

# SSOSurveyStudy

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## Preparation

### Packages

```
library(tidyverse)
library(summarytools)
library(ggfortify)
library(lm.beta)
library(sjPlot)
library(gridExtra)
library(dplyr)
library(hrbrthemes)
library(ggalt)
library(ggtext)
library(ggpubr)
```

### Attach dataset

```
data <- read_csv("ssosurvey283.csv")
summary(data)
```

```

##          id          gender          age          roles
## Min.      : 1.0    Length:283      Min.    :17.00    Length:283
## 1st Qu.: 71.5    Class :character  1st Qu.:19.00    Class :character
## Median :142.0    Mode  :character  Median :22.00    Mode  :character
## Mean      :142.0
## 3rd Qu.:212.5
## Max.       :283.0
##          score          knowledge          attitude          behavior
## Min.      : 34.50    Min.      : 25.00    Min.      : 15.00    Min.      : 25.00
## 1st Qu.: 60.00    1st Qu.: 55.00    1st Qu.: 50.00    1st Qu.: 65.00
## Median : 67.50    Median : 65.00    Median : 60.00    Median : 75.00
## Mean      : 69.31    Mean      : 66.91    Mean      : 62.69    Mean      : 73.41
## 3rd Qu.: 78.50    3rd Qu.: 80.00    3rd Qu.: 75.00    3rd Qu.: 85.00
## Max.       :100.00    Max.       :100.00    Max.       :100.00    Max.       :100.00
## familiarity          privacy          extraversion          agreeableness
## Min.      : 25.00    Min.      : 30.0    Min.      :1.000    Min.      :1.000
## 1st Qu.: 75.00    1st Qu.: 80.0    1st Qu.:3.500    1st Qu.:4.500
## Median : 83.33    Median : 90.0    Median :4.000    Median :5.500
## Mean      : 80.86    Mean      : 85.9    Mean      :4.141    Mean      :5.302
## 3rd Qu.:100.00    3rd Qu.:100.0    3rd Qu.:5.000    3rd Qu.:6.000
## Max.       :100.00    Max.       :100.0    Max.       :7.000    Max.       :7.000
## conscientiousness emotionalstability          openness          f1
## Min.      :2.500    Min.      :2.000    Min.      :1.500    Min.      : 0.0
## 1st Qu.:4.500    1st Qu.:4.000    1st Qu.:4.500    1st Qu.: 75.0
## Median :5.000    Median :4.500    Median :5.500    Median : 75.0
##
## Mean      :5.138    Mean      :4.714    Mean      :5.327    Mean      : 82.6
## 3rd Qu.:6.000    3rd Qu.:5.500    3rd Qu.:6.000    3rd Qu.:100.0
## Max.       :7.000    Max.       :7.000    Max.       :7.000    Max.       :100.0
##          f2          f3          pr1          pr2
## Min.      : 0.00    Min.      : 0.00    Min.      : 0.00    Min.      : 0.00
## 1st Qu.: 75.00    1st Qu.: 75.00    1st Qu.: 75.00    1st Qu.: 75.00
## Median : 75.00    Median :100.00    Median : 75.00    Median :100.00
## Mean      : 77.12    Mean      : 82.86    Mean      : 79.95    Mean      : 84.72
## 3rd Qu.:100.00    3rd Qu.:100.00    3rd Qu.:100.00    3rd Qu.:100.00
## Max.       :100.00    Max.       :100.00    Max.       :100.00    Max.       :100.00
##          pr3          pr4          pr5          k1
## Min.      : 0.00    Min.      : 0.00    Min.      : 0.00    Min.      : 0
## 1st Qu.: 75.00    1st Qu.:100.00    1st Qu.: 75.00    1st Qu.: 25
## Median :100.00    Median :100.00    Median :100.00    Median : 50
## Mean      : 84.28    Mean      : 93.11    Mean      : 87.46    Mean      : 47
## 3rd Qu.:100.00    3rd Qu.:100.00    3rd Qu.:100.00    3rd Qu.: 75
## Max.       :100.00    Max.       :100.00    Max.       :100.00    Max.       :100
##          k2          k3          k4          k5
## Min.      : 0.00    Min.      : 0.00    Min.      : 0.00    Min.      : 0.00
## 1st Qu.: 75.00    1st Qu.: 75.00    1st Qu.: 25.00    1st Qu.: 50.00
## Median :100.00    Median :100.00    Median : 50.00    Median : 75.00
## Mean      : 82.86    Mean      : 84.28    Mean      : 46.38    Mean      : 74.03
## 3rd Qu.:100.00    3rd Qu.:100.00    3rd Qu.: 75.00    3rd Qu.:100.00
## Max.       :100.00    Max.       :100.00    Max.       :100.00    Max.       :100.00
##          a1          a2          a3          a4
## Min.      : 0.0    Min.      : 0.00    Min.      : 0.00    Min.      : 0.00
## 1st Qu.: 25.0    1st Qu.: 75.00    1st Qu.: 50.00    1st Qu.: 25.00
## Median : 50.0    Median :100.00    Median : 50.00    Median : 50.00
## Mean      : 51.5    Mean      : 80.83    Mean      : 60.51    Mean      : 42.84
## 3rd Qu.: 75.0    3rd Qu.:100.00    3rd Qu.: 75.00    3rd Qu.: 75.00

```

```
## Max. :100.0 Max. :100.00 Max. :100.00 Max. :100.00
## a5 b1 b2 b3
## Min. : 0.00 Min. : 0.00 Min. : 0.00 Min. : 0.00
## 1st Qu.: 50.00 1st Qu.: 75.00 1st Qu.: 75.00 1st Qu.: 75.00
## Median : 75.00 Median : 75.00 Median :100.00 Median : 75.00
## Mean : 77.74 Mean : 77.56 Mean : 86.31 Mean : 78.45
## 3rd Qu.:100.00 3rd Qu.:100.00 3rd Qu.:100.00 3rd Qu.:100.00
## Max. :100.00 Max. :100.00 Max. :100.00 Max. :100.00
## b4 b5
## Min. : 0 Min. : 0.00
## 1st Qu.: 50 1st Qu.: 25.00
## Median : 75 Median : 50.00
## Mean : 75 Mean : 49.73
## 3rd Qu.:100 3rd Qu.: 75.00
## Max. :100 Max. :100.00
```

## Summary Statistics

```
data
```

```
## Warning: `...` is not empty.
##
## We detected these problematic arguments:
## * `needs_dots`
##
## These dots only exist to allow future extensions and should be empty.
## Did you misspecify an argument?
```

```
## # A tibble: 283 x 38
## id gender age roles score knowledge attitude behavior familiarity
## <dbl> <chr> <dbl> <chr> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 1 female 43 facu~ 66.5 75 45 70 75
## 2 2 female 48 facu~ 88.5 90 95 85 83.3
## 3 3 male 41 staff 53 45 35 65 75
## 4 4 male 45 staff 88.5 80 85 95 100
## 5 5 male 47 staff 53 60 50 50 100
## 6 6 female 51 facu~ 74 100 45 70 100
## 7 7 male 41 staff 63 65 55 65 75
## 8 8 male 43 facu~ 78.5 75 80 80 83.3
## 9 9 male 45 staff 82.5 90 65 85 100
## 10 10 male 39 staff 100 100 100 100 100
## # ... with 273 more rows, and 29 more variables: privacy <dbl>,
## # extraversion <dbl>, agreeableness <dbl>, conscientiousness <dbl>,
## # emotionalstability <dbl>, openness <dbl>, f1 <dbl>, f2 <dbl>, f3 <dbl>,
## # pr1 <dbl>, pr2 <dbl>, pr3 <dbl>, pr4 <dbl>, pr5 <dbl>, k1 <dbl>, k2 <dbl>,
## # k3 <dbl>, k4 <dbl>, k5 <dbl>, a1 <dbl>, a2 <dbl>, a3 <dbl>, a4 <dbl>,
## # a5 <dbl>, b1 <dbl>, b2 <dbl>, b3 <dbl>, b4 <dbl>, b5 <dbl>
```

```
freq(data, report.nas = F)
```

```
## Variable(s) ignored: id, age, score
```

```
## Frequencies
## data$gender
## Type: Character
##
##           Freq      %   % Cum.
## -----
##    female    135   47.70   47.70
##     male    148   52.30  100.00
##    Total    283  100.00  100.00
##
## data$roles
## Type: Character
##
##           Freq      %   % Cum.
## -----
##   faculty     34   12.01   12.01
##    staff      52   18.37   30.39
##   student    197   69.61  100.00
##    Total    283  100.00  100.00
##
## data$knowledge
## Type: Numeric
##
##           Freq      %   % Cum.
## -----
##          25      2    0.71    0.71
##          30      2    0.71    1.41
##          35      5    1.77    3.18
##          40      8    2.83    6.01
##          45     14    4.95   10.95
##          50     28    9.89   20.85
##          55     23    8.13   28.98
##          60     32   11.31   40.28
##          65     31   10.95   51.24
##          70     35   12.37   63.60
##          75     29   10.25   73.85
##          80     28    9.89   83.75
##          85     14    4.95   88.69
##          90     13    4.59   93.29
##          95      5    1.77   95.05
##         100     14    4.95  100.00
##         Total    283  100.00  100.00
##
## data$attitude
## Type: Numeric
##
##           Freq      %   % Cum.
## -----
##          15      1    0.35    0.35
##          20      6    2.12    2.47
##          25      1    0.35    2.83
##          30      5    1.77    4.59
##          35     10    3.53    8.13
##          40     18    6.36   14.49
##          45     16    5.65   20.14
```

```
##      50      31      10.95      31.10
##      55      30      10.60      41.70
##      60      31      10.95      52.65
##      65      27       9.54      62.19
##      70      19       6.71      68.90
##      75      19       6.71      75.62
##      80      22       7.77      83.39
##      85      16       5.65      89.05
##      90      10       3.53      92.58
##      95      10       3.53      96.11
##     100      11       3.89     100.00
##      Total      283     100.00     100.00
```

```
##
## data$behavior
```

```
## Type: Numeric
```

```
##
##              Freq              %      % Cum.
## -----
##      25          1          0.35          0.35
##      30          1          0.35          0.71
##      35          1          0.35          1.06
##      40          3          1.06          2.12
##      45          4          1.41          3.53
##      50         15          5.30          8.83
##      55         19          6.71         15.55
##      60         21          7.42         22.97
##      65         32         11.31         34.28
##      70         37         13.07         47.35
##      75         32         11.31         58.66
##      80         35         12.37         71.02
##      85         34         12.01         83.04
##      90         13          4.59         87.63
##      95         20          7.07         94.70
##     100         15          5.30        100.00
##      Total      283     100.00        100.00
```

```
##
## data$familiarity
```

```
## Type: Numeric
```

```
##
##              Freq              %      % Cum.
## -----
##      25          4          1.41          1.41
##     33.33          7          2.47          3.89
##     41.67          8          2.83          6.71
##      50         10          3.53         10.25
##     58.33          9          3.18         13.43
##     66.67         32         11.31         24.73
##      75         41         14.49         39.22
##     83.33         58         20.49         59.72
##     91.67         30         10.60         70.32
##     100         84         29.68        100.00
##      Total      283     100.00        100.00
```

```
##
## data$privacy
```

```
## Type: Numeric
```

```
##
```

```
##          Freq      %   % Cum.
## -----
##          30      3    1.06    1.06
##          35      1    0.35    1.41
##          45      3    1.06    2.47
##          50      5    1.77    4.24
##          55      3    1.06    5.30
##          60      4    1.41    6.71
##          65      9    3.18    9.89
##          70     14    4.95   14.84
##          75     25    8.83   23.67
##          80     29   10.25   33.92
##          85     33   11.66   45.58
##          90     36   12.72   58.30
##          95     42   14.84   73.14
##         100     76   26.86  100.00
##        Total    283  100.00  100.00
```

```
##
## data$extraversion
```

```
## Type: Numeric
```

```
##
##          Freq      %   % Cum.
## -----
##           1      1    0.35    0.35
##          1.5      7    2.47    2.83
##           2      7    2.47    5.30
##          2.5     16    5.65   10.95
##           3     31   10.95   21.91
##          3.5     41   14.49   36.40
##           4     51   18.02   54.42
##          4.5     47   16.61   71.02
##           5     33   11.66   82.69
##          5.5     29   10.25   92.93
##           6      8    2.83   95.76
##          6.5      4    1.41   97.17
##           7      8    2.83  100.00
##        Total    283  100.00  100.00
```

```
##
## data$agreeableness
```

```
## Type: Numeric
```

```
##
##          Freq      %   % Cum.
## -----
##           1      1    0.35    0.35
##          1.5      1    0.35    0.71
##           2      1    0.35    1.06
##          2.5      2    0.71    1.77
##           3      3    1.06    2.83
##          3.5      8    2.83    5.65
##           4     22    7.77   13.43
##          4.5     44   15.55   28.98
##           5     48   16.96   45.94
##          5.5     51   18.02   63.96
##           6     52   18.37   82.33
##          6.5     29   10.25   92.58
##           7     21    7.42  100.00
```

```

##      Total      283    100.00    100.00
##
## data$conscientiousness
## Type: Numeric
##
##           Freq      %    % Cum.
## -----
##          2.5      3      1.06      1.06
##           3     11      3.89      4.95
##          3.5     12      4.24      9.19
##           4     31     10.95     20.14
##          4.5     42     14.84     34.98
##           5     56     19.79     54.77
##          5.5     38     13.43     68.20
##           6     49     17.31     85.51
##          6.5     23      8.13     93.64
##           7     18      6.36    100.00
##      Total      283    100.00    100.00
##
## data$emotionalstability
## Type: Numeric
##
##           Freq      %    % Cum.
## -----
##           2      3      1.06      1.06
##          2.5     13      4.59      5.65
##           3     12      4.24      9.89
##          3.5     32     11.31     21.20
##           4     52     18.37     39.58
##          4.5     37     13.07     52.65
##           5     41     14.49     67.14
##          5.5     27      9.54     76.68
##           6     32     11.31     87.99
##          6.5     21      7.42     95.41
##           7     13      4.59    100.00
##      Total      283    100.00    100.00
##
## data$openness
## Type: Numeric
##
##           Freq      %    % Cum.
## -----
##          1.5      1      0.35      0.35
##           2      1      0.35      0.71
##          2.5      3      1.06      1.77
##           3      4      1.41      3.18
##          3.5      9      3.18      6.36
##           4     32     11.31     17.67
##          4.5     33     11.66     29.33
##           5     39     13.78     43.11
##          5.5     51     18.02     61.13
##           6     54     19.08     80.21
##          6.5     30     10.60     90.81
##           7     26      9.19    100.00
##      Total      283    100.00    100.00
##

```

```
## data$f1
## Type: Numeric
##
##          Freq      %   % Cum.
## -----
##          0      1    0.35    0.35
##         25      6    2.12    2.47
##         50     38   13.43   15.90
##         75     99   34.98   50.88
##        100    139   49.12  100.00
##        Total   283  100.00  100.00
##
```

```
## data$f2
## Type: Numeric
##
##          Freq      %   % Cum.
## -----
##          0      2    0.71    0.71
##         25     20    7.07    7.77
##         50     37   13.07   20.85
##         75    117   41.34   62.19
##        100    107   37.81  100.00
##        Total   283  100.00  100.00
##
```

```
## data$f3
## Type: Numeric
##
##          Freq      %   % Cum.
## -----
##          0      3    1.06    1.06
##         25     15    5.30    6.36
##         50     30   10.60   16.96
##         75     77   27.21   44.17
##        100    158   55.83  100.00
##        Total   283  100.00  100.00
##
```

```
## data$pr1
## Type: Numeric
##
##          Freq      %   % Cum.
## -----
##          0      1    0.35    0.35
##         25     10    3.53    3.89
##         50     36   12.72   16.61
##         75    121   42.76   59.36
##        100    115   40.64  100.00
##        Total   283  100.00  100.00
##
```

```
## data$pr2
## Type: Numeric
##
##          Freq      %   % Cum.
## -----
##          0      2    0.71    0.71
##         25      7    2.47    3.18
##         50     29   10.25   13.43
```



```

##          75      86      30.39      43.82
##          100     159      56.18     100.00
##          Total     283     100.00     100.00
##
## data$pr3
## Type: Numeric
##
##          Freq      %      % Cum.
## -----
##          0         3      1.06      1.06
##          25         6      2.12      3.18
##          50        23      8.13     11.31
##          75       102     36.04     47.35
##          100       149     52.65     100.00
##          Total     283     100.00     100.00
##
## data$pr4
## Type: Numeric
##
##          Freq      %      % Cum.
## -----
##          0         1      0.35      0.35
##          25         2      0.71      1.06
##          50         9      3.18      4.24
##          75        50     17.67     21.91
##          100       221     78.09     100.00
##          Total     283     100.00     100.00
##
## data$pr5
## Type: Numeric
##
##          Freq      %      % Cum.
## -----
##          0         1      0.35      0.35
##          25         8      2.83      3.18
##          50        21      7.42     10.60
##          75        72     25.44     36.04
##          100       181     63.96     100.00
##          Total     283     100.00     100.00
##
## data$k1
## Type: Numeric
##
##          Freq      %      % Cum.
## -----
##          0        57     20.14     20.14
##          25        66     23.32     43.46
##          50        66     23.32     66.78
##          75        42     14.84     81.63
##          100        52     18.37     100.00
##          Total     283     100.00     100.00
##
## data$k2
## Type: Numeric
##
##          Freq      %      % Cum.

```

```
## -----
##          0          9          3.18          3.18
##          25         12          4.24          7.42
##          50         32         11.31         18.73
##          75         58         20.49         39.22
##          100        172         60.78        100.00
##          Total        283        100.00        100.00
##
## data$k3
## Type: Numeric
##
##          Freq          %    % Cum.
## -----
##          0          8          2.83          2.83
##          25         12          4.24          7.07
##          50         26          9.19         16.25
##          75         58         20.49         36.75
##          100        179         63.25        100.00
##          Total        283        100.00        100.00
##
## data$k4
## Type: Numeric
##
##          Freq          %    % Cum.
## -----
##          0         55         19.43         19.43
##          25         67         23.67         43.11
##          50         67         23.67         66.78
##          75         52         18.37         85.16
##          100         42         14.84        100.00
##          Total        283        100.00        100.00
##
## data$k5
## Type: Numeric
##
##          Freq          %    % Cum.
## -----
##          0          8          2.83          2.83
##          25         18          6.36          9.19
##          50         57         20.14         29.33
##          75         94         33.22         62.54
##          100        106         37.46        100.00
##          Total        283        100.00        100.00
##
## data$a1
## Type: Numeric
##
##          Freq          %    % Cum.
## -----
##          0         40         14.13         14.13
##          25         66         23.32         37.46
##          50         69         24.38         61.84
##          75         53         18.73         80.57
##          100         55         19.43        100.00
##          Total        283        100.00        100.00
##
```

```
## data$a2
## Type: Numeric
##
##          Freq      %   % Cum.
## -----
##          0      16    5.65    5.65
##         25      14    4.95   10.60
##         50      26    9.19   19.79
##         75      59   20.85   40.64
##        100     168   59.36  100.00
##        Total     283  100.00  100.00
##
```

```
## data$a3
## Type: Numeric
##
##          Freq      %   % Cum.
## -----
##          0      22    7.77    7.77
##         25      41   14.49   22.26
##         50      79   27.92   50.18
##         75      78   27.56   77.74
##        100      63   22.26  100.00
##        Total     283  100.00  100.00
##
```

```
## data$a4
## Type: Numeric
##
##          Freq      %   % Cum.
## -----
##          0      51   18.02   18.02
##         25      90   31.80   49.82
##         50      61   21.55   71.38
##         75      51   18.02   89.40
##        100      30   10.60  100.00
##        Total     283  100.00  100.00
##
```

```
## data$a5
## Type: Numeric
##
##          Freq      %   % Cum.
## -----
##          0       4    1.41    1.41
##         25      14    4.95    6.36
##         50      54   19.08   25.44
##         75      86   30.39   55.83
##        100     125   44.17  100.00
##        Total     283  100.00  100.00
##
```

```
## data$b1
## Type: Numeric
##
##          Freq      %   % Cum.
## -----
##          0      10    3.53    3.53
##         25      18    6.36    9.89
##         50      42   14.84   24.73
```

```
##          75      76      26.86      51.59
##          100     137      48.41     100.00
##          Total     283     100.00     100.00
##
## data$b2
## Type: Numeric
##
##          Freq      %      % Cum.
## -----
##          0         5      1.77      1.77
##          25        11      3.89      5.65
##          50        26      9.19     14.84
##          75        50     17.67     32.51
##          100       191     67.49     100.00
##          Total     283     100.00     100.00
##
## data$b3
## Type: Numeric
##
##          Freq      %      % Cum.
## -----
##          0         7      2.47      2.47
##          25        14      4.95      7.42
##          50        37     13.07     20.49
##          75       100     35.34     55.83
##          100      125     44.17     100.00
##          Total     283     100.00     100.00
##
## data$b4
## Type: Numeric
##
##          Freq      %      % Cum.
## -----
##          0         8      2.83      2.83
##          25        17      6.01      8.83
##          50        59     20.85     29.68
##          75        82     28.98     58.66
##          100       117     41.34     100.00
##          Total     283     100.00     100.00
##
## data$b5
## Type: Numeric
##
##          Freq      %      % Cum.
## -----
##          0        38     13.43     13.43
##          25        66     23.32     36.75
##          50        86     30.39     67.14
##          75        47     16.61     83.75
##          100        46     16.25     100.00
##          Total     283     100.00     100.00
```

## Dependent Variables

```
dv <- data[, c('knowledge','k1','k2','k3','k4','k5','attitude','a1','a2','a3','a4','a5','behavior','b1','b2','b3','b4','b5','score')]
msd.dv <- dv %>% summarise_each(funs(mean, sd, min, max))
```

```
## Warning: `summarise_each()` was deprecated in dplyr 0.7.0.
## Please use `across()` instead.
```

```
## Warning: `funs()` was deprecated in dplyr 0.8.0.
## Please use a list of either functions or lambdas:
##
## # Simple named list:
## list(mean = mean, median = median)
##
## # Auto named with `tibble::lst()`:
## tibble::lst(mean, median)
##
## # Using lambdas
## list(~ mean(., trim = .2), ~ median(., na.rm = TRUE))
```

```
round(msd.dv,digits=2)
```

```
## Warning: `...` is not empty.
##
## We detected these problematic arguments:
## * `needs_dots`
##
## These dots only exist to allow future extensions and should be empty.
## Did you misspecify an argument?
```

```
## # A tibble: 1 x 76
##   knowledge_mean k1_mean k2_mean k3_mean k4_mean k5_mean attitude_mean a1_mean
##           <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>           <dbl> <dbl>
## 1         66.9    47    82.9   84.3   46.4   74.0           62.7   51.5
## # ... with 68 more variables: a2_mean <dbl>, a3_mean <dbl>, a4_mean <dbl>,
## #   a5_mean <dbl>, behavior_mean <dbl>, b1_mean <dbl>, b2_mean <dbl>,
## #   b3_mean <dbl>, b4_mean <dbl>, b5_mean <dbl>, score_mean <dbl>,
## #   knowledge_sd <dbl>, k1_sd <dbl>, k2_sd <dbl>, k3_sd <dbl>, k4_sd <dbl>,
## #   k5_sd <dbl>, attitude_sd <dbl>, a1_sd <dbl>, a2_sd <dbl>, a3_sd <dbl>,
## #   a4_sd <dbl>, a5_sd <dbl>, behavior_sd <dbl>, b1_sd <dbl>, b2_sd <dbl>,
## #   b3_sd <dbl>, b4_sd <dbl>, b5_sd <dbl>, score_sd <dbl>, knowledge_min <dbl>,
## #   k1_min <dbl>, k2_min <dbl>, k3_min <dbl>, k4_min <dbl>, k5_min <dbl>,
## #   attitude_min <dbl>, a1_min <dbl>, a2_min <dbl>, a3_min <dbl>, a4_min <dbl>,
## #   a5_min <dbl>, behavior_min <dbl>, b1_min <dbl>, b2_min <dbl>, b3_min <dbl>,
## #   b4_min <dbl>, b5_min <dbl>, score_min <dbl>, knowledge_max <dbl>,
## #   k1_max <dbl>, k2_max <dbl>, k3_max <dbl>, k4_max <dbl>, k5_max <dbl>,
## #   attitude_max <dbl>, a1_max <dbl>, a2_max <dbl>, a3_max <dbl>, a4_max <dbl>,
## #   a5_max <dbl>, behavior_max <dbl>, b1_max <dbl>, b2_max <dbl>, b3_max <dbl>,
## #   b4_max <dbl>, b5_max <dbl>, score_max <dbl>
```

## Independent Variables

```
iv <- data[, c('familiarity','f1','f2','f3','privacy','pr1','pr2','pr3','pr4','pr5','extraversion','agreeableness','conscientiousness','emotionalstability','openness')]
msd.iv <- iv %>% summarise_each(funs(mean, sd, min, max))
round(msd.iv,digits=2)
```

```
## Warning: `...` is not empty.
##
## We detected these problematic arguments:
## * `needs_dots`
##
## These dots only exist to allow future extensions and should be empty.
## Did you misspecify an argument?
```

```
## # A tibble: 1 x 60
##   familiarity_mean f1_mean f2_mean f3_mean privacy_mean pr1_mean pr2_mean
##             <dbl>   <dbl>   <dbl>   <dbl>         <dbl>   <dbl>   <dbl>
## 1             80.9    82.6    77.1    82.9         85.9    80.0    84.7
## # ... with 53 more variables: pr3_mean <dbl>, pr4_mean <dbl>, pr5_mean <dbl>,
## #   extraversion_mean <dbl>, agreeableness_mean <dbl>,
## #   conscientiousness_mean <dbl>, emotionalstability_mean <dbl>,
## #   openness_mean <dbl>, familiarity_sd <dbl>, f1_sd <dbl>, f2_sd <dbl>,
## #   f3_sd <dbl>, privacy_sd <dbl>, pr1_sd <dbl>, pr2_sd <dbl>, pr3_sd <dbl>,
## #   pr4_sd <dbl>, pr5_sd <dbl>, extraversion_sd <dbl>, agreeableness_sd <dbl>,
## #   conscientiousness_sd <dbl>, emotionalstability_sd <dbl>, openness_sd <dbl>,
## #   familiarity_min <dbl>, f1_min <dbl>, f2_min <dbl>, f3_min <dbl>,
## #   privacy_min <dbl>, pr1_min <dbl>, pr2_min <dbl>, pr3_min <dbl>,
## #   pr4_min <dbl>, pr5_min <dbl>, extraversion_min <dbl>,
## #   agreeableness_min <dbl>, conscientiousness_min <dbl>,
## #   emotionalstability_min <dbl>, openness_min <dbl>, familiarity_max <dbl>,
## #   f1_max <dbl>, f2_max <dbl>, f3_max <dbl>, privacy_max <dbl>, pr1_max <dbl>,
## #   pr2_max <dbl>, pr3_max <dbl>, pr4_max <dbl>, pr5_max <dbl>,
## #   extraversion_max <dbl>, agreeableness_max <dbl>,
## #   conscientiousness_max <dbl>, emotionalstability_max <dbl>,
## #   openness_max <dbl>
```

```
mean(data$age)
```

```
## [1] 26.62898
```

```
sd(data$age)
```

```
## [1] 10.22756
```

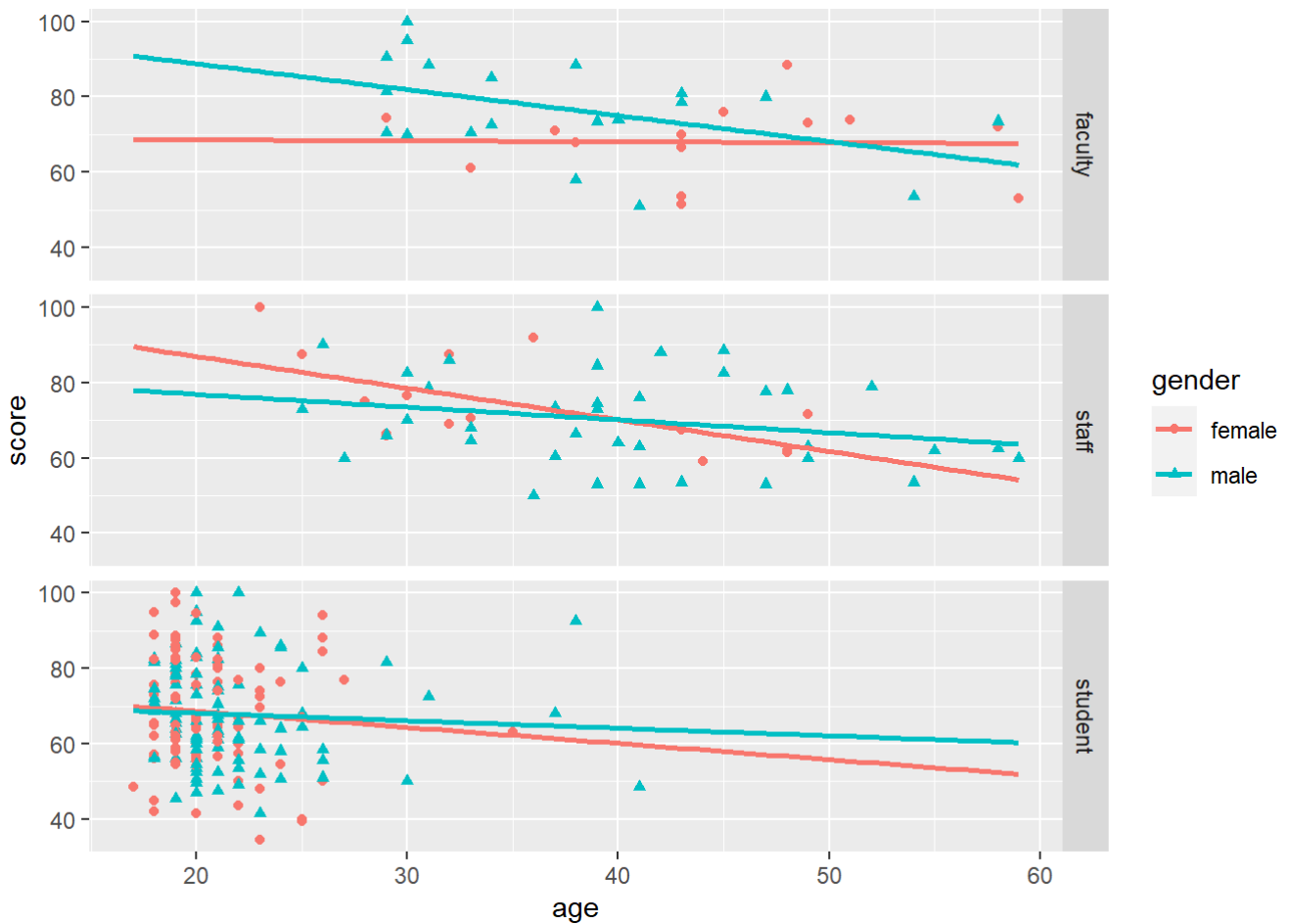
## Data Visualization

### Scatterplot Age - Score

```
g1 <- ggplot(data, aes(x=age, y=score, shape=gender, color=gender)) +
  geom_point() +
  geom_smooth(method=lm, se=FALSE, fullrange=TRUE)

g1 + facet_grid(rows = vars(roles))
```

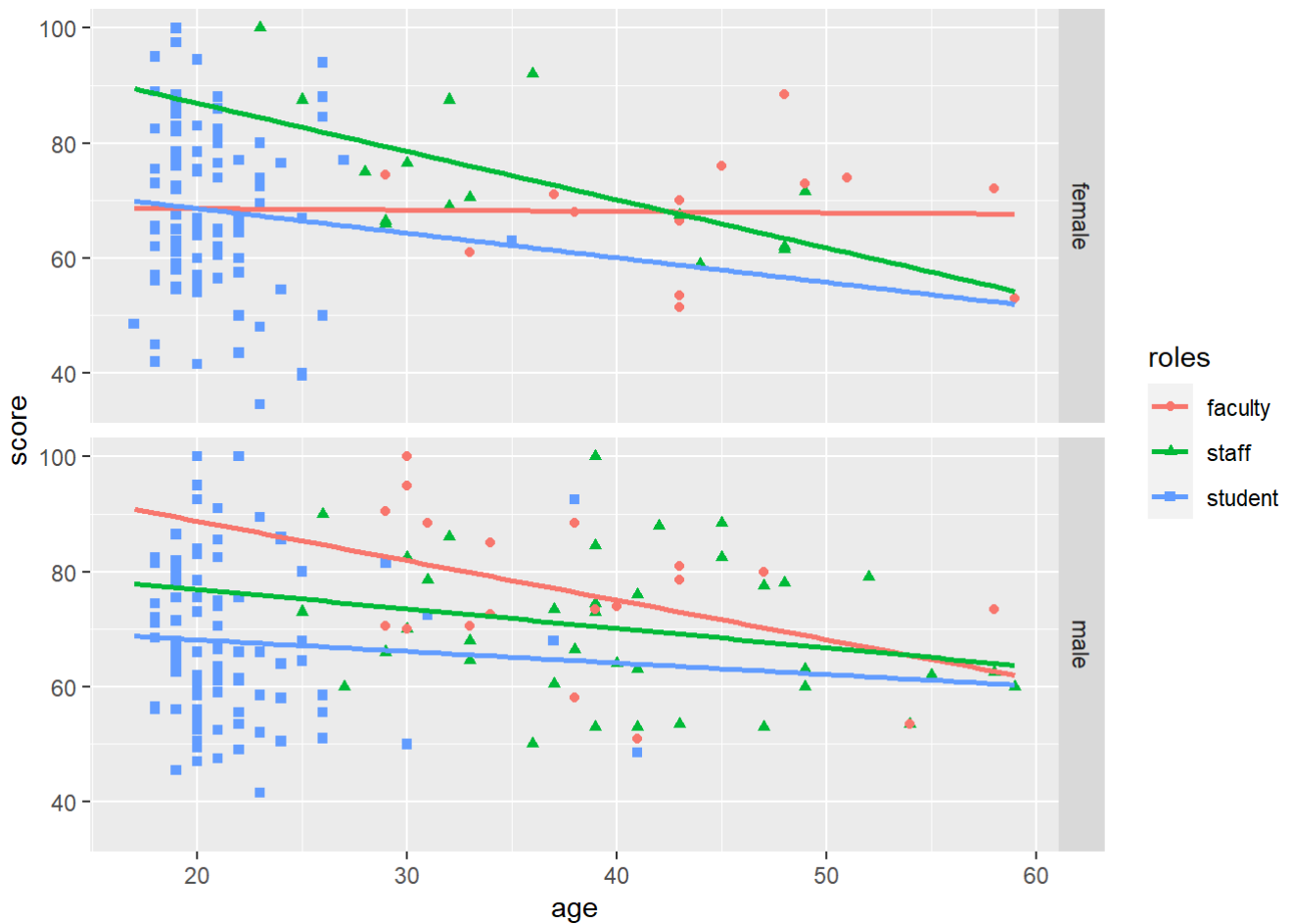
```
## `geom_smooth()` using formula 'y ~ x'
```



```
g2 <- ggplot(data, aes(x=age, y=score, shape=roles, color=roles)) +
  geom_point() +
  geom_smooth(method=lm, se=FALSE, fullrange=TRUE)

g2 + facet_grid(rows = vars(gender))
```

```
## `geom_smooth()` using formula 'y ~ x'
```



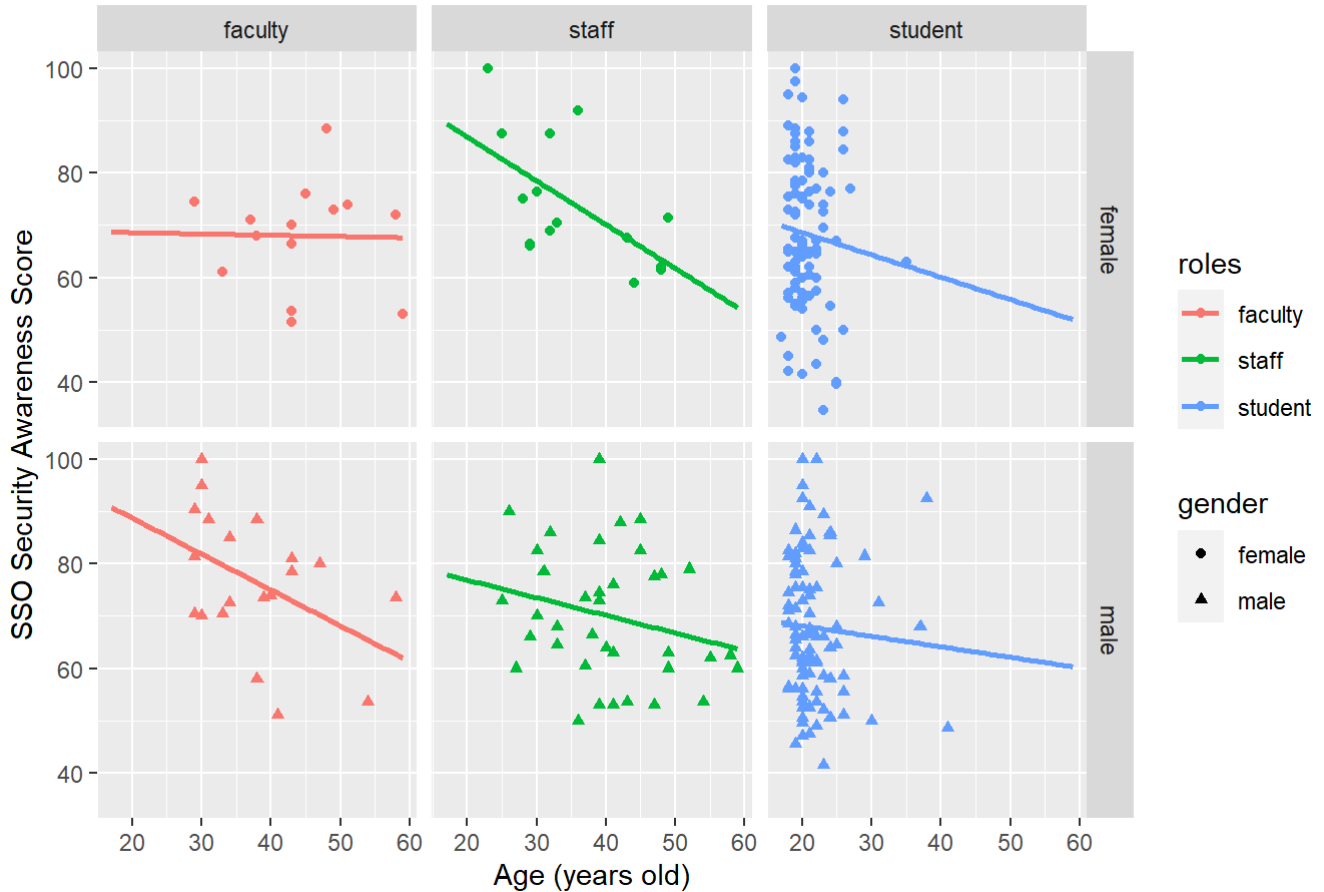
```
g3 <- ggplot(data, aes(x=age, y=score, shape=gender, color=roles)) +
  geom_point() +
  geom_smooth(method=lm, se=FALSE, fullrange=TRUE)

g3 + facet_grid(vars(gender), vars(roles))+
  labs(title = "SSO Security Awareness by Age", x="Age (years old)", y="SSO Security Awareness Score")
```

```
## `geom_smooth()` using formula 'y ~ x'
```



## SSO Security Awareness by Age



```
g4 <- g3 + facet_grid(vars(gender), vars(roles))+
  labs(title = "SSO Security Awareness by Age", x="Age (years old)", y="SSO Security Awareness Score")

#g3 + facet_grid(vars(roles), vars(gender))

ggsave("fig2.pdf", plot= g4, dpi="print")
```

```
## Saving 7 x 5 in image
## `geom_smooth()` using formula 'y ~ x'
```

## Score by Gender

```
scores <- data[,c('gender','score','knowledge','attitude','behavior')]
sg <- scores %>%
  group_by(gender) %>%
  summarize_each(funs(mean))
sg
```

```
## Warning: `...` is not empty.
##
## We detected these problematic arguments:
## * `needs_dots`
##
## These dots only exist to allow future extensions and should be empty.
## Did you misspecify an argument?
```

```
## # A tibble: 2 x 5
##   gender score knowledge attitude behavior
##   <chr>   <dbl>     <dbl>     <dbl>     <dbl>
## 1 female  69.0       65.8       62.3       73.6
## 2 male    69.6       67.9       63.0       73.2
```

## Score by Roles

```
scores <- data[,c('roles','score','knowledge','attitude','behavior')]
sg <- scores %>%
  group_by(roles) %>%
  summarize_each(funs(mean))
sg
```

```
## Warning: `...` is not empty.
##
## We detected these problematic arguments:
## * `needs_dots`
##
## These dots only exist to allow future extensions and should be empty.
## Did you misspecify an argument?
```

```
## # A tibble: 3 x 5
##   roles   score knowledge attitude behavior
##   <chr>   <dbl>     <dbl>     <dbl>     <dbl>
## 1 faculty 73.2       71.9       70.1       75.1
## 2 staff   71.2       70.5       63.6       74.7
## 3 student 68.1       65.1       61.2       72.8
```

## Dumbbell Plots by Gender and Roles

```
tibble(
  Male = c(67.91, 63.04, 73.21, 69.59),
  Female = c(65.81, 62.30, 73.63, 69.02),
  Category = factor(c("Knowledge", "Attitude", "Behavior", "Total Score"), levels = c("Knowle
dge", "Attitude", "Behavior", "Total Score"))
) -> xdf_gender

xdf_gender2 <- gather(xdf_gender, group, value, !Category)
xdf_gender2
```

```
## Warning: `...` is not empty.
##
## We detected these problematic arguments:
## * `needs_dots`
##
## These dots only exist to allow future extensions and should be empty.
## Did you misspecify an argument?
```

```
## # A tibble: 8 x 3
##   Category    group  value
##   <fct>      <chr> <dbl>
## 1 Knowledge   Male    67.9
## 2 Attitude   Male    63.0
## 3 Behavior    Male    73.2
## 4 Total Score Male    69.6
## 5 Knowledge   Female  65.8
## 6 Attitude    Female  62.3
## 7 Behavior    Female  73.6
## 8 Total Score Female  69.0
```

```

db_plot_gender <- ggplot(xdf_gender, aes(y = Category)) +
  geom_dumbbell(aes(x = Female, xend = Male), size=3, color="darkgrey", size_x=5, size_xend=5
) +
  geom_point(data = xdf_gender2, aes(x = value, color = group), size = 5) +
  theme_classic() +
  scale_color_manual(name = "Gender", values = c("red", "blue") ) +
  labs(x="Score",
       y=element_blank()) +
  theme(legend.position = "top") +
  scale_x_continuous(#breaks=seq(5,13,1),
                    limits = c(60,80))

#dataset for academic role

tibble(
  Student = c(65.0, 61.17, 72.77, 68.15),
  Faculty = c(71.91, 70.15, 75.15, 73.18),
  Staff = c(70.48, 63.56, 74.71, 71.21),
  Category = factor(c("Knowledge", "Attitude", "Behavior", "Total Score"), levels = c("Knowle
dge", "Attitude", "Behavior", "Total Score"))
) -> xdf_role

xdf_role2 <- gather(xdf_role, group, value, !Category)

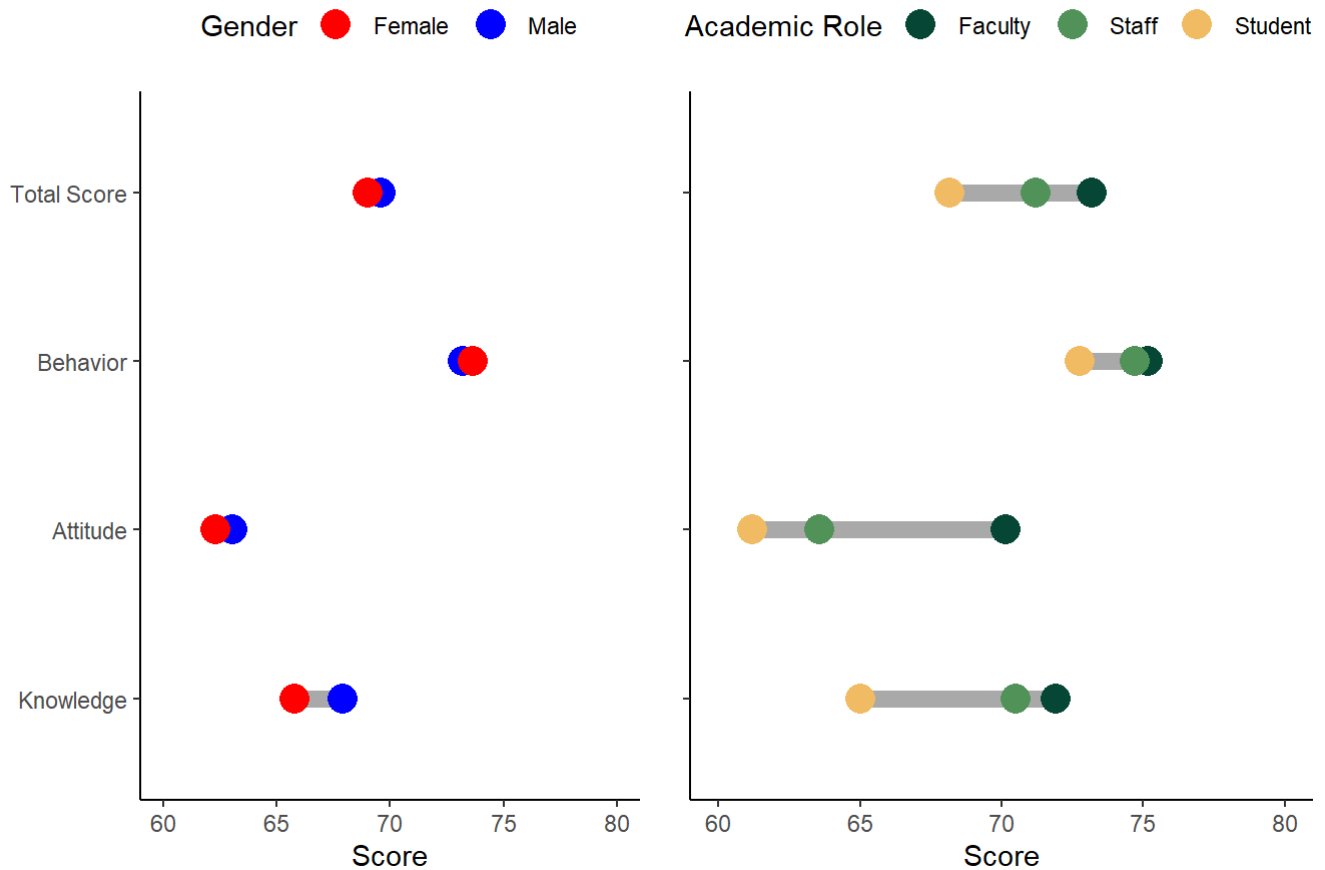
db_plot_role <- ggplot(xdf_role, aes(y = Category)) +
  geom_dumbbell(aes(x = Student, xend = Faculty), size=3, color="darkgrey", size_x=5, size_xe
nd=5) +
  geom_point(data = xdf_role2, aes(x = value, color = group), size = 5) +
  theme_classic() +
  scale_color_manual(name = "Academic Role", values = c("#064635", "#519259", "#F0BB62") ) +
  labs(x="Score",
       y=element_blank()) +
  theme(legend.position = "top") +
  scale_x_continuous(
    limits = c(60,80)) +
  rremove("y.text")

#combine two plots

fig3 <- ggarrange(db_plot_gender, db_plot_role) #combine plots
fig3 <- annotate_figure(fig3,
                       top = text_grob("SSO Account Security Awareness by Gender and Academic Role",
face = "bold", size = 14)) #add text in the middle
fig3

```

## SSO Account Security Awareness by Gender and Academic Role



```
ggsave("fig3.pdf", plot= fig3, dpi="print")
```

```
## Saving 7 x 5 in image
```

## OLS Regression

### Model 1: Privacy

```
model1 <- lm(score ~ gender + age + roles + familiarity + privacy, data = data)
summary(model1)
```

```
##
## Call:
## lm(formula = score ~ gender + age + roles + familiarity + privacy,
##     data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -36.754  -8.548  -0.625   8.717  34.228
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  65.18460    8.84774   7.367 2.02e-12 ***
## gendermale    0.12303    1.58773   0.077 0.938293
## age         -0.32118    0.14053  -2.285 0.023045 *
## rolesstaff  -2.40222    2.88298  -0.833 0.405429
## rolesstudent -12.81880    3.56549  -3.595 0.000384 ***
## familiarity   0.11657    0.04330   2.692 0.007529 **
## privacy       0.14618    0.05873   2.489 0.013405 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 12.99 on 276 degrees of freedom
## Multiple R-squared:  0.1098, Adjusted R-squared:  0.09043
## F-statistic: 5.673 on 6 and 276 DF,  p-value: 1.413e-05
```

## Model 2: Privacy + Big5

```
model2 <- lm(score ~ gender + age + roles + familiarity + privacy + extraversion + agreeableness + conscientiousness + emotionalstability + openness, data = data)
summary(model2)
```

```
##
## Call:
## lm(formula = score ~ gender + age + roles + familiarity + privacy +
##     extraversion + agreeableness + conscientiousness + emotionalstability +
##     openness, data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -39.680  -8.343  -0.343   7.925  34.050
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    67.23559     9.74161   6.902 3.63e-11 ***
## gendermale     -0.44824     1.60975  -0.278 0.780877
## age            -0.30369     0.14087  -2.156 0.031980 *
## rolesstaff     -2.73726     2.86568  -0.955 0.340335
## rolesstudent  -11.97743     3.54832  -3.376 0.000845 ***
## familiarity     0.09744     0.04514   2.159 0.031754 *
## privacy         0.14568     0.05899   2.470 0.014139 *
## extraversion   -1.20486     0.68055  -1.770 0.077781 .
## agreeableness  -1.31153     0.86795  -1.511 0.131935
## conscientiousness 1.67437     0.89535   1.870 0.062551 .
## emotionalstability 1.17025     0.81947   1.428 0.154428
## openness       -0.62474     0.85806  -0.728 0.467191
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 12.84 on 271 degrees of freedom
## Multiple R-squared:  0.1464, Adjusted R-squared:  0.1118
## F-statistic: 4.227 on 11 and 271 DF,  p-value: 8.502e-06
```

## Model 3: Privacy x Big5

```
model3 <- lm(score ~ gender + age + roles + familiarity + privacy + extraversion + agreeablen
ess*privacy + conscientiousness*privacy + emotionalstability + openness, data = data)
summary(model3)
```

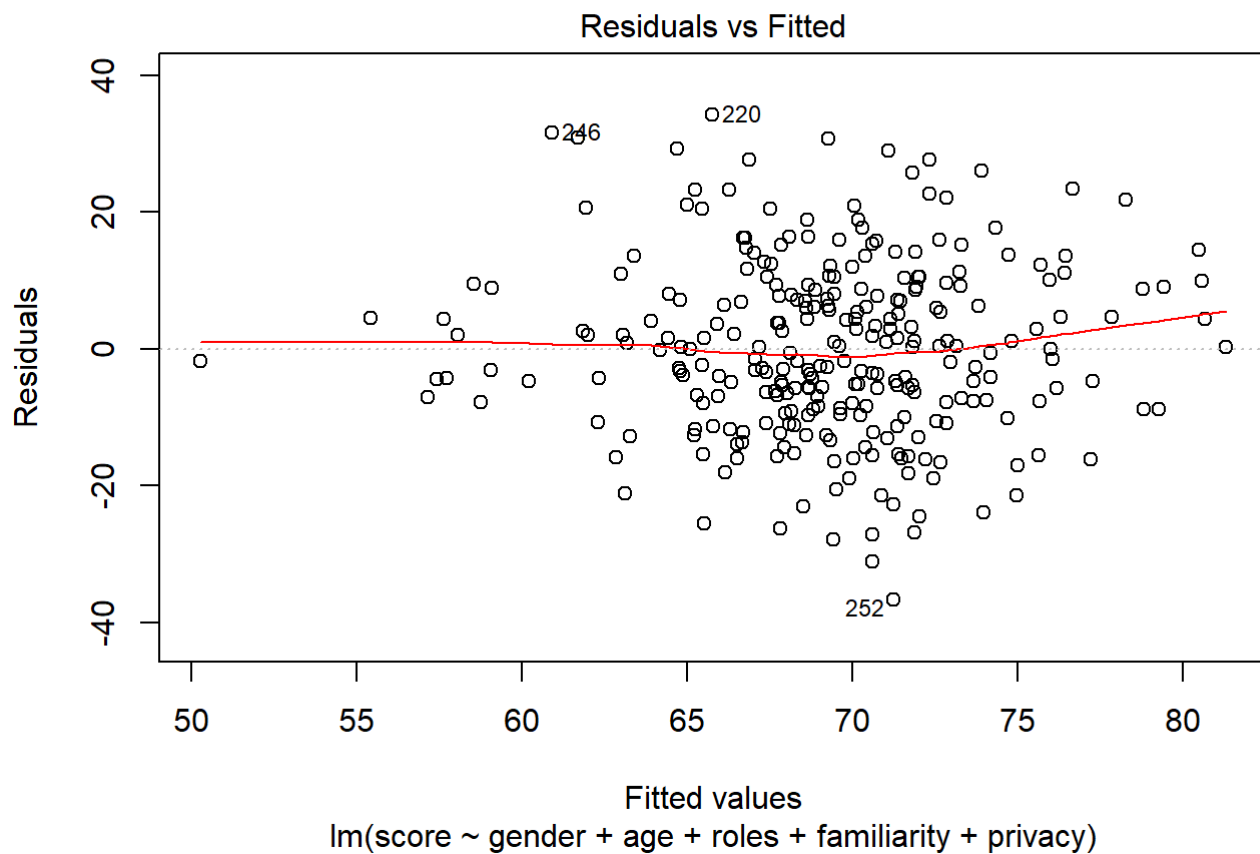
```
##
## Call:
## lm(formula = score ~ gender + age + roles + familiarity + privacy +
##      extraversion + agreeableness * privacy + conscientiousness *
##      privacy + emotionalstability + openness, data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -38.631  -8.918  -0.500   8.273  33.953
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    66.99399    26.48445   2.530 0.011992 *
## gendermale     -0.52353     1.58828  -0.330 0.741943
## age           -0.30919     0.13895  -2.225 0.026894 *
## rolesstaff     -2.85076     2.82864  -1.008 0.314446
## rolesstudent  -12.36247     3.50555  -3.527 0.000495 ***
## familiarity     0.09727     0.04478   2.172 0.030714 *
## privacy         0.15591     0.29570   0.527 0.598459
## extraversion   -1.04614     0.67326  -1.554 0.121398
## agreeableness  -16.28630     5.22743  -3.116 0.002035 **
## conscientiousness 16.07013     5.59876   2.870 0.004427 **
## emotionalstability 1.43220     0.81263   1.762 0.079134 .
## openness       -0.62294     0.84691  -0.736 0.462648
## privacy:agreeableness 0.16675     0.05781   2.884 0.004240 **
## privacy:conscientiousness -0.16493     0.06394  -2.580 0.010422 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 12.66 on 269 degrees of freedom
## Multiple R-squared:  0.176, Adjusted R-squared:  0.1361
## F-statistic: 4.418 on 13 and 269 DF, p-value: 8.681e-07
```

## Diagnostics

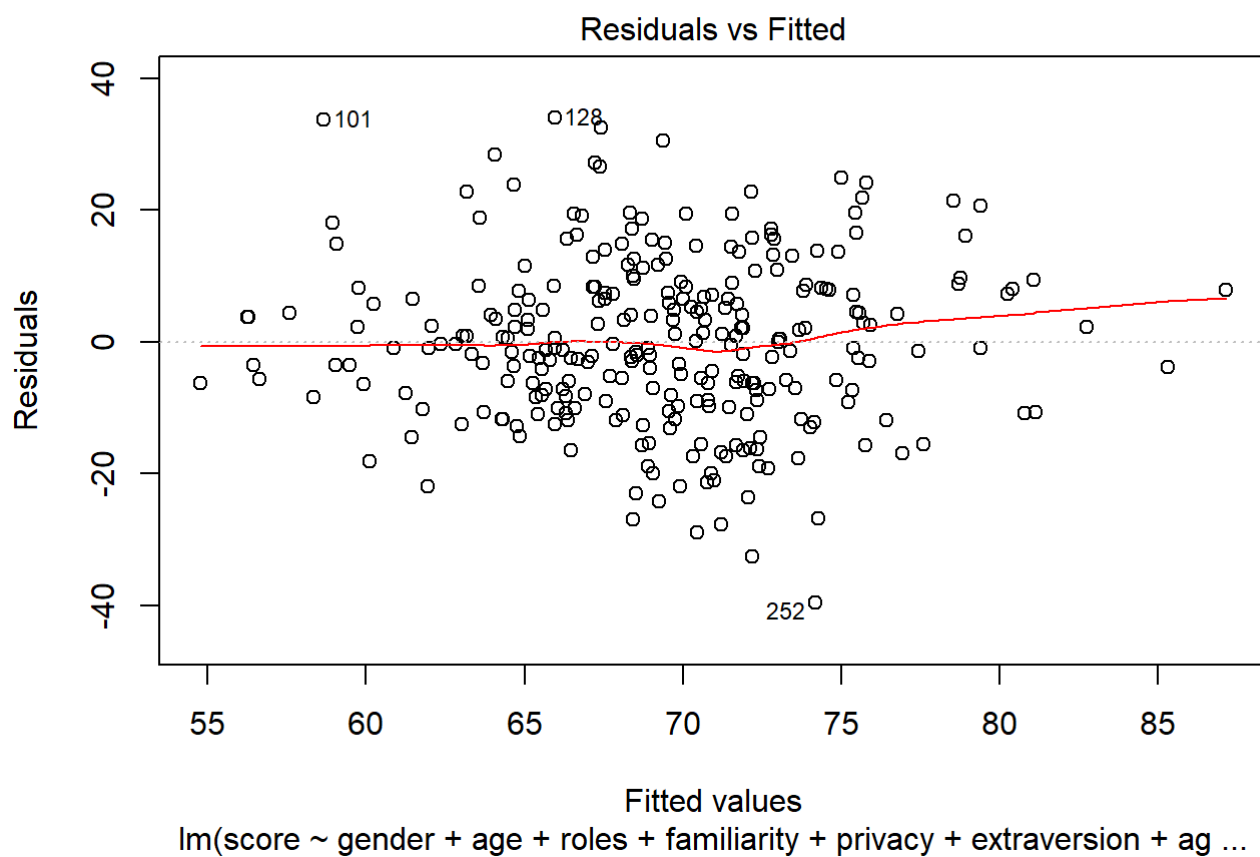
### Residuals vs Fitted

```
plot(model1, 1)
```

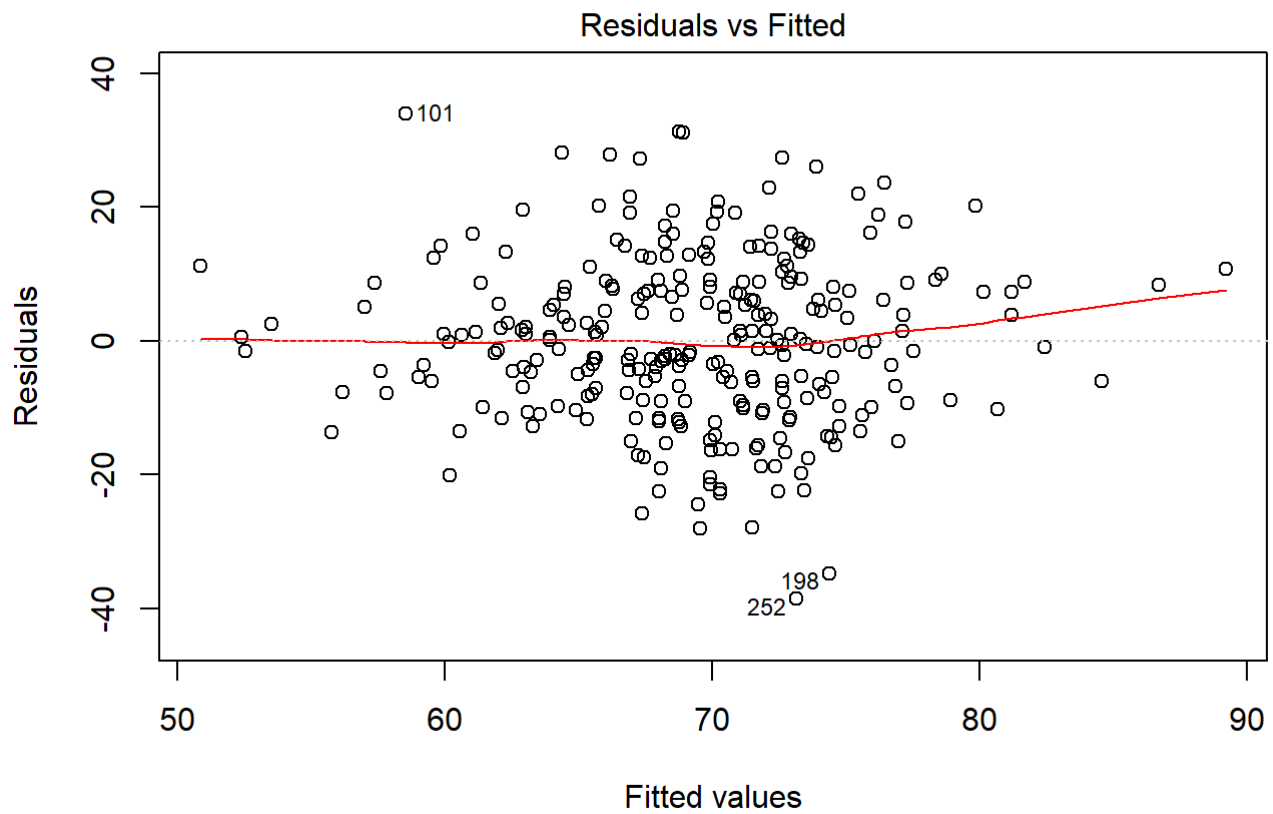




```
plot(model2, 1)
```



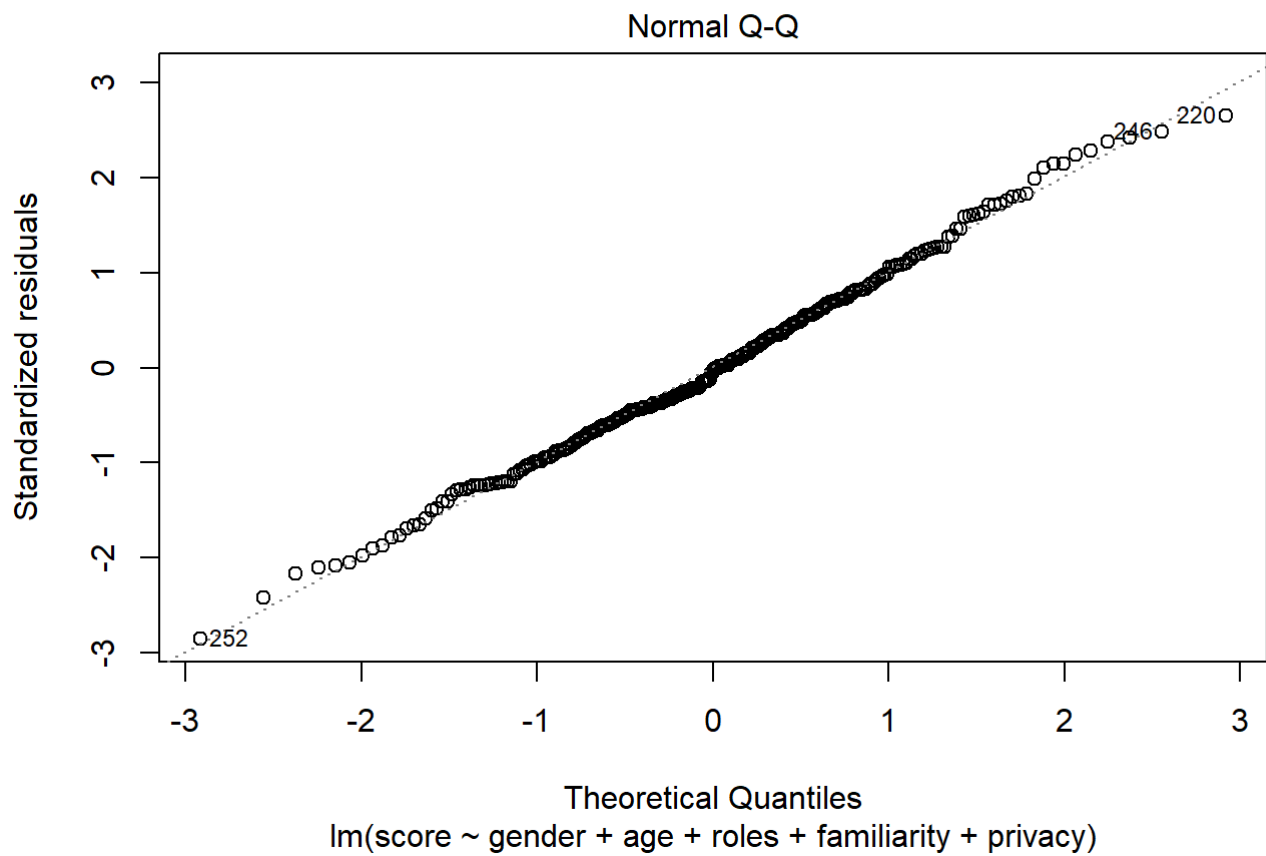
```
plot(model3, 1)
```



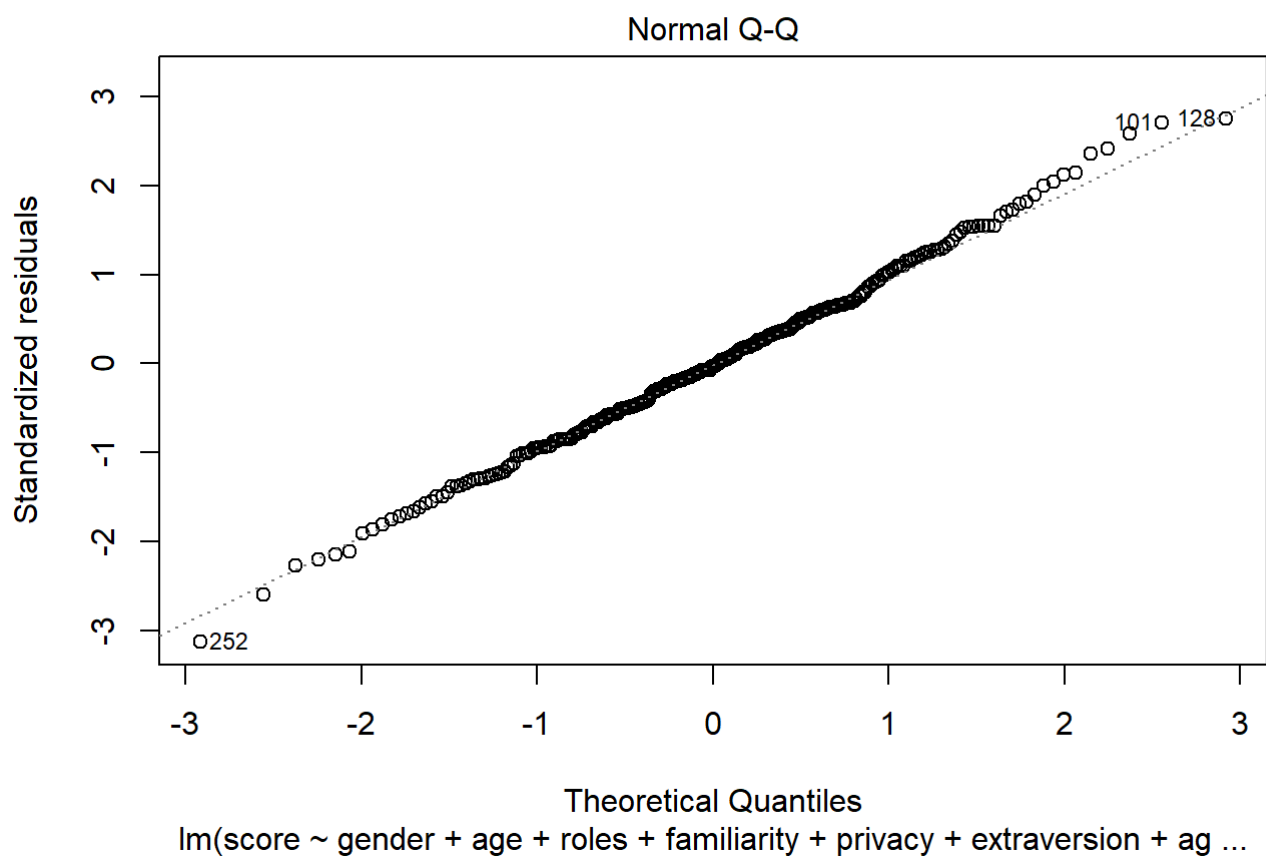
lm(score ~ gender + age + roles + familiarity + privacy + extraversion + ag ...

### Normal Q-Q

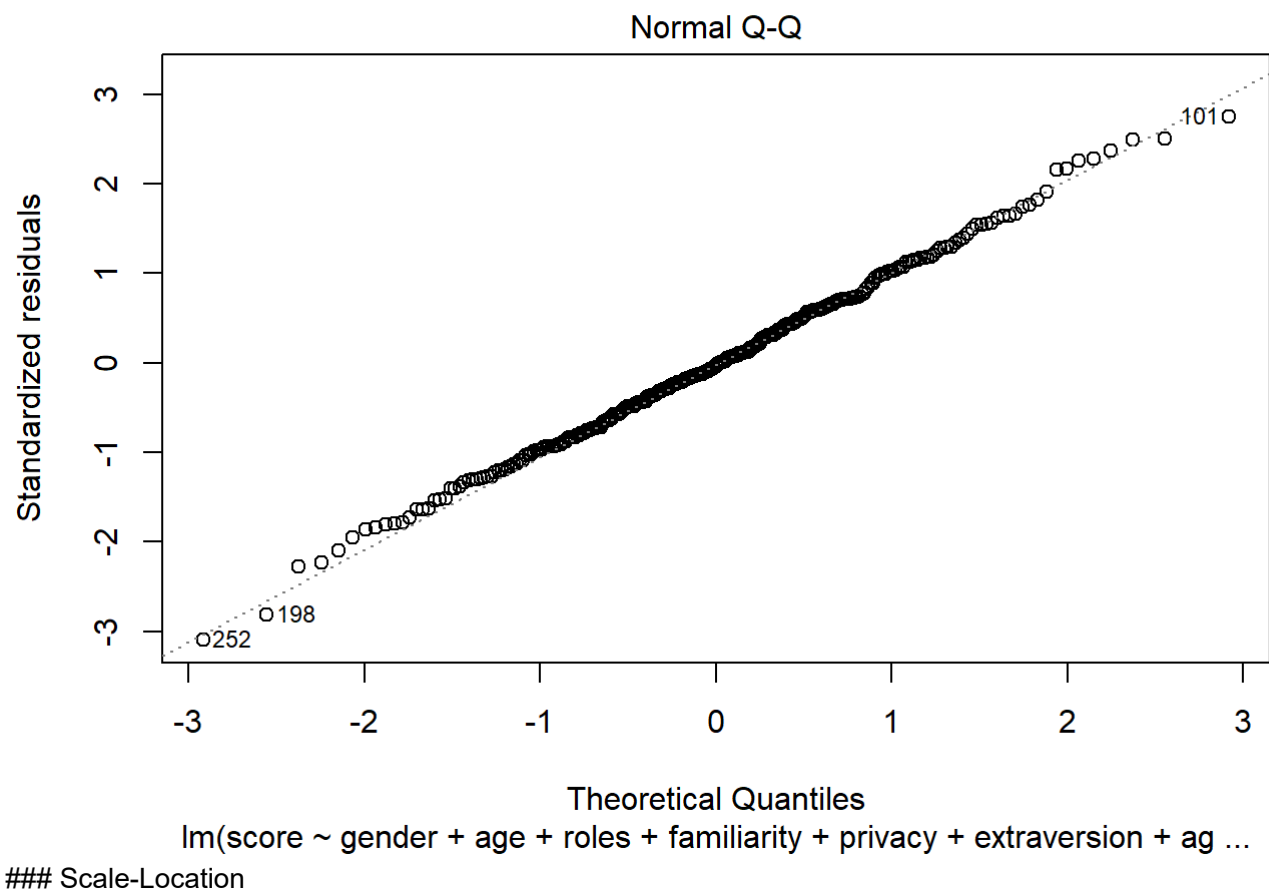
```
plot(model1, 2)
```



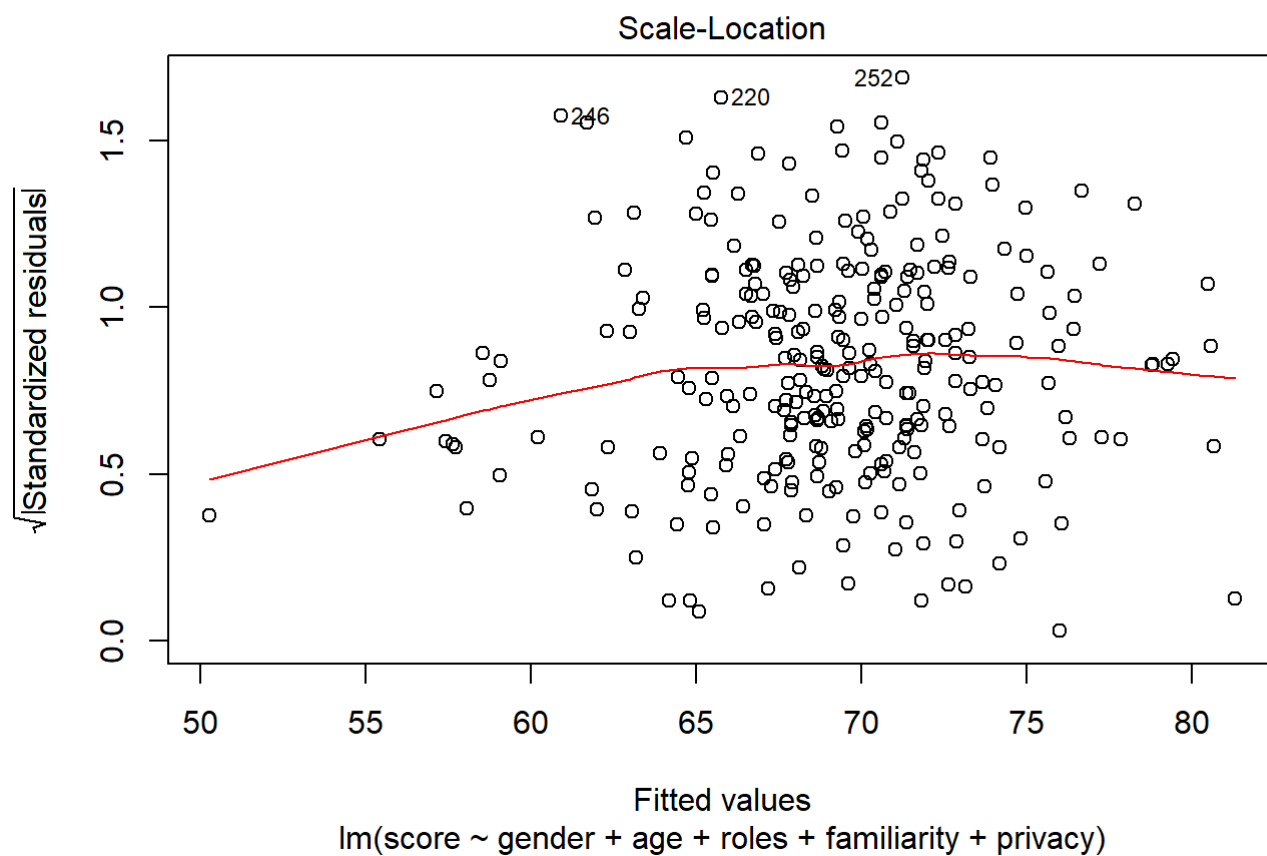
```
plot(model12, 2)
```



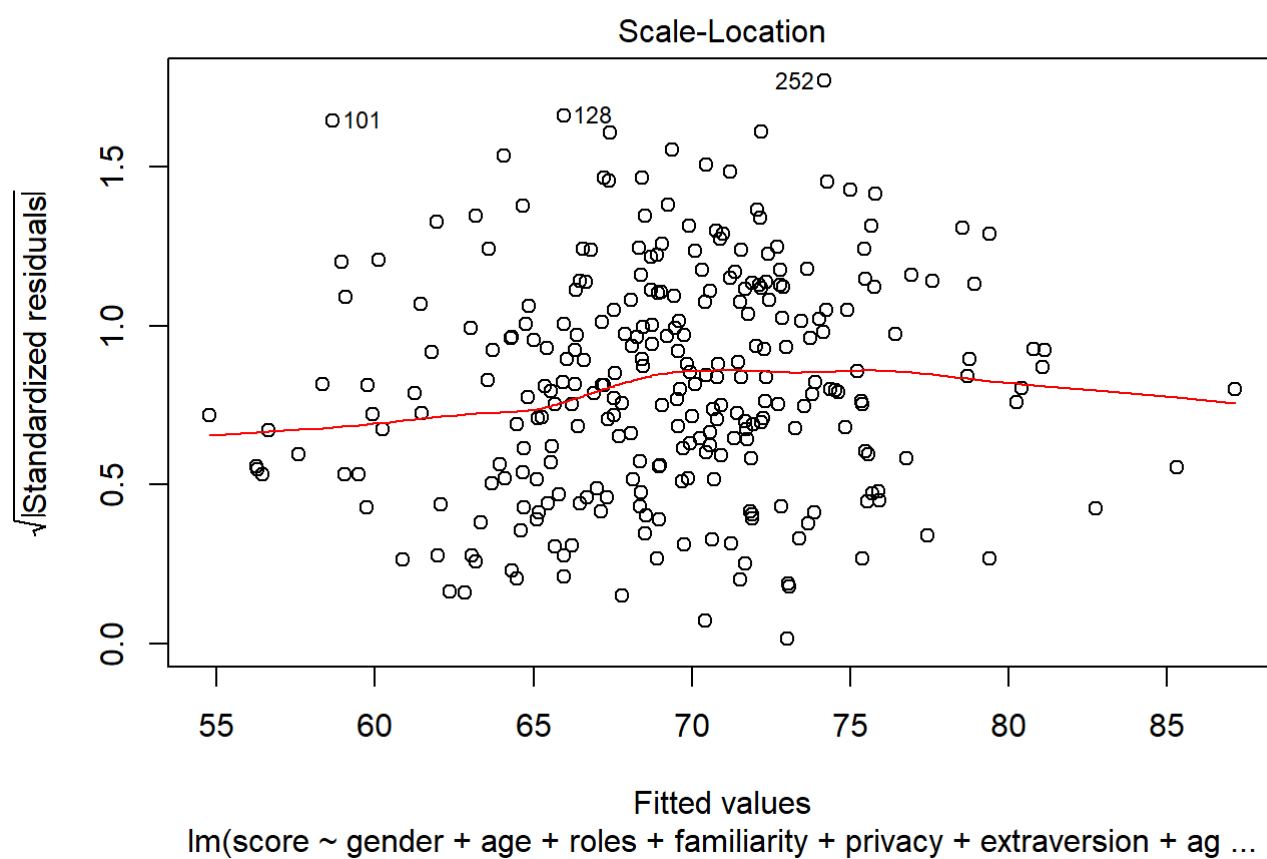
```
plot(model3, 2)
```



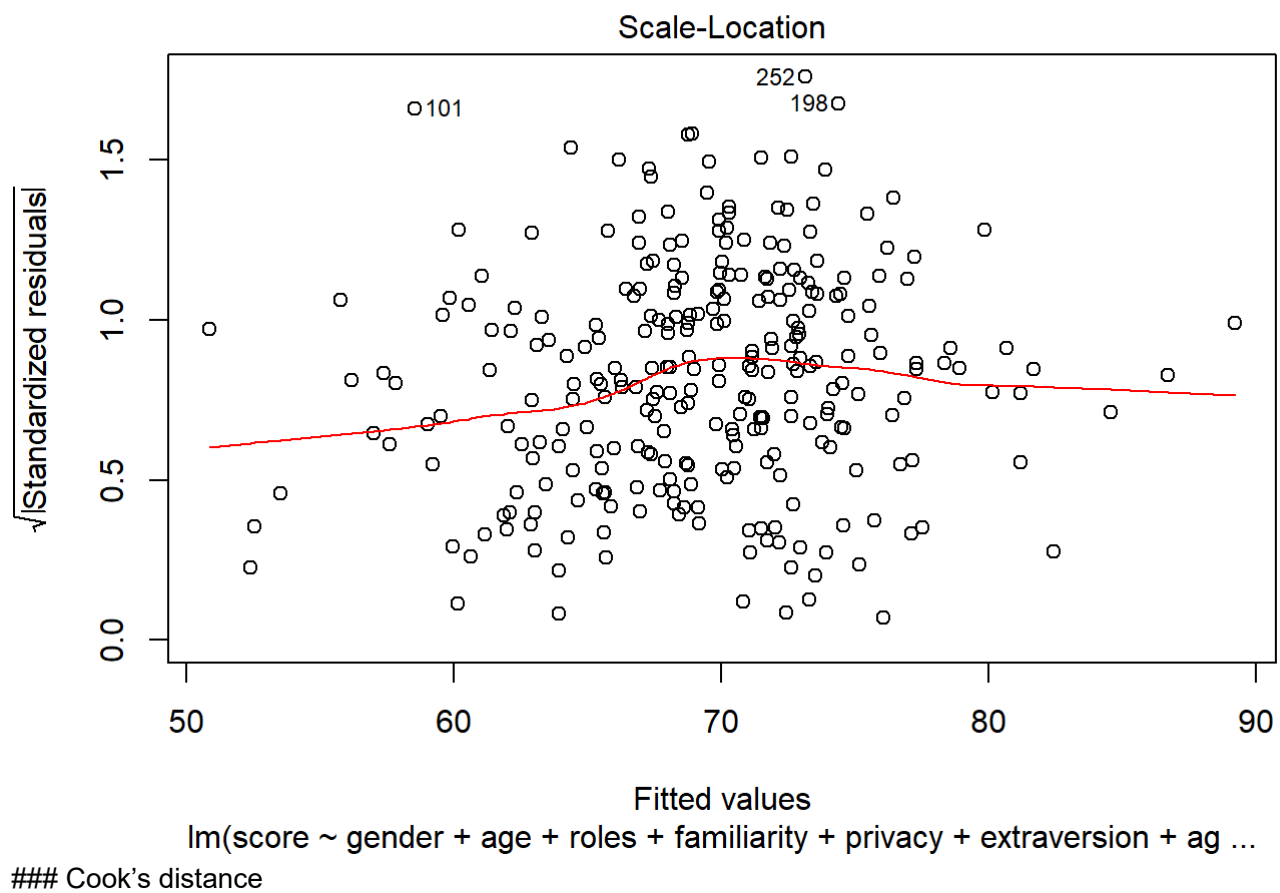
```
plot(model1, 3)
```



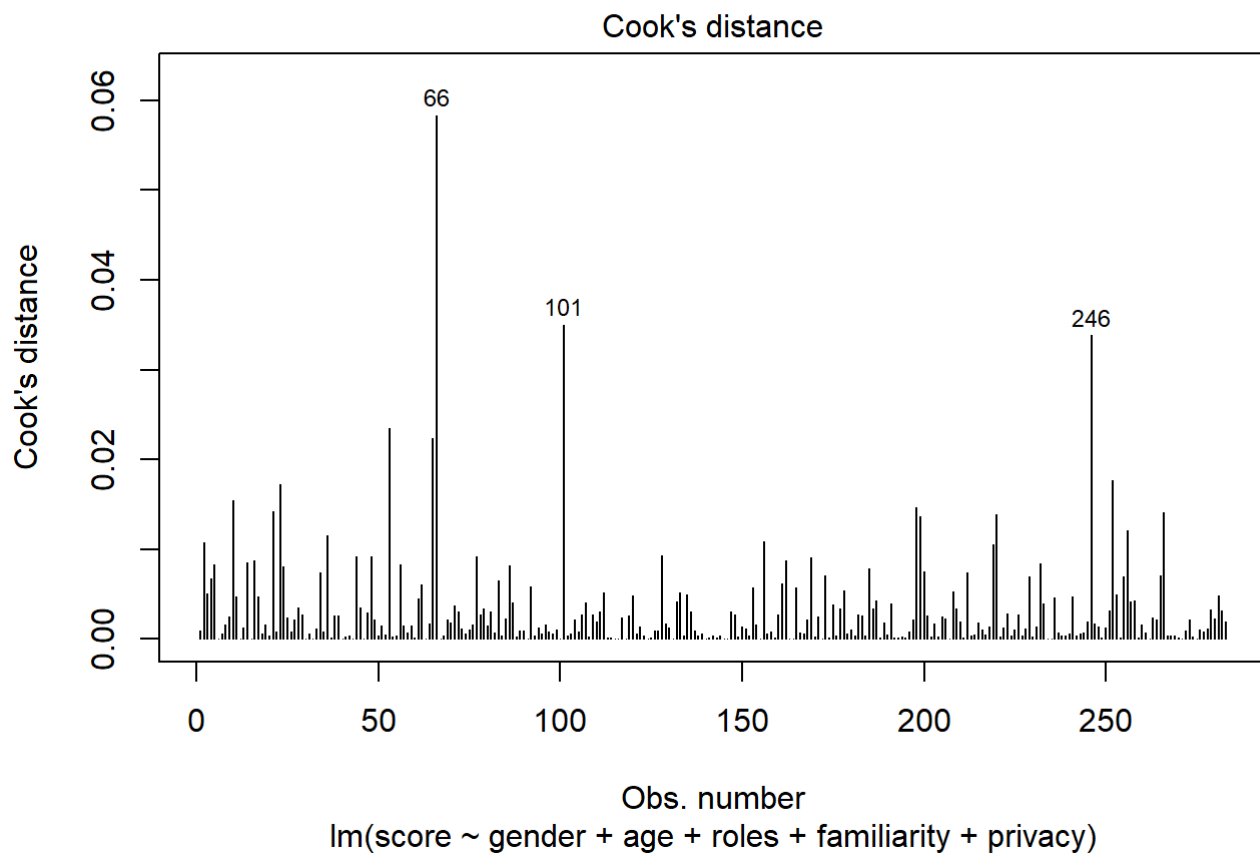
```
plot(model12, 3)
```



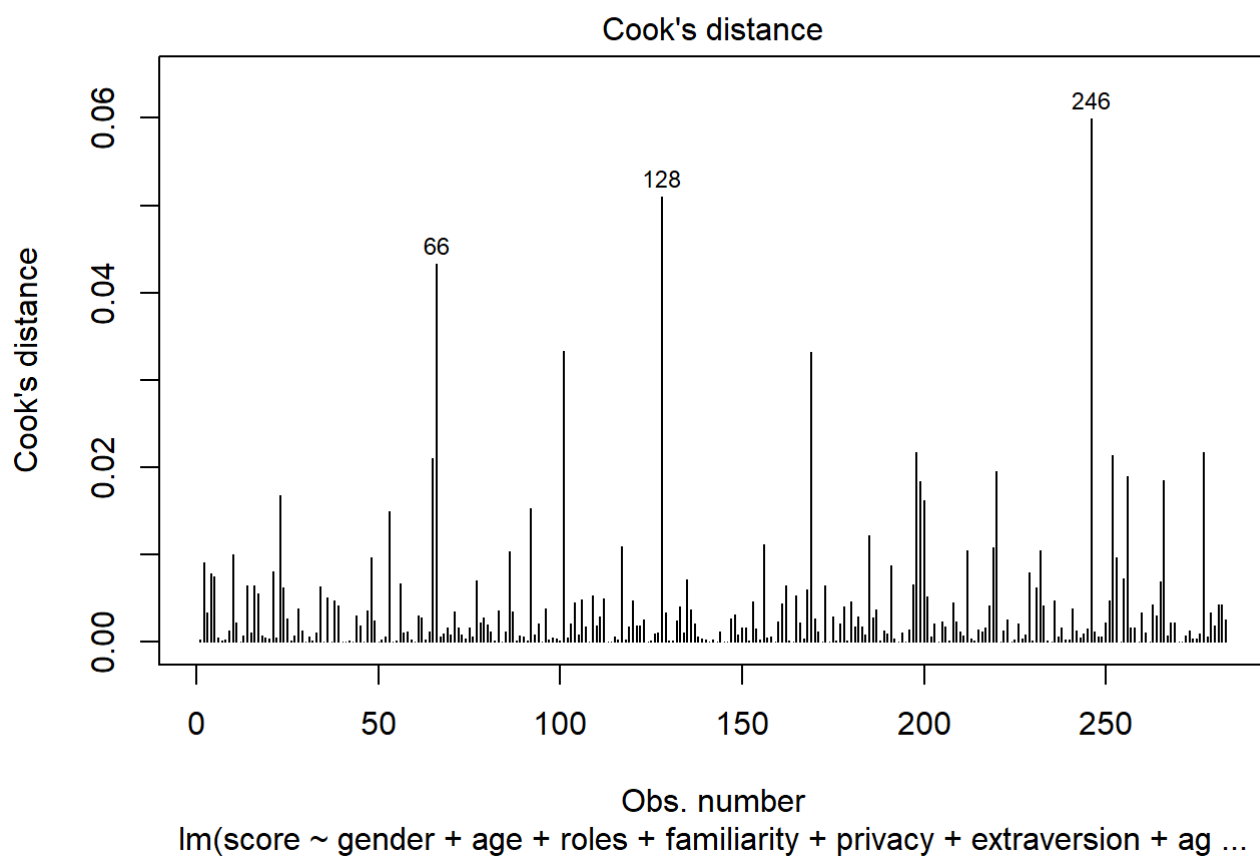
```
plot(model3, 3)
```



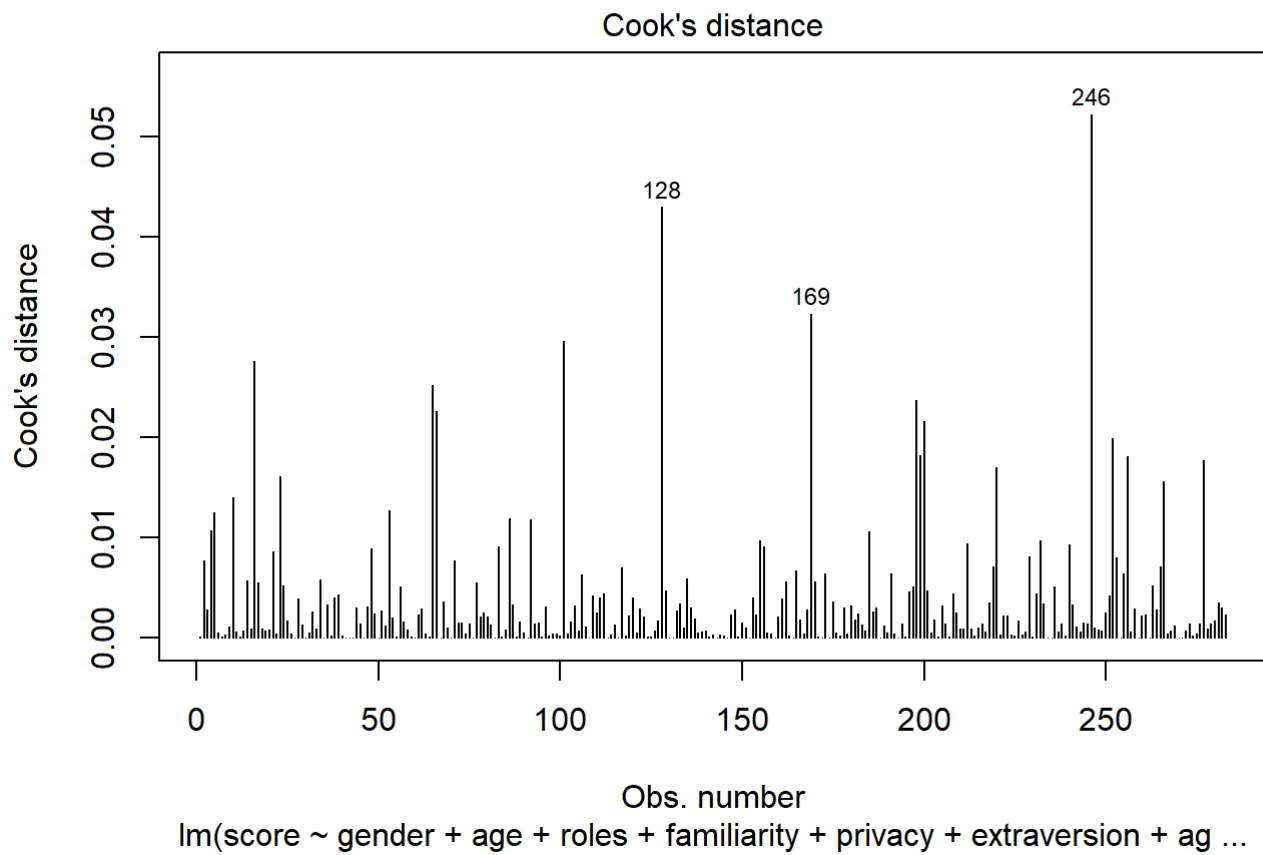
```
plot(model11, 4)
```



```
plot(model12, 4)
```



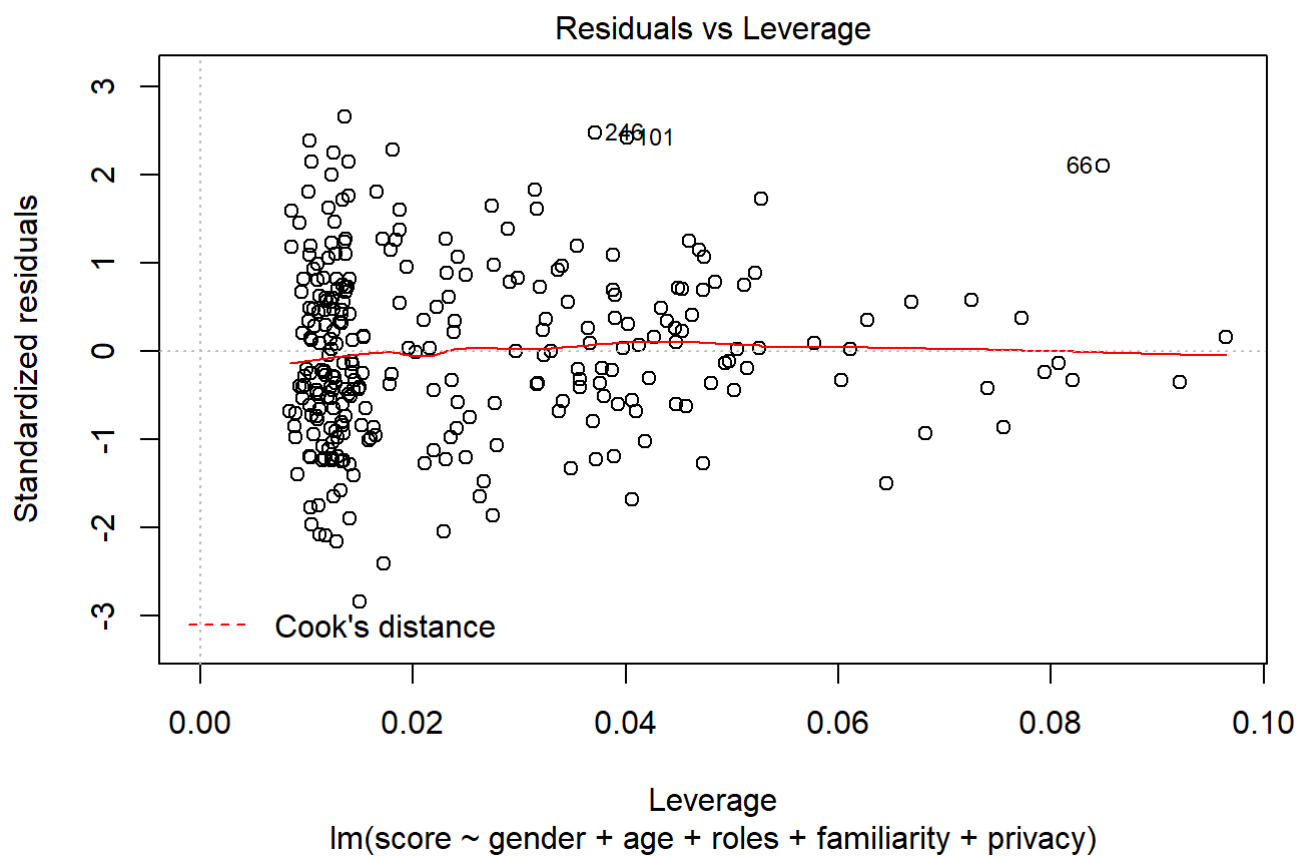
```
plot(model3, 4)
```



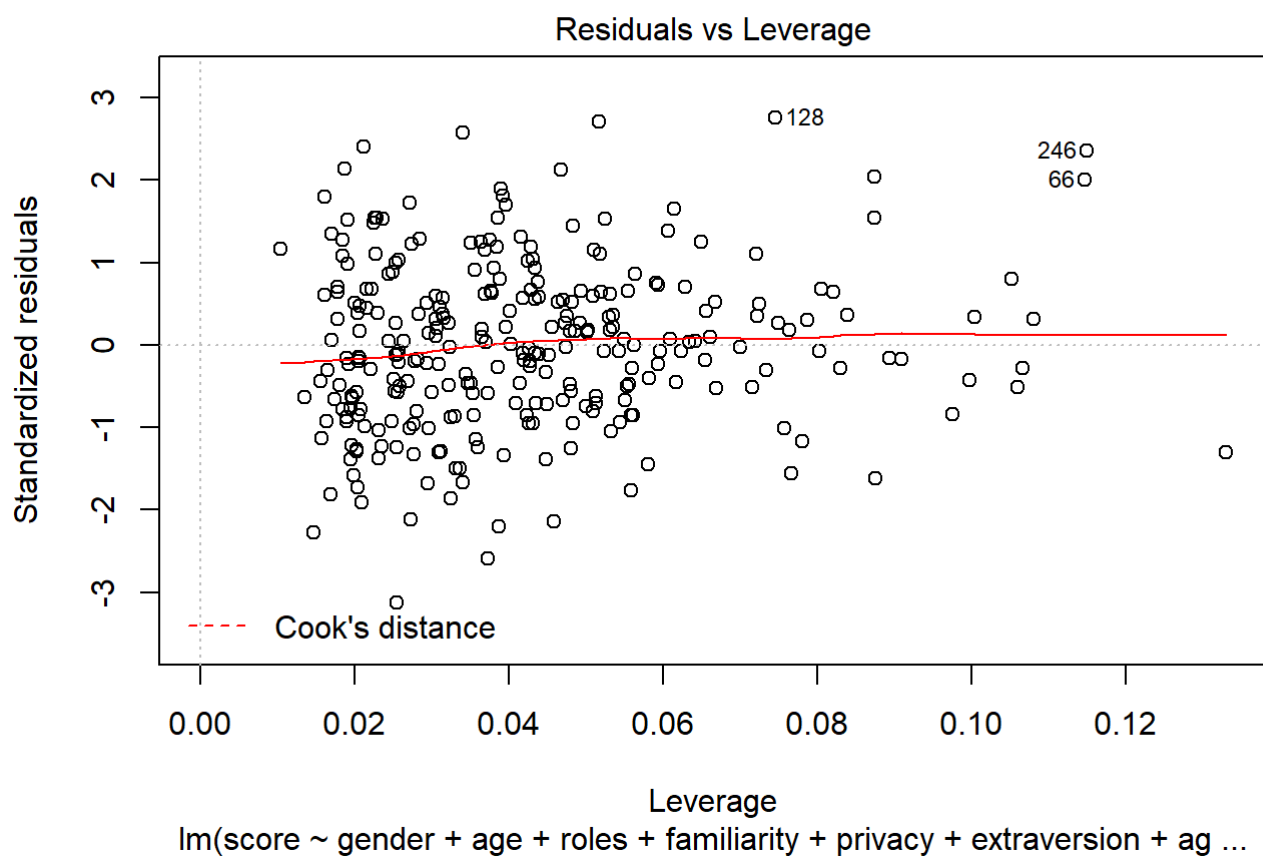
## Residuals vs Leverage

```
plot(model1, 5)
```

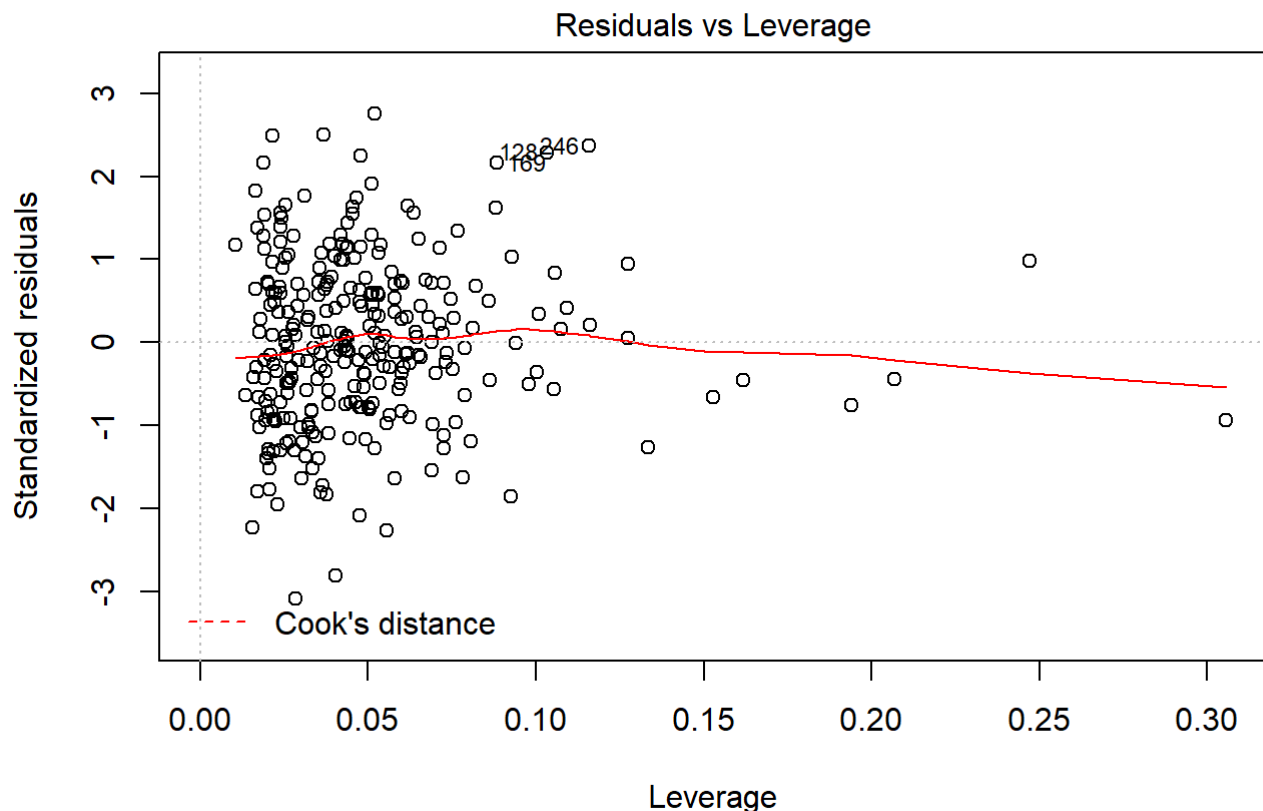




```
plot(model2, 5)
```



```
plot(model3, 5)
```



lm(score ~ gender + age + roles + familiarity + privacy + extraversion + ag ...

### Other Approaches

```
library("car")
```

```
## Loading required package: carData
```

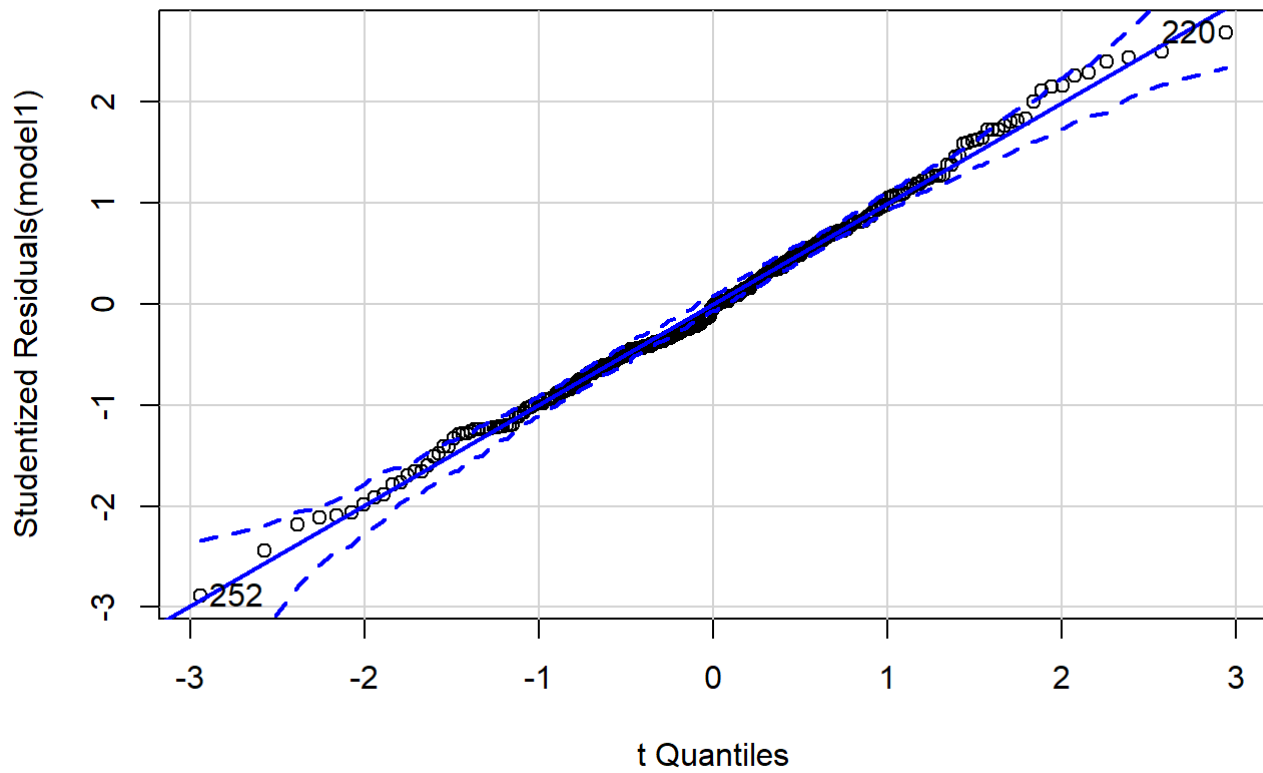
```
##  
## Attaching package: 'car'
```

```
## The following object is masked from 'package:dplyr':  
##  
##   recode
```

```
## The following object is masked from 'package:purrr':  
##  
##   some
```

```
qqPlot(model1, labels=row.names(id), id.method="identify", simulate=TRUE, main="Q-Q Plot")
```

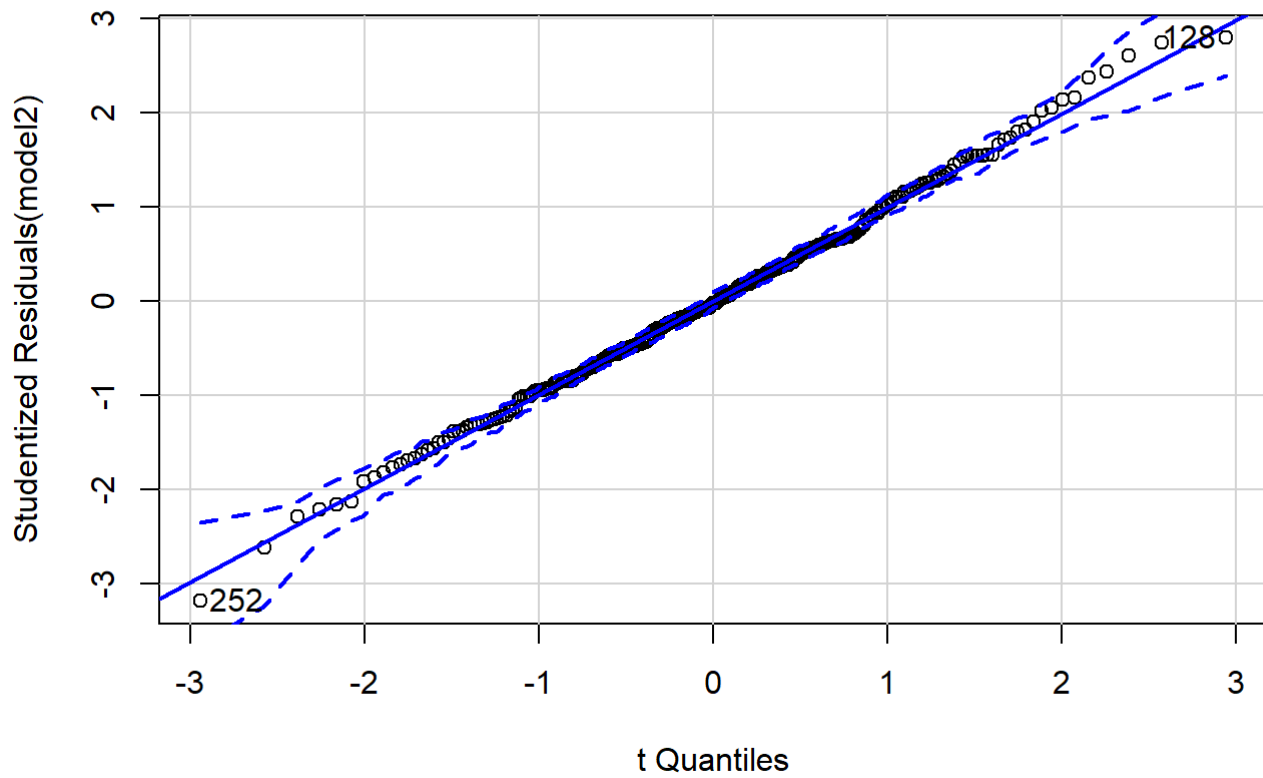
## Q-Q Plot



```
## [1] 220 252
```

```
qqPlot(model2, labels=row.names(id), id.method="identify", simulate=TRUE, main="Q-Q Plot")
```

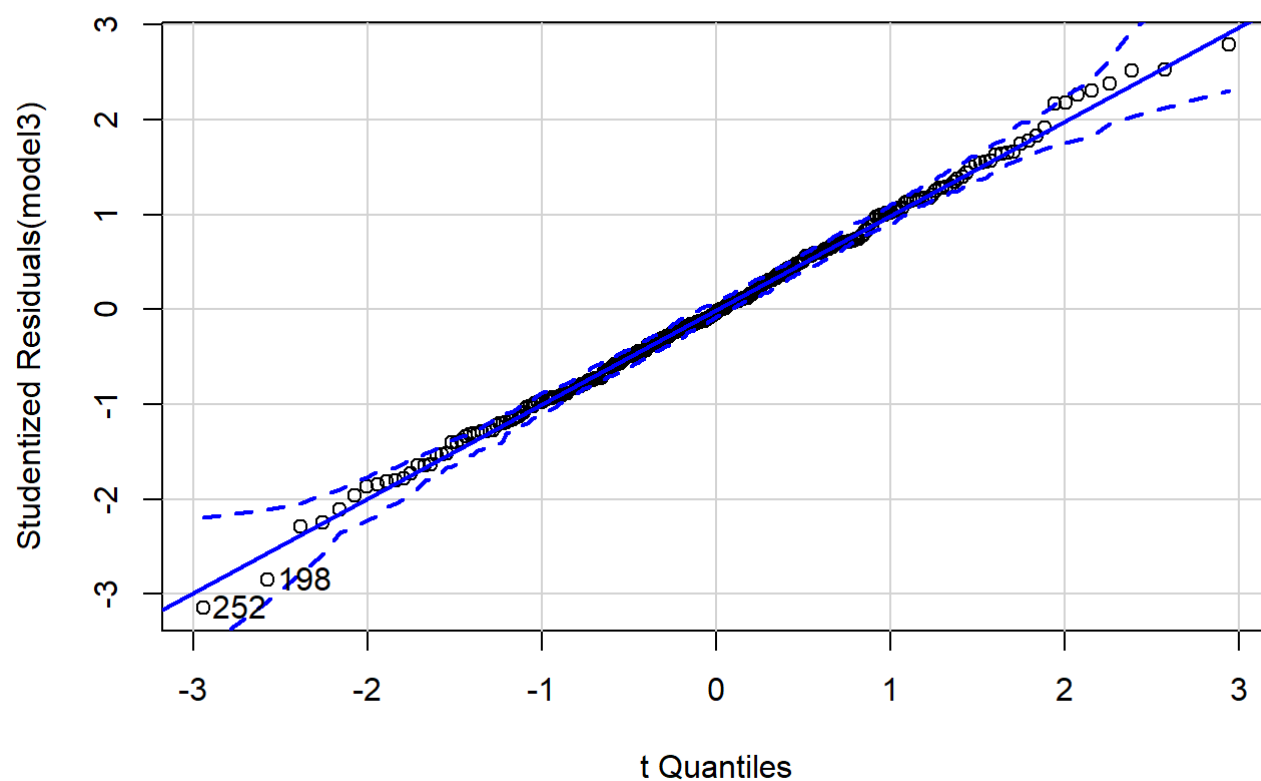
## Q-Q Plot



```
## [1] 128 252
```

```
qqPlot(model3, labels=row.names(id), id.method="identify", simulate=TRUE, main="Q-Q Plot")
```

## Q-Q Plot



```
## [1] 198 252
```

```
outlierTest(model1)
```

```
## No Studentized residuals with Bonferroni p < 0.05
## Largest |rstudent|:
##      rstudent unadjusted p-value Bonferroni p
## 252 -2.888012      0.004185      NA
```

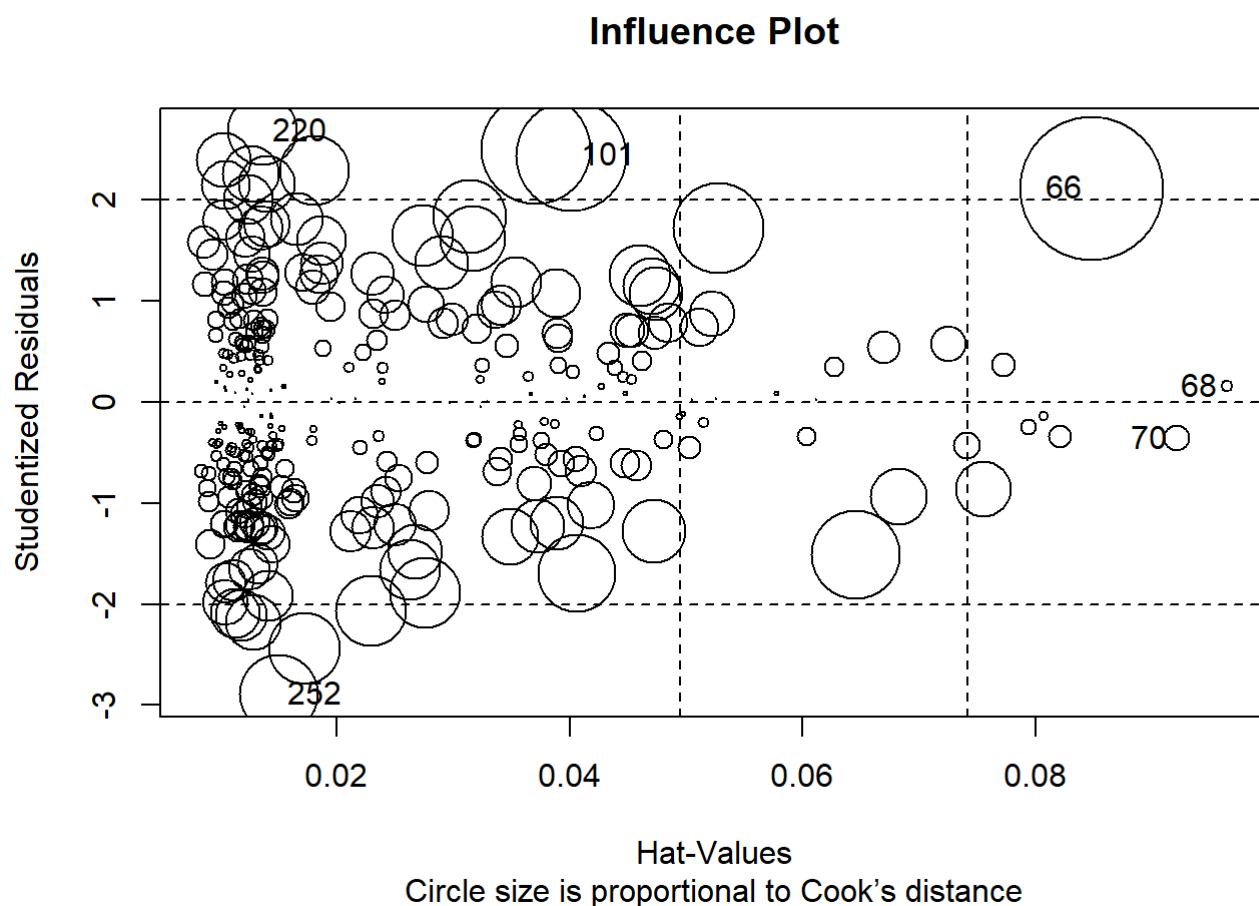
```
outlierTest(model2)
```

```
## No Studentized residuals with Bonferroni p < 0.05
## Largest |rstudent|:
##      rstudent unadjusted p-value Bonferroni p
## 252 -3.183166      0.0016272      0.4605
```

```
outlierTest(model3)
```

```
## No Studentized residuals with Bonferroni p < 0.05
## Largest |rstudent|:
##      rstudent unadjusted p-value Bonferroni p
## 252 -3.145981      0.0018419      0.52126
```

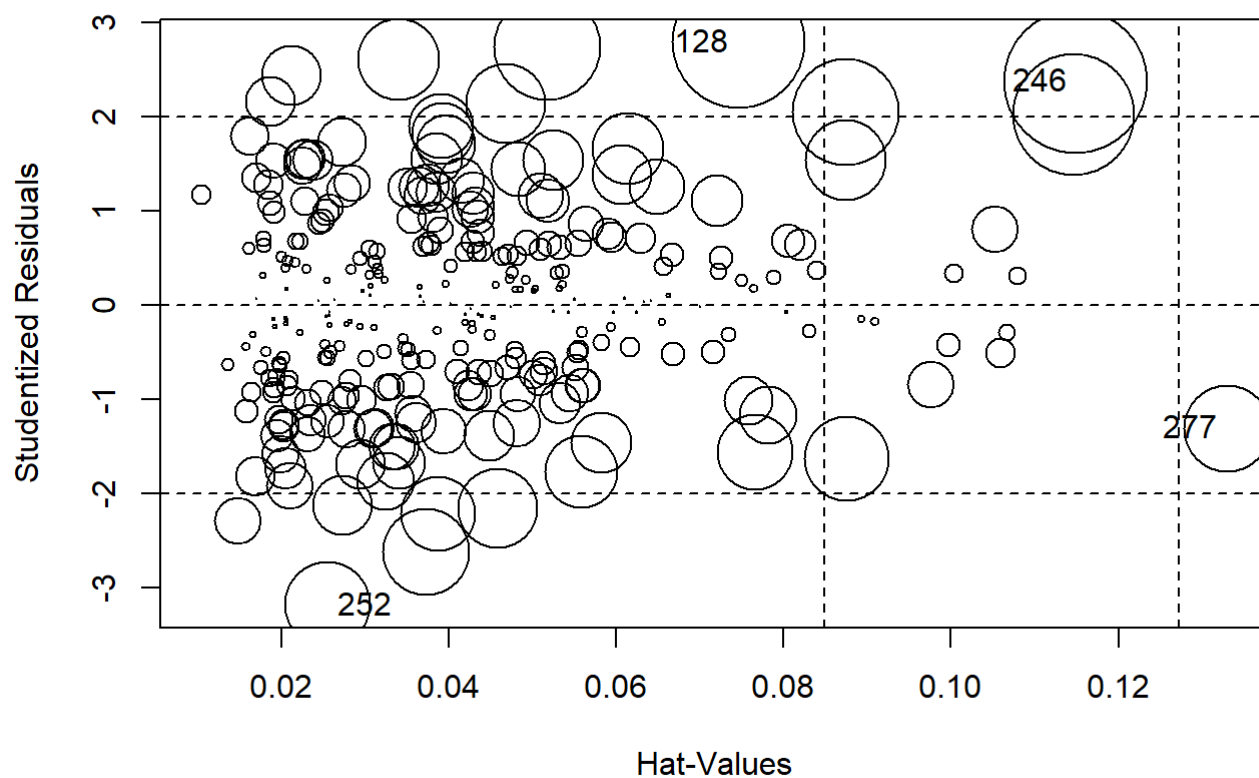
```
influencePlot(model1, main="Influence Plot", sub="Circle size is proportional to Cook's distance")
```



##	StudRes	Hat	CookD
## 66	2.1124826	0.08481837	0.0583520737
## 68	0.1571987	0.09643844	0.0003781202
## 70	-0.3572603	0.09213112	0.0018562201
## 101	2.4419736	0.04011204	0.0349701631
## 220	2.6822861	0.01361101	0.0138712169
## 252	-2.8880125	0.01496857	0.0176372373

```
influencePlot(model2, main="Influence Plot", sub="Circle size is proportional to Cook's distance")
```

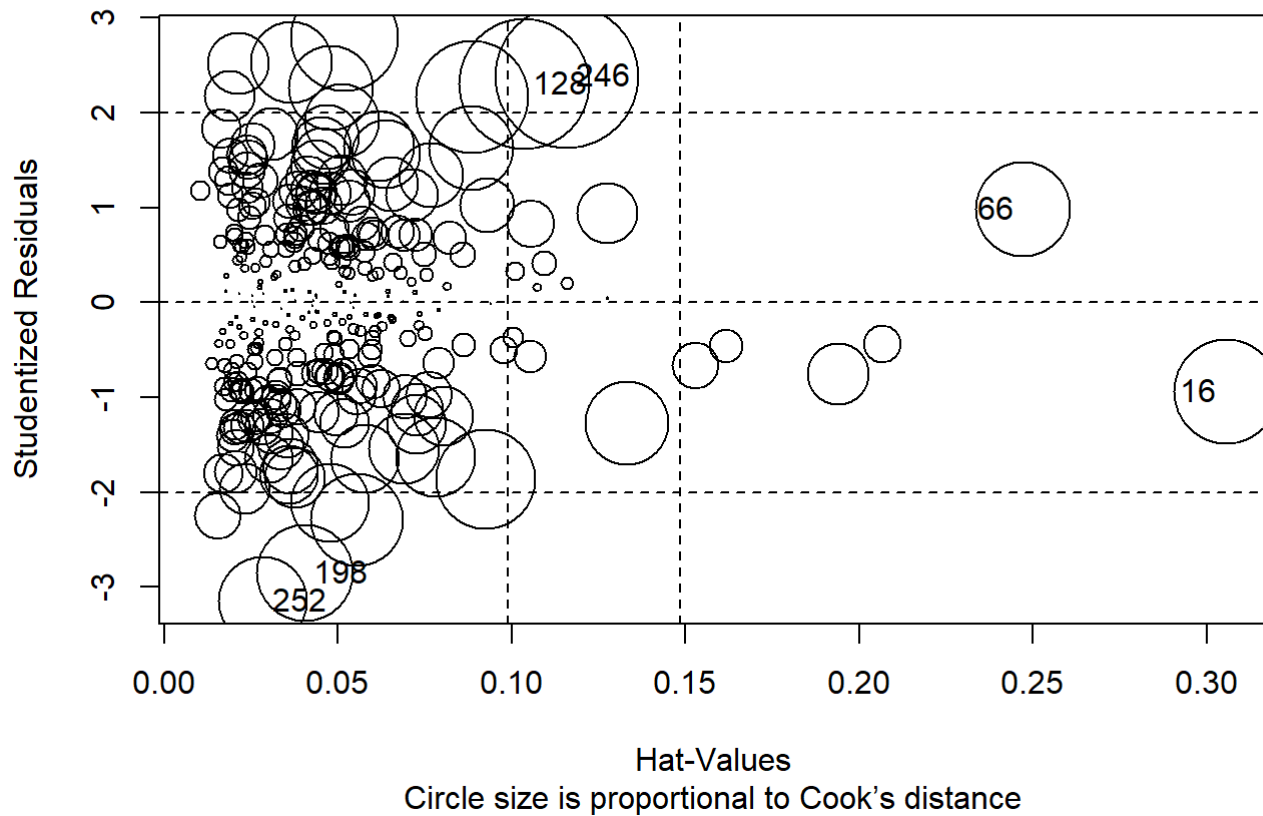
## Influence Plot



##	StudRes	Hat	CookD
## 128	2.791278	0.07456718	0.05103623
## 246	2.374304	0.11493676	0.05998014
## 252	-3.183166	0.02550734	0.02138107
## 277	-1.305121	0.13296805	0.02171235

```
influencePlot(model3, main="Influence Plot", sub="Circle size is proportional to Cook's distance")
```

## Influence Plot

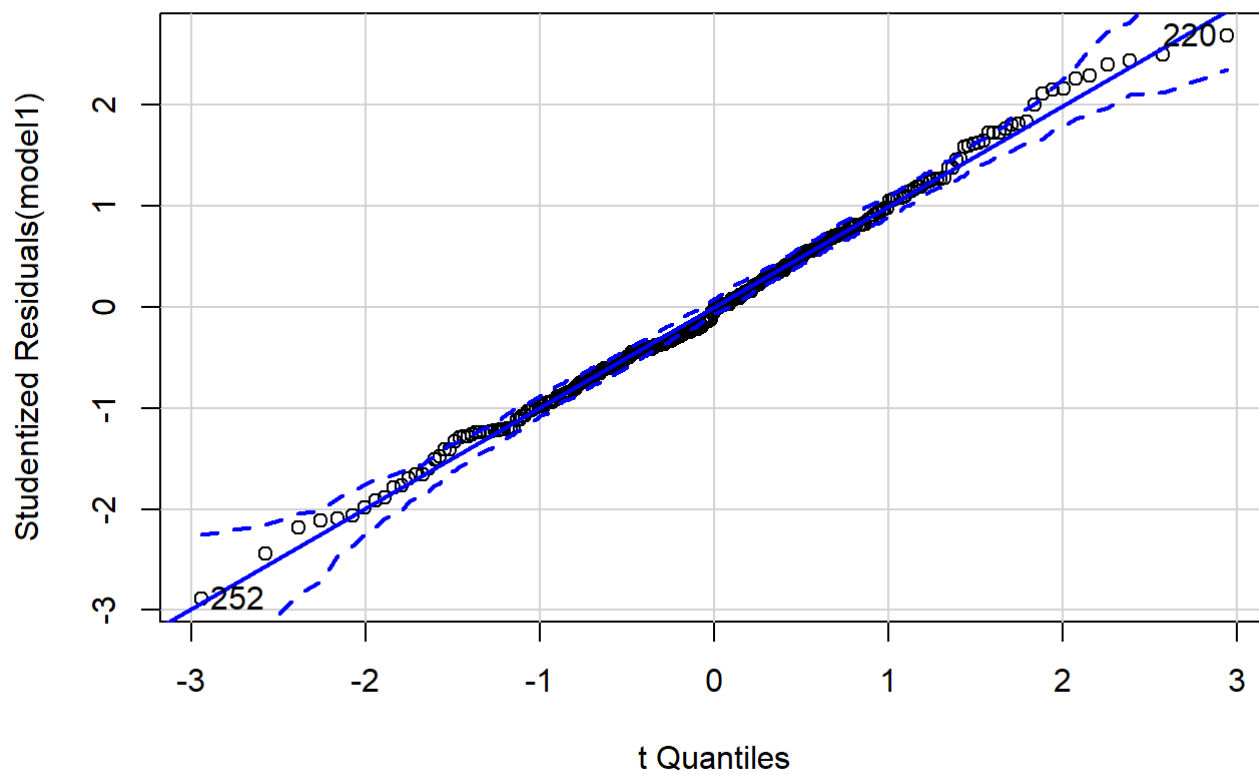


##	StudRes	Hat	CookD
## 16	-0.9381115	0.30549679	0.02766349
## 66	0.9824222	0.24707779	0.02262602
## 128	2.3023026	0.10340082	0.04297681
## 198	-2.8471873	0.04038638	0.02374205
## 246	2.3840589	0.11580305	0.05226130
## 252	-3.1459809	0.02833914	0.01995833

```
qqPlot(model1, labels=row.names(id), id.method="identify", simulate=TRUE, main="Q-Q Plot")
```



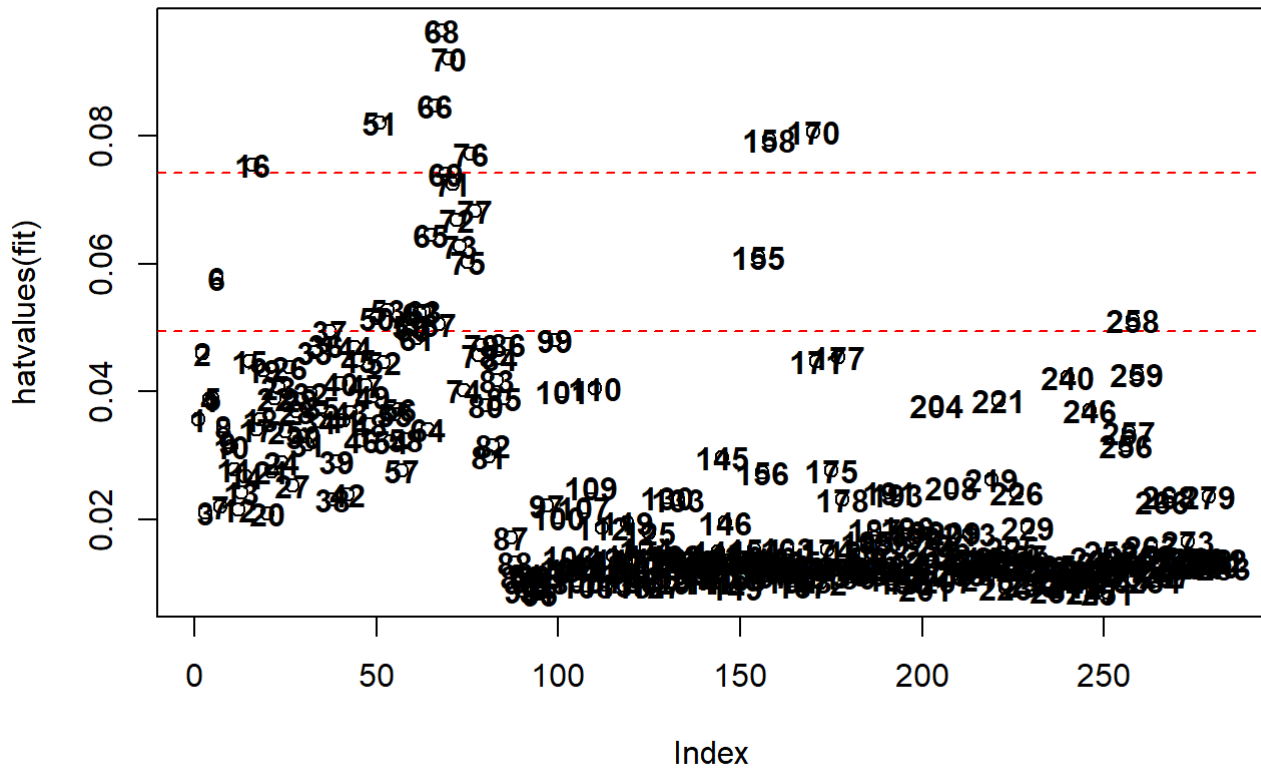
## Q-Q Plot



```
## [1] 220 252
```

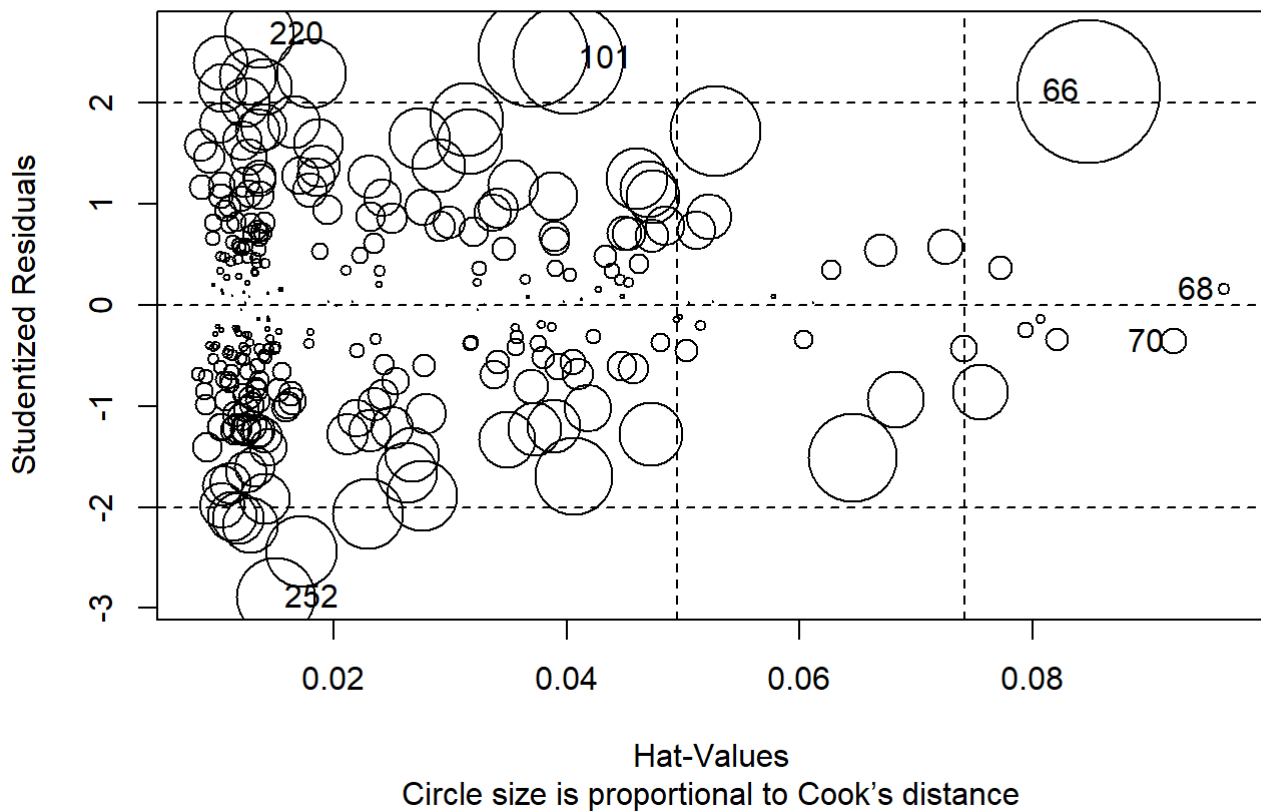
```
highleverage <- function(fit) {
  p <- length(coefficients(fit))
  n <- length(fitted(fit))
  ratio <- p/n
  plot(hatvalues(fit), main="Index Plot of Ratio")
  abline(h=c(2,3)*ratio, col="red", lty=2)
  text(hatvalues(fit), labels=rownames(data), font = 2)
}
highleverage(model1)
```

## Index Plot of Ratio



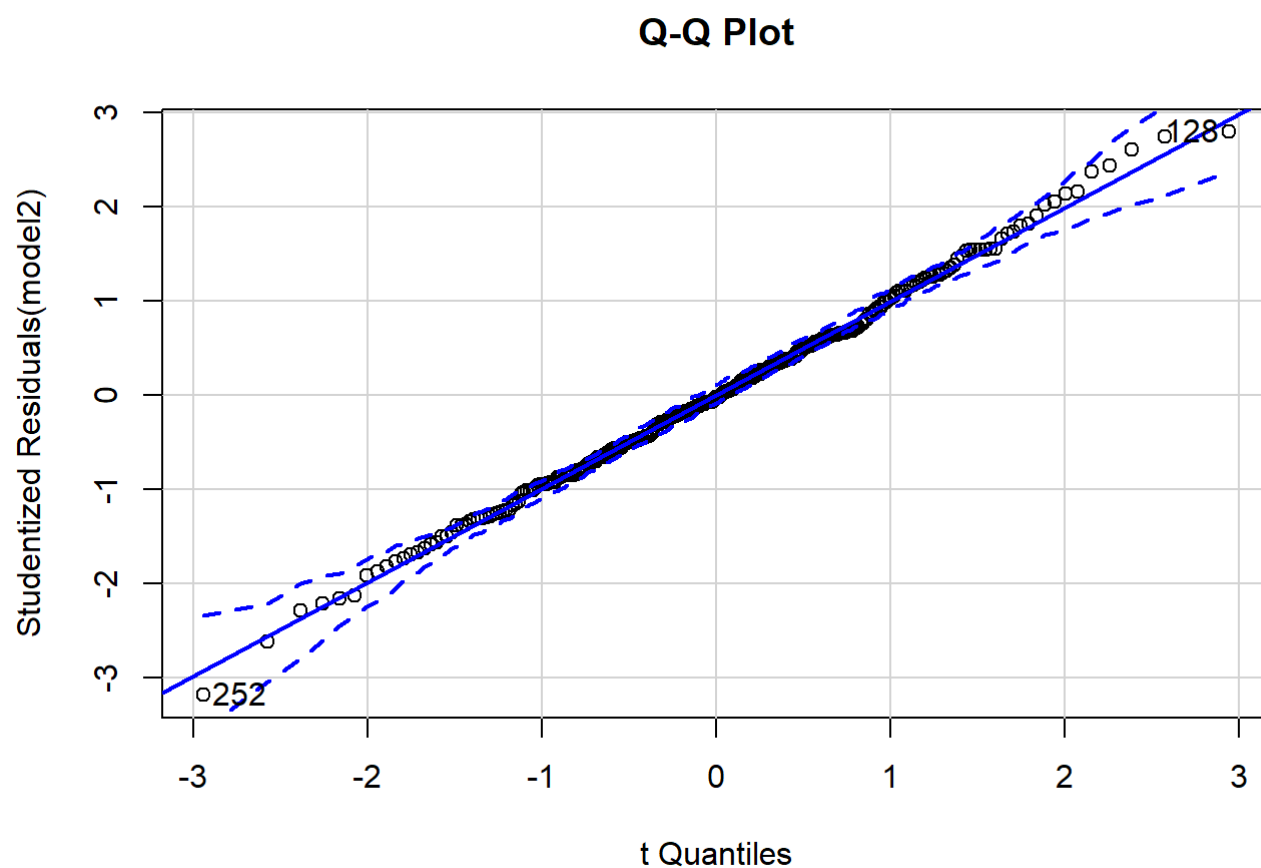
```
influencePlot(model1, main="Influence Plot", sub="Circle size is proportional to Cook's distance")
```

## Influence Plot



##	StudRes	Hat	CookD
## 66	2.1124826	0.08481837	0.0583520737
## 68	0.1571987	0.09643844	0.0003781202
## 70	-0.3572603	0.09213112	0.0018562201
## 101	2.4419736	0.04011204	0.0349701631
## 220	2.6822861	0.01361101	0.0138712169
## 252	-2.8880125	0.01496857	0.0176372373

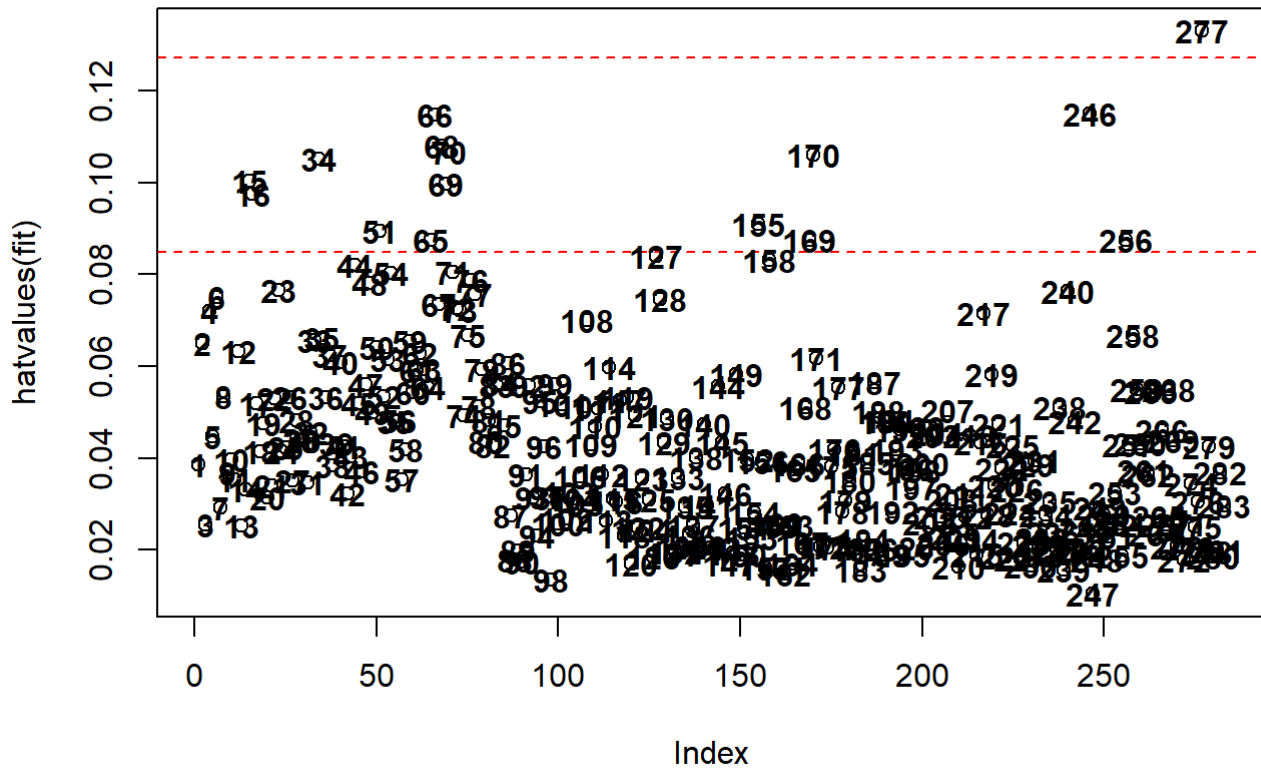
```
qqPlot(model2, labels=row.names(id), id.method="identify", simulate=TRUE, main="Q-Q Plot")
```



```
## [1] 128 252
```

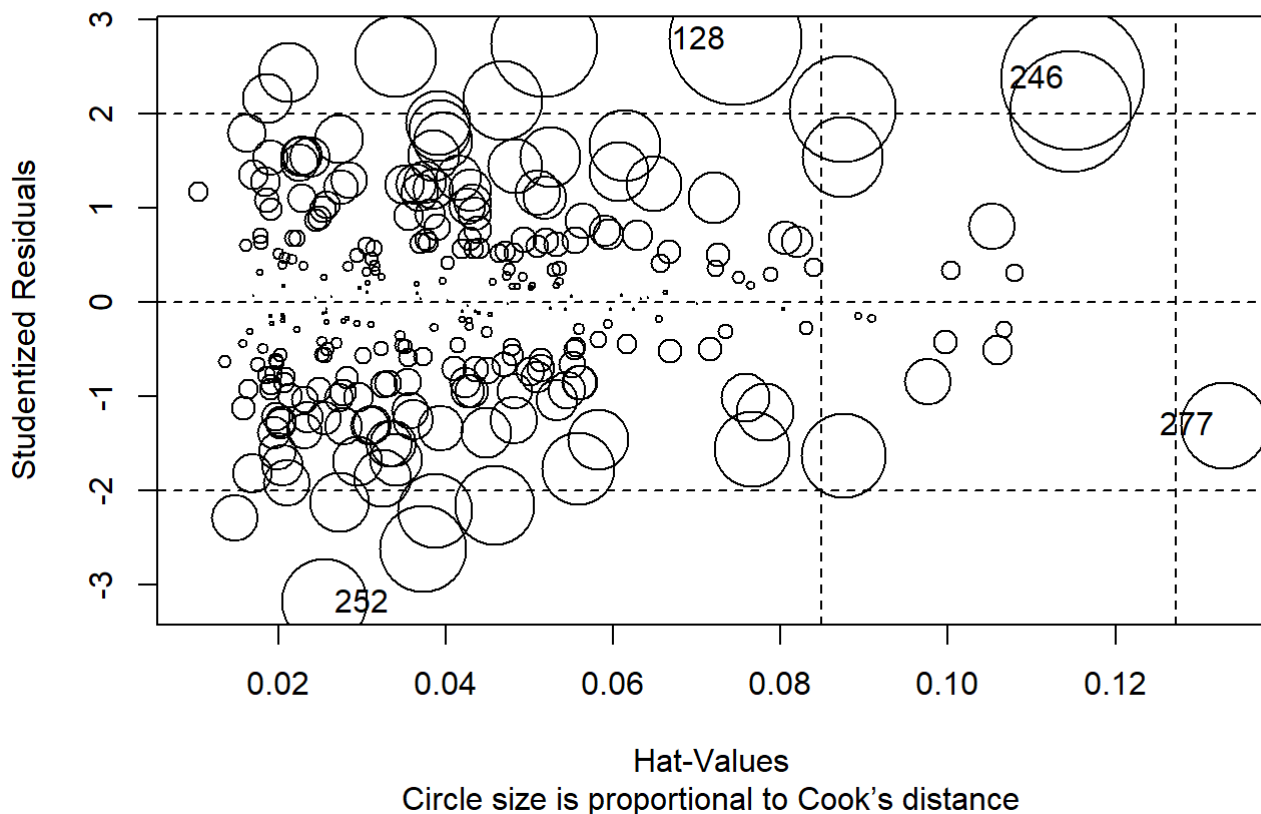
```
highleverage <- function(fit) {
  p <- length(coefficients(fit))
  n <- length(fitted(fit))
  ratio <- p/n
  plot(hatvalues(fit), main="Index Plot of Ratio")
  abline(h=c(2,3)*ratio, col="red", lty=2)
  text(hatvalues(fit), labels=row.names(data), font = 2)
}
highleverage(model2)
```

### Index Plot of Ratio



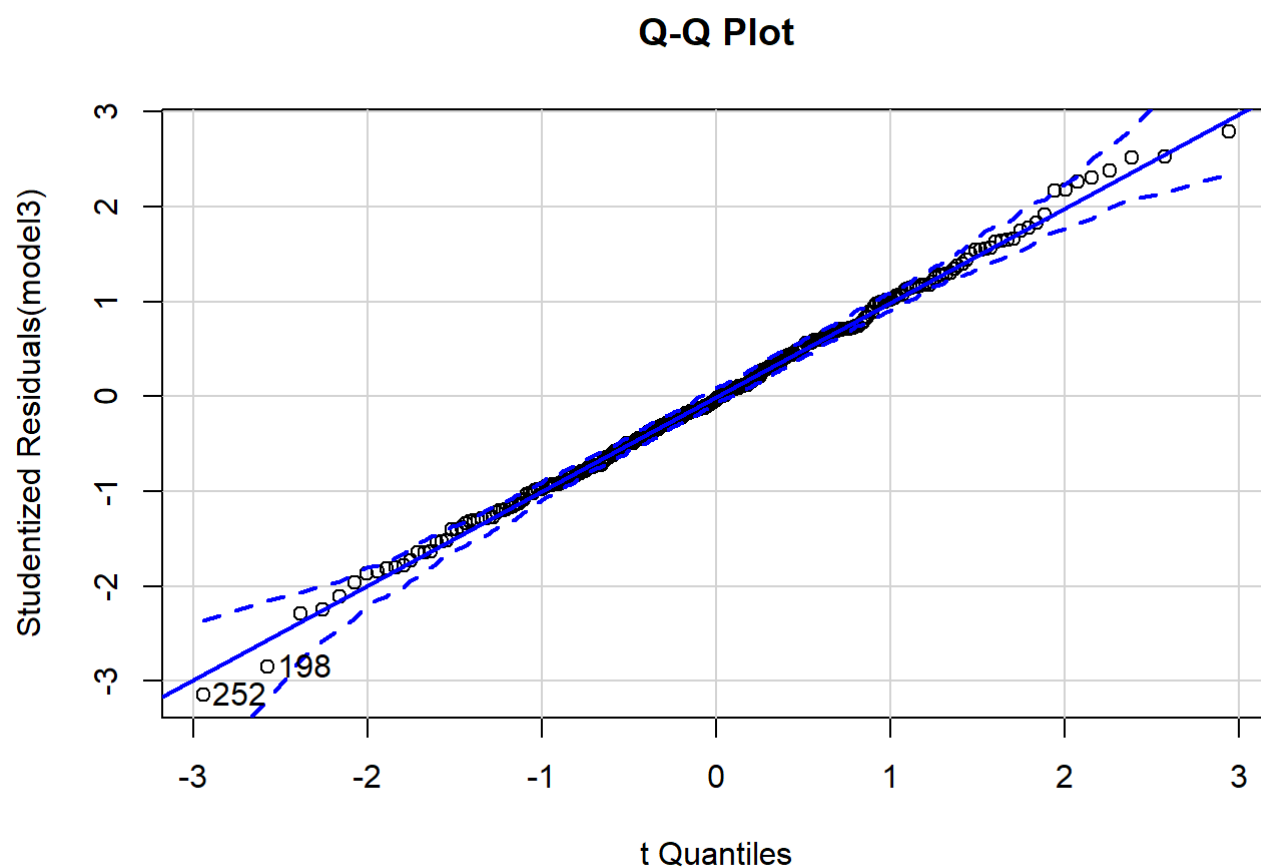
```
influencePlot(model2, main="Influence Plot", sub="Circle size is proportional to Cook's distance")
```

### Influence Plot



```
##      StudRes      Hat      CookD
## 128  2.791278 0.07456718 0.05103623
## 246  2.374304 0.11493676 0.05998014
## 252 -3.183166 0.02550734 0.02138107
## 277 -1.305121 0.13296805 0.02171235
```

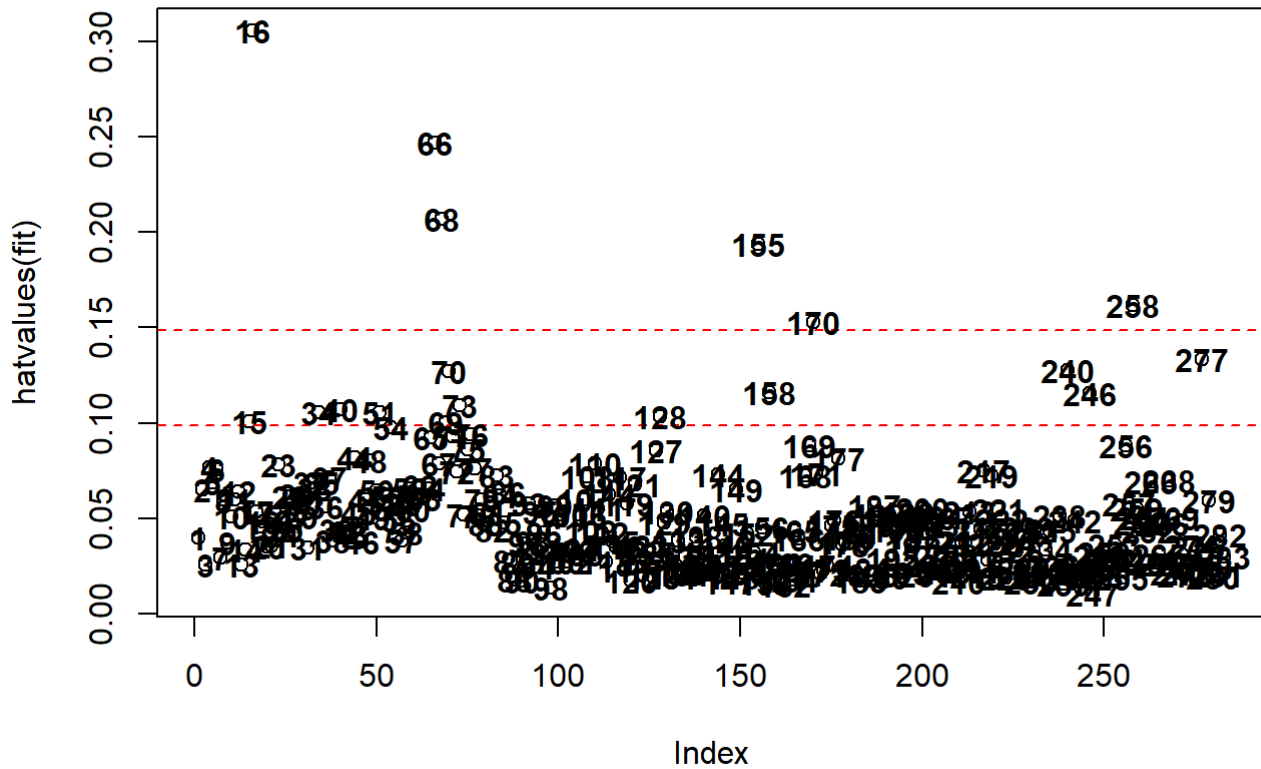
```
qqPlot(model3, labels=row.names(id), id.method="identify", simulate=TRUE, main="Q-Q Plot")
```



```
## [1] 198 252
```

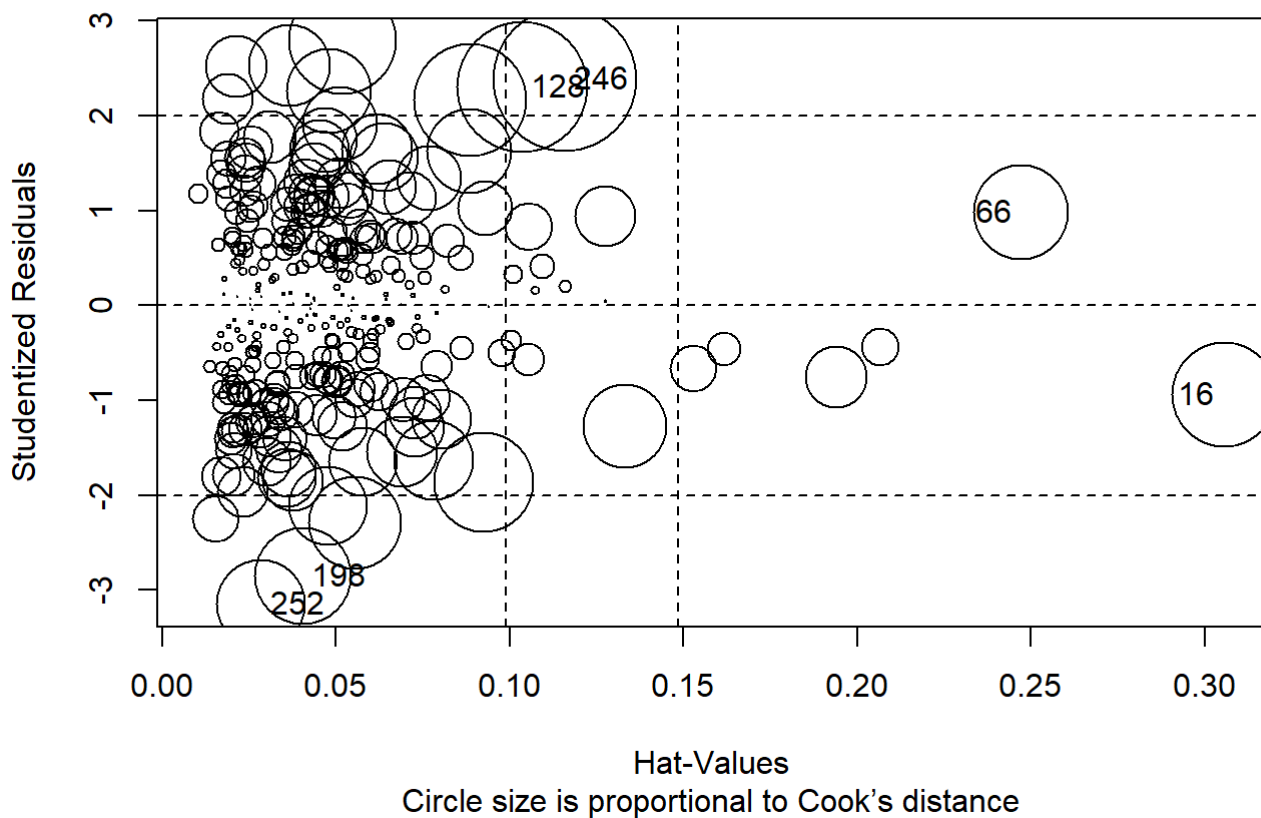
```
highleverage <- function(fit) {
  p <- length(coefficients(fit))
  n <- length(fitted(fit))
  ratio <- p/n
  plot(hatvalues(fit), main="Index Plot of Ratio")
  abline(h=c(2,3)*ratio, col="red", lty=2)
  text(hatvalues(fit), labels=row.names(data), font = 2)
}
highleverage(model3)
```

### Index Plot of Ratio



```
influencePlot(model3, main="Influence Plot", sub="Circle size is proportional to Cook's distance")
```

### Influence Plot



##	StudRes	Hat	CookD
## 16	-0.9381115	0.30549679	0.02766349
## 66	0.9824222	0.24707779	0.02262602
## 128	2.3023026	0.10340082	0.04297681
## 198	-2.8471873	0.04038638	0.02374205
## 246	2.3840589	0.11580305	0.05226130
## 252	-3.1459809	0.02833914	0.01995833

## Without Outliers, High-Leverage, & Influential Cases

```
data2 <- data[-c(101, 252, 169),]  
summary(data2)
```

##	id	gender	age	roles
##	Min. : 1.00	Length:280	Min. :17.00	Length:280
##	1st Qu.: 70.75	Class :character	1st Qu.:19.00	Class :character
##	Median :141.50	Mode :character	Median :21.50	Mode :character
##	Mean :141.66		Mean :26.63	
##	3rd Qu.:212.25		3rd Qu.:31.00	
##	Max. :283.00		Max. :59.00	
##	score	knowledge	attitude	behavior
##	Min. : 39.50	Min. : 25.0	Min. : 15.0	Min. : 30.00
##	1st Qu.: 60.00	1st Qu.: 55.0	1st Qu.: 50.0	1st Qu.: 65.00
##	Median : 67.50	Median : 65.0	Median : 60.0	Median : 75.00
##	Mean : 69.25	Mean : 66.8	Mean : 62.5	Mean : 73.41
##	3rd Qu.: 78.50	3rd Qu.: 80.0	3rd Qu.: 75.0	3rd Qu.: 85.00
##	Max. :100.00	Max. :100.0	Max. :100.0	Max. :100.00
##	familiarity	privacy	extraversion	agreeableness
##	Min. : 25.00	Min. : 30.00	Min. :1.000	Min. :1.000
##	1st Qu.: 72.92	1st Qu.: 80.00	1st Qu.:3.500	1st Qu.:4.500
##	Median : 83.33	Median : 90.00	Median :4.000	Median :5.500
##	Mean : 80.71	Mean : 85.86	Mean :4.138	Mean :5.318
##	3rd Qu.:100.00	3rd Qu.:100.00	3rd Qu.:5.000	3rd Qu.:6.000
##	Max. :100.00	Max. :100.00	Max. :7.000	Max. :7.000
##	conscientiousness	emotionalstability	openness	f1
##	Min. :2.500	Min. :2.00	Min. :1.500	Min. : 0.00
##	1st Qu.:4.500	1st Qu.:4.00	1st Qu.:4.500	1st Qu.: 75.00
##	Median :5.000	Median :4.50	Median :5.500	Median : 75.00
##	Mean :5.132	Mean :4.72	Mean :5.316	Mean : 82.41
##	3rd Qu.:6.000	3rd Qu.:5.50	3rd Qu.:6.000	3rd Qu.:100.00
##	Max. :7.000	Max. :7.00	Max. :7.000	Max. :100.00
##	f2	f3	pr1	pr2
##	Min. : 0.00	Min. : 0.00	Min. : 0.00	Min. : 0.00
##	1st Qu.: 75.00	1st Qu.: 75.00	1st Qu.: 75.00	1st Qu.: 75.00
##	Median : 75.00	Median :100.00	Median : 75.00	Median :100.00
##	Mean : 76.96	Mean : 82.77	Mean : 79.82	Mean : 84.73
##	3rd Qu.:100.00	3rd Qu.:100.00	3rd Qu.:100.00	3rd Qu.:100.00
##	Max. :100.00	Max. :100.00	Max. :100.00	Max. :100.00
##	pr3	pr4	pr5	k1
##	Min. : 0.0	Min. : 0.00	Min. : 0.0	Min. : 0.00
##	1st Qu.: 75.0	1st Qu.:100.00	1st Qu.: 75.0	1st Qu.: 25.00
##	Median :100.0	Median :100.00	Median :100.0	Median : 50.00
##	Mean : 84.2	Mean : 93.04	Mean : 87.5	Mean : 46.79
##	3rd Qu.:100.0	3rd Qu.:100.00	3rd Qu.:100.0	3rd Qu.: 75.00
##	Max. :100.0	Max. :100.00	Max. :100.0	Max. :100.00
##	k2	k3	k4	k5
##	Min. : 0.00	Min. : 0.00	Min. : 0.00	Min. : 0.00
##	1st Qu.: 75.00	1st Qu.: 75.00	1st Qu.: 25.00	1st Qu.: 50.00
##	Median :100.00	Median :100.00	Median : 50.00	Median : 75.00
##	Mean : 82.95	Mean : 84.29	Mean : 46.07	Mean : 73.93
##	3rd Qu.:100.00	3rd Qu.:100.00	3rd Qu.: 75.00	3rd Qu.:100.00
##	Max. :100.00	Max. :100.00	Max. :100.00	Max. :100.00
##	a1	a2	a3	a4
##	Min. : 0.00	Min. : 0.00	Min. : 0.00	Min. : 0.00
##	1st Qu.: 25.00	1st Qu.: 75.00	1st Qu.: 50.00	1st Qu.: 25.00
##	Median : 50.00	Median :100.00	Median : 50.00	Median : 50.00
##	Mean : 51.07	Mean : 80.71	Mean : 60.27	Mean : 42.77
##	3rd Qu.: 75.00	3rd Qu.:100.00	3rd Qu.: 75.00	3rd Qu.: 75.00



```
## Max. :100.00 Max. :100.00 Max. :100.00 Max. :100.00
## a5 b1 b2 b3
## Min. : 0.00 Min. : 0.00 Min. : 0.00 Min. : 0.00
## 1st Qu.: 50.00 1st Qu.: 68.75 1st Qu.: 75.00 1st Qu.: 75.00
## Median : 75.00 Median : 75.00 Median :100.00 Median : 75.00
## Mean : 77.68 Mean : 77.32 Mean : 86.43 Mean : 78.57
## 3rd Qu.:100.00 3rd Qu.:100.00 3rd Qu.:100.00 3rd Qu.:100.00
## Max. :100.00 Max. :100.00 Max. :100.00 Max. :100.00
## b4 b5
## Min. : 0.00 Min. : 0.00
## 1st Qu.: 50.00 1st Qu.: 25.00
## Median : 75.00 Median : 50.00
## Mean : 75.09 Mean : 49.64
## 3rd Qu.:100.00 3rd Qu.: 75.00
## Max. :100.00 Max. :100.00
```

## Model 01: Demographics Only

```
model0b <- lm(score ~ gender + age + roles, data = data2)
summary(model0b)
```

```
##
## Call:
## lm(formula = score ~ gender + age + roles, data = data2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -27.455  -9.518  -1.674   9.551  32.434
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   93.3716     6.0199  15.510 < 2e-16 ***
## gendermale     0.1243     1.5878   0.078 0.937677
## age           -0.5034     0.1384  -3.638 0.000328 ***
## rolesstaff    -2.6556     2.8780  -0.923 0.356959
## rolesstudent -14.8560     3.5990  -4.128 4.86e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 12.99 on 275 degrees of freedom
## Multiple R-squared:  0.06545, Adjusted R-squared:  0.05186
## F-statistic: 4.815 on 4 and 275 DF, p-value: 0.0009075
```

## Model 02: Familiarity

```
model0c <- lm(score ~ gender + age + roles + familiarity, data = data2)
summary(model0c)
```

```
##
## Call:
## lm(formula = score ~ gender + age + roles + familiarity, data = data2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -29.689  -8.448  -1.488   8.826  32.602
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   80.01852     7.14831  11.194 < 2e-16 ***
## gendermale    -0.32182     1.56535  -0.206  0.83726
## age           -0.43465     0.13746  -3.162  0.00174 **
## rolesstaff    -2.80007     2.82714  -0.990  0.32284
## rolesstudent -14.01176     3.54407  -3.954 9.81e-05 ***
## familiarity    0.13875     0.04174   3.324  0.00101 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 12.76 on 274 degrees of freedom
## Multiple R-squared:  0.1017, Adjusted R-squared:  0.08528
## F-statistic: 6.203 on 5 and 274 DF,  p-value: 1.817e-05
```

## Model 1b: Privacy

```
model1b <- lm(score ~ gender + age + roles + familiarity + privacy, data = data2)
summary(model1b)
```

```
##
## Call:
## lm(formula = score ~ gender + age + roles + familiarity + privacy,
##      data = data2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -31.016  -8.509  -0.411   8.484  34.556
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   66.36537     8.67561   7.650 3.47e-13 ***
## gendermale    -0.13503     1.54903  -0.087 0.930601
## age           -0.36037     0.13862  -2.600 0.009841 **
## rolesstaff    -2.40412     2.79870  -0.859 0.391087
## rolesstudent -13.79422     3.50456  -3.936 0.000105 ***
## familiarity    0.11473     0.04220   2.718 0.006980 **
## privacy        0.15481     0.05706   2.713 0.007093 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 12.61 on 273 degrees of freedom
## Multiple R-squared:  0.1253, Adjusted R-squared:  0.106
## F-statistic: 6.515 on 6 and 273 DF,  p-value: 1.927e-06
```

```
lm.beta(model1b)
```

```
##
## Call:
## lm(formula = score ~ gender + age + roles + familiarity + privacy,
##     data = data2)
##
## Standardized Coefficients::
## (Intercept)    gendermale          age    rolesstaff rolesstudent  familiarity
##  0.000000000 -0.00506419  -0.27685103  -0.07021533  -0.47791925   0.15988792
##      privacy
##  0.16934345
```

## Model 2b: Privacy + Big5

```
model2b <- lm(score ~ gender + age + roles + familiarity + privacy + extraversion + agreeable
ness + conscientiousness + emotionalstability + openness, data = data2)
summary(model2b)
```

```
##
## Call:
## lm(formula = score ~ gender + age + roles + familiarity + privacy +
##     extraversion + agreeableness + conscientiousness + emotionalstability +
##     openness, data = data2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -33.356  -8.588  -0.325   7.604  33.897
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    67.83200    9.48756   7.150 8.28e-12 ***
## gendermale     -0.76677    1.56602  -0.490 0.624799
## age            -0.34416    0.13829  -2.489 0.013431 *
## rolesstaff     -2.77278    2.76749  -1.002 0.317290
## rolesstudent  -12.87717    3.46399  -3.717 0.000245 ***
## familiarity     0.09941    0.04363   2.279 0.023475 *
## privacy         0.14847    0.05703   2.604 0.009739 **
## extraversion   -1.46799    0.65989  -2.225 0.026941 *
## agreeableness  -0.92773    0.86110  -1.077 0.282283
## conscientiousness  1.56834    0.87426   1.794 0.073955 .
## emotionalstability  1.36944    0.79269   1.728 0.085217 .
## openness       -0.72560    0.83334  -0.871 0.384691
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 12.4 on 268 degrees of freedom
## Multiple R-squared:  0.1701, Adjusted R-squared:  0.136
## F-statistic: 4.993 on 11 and 268 DF, p-value: 4.518e-07
```

```
lm.beta(model2b)
```

```
##
## Call:
## lm(formula = score ~ gender + age + roles + familiarity + privacy +
##     extraversion + agreeableness + conscientiousness + emotionalstability +
##     openness, data = data2)
##
## Standardized Coefficients::
##      (Intercept)      gendermale          age      rolesstaff
##      0.00000000    -0.02875771    -0.26440075    -0.08098268
##      rolesstudent      familiarity          privacy      extraversion
##      -0.44614668      0.13853703      0.16240736    -0.12969442
##      agreeableness  conscientiousness  emotionalstability      openness
##      -0.07038329      0.12295752      0.12296731    -0.05837435
```

## Model 3b: Privacy x Big5

```
model3b <- lm(score ~ gender + age + roles + familiarity + privacy + extraversion + agreeable
ness*privacy + conscientiousness*privacy + emotionalstability + openness, data = data2)
summary(model3b)
```

```
##
## Call:
## lm(formula = score ~ gender + age + roles + familiarity + privacy +
##     extraversion + agreeableness * privacy + conscientiousness *
##     privacy + emotionalstability + openness, data = data2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -35.534  -8.500  -0.353   8.005  31.862
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    71.46764   25.56331   2.796 0.005556 **
## gendermale     -0.82720    1.54305  -0.536 0.592348
## age            -0.35049    0.13622  -2.573 0.010624 *
## rolesstaff     -2.86702    2.72803  -1.051 0.294236
## rolesstudent  -13.24934    3.41818  -3.876 0.000134 ***
## familiarity     0.09831    0.04321   2.275 0.023696 *
## privacy         0.11305    0.28545   0.396 0.692392
## extraversion   -1.30956    0.65205  -2.008 0.045616 *
## agreeableness  -16.11347    5.04150  -3.196 0.001561 **
## conscientiousness 15.43123    5.40578   2.855 0.004649 **
## emotionalstability 1.63395    0.78508   2.081 0.038366 *
## openness       -0.72602    0.82148  -0.884 0.377608
## privacy:agreeableness 0.16950    0.05579   3.038 0.002615 **
## privacy:conscientiousness -0.15879    0.06174  -2.572 0.010657 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 12.21 on 266 degrees of freedom
## Multiple R-squared:  0.201, Adjusted R-squared:  0.162
## F-statistic: 5.148 on 13 and 266 DF, p-value: 3.629e-08
```

```
lm.beta(model3b)
```

```
##
## Call:
## lm(formula = score ~ gender + age + roles + familiarity + privacy +
##     extraversion + agreeableness * privacy + conscientiousness *
##     privacy + emotionalstability + openness, data = data2)
##
## Standardized Coefficients::
##              (Intercept)              gendermale              age
##              0.00000000              -0.03102441              -0.26926466
##              rolesstaff              rolesstudent              familiarity
##              -0.08373501              -0.45904107              0.13701201
##              privacy              extraversion              agreeableness
##              0.12365891              -0.11569687              -1.22247151
##              conscientiousness              emotionalstability              openness
##              1.20980565              0.14671901              -0.05840817
##      privacy:agreeableness privacy:conscientiousness
##              1.56058559              -1.42143517
```

# Model Comparison

## Model 1b vs Model 2b

```
anova(model1b, model2b)
```

```
## Analysis of Variance Table
##
## Model 1: score ~ gender + age + roles + familiarity + privacy
## Model 2: score ~ gender + age + roles + familiarity + privacy + extraversion +
##     agreeableness + conscientiousness + emotionalstability +
##     openness
##   Res.Df    RSS Df Sum of Sq    F Pr(>F)
## 1      273 43422
## 2      268 41197   5    2225.1 2.895 0.01453 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(model1b, model2b, test="Chisq")
```

```
## Analysis of Variance Table
##
## Model 1: score ~ gender + age + roles + familiarity + privacy
## Model 2: score ~ gender + age + roles + familiarity + privacy + extraversion +
##   agreeableness + conscientiousness + emotionalstability +
##   openness
##   Res.Df    RSS Df Sum of Sq Pr(>Chi)
## 1      273 43422
## 2      268 41197  5    2225.1  0.01286 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

## Model 2b vs Model 3b

```
anova(model2b, model3b)
```

```
## Analysis of Variance Table
##
## Model 1: score ~ gender + age + roles + familiarity + privacy + extraversion +
##   agreeableness + conscientiousness + emotionalstability +
##   openness
## Model 2: score ~ gender + age + roles + familiarity + privacy + extraversion +
##   agreeableness * privacy + conscientiousness * privacy + emotionalstability +
##   openness
##   Res.Df    RSS Df Sum of Sq      F    Pr(>F)
## 1      268 41197
## 2      266 39662  2    1535.1 5.1477 0.006405 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(model2b, model3b, test="Chisq")
```

```
## Analysis of Variance Table
##
## Model 1: score ~ gender + age + roles + familiarity + privacy + extraversion +
##   agreeableness + conscientiousness + emotionalstability +
##   openness
## Model 2: score ~ gender + age + roles + familiarity + privacy + extraversion +
##   agreeableness * privacy + conscientiousness * privacy + emotionalstability +
##   openness
##   Res.Df    RSS Df Sum of Sq Pr(>Chi)
## 1      268 41197
## 2      266 39662  2    1535.1 0.005813 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

## Regression Visualization

### Marginal Effects Plot

```
plot1 <- plot_model(model3b, type = "pred", terms = c("privacy", "agreeableness[1,3,5,7]"), title = "", axis.title = c("Privacy Concerns", "Predicted Security Awareness Score"), legend.title = "Agreeableness", colors = "PRGn") + ylim(0, 100) + aes(linetype=group, color=group)
```

```
## Scale for 'y' is already present. Adding another scale for 'y', which will
## replace the existing scale.
```

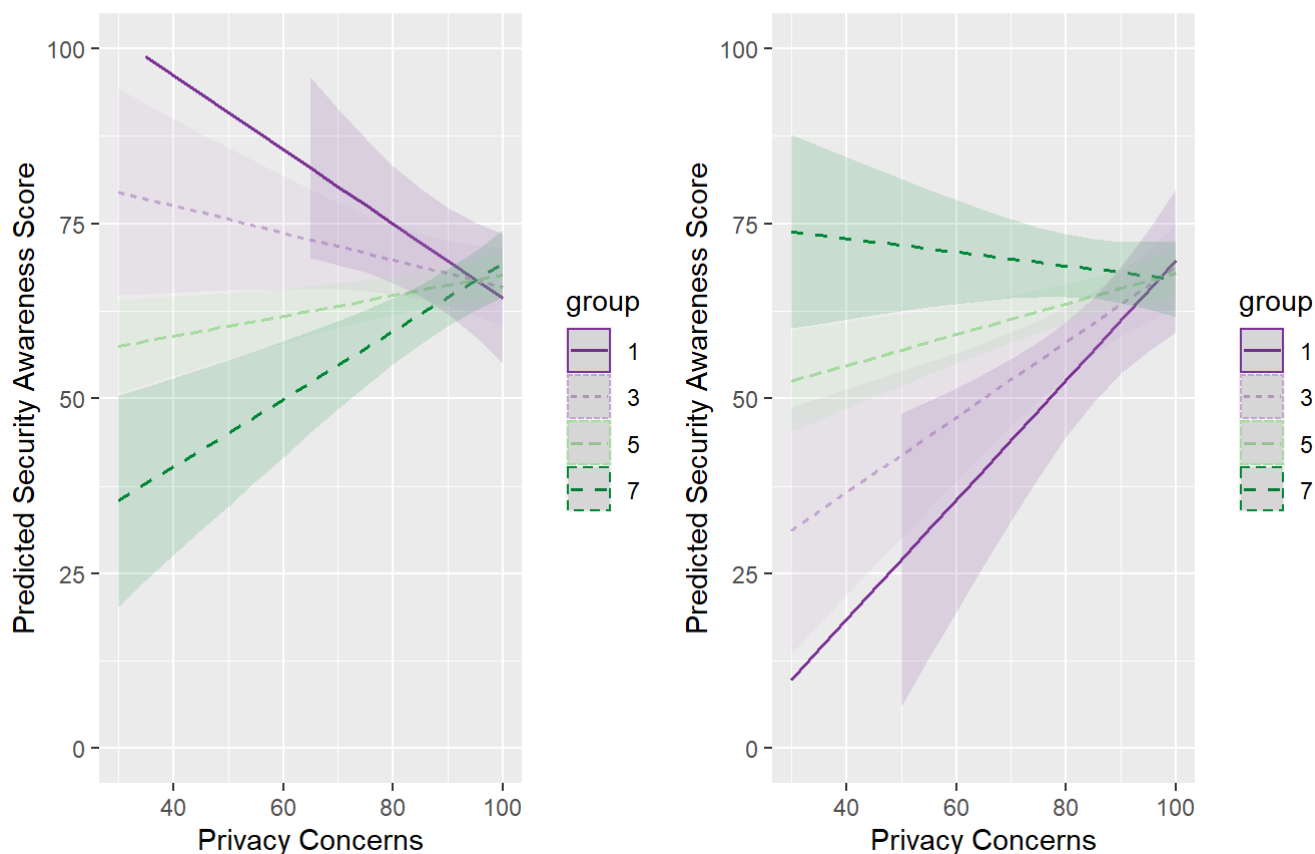
```
plot2 <- plot_model(model3b, type = "pred", terms = c("privacy", "conscientiousness[1,3,5,7]"), title = "", axis.title = c("Privacy Concerns", "Predicted Security Awareness Score"), legend.title = "Conscientiousness", colors = "PRGn") + ylim(0, 100) + aes(linetype=group, color=group)
```

```
## Scale for 'y' is already present. Adding another scale for 'y', which will
## replace the existing scale.
```

```
#plot1
#plot2
fig4 <- grid.arrange(plot1, plot2, ncol=2, top=text_grob("Marginal Effects on SSO Security Awareness Score"))
```

```
## Warning: Removed 1 row(s) containing missing values (geom_path).
```

### Marginal Effects on SSO Security Awareness Score



```
ggsave("fig4.pdf", plot= fig4, dpi="print")
```

```
## Saving 7 x 5 in image
```