# Thesis Survey Data analysis

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This data analysis is conducted using the R language and the data is stored in a .csv file.

Session Info:

```
## R version 3.6.3 (2020-02-29)
## Platform: x86_64-pc-linux-gnu (64-bit)
## Running under: Linux Mint 20.3
##
## Matrix products: default
## BLAS:   /usr/lib/x86_64-linux-gnu/blas/libblas.so.3.9.0
## LAPACK: /usr/lib/x86_64-linux-gnu/lapack/liblapack.so.3.9.0
##
## locale:
##  [1] LC_CTYPE=en_US.UTF-8    LC_NUMERIC=C            LC_TIME=en_US.UTF-8
##  [4] LC_COLLATE=en_US.UTF-8  LC_MONETARY=az_IR       LC_MESSAGES=en_US.UTF-8
##  [7] LC_PAPER=az_IR          LC_NAME=C               LC_ADDRESS=C
## [10] LC_TELEPHONE=C          LC_MEASUREMENT=az_IR    LC_IDENTIFICATION=C
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
## [1] GGally_2.1.2  ggplot2_3.3.5
##
## loaded via a namespace (and not attached):
##  [1] Rcpp_1.0.8.3       plyr_1.8.6         pillar_1.7.0       compiler_3.6.3
##  [5] RColorBrewer_1.1-2 tools_3.6.3        digest_0.6.29      evaluate_0.15
##  [9] lifecycle_1.0.1    tibble_3.1.6       gtable_0.3.0       pkgconfig_2.0.3
## [13] rlang_1.0.2        cli_3.2.0          yaml_2.3.5         xfun_0.30
## [17] fastmap_1.1.0      withr_2.5.0        stringr_1.4.0      dplyr_1.0.8
## [21] knitr_1.38         generics_0.1.2     vctrs_0.3.8        grid_3.6.3
## [25] tidyselect_1.1.2   reshape_0.8.8      glue_1.6.2         R6_2.5.1
## [29] fansi_1.0.2        rmarkdown_2.13     purrr_0.3.4        magrittr_2.0.2
## [33] scales_1.1.1       ellipsis_0.3.2     htmltools_0.5.2    colorspace_2.0-3
## [37] utf8_1.2.2         stringi_1.7.6      munsell_0.5.0      crayon_1.5.0
```

## Dataset

### Aggregated data from teams that participated

```
##       team     org team_size response_rate response_count   age tenure
## 1  VxWVZXy qXOd3XD         3          0.67              2 26.00   7.00
## 2  OlvA1P1 ml4MwXj         4          0.75              3 25.33   6.00
## 3  5xOnMXW oXoqeP0         3          1.00              3 24.00   4.00
## 4  JlBq3PN Kl3zeP6         4          0.75              3 25.00   2.00
```

```
## 5  rX1wnPb ylrepPL         6          0.83              5 29.20   4.00
## 6  5xOnqXW 2PJKklO         3          0.67              2 29.50   9.50
## 7  KPjegx7 VxWvAXy         4          0.75              3 24.33   3.00
## 8  WXzOpPm 0xAoGlQ         4          0.75              3 28.67   4.67
## 9  zP7KKP8 5xO2qXW         6          0.67              4 24.00   3.75
## 10 5P88oP9 5xO2qXW         7          0.86              6 26.50   6.42
## 11 4xdmYPE 5P8oox9         3          1.00              3 29.67   8.33
## 12 YXmyDXN k7lkqxD         3          0.67              2 25.00   3.00
## 13 DPpkGx8 k7lkqxD         4          0.75              3 23.00   1.67
## 14 8xNAJXm yEXnYlg         5          1.00              5 23.80   5.00
## 15 ml4MwXj GVX26X9         5          0.80              4 22.75   4.00
## 16 gxwyalv M8xNJxm         3          1.00              3 28.67   4.00
## 17 ylrepPL M8xNJxm         3          0.67              2 30.00   4.50
## 18 2PJKklO M8xNJxm         3          1.00              3 23.00   0.33
## 19 VxWvAXy M8xNJxm         6          0.83              5 30.20   7.20
## 20 0xAoGlQ 3Bl6Nlb         3          0.67              2 27.00   4.50
## 21 rX1dnlb 3Bl6Nlb         5          0.80              4 26.25   5.75
## 22 5xO2qXW 3Bl6Nlb         6          0.50              3 24.67   3.33
## 23 JlBJYlN 3Bl6Nlb         6          1.00              6 35.33   6.25
##    overconfidence history voice_behavior coordination effectiveness
## 1            4.00    6.50          3.92         3.80          5.30
## 2            4.00   12.67          4.72         4.53          6.83
## 3            5.67   20.33          3.45         3.33          4.67
## 4            7.33   14.00          3.28         3.40          5.87
## 5            3.20   11.60          3.77         2.56          4.76
## 6            6.50    6.00          4.08         4.00          4.85
## 7            6.67    8.33          4.55         2.80          4.90
## 8            4.33   11.67          3.61         2.93          4.57
## 9            3.25    4.25          4.17         4.15          6.35
## 10           5.83   19.67          4.28         3.20          5.85
## 11           3.33    5.00          4.33         3.67          6.27
## 12           6.00   14.00          4.17         3.80          6.00
## 13           4.67    5.67          3.78         4.00          5.33
## 14           4.00   32.40          3.57         4.04          5.70
## 15           6.00   29.50          3.62         2.80          5.48
## 16           6.33   11.00          4.33         3.07          5.60
## 17           5.00   19.00          3.83         3.50          5.25
## 18           4.33    3.00          4.39         3.87          6.17
## 19           4.60   13.40          4.07         3.52          5.42
## 20           5.50   12.00          4.92         2.80          5.45
## 21           5.00   38.00          3.88         3.90          6.18
## 22           3.33   21.33          3.33         2.80          4.13
## 23           5.67   34.83          3.50         3.17          4.68
```

### Data from actual survey responses

| | id | team | eff_q1 | eff_q2 | eff_q3 | eff_q4 | eff_q5 | eff_q6 | eff_q7 | eff_q8 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | KPjenx7 | VxWVZXy | 6 | 7 | 6 | 6 | 6 | 6 | 6 | 6 |
| 2 | 8XM1vXy | VxWVZXy | 5 | 3 | 5 | 6 | 3 | 5 | 6 | 6 |
| 3 | WXzONPm | OlvA1P1 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 4 | GxD15PN | OlvA1P1 | 7 | 2 | 7 | 7 | 7 | 7 | 7 | 7 |
| 5 | YxeoLl9 | OlvA1P1 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 6 | zP7KkP8 | JlBq3PN | 7 | 5 | 7 | 7 | 7 | 6 | 7 | 6 |
| 7 | 5P88MP9 | 5xOnMXW | 6 | 5 | 3 | 4 | 4 | 2 | 3 | 2 |
| 8 | RXKYnPe | 5xOnMXW | 6 | 5 | 4 | 7 | 2 | 5 | 5 | 6 |
| 9 | 0xAJGPQ | JlBq3PN | 6 | 6 | 7 | 7 | 7 | 4 | 6 | 6 |
| 10 | 5xOnqXW | JlBq3PN | 6 | 6 | 6 | 7 | 6 | 5 | 4 | 5 |
| 11 | JlBqYPN | 5xOnMXW | 6 | 6 | 5 | 7 | 4 | 5 | 5 | 6 |
| 12 | 8XM1qXy | ml4MwXj | 6 | 5 | 7 | 7 | 6 | 6 | 3 | 6 |
| 13 | WXz0pPm | ml4MwXj | 5 | 6 | 7 | 7 | 7 | 4 | 6 | 4 |
| 14 | Yxeo0l9 | 0xAoGlQ | 6 | 6 | 6 | 6 | 5 | 4 | 5 | 5 |
| 15 | zP7KKP8 | 5xO2qXW | 7 | 6 | 6 | 7 | 5 | 4 | 3 | 5 |
| 16 | 5P88oP9 | JlBJYlN | 7 | 7 | 6 | 7 | 5 | 4 | 3 | 5 |
| 17 | RXKY8Pe | DPpkGx8 | 6 | 4 | 6 | 7 | 6 | 6 | 5 | 6 |
| 18 | BXqe5Xb | rX1wnPb | 6 | 1 | 6 | 7 | 5 | 5 | 6 | 6 |
| 19 | EXnKYxg | rX1wnPb | 7 | 1 | 6 | 7 | 3 | 7 | 5 | 7 |
| 20 | NP97vXA | YXmyDXN | 7 | 3 | 6 | 7 | 5 | 6 | 5 | 6 |
| 21 | GlgNzPg | YXmyDXN | 6 | 7 | 7 | 7 | 7 | 6 | 7 | 6 |
| 22 | oPGYjXz | DPpkGx8 | 6 | 6 | 5 | 6 | 4 | 5 | 5 | 4 |
| 23 | VX2m6l9 | 8xNAJXm | 7 | 7 | 7 | 7 | 5 | 6 | 7 | 7 |
| 24 | JPRoKly | 8xNAJXm | 7 | 6 | 7 | 7 | 4 | 3 | 5 | 5 |
| 25 | YXmyDXN | 8xNAJXm | 6 | 5 | 6 | 6 | 1 | 6 | 5 | 6 |
| 26 | DPpkGx8 | 8xNAJXm | 6 | 5 | 6 | 5 | 4 | 5 | 6 | 5 |
| 27 | 2PyOwXW | 8xNAJXm | 6 | 5 | 5 | 5 | 4 | 4 | 6 | 5 |
| 28 | mPZ9Yxv | 5xOnqXW | 6 | 3 | 5 | 6 | 4 | 6 | 5 | 6 |
| 29 | 8xNAJXm | KPjegx7 | 3 | 6 | 6 | 7 | 5 | 4 | 3 | 5 |
| 30 | WlQnRXO | 5xOnqXW | 5 | 1 | 5 | 7 | 3 | 6 | 6 | 6 |
| 31 | Bl6eNPb | rX1wnPb | 6 | 6 | 3 | 7 | 2 | 2 | 5 | 5 |
| 32 | qXOd3XD | gxwyalv | 7 | 1 | 5 | 7 | 4 | 7 | 6 | 7 |
| 33 | ml4MwXj | gxwyalv | 6 | 2 | 7 | 7 | 7 | 4 | 6 | 7 |
| 34 | 7lEA9lQ | rX1wnPb | 5 | 5 | 6 | 7 | 5 | 6 | 5 | 5 |
| 35 | oXoqeP0 | VxWvAXy | 6 | 6 | 3 | 6 | 6 | 5 | 6 | 2 |
| 36 | jXVAWle | zP7KKP8 | 7 | 5 | 7 | 7 | 6 | 6 | 7 | 7 |
| 37 | 8PYv8lL | zP7KKP8 | 6 | 6 | 7 | 7 | 6 | 7 | 7 | 7 |
| 38 | ePbaqxJ | 5P88oP9 | 7 | 4 | 7 | 7 | 6 | 6 | 6 | 5 |
| 39 | rlLNAx2 | 5P88oP9 | 6 | 2 | 7 | 6 | 6 | 6 | 6 | 7 |
| 40 | gxwyalv | 5P88oP9 | 6 | 6 | 7 | 7 | 6 | 6 | 6 | 6 |
| 41 | ylrepPL | 5P88oP9 | 6 | 4 | 7 | 7 | 7 | 5 | 6 | 5 |
| 42 | 2PJKklO | 5P88oP9 | 7 | 6 | 7 | 7 | 6 | 5 | 6 | 4 |
| 43 | RX5ybXO | zP7KKP8 | 7 | 6 | 7 | 7 | 6 | 7 | 7 | 7 |
| 44 | VxWvAXy | zP7KKP8 | 7 | 2 | 7 | 7 | 6 | 7 | 6 | 6 |
| 45 | Olv9DP1 | KPjegx7 | 7 | 5 | 7 | 7 | 5 | 6 | 1 | 7 |
| 46 | 0xAoGlQ | KPjegx7 | 7 | 6 | 6 | 7 | 4 | 5 | 4 | 5 |
| 47 | rX1dnlb | 5P88oP9 | 7 | 7 | 7 | 7 | 5 | 5 | 4 | 6 |
| 48 | 5xO2qXW | rX1dnlb | 6 | 7 | 6 | 7 | 6 | 5 | 6 | 6 |
| 49 | JlBJYlN | WXz0pPm | 7 | 7 | 1 | 6 | 1 | 6 | 5 | 1 |
| 50 | KPjEgx7 | VxWvAXy | 7 | 6 | 7 | 7 | 6 | 6 | 4 | 6 |
| 51 | WXzqplm | 5xO2qXW | 5 | 3 | 5 | 6 | 2 | 3 | 4 | 5 |

```
## 52 GxDEwPN WXz0pPm      5      5      6      7      4      5      4      6
## 53 Yxe40X9 WXz0pPm      5      5      6      6      3      4      5      4
## 54 k7lkqxD JlBJYlN      6      6      6      7      4      5      3      5
## 55 5GlgzPg 4xdmYPE      7      7      7      7      6      6      6      5
## 56 roPGjxz 4xdmYPE      6      3      7      6      5      6      6      6
## 57 GVX26X9 4xdmYPE      7      7      7      7      7      7      7      7
## 58 D4xdYPE JlBJYlN      1      1      1      1      1      1      1      1
## 59 wJPRKly gxwyalv      7      2      7      7      7      7      5      7
## 60 VYXmDlN DPpkGx8      6      3      6      7      5      6      5      6
## 61 M8xNJxm ml4MwXj      5      4      7      7      6      4      4      6
## 62 3Bl6Nlb ml4MwXj      6      7      7      7      5      6      5      6
## 63 zml4wPj rX1wnPb      6      2      1      7      1      1      4      4
## 64 N7lE9lQ ylrepPL      6      6      6      7      4      5      6      6
## 65 1oXoeP0 VxWvAXy      6      5      6      6      6      5      6      5
## 66 aKl3ex6 VxWvAXy      6      5      5      7      2      5      6      6
## 67 eYXaMXq JlBJYlN      6      6      6      7      6      7      7      6
## 68 yjXVWxe ylrepPL      6      5      5      7      2      5      5      5
## 69 E8PY8xL 2PJKklO      7      6      6      7      6      7      7      7
## 70 1ePbqxJ 2PJKklO      7      7      7      7      7      1      6      6
## 71 GylrpxL 2PJKklO      7      6      6      7      5      6      5      6
## 72 7RX5bxO VxWvAXy      6      5      7      7      5      5      6      5
## 73 oVxWAly 5xO2qXW      5      3      2      7      1      5      4      5
## 74 eOlvDx1 0xAoGlQ      7      4      7      7      6      7      4      7
## 75 y0xAGlQ rX1dnlb      6      6      7      7      6      6      6      6
## 76 ZrX1nxb rX1dnlb      7      7      7      7      7      7      7      6
## 77 K5xOqlW JlBJYlN      6      5      4      7      5      5      5      6
## 78 mJlBYPN rX1dnlb      6      6      6      6      5      6      5      4
## 79 mKPjgl7 JlBJYlN      7      5      6      7      5      5      5      6
##    eff_q9 eff_q10 coord_q1 coord_q2 coord_q3 coord_q4 coord_q5 voice_q1
## 1       6       4        5        2        3        4        4        4
## 2       5       3        5        4        4        4        3        5
## 3       7       7        5        4        5        5        4        5
## 4       7       7        5        4        4        5        4        4
## 5       7       7        5        4        5        5        4        5
## 6       6       6        4        1        2        4        4        2
## 7       2       5        4        4        2        5        4        3
## 8       6       4        3        2        2        4        2        3
## 9       4       6        4        2        4        4        3        4
## 10      4       4        3        4        4        4        4        4
## 11      5       5        4        4        4        3        3        4
## 12      3       4        2        3        1        4        2        5
## 13      6       4        1        3        5        2        3        2
## 14      3       5        3        2        3        3        2        5
## 15      2       4        3        4        2        3        2        5
## 16      1       4        3        2        2        3        2        5
## 17      6       5        4        4        4        4        3        3
## 18      4       4        4        3        3        4        2        3
## 19      4       6        5        3        3        4        2        4
## 20      5       6        4        3        4        3        3        4
## 21      5       6        4        4        5        4        4        5
## 22      5       6        5        4        3        4        4        4
## 23      6       7        5        3        4        5        5        3
## 24      6       7        5        3        5        5        4        5
## 25      5       7        4        3        5        4        2        2
```

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

```
##    voice_q2 voice_q3 voice_q4 voice_q5 voice_q6 ovconf_q1h ovconf_q1l
## 1         4        4        4        3        4         33         25
## 2         4        4        3        4        4         30         20
## 3         4        5        4        5        4         33         27
## 4         5        5        5        5        4         35         30
## 5         5        5        5        5        5         31         30
## 6         4        5        3        4        2         40         32
## 7         4        4        5        2        4         60         45
## 8         2        1        4        4        2         35         32
## 9         4        3        3        4        4         25         20
## 10        2        4        3        2        2         35         33
## 11        4        4        4        4        4         36         31
## 12        5        5        4        4        5         32         31
## 13        4        4        3        2        2         40         36
## 14        5        5        5        5        5         40         20
## 15        4        5        5        5        5         40         20
## 16        5        5        5        5        5         25         15
## 17        4        4        4        3        4         35         30
## 18        3        3        4        3        3         30         23
## 19        4        4        4        4        4         34         24
## 20        4        3        3        3        5         35         30
## 21        5        4        4        5        5         31         30
## 22        4        4        4        4        5         32         30
## 23        3        4        4        3        3         35         28
## 24        5        5        4        3        4         38         30
## 25        2        2        2        4        1         33         28
## 26        5        4        3        4        4         33         30
## 27        4        5        4        3        4         33         30
## 28        4        4        4        4        4         28         28
## 29        5        5        5        5        5         31         31
## 30        3        5        3        4        5         32         28
## 31        4        4        4        4        3         29         27
## 32        5        4        4        4        5         35         25
## 33        5        3        4        5        5         31         30
## 34        4        4        3        4        4         31         31
## 35        5        5        4        4        4         33         30
## 36        5        4        4        4        5         36         30
## 37        4        3        4        4        4         32         31
## 38        4        5        4        4        4         34         31
## 39        5        4        4        4        4         32         30
## 40        4        4        4        5        5         34         30
## 41        4        5        4        4        5         35         31
## 42        4        4        4        4        3         35         30
## 43        5        5        4        4        5         34         31
## 44        4        4        4        3        4         35         30
## 45        4        4        4        5        5         33         30
## 46        5        4        4        5        4         37         32
## 47        5        5        5        5        5         34         28
## 48        3        4        4        3        4         32         31
## 49        2        2        3        4        2         40         30
## 50        4        4        4        4        4         35         30
## 51        4        4        3        2        3         35         30
## 52        5        5        4        3        5         30         28
## 53        4        3        4        4        3         33         28
```

```
## 54        2        2        3        2        2         32         30
## 55        4        4        4        3        4         31         30
## 56        5        5        5        3        4         33         30
## 57        5        5        4        5        5         33         29
## 58        3        3        1        3        2          9          9
## 59        5        4        4        3        4         33         32
## 60        4        3        3        4        3         35         32
## 61        3        4        3        3        4         33         32
## 62        3        3        3        4        3         40         35
## 63        4        3        4        3        5         32         28
## 64        4        5        4        3        3         40         30
## 65        5        4        4        4        4        100         50
## 66        3        4        4        4        3         50         40
## 67        4        4        4        4        4         32         31
## 68        4        4        4        4        4         37         29
## 69        5        4        4        5        4         34         30
## 70        4        5        5        5        4         40         30
## 71        4        5        4        5        3         34         30
## 72        5        4        3        3        5         32         31
## 73        2        1        3        2        2         32         30
## 74        5        5        4        5        5         30         23
## 75        4        4        4        4        4         31         30
## 76        4        4        3        4        4         33         32
## 77        3        4        3        4        3         33         33
## 78        4        4        4        4        4         33         30
## 79        4        4        3        3        4         35         31
##    ovconf_q2h ovconf_q2l ovconf_q3h ovconf_q3l ovconf_q4h ovconf_q4l ovconf_q5h
## 1        2008       2005         10          5       2003       2000         30
## 2        2000       1992         50         20       2019       2000         10
## 3        2000       1990         50         10       2000       1990        100
## 4        2009       2007         45         20       2005       2000         50
## 5        1995       1990         30         20       2000       1990         20
## 6        2010       2009         45         35       2005       2000         56
## 7        2010       2000         50         40       2000       1995         45
## 8        2000       1950         30         15       2000       1950          5
## 9        1970       1950         25         20       1890       1870         53
## 10       2010       2005         68         56       2005       2002         35
## 11       2005       2002         35         20       2003       2000         30
## 12       2005       1990         10          5       2000       1980         10
## 13       2010       2007         60         30       2002       2000         30
## 14       2000       1990         20         10       2000       1995         20
## 15       2005       1990         20         10       2005       1995         40
## 16       2005       1995         20         10       2000       1996         40
## 17       2000       1980         50         30       2010       1990         35
## 18       2008       2005         22         12       2003       2000         28
## 19       2010       2002         30         20       2010       2000         30
## 20       2012       2010        120         50       2000       1997         15
## 21       2008       2007         60         50       2002       2000          3
## 22       2010       2005         50         30       2005       2000         13
## 23       2011       2010        100         20       2000       1900        100
## 24       2005       1990         40         20       2005       2000          4
## 25       2008       2006         50         30       2004       2000          6
## 26       2005       2003         60         40       2001       1999          2
## 27       2008       2006         40         20       2005       2001          3
```

```
## 28       2008       2004         30         20       2001       2001          5
## 29       2007       2007         25         20       2010       2005          5
## 30       1970       1950         15         10       1980       1970          5
## 31       2008       2006         50         30       2003       2000         20
## 32       2005       2000         80         50       2003       2001        130
## 33       2006       2004         39         10       2000       1996          4
## 34       2010       2005         50         45       2001       2000         25
## 35       2008       2006         30         25       2002       2000         25
## 36       2000       1990         60         40       2005       2000          7
## 37       2008       2007         44         44       2001       2000         23
## 38       2000       1995         15         10       1995       1985          5
## 39       2008       2004         25         15       2004       1998         20
## 40       2007       2007        100         80       2004       2002          4
## 41       2005       2000         80         50       2005       2000         30
## 42       1390       1384        100         40       1385       1378          5
## 43       2010       1998         45         35       2005       1990          7
## 44       2010       2005         30         20       2010       2000         15
## 45       2002       2000         20         10       2012       2008         15
## 46       2004       2002         10          5       2002       2000        250
## 47       2005       2002         24         17       2002       2000          4
## 48       2008       2007         30         20       2004       2002          7
## 49       2010       2000         60         10       2002       1990         40
## 50       2002       2000        150        100       2000       1995         30
## 51       2011       2007         40         30       2003       1998         10
## 52       2010       2005         14         10       2000       1990         15
## 53       2006       2002         21         15       2000       1995          3
## 54       2012       2010         50         30       2005       2000         50
## 55       2011       2009         50         40       2002       2000         23
## 56       2007       2007         70         50       2003       2002          7
## 57       2010       2005         60         40       2010       2005         30
## 58          8          8          9          9          9          9          9
## 59       2000       1990         60         50       2000       1990         60
## 60       2010       2000         15         10       2010       2000          8
## 61       2005       2000         12          9       2002       1996          3
## 62       2009       2006         30         20       2003       2000          3
## 63       2008       2005         35         25       2000       1999          5
## 64       2000       1990         25         15       1389       1385         12
## 65       1998       1994         10          5       2000       1985          4
## 66       2012       2005         60         40       2000       1990         12
## 67       2005       2000         15          7       2005       1997          3
## 68       2008       2004         50         30       2002       1998         12
## 69       2009       2005         50         40       2005       1990          2
## 70       2015       2000         40         25       2008       2000          4
## 71       2005       1995        180        100       1999       1995         18
## 72       2002       2000         25         22       2003       2001         10
## 73       2009       2005        120         90       2005       2002         25
## 74       2005       2000         25         20       2000       1998         50
## 75       2007       2006          8          5       2000       1995         30
## 76       1980       1960          6          5       2000       1996          2
## 77       2008       2007         27         26       2011       2002         23
## 78       2004       2000        110         60       2000       1996         15
## 79       2005       1998        100         50       2005       1998          4
##    ovconf_q5l ovconf_q6h ovconf_q6l ovconf_q7h ovconf_q7l ovconf_q8h ovconf_q8l
## 1          20       2000       1960       2005       1990         33         20
```

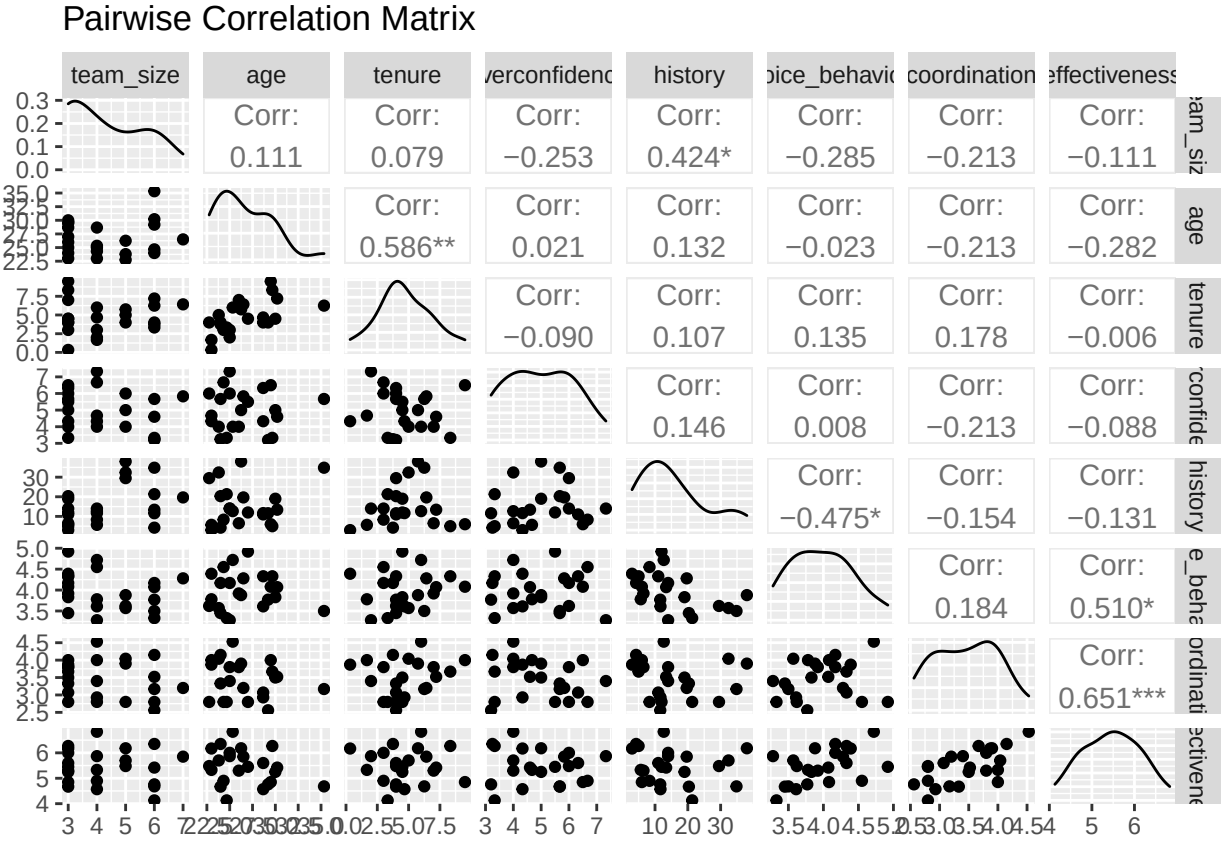
```
## 2    3 2000 1993 2000 1993 35 29
## 3   10 2000 1980 2005 1990 33 28
## 4   20 1990 1980 2008 2000 32 28
## 5   10 1970 1960 1980 1960 32 30
## 6   44 2000 1996 2000 1990 33 23
## 7   35 1970 1960 2000 1990 35 25
## 8    2 2000 1950 2000 1950 34 30
## 9   47 1900 1890 1990 1980 32 28
## 10  25 2000 1994 1999 1996 33 30
## 11  20 1985 1970 1985 1970 36 30
## 12   5 1990 1980 1995 1980 36 32
## 13  20 1970 1940 1990 1970 34 34
## 14  10 2000 1980 2000 1990 34 30
## 15  20 1990 1970 2005 1990 34 30
## 16  20 1990 1970 2000 1990 34 30
## 17  25 2000 1980 2000 1980 32 28
## 18  20 1990 1980 1995 1990 32 20
## 19  20 1990 1980 1985 1980 34 28
## 20  10 1990 1950 1990 1960 33 30
## 21   2 2000 1990 1998 1995 32 28
## 22  10 2000 1995 2005 2000 34 32
## 23  40 2000 1990 2000 1980 35 25
## 24   2 2000 1980 1999 1997 30 26
## 25   2 1996 1980 1996 1980 32 28
## 26   2 2000 1998 2000 1990 35 30
## 27   2 2000 1998 2000 1995 35 30
## 28   3 1980 1950 1998 1998 32 32
## 29   2 1960 1950 1990 1980 32 28
## 30   1 1920 1910 1990 1980 32  1
## 31  10 1995 1990 1997 1990 34 32
## 32  60 1930 1850 1965 1950 34 30
## 33   2 1990 1970 2030 1971 34 27
## 34  15 2000 1990 1990 1985 33 30
## 35  20 1990 1985 1995 1990 32 28
## 36   3 1990 1980 1995 1985 34 30
## 37  20 1992 1991 1994 1993 32 32
## 38   3 1990 1950 2000 1990 38 34
## 39  10 1970 1950 1980 1970 32 28
## 40   2 1995 1990 1998 1995 32 28
## 41  20 1960 1930 1990 1980 32 30
## 42   2 1385 1378 1385 1378 32 26
## 43   3 2005 1985 2000 1985 34 30
## 44  10 2000 1980 2010 2000 32 32
## 45  10 1998 1980 1998 1980 35 30
## 46 150 19900 1970 2000 1995 32 30
## 47   2 1980 1960 1985 1980 38 34
## 48   4 1995 1985 2000 1998 32 28
## 49  10 1980 1940 2000 1990 35 30
## 50  20 1950 1950 1950 1950 32 32
## 51   4 2000 1990 2000 1990 32 28
## 52   8 1980 1950 1990 1970 24 20
## 53   2 1990 1980 2001 1987 34 30
## 54  40 2000 1990 2000 1990 32 32
## 55  20 1990 1989 1993 1992 32 30
```

```
## 56          5       1986       1985       1999       1996         32         28
## 57         20       1995       1985       1995       1990         32         28
## 58          9          9          8          9          9          9          9
## 59         50       2000       1980       1900       1880         32         32
## 60          5       2000       1990       1985       1980         32         30
## 61          2       1990       1987       1996       1984         33         32
## 62          2       2000       1995       2002       1995         30         15
## 63          4       1996       1990       1998       1990         32         32
## 64          8       1978       1975       1967       1960         32         31
## 65          2       2001       1990       2000       1950         35         30
## 66          8       2000       1990       2000       1990         36         36
## 67          2       1987       1980       1995       1988         34         32
## 68          3       1990       1960       1985       1970         32         32
## 69          2       2000       1990       1996       1980         32         30
## 70          3       2005       1990       2010       1990         32         28
## 71         10       1980       1890       1998       1960         33         27
## 72          5       1995       1990       1995       1990         32         32
## 73         10       1990       1970       1990       1975         32         28
## 74         40       2000       1995       1990       1980         32         32
## 75         20       2000       1991       1970       1960         32         29
## 76          2       1960       1950       1960       1960         36         32
## 77         10       1991       1989       1963       1960         32         28
## 78          5       1996       1990       1996       1990         32         30
## 79          2       2005       2000       2003       1990         32         28
##    ovconf_q9h ovconf_q9l ovconf_q10h ovconf_q10l
## 1         700        600          15           8
## 2        1000        700          50          40
## 3        1500       1000          70          40
## 4        1200        800          60          40
## 5         800        600          15          10
## 6        3000       2000          26          25
## 7        1400       1000          90          80
## 8        1200        900         250         150
## 9         990        870          45          30
## 10       4000       3000          28          25
## 11       1300       1000          80          60
## 12       1000        900          30          20
## 13        800        700          20          15
## 14       1000        800          50          40
## 15       1000        800          50          40
## 16       1000        800          50          40
## 17       1200       1000          60          40
## 18       1000        800          54          18
## 19        900        700          56          46
## 20       1200        700          30          20
## 21       1600       1400          70          60
## 22       1100       1000          50          40
## 23       1500        720         100          40
## 24       1200        800          70          50
## 25      10000        800          75          45
## 26       1100       1000          60          50
## 27       1200        900          55          45
## 28        950        900          60          50
## 29        700        650          50          40
```

```
## 30       1200        900         80          70
## 31       1200        900         60          50
## 32       1000        600         45          30
## 33       1000        900         50          40
## 34       1200        800         55          50
## 35       1000        800         45          40
## 36       1200        800        110          70
## 37       1000        500         60          50
## 38       2200       1900         65          45
## 39       1200       1100         70          50
## 40       1000        800         60          50
## 41       1000        900        100          70
## 42        250        120         80          50
## 43       1100        900         95          80
## 44       1800       1500         50          40
## 45       1000         80        120          80
## 46      25000      20000        100          80
## 47        650        400         55          43
## 48       1000        800         60          50
## 49      13000        900         60          40
## 50       1000        900         50          45
## 51       1200        900         55          45
## 52        500        100          8           3
## 53        900        700         50          40
## 54        900        800         50          40
## 55       1000        998         55          45
## 56       1000        900         60          50
## 57        950        900         53          48
## 58          9          9          9           9
## 59       1000        999         60          59
## 60        900        800        150         100
## 61        650        400         50          40
## 62        600        400         60          50
## 63       1000        900         17          16
## 64       1000        700        100          90
## 65      30000       5000       1400          89
## 66       1200        700         60          50
## 67       1000        900         62          59
## 68       1200        800         75          50
## 69       1100        950         60          50
## 70       1000        900        100          40
## 71       1100        950        130          70
## 72       1000        900         50          40
## 73        950        890         80          50
## 74       1000        999         60          50
## 75        920        850         52          45
## 76        750        700         40          30
## 77        900        890         55          52
## 78        990        900         55          40
## 79       1800       1200         85          75
```

# General Analysis

## Correlogram of core variables



### Multiple Linear Regression of all variables against team effectiveness

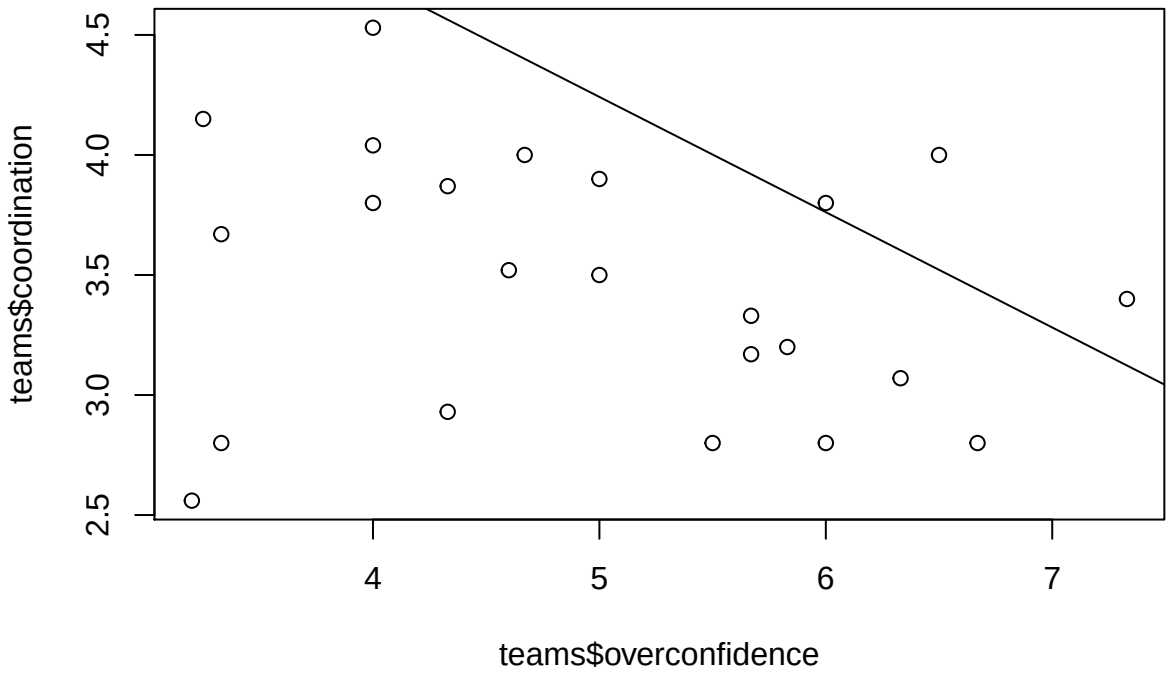
```
##
## Call:
## lm(formula = effectiveness ~ ., data = core_data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.62854 -0.22927 -0.03915  0.16603  0.86074
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.49250    2.01881  -0.244  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
```

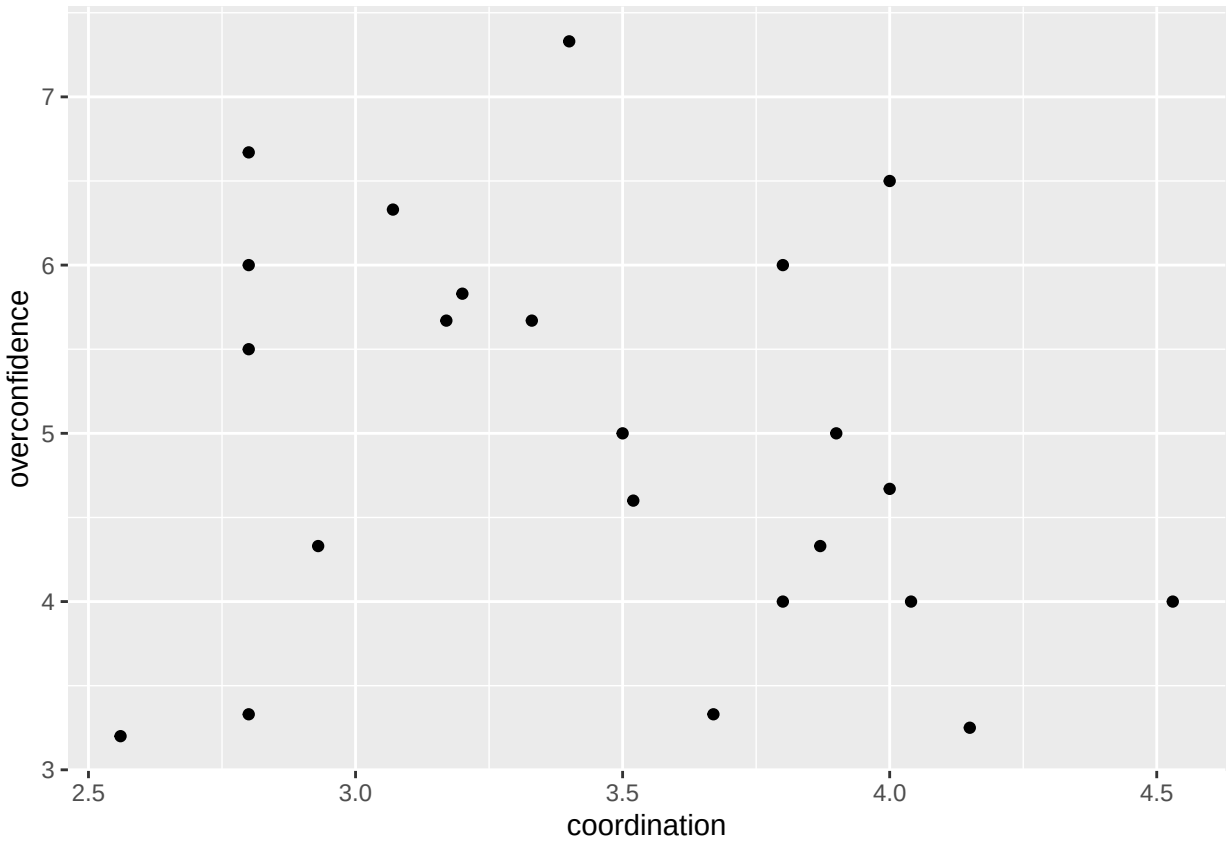
# Hypothesis testing

## Hypothesis No. 1

H1: Team Overconfidence has a negative effect on team coordination

```
##
## Call:
## lm(formula = overconfidence ~ coordination, data = teams)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.21342 -0.76037  0.03795  0.71286  2.31994
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    6.6427     1.6803   3.953 0.000726 ***
## coordination  -0.4802     0.4798  -1.001 0.328300
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.208 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
```

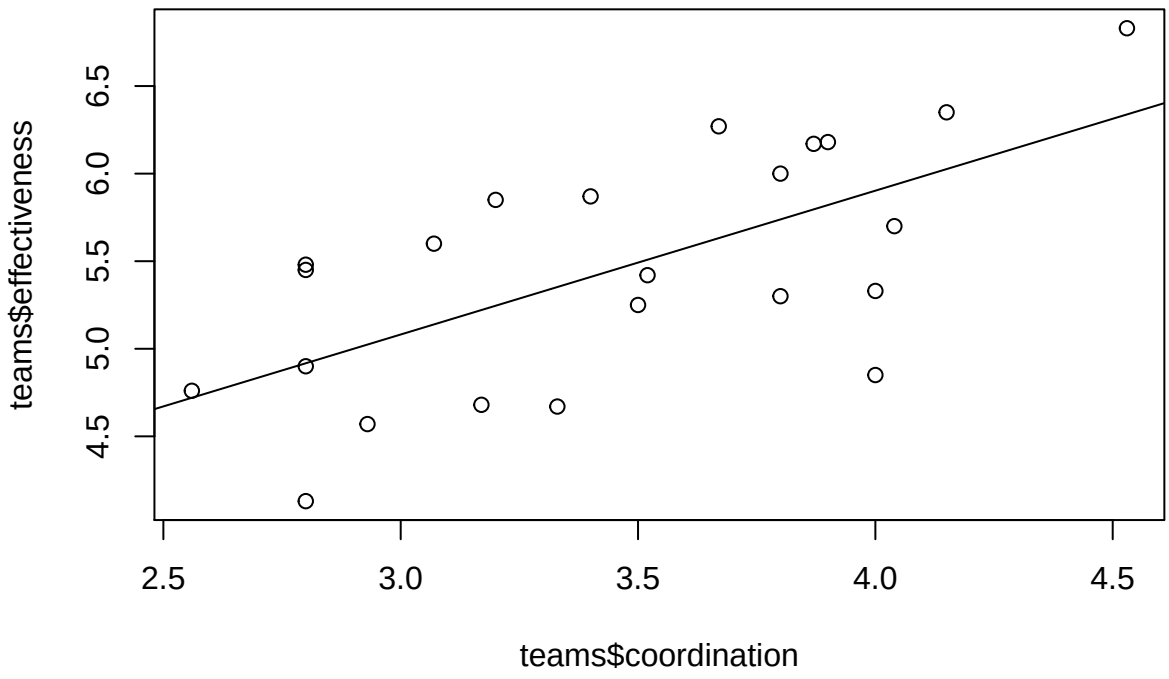


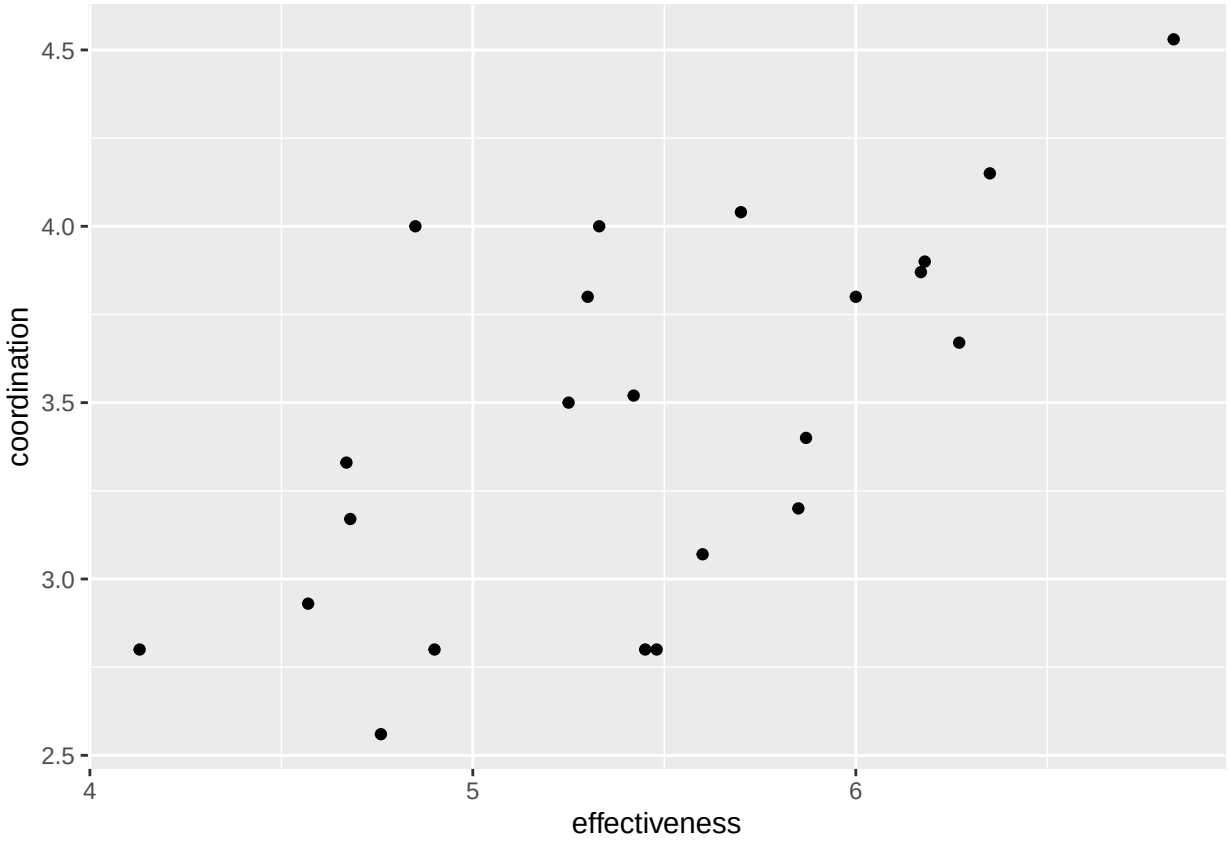

overconfidence
coordination
7
6
5
4
3
2.5
3.0
3.5
4.0
4.5

### 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
```



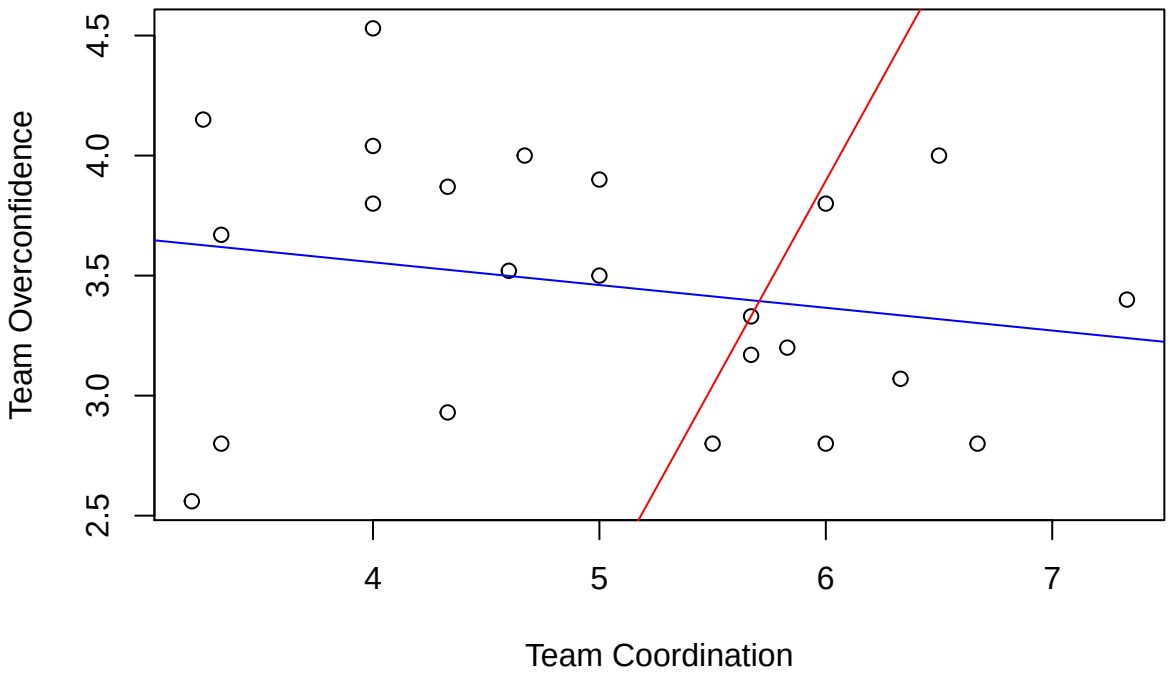

4.5
4.0
3.5
3.0
2.5
coordination
4
5
6
effectiveness

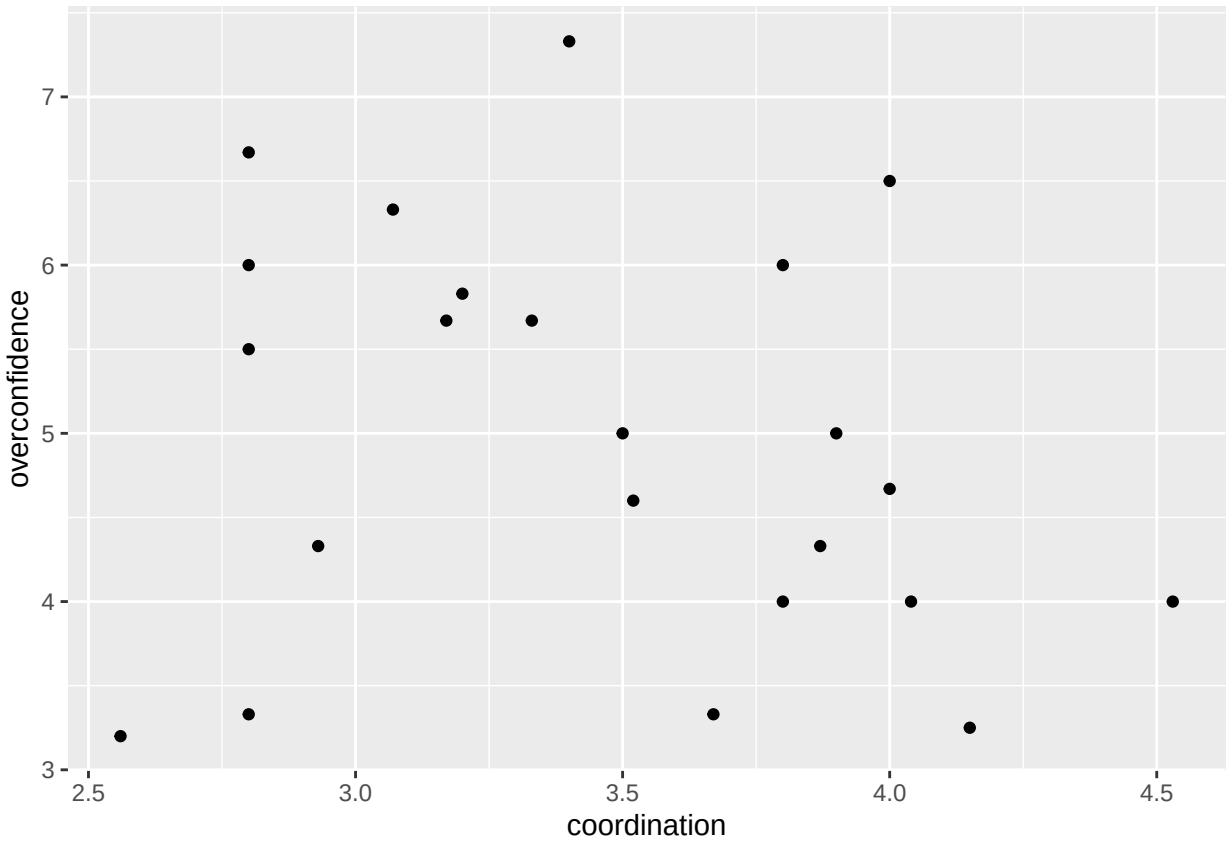
### Hypothesis No. 3

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)
##
## 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

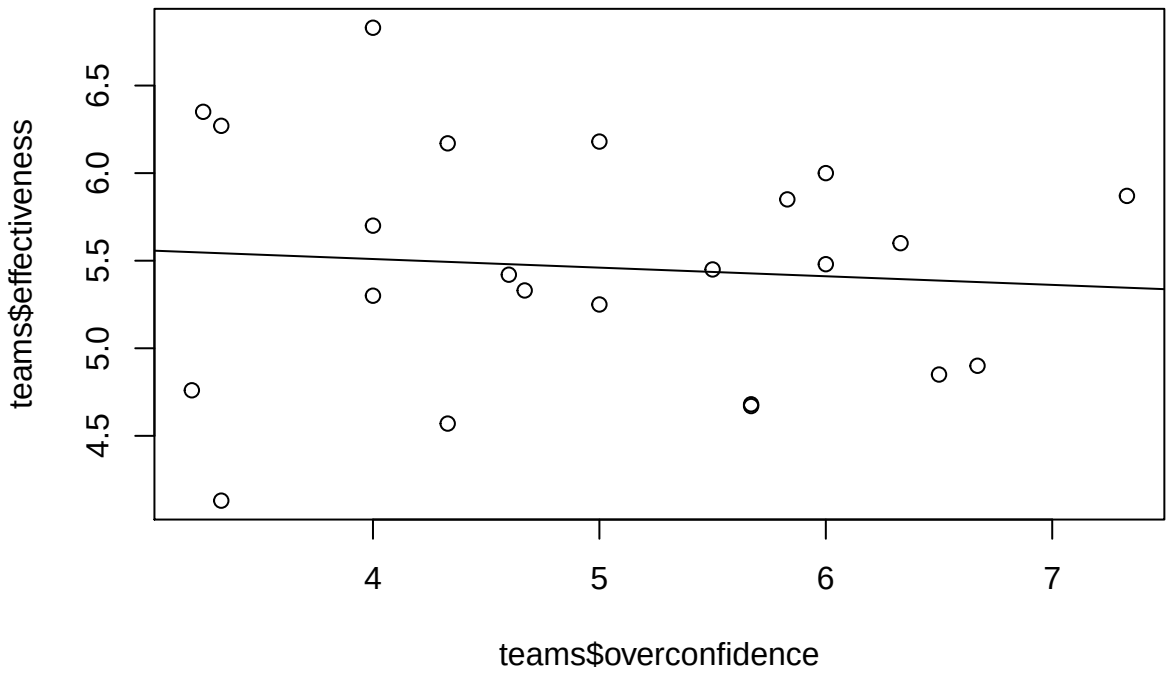

overconfidence
7
6
5
4
3
2.5
3.0
3.5
4.0
4.5
coordination

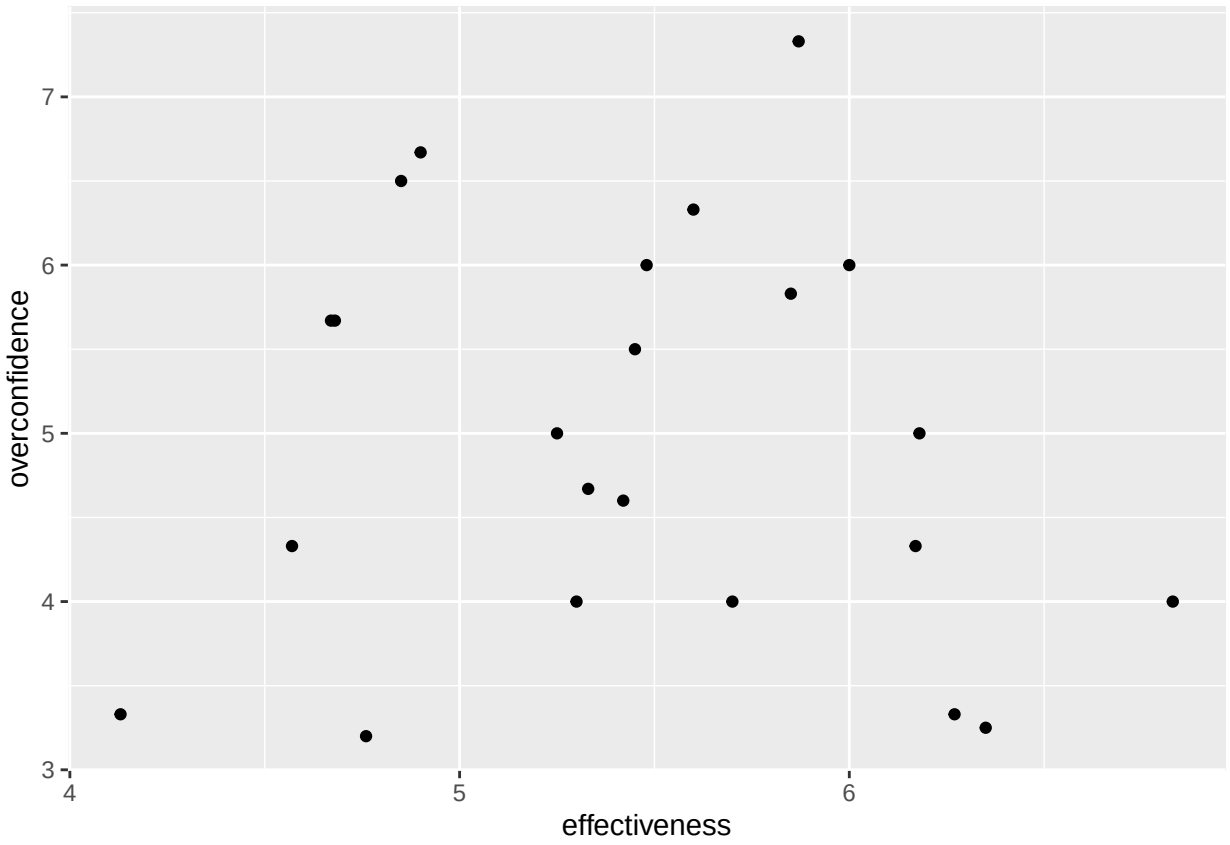
# Extra Hypotheses

## 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
```



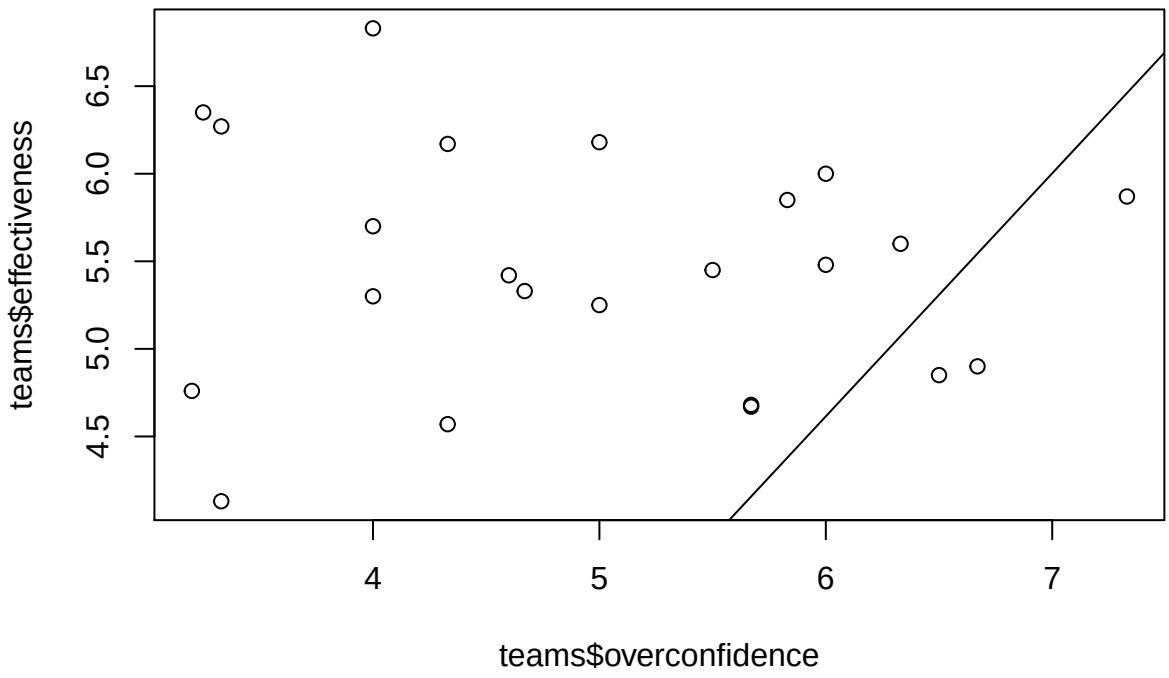

overconfidence
effectiveness
7
6
5
4
3
4
5
6

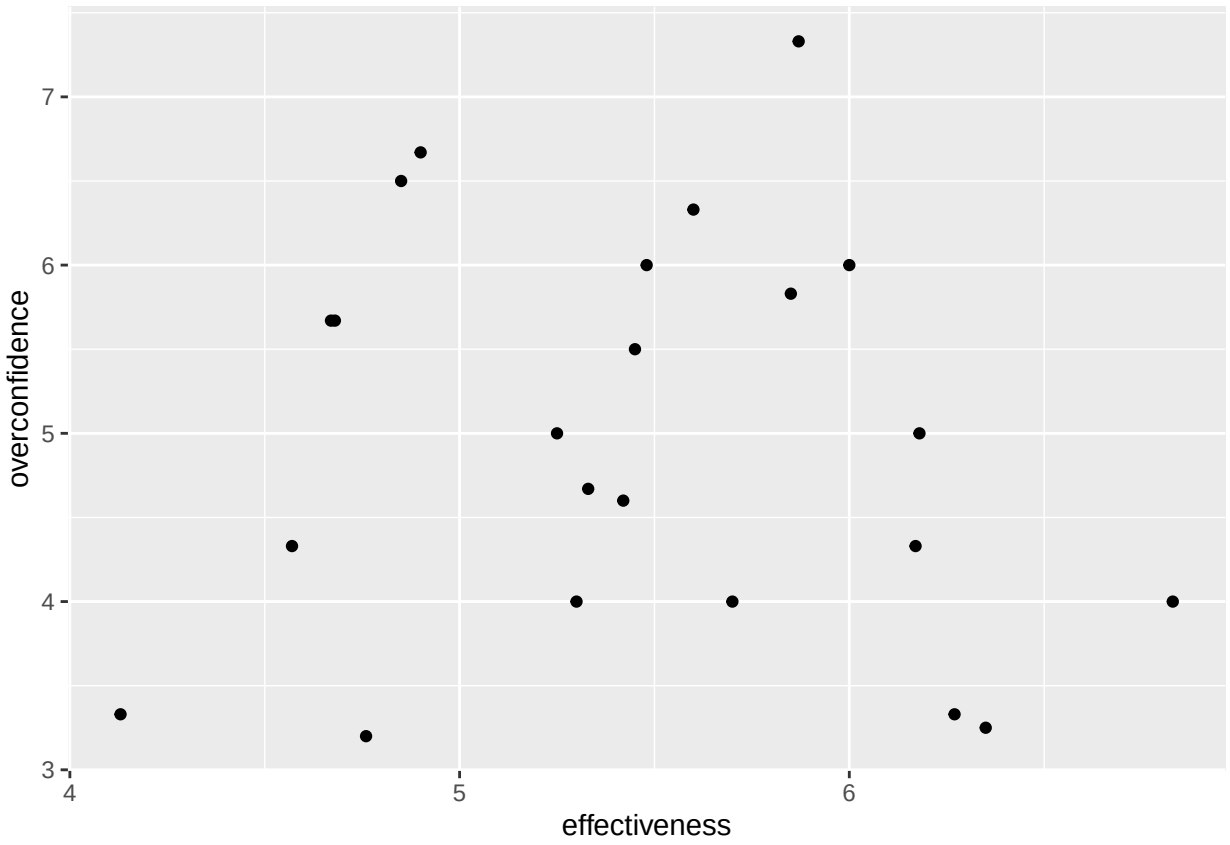
### Hypothesis No. 1 - b

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

```
##
## Call:
## lm(formula = effectiveness ~ overconfidence + coordination +
##     inter2, data = teams)
##
## 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$effectiveness
4.5
5.0
5.5
6.0
6.5
4
5
6
7
teams$overconfidence




## 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%
## 0.698 0.886
```

### 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%
## 0.497 0.782
```

### 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%
## 0.773 0.894
```

### 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%
## 0.235 0.756
```

# Conclusion