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Math 301
Report 1
16 March 2020

Introduction

I wanted to know if playing the game 2048 and using 10 swipes versus 15 swipes would significantly change my average score. In order to do this, I collected data by playing 2048 a total of 40 times using 10 swipes then 40 times using 15 swipes. I recorded the final score each time. I then put my data into RStudio Cloud and took a simple random sample of size 20 from the scores I collected (pictured below). In order to find if there is a significant difference in the average score when using 10 swipes or 15 swipes, I ran a 2 Sample T-test. I chose a 2 Sample T-test over a matched pairs T-test because my two populations are not connected by a before-and-after type of variable. Instead, they are two completely independent populations. For instance, this would have been a matched pairs t-test problem if I recorded scores for 10 swipes and then continued the same game until I got to 15 swipes and recorded the score again. Then, the data would have a before-and-after effect. With keeping this in mind, I defined my parameters as μ_1 representing the mean score after 10 swipes and μ_2 as the mean score after 15 swipes.

```
x10 = c(28,24,48,36,44,28,20,28,32,48,
        52,48,52,32,48,48,52,28,24,48,
        32,48,28,56,24,52,28,28,32,28,
        48,28,48,32,56,48,36,32,28,32)
```

```
x15 = c(56,68,64,64,68,68,76,64,72,72,
        68,64,68,64,60,68,64,68,72,72,
        68,76,60,72,72,64,64,68,68,76,
        68,68,64,72,76,76,68,60,72,68)
```

	swipes	score
1	10	32
2	10	32
3	10	48
4	10	32
5	10	28
6	10	28
7	10	52
8	10	24
9	10	28
10	10	48

	swipes	score
11	10	48
12	10	28
13	10	52
14	10	48
15	10	32
16	10	24
17	10	28
18	10	52
19	10	48
20	10	28

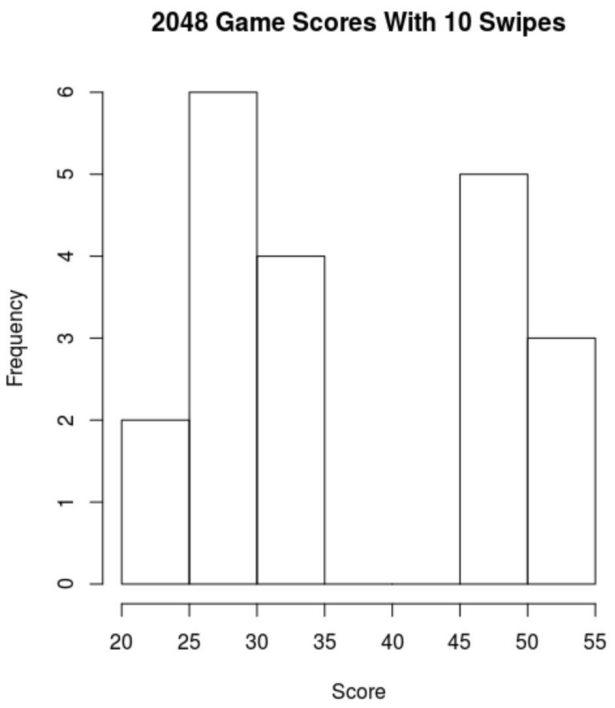
	swipes	score
21	15	68
22	15	60
23	15	56
24	15	68
25	15	64
26	15	68
27	15	72
28	15	68
29	15	64
30	15	68

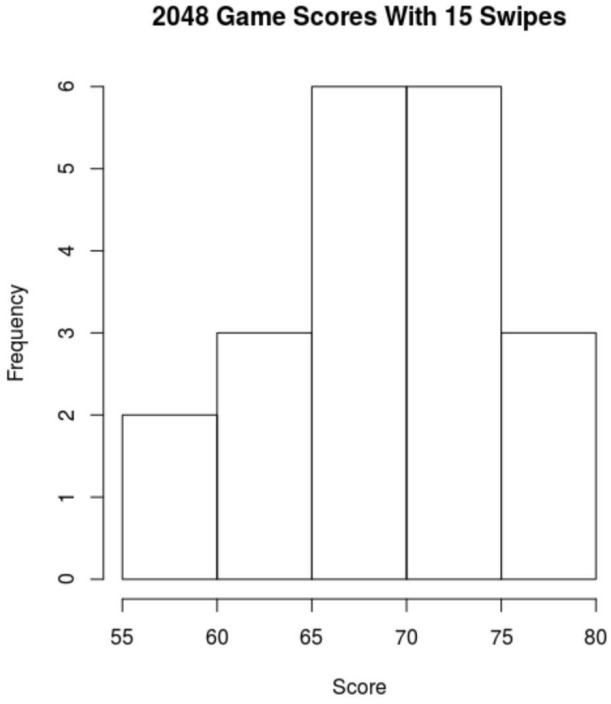
	swipes	score
31	15	72
32	15	76
33	15	72
34	15	72
35	15	72
36	15	68
37	15	72
38	15	64
39	15	76
40	15	76

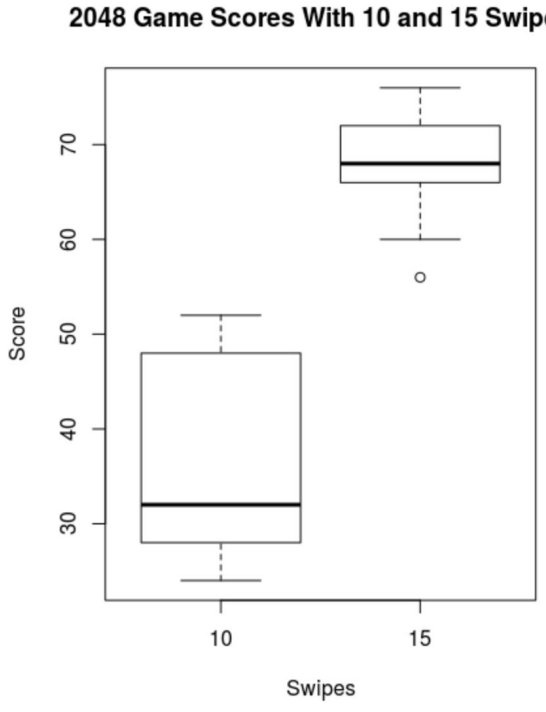
Analysis

As previously stated, I completed a 2 Sample T-test, but I needed to check the conditions before continuing. First, I know that my samples are Simple Random Samples (SRSs), or close to it, because I collected the data myself and used RStudio to randomly extract 20 scores from each sample of 40 scores. The sample sizes (n_1 and n_2) are an okay size because n must be

greater than or equal to (≥) 20 to complete a 2 Sample T-test. Although the sample size is good, I also checked the boxplot graph and histograms for outliers or strong skew (as pictured below). As you can see, the histogram titled “2048 Game Scores With 10 Swipes” shows a major gap between scores of 35 and 45; obviously this data is not close to being normally distributed. In the histogram “2048 Game Score With 15 Swipes”, you can see that most of the data is in the middle and there is not a strong skew; it closely resembles data that is normally distributed. However, in the box plot “2048 Game Scores With 10 and 15 Swipes”, there is an outlier for the sample scores with 15 swipes. Meaning, neither of these samples are the most ideal to use for a 2 Sample T-test so I kept this in mind as I proceeded. If I wanted to create better conditions for this test, I would collect more data to create a more accurate or better representative SRS.







After creating the box plot, "2048 Scores With 10 and 15 Swipes", I noticed a major difference in the median of my SRSs. This indicates to me that the results of the test may show there is a significant difference in the average score when using 10 and 15 swipes.

Once I had checked the conditions, I defined my hypotheses based on the investigative question: Is there a significant difference in the average score of a 2048 game when using 10 and 15 swipes? The null hypothesis is that the average score with 10 swipes and the average score with 15 swipes are the same (H_o: $\mu_1 = \mu_2$) and the alternative hypothesis is that the average score with 10 swipes and the average score with 15 swipes are not the same (H_a: $\mu_1 \neq \mu_2$). In other words, my alternative hypothesis is representing my investigative question by stating there is a difference between average scores.

Using RStudio Cloud once again, I completed my 2 Sample T-test. I found that my t-statistic is -11.853 and my p-value is 2.474e-14. I also found the five number summary (minimum, first quartile or Q1, median, third quartile or Q3, and maximum), mean ($\bar{x}$), and standard deviation (s) of my SRSs which can be found in the table below.

Swipes	Minimum	Q1	Median	Q3	Maximum	$\bar{x}$	s
10	24	28	32	48	52	37	10.770330
15	56	67	68	72	76	68.8	5.287523

Conclusion

With my p-value of 2.474e-14 being less than (<) my alpha (α) of .05, I reject the null hypothesis (H_o: $\mu_1 = \mu_2$). Meaning, I have strong evidence that there is a significant difference in the average score of a 2048 game when using 10 and 15 swipes. My conclusion also agrees with my initial thoughts after seeing the box plot "2048 Game Score With 10 and 15 Swipes". If I were to take this problem further, I might test to see if using 15 swipes results in a higher average score than when using 10 swipes.