Self Control Capacity and Habit Execution

DATA606 Final Project
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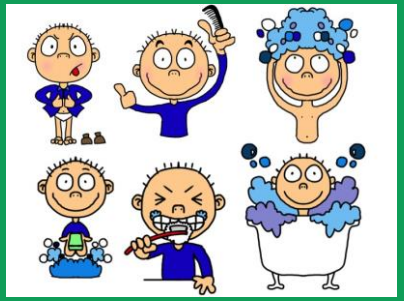
Rpubs: RPubs - DATA606 Final Project [https://rpubs.com/devcraig/DATA606projFinal]
Github: DATA606/Project at main · d-ev-craig/DATA606 (github.com) [https://github.com/d-ev-craig/DATA606/tree/main/Project]

Overview



Research Question: Does an individual's capacity for self control impact their ability to perform a desired action?

Dependent Variable: Daily Habit Execution Score Average

Context: Group of participants agreed to log daily habit executions, measure their self control capacity, and measure their habit strength with a phone app

Data Source: Frontiers | How to Form Good Habits? A Longitudinal Field Study on the Role of Self-Control in Habit Formation (frontiersin.org)

Important Notes on Context:
The data was gathered from a study that was focused on the progression of habit formation over time and the role self control capacity played in that formation. Their study gathered the data this analysis works with, but for a different purpose. Not all of the original study's data was used to perform this analysis due to the lack of relevancy from the change in research question. Limitations and issues created by this will be mentioned at the end.

Data Structure

Self Control Capacity

Self-control capacity was measured using a bi-weekly Brief Self-Control Scale which consisted of 13 statements describing their level of self control in general with responses on a Likert scale (1 to 5, with 1 being "not at all" and 5 being "very much")

Daily Habit Execution

Habit execution was measured with by the daily phone app questions in 3 questions. These questions are translated and while a part of their meaning may be lost, their rough effects for the study are maintained.

1. Did the context you chose for your habit occur today? (ie. Did you have breakfast today?)
2. Did you perform your chosen habit today? (ie. Did you eat fruit toay?)
3. Did you perform your chosen habit in the chosen context today? (ie. Did you eat fruit at breakfast today?)

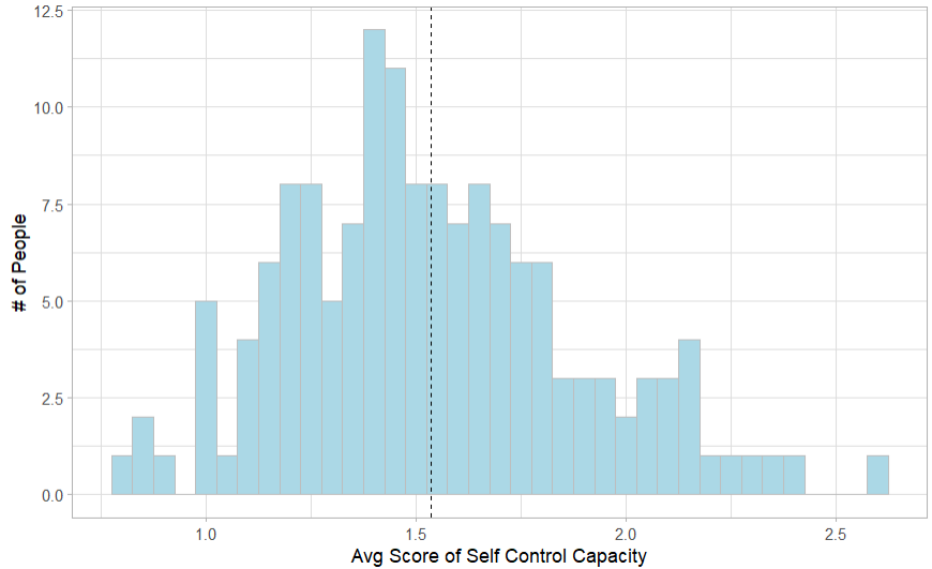
PPN <dbl>	DATE <dbl>	DAY <dbl>	Q1 <dbl>	Q2 <dbl>	Q3 <dbl>	Q4 <dbl>	Q5 <dbl>	Q6 <dbl>	Q7 <dbl>
4021	20161016	13	3	1	2	0	2	1	3
4084	20161016	13	1	1	1	0	1	2	3
1915	20161016	10	2	2	1	1	2	1	1
4026	20161016	11	1	3	0	1	3	2	2

PPN <dbl>	DATE <dbl>	DAY <dbl>	Q1 <dbl>	Q2 <dbl>	Q3 <dbl>
4021	20161005	2	0	0	-1
7872	20161005	2	1	1	1
4057	20161005	2	1	1	0
4020	20161005	1	1	1	0
1078	20161005	1	1	1	1

Brief Self Control Scale: (https://onlinelibrary.wiley.com/doi/10.1111/j.0022-3506.2004.00263.x)

Summary Stats | Self Control

Self Control Capacity



Classifier Creation

Classifiers of “Low”, “Mid”, and “High” were determined by the 3 quantiles represented here to label if an individual inside a particular time period were of a certain level of Self Control

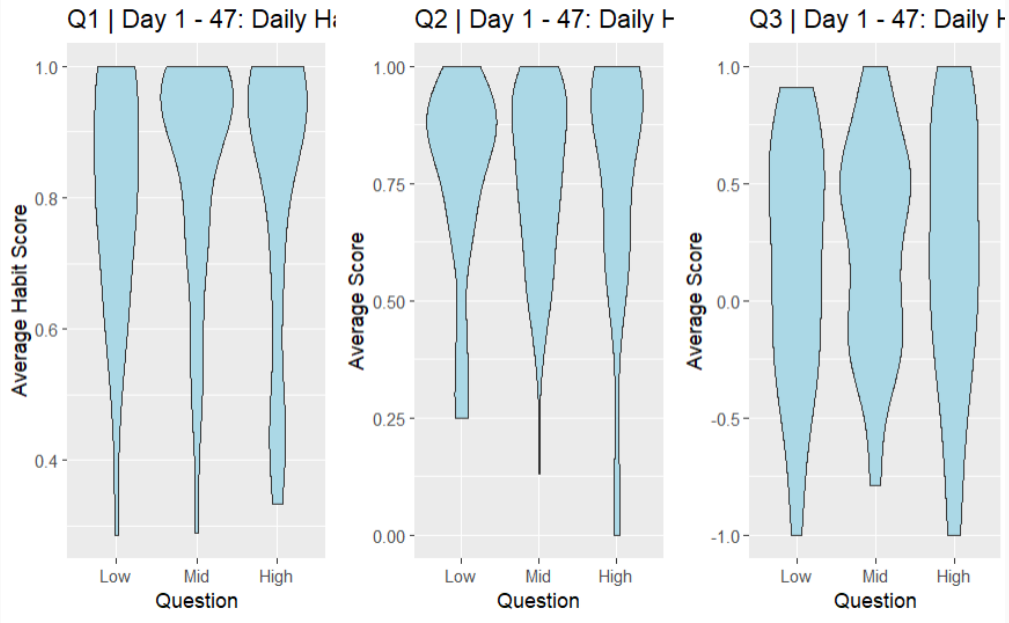
```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 0.8077  1.3013  1.4945  1.5359  1.7436  2.5897
```

Summary Stats | Habit Execution Day 1 - 47

Habit Execution was segmented into 3 time segments.
Days : 1 - 47 | 48 - 95 | 96+

This was to remove any influence of a habit becoming stronger over time and keep interpretation focused on the relationship between Self Control Capacity and executing a desired behavior.

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 0.0000  0.7259  0.8970  0.8255  0.9773  1.0000
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 0.0000  0.6028  0.8048  0.7312  0.9231  1.0000
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
-1.0000 -0.2176  0.2071  0.1714  0.5861  1.0000
```



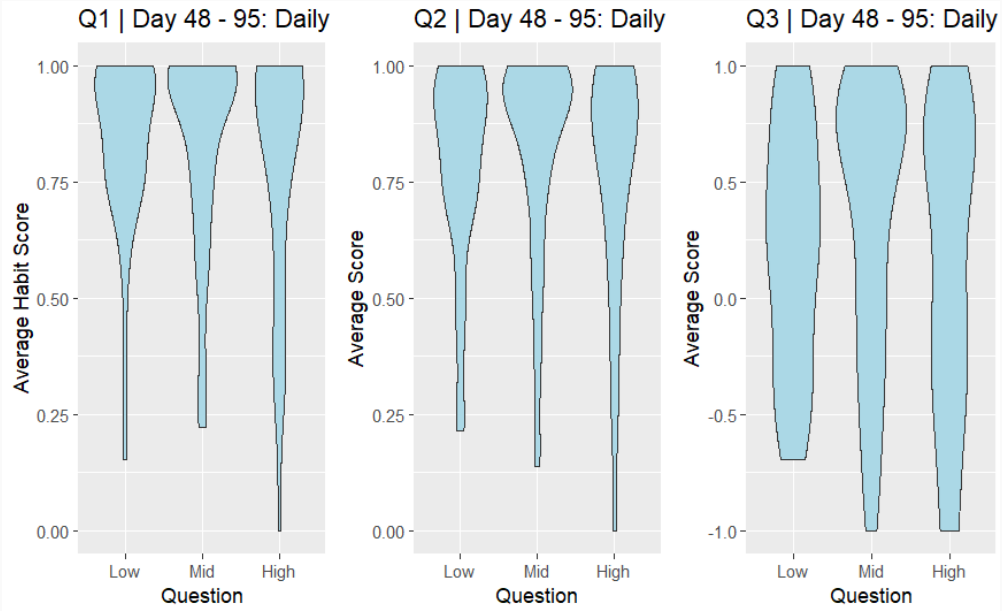
Do any of the Low, Mid, or High groups have a noticeably better distribution of average habit score?

Summary Stats | Habit Execution Day 48 - 95

Habit Execution was segmented into 3 time segments.
Days : 1 - 47 | 48 - 95 | 96+

This was to remove any influence of a habit becoming stronger over time and keep interpretation focused on the relationship between Self Control Capacity and executing a desired behavior.

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 0.0000  0.7267  0.9286  0.8037  1.0000  1.0000
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 0.0000  0.6974  0.8889  0.7845  0.9765  1.0000
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
-1.0000 -0.2952  0.3333  0.2296  0.7661  1.0000
```



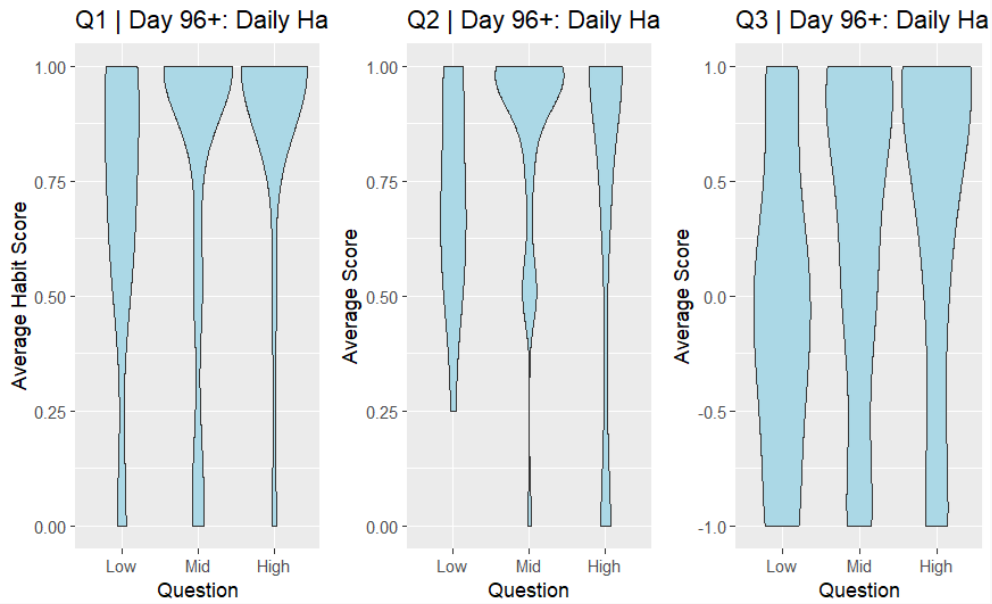
Do any of the Low, Mid, or High groups have a noticeably better distribution of average habit score?

Summary Stats | Habit Execution Day 1 - 47

Habit Execution was segmented into 3 time segments.
Days : 1 - 47 | 48 - 95 | 96+

This was to remove any influence of a habit becoming stronger over time and keep interpretation focused on the relationship between Self Control Capacity and executing a desired behavior.

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 0.0000  0.7500  1.0000  0.8084  1.0000  1.0000
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 0.0000  0.6667  1.0000  0.8097  1.0000  1.0000
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
-1.0000 -0.3333  0.5000  0.2842  1.0000  1.0000
```



Do any of the Low, Mid, or High groups have a noticeably different distribution of average habit score?

Inference & Testing

Ho: $u_1 = u_2 = u_3$

Ha: at least one mean is different

Test: ANOVA

```r
anovaSeg1Q1 <- aov(Avg_Response ~ SEGCLASS, data = dailySeg1AvgClass[dailySeg1AvgClass$Question == 'Q1',])
summary(anovaSeg1Q1)

anovaSeg1Q2 <- aov(Avg_Response ~ SEGCLASS, data = dailySeg1AvgClass[dailySeg1AvgClass$Question == 'Q2',])
summary(anovaSeg1Q2)

anovaSeg1Q3 <- aov(Avg_Response ~ SEGCLASS, data = dailySeg1AvgClass[dailySeg1AvgClass$Question == 'Q3',])
summary(anovaSeg1Q3)
```

```r
anovaSeg2Q1 <- aov(Avg_Response ~ SEGCLASS, data = dailySeg2AvgClass[dailySeg2AvgClass$Question == 'Q1',])
summary(anovaSeg2Q1)

anovaSeg2Q2 <- aov(Avg_Response ~ SEGCLASS, data = dailySeg2AvgClass[dailySeg2AvgClass$Question == 'Q2',])
summary(anovaSeg2Q2)

anovaSeg2Q3 <- aov(Avg_Response ~ SEGCLASS, data = dailySeg2AvgClass[dailySeg2AvgClass$Question == 'Q3',])
summary(anovaSeg2Q3)
```

```r
anovaSeg3Q1 <- aov(Avg_Response ~ SEGCLASS, data = dailySeg3AvgClass[dailySeg3AvgClass$Question == 'Q1',])
summary(anovaSeg3Q1)

anovaSeg3Q2 <- aov(Avg_Response ~ SEGCLASS, data = dailySeg3AvgClass[dailySeg3AvgClass$Question == 'Q2',])
summary(anovaSeg3Q2)

anovaSeg3Q3 <- aov(Avg_Response ~ SEGCLASS, data = dailySeg3AvgClass[dailySeg3AvgClass$Question == 'Q3',])
summary(anovaSeg3Q3)
```

```
             Df Sum Sq Mean Sq F value Pr(>F)
SEGCLASS      2  0.048 0.02414   0.709  0.494
Residuals   145  4.935 0.03403
             Df Sum Sq Mean Sq F value Pr(>F)
SEGCLASS      2  0.001 0.00049   0.011  0.989
Residuals   145  6.567 0.04529
             Df Sum Sq Mean Sq F value Pr(>F)
SEGCLASS      2   0.16 0.07952   0.322  0.725
Residuals   145  35.78 0.24676
```

```
             Df Sum Sq Mean Sq F valu Pr(>F)
SEGCLASS      2  0.040 0.01998   0.37  0.687
Residuals   112  5.951 0.05313
             Df Sum Sq Mean Sq F valu Pr(>F)
SEGCLASS      2  0.047 0.02355   0.45  0.638
Residuals   112  5.855 0.05227
             Df Sum Sq Mean Sq F valu Pr(>F)
SEGCLASS      2   0.76  0.3819   1.09  0.338
Residuals   112  39.09  0.3490
```

```
             Df Sum Sq Mean Sq F valu Pr(>F)
SEGCLASS      2  0.326  0.1631   1.57  0.216
Residuals    55  5.691  0.1035
             Df Sum Sq Mean Sq F valu Pr(>F)
SEGCLASS      2  0.229 0.11442    1.3  0.268
Residuals    55  4.660 0.08473
             Df Sum Sq Mean Sq F valu Pr(>F)
SEGCLASS      2  1.668  0.8342   1.51  0.228
Residuals    55 30.241  0.5498
```

Conclusion

Regardless of the time spent building a habit, this analysis shows there is no evidence to suggest that higher self control capacity aids in the execution of a desired habit as analysis of variance does not show significant difference between average scores in daily execution of the three self control groups

Importance: Those that believe they have low self control, may find it more useful to perform a different action in place of another, rather than abstinence motivated by self control

Limitations/Criticisms:

- Misalignment between original data collection method and intended research question
- Using score averages rather than analysis in differences of count
- Does not speak towards self control impacting ability to restrict behavior, only as a catalyst for behavior

Citations

- [Main Study](https://www.frontiersin.org/articles/10.3389/fpsyg.2020.00560/full#B28)

van der Weiden A, Benjamins J, Gillebaart M, Ybema JF and de Ridder D (2020) How to Form Good Habits? A Longitudinal Field Study on the Role of Self-Control in Habit Formation. Front. Psychol. 11:560. doi: 10.3389/fpsyg.2020.00560

- [Brief Self Control Scale](https://onlinelibrary.wiley.com/doi/10.1111/j.0022-3506.2004.00263.x)

Tangney, J.P., Baumeister, R.F. and Boone, A.L. (2004), High Self-Control Predicts Good Adjustment, Less Pathology, Better Grades, and Interpersonal Success. Journal of Personality, 72: 271-324. https://doi.org/10.1111/j.0022-3506.2004.00263.x