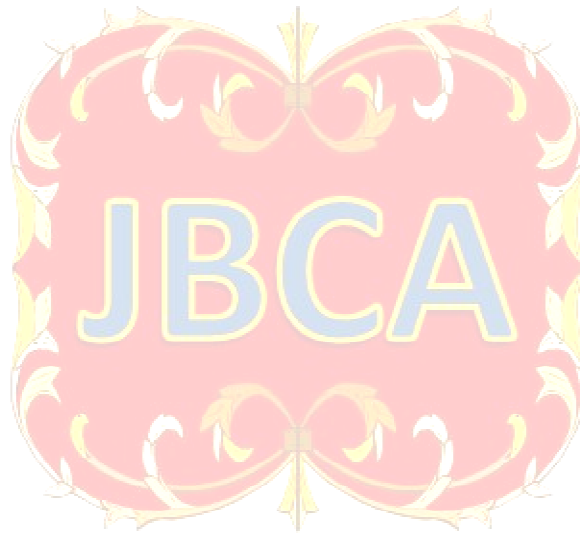


## **That pesky golf game and the dreaded stats class**

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A case study that involves golf and statistics is presented. This case study focuses on descriptive statistics and can serve as a useful project in an introductory statistics course for learning and assessment purposes. An instructor's guide which includes tables, graphs, and numerical measures of the case data is provided.

Keywords: golf and statistics, descriptive statistics, statistics, golf, statistics case study, golf case study



## CASE STUDY

The professor is in a pickle. Her two statistics students, Tommy and Jess, did not do too well on their last statistics exam and have been continually asking the professor for some extra credit opportunities in order to improve their grades. In addition, the professor has been having trouble with her golf game. She will be entering a longest drive competition within the next couple of weeks at the local golf course. The person with the longest drive that lands between two posts 25 yards apart will win the contest. The professor has won the longest drive competition for the past four years. However, she has been having trouble with distance on her drives lately and is worried that she will not retain her winning streak.

After a long day grading papers and teaching, the professor decides to escape to the driving range at the local golf course for a couple of hours. While hitting some golf balls, the professor begins to wonder if she will see an improvement if she switches to a slightly different swing style and takes less practice swings prior to hitting the golf ball. The professor recently read about a new swing technique in a golf magazine and thinks it might be worth trying out this new golf swing method. Also, the professor has always taken two practice swings prior to hitting a golf ball and wonders if one less practice swing will suffice. She thinks that two practice swings is throwing off her concentration. The professor wants to collect some data and do some analysis before committing to changing her golf swing method and the number of practice swings that she takes prior to hitting a golf ball. Suddenly, a light bulb goes off in the professor's head, and she realizes that she can work on her game and at the same time help her struggling stats students better grasp the material and earn some extra credit points.

The professor asks Tommy and Jess whether they would be interested in helping her with her golf game and at the same time have the opportunity to better understand the material and improve their grades. The professor will have the students keep track of how far she hits the golf ball with her driver under the two different swing techniques. In addition, the students will keep track of the number of practice swings the professor takes prior to hitting each golf ball. The students will then organize the data and make some observations and recommendations to the professor. Both students are eager to help the professor out with her game and at the same time try to salvage their stats grades!

The professor and the students first do a review of some of the topics covered on the last exam that will be needed for this project. The exam covered descriptive statistics, and the professor wants to make sure that Tommy and Jess are comfortable with descriptive statistics since it will lay the foundation for the rest of the course. Once the students feel more confident regarding the material, the students and the professor head to the golf course.

The professor has one student record the swing method used and the number of practice swings taken prior to hitting a golf ball. The other student measures the total distance each golf ball travels. The professor hits a total of 200 golf balls with her driver and the distance each golf ball travels (measured in yards) is recorded. Method 1 is the professor's old swing method and Method 2 is the new golf swing method.

Table 1 (Appendix) shows the distances for 50 golf balls hit by the professor using Method 1 and only taking one practice swing prior to hitting each of the golf balls. Table 2 (Appendix) shows the distances for 50 golf balls hit by the professor using Method 1 and taking two practice swings prior to hitting each of the golf balls.

Table 3 (Appendix) shows the distances for 50 golf balls hit by the professor using Method 2 and taking only one practice swing prior to hitting each of the golf balls. Table 4 (Appendix)

shows the distances for 50 golf balls hit by the professor using Method 2 and taking two practice swings prior to hitting each of the golf balls.

The professor thanks Tommy and Jess for their help in collecting the data. She feels that this project will help the students better understand descriptive statistics and at the same time help her golf game and preparation for the longest drive competition. The professor asks the students to prepare a report that includes some tables, graphs, numerical measures, observations, and recommendations. The professor tells the students that she will have them do some inferential statistics such as constructing confidence intervals and conducting hypothesis tests on the collected data later in the semester once these topics have been covered in class. Tommy and Jess promise the professor that they will work diligently on the report over the weekend and will have the report to her first thing Monday morning.

## **INSTRUCTOR'S GUIDE**

This case study can be used in an introductory statistics course as a learning tool for understanding descriptive statistics, which lays the foundation for advanced statistical topics such as confidence intervals and hypothesis testing. An instructor may decide to use this case study as a project to assess student learning once descriptive statistics has been covered in the class. Students can create tables such as frequency and relative frequency distributions and graphs such as histograms for the provided data. In addition, students can calculate numerical measures such as the mean, median, mode, quartiles, range, sample standard deviation, sample variance, sample skewness, interquartile range, and the coefficient of variation for the provided case data. Finally, students can then write a report that includes observations and recommendations based on the results of the tables, graphs, and numerical measures created and calculated.

This case study can also be used for assessing how well students are understanding inferential statistics. For example, students can construct different types of confidence intervals and run different types of hypothesis tests with the provided case data. Students can then provide a summary of their findings and make recommendations and conclusions in a report.

The following are some tables, graphs, and numerical measures that can be created and calculated from the case data. Other tables, graphs, and numerical measures can also be created and calculated. In addition, statistical inference techniques such as confidence intervals and hypothesis tests can be constructed and conducted on the provided case data.

### **Tables and Graphs**

Table 5 (Appendix) displays a frequency distribution and a relative frequency distribution and Figure 1 (Appendix) shows a histogram for golf balls hit with a driver using Method 1 and only taking one practice swing prior to hitting each golf ball. Table 6 (Appendix) displays a frequency distribution and a relative frequency distribution and Figure 2 (Appendix) shows a histogram for golf balls hit with a driver using Method 1 and taking two practice swings prior to hitting each golf ball.

Table 7 (Appendix) displays a frequency distribution and a relative frequency distribution and Figure 3 (Appendix) shows a histogram for golf balls hit with a driver using Method 2 and taking only one practice swing prior to hitting each golf ball. Table 8 (Appendix) displays a frequency distribution and a relative frequency distribution and Figure 4 (Appendix) shows a

histogram for golf balls hit with a driver using Method 2 and taking two practice swings prior to hitting each golf ball.

### Numerical Measures

Tables 9, 10, and 11 (Appendix) display some numerical measures for the case data. The numerical measures: mean, median, mode, first and third quartiles, min, max, range, interquartile range, sample standard deviation, sample variance, sample skewness, and the coefficient of variation are provided for the following: all drives, all drives using Method 1, all drives using Method 2, all drives taking only one practice swing, all drives taking two practice swings, all drives using Method 1 and taking one practice swing, all drives using Method 1 and taking two practice swings, all drives using Method 2 and taking one practice swing, and all drives using Method 2 and taking two practice swings.

### APPENDIX

**Table 1: Method 1 and One Practice Swing Data**

241	222	227	207	262
224	259	191	236	234
215	191	215	245	229
243	271	248	217	196
217	174	209	216	186
199	194	228	230	231
216	190	249	196	243
200	222	233	223	233
189	198	252	185	216
260	268	217	220	226

**Table 2: Method 1 and Two Practice Swings Data**

205	212	223	220	192
230	210	210	217	226
230	191	192	209	211
253	213	219	214	242
209	231	206	192	235
227	195	209	222	227
218	252	174	222	208
213	247	222	195	203
194	209	228	194	224
201	234	233	221	211

**Table 3: Method 2 and One Practice Swing Data**

232	240	225	244	232
248	207	246	215	237
204	252	231	249	243
236	260	239	247	242
233	242	248	228	246
231	223	252	242	254
251	253	239	262	224
190	237	234	219	227
212	237	227	241	241
250	235	250	224	243

**Table 4: Method 2 and Two Practice Swings Data**

228	236	239	223	200
219	220	258	229	258
229	223	222	236	215
228	212	229	210	224
230	249	244	227	247
247	224	228	241	234
241	237	238	214	224
237	226	231	210	227
219	224	245	219	225
205	249	224	242	204

**Table 5: Method 1 and One Practice Swing**

<u>Distance</u>	<u>Frequency</u>	<u>Relative Frequency</u>
170 to 184 yards	1	0.02
185 to 199 yards	11	0.22
200 to 214 yards	3	0.06
215 to 229 yards	17	0.34
230 to 244 yards	9	0.18
245 to 259 yards	5	0.10
260 to 274 yards	4	0.08

**Table 6: Method 1 and Two Practice Swings**

<u>Distance</u>	<u>Frequency</u>	<u>Relative Frequency</u>
170 to 184 yards	1	0.02
185 to 199 yards	8	0.16
200 to 214 yards	17	0.34
215 to 229 yards	14	0.28
230 to 244 yards	7	0.14
245 to 259 yards	3	0.06
260 to 274 yards	0	0.00

**Table 7: Method 2 and One Practice Swing**

<u>Distance</u>	<u>Frequency</u>	<u>Relative Frequency</u>
170 to 184 yards	0	0.00
185 to 199 yards	1	0.02
200 to 214 yards	3	0.06
215 to 229 yards	9	0.18
230 to 244 yards	22	0.44
245 to 259 yards	13	0.26
260 to 274 yards	2	0.04

**Table 8: Method 2 and Two Practice Swings**

<u>Distance</u>	<u>Frequency</u>	<u>Relative Frequency</u>
170 to 184 yards	0	0.00
185 to 199 yards	0	0.00
200 to 214 yards	7	0.14
215 to 229 yards	23	0.46
230 to 244 yards	13	0.26
245 to 259 yards	7	0.14
260 to 274 yards	0	0.00

**Table 9: Numerical Measures**

	Mean	Median	Mode	First Quartile	Third Quartile
All drives	225.71	227.00	224.00	213.75	240.25
All drives using Method 1	218.68	217.50	209.00 222.00	205.75	230.25
All drives using Method 2	232.74	233.50	224.00	224.00	243.00
All drives taking one practice swing	229.17	232.00	243.00	216.75	243.25
All drives taking two practice swings	222.25	223.50	224.00	210.75	231.50
All drives using Method 1 and taking one practice swing	221.86	222.00	216.00 217.00	201.75	235.50
All drives using Method 1 and taking two practice swings	215.50	213.50	209.00	206.50	226.75
All drives using Method 2 and taking one practice swing	236.48	239.00	237.00 242.00	228.75	246.75
All drives using Method 2 and taking two practice swings	229.00	228.00	224.00	222.25	237.75

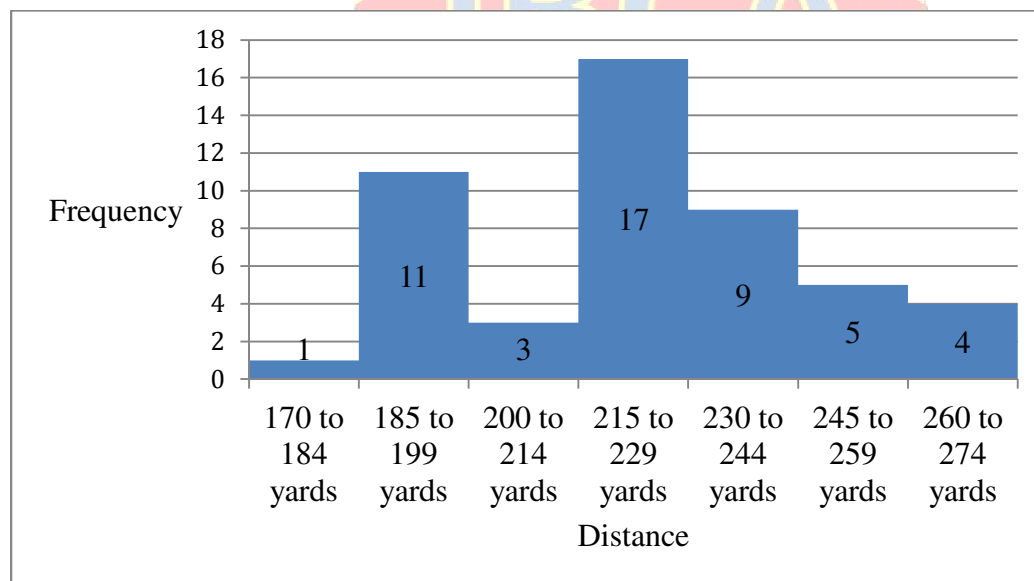
**Table 10: Numerical Measures**

	Min	Max	Range	Interquartile Range
All drives	174.00	271.00	97.00	26.50
All drives using Method 1	174.00	271.00	97.00	24.50
All drives using Method 2	190.00	262.00	72.00	19.00
All drives taking one practice swing	174.00	271.00	97.00	26.50
All drives taking two practice swings	174.00	258.00	84.00	20.75
All drives using Method 1 and taking one practice swing	174.00	271.00	97.00	33.75
All drives using Method 1 and taking two practice swings	174.00	253.00	79.00	20.25
All drives using Method 2 and taking one practice swing	190.00	262.00	72.00	18.00
All drives using Method 2 and taking two practice swings	200.00	258.00	58.00	15.50

**Table 11: Numerical Measures**

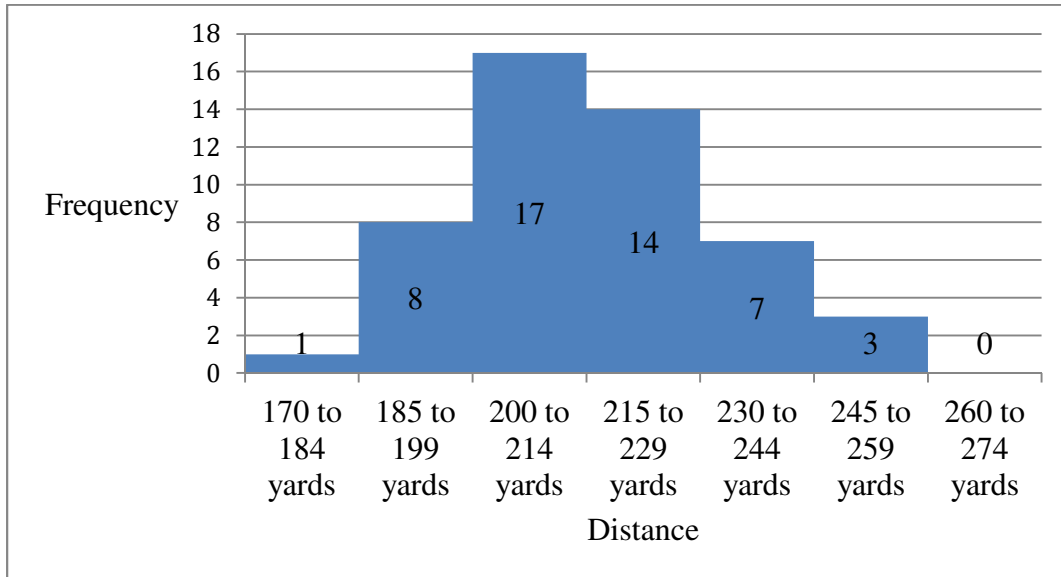
	Sample Standard Deviation	Sample Variance	Sample Skewness	Coefficient of Variation
All drives	19.04	362.60	-0.25	0.08
All drives using Method 1	20.58	423.51	0.26	0.09
All drives using Method 2	14.34	205.51	-0.38	0.06
All drives taking one practice swing	20.82	433.54	-0.50	0.09
All drives taking two practice swings	16.47	271.14	-0.17	0.07
All drives using Method 1 and taking one practice swing	23.59	556.57	0.11	0.11
All drives using Method 1 and taking two practice swings	16.69	278.46	0.08	0.08
All drives using Method 2 and taking one practice swing	14.50	210.30	-0.95	0.06
All drives using Method 2 and taking two practice swings	13.28	176.37	0.08	0.06

**Figure 1: Method 1 and One Practice Swing**

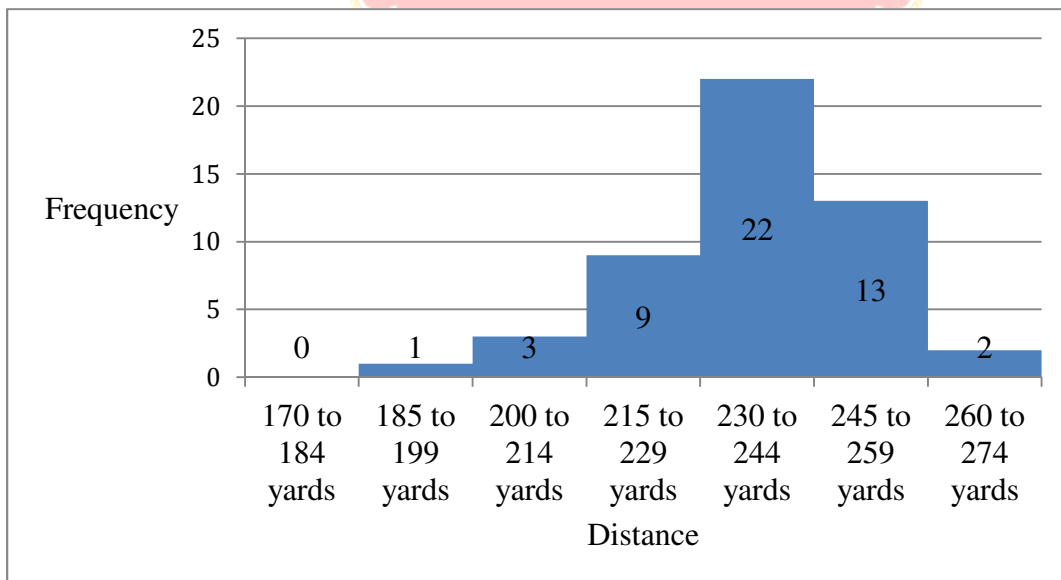




**Figure 2: Method 1 and Two Practice Swings**



**Figure 3: Method 2 and One Practice Swing**



**Figure 4: Method 2 and Two Practice Swings**

