Appendix D: Power Calculations for W241 Project

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Power calculations for the Experiment only, Trial calculations are not included.

Reading data

```
# Reading data set to include both Trial and Experiment
all_test <- fread('/Users/jasonabaker/W241/Final_Project/Data/Post_Experiment_Results.csv')

# Subsetting observations that were in the Experiment, Complied with the Treatment, Had valid test scor
ex_sub <- all_test[which(all_test$`Study Phase` == 'experiment' & all_test$`Treatment Outcome (Particip
```

Subsetting *ex_sub* into "Gaming", "Music", and "Reading".

```
ex_1_game <- ex_sub[which(ex_sub$`Test Description` == "Gaming"),]
ex_1_music <- ex_sub[which(ex_sub$`Test Description` == "Reading"),]
ex_1_read <- ex_sub[which(ex_sub$`Test Description` == "Music"),]
```

Calculate the overall mean and store it in a variable called grand_mean.

```
grand_mean_1 <- round(mean(ex_sub$Score_diff), 2)
```

Grand Mean: 3.39

Calculating the mean score difference for each group.

```
game_average_1 <- round(mean(ex_1_game$Score_diff),2)
music_average_1 <- round(mean(ex_1_music$Score_diff),2)
read_average_1 <- round(mean(ex_1_read$Score_diff),2)
```

Gaming Average: 2.81
Music Average: 3.5
Reading Average: 3.82

Calculating the sample size of each group.

```r
sample_game_1 <- nrow(ex_1_game)
sample_music_1 <- nrow(ex_1_music)
sample_read_1 <- nrow(ex_1_read)
```

Gaming Sample Size: 106
Music Sample Size: 156
Reading Sample Size: 100

Calculate the Between Group Variance

```r
between_group_variance_1 <- (sample_game_1 * (game_average_1 - grand_mean_1)^2 + sample_music_1 * (musi
```

Between group variance: 28.018

Calculate sum of squares for each group

- Used in *within group variance*

```r
sum_squares_game_1 <- sum((ex_1_game$Score_diff - game_average_1)^2)
sum_squares_music_1 <- sum((ex_1_music$Score_diff - music_average_1)^2)
sum_squares_read_1 <- sum((ex_1_read$Score_diff - read_average_1)^2)
```

Gaming Sum of Squares: 3472.2266
Music Sum of Squares: 6055
Reading Sum of Squares: 2422.76

Calculate the Within Group Variance

```r
within_group_variance_1 <- round((sum_squares_game_1 + sum_squares_music_1 + sum_squares_read_1) / (nro
```

Within group variance: 33

Power calculation

Power calculation (ANOVA) for current variances and sample sizes

```r
s_1 <- power.anova.test(groups = 3,
                        between.var = between_group_variance_1, within.var = within_group_variance_1,
                        power = NULL, sig.level = 0.05, n = 120.6)
s_1
```

```
##
##      Balanced one-way analysis of variance power calculation
##
##          groups = 3
##               n = 120.6
##     between.var = 28.018
##      within.var = 33
##       sig.level = 0.05
##           power = 1
##
## NOTE: n is number in each group
```

Iterated Power Calculation

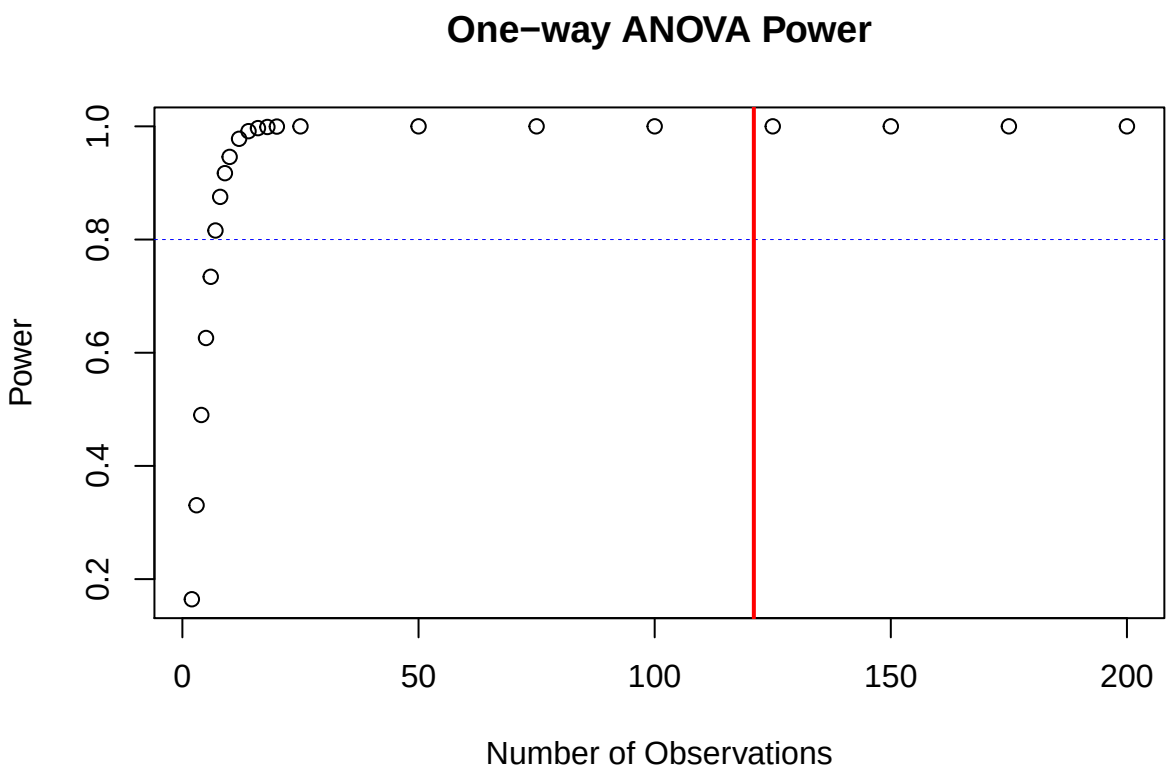
We iterated through the power calculation to derive an understanding of our power relative to sample size.

Setting n to loop through ANOVA calculation

```
n_1 <- c(seq(2,10,by=1),seq(12,20,by=2),seq(25,200,by=25))
```

Iterated power calculation

```
p_1 <- power.anova.test(groups = 3,
                        between.var = between_group_variance_1, within.var = within_group_variance_1,
                        power = NULL, sig.level = 0.05, n=n_1)
```


One−way ANOVA Power
Power
0.2
0.4
0.6
0.8
1.0
0
50
100
150
200
Number of Observations