Exploring the “psych” package in R

Emily Foreacre & Daniela Cruz Perez

DSS 445- R Statistical Programming Language Fall 2025

What is the “psych” package?

- Developed in 2005 at Northwestern University by William Revelle; originally for psychological and personality research
- Projects supported by psych include SAPA (Synthetic Aperture Personality Assessment) and ICAR (International Cognitive Ability Resource)
- Provides a wide range of functions to support multivariate analysis, IRT (item response theory), scale construction, simulation, reliability, and graphical displays, etc.

Functions and Their Purpose

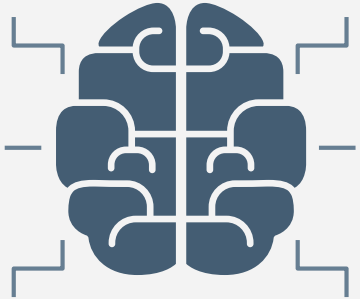
Functions of the psych package

describe()	Descriptive psychometrics statistics
pairs.panels()	Scatterplot Matrix with correlations
corPlot()	Correlation heatmap
fa()	Factor Analysis

Dataset

- The package includes several built-in datasets. We used the bfi dataset (Big Five Inventory) for demonstrating some of the common functions this package can do.
- “25 Personality items representing 5 factors”(Revelle); has 2,800 observations
- “25 personality self report items taken from the International Personality Item Pool (ipip.ori.org) were included as part of the Synthetic Aperture Personality Assessment (SAPA) web based personality assessment project” (Revelle).

Revelle, William. “Psych: Procedures for Psychological, Psychometric, and Personality Research.” *CRAN: Contributed Packages*, May 2007, https://doi.org/10.32614/cran.package.psych.

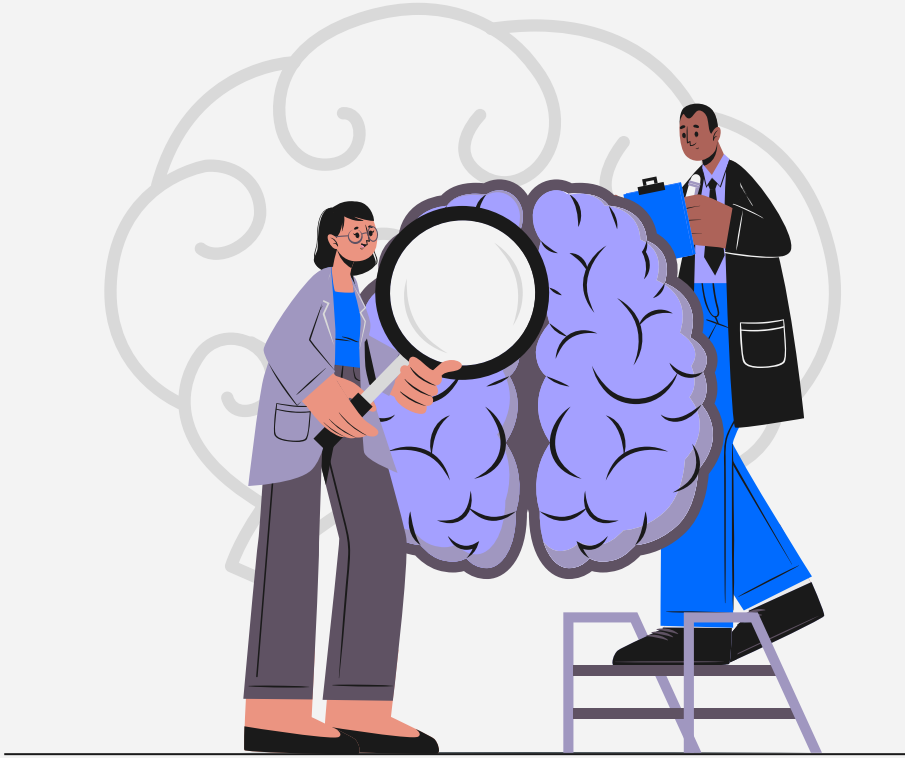


Five Factors:
Agreeableness, Conscientiousness, Extraversion, Neuroticism, and Openness.
Gender: Males = 1, Females =2
Education: 1 = HS, 2 = finished HS, 3 = some college, 4 = college graduate 5 = graduate degree age age in years

head(bfi)

```
> head(bfi)
      A1 A2 A3 A4 A5 C1 C2 C3 C4 C5 E1 E2 E3 E4 E5 N1 N2 N3 N4 N5 O1 O2 O3 O4 O5 gender education age
61617  2  4  3  4  4  2  3  3  4  4  3  3  3  4  4  3  4  2  2  3  3  6  3  4  3      1        NA  16
61618  2  4  5  2  5  5  4  4  3  4  1  1  6  4  3  3  3  3  5  5  4  2  4  3  3      2        NA  18
61620  5  4  5  4  4  4  5  4  2  5  2  4  4  4  5  4  5  4  2  3  4  2  5  5  2      2        NA  17
61621  4  4  6  5  5  4  4  3  5  5  5  3  4  4  4  2  5  2  4  1  3  3  4  3  5      2        NA  17
61622  2  3  3  4  5  4  4  5  3  2  2  2  5  4  5  2  3  4  4  3  3  3  4  3  3      1        NA  17
61623  6  6  5  6  5  6  6  6  1  3  2  1  6  5  6  3  5  2  2  3  4  3  5  6  1      2         3  21
> 
```

Demo



> describe(bfi)

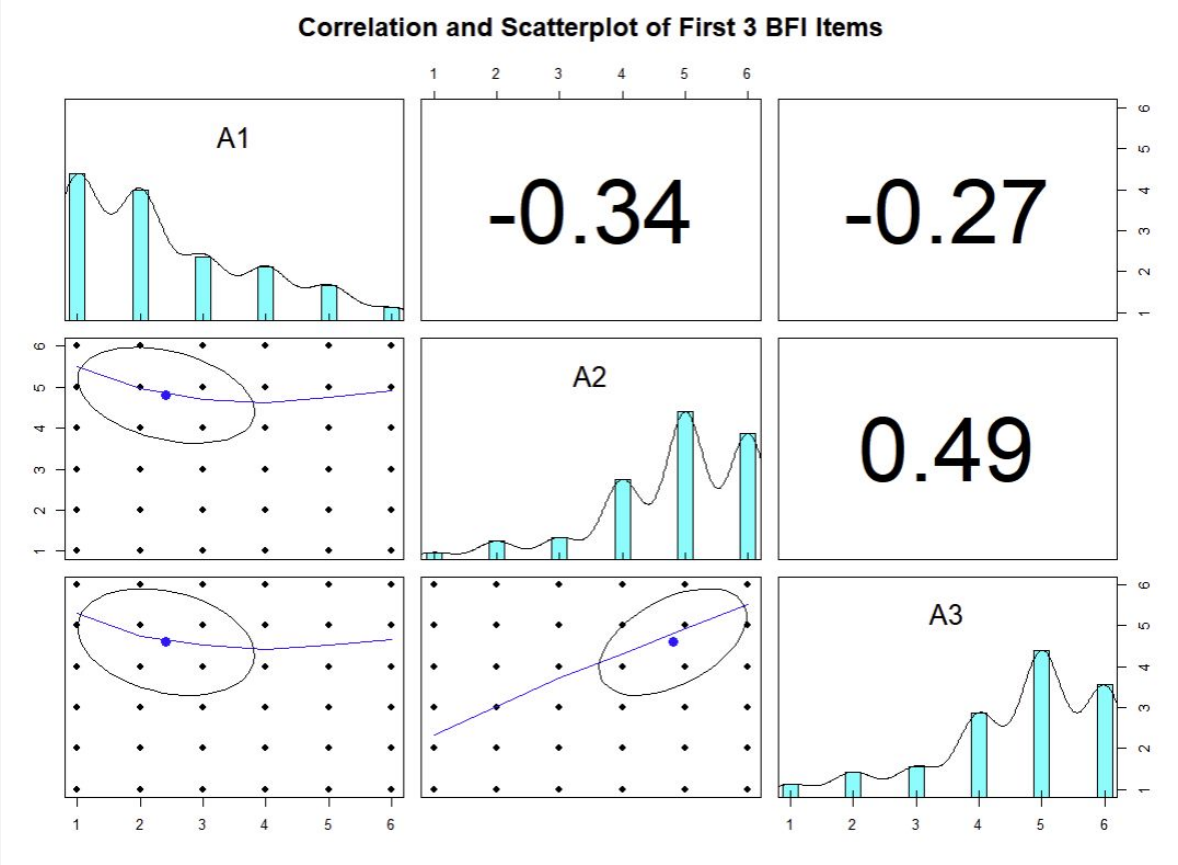
```
> describe(bfi)
          vars    n  mean    sd median trimmed   mad min max range  skew kurtosis   se
A1           1 2784  2.41  1.41      2    2.23  1.48   1   6     5  0.83    -0.31 0.03
A2           2 2773  4.80  1.17      5    4.98  1.48   1   6     5 -1.12     1.05 0.02
A3           3 2774  4.60  1.30      5    4.79  1.48   1   6     5 -1.00     0.44 0.02
A4           4 2781  4.70  1.48      5    4.93  1.48   1   6     5 -1.03     0.04 0.03
A5           5 2784  4.56  1.26      5    4.71  1.48   1   6     5 -0.85     0.16 0.02
C1           6 2779  4.50  1.24      5    4.64  1.48   1   6     5 -0.85     0.30 0.02
C2           7 2776  4.37  1.32      5    4.50  1.48   1   6     5 -0.74    -0.14 0.03
C3           8 2780  4.30  1.29      5    4.42  1.48   1   6     5 -0.69    -0.13 0.02
C4           9 2774  2.55  1.38      2    2.41  1.48   1   6     5  0.60    -0.62 0.03
C5          10 2784  3.30  1.63      3    3.25  1.48   1   6     5  0.07    -1.22 0.03
E1          11 2777  2.97  1.63      3    2.86  1.48   1   6     5  0.37    -1.09 0.03
E2          12 2784  3.14  1.61      3    3.06  1.48   1   6     5  0.22    -1.15 0.03
E3          13 2775  4.00  1.35      4    4.07  1.48   1   6     5 -0.47    -0.47 0.03
E4          14 2791  4.42  1.46      5    4.59  1.48   1   6     5 -0.82    -0.30 0.03
E5          15 2779  4.42  1.33      5    4.56  1.48   1   6     5 -0.78    -0.09 0.03
N1          16 2778  2.93  1.57      3    2.82  1.48   1   6     5  0.37    -1.01 0.03
N2          17 2779  3.51  1.53      4    3.51  1.48   1   6     5 -0.08    -1.05 0.03
N3          18 2789  3.22  1.60      3    3.16  1.48   1   6     5  0.15    -1.18 0.03
N4          19 2764  3.19  1.57      3    3.12  1.48   1   6     5  0.20    -1.09 0.03
N5          20 2771  2.97  1.62      3    2.85  1.48   1   6     5  0.37    -1.06 0.03
O1          21 2778  4.82  1.13      5    4.96  1.48   1   6     5 -0.90     0.43 0.02
O2          22 2800  2.71  1.57      2    2.56  1.48   1   6     5  0.59    -0.81 0.03
O3          23 2772  4.44  1.22      5    4.56  1.48   1   6     5 -0.77     0.30 0.02
O4          24 2786  4.89  1.22      5    5.10  1.48   1   6     5 -1.22     1.08 0.02
O5          25 2780  2.49  1.33      2    2.34  1.48   1   6     5  0.74    -0.24 0.03
gender      26 2800  1.67  0.47      2    1.71  0.00   1   2     1 -0.73    -1.47 0.01
education   27 2577  3.19  1.11      3    3.22  1.48   1   5     4 -0.05    -0.32 0.02
age         28 2800 28.78 11.13     26   27.43 10.38   3  86    83  1.02     0.56 0.21
>
```

vars n mean sd median trimmed mad min max range skew kurtosis se

```
> corPlot(bfi[,1:5])
```

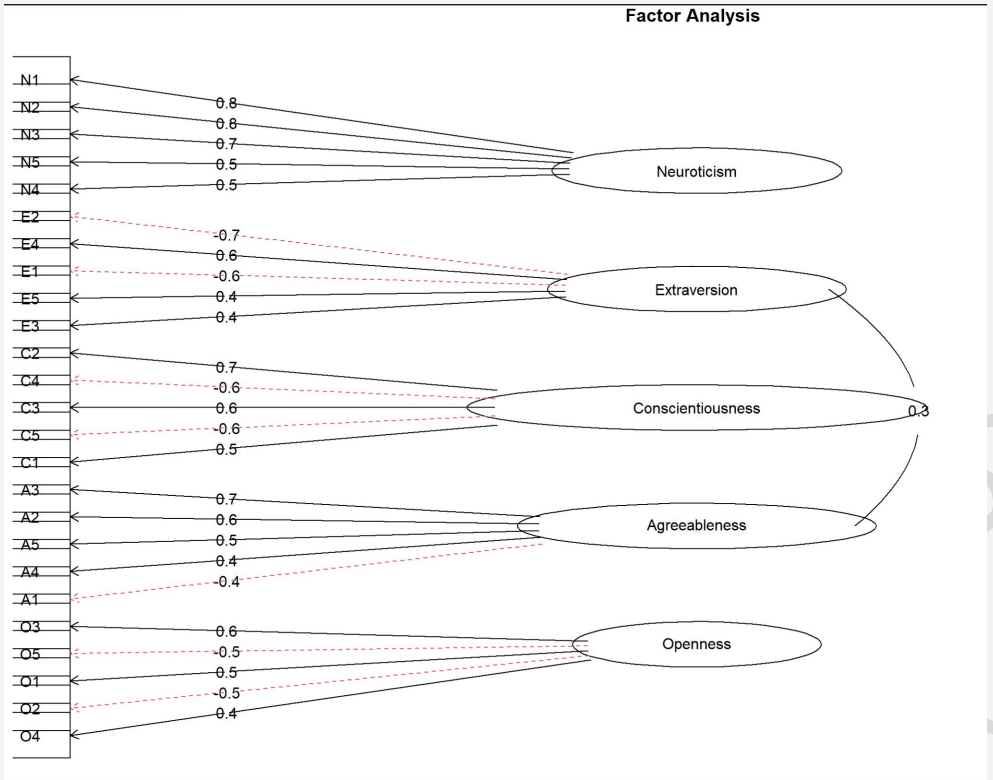
pairs.panels()

```
pairs.panels(bfi[,1:3],
             col = "blue",
             pch = 19,
             main = "Correlation and
Scatterplot of First 3 BFI Items")
```



Factor Analysis to identify the latent structure

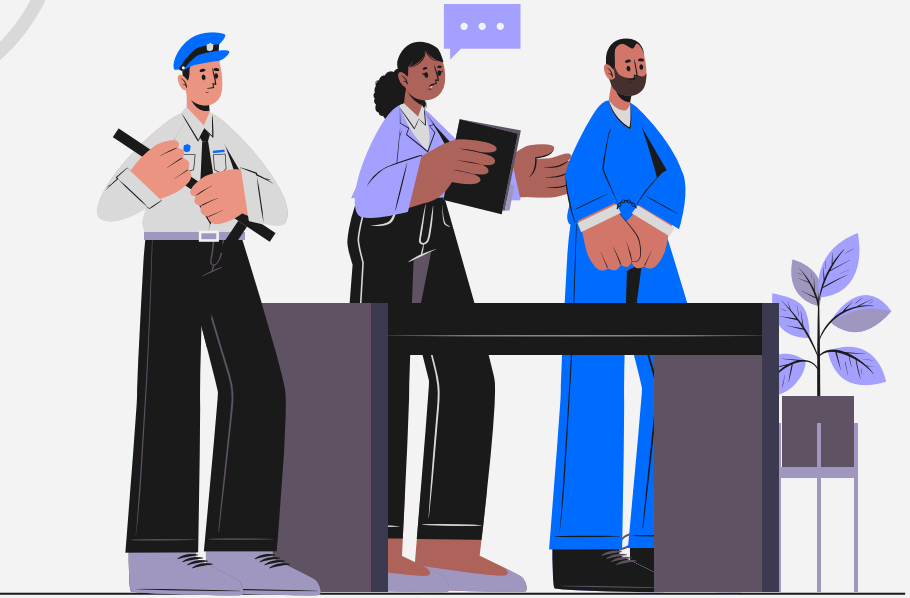
```
bfi_items <- bfi[,1:25]

fa_result <- fa(bfi_items, nfactors = 5)

colnames(fa_result$loadings) <-
c("Neuroticism", "Extraversion",
"Conscientiousness", "Agreeableness",
"Openness")

fa.diagram(fa_result)
```



Estimated individual trait score

colnames(fa_result$scores) <- c("Neuroticism", "Extraversion", "Conscientiousness", "Agreeableness", "Openness")
trait_scores <- fa_result$scores
trait_scores

	Neuroticism	Extraversion	Conscientiousness	Agreeableness	Openness
61617	-2.141094e-01	0.0692467477	-1.3320885970	-8.536473e-01	-1.5809243884
61618	1.500846e-01	0.4813972942	-0.5995026202	-8.478873e-02	-0.1876069640
61620	6.282795e-01	0.1096416172	-0.0480081594	-5.561687e-01	0.2502734630
61621	-9.425827e-02	0.0383648878	-1.0508953868	-1.039494e-01	-1.1000032084
61622	-1.636842e-01	0.4425365741	-0.1051966862	-7.185746e-01	-0.6612202705
61623	1.898431e-01	1.0843917718	1.4073083518	3.927879e-01	0.6222355861
61624	-1.241412e+00	0.1886179990	0.1905076189	1.021868e-03	0.7533292597
61629	5.801696e-01	-1.5721118666	-1.1349511809	-2.215361e+00	-0.8062804199
61630	NA	NA	NA	NA	NA
61633	8.372097e-01	0.6284452054	1.1626863901	5.634071e-01	0.4001811628
61634	-1.073190e-01	0.2949940604	-0.1598366878	-3.288200e-02	-0.2398161287
61636	NA	NA	NA	NA	NA
61637	-1.185482e+00	-0.4075190488	0.1800566224	-4.293320e-01	-0.1915942965



Thank you

Questions?

[redacted] [sqo](),