Thesis Survey Data analysis

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```
## Call: ICC(x = coord_trans_df)
##
## Intraclass correlation coefficients
##                            type   ICC    F df1 df2       p lower bound
## Single_raters_absolute    ICC1 0.080  7.9   4 390 4.2e-06       0.022
## Single_random_raters      ICC2 0.083 11.0   4 312 2.2e-08       0.026
## Single_fixed_raters       ICC3 0.113 11.0   4 312 2.2e-08       0.035
## Average_raters_absolute ICC1k 0.873  7.9   4 390 4.2e-06       0.641
## Average_random_raters   ICC2k 0.877 11.0   4 312 2.2e-08       0.674
## Average_fixed_raters    ICC3k 0.909 11.0   4 312 2.2e-08       0.744
##                           upper bound
## Single_raters_absolute           0.45
## Single_random_raters             0.45
## Single_fixed_raters              0.53
## Average_raters_absolute          0.98
## Average_random_raters            0.98
## Average_fixed_raters             0.99
##
##  Number of subjects = 5     Number of Judges =  79
## See the help file for a discussion of the other 4 McGraw and Wong estimates,
```

Single Score Analysis

ICC1 is

```
## [1] 0.4858979
```

ICC2 is

```
## [1] 0.7645034
```

Team Effectiveness

Multi-item Analysis

```
## Call: ICC(x = eff_trans_df)
##
## Intraclass correlation coefficients
##                            type  ICC  F df1 df2       p lower bound upper bound
## Single_raters_absolute    ICC1 0.15 15   9 780 6.9e-23       0.072        0.39
## Single_random_raters      ICC2 0.15 22   9 702 2.3e-33       0.075        0.39
## Single_fixed_raters       ICC3 0.21 22   9 702 2.3e-33       0.107        0.48
## Average_raters_absolute ICC1k 0.93 15   9 780 6.9e-23       0.859        0.98
## Average_random_raters   ICC2k 0.94 22   9 702 2.3e-33       0.865        0.98
## Average_fixed_raters    ICC3k 0.96 22   9 702 2.3e-33       0.904        0.99
##
##  Number of subjects = 10     Number of Judges =  79
## See the help file for a discussion of the other 4 McGraw and Wong estimates,
```

Single Score Analysis

ICC1 is

```
## [1] 0.4018889
```

ICC2 is

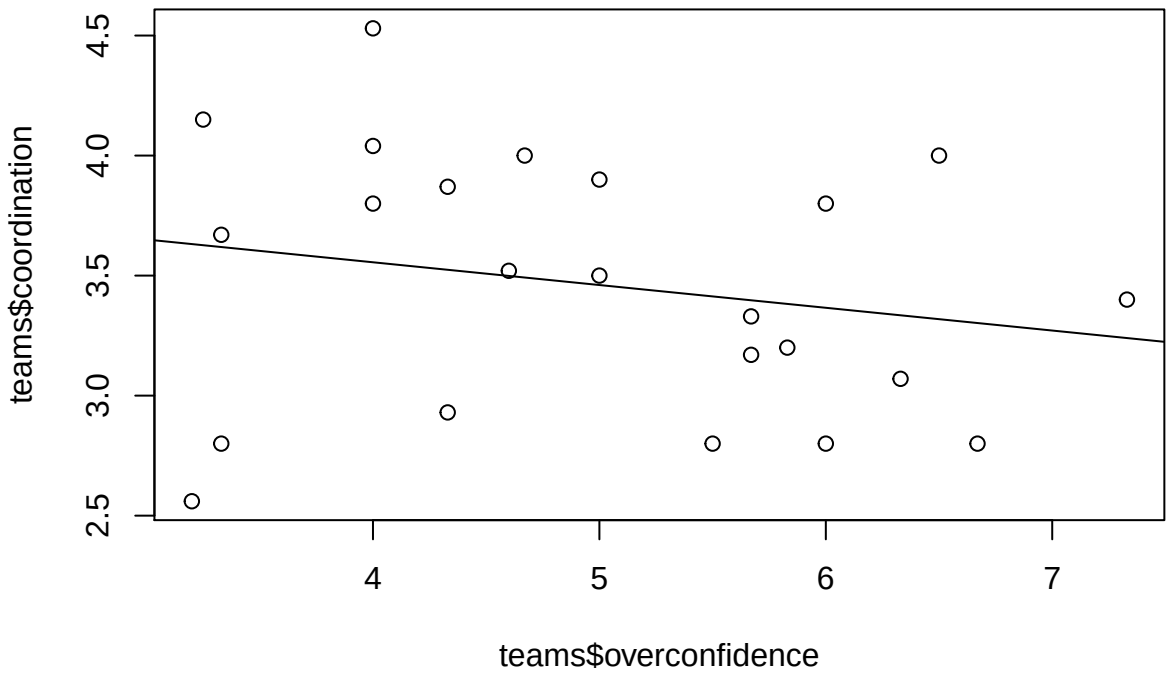
```
## [1] 0.6976965
```

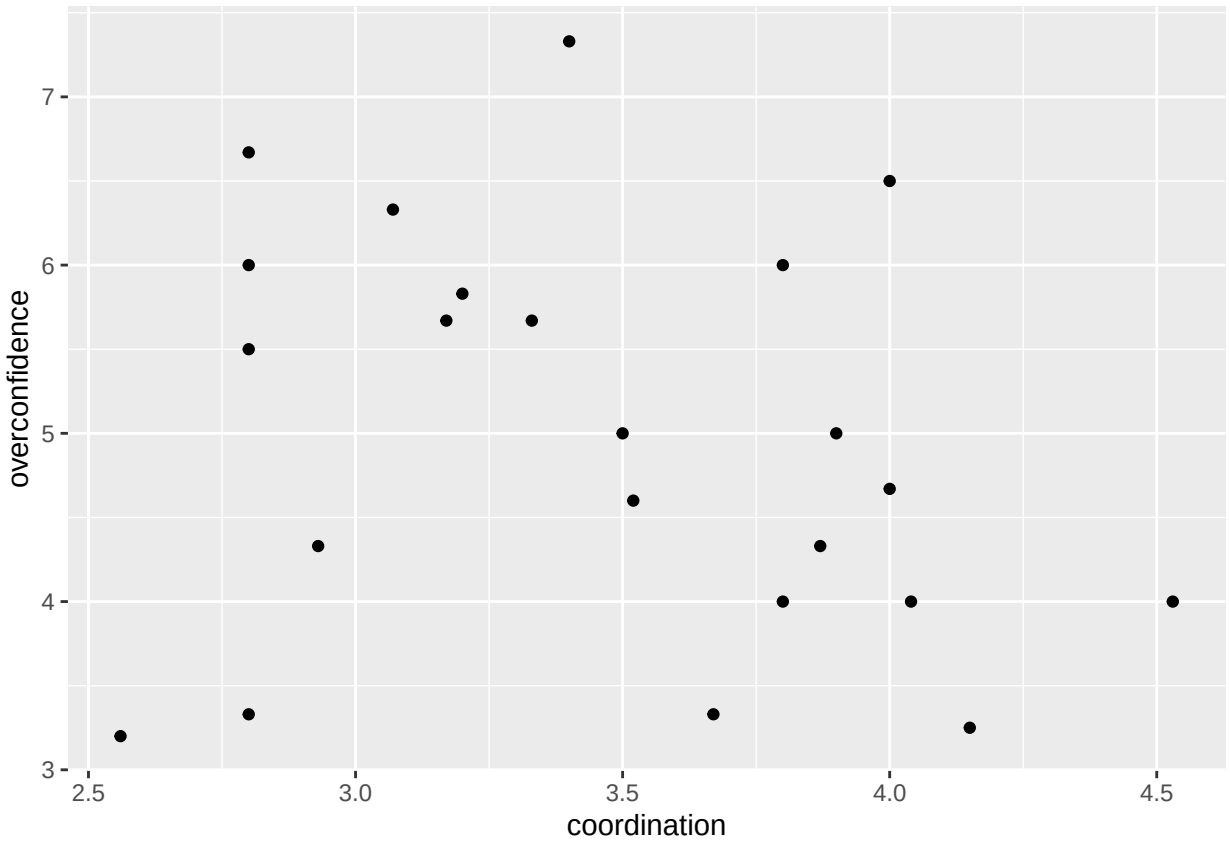
Hypothesis Testing

Hypothesis No. 1

H1: Team Overconfidence has a negative effect on team coordination

```
##
## Call:
## lm(formula = coordination ~ overconfidence, data = teams)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.07137 -0.38350  0.03929  0.43669  0.97448
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)     3.93477    0.48486   8.115 6.54e-08 ***
## overconfidence -0.09481    0.09473  -1.001    0.328
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5368 on 21 degrees of freedom
## Multiple R-squared:  0.04553,    Adjusted R-squared:  7.595e-05
## F-statistic: 1.002 on 1 and 21 DF,  p-value: 0.3283
```

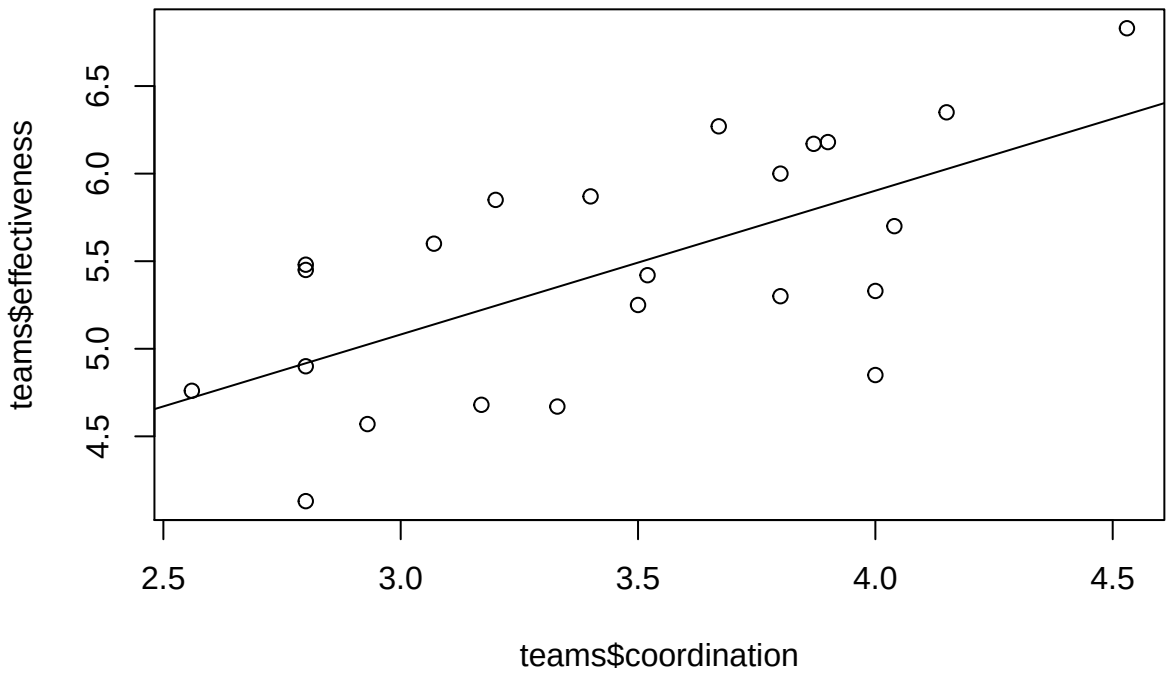

teams$coordination
2.5
3.0
3.5
4.0
4.5
4
5
6
7
teams$overconfidence

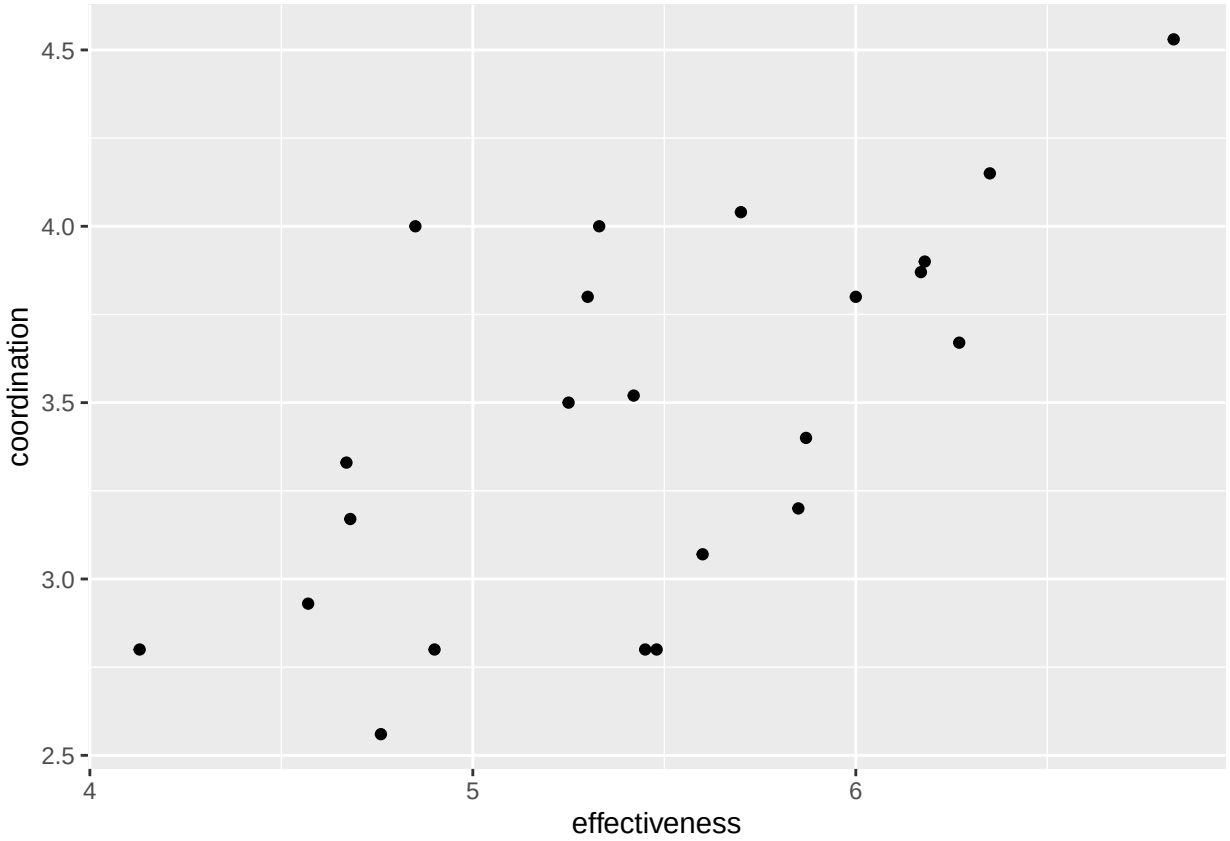

overconfidence
coordination
7
6
5
4
3
2.5
3.0
3.5
4.0
4.5

Hypothesis No. 2

H2: Team Coordination has a positive effect on team effectiveness

```
##
## Call:
## lm(formula = effectiveness ~ coordination, data = teams)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.05262 -0.44615  0.03993  0.46061  0.63838
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    2.6177     0.7321   3.576 0.001784 **
## coordination   0.8212     0.2090   3.928 0.000771 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5264 on 21 degrees of freedom
## Multiple R-squared:  0.4236, Adjusted R-squared:  0.3961
## F-statistic: 15.43 on 1 and 21 DF,  p-value: 0.0007709
```



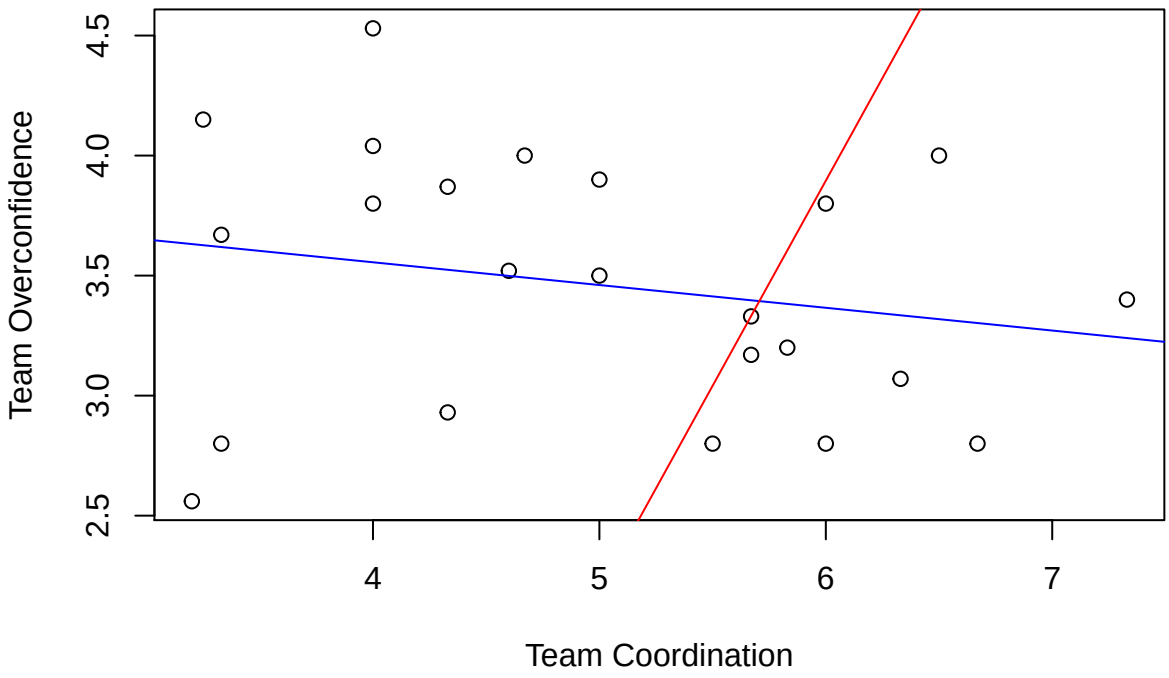

coordination
4.5
4.0
3.5
3.0
2.5
4
5
6
effectiveness

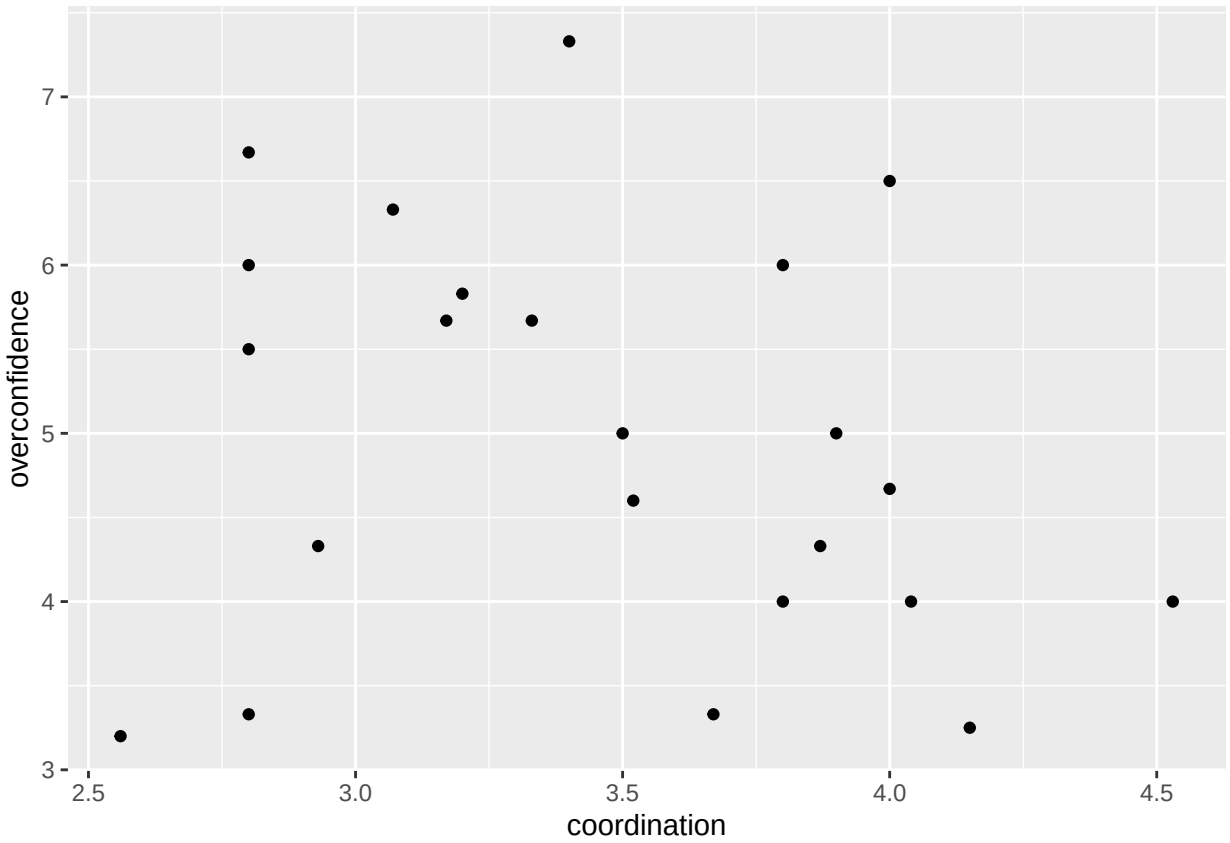
Hypothesis No. 3

H3: Voice Behavior has a moderator effect on the relationship between overconfidence and team coordination

```
##
## Call:
## lm(formula = coordination ~ overconfidence + voice_behavior +
##     inter, data = teams_voice_interaction)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.8892 -0.2471 -0.0404  0.3102  0.7715
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)     -6.3579     3.8966  -1.632   0.1192
## overconfidence   1.7089     0.7269   2.351   0.0297 *
## voice_behavior   2.6272     0.9888   2.657   0.0156 *
## inter           -0.4614     0.1846  -2.499   0.0218 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4807 on 19 degrees of freedom
## Multiple R-squared:  0.3075, Adjusted R-squared:  0.1982
## F-statistic: 2.813 on 3 and 19 DF,  p-value: 0.06707
```

```
## Warning in abline(lm_voice_coordination, col = "red"): only using the first two
## of 4 regression coefficients
```


Team Overconfidence
2.5
3.0
3.5
4.0
4.5
4
5
6
7
Team Coordination


overconfidence
coordination
7
6
5
4
3
2.5
3.0
3.5
4.0
4.5

Hypothesis No. 4

H4: Team Coordination has a mediator effect on the relationship between overconfidence and team effectiveness

```
##
## Call:
## lm(formula = effectiveness ~ overconfidence, data = teams)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.4125 -0.5073  0.0143  0.5566  1.3204
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)     5.70648    0.62380   9.148    9e-09 ***
## overconfidence -0.04923    0.12188  -0.404     0.69
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6906 on 21 degrees of freedom
## Multiple R-squared:  0.00771,    Adjusted R-squared:  -0.03954
## F-statistic: 0.1632 on 1 and 21 DF,  p-value: 0.6903
```

```
##
## Call:
## lm(formula = coordination ~ overconfidence, data = teams)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.07137 -0.38350  0.03929  0.43669  0.97448
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)     3.93477    0.48486   8.115 6.54e-08 ***
## overconfidence -0.09481    0.09473  -1.001    0.328
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5368 on 21 degrees of freedom
## Multiple R-squared:  0.04553,    Adjusted R-squared:  7.595e-05
## F-statistic: 1.002 on 1 and 21 DF,  p-value: 0.3283
```

```
##
## Call:
## lm(formula = effectiveness ~ overconfidence + coordination, data = teams)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.1059 -0.4203  0.1063  0.4084  0.6849
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)     2.41851    0.98844   2.447  0.02378 *
## overconfidence  0.02999    0.09720   0.309  0.76082
## coordination    0.83562    0.21874   3.820  0.00107 **
## ---
```

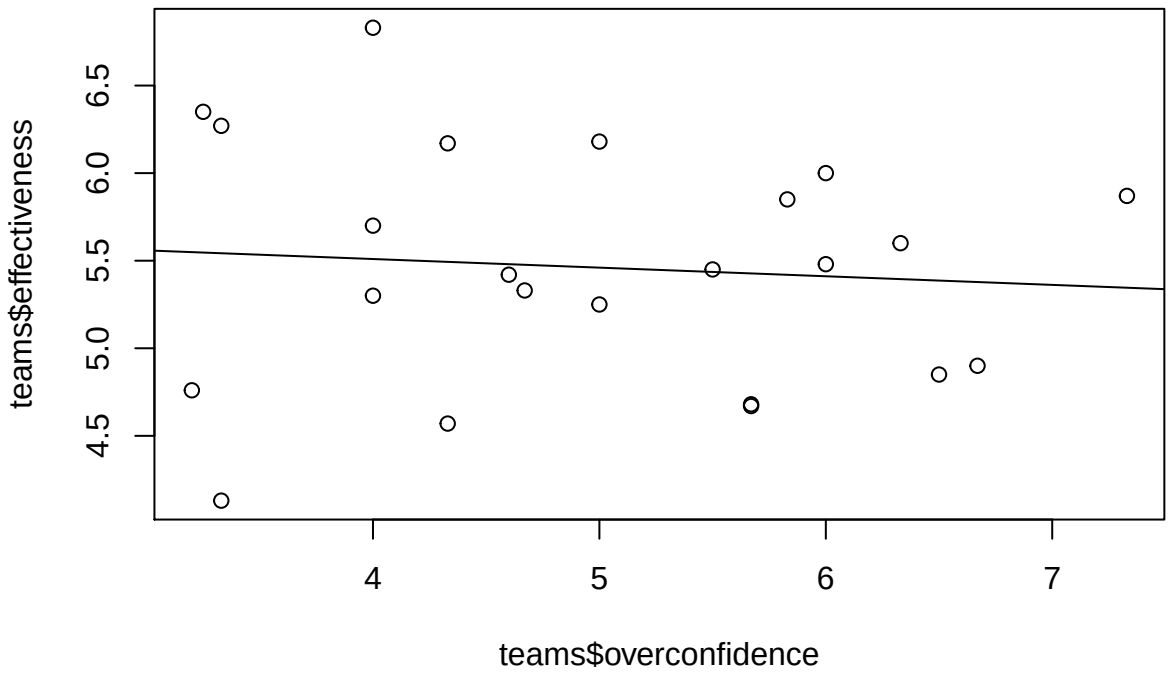
```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5381 on 20 degrees of freedom
## Multiple R-squared:  0.4263, Adjusted R-squared:  0.3689
## F-statistic: 7.431 on 2 and 20 DF,  p-value: 0.003861
```

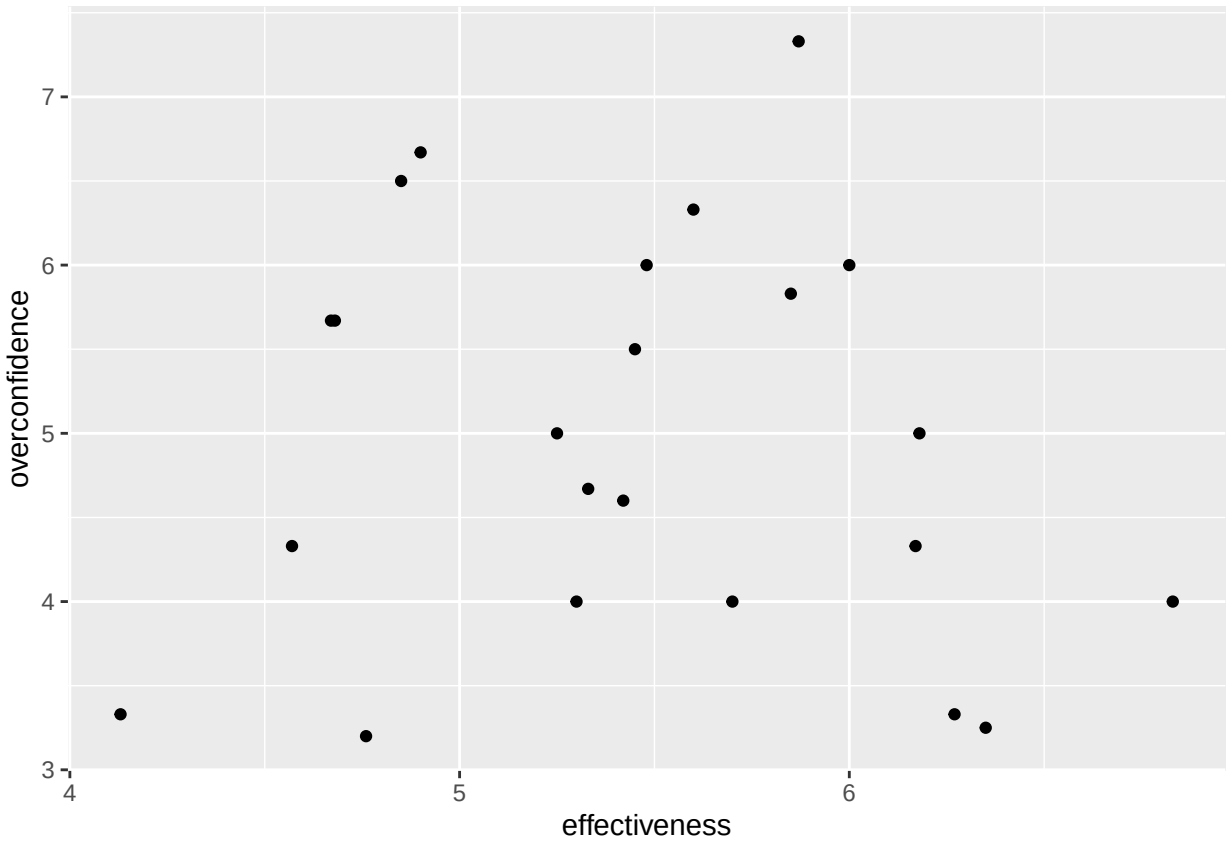
Extra Hypotheses

Hypothesis No. 1 - a

Hx1a: Team Overconfidence has a negative effect on team Effectiveness

```
##
## Call:
## lm(formula = effectiveness ~ overconfidence, data = teams)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.4125 -0.5073  0.0143  0.5566  1.3204
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)     5.70648    0.62380   9.148    9e-09 ***
## overconfidence -0.04923    0.12188  -0.404     0.69
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6906 on 21 degrees of freedom
## Multiple R-squared:  0.00771,    Adjusted R-squared:  -0.03954
## F-statistic: 0.1632 on 1 and 21 DF,  p-value: 0.6903
```



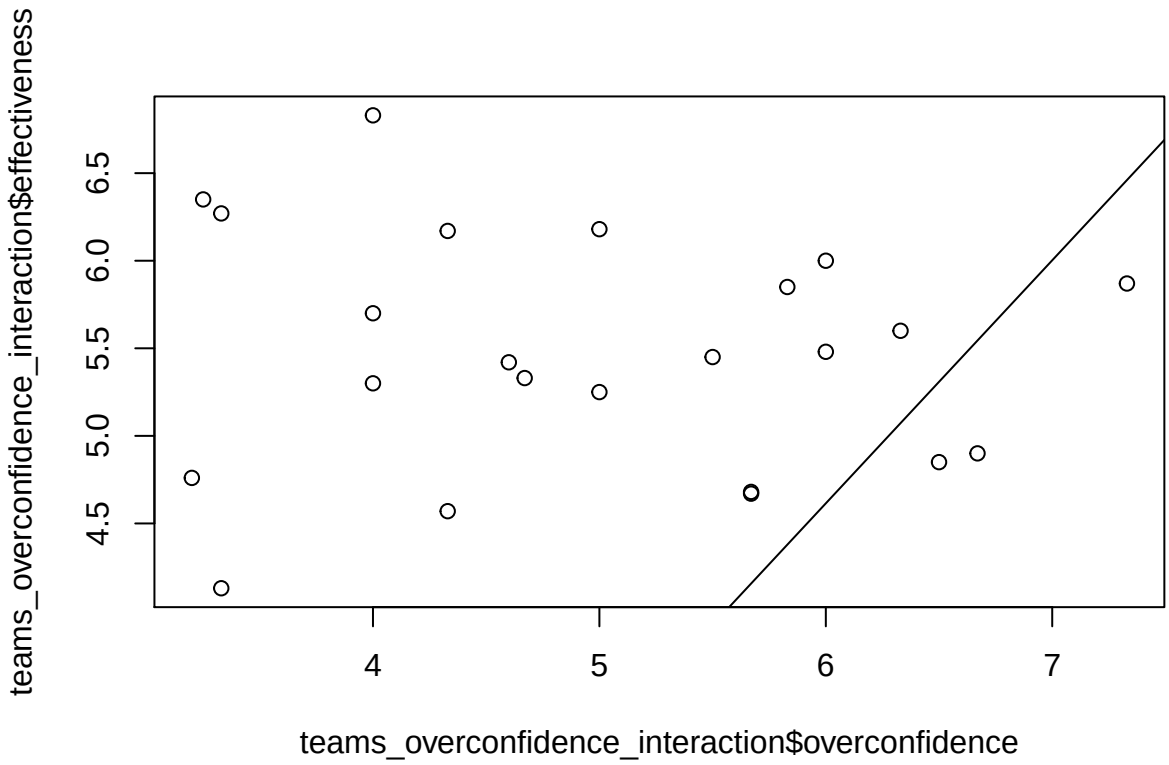

overconfidence
7
6
5
4
3
4
5
6
effectiveness

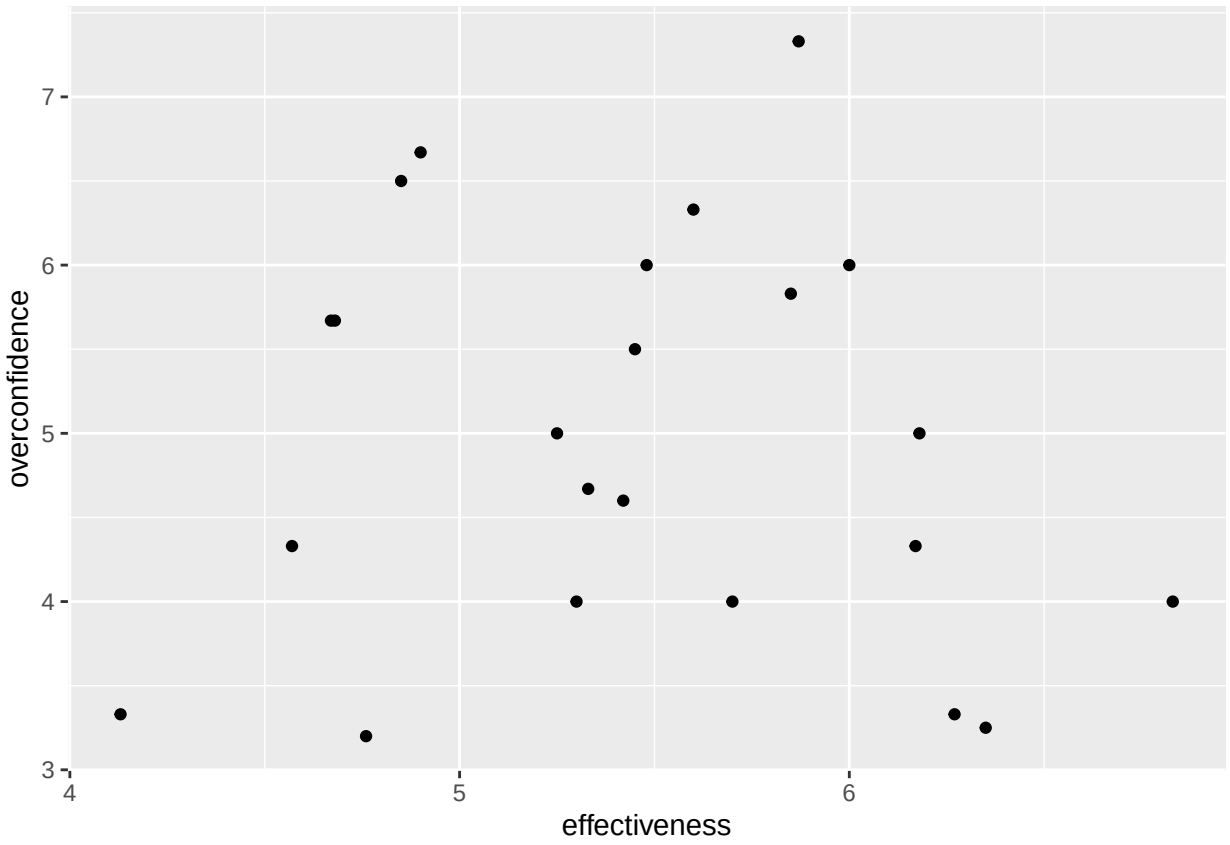
Hypothesis No. 1 - b

Hx1b: Team Overconfidence has a reverse effect on team Effectiveness mediated by team Coordination

```
##
## Call:
## lm(formula = effectiveness ~ overconfidence + coordination +
##     inter2, data = teams_overconfidence_interaction)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.67371 -0.46438 -0.02151  0.43862  0.55177
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)     -3.7121     2.7257  -1.362  0.18917
## overconfidence   1.3878     0.5773   2.404  0.02658 *
## coordination     2.6678     0.7947   3.357  0.00331 **
## inter2          -0.4076     0.1713  -2.380  0.02796 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4846 on 19 degrees of freedom
## Multiple R-squared:  0.558,  Adjusted R-squared:  0.4882
## F-statistic: 7.997 on 3 and 19 DF,  p-value: 0.001197
```

```
## Warning in abline(lm_overconfidence_effectiveness_coordination): only using the
## first two of 4 regression coefficients
```


teams_overconfidence_interaction$effectiveness
4.5
5.0
5.5
6.0
6.5
4
5
6
7
teams_overconfidence_interaction$overconfidence


overconfidence
7
6
5
4
3
4
5
6
effectiveness

Analysis of Internal Reliability

Cronbach's Alpha is used to determine the reliability of the survey used for each variable.

Team Effectiveness

```
##
## Cronbach's alpha for the 'eff_survey' data-set
##
## Items: 10
## Sample units: 79
## alpha: 0.823
##
## Bootstrap 95% CI based on 1000 samples
##  2.5% 97.5%
## 0.709 0.887
```

Team Commitment

```
##
## Cronbach's alpha for the 'commit_survey' data-set
##
## Items: 5
## Sample units: 79
## alpha: 0.728
##
## Bootstrap 95% CI based on 1000 samples
##  2.5% 97.5%
## 0.508 0.841
```

Team Performance

```
##
## Cronbach's alpha for the 'perf_survey' data-set
##
## Items: 5
## Sample units: 79
## alpha: 0.753
##
## Bootstrap 95% CI based on 1000 samples
##  2.5% 97.5%
## 0.629 0.826
```

Team Coordination

```
##
## Cronbach's alpha for the 'coord_survey' data-set
##
## Items: 5
## Sample units: 79
## alpha: 0.67
##
## Bootstrap 95% CI based on 1000 samples
##  2.5% 97.5%
## 0.509 0.775
```

Team Voice Behavior

```
##
## Cronbach's alpha for the 'voice_survey' data-set
##
## Items: 6
## Sample units: 79
## alpha: 0.85
##
## Bootstrap 95% CI based on 1000 samples
##  2.5% 97.5%
## 0.772 0.891
```

Overconfidence

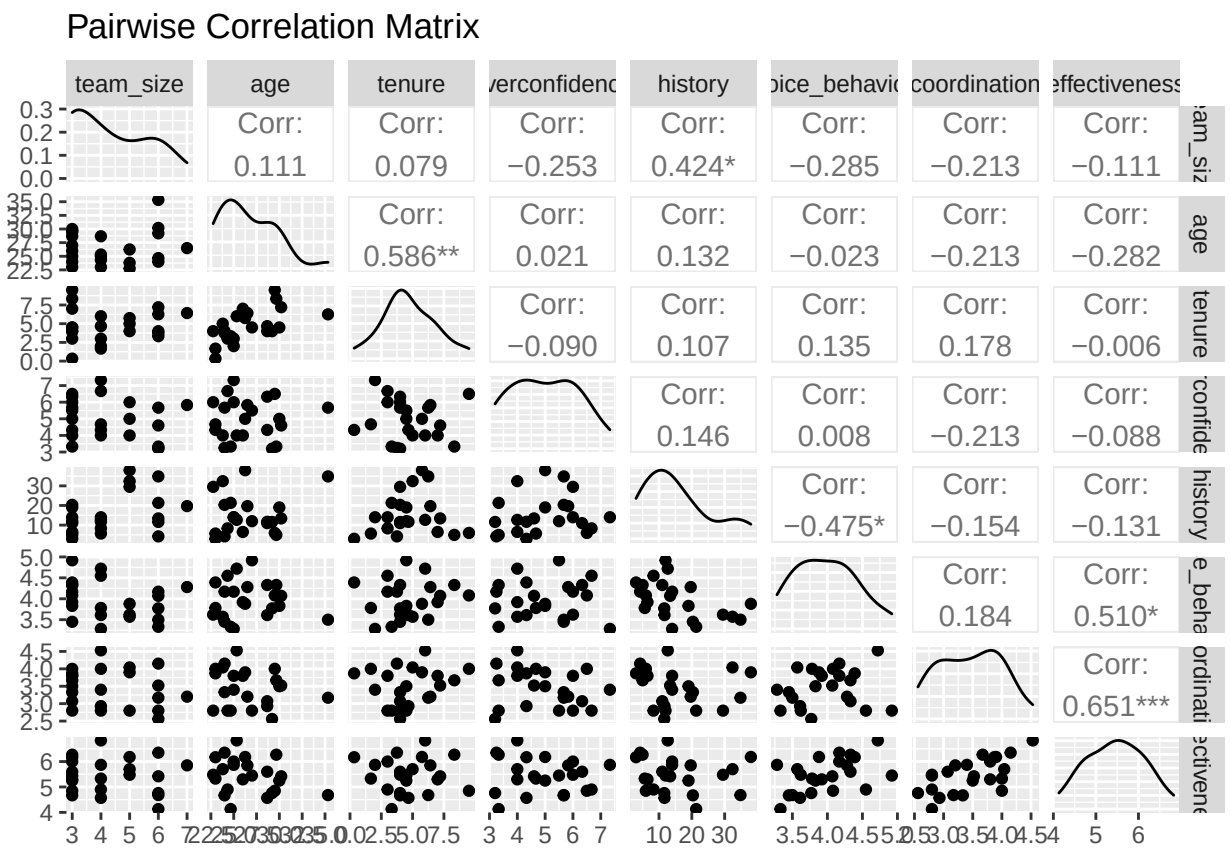
```
##
## Cronbach's alpha for the 'ovconf_survey' data-set
##
## Items: 20
## Sample units: 79
## alpha: 0.607
##
## Bootstrap 95% CI based on 1000 samples
##  2.5% 97.5%
## 0.230 0.756
```

Multiple Regression Backward Elimination of Variables

$$\widehat{\text{effectiveness}} = -0.49 + 0.06(\text{team\_size}) - 0.02(\text{age}) - 0.06(\text{tenure}) + 0.02(\text{overconfidence}) + 0.01(\text{history}) + 0.83(\text{voice\_behavior}) + 0.8(\text{coordination}) \quad (1)$$

Stage 0: All Variables Included

Initial




```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.62854 -0.22927 -0.03915  0.16603  0.86074
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.49250    2.01881  -0.244  0.81057
## team_size       0.06384    0.09287   0.687  0.50230
## age            -0.01548    0.04384  -0.353  0.72891
## tenure         -0.05607    0.06438  -0.871  0.39754
## overconfidence  0.01759    0.09439   0.186  0.85467
## history         0.01310    0.01287   1.018  0.32502
## voice_behavior  0.83127    0.26915   3.088  0.00749 **
## coordination    0.79609    0.22088   3.604  0.00260 **
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4735 on 15 degrees of freedom
## Multiple R-squared:  0.6668, Adjusted R-squared:  0.5113
## F-statistic: 4.289 on 7 and 15 DF,  p-value: 0.008611
```

Eliminating Overconfidence

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_overconfidence)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.59581 -0.23279 -0.03367  0.15673  0.90227
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.37168    1.85330  -0.201  0.84358
## team_size       0.05719    0.08310   0.688  0.50121
## age            -0.01540    0.04249  -0.362  0.72179
## tenure         -0.05675    0.06231  -0.911  0.37587
## history         0.01381    0.01191   1.160  0.26313
## voice_behavior  0.83637    0.25955   3.222  0.00532 **
## coordination    0.78602    0.20762   3.786  0.00162 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.459 on 16 degrees of freedom
## Multiple R-squared:  0.6661, Adjusted R-squared:  0.5408
## F-statistic: 5.319 on 6 and 16 DF,  p-value: 0.003449
```

Eliminating Coordination

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_coordination)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.02281 -0.36840  0.09421  0.33216  1.15332
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)     3.94306    2.11665   1.863   0.0809 .
## team_size      -0.01723    0.11917  -0.145   0.8868
## age            -0.07396    0.05386  -1.373   0.1886
## tenure          0.02619    0.07962   0.329   0.7464
## overconfidence -0.06557    0.12106  -0.542   0.5955
## history         0.01427    0.01702   0.838   0.4142
## voice_behavior  0.89026    0.35533   2.505   0.0234 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6263 on 16 degrees of freedom
## Multiple R-squared:  0.3783, Adjusted R-squared:  0.1452
## F-statistic: 1.623 on 6 and 16 DF,  p-value: 0.2048
```

Eliminating Voice Behavior

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_voice_behavior)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.9608 -0.3387  0.0967  0.4294  0.8673
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)     2.926057   2.090840   1.399  0.18076
## team_size       0.047799   0.114829   0.416  0.68275
## age            -0.025175   0.054148  -0.465  0.64825
## tenure         -0.015705   0.078070  -0.201  0.84310
## overconfidence  0.047276   0.116287   0.407  0.68972
## history        -0.004059   0.014377  -0.282  0.78129
## coordination    0.837574   0.273034   3.068  0.00736 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5864 on 16 degrees of freedom
## Multiple R-squared:  0.455,  Adjusted R-squared:  0.2506
## F-statistic: 2.226 on 6 and 16 DF,  p-value: 0.09416
```

Eliminating History

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_history)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.78325 -0.16354  0.01271  0.13269  0.81803
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.17433    1.99666  -0.087  0.93151
## team_size       0.10072    0.08560   1.177  0.25657
## age            -0.01595    0.04388  -0.363  0.72108
## tenure         -0.04642    0.06375  -0.728  0.47703
## overconfidence  0.04624    0.09019   0.513  0.61522
## voice_behavior  0.71306    0.24306   2.934  0.00974 **
## coordination    0.80175    0.22105   3.627  0.00227 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.474 on 16 degrees of freedom
## Multiple R-squared:  0.6438, Adjusted R-squared:  0.5103
## F-statistic:  4.82 on 6 and 16 DF,  p-value: 0.005457
```

Eliminating Tenure

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_tenure)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.81388 -0.18447  0.03224  0.19101  0.92059
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)     0.34513    1.76152   0.196  0.84714
## team_size       0.05901    0.09200   0.641  0.53031
## age            -0.04003    0.03332  -1.202  0.24703
## overconfidence  0.02229    0.09352   0.238  0.81460
## history         0.01145    0.01263   0.906  0.37838
## voice_behavior  0.78368    0.26155   2.996  0.00855 **
## coordination    0.72789    0.20497   3.551  0.00266 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4699 on 16 degrees of freedom
## Multiple R-squared:   0.65,  Adjusted R-squared:  0.5187
## F-statistic: 4.952 on 6 and 16 DF,  p-value: 0.004823
```

Eliminating Age

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_age)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.61751 -0.21310 -0.02139  0.16785  0.85367
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.96501    1.46974  -0.657 0.520781
## team_size       0.06461    0.09027   0.716 0.484427
## tenure         -0.07069    0.04794  -1.475 0.159714
## overconfidence  0.01726    0.09177   0.188 0.853173
## history         0.01314    0.01251   1.050 0.309120
## voice_behavior  0.83807    0.26101   3.211 0.005452 **
## coordination    0.82496    0.19950   4.135 0.000777 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4604 on 16 degrees of freedom
## Multiple R-squared:  0.6641, Adjusted R-squared:  0.5381
## F-statistic: 5.271 on 6 and 16 DF,  p-value: 0.003599
```

Eliminating Team Size

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_team_size)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.63126 -0.24063 -0.02852  0.21967  0.90123
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)     0.028413   1.840108   0.015  0.98787
## age            -0.016190   0.043096  -0.376  0.71209
## tenure         -0.053427   0.063198  -0.845  0.41036
## overconfidence -0.007364   0.085684  -0.086  0.93258
## history         0.016548   0.011653   1.420  0.17476
## voice_behavior  0.820917   0.264264   3.106  0.00679 **
## coordination    0.759307   0.210741   3.603  0.00238 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4656 on 16 degrees of freedom
## Multiple R-squared:  0.6563, Adjusted R-squared:  0.5275
## F-statistic: 5.093 on 6 and 16 DF,  p-value: 0.004234
```

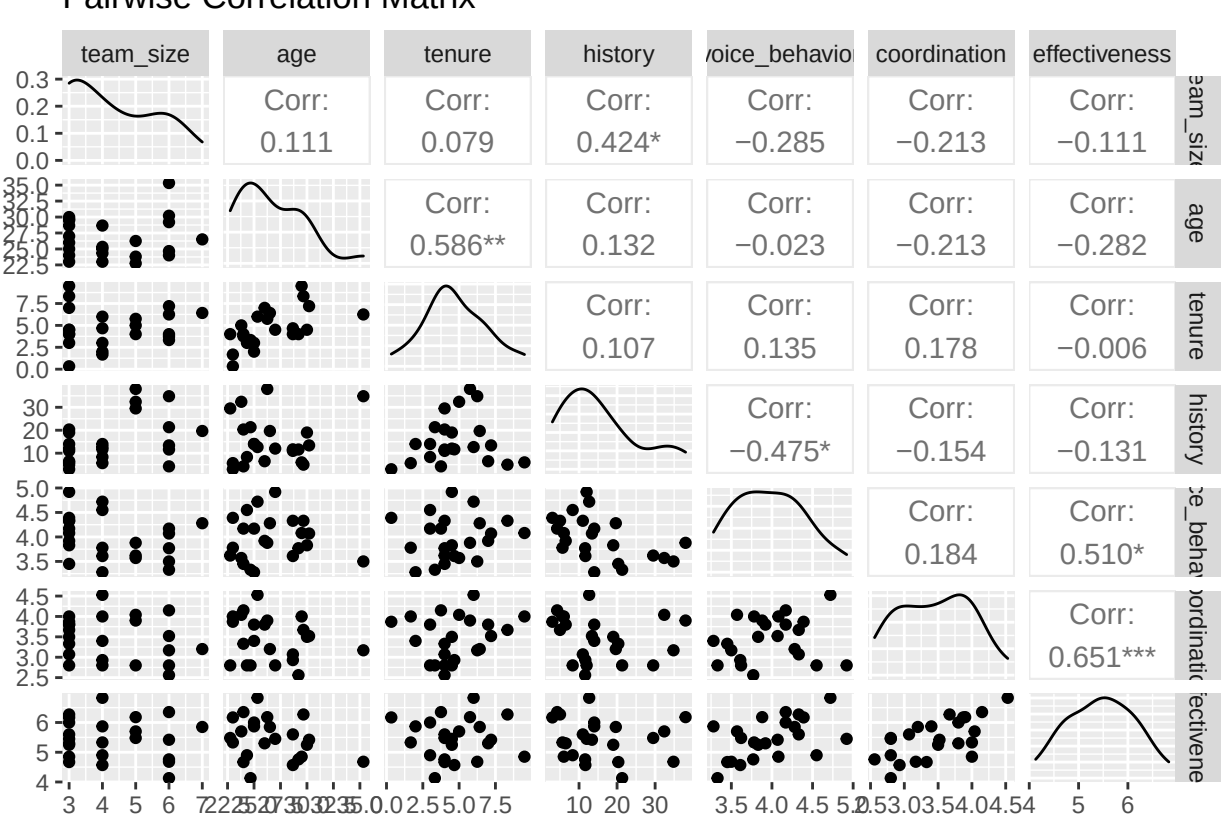
Outcome

Overconfidence is the least correlated with the Effectiveness, so it is eliminated.

$$\begin{aligned}\widehat{\text{effectiveness}} = -0.37 + 0.06(\text{team\_size}) - 0.02(\text{age}) - 0.06(\text{tenure}) + \\ 0.01(\text{history}) + 0.84(\text{voice\_behavior}) + 0.79(\text{coordination})\end{aligned} \tag{2}$$

Stage 1: Overconfidence is Eliminated

Initial




```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.59581 -0.23279 -0.03367  0.15673  0.90227
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.37168    1.85330  -0.201  0.84358
## team_size       0.05719    0.08310   0.688  0.50121
## age            -0.01540    0.04249  -0.362  0.72179
## tenure         -0.05675    0.06231  -0.911  0.37587
## history         0.01381    0.01191   1.160  0.26313
## voice_behavior  0.83637    0.25955   3.222  0.00532 **
## coordination    0.78602    0.20762   3.786  0.00162 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.459 on 16 degrees of freedom
## Multiple R-squared:  0.6661, Adjusted R-squared:  0.5408
## F-statistic: 5.319 on 6 and 16 DF,  p-value: 0.003449
```

Eliminating Coordination

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_coordination)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.09496 -0.31082  0.02896  0.34751  1.00334
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)     3.686304   2.019551   1.825   0.0856 .
## team_size       0.005092   0.109471   0.047   0.9634
## age            -0.077211   0.052401  -1.473   0.1589
## tenure          0.033039   0.076961   0.429   0.6731
## history         0.011489   0.015885   0.723   0.4794
## voice_behavior  0.872970   0.346460   2.520   0.0220 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6131 on 17 degrees of freedom
## Multiple R-squared:  0.3669, Adjusted R-squared:  0.1807
## F-statistic:  1.97 on 5 and 17 DF,  p-value: 0.1351
```

Eliminating Voice Behavior

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_voice_behavior)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.90144 -0.34809  0.02491  0.43369  0.79225
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)   3.311244   1.817518   1.822   0.0861 .
## team_size     0.029456   0.102969   0.286   0.7783
## age          -0.025118   0.052802  -0.476   0.6403
## tenure       -0.016897   0.076076  -0.222   0.8269
## history      -0.002403   0.013445  -0.179   0.8603
## coordination  0.810941   0.258470   3.137   0.0060 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5718 on 17 degrees of freedom
## Multiple R-squared:  0.4493, Adjusted R-squared:  0.2874
## F-statistic: 2.774 on 5 and 17 DF,  p-value: 0.05208
```

Eliminating History

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_history)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.71318 -0.16321 -0.01143  0.18738  0.82834
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)     0.22441    1.79861   0.125  0.90217
## team_size       0.08733    0.07973   1.095  0.28867
## age            -0.01579    0.04292  -0.368  0.71754
## tenure         -0.04688    0.06235  -0.752  0.46235
## voice_behavior  0.70917    0.23762   2.985  0.00833 **
## coordination    0.77362    0.20944   3.694  0.00180 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4636 on 17 degrees of freedom
## Multiple R-squared:  0.638,  Adjusted R-squared:  0.5315
## F-statistic: 5.992 on 5 and 17 DF,  p-value: 0.00226
```

Eliminating Tenure

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_tenure)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.77514 -0.20528  0.02038  0.17158  0.97433
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)     0.51182    1.57131   0.326  0.74861
## team_size       0.05048    0.08236   0.613  0.54806
## age            -0.04031    0.03236  -1.246  0.22976
## history         0.01233    0.01174   1.050  0.30821
## voice_behavior  0.78944    0.25311   3.119  0.00625 **
## coordination    0.71403    0.19102   3.738  0.00164 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4567 on 17 degrees of freedom
## Multiple R-squared:  0.6487, Adjusted R-squared:  0.5454
## F-statistic: 6.279 on 5 and 17 DF,  p-value: 0.001786
```

Eliminating Age

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_age)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.58544 -0.21699 -0.03302  0.16233  0.89446
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.84402    1.28346  -0.658 0.519593
## team_size       0.05808    0.08091   0.718 0.482639
## tenure         -0.07129    0.04645  -1.535 0.143280
## history         0.01385    0.01160   1.194 0.249017
## voice_behavior  0.84305    0.25219   3.343 0.003856 **
## coordination    0.81494    0.18672   4.364 0.000422 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4471 on 17 degrees of freedom
## Multiple R-squared:  0.6633, Adjusted R-squared:  0.5643
## F-statistic: 6.698 on 5 and 17 DF,  p-value: 0.001282
```

Eliminating Team Size

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_team_size)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.64748 -0.24150 -0.02411  0.22325  0.88290
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.004267   1.747035  -0.002  0.99808
## age            -0.016266   0.041810  -0.389  0.70207
## tenure         -0.052954   0.061093  -0.867  0.39813
## history         0.016374   0.011134   1.471  0.15967
## voice_behavior  0.817878   0.254126   3.218  0.00504 **
## coordination    0.762367   0.201558   3.782  0.00149 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4518 on 17 degrees of freedom
## Multiple R-squared:  0.6562, Adjusted R-squared:  0.555
## F-statistic: 6.489 on 5 and 17 DF,  p-value: 0.001511
```

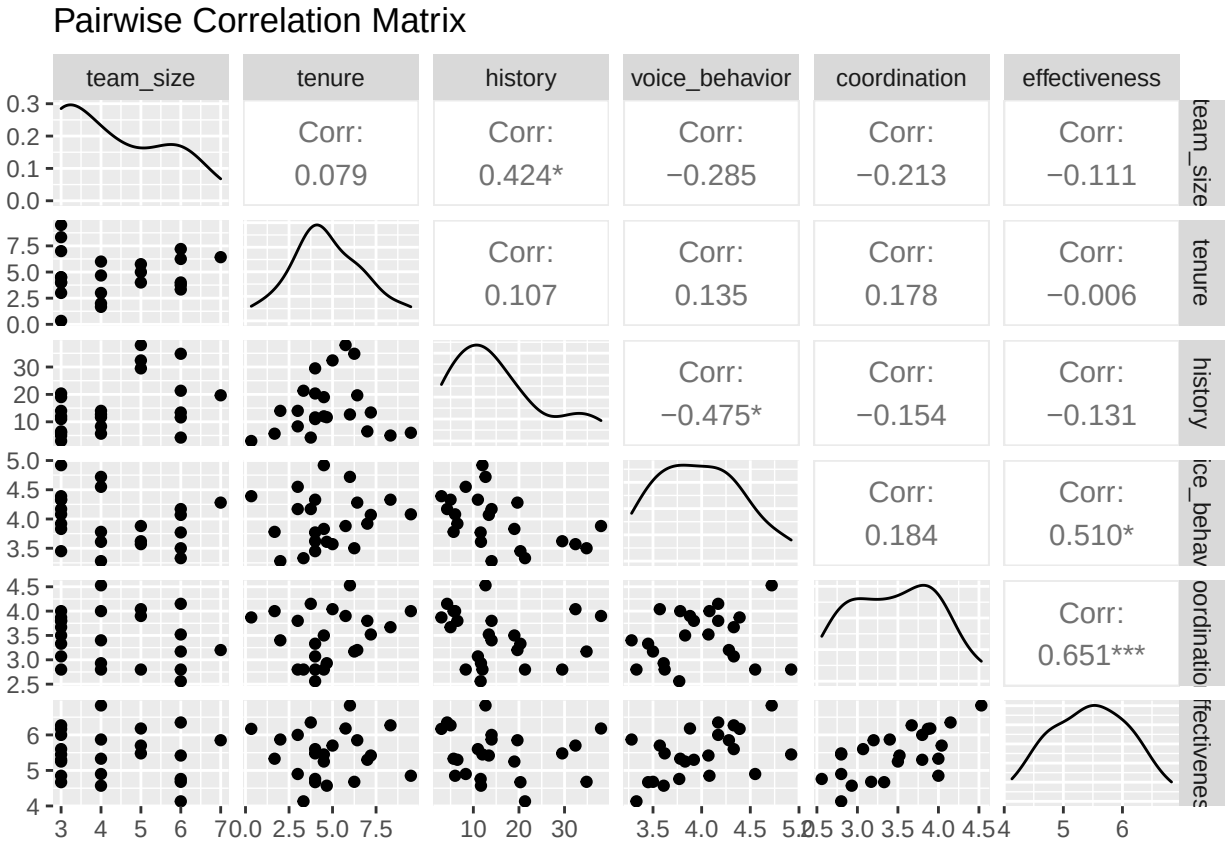
Outcome

Age has the least correlation with the Effectiveness, so it is eliminated.

$$\widehat{\text{effectiveness}} = -0.84 + 0.06(\text{team\_size}) - 0.07(\text{tenure}) + 0.01(\text{history}) + 0.84(\text{voice\_behavior}) + 0.81(\text{coordination}) \tag{3}$$

Stage 2: Age is Eliminated

Initial




```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.58544 -0.21699 -0.03302  0.16233  0.89446
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.84402    1.28346  -0.658 0.519593
## team_size       0.05808    0.08091   0.718 0.482639
## tenure         -0.07129    0.04645  -1.535 0.143280
## history         0.01385    0.01160   1.194 0.249017
## voice_behavior  0.84305    0.25219   3.343 0.003856 **
## coordination    0.81494    0.18672   4.364 0.000422 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4471 on 17 degrees of freedom
## Multiple R-squared:  0.6633, Adjusted R-squared:  0.5643
## F-statistic: 6.698 on 5 and 17 DF,  p-value: 0.001282
```

Eliminating Coordination

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_coordination)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.06289 -0.46376  0.06147  0.38072  0.97927
##
## Coefficients:
##                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)     1.7857442  1.6037247   1.113   0.2801
## team_size      -0.0009279  0.1128976  -0.008   0.9935
## tenure         -0.0330196  0.0645573  -0.511   0.6152
## history         0.0111862  0.0163923   0.682   0.5037
## voice_behavior  0.9201626  0.3560216   2.585   0.0187 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6328 on 18 degrees of freedom
## Multiple R-squared:  0.2861, Adjusted R-squared:  0.1274
## F-statistic: 1.803 on 4 and 18 DF,  p-value: 0.1723
```

Eliminating Voice Behavior

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_voice_behavior)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.86416 -0.38862 -0.01612  0.44893  0.78961
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   2.58509    0.96506   2.679   0.0153 *
## team_size     0.03056    0.10071   0.303   0.7650
## tenure       -0.04020    0.05694  -0.706   0.4892
## history      -0.00256    0.01315  -0.195   0.8478
## coordination  0.85866    0.23303   3.685   0.0017 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5594 on 18 degrees of freedom
## Multiple R-squared:  0.442,  Adjusted R-squared:  0.318
## F-statistic: 3.565 on 4 and 18 DF,  p-value: 0.02611
```

Eliminating History

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_history)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7028 -0.2035 -0.0311  0.1975  0.8202
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.25836    1.19988  -0.215 0.831940
## team_size       0.08832    0.07775   1.136 0.270874
## tenure         -0.06176    0.04630  -1.334 0.198876
## voice_behavior  0.71569    0.23119   3.096 0.006238 **
## coordination    0.80323    0.18865   4.258 0.000473 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4524 on 18 degrees of freedom
## Multiple R-squared:  0.6351, Adjusted R-squared:  0.554
## F-statistic: 7.832 on 4 and 18 DF,  p-value: 0.0007703
```

Eliminating Tenure

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_tenure)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.9340 -0.2412 -0.1023  0.2372  1.0219
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.58800    1.31960  -0.446 0.661209
## team_size       0.04679    0.08356   0.560 0.582410
## history         0.01079    0.01185   0.910 0.374719
## voice_behavior  0.76557    0.25622   2.988 0.007890 **
## coordination    0.76085    0.19014   4.002 0.000837 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4636 on 18 degrees of freedom
## Multiple R-squared:  0.6167, Adjusted R-squared:  0.5315
## F-statistic: 7.239 on 4 and 18 DF,  p-value: 0.00117
```

Eliminating Team Size

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_team_size)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.63737 -0.29321 -0.04652  0.19393  0.87433
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.49758    1.17312  -0.424 0.676485
## tenure         -0.06826    0.04563  -1.496 0.152049
## history         0.01645    0.01087   1.514 0.147395
## voice_behavior  0.82463    0.24748   3.332 0.003709 **
## coordination    0.79254    0.18160   4.364 0.000374 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4411 on 18 degrees of freedom
## Multiple R-squared:  0.6531, Adjusted R-squared:  0.576
## F-statistic: 8.473 on 4 and 18 DF,  p-value: 0.0005002
```

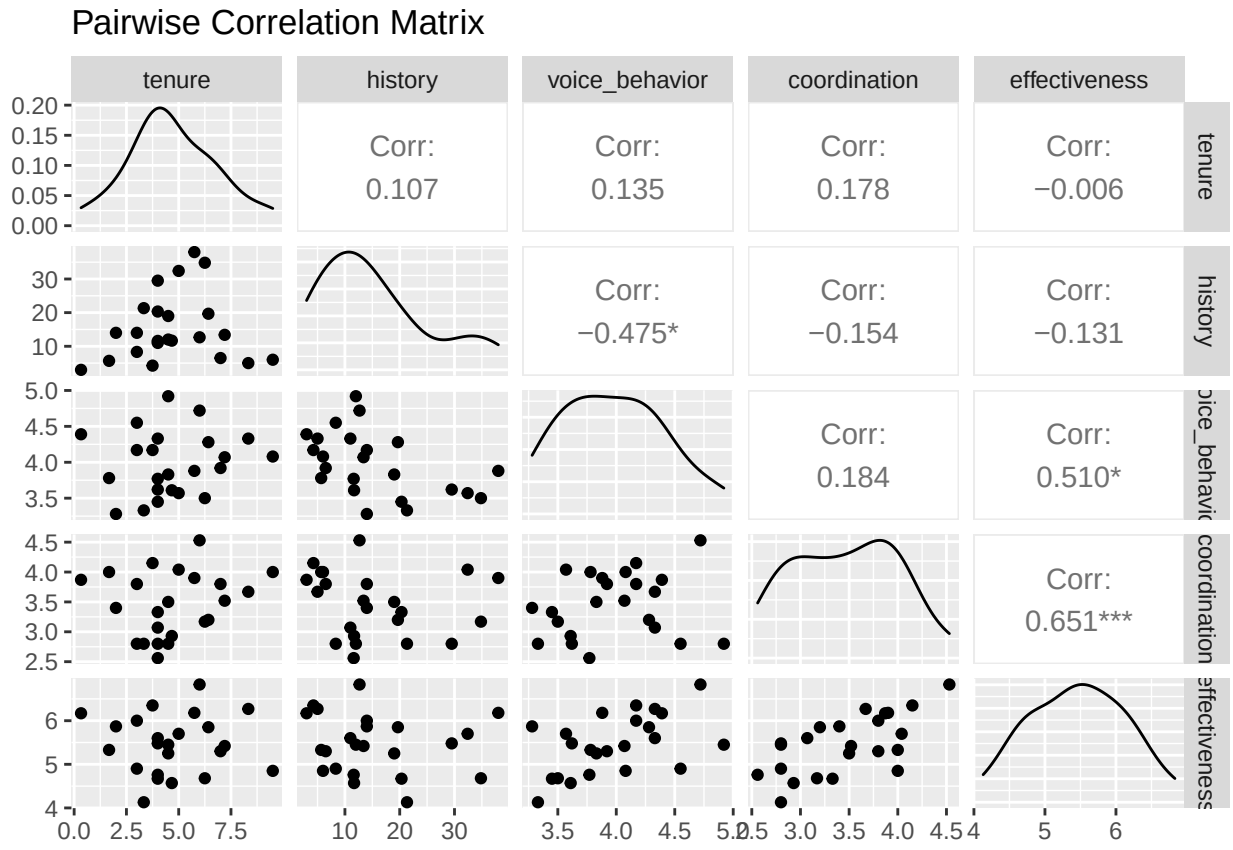
Outcome

Team Size seems to have the least correlation with the Effectiveness, so it is eliminated.

$$\widehat{\text{effectiveness}} = -0.5 - 0.07(\text{tenure}) + 0.02(\text{history}) + 0.82(\text{voice\_behavior}) + 0.79(\text{coordination}) \tag{4}$$

Stage 3: Team Size is Eliminated

Initial




```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.63737 -0.29321 -0.04652  0.19393  0.87433
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.49758    1.17312  -0.424 0.676485
## tenure         -0.06826    0.04563  -1.496 0.152049
## history         0.01645    0.01087   1.514 0.147395
## voice_behavior  0.82463    0.24748   3.332 0.003709 **
## coordination    0.79254    0.18160   4.364 0.000374 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4411 on 18 degrees of freedom
## Multiple R-squared:  0.6531, Adjusted R-squared:  0.576
## F-statistic: 8.473 on 4 and 18 DF,  p-value: 0.0005002
```

Eliminating Coordination

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_coordination)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.06317 -0.46415  0.06129  0.38104  0.97964
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)     1.78124    1.46690   1.214    0.240
## tenure         -0.03305    0.06272  -0.527    0.604
## history         0.01114    0.01508   0.739    0.469
## voice_behavior  0.92050    0.34421   2.674    0.015 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6159 on 19 degrees of freedom
## Multiple R-squared:  0.2861, Adjusted R-squared:  0.1733
## F-statistic: 2.538 on 3 and 19 DF,  p-value: 0.08724
```

Eliminating Voice Behavior

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_voice_behavior)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.88853 -0.40587  0.03136  0.42534  0.76418
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)   2.7294401  0.8193399   3.331  0.00351 **
## tenure       -0.0389490  0.0554180  -0.703  0.49069
## history      -0.0009833  0.0117871  -0.083  0.93439
## coordination  0.8462506  0.2238636   3.780  0.00127 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5459 on 19 degrees of freedom
## Multiple R-squared:  0.4391, Adjusted R-squared:  0.3506
## F-statistic: 4.959 on 3 and 19 DF,  p-value: 0.01042
```

Eliminating History

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_history)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.82767 -0.25254 -0.00891  0.18329  0.76261
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)     0.51162    0.99762   0.513 0.613972
## tenure         -0.05362    0.04609  -1.163 0.259071
## voice_behavior  0.64421    0.22416   2.874 0.009719 **
## coordination    0.76176    0.18649   4.085 0.000631 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4558 on 19 degrees of freedom
## Multiple R-squared:  0.6089, Adjusted R-squared:  0.5472
## F-statistic: 9.862 on 3 and 19 DF,  p-value: 0.0003884
```

Eliminating Tenure

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_tenure)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.9642 -0.2525 -0.1032  0.2415  1.0011
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.31542    1.20418  -0.262 0.796190
## history         0.01301    0.01096   1.187 0.249904
## voice_behavior  0.75329    0.25063   3.006 0.007271 **
## coordination    0.74453    0.18447   4.036 0.000706 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4552 on 19 degrees of freedom
## Multiple R-squared:   0.61,  Adjusted R-squared:  0.5484
## F-statistic: 9.906 on 3 and 19 DF,  p-value: 0.0003788
```

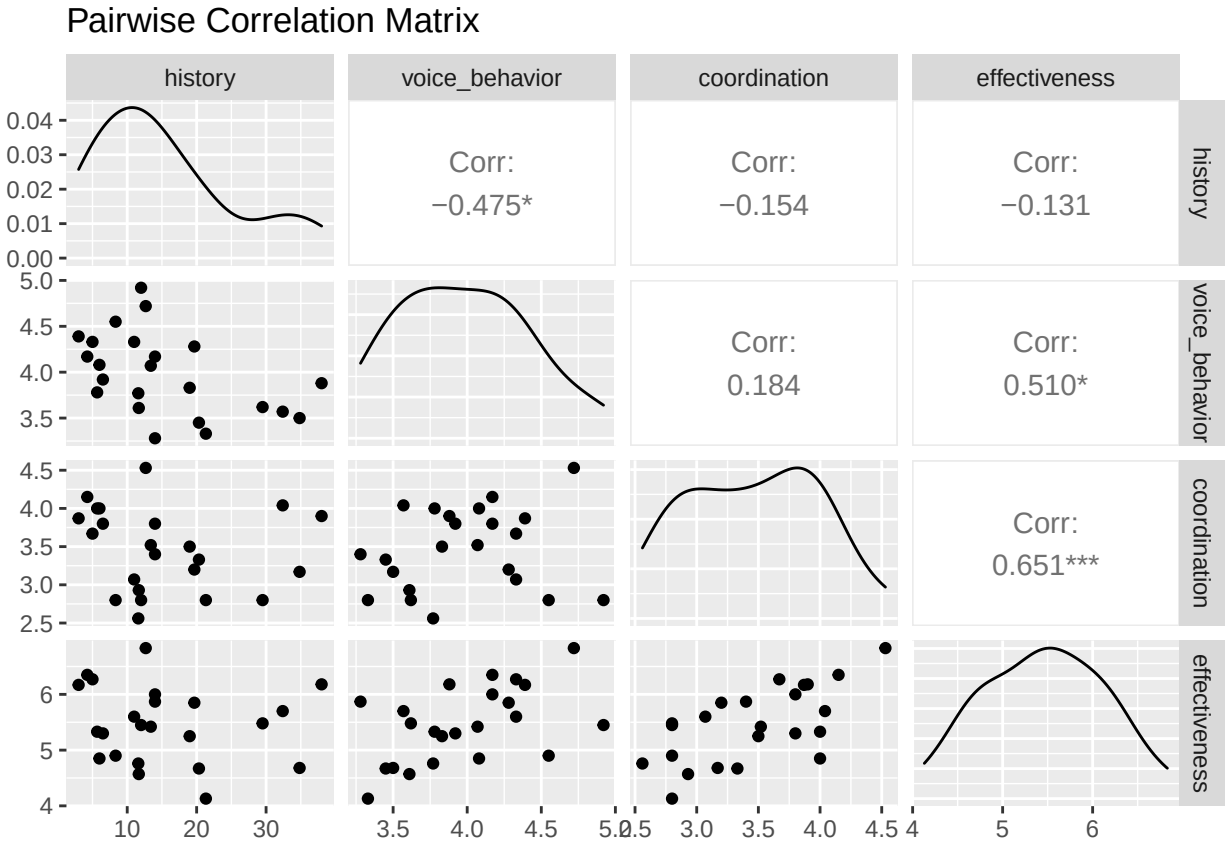
Outcome

The elimination of either History or Tenure seems to reduce the goodness of fit of the model. However, eliminating tenure has less negative effect on the model, so it is excluded.

$$\widehat{\text{effectiveness}} = -0.32 + 0.01(\text{history}) + 0.75(\text{voice\_behavior}) + 0.74(\text{coordination}) \tag{5}$$

Stage 4: Tenure is Eliminated

Initial




```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.9642 -0.2525 -0.1032  0.2415  1.0011
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.31542    1.20418  -0.262 0.796190
## history         0.01301    0.01096   1.187 0.249904
## voice_behavior  0.75329    0.25063   3.006 0.007271 **
## coordination    0.74453    0.18447   4.036 0.000706 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4552 on 19 degrees of freedom
## Multiple R-squared:   0.61,  Adjusted R-squared:  0.5484
## F-statistic: 9.906 on 3 and 19 DF,  p-value: 0.0003788
```

Eliminating Coordination

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_coordination)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.99590 -0.50411 -0.02275  0.45202  1.03983
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)    1.803285   1.439580   1.253   0.2248
## history        0.009582   0.014516   0.660   0.5167
## voice_behavior 0.881934   0.330215   2.671   0.0147 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6047 on 20 degrees of freedom
## Multiple R-squared:  0.2756, Adjusted R-squared:  0.2032
## F-statistic: 3.805 on 2 and 20 DF,  p-value: 0.03978
```

Eliminating Voice Behavior

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_voice_behavior)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.06932 -0.46020  0.02627  0.45303  0.61752
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   2.67193    0.80486   3.320  0.00342 **
## history      -0.00213    0.01153  -0.185  0.85524
## coordination  0.81504    0.21662   3.763  0.00123 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5389 on 20 degrees of freedom
## Multiple R-squared:  0.4246, Adjusted R-squared:  0.367
## F-statistic: 7.378 on 2 and 20 DF,  p-value: 0.003981
```

Eliminating History

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_history)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.06368 -0.32158  0.07167  0.24025  0.88613
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.4877     1.0062   0.485 0.633136
## voice_behavior   0.6166     0.2249   2.742 0.012562 *
## coordination     0.7276     0.1858   3.916 0.000856 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4598 on 20 degrees of freedom
## Multiple R-squared:  0.5811, Adjusted R-squared:  0.5392
## F-statistic: 13.87 on 2 and 20 DF,  p-value: 0.0001665
```

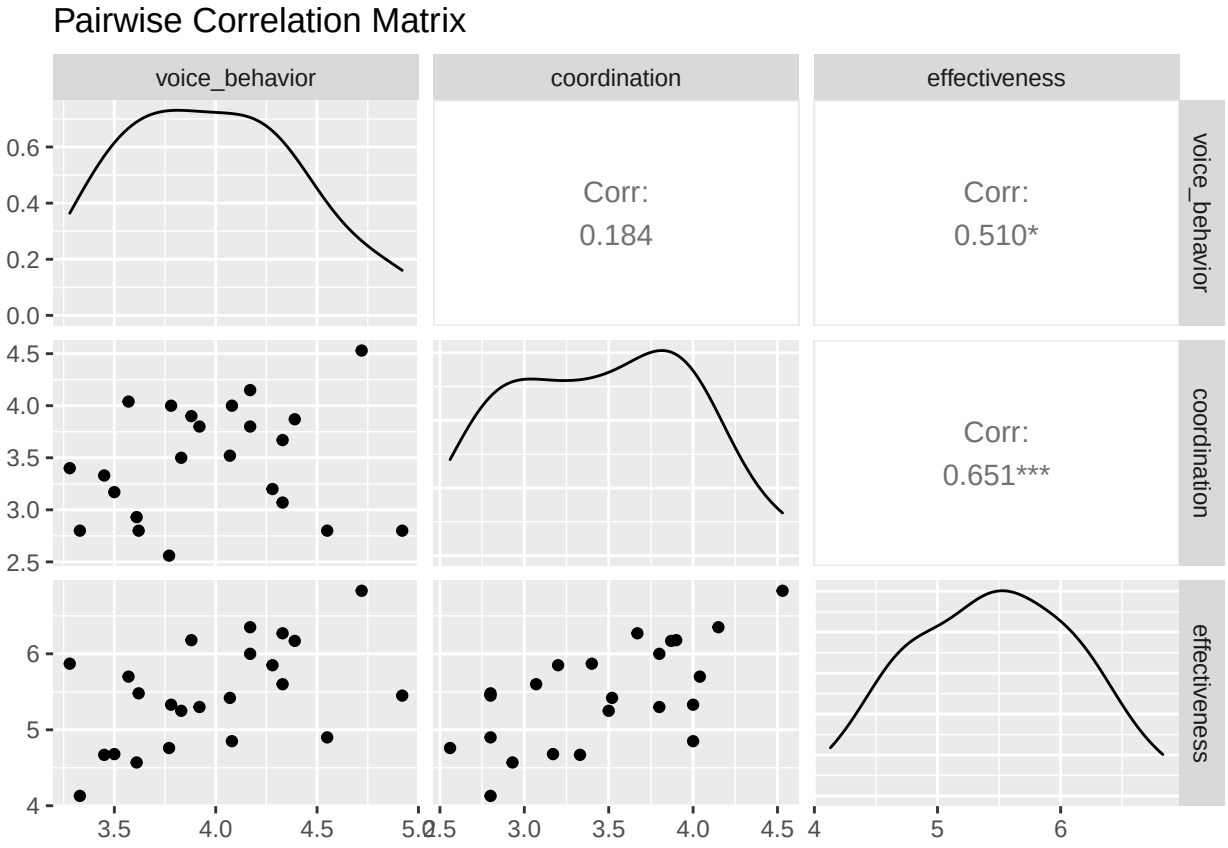
Outcome

History has the least correlation with the Effectiveness, so it is eliminated.

$$\widehat{\text{effectiveness}} = 0.49 + 0.62(\text{voice\_behavior}) + 0.73(\text{coordination}) \tag{6}$$

Stage 5: History is Eliminated

Initial




```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.06368 -0.32158  0.07167  0.24025  0.88613
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.4877     1.0062   0.485 0.633136
## voice_behavior   0.6166     0.2249   2.742 0.012562 *
## coordination     0.7276     0.1858   3.916 0.000856 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4598 on 20 degrees of freedom
## Multiple R-squared:  0.5811, Adjusted R-squared:  0.5392
## F-statistic: 13.87 on 2 and 20 DF,  p-value: 0.0001665
```

Eliminating Coordination

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_coordination)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.0047 -0.4724 -0.0942  0.4638  0.9540
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)      2.3627     1.1480   2.058   0.0522 .
## voice_behavior   0.7785     0.2867   2.715   0.0130 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5965 on 21 degrees of freedom
## Multiple R-squared:  0.2598, Adjusted R-squared:  0.2246
## F-statistic: 7.372 on 1 and 21 DF,  p-value: 0.01297
```

Eliminating Voice Behavior

```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data_except_voice_behavior)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.05262 -0.44615  0.03993  0.46061  0.63838
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    2.6177     0.7321   3.576 0.001784 **
## coordination   0.8212     0.2090   3.928 0.000771 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5264 on 21 degrees of freedom
## Multiple R-squared:  0.4236, Adjusted R-squared:  0.3961
## F-statistic: 15.43 on 1 and 21 DF,  p-value: 0.0007709
```

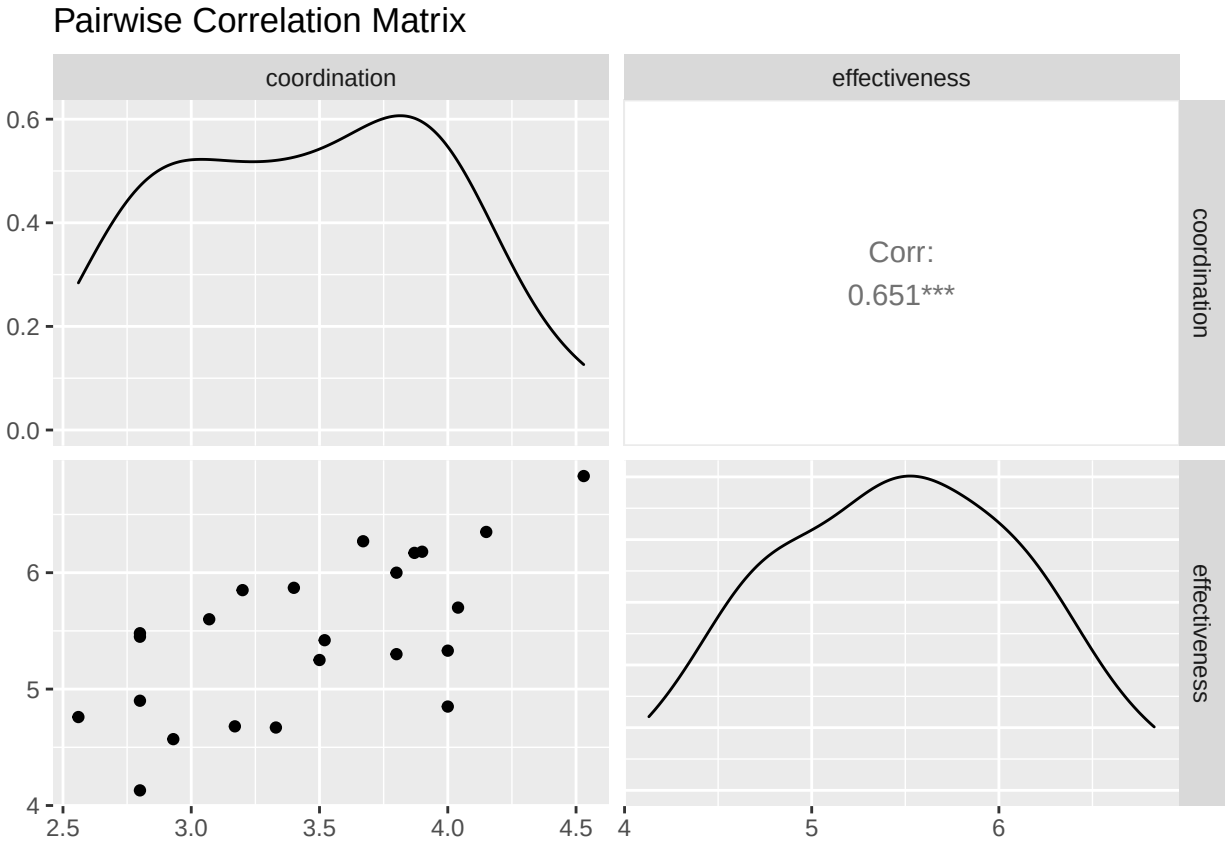
Outcome

Eliminating Voice Behavior has less detrimental effect on Adjusted R-Sqaured, so it is eliminated.

$$\widehat{\text{effectiveness}} = 2.62 + 0.82(\text{coordination}) \tag{7}$$

Stage 6: Voice Behavior is Eliminated

At this point, the model only includes one independant variable which is Coordination.




```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.05262 -0.44615  0.03993  0.46061  0.63838
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    2.6177     0.7321   3.576 0.001784 **
## coordination   0.8212     0.2090   3.928 0.000771 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5264 on 21 degrees of freedom
## Multiple R-squared:  0.4236, Adjusted R-squared:  0.3961
## F-statistic: 15.43 on 1 and 21 DF,  p-value: 0.0007709
```

Results

The table of independant variables in order of their predictive power (highest to lowest) is as follows:

Rank	Variable
1	Coordination
2	Voice Behavior
3	History
4	Tenure
5	Team Size
6	Age
7	Overconfidence

The optimal model (model with highest adjusted R-Squared) is as follows:

$$\widehat{\text{effectiveness}} = -0.5 - 0.07(\text{tenure}) + 0.02(\text{history}) + 0.82(\text{voice\_behavior}) + 0.79(\text{coordination}) \tag{8}$$

Conclusion

Appendix A: Aggregated Data From Teams That Participated

team	org	team_size	response_rate	response_count	age	tenure	overconfidence	history	voice_behavior	coordination	effectiveness
VxWVZXy	qX0d3XD	3	0.67	2	26.00	7.00	4.00	6.50	3.92	3.80	5.30
OlvA1P1	ml4MwXj	4	0.75	3	25.33	6.00	4.00	12.67	4.72	4.53	6.83
5xOnMXW	oXoqeP0	3	1.00	3	24.00	4.00	5.67	20.33	3.45	3.33	4.67
JlBq3PN	Kl3zeP6	4	0.75	3	25.00	2.00	7.33	14.00	3.28	3.40	5.87
rX1wnPb	ylrepPL	6	0.83	5	29.20	4.00	3.20	11.60	3.77	2.56	4.76
5xOnqXW	2PJKklO	3	0.67	2	29.50	9.50	6.50	6.00	4.08	4.00	4.85
KPjegx7	VxWvAXy	4	0.75	3	24.33	3.00	6.67	8.33	4.55	2.80	4.90
WXz0pPm	0xAoGlQ	4	0.75	3	28.67	4.67	4.33	11.67	3.61	2.93	4.57
zP7KKP8	5xO2qXW	6	0.67	4	24.00	3.75	3.25	4.25	4.17	4.15	6.35
5P88oP9	5xO2qXW	7	0.86	6	26.50	6.42	5.83	19.67	4.28	3.20	5.85
4xdmYPE	5P8oox9	3	1.00	3	29.67	8.33	3.33	5.00	4.33	3.67	6.27
YXmyDXN	k7lkqxD	3	0.67	2	25.00	3.00	6.00	14.00	4.17	3.80	6.00
DPpkGx8	k7lkqxD	4	0.75	3	23.00	1.67	4.67	5.67	3.78	4.00	5.33
8xNAJXm	yEXnYlg	5	1.00	5	23.80	5.00	4.00	32.40	3.57	4.04	5.70
ml4MwXj	GVX26X9	5	0.80	4	22.75	4.00	6.00	29.50	3.62	2.80	5.48
gxwyalv	M8xNJxm	3	1.00	3	28.67	4.00	6.33	11.00	4.33	3.07	5.60
ylrepPL	M8xNJxm	3	0.67	2	30.00	4.50	5.00	19.00	3.83	3.50	5.25
2PJKklO	M8xNJxm	3	1.00	3	23.00	0.33	4.33	3.00	4.39	3.87	6.17
VxWvAXy	M8xNJxm	6	0.83	5	30.20	7.20	4.60	13.40	4.07	3.52	5.42
0xAoGlQ	3Bl6Nlb	3	0.67	2	27.00	4.50	5.50	12.00	4.92	2.80	5.45
rX1dnlb	3Bl6Nlb	5	0.80	4	26.25	5.75	5.00	38.00	3.88	3.90	6.18
5xO2qXW	3Bl6Nlb	6	0.50	3	24.67	3.33	3.33	21.33	3.33	2.80	4.13
JlBJYlN	3Bl6Nlb	6	1.00	6	35.33	6.25	5.67	34.83	3.50	3.17	4.68

Appendix B: Data From Actual Survey Responses

```
##         id    team gender tenure team_history age overconfidence voice eff_q1
## 1  KPjenx7 VxWVZXy   male    4.0            2  23              4  3.83      6
## 2  8XM1vXy VxWVZXy   male   10.0           11  29              4  4.00      5
## 3  WXz0NPm OlvA1P1   male    6.0           13  27              3  4.50      7
## 4  GxD15PN OlvA1P1 female    4.0           12  24              2  4.67      7
## 5  YxeoLl9 OlvA1P1 female    8.0           13  25              7  5.00      7
## 6  zP7KkP8 JlBq3PN female    1.0           12  23              6  3.33      7
## 7  5P88MP9 5xOnMXW   male    4.0           12  23              5  3.67      6
## 8  RXKYnPe 5xOnMXW   male    3.0           23  22              6  2.67      6
## 9  0xAJGPQ JlBq3PN female    3.0           20  27              8  3.67      6
## 10 5xOnqXW JlBq3PN female    2.0           10  25              8  2.83      6
## 11 JlBqYPN 5xOnMXW   male    5.0           26  27              6  4.00      6
## 12 8XM1qXy ml4MwXj   male    1.0           36  18              5  4.67      6
## 13 WXz0pPm ml4MwXj   male    4.0           48  24              6  2.83      5
## 14 Yxeo0l9 0xAoGlQ female    7.0            4  30              4  5.00      6
## 15 zP7KKP8 5xO2qXW female    7.0           42  30              3  4.83      7
## 16 5P88oP9 JlBJYlN female    7.0           42  25              4  5.00      7
## 17 RXKY8Pe DPpkGx8 female    1.0            5  22              4  3.67      6
## 18 BXqe5Xb rX1wnPb   male    6.0           11  30              3  3.17      6
## 19 EXnKYxg rX1wnPb female    4.0           10  30              3  4.00      7
## 20 NP97vXA YXmyDXN   male    1.0            8  21              6  3.67      7
## 21 GlgNzPg YXmyDXN   male    5.0           20  29              6  4.67      6
## 22 oPGYjXz DPpkGx8   male    3.0            2  22              4  4.17      6
## 23 VX2m6l9 8xNAJXm female    5.0           24  24              3  3.33      7
## 24 JPRoKly 8xNAJXm   male    6.0           60  23              6  4.33      7
## 25 YXmyDXN 8xNAJXm   male    2.0            6  25              2  2.17      6
## 26 DPpkGx8 8xNAJXm   male    7.0           36  24              4  4.17      6
## 27 2PyOwXW 8xNAJXm   male    5.0           36  23              5  3.83      6
## 28 mPZ9Yxv 5xOnqXW   male   16.0            2  36              6  4.00      6
## 29 8xNAJXm KPjegx7   male    5.0            9  22              6  5.00      3
## 30 WlQnRXO 5xOnqXW   male    3.0           10  23              7  4.17      5
## 31 Bl6eNPb rX1wnPb   male    1.0           11  31              3  3.83      6
## 32 qXOd3XD gxwyalv   male    5.0           23  32              7  4.33      7
## 33 ml4MwXj gxwyalv   male    5.0            3  30              4  4.50      6
## 34 7lEA9lQ rX1wnPb female    4.0            2  30              3  3.83      5
## 35 oXoqePO VxWvAXy   male   15.0           40  37              3  4.50      6
## 36 jXVAWle zP7KKP8   male    3.0            5  22              4  4.33      7
## 37 8PYv8lL zP7KKP8   male    9.0            5  32              1  3.83      6
## 38 ePbaqxJ 5P88oP9   male   10.0           34  29              7  4.33      7
## 39 rlLNAx2 5P88oP9   male    6.0           21  30              5  4.00      6
## 40 gxwyalv 5P88oP9   male    4.0            4  24              5  4.33      6
## 41 ylrepPL 5P88oP9   male   10.0           22  30              5  4.33      6
## 42 2PJKklO 5P88oP9 female    1.5            4  22              6  3.67      7
## 43 RX5ybXO zP7KKP8   male    2.0            4  21              3  4.67      7
## 44 VxWvAXy zP7KKP8 female    1.0            3  21              5  3.83      7
## 45 Olv9DP1 KPjegx7 female    1.0            9  23              6  4.33      7
## 46 0xAoGlQ KPjegx7 female    3.0            7  28              8  4.33      7
## 47 rX1dnlb 5P88oP9   male    7.0           33  24              7  5.00      7
## 48 5xO2qXW rX1dnlb   male    3.0           16  25              5  3.67      6
## 49 JlBJYlN WXz0pPm   male    2.0           12  26              1  2.83      7
## 50 KPjEgx7 VxWvAXy female    3.0            1  25              4  4.00      7
## 51 WXzqplm 5xO2qXW female    2.0           18  24              3  3.00      5
```

```
## 52 GxDEwPN WXz0pPm   male    5.0           3  32             8  4.33      5
## 53 Yxe40X9 WXz0pPm   male    7.0          20  28             4  3.67      5
## 54 k7lkqxD JlBJYlN female    1.5          17  24             3  2.17      6
## 55 5GlgzPg 4xdmYPE   male    7.0           5  29             3  3.83      7
## 56 roPGjxz 4xdmYPE   male    6.0           5  26             5  4.33      6
## 57 GVX26X9 4xdmYPE female   12.0           5  34             2  4.83      7
## 58 D4xdYPE JlBJYlN   male    6.0           6  66            10  2.83      1
## 59 wJPRKly gxwyalv female    2.0           7  24             8  4.17      7
## 60 VYXmDlN DPpkGx8 female    1.0          10  25             6  3.50      6
## 61 M8xNJxm ml4MwXj   male    1.0          10  19             6  3.50      5
## 62 3Bl6Nlb ml4MwXj   male   10.0          24  30             7  3.50      6
## 63 zml4wPj rX1wnPb   male    5.0          24  25             4  4.00      6
## 64 N7lE9lQ ylrepPL female    3.0          36  33             7  3.67      6
## 65 1oXoeP0 VxWvAXy female    2.0           5  22             7  4.00      6
## 66 aKl3ex6 VxWvAXy   male    8.0           6  36             4  3.67      6
## 67 eYXaMXq JlBJYlN female   14.0          52  36             5  4.00      6
## 68 yjXVWxe ylrepPL   male    6.0           2  27             3  4.00      6
## 69 E8PY8xL 2PJKklO female    0.0           4  22             3  4.33      7
## 70 1ePbqxJ 2PJKklO female    0.0           4  24             3  4.67      7
## 71 GylrpxL 2PJKklO   male    1.0           1  23             7  4.17      7
## 72 7RX5bxO VxWvAXy   male    8.0          15  31             5  4.17      6
## 73 oVxWAly 5xO2qXW   male    1.0           4  20             4  2.17      5
## 74 eOlvDx1 0xAoGlQ female    2.0          20  24             7  4.83      7
## 75 y0xAGlQ rX1dnlb female    5.0          28  27             3  4.00      6
## 76 ZrX1nxb rX1dnlb   male    8.0          24  26             8  3.83      7
## 77 K5xOqlW JlBJYlN female    7.0          84  36             6  3.33      6
## 78 mJlBYPN rX1dnlb   male    7.0          84  27             4  4.00      6
## 79 mKPjgl7 JlBJYlN female    2.0           8  25             6  3.67      7
##    eff_q2 eff_q3 eff_q4 eff_q5 eff_q6 eff_q7 eff_q8 eff_q9 eff_q10 coord_q1
## 1       7      6      6      6      6      6      6      6       4        5
## 2       3      5      6      3      5      6      6      5       3        5
## 3       7      7      7      7      7      7      7      7       7        5
## 4       2      7      7      7      7      7      7      7       7        5
## 5       7      7      7      7      7      7      7      7       7        5
## 6       5      7      7      7      6      7      6      6       6        4
## 7       5      3      4      4      2      3      2      2       5        4
## 8       5      4      7      2      5      5      6      6       4        3
## 9       6      7      7      7      4      6      6      4       6        4
## 10      6      6      7      6      5      4      5      4       4        3
## 11      6      5      7      4      5      5      6      5       5        4
## 12      5      7      7      6      6      3      6      3       4        2
## 13      6      7      7      7      4      6      4      6       4        1
## 14      6      6      6      5      4      5      5      3       5        3
## 15      6      6      7      5      4      3      5      2       4        3
## 16      7      6      7      5      4      3      5      1       4        3
## 17      4      6      7      6      6      5      6      6       5        4
## 18      1      6      7      5      5      6      6      4       4        4
## 19      1      6      7      3      7      5      7      4       6        5
## 20      3      6      7      5      6      5      6      5       6        4
## 21      7      7      7      7      6      7      6      5       6        4
## 22      6      5      6      4      5      5      4      5       6        5
## 23      7      7      7      5      6      7      7      6       7        5
## 24      6      7      7      4      3      5      5      6       7        5
## 25      5      6      6      1      6      5      6      5       7        4
```

```
## 26     5     6     5     4     5     6     5     7     6     4
## 27     5     5     5     4     4     6     5     7     7     4
## 28     3     5     6     4     6     5     6     4     6     4
## 29     6     6     7     5     4     3     5     2     3     4
## 30     1     5     7     3     6     6     6     4     3     4
## 31     6     3     7     2     2     5     5     2     4     2
## 32     1     5     7     4     7     6     7     4     6     4
## 33     2     7     7     7     4     6     7     4     6     4
## 34     5     6     7     5     6     5     5     5     5     4
## 35     6     3     6     6     5     6     2     3     5     4
## 36     5     7     7     6     6     7     7     7     6     4
## 37     6     7     7     6     7     7     7     7     6     4
## 38     4     7     7     6     6     6     5     6     6     5
## 39     2     7     6     6     6     6     7     4     6     4
## 40     6     7     7     6     6     6     6     5     5     4
## 41     4     7     7     7     5     6     5     4     6     4
## 42     6     7     7     6     5     6     4     6     5     3
## 43     6     7     7     6     7     7     7     7     7     4
## 44     2     7     7     6     7     6     6     1     6     4
## 45     5     7     7     5     6     1     7     1     6     4
## 46     6     6     7     4     5     4     5     3     4     4
## 47     7     7     7     5     5     4     6     5     6     5
## 48     7     6     7     6     5     6     6     6     6     5
## 49     7     1     6     1     6     5     1     5     1     4
## 50     6     7     7     6     6     4     6     4     6     4
## 51     3     5     6     2     3     4     5     1     3     2
## 52     5     6     7     4     5     4     6     5     4     3
## 53     5     6     6     3     4     5     4     3     5     4
## 54     6     6     7     4     5     3     5     3     3     3
## 55     7     7     7     6     6     6     5     7     6     4
## 56     3     7     6     5     6     6     6     6     5     5
## 57     7     7     7     7     7     7     7     6     6     5
## 58     1     1     1     1     1     1     1     7     1     1
## 59     2     7     7     7     7     5     7     4     5     2
## 60     3     6     7     5     6     5     6     3     4     4
## 61     4     7     7     6     4     4     6     3     4     2
## 62     7     7     7     5     6     5     6     4     7     4
## 63     2     1     7     1     1     4     4     7     6     1
## 64     6     6     7     4     5     6     6     4     5     4
## 65     5     6     6     6     5     6     5     5     6     3
## 66     5     5     7     2     5     6     6     2     6     4
## 67     6     6     7     6     7     7     6     6     5     5
## 68     5     5     7     2     5     5     5     4     6     4
## 69     6     6     7     6     7     7     7     7     7     4
## 70     7     7     7     7     1     6     6     6     6     4
## 71     6     6     7     5     6     5     6     4     6     5
## 72     5     7     7     5     5     6     5     6     6     5
## 73     3     2     7     1     5     4     5     3     3     3
## 74     4     7     7     6     7     4     7     3     6     4
## 75     6     7     7     6     6     6     6     6     7     4
## 76     7     7     7     7     7     7     6     5     7     5
## 77     5     4     7     5     5     5     6     5     4     3
## 78     6     6     6     5     6     5     4     5     7     4
## 79     5     6     7     5     5     5     6     5     3     4
```

```
##    coord_q2 coord_q3 coord_q4 coord_q5 voice_q1 voice_q2 voice_q3 voice_q4
## 1         2        3        4        4        4        4        4        4
## 2         4        4        4        3        5        4        4        3
## 3         4        5        5        4        5        4        5        4
## 4         4        4        5        4        4        5        5        5
## 5         4        5        5        4        5        5        5        5
## 6         1        2        4        4        2        4        5        3
## 7         4        2        5        4        3        4        4        5
## 8         2        2        4        2        3        2        1        4
## 9         2        4        4        3        4        4        3        3
## 10        4        4        4        4        4        2        4        3
## 11        4        4        3        3        4        4        4        4
## 12        3        1        4        2        5        5        5        4
## 13        3        5        2        3        2        4        4        3
## 14        2        3        3        2        5        5        5        5
## 15        4        2        3        2        5        4        5        5
## 16        2        2        3        2        5        5        5        5
## 17        4        4        4        3        3        4        4        4
## 18        3        3        4        2        3        3        3        4
## 19        3        3        4        2        4        4        4        4
## 20        3        4        3        3        4        4        3        3
## 21        4        5        4        4        5        5        4        4
## 22        4        3        4        4        4        4        4        4
## 23        3        4        5        5        3        3        4        4
## 24        3        5        5        4        5        5        5        4
## 25        3        5        4        2        2        2        2        2
## 26        4        5        4        3        5        5        4        3
## 27        3        4        4        4        3        4        5        4
## 28        4        4        4        4        4        4        4        4
## 29        3        4        2        3        5        5        5        5
## 30        4        4        4        4        5        3        5        3
## 31        2        2        2        2        4        4        4        4
## 32        3        2        4        2        4        5        4        4
## 33        2        3        4        5        5        5        3        4
## 34        3        2        3        3        4        4        4        3
## 35        4        4        3        3        5        5        5        4
## 36        4        4        4        3        4        5        4        4
## 37        4        4        4        4        4        4        3        4
## 38        2        4        4        3        5        4        5        4
## 39        4        3        4        4        3        5        4        4
## 40        3        4        4        3        4        4        4        4
## 41        2        2        3        2        4        4        5        4
## 42        2        2        4        3        3        4        4        4
## 43        5        5        5        4        5        5        5        4
## 44        4        5        4        4        4        4        4        4
## 45        2        2        3        1        4        4        4        4
## 46        2        2        3        3        4        5        4        4
## 47        2        1        4        2        5        5        5        5
## 48        5        5        3        4        4        3        4        4
## 49        1        4        3        1        4        2        2        3
## 50        4        4        4        4        4        4        4        4
## 51        3        4        2        2        2        4        4        3
## 52        2        2        4        2        4        5        5        4
## 53        3        4        3        4        4        4        3        4
```

```
## 54        3        2        2        4        2        2        2        3
## 55        5        2        5        4        4        4        4        4
## 56        3        2        4        2        4        5        5        5
## 57        4        2        4        4        5        5        5        4
## 58        1        5        2        5        5        3        3        1
## 59        4        2        4        1        5        5        4        4
## 60        4        5        4        4        4        4        3        3
## 61        2        3        3        5        4        3        4        3
## 62        1        1        5        4        5        3        3        3
## 63        1        1        2        1        5        4        3        4
## 64        4        4        4        3        3        4        5        4
## 65        3        4        3        4        3        5        4        4
## 66        2        4        2        4        4        3        4        4
## 67        5        2        5        4        4        4        4        4
## 68        3        2        4        3        4        4        4        4
## 69        2        3        4        4        4        5        4        4
## 70        4        3        4        4        5        4        5        5
## 71        5        3        4        5        4        4        5        4
## 72        4        2        4        2        5        5        4        3
## 73        2        4        3        3        3        2        1        3
## 74        2        3        4        2        5        5        5        4
## 75        4        4        4        4        4        4        4        4
## 76        4        1        4        4        4        4        4        3
## 77        4        3        4        3        3        3        4        3
## 78        4        3        4        3        4        4        4        4
## 79        3        4        3        3        4        4        4        3
##    voice_q5 voice_q6 ovconf_q1h ovconf_q1l ovconf_q2h ovconf_q2l ovconf_q3h
## 1         3        4         33         25       2008       2005         10
## 2         4        4         30         20       2000       1992         50
## 3         5        4         33         27       2000       1990         50
## 4         5        4         35         30       2009       2007         45
## 5         5        5         31         30       1995       1990         30
## 6         4        2         40         32       2010       2009         45
## 7         2        4         60         45       2010       2000         50
## 8         4        2         35         32       2000       1950         30
## 9         4        4         25         20       1970       1950         25
## 10        2        2         35         33       2010       2005         68
## 11        4        4         36         31       2005       2002         35
## 12        4        5         32         31       2005       1990         10
## 13        2        2         40         36       2010       2007         60
## 14        5        5         40         20       2000       1990         20
## 15        5        5         40         20       2005       1990         20
## 16        5        5         25         15       2005       1995         20
## 17        3        4         35         30       2000       1980         50
## 18        3        3         30         23       2008       2005         22
## 19        4        4         34         24       2010       2002         30
## 20        3        5         35         30       2012       2010        120
## 21        5        5         31         30       2008       2007         60
## 22        4        5         32         30       2010       2005         50
## 23        3        3         35         28       2011       2010        100
## 24        3        4         38         30       2005       1990         40
## 25        4        1         33         28       2008       2006         50
## 26        4        4         33         30       2005       2003         60
## 27        3        4         33         30       2008       2006         40
```

```
## 28        4        4         28         28       2008       2004         30
## 29        5        5         31         31       2007       2007         25
## 30        4        5         32         28       1970       1950         15
## 31        4        3         29         27       2008       2006         50
## 32        4        5         35         25       2005       2000         80
## 33        5        5         31         30       2006       2004         39
## 34        4        4         31         31       2010       2005         50
## 35        4        4         33         30       2008       2006         30
## 36        4        5         36         30       2000       1990         60
## 37        4        4         32         31       2008       2007         44
## 38        4        4         34         31       2000       1995         15
## 39        4        4         32         30       2008       2004         25
## 40        5        5         34         30       2007       2007        100
## 41        4        5         35         31       2005       2000         80
## 42        4        3         35         30       1390       1384        100
## 43        4        5         34         31       2010       1998         45
## 44        3        4         35         30       2010       2005         30
## 45        5        5         33         30       2002       2000         20
## 46        5        4         37         32       2004       2002         10
## 47        5        5         34         28       2005       2002         24
## 48        3        4         32         31       2008       2007         30
## 49        4        2         40         30       2010       2000         60
## 50        4        4         35         30       2002       2000        150
## 51        2        3         35         30       2011       2007         40
## 52        3        5         30         28       2010       2005         14
## 53        4        3         33         28       2006       2002         21
## 54        2        2         32         30       2012       2010         50
## 55        3        4         31         30       2011       2009         50
## 56        3        4         33         30       2007       2007         70
## 57        5        5         33         29       2010       2005         60
## 58        3        2          9          9          8          8          9
## 59        3        4         33         32       2000       1990         60
## 60        4        3         35         32       2010       2000         15
## 61        3        4         33         32       2005       2000         12
## 62        4        3         40         35       2009       2006         30
## 63        3        5         32         28       2008       2005         35
## 64        3        3         40         30       2000       1990         25
## 65        4        4        100         50       1998       1994         10
## 66        4        3         50         40       2012       2005         60
## 67        4        4         32         31       2005       2000         15
## 68        4        4         37         29       2008       2004         50
## 69        5        4         34         30       2009       2005         50
## 70        5        4         40         30       2015       2000         40
## 71        5        3         34         30       2005       1995        180
## 72        3        5         32         31       2002       2000         25
## 73        2        2         32         30       2009       2005        120
## 74        5        5         30         23       2005       2000         25
## 75        4        4         31         30       2007       2006          8
## 76        4        4         33         32       1980       1960          6
## 77        4        3         33         33       2008       2007         27
## 78        4        4         33         30       2004       2000        110
## 79        3        4         35         31       2005       1998        100
##    ovconf_q3l ovconf_q4h ovconf_q4l ovconf_q5h ovconf_q5l ovconf_q6h ovconf_q6l
## 1           5       2003       2000         30         20       2000       1960
```

```
## 2          20         2019         2000          10           3         2000         1993
## 3          10         2000         1990         100          10         2000         1980
## 4          20         2005         2000          50          20         1990         1980
## 5          20         2000         1990          20          10         1970         1960
## 6          35         2005         2000          56          44         2000         1996
## 7          40         2000         1995          45          35         1970         1960
## 8          15         2000         1950           5           2         2000         1950
## 9          20         1890         1870          53          47         1900         1890
## 10         56         2005         2002          35          25         2000         1994
## 11         20         2003         2000          30          20         1985         1970
## 12          5         2000         1980          10           5         1990         1980
## 13         30         2002         2000          30          20         1970         1940
## 14         10         2000         1995          20          10         2000         1980
## 15         10         2005         1995          40          20         1990         1970
## 16         10         2000         1996          40          20         1990         1970
## 17         30         2010         1990          35          25         2000         1980
## 18         12         2003         2000          28          20         1990         1980
## 19         20         2010         2000          30          20         1990         1980
## 20         50         2000         1997          15          10         1990         1950
## 21         50         2002         2000           3           2         2000         1990
## 22         30         2005         2000          13          10         2000         1995
## 23         20         2000         1900         100          40         2000         1990
## 24         20         2005         2000           4           2         2000         1980
## 25         30         2004         2000           6           2         1996         1980
## 26         40         2001         1999           2           2         2000         1998
## 27         20         2005         2001           3           2         2000         1998
## 28         20         2001         2001           5           3         1980         1950
## 29         20         2010         2005           5           2         1960         1950
## 30         10         1980         1970           5           1         1920         1910
## 31         30         2003         2000          20          10         1995         1990
## 32         50         2003         2001         130          60         1930         1850
## 33         10         2000         1996           4           2         1990         1970
## 34         45         2001         2000          25          15         2000         1990
## 35         25         2002         2000          25          20         1990         1985
## 36         40         2005         2000           7           3         1990         1980
## 37         44         2001         2000          23          20         1992         1991
## 38         10         1995         1985           5           3         1990         1950
## 39         15         2004         1998          20          10         1970         1950
## 40         80         2004         2002           4           2         1995         1990
## 41         50         2005         2000          30          20         1960         1930
## 42         40         1385         1378           5           2         1385         1378
## 43         35         2005         1990           7           3         2005         1985
## 44         20         2010         2000          15          10         2000         1980
## 45         10         2012         2008          15          10         1998         1980
## 46          5         2002         2000         250         150        19900         1970
## 47         17         2002         2000           4           2         1980         1960
## 48         20         2004         2002           7           4         1995         1985
## 49         10         2002         1990          40          10         1980         1940
## 50        100         2000         1995          30          20         1950         1950
## 51         30         2003         1998          10           4         2000         1990
## 52         10         2000         1990          15           8         1980         1950
## 53         15         2000         1995           3           2         1990         1980
## 54         30         2005         2000          50          40         2000         1990
## 55         40         2002         2000          23          20         1990         1989
```

```
## 56         50       2003       2002          7          5       1986       1985
## 57         40       2010       2005         30         20       1995       1985
## 58          9          9          9          9          9          9          8
## 59         50       2000       1990         60         50       2000       1980
## 60         10       2010       2000          8          5       2000       1990
## 61          9       2002       1996          3          2       1990       1987
## 62         20       2003       2000          3          2       2000       1995
## 63         25       2000       1999          5          4       1996       1990
## 64         15       1389       1385         12          8       1978       1975
## 65          5       2000       1985          4          2       2001       1990
## 66         40       2000       1990         12          8       2000       1990
## 67          7       2005       1997          3          2       1987       1980
## 68         30       2002       1998         12          3       1990       1960
## 69         40       2005       1990          2          2       2000       1990
## 70         25       2008       2000          4          3       2005       1990
## 71        100       1999       1995         18         10       1980       1890
## 72         22       2003       2001         10          5       1995       1990
## 73         90       2005       2002         25         10       1990       1970
## 74         20       2000       1998         50         40       2000       1995
## 75          5       2000       1995         30         20       2000       1991
## 76          5       2000       1996          2          2       1960       1950
## 77         26       2011       2002         23         10       1991       1989
## 78         60       2000       1996         15          5       1996       1990
## 79         50       2005       1998          4          2       2005       2000
##    ovconf_q7h ovconf_q7l ovconf_q8h ovconf_q8l ovconf_q9h ovconf_q9l
## 1        2005       1990         33         20        700        600
## 2        2000       1993         35         29       1000        700
## 3        2005       1990         33         28       1500       1000
## 4        2008       2000         32         28       1200        800
## 5        1980       1960         32         30        800        600
## 6        2000       1990         33         23       3000       2000
## 7        2000       1990         35         25       1400       1000
## 8        2000       1950         34         30       1200        900
## 9        1990       1980         32         28        990        870
## 10       1999       1996         33         30       4000       3000
## 11       1985       1970         36         30       1300       1000
## 12       1995       1980         36         32       1000        900
## 13       1990       1970         34         34        800        700
## 14       2000       1990         34         30       1000        800
## 15       2005       1990         34         30       1000        800
## 16       2000       1990         34         30       1000        800
## 17       2000       1980         32         28       1200       1000
## 18       1995       1990         32         20       1000        800
## 19       1985       1980         34         28        900        700
## 20       1990       1960         33         30       1200        700
## 21       1998       1995         32         28       1600       1400
## 22       2005       2000         34         32       1100       1000
## 23       2000       1980         35         25       1500        720
## 24       1999       1997         30         26       1200        800
## 25       1996       1980         32         28      10000        800
## 26       2000       1990         35         30       1100       1000
## 27       2000       1995         35         30       1200        900
## 28       1998       1998         32         32        950        900
## 29       1990       1980         32         28        700        650
```

```
## 30       1990       1980         32          1       1200        900
## 31       1997       1990         34         32       1200        900
## 32       1965       1950         34         30       1000        600
## 33       2030       1971         34         27       1000        900
## 34       1990       1985         33         30       1200        800
## 35       1995       1990         32         28       1000        800
## 36       1995       1985         34         30       1200        800
## 37       1994       1993         32         32       1000        500
## 38       2000       1990         38         34       2200       1900
## 39       1980       1970         32         28       1200       1100
## 40       1998       1995         32         28       1000        800
## 41       1990       1980         32         30       1000        900
## 42       1385       1378         32         26        250        120
## 43       2000       1985         34         30       1100        900
## 44       2010       2000         32         32       1800       1500
## 45       1998       1980         35         30       1000         80
## 46       2000       1995         32         30      25000      20000
## 47       1985       1980         38         34        650        400
## 48       2000       1998         32         28       1000        800
## 49       2000       1990         35         30      13000        900
## 50       1950       1950         32         32       1000        900
## 51       2000       1990         32         28       1200        900
## 52       1990       1970         24         20        500        100
## 53       2001       1987         34         30        900        700
## 54       2000       1990         32         32        900        800
## 55       1993       1992         32         30       1000        998
## 56       1999       1996         32         28       1000        900
## 57       1995       1990         32         28        950        900
## 58          9          9          9          9          9          9
## 59       1900       1880         32         32       1000        999
## 60       1985       1980         32         30        900        800
## 61       1996       1984         33         32        650        400
## 62       2002       1995         30         15        600        400
## 63       1998       1990         32         32       1000        900
## 64       1967       1960         32         31       1000        700
## 65       2000       1950         35         30      30000       5000
## 66       2000       1990         36         36       1200        700
## 67       1995       1988         34         32       1000        900
## 68       1985       1970         32         32       1200        800
## 69       1996       1980         32         30       1100        950
## 70       2010       1990         32         28       1000        900
## 71       1998       1960         33         27       1100        950
## 72       1995       1990         32         32       1000        900
## 73       1990       1975         32         28        950        890
## 74       1990       1980         32         32       1000        999
## 75       1970       1960         32         29        920        850
## 76       1960       1960         36         32        750        700
## 77       1963       1960         32         28        900        890
## 78       1996       1990         32         30        990        900
## 79       2003       1990         32         28       1800       1200
##    ovconf_q10h ovconf_q10l
## 1           15           8
## 2           50          40
## 3           70          40
```

```
## 4           60          40
## 5           15          10
## 6           26          25
## 7           90          80
## 8          250         150
## 9           45          30
## 10          28          25
## 11          80          60
## 12          30          20
## 13          20          15
## 14          50          40
## 15          50          40
## 16          50          40
## 17          60          40
## 18          54          18
## 19          56          46
## 20          30          20
## 21          70          60
## 22          50          40
## 23         100          40
## 24          70          50
## 25          75          45
## 26          60          50
## 27          55          45
## 28          60          50
## 29          50          40
## 30          80          70
## 31          60          50
## 32          45          30
## 33          50          40
## 34          55          50
## 35          45          40
## 36         110          70
## 37          60          50
## 38          65          45
## 39          70          50
## 40          60          50
## 41         100          70
## 42          80          50
## 43          95          80
## 44          50          40
## 45         120          80
## 46         100          80
## 47          55          43
## 48          60          50
## 49          60          40
## 50          50          45
## 51          55          45
## 52           8           3
## 53          50          40
## 54          50          40
## 55          55          45
## 56          60          50
## 57          53          48
```

```
## 58           9           9
## 59          60          59
## 60         150         100
## 61          50          40
## 62          60          50
## 63          17          16
## 64         100          90
## 65        1400          89
## 66          60          50
## 67          62          59
## 68          75          50
## 69          60          50
## 70         100          40
## 71         130          70
## 72          50          40
## 73          80          50
## 74          60          50
## 75          52          45
## 76          40          30
## 77          55          52
## 78          55          40
## 79          85          75
```

Appendix C: R Version

```
##                _
## platform       x86_64-pc-linux-gnu
## arch           x86_64
## os             linux-gnu
## system         x86_64, linux-gnu
## status
## major          3
## minor          6.3
## year           2020
## month          02
## day            29
## svn rev        77875
## language       R
## version.string R version 3.6.3 (2020-02-29)
## nickname       Holding the Windsock
```

Appendix D: R Packages