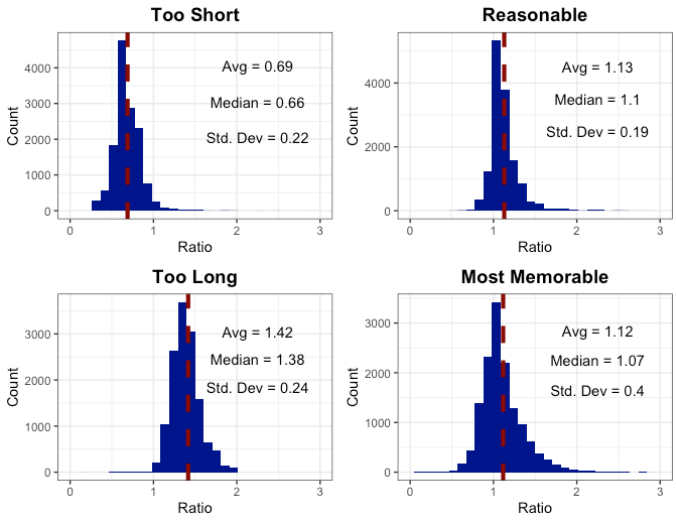
		Driving Accuracy				
		< 25%	**25 - 49%**	**50 - 74%**	**75 - 89%**	**> 90%**
Handicap Midpoint	**Scratch**	5%	12%	28%	27%	8%
	3	1%	10%	46%	33%	8%
	9	1%	16%	49%	28%	5%
	16.5	2%	22%	47%	22%	4%
	24.5	5%	28%	41%	20%	4%
	32.5	8%	28%	40%	17%	5%
	41	13%	29%	35%	15%	3%
	50	21%	31%	24%	11%	3%

5. Self-reported Club Distance to Preferred Hole Length Ratios

The survey then asked respondents about their hole length preferences when playing a round of golf for par 3, par 4 and par 5 holes. These preferences were split into four different categories for each type of hole – what hole length is too long, too short, reasonable, and most memorable. By calculating the ratio of the respondents' hole length preferences to their estimated club hitting distances, we are able to normalize hole length preferences for golfers.

Figure 8 shows the ratio of respondents' Par 3 hole length preferences to 7-Iron distances for each hole category. Focusing on the median indicated by the red line and shown on each chart, golfers find that Par 3's get too short when they are less than 66% of their 7-iron distance. They become too long at 138% of their 7-iron distance and are reasonable at 110% of their 7-iron distance (or about a 6-iron distance). **These ratios bracket the desired Par 3 distances according to golfers.**

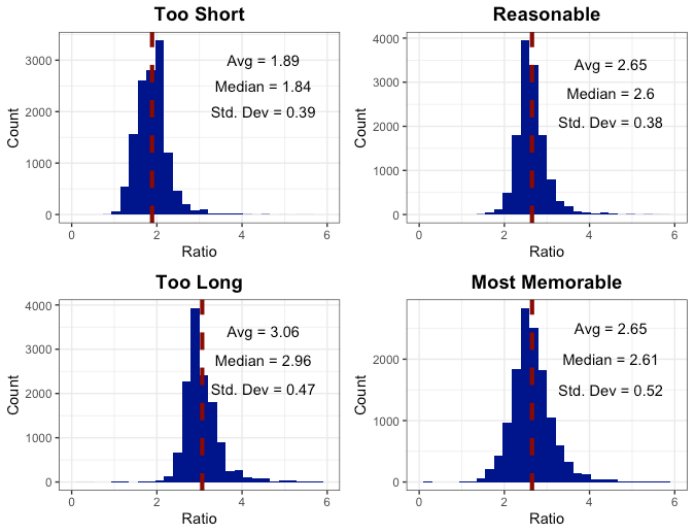
Figure 8: Self-reported 7-Iron vs. Par 3 Hole Length Preference Ratios



The same process was applied to survey respondents' hole length preferences for Par 4's. The ratios increase as hole lengths for Par 4's are longer than Par 3's. It's noted that reasonable and most memorable ratios are again similar, but this should not be overstated. Although memorable holes align with a golfer's ability and are not too long or too short; there are memorable holes that are relatively short (7th hole at Pebble Beach, Postage Stamp at Troon) or relatively long (Road Hole at St. Andrews).

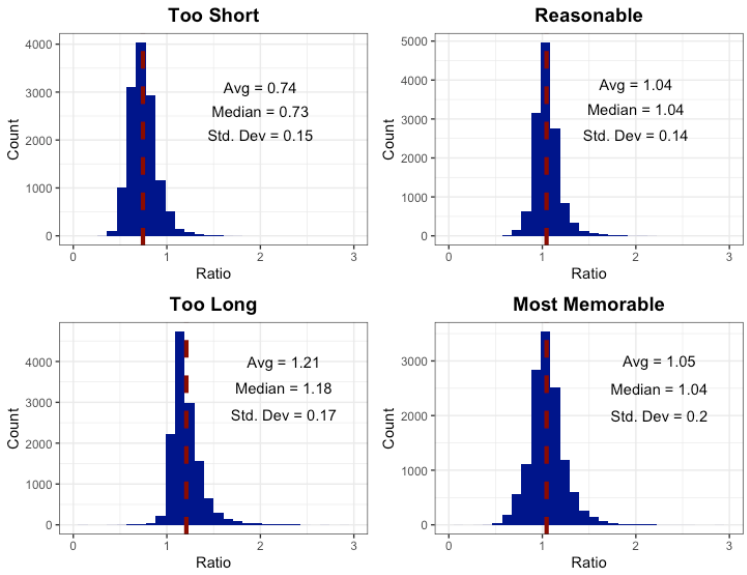
Figure 9 shows the ratio of respondents' Par 4 hole length preferences to 7-Iron distances for each hole category. Focusing on the median indicated by the red line and shown on each chart, golfers find that Par 4's get too short when they are less than 184% of their 7-iron distance. They become too long at 296% of their 7-iron distance and are reasonable at 260% of their 7-iron distance. **These ratios bracket the desired Par 4 distances according to golfers.**

Figure 9: Self-reported 7-Iron vs. Par 4 Hole Length Preference Ratios



A golfer will normally use multiple clubs on a Par 4. Figure 10 shows the results using a more realistic ratio calculated using both a golfer's driver and 7-Iron distances. The formula presumes a Driver off the tee, followed by a 7-iron into the green. Focusing on the median indicated by the red line and shown on each chart, golfers find that Par 4's get too short when they are less than 73% of their Driver + 7-iron distance. They become too long at 118% of their Driver + 7-iron distance and are reasonable at 104% of their Driver + 7-iron distance. **These ratios bracket the desired Par 4 distances according to golfers.** Interestingly, the Driver + 7-iron ratios in this figure are similar to the Par 3 ratios in Figure 5.

Figure 10: Self-reported Driver & 7-Iron vs. Par 4 Hole Length Preference Ratios



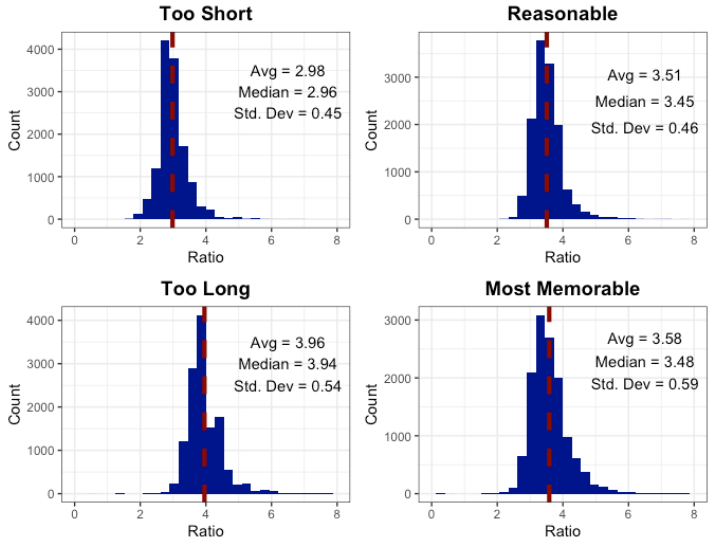
The formula for Par 4 reference distance using multiple clubs of Driver and 7-iron is:

Par 4 Club Reference Distance = Driver Distance + 7-iron Distance

The single club ratio and a multiple club ratio procedure were applied to hole length preferences for Par 5's. Figure 11 shows the ratio of respondents' Par 5 hole length preferences to 7-Iron distances for each hole category. Focusing on the median indicated by the red line and shown on each chart, golfers find that Par 5's get too short when they are less than 296% of their 7-iron distance. They become too long at 394% of their 7-iron distance and are reasonable at 345% of their 7-iron distance. **These ratios bracket the desired Par 4 distances according to golfers.**

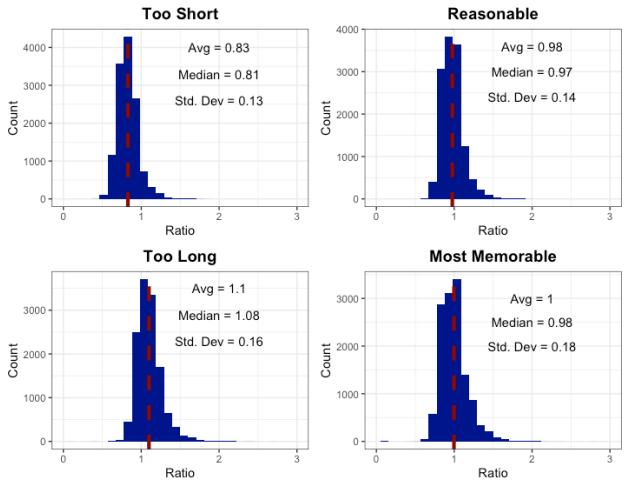
Again, note that the most memorable Par 5 holes are ones that are reasonable in length to the player. A golfer gets the most satisfaction when they are playing a hole that is not too long nor too short.

Figure 11: Self-reported 7-Iron vs. Par 5 Hole Length Preference Ratios



As with Par 4 holes, a golfer will normally use multiple clubs on a Par 5. Figure 12 shows the results using a more realistic ratio calculated using both a golfer's Driver and PW distances. The formula presumes a Driver off the tee, followed by a fairway wood or hybrid at 85% of the driver distance followed by a 9-iron into the green which is 110% of the PW distance. Focusing on the median indicated by the red line and shown on each chart, golfers find that Par 5's get too short when they are less than 81% of their Driver/PW reference distance. They become too long at 108% of their Driver/PW reference distance and are reasonable at 97% of their Driver/PW reference distance. **These ratios bracket the desired Par 5 distances according to golfers.** These ratios are in line with what was shown in the previous plots. Most memorable Par 5's are what golfers consider to be a reasonable distance.

Figure 12: Self-reported Club Reference Calculation vs. Par 5 Hole Length Preference Ratios



The formula for Par 5 reference distance using multiple clubs of driver and PW is:

*Par 5 Club Reference Distance = 1.85 * Driver Distance + 1.1 * PW Distance*

The results using preferred multi-club method are presented in Table 7

Table 7: Summary of Median Hole Reference Ratios using the Multi-club Approach (preferred)

Hole Par	Reference Clubs	Too Short	Reasonable	Memorable	Too Long
3	7-iron	0.66	1.10	1.07	1.38
4	D + 7-iron	0.73	1.04	1.04	1.18
5	D + PW	0.83	0.97	0.98	1.08

Tables 8 & 9 show the calculated hole and par-72 course lengths for average male and average female golfers using these ratios. The “model course” is made up of ten par 4’s, four par 3’s and four par 5’s.

Table 8: Hole and Course Lengths (yards) for Average Female Golfer using the Multi-club Approach

Hole Par	Reference Clubs	Too Short	Reasonable	Memorable	Too Long
3	7-iron	67	111	108	139
4	D + 7-iron	183	261	261	296
5	D + PW	303	354	357	394
Course	Par 72	3310	4469	4472	5094

Table 9: Hole and Course Lengths (yards) for Average Male Golfer using the Multi-club Approach

Hole Par	Reference Clubs	Too Short	Reasonable	Memorable	Too Long
3	7-iron	92	154	150	193
4	D + 7-iron	254	362	362	411
5	D + PW	420	491	496	546
Course	Par 72	4589	6198	6201	7064

6. Course Length Distribution by Gender

The survey data also included the course lengths that golfers prefer to play from when playing a round of golf. The distribution of these lengths for both males and females are presented in Figure 13. The most common or frequent playing length for males is centered around the 6,000-6,499 yard bin while females are centered around 5,000-5,499 yard bin.

Figure 13: Course Length Distribution by Gender (Survey Data)

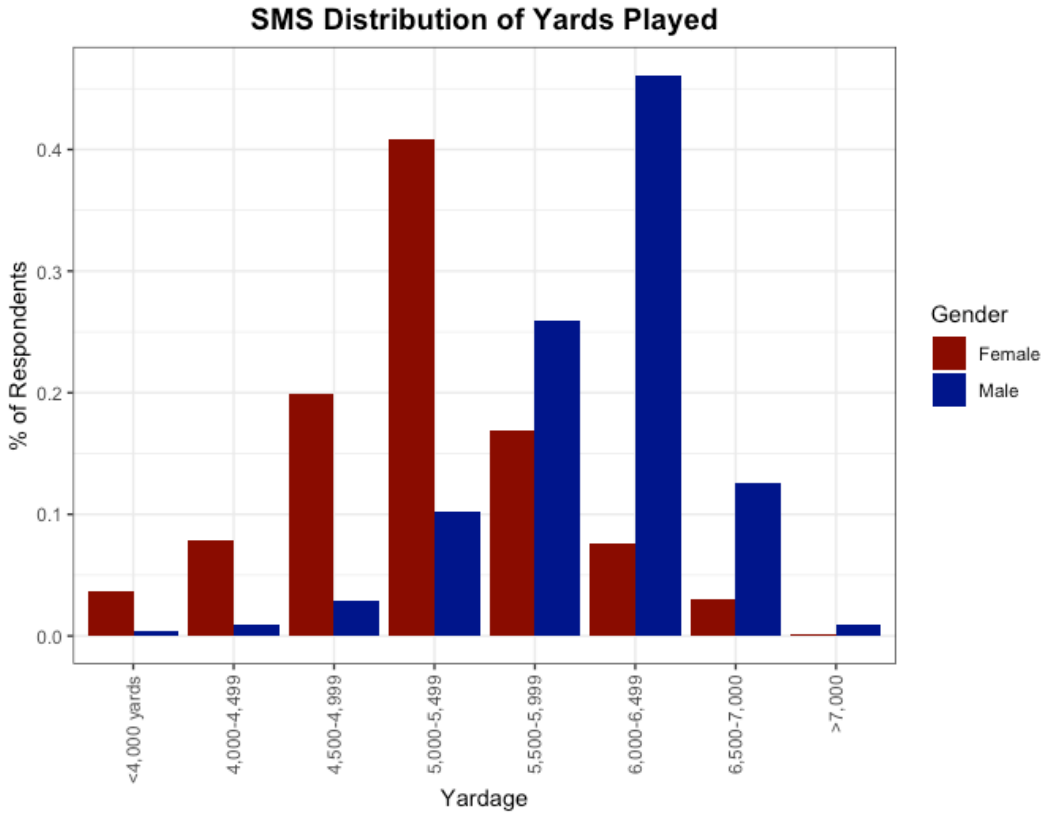
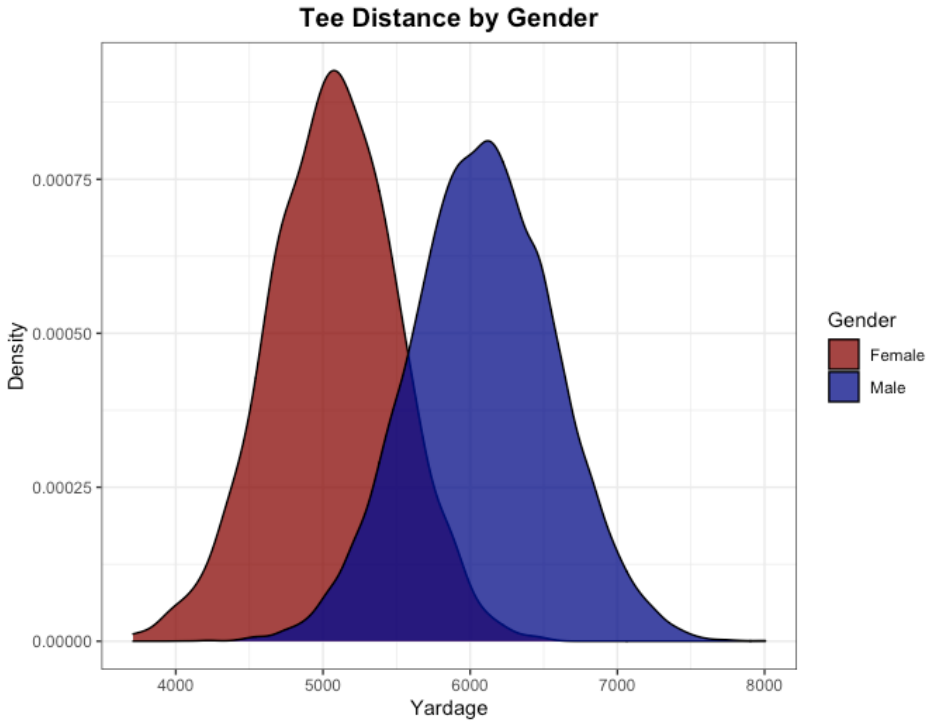


Figure 14 demonstrates that the survey course length distributions align with GHIN score posting course length distributions. Having two separate data sources showing the same playing length trends increases our confidence that course length by gender follows these distributions.

Figure 14: Course Length Distribution by Gender (2020 Score Posting Data Analysis)

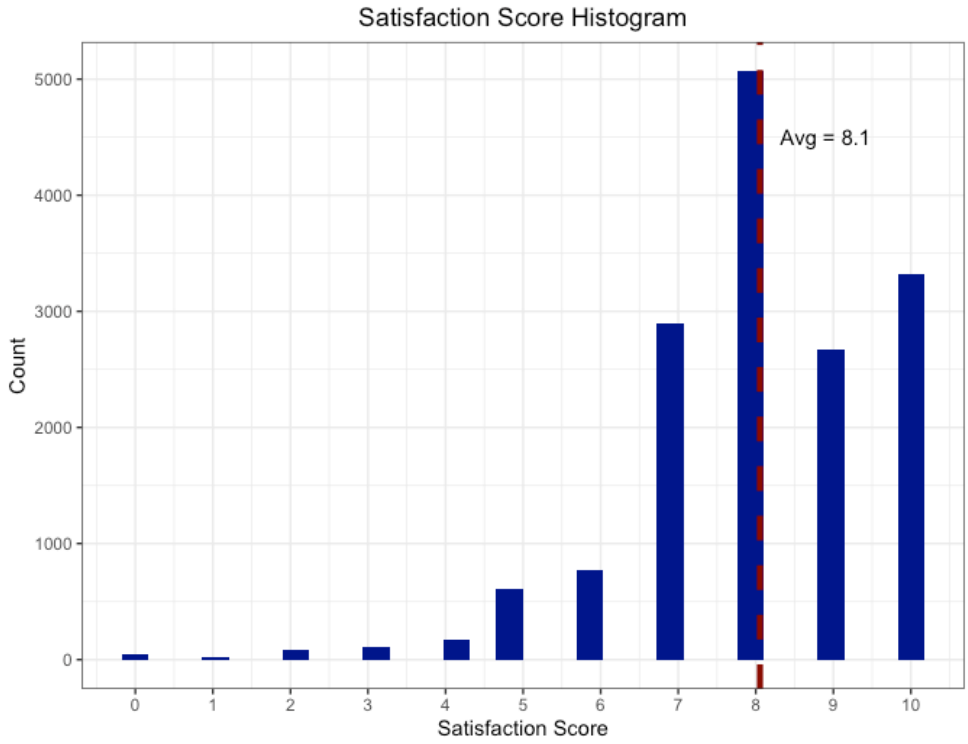


It is important to note that the average course length played by men in Figure 14 closely matches with the desired playing length for the average male golfer in Table 9 while **the average course length played by women in Figure 14 exceed the desired playing length for the average female golfer in Table 8 by about 600 yards.**

7. Overall Golfer Satisfaction

Survey respondents were asked about their overall satisfaction with golf. Figure 15 shows the results of the golfer satisfaction scores reported. The average score was 8.1 and the most frequent score was 8 (out of a maximum of 10). Golfers that filled out the survey generally enjoyed their round of golf with an average satisfaction score of 8.1.

Figure 15: Distribution of Overall Golfer Satisfaction



8. Conclusions

The overall goal of this study was to explore the more quantitative portions of the SMS survey data. First, consistency of the self-reported data was checked. Examining handicap versus typical score confirmed that golfers are reporting both consistently. Also, lower handicap golfers reported longer hitting distances for all clubs queried.

Next, correlations between handicap and self-reported hitting distance as well as hitting distance between clubs was determined. These correlations should be considered approximate because the data was requested in bins. The relationship between handicap and accuracy demonstrated clearly that better golfers report to be more accurate showing that golfers are self-aware of their skill level.

In particular, a better understanding of the hole distances that recreational players prefer on a normalized basis to a golfer's self-reported hitting distance was determined. **This study established a new methodology for normalized hole length resulting in the development of clear hole and course length guidelines based on golfers' preferences and abilities.** Utilizing either a single club or three clubs are viable approaches to determining desired hole lengths with the three-club method preferred because the distribution of hole lengths are narrower. This study also shows that on average, the most memorable holes are generally reasonable in length as opposed too long or too short while understanding that there are notable exceptions. It is clearly demonstrated that while the average male golfer desired course length matches closely to desired playing length, that the average female golfer plays a course that is about 600

yards longer than they prefer. These ratios should be used to examine preferred course lengths for the full distribution of hitting distances from the slowest to fastest swing speeds demonstrated by recreational golfers to bracket playing lengths that should be considered by facilities to supply that covers both genders across their golfing lifetimes.

Finally, distribution of course length currently played and overall golfer satisfaction were reported and are consistent with previous data.