IADQ Psychometric Analysis: Reproducible Report

Contents

1 Settings

1.1 Clear working environment

```
rm(list = ls())
```

1.2 Required package

lavaan and semTools : Perform confirmatory factor analysis and measure composite reliability.

robustbase and car : Perform univariate and multivariate regression.

dplyr and psych : Perform corrected item-total correlations.

```
packages <- c("lavaan","semTools","robustbase","car","dplyr","psych")

for (package in packages) {

  if (!requireNamespace(package, quietly = TRUE))
    install.packages(package)

  suppressPackageStartupMessages(library(package, character.only = TRUE))

}
```

```
## Warning: package 'lavaan' was built under R version 4.4.3

## Warning: package 'semTools' was built under R version 4.4.3

## Warning: package 'robustbase' was built under R version 4.4.3

## Warning: package 'psych' was built under R version 4.4.3
```

1.3 Import and inspect data attributes

```
# load the data file
IADQ <- read.csv("IADQ dataset.csv")

attributes(IADQ)[names(attributes(IADQ)) != "row.names"]
```

```
## $names
##  [1] "ID"                           "Center...Ward"
##  [3] "Responder.is"                 "Age..Years."
##  [5] "Sex"                          "Ethnicity"
##  [7] "Province"                     "Marrital.status"
##  [9] "Educational.level"            "Residence"
## [11] "Housing"                      "Smoking"
## [13] "ajd1"                         "ajd2"
## [15] "ajd3"                         "ajd4"
## [17] "ajd5"                         "ajd6"
## [19] "ajd7"                         "ajd8"
## [21] "ajd9"                         "se"
## [23] "ajd10"                        "ajd11"
## [25] "ajd12"                        "ajd13"
## [27] "ajd14"                        "ajd15"
## [29] "preoc"                        "fta"
## [31] "total"                        "ajd17"
## [33] "ajd18"                        "ajd19"
## [35] "im"                           "ajd10e"
## [37] "ajd11e"                       "ajd12e"
## [39] "ajd13e"                       "ajd14e"
## [41] "ajd15e"                       "ajd17e"
## [43] "ajd18e"                       "ajd19e"
## [45] "Stressors.Endorsement"        "Preoccupation.Endorsement"
## [47] "Failure.to.adapt.Endorsement" "ajd16"
## [49] "Impairment.Endorsement"       "AjD.status.w.o.exclusion"
## [51] "GAD7.Q1"                      "GAD7.Q2"
## [53] "GAD7.Q3"                      "GAD7.Q4"
## [55] "GAD7.Q5"                      "GAD7.Q6"
## [57] "GAD7.Q7"                      "gad7"
## [59] "PHQ9.Q1"                      "PHQ9.Q2"
## [61] "PHQ9.Q3"                      "PHQ9.Q4"
## [63] "PHQ9.Q5"                      "PHQ9.Q6"
## [65] "PHQ9.Q7"                      "PHQ9.Q8"
## [67] "PHQ9.Q9"                      "phq9"
##
## $class
## [1] "data.frame"
```

2 Confirmatory factor analysis for continous scales

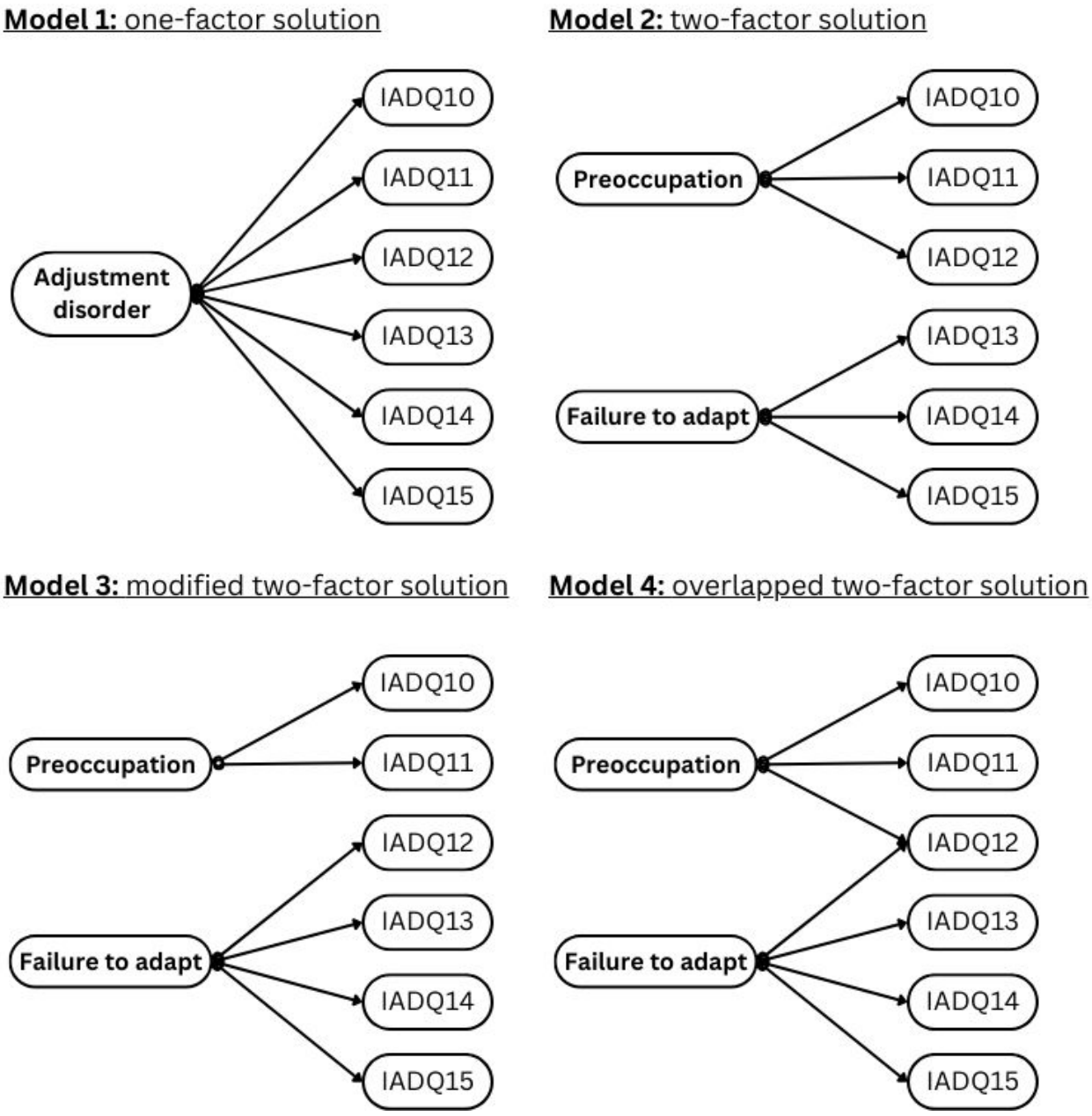

Figure 1: CFA models

2.1 Model 1: 1-factor solution

```
cont_mod1 <-'f =~ ajd10 + ajd11 + ajd12 + ajd13 + ajd14 + ajd15'
cont_mod1_fit <- cfa(cont_mod1,
                     data = IADQ,
                     estimator = "MLR"
                     )
summary(cont_mod1_fit,
        standardized = TRUE,
        fit.measures = TRUE
        )
```

```
## lavaan 0.6-20 ended normally after 27 iterations
##
##   Estimator                                         ML
##   Optimization method                           NLMINB
##   Number of model parameters                        12
##
##   Number of observations                           183
##
## Model Test User Model:
##                                              Standard      Scaled
##   Test Statistic                               42.256      40.192
##   Degrees of freedom                                9           9
##   P-value (Chi-square)                          0.000       0.000
##   Scaling correction factor                                 1.051
##     Yuan-Bentler correction (Mplus variant)
##
## Model Test Baseline Model:
##
##   Test statistic                              358.858     289.768
##   Degrees of freedom                               15          15
##   P-value                                       0.000       0.000
##   Scaling correction factor                                 1.238
##
## User Model versus Baseline Model:
##
##   Comparative Fit Index (CFI)                   0.903       0.886
##   Tucker-Lewis Index (TLI)                      0.839       0.811
##
##   Robust Comparative Fit Index (CFI)                        0.904
##   Robust Tucker-Lewis Index (TLI)                           0.839
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)              -1693.439   -1693.439
##   Scaling correction factor                                 0.980
##       for the MLR correction
##   Loglikelihood unrestricted model (H1)      -1672.311   -1672.311
##   Scaling correction factor                                 1.010
##       for the MLR correction
##
##   Akaike (AIC)                                3410.879    3410.879
```

```
##   Bayesian (BIC)                                 3449.392    3449.392
##   Sample-size adjusted Bayesian (SABIC)          3411.386    3411.386
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                             0.142       0.138
##   90 Percent confidence interval - lower            0.101       0.097
##   90 Percent confidence interval - upper            0.187       0.181
##   P-value H_0: RMSEA <= 0.050                       0.000       0.000
##   P-value H_0: RMSEA >= 0.080                       0.992       0.989
##
##   Robust RMSEA                                                  0.141
##   90 Percent confidence interval - lower                        0.098
##   90 Percent confidence interval - upper                        0.187
##   P-value H_0: Robust RMSEA <= 0.050                            0.000
##   P-value H_0: Robust RMSEA >= 0.080                            0.989
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                              0.067       0.067
##
## Parameter Estimates:
##
##   Standard errors                               Sandwich
##   Information bread                             Observed
##   Observed information based on                  Hessian
##
## Latent Variables:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   f =~
##     ajd10            1.000                               0.663    0.530
##     ajd11            1.069    0.130    8.249    0.000    0.709    0.537
##     ajd12            1.117    0.201    5.553    0.000    0.741    0.546
##     ajd13            1.298    0.239    5.420    0.000    0.861    0.666
##     ajd14            1.520    0.289    5.269    0.000    1.008    0.781
##     ajd15            1.610    0.278    5.787    0.000    1.068    0.803
##
## Variances:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .ajd10            1.128    0.129    8.757    0.000    1.128    0.720
##    .ajd11            1.238    0.144    8.626    0.000    1.238    0.711
##    .ajd12            1.296    0.139    9.320    0.000    1.296    0.702
##    .ajd13            0.929    0.145    6.424    0.000    0.929    0.556
##    .ajd14            0.649    0.123    5.277    0.000    0.649    0.390
##    .ajd15            0.629    0.130    4.852    0.000    0.629    0.356
##     f                0.440    0.140    3.140    0.002    1.000    1.000
```

2.2 Model 2: 2-factor solution

```
cont_mod2 <- 'f1 =~ ajd10 + ajd11 + ajd12
              f2 =~ ajd13 + ajd14 + ajd15
              #Correlation between factors
              f1 ~~ f2'
cont_mod2_fit <- cfa(cont_mod2,
                     data = IADQ,
                     estimator = "MLR"
                     )
summary(cont_mod2_fit,
        standardized = TRUE,
        fit.measures = TRUE
        )
```

```
## lavaan 0.6-20 ended normally after 28 iterations
##
##   Estimator                                         ML
##   Optimization method                           NLMINB
##   Number of model parameters                        13
##
##   Number of observations                           183
##
## Model Test User Model:
##                                              Standard      Scaled
##   Test Statistic                               17.567      17.229
##   Degrees of freedom                                8           8
##   P-value (Chi-square)                          0.025       0.028
##   Scaling correction factor                                 1.020
##     Yuan-Bentler correction (Mplus variant)
##
## Model Test Baseline Model:
##
##   Test statistic                              358.858     289.768
##   Degrees of freedom                               15          15
##   P-value                                       0.000       0.000
##   Scaling correction factor                                 1.238
##
## User Model versus Baseline Model:
##
##   Comparative Fit Index (CFI)                   0.972       0.966
##   Tucker-Lewis Index (TLI)                      0.948       0.937
##
##   Robust Comparative Fit Index (CFI)                        0.972
##   Robust Tucker-Lewis Index (TLI)                           0.948
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)              -1681.095   -1681.095
##   Scaling correction factor                                 1.005
##       for the MLR correction
##   Loglikelihood unrestricted model (H1)      -1672.311   -1672.311
##   Scaling correction factor                                 1.010
```

```
##       for the MLR correction
##
##   Akaike (AIC)                                3388.189    3388.189
##   Bayesian (BIC)                              3429.912    3429.912
##   Sample-size adjusted Bayesian (SABIC)       3388.739    3388.739
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.081       0.079
##   90 Percent confidence interval - lower         0.027       0.026
##   90 Percent confidence interval - upper         0.133       0.131
##   P-value H_0: RMSEA <= 0.050                    0.141       0.150
##   P-value H_0: RMSEA >= 0.080                    0.560       0.541
##
##   Robust RMSEA                                                0.080
##   90 Percent confidence interval - lower                      0.025
##   90 Percent confidence interval - upper                      0.133
##   P-value H_0: Robust RMSEA <= 0.050                          0.149
##   P-value H_0: Robust RMSEA >= 0.080                          0.552
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.047       0.047
##
## Parameter Estimates:
##
##   Standard errors                             Sandwich
##   Information bread                           Observed
##   Observed information based on                Hessian
##
## Latent Variables:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   f1 =~
##     ajd10             1.000                               0.857    0.684
##     ajd11             1.074    0.126    8.506    0.000    0.920    0.697
##     ajd12             0.912    0.188    4.843    0.000    0.782    0.575
##   f2 =~
##     ajd13             1.000                               0.842    0.652
##     ajd14             1.244    0.160    7.774    0.000    1.048    0.812
##     ajd15             1.305    0.174    7.517    0.000    1.099    0.826
##
## Covariances:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   f1 ~~
##     f2                0.516    0.106    4.855    0.000    0.715    0.715
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .ajd10             0.834    0.157    5.321    0.000    0.834    0.532
##    .ajd11             0.894    0.164    5.467    0.000    0.894    0.514
##    .ajd12             1.234    0.163    7.583    0.000    1.234    0.669
##    .ajd13             0.961    0.148    6.476    0.000    0.961    0.576
##    .ajd14             0.568    0.118    4.806    0.000    0.568    0.341
##    .ajd15             0.561    0.126    4.459    0.000    0.561    0.317
```

```
##     f1                0.734    0.173    4.252    0.000    1.000    1.000
##     f2                0.709    0.169    4.203    0.000    1.000    1.000
```

2.3 Model 3: modified 2-factor solution

```
cont_mod3 <- 'f1 =~ ajd10 + ajd11
              f2 =~ ajd12 + ajd13 + ajd14 + ajd15
              #Correlation between factors
              f1 ~~ f2'
cont_mod3_fit <- cfa(cont_mod3,
                     data = IADQ,
                     estimator = "MLR"
                     )
summary(cont_mod3_fit,
        standardized = TRUE,
        fit.measures = TRUE
        )
```

```
## lavaan 0.6-20 ended normally after 33 iterations
##
##   Estimator                                         ML
##   Optimization method                           NLMINB
##   Number of model parameters                        13
##
##   Number of observations                           183
##
## Model Test User Model:
##                                               Standard      Scaled
##   Test Statistic                                17.253      16.424
##   Degrees of freedom                                 8           8
##   P-value (Chi-square)                           0.028       0.037
##   Scaling correction factor                                  1.050
##     Yuan-Bentler correction (Mplus variant)
##
## Model Test Baseline Model:
##
##   Test statistic                               358.858     289.768
##   Degrees of freedom                                15          15
##   P-value                                        0.000       0.000
##   Scaling correction factor                                  1.238
##
## User Model versus Baseline Model:
##
##   Comparative Fit Index (CFI)                    0.973       0.969
##   Tucker-Lewis Index (TLI)                       0.950       0.943
##
##   Robust Comparative Fit Index (CFI)                         0.974
##   Robust Tucker-Lewis Index (TLI)                            0.951
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)              -1680.938   -1680.938
##   Scaling correction factor                                  0.986
##       for the MLR correction
##   Loglikelihood unrestricted model (H1)      -1672.311   -1672.311
##   Scaling correction factor                                  1.010
```

```
##       for the MLR correction
##
##   Akaike (AIC)                                3387.876    3387.876
##   Bayesian (BIC)                              3429.599    3429.599
##   Sample-size adjusted Bayesian (SABIC)       3388.426    3388.426
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.080       0.076
##   90 Percent confidence interval - lower         0.025       0.020
##   90 Percent confidence interval - upper         0.131       0.127
##   P-value H_0: RMSEA <= 0.050                    0.151       0.177
##   P-value H_0: RMSEA >= 0.080                    0.543       0.495
##
##   Robust RMSEA                                                0.078
##   90 Percent confidence interval - lower                      0.019
##   90 Percent confidence interval - upper                      0.131
##   P-value H_0: Robust RMSEA <= 0.050                          0.172
##   P-value H_0: Robust RMSEA >= 0.080                          0.523
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.044       0.044
##
## Parameter Estimates:
##
##   Standard errors                             Sandwich
##   Information bread                           Observed
##   Observed information based on                Hessian
##
## Latent Variables:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   f1 =~
##     ajd10            1.000                               0.897    0.716
##     ajd11            1.076    0.159    6.781    0.000    0.965    0.731
##   f2 =~
##     ajd12            1.000                               0.721    0.531
##     ajd13            1.189    0.190    6.268    0.000    0.857    0.663
##     ajd14            1.437    0.220    6.520    0.000    1.037    0.803
##     ajd15            1.501    0.237    6.340    0.000    1.083    0.814
##
## Covariances:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   f1 ~~
##     f2               0.434    0.106    4.072    0.000    0.671    0.671
##
## Variances:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .ajd10            0.764    0.160    4.772    0.000    0.764    0.487
##    .ajd11            0.810    0.163    4.958    0.000    0.810    0.465
##    .ajd12            1.325    0.136    9.737    0.000    1.325    0.718
##    .ajd13            0.935    0.148    6.326    0.000    0.935    0.560
##    .ajd14            0.591    0.117    5.048    0.000    0.591    0.355
##    .ajd15            0.596    0.123    4.851    0.000    0.596    0.337
```

```
##     f1                0.804    0.177    4.530    0.000    1.000    1.000
##     f2                0.520    0.146    3.570    0.000    1.000    1.000
```

2.4 Model 4: overlapping 2-factor solution

```
cont_mod4 <- 'f1 =~ ajd10 + ajd11 + ajd12
              f2 =~ ajd12 + ajd13 + ajd14 + ajd15
              #Correlation between factors
              f1 ~~ f2'
cont_mod4_fit <- cfa(cont_mod4,
                     data = IADQ,
                     estimator = "MLR"
                     )
summary(cont_mod4_fit,
        standardized = TRUE,
        fit.measures = TRUE
        )
```

```
## lavaan 0.6-20 ended normally after 39 iterations
##
##   Estimator                                         ML
##   Optimization method                           NLMINB
##   Number of model parameters                        14
##
##   Number of observations                           183
##
## Model Test User Model:
##                                              Standard      Scaled
##   Test Statistic                               10.887      10.389
##   Degrees of freedom                                7           7
##   P-value (Chi-square)                          0.144       0.168
##   Scaling correction factor                                 1.048
##     Yuan-Bentler correction (Mplus variant)
##
## Model Test Baseline Model:
##
##   Test statistic                              358.858     289.768
##   Degrees of freedom                               15          15
##   P-value                                       0.000       0.000
##   Scaling correction factor                                 1.238
##
## User Model versus Baseline Model:
##
##   Comparative Fit Index (CFI)                   0.989       0.988
##   Tucker-Lewis Index (TLI)                      0.976       0.974
##
##   Robust Comparative Fit Index (CFI)                        0.990
##   Robust Tucker-Lewis Index (TLI)                           0.978
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)              -1677.755   -1677.755
##   Scaling correction factor                                 0.992
##       for the MLR correction
##   Loglikelihood unrestricted model (H1)      -1672.311   -1672.311
##   Scaling correction factor                                 1.010
```

```
##       for the MLR correction
##
##   Akaike (AIC)                                3383.509    3383.509
##   Bayesian (BIC)                              3428.442    3428.442
##   Sample-size adjusted Bayesian (SABIC)       3384.101    3384.101
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.055       0.051
##   90 Percent confidence interval - lower         0.000       0.000
##   90 Percent confidence interval - upper         0.115       0.111
##   P-value H_0: RMSEA <= 0.050                    0.386       0.423
##   P-value H_0: RMSEA >= 0.080                    0.291       0.254
##
##   Robust RMSEA                                                0.053
##   90 Percent confidence interval - lower                      0.000
##   90 Percent confidence interval - upper                      0.115
##   P-value H_0: Robust RMSEA <= 0.050                          0.411
##   P-value H_0: Robust RMSEA >= 0.080                          0.280
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.031       0.031
##
## Parameter Estimates:
##
##   Standard errors                             Sandwich
##   Information bread                           Observed
##   Observed information based on                Hessian
##
## Latent Variables:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   f1 =~
##     ajd10            1.000                               0.894    0.714
##     ajd11            1.081    0.161    6.709    0.000    0.967    0.733
##     ajd12            0.454    0.175    2.593    0.010    0.406    0.299
##   f2 =~
##     ajd12            1.000                               0.425    0.313
##     ajd13            1.999    0.646    3.095    0.002    0.850    0.657
##     ajd14            2.471    0.815    3.033    0.002    1.050    0.814
##     ajd15            2.567    0.865    2.969    0.003    1.091    0.820
##
## Covariances:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   f1 ~~
##     f2               0.244    0.087    2.802    0.005    0.641    0.641
##
## Variances:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .ajd10            0.768    0.162    4.741    0.000    0.768    0.490
##    .ajd11            0.805    0.165    4.875    0.000    0.805    0.463
##    .ajd12            1.278    0.136    9.378    0.000    1.278    0.693
##    .ajd13            0.948    0.148    6.392    0.000    0.948    0.568
##    .ajd14            0.563    0.118    4.763    0.000    0.563    0.338
```

```
##    .ajd15            0.578    0.123    4.691    0.000    0.578    0.327
##     f1               0.800    0.177    4.511    0.000    1.000    1.000
##     f2               0.181    0.120    1.511    0.131    1.000    1.000
```

3 Confirmatory factor analysis for endorsement rates

```
# Store variable names
ordered_vars <- c("ajd10e", "ajd11e", "ajd12e", "ajd13e", "ajd14e", "ajd15e")
```

3.1 Model 1: 1-factor solution

```
endo_mod1 <- 'fe =~ ajd10e + ajd11e + ajd12e + ajd13e + ajd14e + ajd15e'
endo_mod1_fit <- cfa(endo_mod1,
                     data = IADQ,
                     estimator = "WLSMV",
                     ordered = ordered_vars
                     )
summary(endo_mod1_fit,
        standardized = TRUE,
        fit.measures = TRUE
        )
```

```
## lavaan 0.6-20 ended normally after 24 iterations
##
##   Estimator                                         DWLS
##   Optimization method                           NLMINB
##   Number of model parameters                        12
##
##   Number of observations                           183
##
## Model Test User Model:
##                                               Standard      Scaled
##   Test Statistic                                11.188      16.939
##   Degrees of freedom                                 9           9
##   P-value (Chi-square)                           0.263       0.050
##   Scaling correction factor                                  0.687
##   Shift parameter                                            0.646
##     simple second-order correction
##
## Model Test Baseline Model:
##
##   Test statistic                               398.390     325.502
##   Degrees of freedom                                15          15
##   P-value                                        0.000       0.000
##   Scaling correction factor                                  1.235
##
## User Model versus Baseline Model:
##
##   Comparative Fit Index (CFI)                    0.994       0.974
##   Tucker-Lewis Index (TLI)                       0.990       0.957
##
##   Robust Comparative Fit Index (CFI)                         0.917
##   Robust Tucker-Lewis Index (TLI)                            0.862
##
```

```
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.037       0.070
##   90 Percent confidence interval - lower         0.000       0.003
##   90 Percent confidence interval - upper         0.096       0.120
##   P-value H_0: RMSEA <= 0.050                    0.578       0.230
##   P-value H_0: RMSEA >= 0.080                    0.131       0.412
##
##   Robust RMSEA                                                0.144
##   90 Percent confidence interval - lower                      0.000
##   90 Percent confidence interval - upper                      0.249
##   P-value H_0: Robust RMSEA <= 0.050                          0.084
##   P-value H_0: Robust RMSEA >= 0.080                          0.853
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.074       0.074
##
## Parameter Estimates:
##
##   Parameterization                                 Delta
##   Standard errors                            Robust.sem
##   Information                                  Expected
##   Information saturated (h1) model        Unstructured
##
## Latent Variables:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   fe =~
##     ajd10e           1.000                               0.458    0.458
##     ajd11e           1.225    0.283    4.327    0.000    0.561    0.561
##     ajd12e           1.270    0.324    3.921    0.000    0.582    0.582
##     ajd13e           1.583    0.357    4.441    0.000    0.726    0.726
##     ajd14e           1.756    0.370    4.744    0.000    0.805    0.805
##     ajd15e           1.903    0.411    4.636    0.000    0.872    0.872
##
## Thresholds:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##     ajd10e|t1       -0.144    0.093   -1.548    0.122   -0.144   -0.144
##     ajd11e|t1       -0.242    0.094   -2.578    0.010   -0.242   -0.242
##     ajd12e|t1       -0.371    0.095   -3.898    0.000   -0.371   -0.371
##     ajd13e|t1        0.242    0.094    2.578    0.010    0.242    0.242
##     ajd14e|t1        0.021    0.093    0.221    0.825    0.021    0.021
##     ajd15e|t1        0.285    0.094    3.019    0.003    0.285    0.285
##
## Variances:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .ajd10e           0.790                               0.790    0.790
##    .ajd11e           0.685                               0.685    0.685
##    .ajd12e           0.661                               0.661    0.661
##    .ajd13e           0.473                               0.473    0.473
##    .ajd14e           0.353                               0.353    0.353
##    .ajd15e           0.239                               0.239    0.239
##     fe               0.210    0.085    2.459    0.014    1.000    1.000
```

3.2 Model 2: 2-factor solution

```
endo_mod2 <- 'f1e =~ ajd10e + ajd11e + ajd12e
              f2e =~ ajd13e + ajd14e + ajd15e
              #Correlation between factors
              f1e ~~ f2e'
endo_mod2_fit <- cfa(endo_mod2,
                     data=IADQ,
                     estimator = "WLSMV",
                     ordered = ordered_vars
                     )
summary(endo_mod2_fit,
        standardized = TRUE,
        fit.measures = TRUE
        )
```

```
## lavaan 0.6-20 ended normally after 23 iterations
##
##   Estimator                                         DWLS
##   Optimization method                           NLMINB
##   Number of model parameters                        13
##
##   Number of observations                           183
##
## Model Test User Model:
##                                               Standard      Scaled
##   Test Statistic                                 6.794      11.085
##   Degrees of freedom                                 8           8
##   P-value (Chi-square)                           0.559       0.197
##   Scaling correction factor                                  0.642
##   Shift parameter                                            0.499
##     simple second-order correction
##
## Model Test Baseline Model:
##
##   Test statistic                               398.390     325.502
##   Degrees of freedom                                15          15
##   P-value                                        0.000       0.000
##   Scaling correction factor                                  1.235
##
## User Model versus Baseline Model:
##
##   Comparative Fit Index (CFI)                    1.000       0.990
##   Tucker-Lewis Index (TLI)                       1.006       0.981
##
##   Robust Comparative Fit Index (CFI)                         0.957
##   Robust Tucker-Lewis Index (TLI)                            0.920
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.000       0.046
##   90 Percent confidence interval - lower         0.000       0.000
##   90 Percent confidence interval - upper         0.078       0.105
```

```
##   P-value H_0: RMSEA <= 0.050                    0.807       0.480
##   P-value H_0: RMSEA >= 0.080                    0.044       0.203
##
##   Robust RMSEA                                                0.110
##   90 Percent confidence interval - lower                      0.000
##   90 Percent confidence interval - upper                      0.233
##   P-value H_0: Robust RMSEA <= 0.050                          0.216
##   P-value H_0: Robust RMSEA >= 0.080                          0.692
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.057       0.057
##
## Parameter Estimates:
##
##   Parameterization                                Delta
##   Standard errors                             Robust.sem
##   Information                                   Expected
##   Information saturated (h1) model          Unstructured
##
## Latent Variables:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   f1e =~
##     ajd10e           1.000                               0.531    0.531
##     ajd11e           1.240    0.293    4.234    0.000    0.658    0.658
##     ajd12e           1.266    0.326    3.886    0.000    0.671    0.671
##   f2e =~
##     ajd13e           1.000                               0.738    0.738
##     ajd14e           1.109    0.147    7.563    0.000    0.818    0.818
##     ajd15e           1.205    0.156    7.730    0.000    0.888    0.888
##
## Covariances:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   f1e ~~
##     f2e              0.298    0.075    3.982    0.000    0.761    0.761
##
## Thresholds:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##     ajd10e|t1       -0.144    0.093   -1.548    0.122   -0.144   -0.144
##     ajd11e|t1       -0.242    0.094   -2.578    0.010   -0.242   -0.242
##     ajd12e|t1       -0.371    0.095   -3.898    0.000   -0.371   -0.371
##     ajd13e|t1        0.242    0.094    2.578    0.010    0.242    0.242
##     ajd14e|t1        0.021    0.093    0.221    0.825    0.021    0.021
##     ajd15e|t1        0.285    0.094    3.019    0.003    0.285    0.285
##
## Variances:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .ajd10e           0.719                               0.719    0.719
##    .ajd11e           0.567                               0.567    0.567
##    .ajd12e           0.549                               0.549    0.549
##    .ajd13e           0.456                               0.456    0.456
##    .ajd14e           0.331                               0.331    0.331
##    .ajd15e           0.211                               0.211    0.211
##     f1e              0.281    0.108    2.606    0.009    1.000    1.000
```

```
##      f2e               0.544    0.111    4.904    0.000    1.000    1.000
```

3.3 Model 3: modified 2-factor solution

```
endo_mod3 <- 'f1e =~ ajd10e + ajd11e
              f2e =~ ajd12e + ajd13e + ajd14e + ajd15e
              #Correlation between factors
              f1e ~~ f2e'
endo_mod3_fit <- cfa(endo_mod3,
                     data = IADQ,
                     estimator = "WLSMV",
                     ordered = ordered_vars
                     )
summary(endo_mod3_fit,
        standardized = TRUE,
        fit.measures = TRUE
        )
```

```
## lavaan 0.6-20 ended normally after 25 iterations
##
##   Estimator                                         DWLS
##   Optimization method                           NLMINB
##   Number of model parameters                        13
##
##   Number of observations                           183
##
## Model Test User Model:
##                                               Standard      Scaled
##   Test Statistic                                 6.235      10.345
##   Degrees of freedom                                 8           8
##   P-value (Chi-square)                           0.621       0.242
##   Scaling correction factor                                  0.634
##   Shift parameter                                            0.510
##     simple second-order correction
##
## Model Test Baseline Model:
##
##   Test statistic                               398.390     325.502
##   Degrees of freedom                                15          15
##   P-value                                        0.000       0.000
##   Scaling correction factor                                  1.235
##
## User Model versus Baseline Model:
##
##   Comparative Fit Index (CFI)                    1.000       0.992
##   Tucker-Lewis Index (TLI)                       1.009       0.986
##
##   Robust Comparative Fit Index (CFI)                         0.961
##   Robust Tucker-Lewis Index (TLI)                            0.926
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.000       0.040
##   90 Percent confidence interval - lower         0.000       0.000
##   90 Percent confidence interval - upper         0.073       0.101
```

```
##   P-value H_0: RMSEA <= 0.050                    0.845       0.536
##   P-value H_0: RMSEA >= 0.080                    0.033       0.167
##
##   Robust RMSEA                                                0.105
##   90 Percent confidence interval - lower                      0.000
##   90 Percent confidence interval - upper                      0.229
##   P-value H_0: Robust RMSEA <= 0.050                          0.232
##   P-value H_0: Robust RMSEA >= 0.080                          0.673
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.056       0.056
##
## Parameter Estimates:
##
##   Parameterization                                 Delta
##   Standard errors                            Robust.sem
##   Information                                  Expected
##   Information saturated (h1) model        Unstructured
##
## Latent Variables:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   f1e =~
##     ajd10e           1.000                               0.592    0.592
##     ajd11e           1.294    0.338    3.832    0.000    0.766    0.766
##   f2e =~
##     ajd12e           1.000                               0.587    0.587
##     ajd13e           1.249    0.237    5.267    0.000    0.733    0.733
##     ajd14e           1.383    0.243    5.698    0.000    0.811    0.811
##     ajd15e           1.501    0.268    5.598    0.000    0.881    0.881
##
## Covariances:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   f1e ~~
##     f2e              0.232    0.070    3.325    0.001    0.669    0.669
##
## Thresholds:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##     ajd10e|t1       -0.144    0.093   -1.548    0.122   -0.144   -0.144
##     ajd11e|t1       -0.242    0.094   -2.578    0.010   -0.242   -0.242
##     ajd12e|t1       -0.371    0.095   -3.898    0.000   -0.371   -0.371
##     ajd13e|t1        0.242    0.094    2.578    0.010    0.242    0.242
##     ajd14e|t1        0.021    0.093    0.221    0.825    0.021    0.021
##     ajd15e|t1        0.285    0.094    3.019    0.003    0.285    0.285
##
## Variances:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .ajd10e           0.650                               0.650    0.650
##    .ajd11e           0.413                               0.413    0.413
##    .ajd12e           0.656                               0.656    0.656
##    .ajd13e           0.463                               0.463    0.463
##    .ajd14e           0.342                               0.342    0.342
##    .ajd15e           0.224                               0.224    0.224
##     f1e              0.350    0.130    2.704    0.007    1.000    1.000
```

```
##      f2e               0.344    0.109    3.159    0.002    1.000    1.000
```

3.4 Model 4: overlapping 2-factor solution

```
endo_mod4 <- 'f1e =~ ajd10e + ajd11e + ajd12e
              f2e =~ ajd12e + ajd13e + ajd14e + ajd15e
              #Correlation between factors
              f1e ~~ f2e'
endo_mod4_fit <- cfa(endo_mod4,
                     data = IADQ,
                     estimator = "WLSMV",
                     ordered = ordered_vars
                     )
summary(endo_mod4_fit,
        standardized = TRUE,
        fit.measures = TRUE
        )
```

```
## lavaan 0.6-20 ended normally after 42 iterations
##
##   Estimator                                         DWLS
##   Optimization method                           NLMINB
##   Number of model parameters                        14
##
##   Number of observations                           183
##
## Model Test User Model:
##                                               Standard      Scaled
##   Test Statistic                                 4.742       8.486
##   Degrees of freedom                                 7           7
##   P-value (Chi-square)                           0.691       0.292
##   Scaling correction factor                                  0.585
##   Shift parameter                                            0.381
##     simple second-order correction
##
## Model Test Baseline Model:
##
##   Test statistic                               398.390     325.502
##   Degrees of freedom                                15          15
##   P-value                                        0.000       0.000
##   Scaling correction factor                                  1.235
##
## User Model versus Baseline Model:
##
##   Comparative Fit Index (CFI)                    1.000       0.995
##   Tucker-Lewis Index (TLI)                       1.013       0.990
##
##   Robust Comparative Fit Index (CFI)                         0.970
##   Robust Tucker-Lewis Index (TLI)                            0.935
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.000       0.034
##   90 Percent confidence interval - lower         0.000       0.000
##   90 Percent confidence interval - upper         0.070       0.101
```

```
##   P-value H_0: RMSEA <= 0.050                    0.873       0.572
##   P-value H_0: RMSEA >= 0.080                    0.028       0.159
##
##   Robust RMSEA                                                0.099
##   90 Percent confidence interval - lower                      0.000
##   90 Percent confidence interval - upper                      0.237
##   P-value H_0: Robust RMSEA <= 0.050                          0.270
##   P-value H_0: Robust RMSEA >= 0.080                          0.641
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.048       0.048
##
## Parameter Estimates:
##
##   Parameterization                                 Delta
##   Standard errors                            Robust.sem
##   Information                                  Expected
##   Information saturated (h1) model        Unstructured
##
## Latent Variables:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   f1e =~
##     ajd10e           1.000                               0.592    0.592
##     ajd11e           1.294    0.337    3.845    0.000    0.766    0.766
##     ajd12e           0.453    0.346    1.309    0.191    0.268    0.268
##   f2e =~
##     ajd12e           1.000                               0.380    0.380
##     ajd13e           1.943    0.936    2.075    0.038    0.738    0.738
##     ajd14e           2.152    1.019    2.112    0.035    0.817    0.817
##     ajd15e           2.339    1.135    2.060    0.039    0.888    0.888
##
## Covariances:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   f1e ~~
##     f2e              0.142    0.072    1.967    0.049    0.631    0.631
##
## Thresholds:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##     ajd10e|t1       -0.144    0.093   -1.548    0.122   -0.144   -0.144
##     ajd11e|t1       -0.242    0.094   -2.578    0.010   -0.242   -0.242
##     ajd12e|t1       -0.371    0.095   -3.898    0.000   -0.371   -0.371
##     ajd13e|t1        0.242    0.094    2.578    0.010    0.242    0.242
##     ajd14e|t1        0.021    0.093    0.221    0.825    0.021    0.021
##     ajd15e|t1        0.285    0.094    3.019    0.003    0.285    0.285
##
## Variances:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .ajd10e           0.650                               0.650    0.650
##    .ajd11e           0.413                               0.413    0.413
##    .ajd12e           0.655                               0.655    0.655
##    .ajd13e           0.455                               0.455    0.455
##    .ajd14e           0.332                               0.332    0.332
##    .ajd15e           0.211                               0.211    0.211
```

```
##     f1e              0.350    0.129    2.708    0.007    1.000    1.000
##     f2e              0.144    0.136    1.062    0.288    1.000    1.000
```

3.5 Relative fitness between endorsement models

3.5.1 Relative fitness between the 2-factor solutions and the 1-factor solution

```
lavTestLRT(endo_mod1_fit, endo_mod2_fit)
```

```
##
## Scaled Chi-Squared Difference Test (method = "satorra.2000")
##
## lavaan->lavTestLRT():
##    lavaan NOTE: The "Chisq" column contains standard test statistics, not the
##    robust test that should be reported per model. A robust difference test is
##    a function of two standard (not robust) statistics.
##
##               Df AIC BIC   Chisq Chisq diff   RMSEA Df diff Pr(>Chisq)
## endo_mod2_fit  8          6.7942
## endo_mod1_fit  9         11.1884     4.4231 0.13619       1    0.03546 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
lavTestLRT(endo_mod1_fit, endo_mod3_fit)
```

```
##
## Scaled Chi-Squared Difference Test (method = "satorra.2000")
##
## lavaan->lavTestLRT():
##    lavaan NOTE: The "Chisq" column contains standard test statistics, not the
##    robust test that should be reported per model. A robust difference test is
##    a function of two standard (not robust) statistics.
##
##               Df AIC BIC   Chisq Chisq diff   RMSEA Df diff Pr(>Chisq)
## endo_mod3_fit  8          6.2354
## endo_mod1_fit  9         11.1884     4.9806 0.14697       1    0.02563 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
lavTestLRT(endo_mod1_fit, endo_mod4_fit)
```

```
##
## Scaled Chi-Squared Difference Test (method = "satorra.2000")
##
## lavaan->lavTestLRT():
##    lavaan NOTE: The "Chisq" column contains standard test statistics, not the
##    robust test that should be reported per model. A robust difference test is
##    a function of two standard (not robust) statistics.
##
##               Df AIC BIC  Chisq Chisq diff   RMSEA Df diff Pr(>Chisq)
## endo_mod4_fit  7          4.742
## endo_mod1_fit  9         11.188     6.8584 0.11022       2    0.03241 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

3.5.2 Relative fitness between the overlapped 2-factor solutions and the original 2-factor solution

```
lavTestLRT(endo_mod2_fit, endo_mod4_fit)
```

```
##
## Scaled Chi-Squared Difference Test (method = "satorra.2000")
##
## lavaan->lavTestLRT():
##    lavaan NOTE: The "Chisq" column contains standard test statistics, not the
##    robust test that should be reported per model. A robust difference test is
##    a function of two standard (not robust) statistics.
##
##               Df AIC BIC  Chisq Chisq diff    RMSEA Df diff Pr(>Chisq)
## endo_mod4_fit  7         4.7420
## endo_mod2_fit  8         6.7942     2.1744 0.075826       1     0.1403
```

4 Reliability analysis

```
#Store items of each factors
Preop <- select(IADQ, "ajd10", "ajd11", "ajd12")
FTA <- select(IADQ, "ajd13", "ajd14", "ajd15")
```

4.1 Corrected item-total spearman's correlation

4.1.1 Preoccupation items

```
Preop_rel <- alpha(cor(Preop, method = "spearman"))
Preop_rel$item.stats
```

```
##               r     r.cor    r.drop
## ajd10 0.7999691 0.6489865 0.5278820
## ajd11 0.8049671 0.6592453 0.5372585
## ajd12 0.7368656 0.4979244 0.4166466
```

4.1.2 Failure to adapt items

```
FTA_rel <- alpha(cor(FTA, method = "spearman"))
FTA_rel$item.stats
```

```
##               r     r.cor    r.drop
## ajd13 0.7985802 0.6172016 0.5545010
## ajd14 0.8704963 0.7862736 0.6928970
## ajd15 0.8464608 0.7378501 0.6445991
```

4.2 Spearman's correlation to other scales

4.2.1 Preoccupation items

```
print(corr.test(IADQ$ajd10, IADQ$fta, method = "spearman"), digits = 3)
```

```
## Call:corr.test(x = IADQ$ajd10, y = IADQ$fta, method = "spearman")
## Correlation matrix
## [1] 0.4
## Sample Size
## [1] 183
## These are the unadjusted probability values.
##   The probability values  adjusted for multiple tests are in the p.adj object.
## [1] 0
##
##  To see confidence intervals of the correlations, print with the short=FALSE option
```

```
print(corr.test(IADQ$ajd11, IADQ$fta, method = "spearman"), digits = 3)
```

```
## Call:corr.test(x = IADQ$ajd11, y = IADQ$fta, method = "spearman")
## Correlation matrix
## [1] 0.421
## Sample Size
## [1] 183
## These are the unadjusted probability values.
##   The probability values  adjusted for multiple tests are in the p.adj object.
## [1] 0
##
##  To see confidence intervals of the correlations, print with the short=FALSE option
```

```
print(corr.test(IADQ$ajd12, IADQ$fta, method = "spearman"), digits = 3)
```

```
## Call:corr.test(x = IADQ$ajd12, y = IADQ$fta, method = "spearman")
## Correlation matrix
## [1] 0.474
## Sample Size
## [1] 183
## These are the unadjusted probability values.
##   The probability values  adjusted for multiple tests are in the p.adj object.
## [1] 0
##
##  To see confidence intervals of the correlations, print with the short=FALSE option
```

4.2.2 Failure to adapt items

```
print(corr.test(IADQ$ajd13, IADQ$preoc, method = "spearman"), digits = 3)
```

```
## Call:corr.test(x = IADQ$ajd13, y = IADQ$preoc, method = "spearman")
```

```
## Correlation matrix
## [1] 0.473
## Sample Size
## [1] 183
## These are the unadjusted probability values.
##   The probability values  adjusted for multiple tests are in the p.adj object.
## [1] 0
##
##  To see confidence intervals of the correlations, print with the short=FALSE option
```

```
print(corr.test(IADQ$ajd14, IADQ$preoc, method = "spearman"), digits = 3)
```

```
## Call:corr.test(x = IADQ$ajd14, y = IADQ$preoc, method = "spearman")
## Correlation matrix
## [1] 0.432
## Sample Size
## [1] 183
## These are the unadjusted probability values.
##   The probability values  adjusted for multiple tests are in the p.adj object.
## [1] 0
##
##  To see confidence intervals of the correlations, print with the short=FALSE option
```

```
print(corr.test(IADQ$ajd15, IADQ$preoc, method = "spearman"), digits = 3)
```

```
## Call:corr.test(x = IADQ$ajd15, y = IADQ$preoc, method = "spearman")
## Correlation matrix
## [1] 0.475
## Sample Size
## [1] 183
## These are the unadjusted probability values.
##   The probability values  adjusted for multiple tests are in the p.adj object.
## [1] 0
##
##  To see confidence intervals of the correlations, print with the short=FALSE option
```

4.3 Composite reliability

4.3.1 Model 1: 1-factor solution

```
#For the total symptoms scale provided by model 1
comp_rel1 <- compRelSEM(cont_mod1_fit)
print(comp_rel1, digits = 3)
```

```
##     f
## 0.798
```

4.3.2 Model 2: 2-factor solution

```
#For the preoccupation and failure to adapt subscales provided by model 2
comp_rel2 <- compRelSEM(cont_mod2_fit)
print(comp_rel2, digits = 3)
```

```
##    f1    f2
## 0.695 0.814
```

5 Concurrent validity

5.1 Intrinsic validity: stressor scale —> preoccupation, failure to adapt

```
# Univariate model: stressor scale ---> preoccupation
se_preoc <- lmrob(preoc ~ se, data = IADQ)
summary(se_preoc)
```

```
##
## Call:
## lmrob(formula = preoc ~ se, data = IADQ)
##  \--> method = "MM"
## Residuals:
##    Min     1Q Median     3Q    Max
## -7.278 -1.952  0.048  2.048  6.932
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   4.6255     0.5209   8.880  6.5e-16 ***
## se            0.4422     0.1438   3.074  0.00244 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Robust residual standard error: 3.121
## Multiple R-squared:  0.0573, Adjusted R-squared:  0.05209
## Convergence in 9 IRWLS iterations
##
## Robustness weights:
##  19 weights are ~= 1. The remaining 164 ones are summarized as
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.5659  0.8606  0.9496  0.9118  0.9854  0.9985
## Algorithmic parameters:
##        tuning.chi                bb        tuning.psi        refine.tol
##         1.548e+00         5.000e-01         4.685e+00         1.000e-07
##           rel.tol         scale.tol         solve.tol          zero.tol
##         1.000e-07         1.000e-10         1.000e-07         1.000e-10
##       eps.outlier             eps.x warn.limit.reject warn.limit.meanrw
##         5.464e-04         1.455e-11         5.000e-01         5.000e-01
##      nResample         max.it       best.r.s       k.fast.s           k.max
##            500             50              2              1             200
##    maxit.scale      trace.lev            mts     compute.rd fast.s.large.n
##            200              0           1000              0            2000
##                psi           subsampling                   cov
##          "bisquare"         "nonsingular"         ".vcov.avar1"
## compute.outlier.stats
##                 "SM"
## seed : int(0)
```

```
# Univariate model: stressor scale ---> failure to adapt
se_fta <- lmrob(fta ~ se, data = IADQ)
summary(se_fta)
```

```
##
## Call:
## lmrob(formula = fta ~ se, data = IADQ)
##  \--> method = "MM"
## Residuals:
##     Min      1Q  Median      3Q     Max
## -5.6199 -2.0203 -0.4207  2.4465  8.5793
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   2.8875     0.5240    5.51 1.22e-07 ***
## se            0.5332     0.1433    3.72 0.000265 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Robust residual standard error: 3.201
## Multiple R-squared:  0.07363,    Adjusted R-squared:  0.06851
## Convergence in 10 IRWLS iterations
##
## Robustness weights:
##  10 weights are ~= 1. The remaining 173 ones are summarized as
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.4526  0.8658  0.9458  0.9091  0.9821  0.9987
## Algorithmic parameters:
##        tuning.chi                bb        tuning.psi        refine.tol
##         1.548e+00         5.000e-01         4.685e+00         1.000e-07
##           rel.tol         scale.tol         solve.tol          zero.tol
##         1.000e-07         1.000e-10         1.000e-07         1.000e-10
##       eps.outlier             eps.x warn.limit.reject warn.limit.meanrw
##         5.464e-04         1.455e-11         5.000e-01         5.000e-01
##      nResample         max.it       best.r.s       k.fast.s          k.max
##            500             50              2              1            200
##    maxit.scale      trace.lev            mts     compute.rd fast.s.large.n
##            200               0           1000              0           2000
##                  psi           subsampling                   cov
##            "bisquare"         "nonsingular"         ".vcov.avar1"
## compute.outlier.stats
##                  "SM"
## seed : int(0)
```

```r
# Multivariate model: stressor scale ---> preoccupation, failure to adapt
se_multi <- manova(cbind(preoc, fta) ~ se, data = IADQ)
Anova(se_multi, type = "III")
```

```
##
## Type III MANOVA Tests: Pillai test statistic
##             Df test stat approx F num Df den Df    Pr(>F)
## (Intercept)  1   0.35832   50.257      2    180 < 2.2e-16 ***
## se           1   0.07613    7.416      2    180 0.0008034 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

5.2 Extrensic validity: preoccupation, failure to adapt —> PHQ-9, GAD-7

5.2.1 Univariate models with preoccupation as a predictor

```
# preoccupation ---> PHQ-9
preoc_phq9 <- lmrob(phq9 ~ preoc, data = IADQ)
summary(preoc_phq9)
```

```
##
## Call:
## lmrob(formula = phq9 ~ preoc, data = IADQ)
##  \--> method = "MM"
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.9734  -3.9748  -0.4737   3.5263  14.5263
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   6.4767     0.8871   7.301 8.72e-12 ***
## preoc         0.4996     0.1364   3.664 0.000326 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Robust residual standard error: 5.608
## Multiple R-squared:  0.0705, Adjusted R-squared:  0.06537
## Convergence in 10 IRWLS iterations
##
## Robustness weights:
##  16 weights are ~= 1. The remaining 167 ones are summarized as
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.4821  0.8822  0.9428  0.9103  0.9781  0.9973
## Algorithmic parameters:
##        tuning.chi                bb        tuning.psi        refine.tol
##         1.548e+00         5.000e-01         4.685e+00         1.000e-07
##           rel.tol         scale.tol         solve.tol          zero.tol
##         1.000e-07         1.000e-10         1.000e-07         1.000e-10
##       eps.outlier             eps.x warn.limit.reject warn.limit.meanrw
##         5.464e-04         2.183e-11         5.000e-01         5.000e-01
##      nResample         max.it       best.r.s       k.fast.s          k.max
##            500             50              2              1            200
##    maxit.scale      trace.lev            mts     compute.rd fast.s.large.n
##            200              0           1000              0           2000
##                   psi           subsampling                   cov
##            "bisquare"         "nonsingular"         ".vcov.avar1"
## compute.outlier.stats
##                  "SM"
## seed : int(0)
```

```
# preoccupation ---> GAD-7
preoc_gad7 <- lmrob(gad7 ~ preoc, data = IADQ)
summary(preoc_gad7)
```

```
##
```

```
## Call:
## lmrob(formula = gad7 ~ preoc, data = IADQ)
##  \--> method = "MM"
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.0598  -3.7039  -0.2125   3.8724  12.7875
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   5.3651     0.8360   6.418 1.18e-09 ***
## preoc         0.7118     0.1237   5.753 3.67e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Robust residual standard error: 5.394
## Multiple R-squared:  0.157,  Adjusted R-squared:  0.1524
## Convergence in 9 IRWLS iterations
##
## Robustness weights:
##  10 weights are ~= 1. The remaining 173 ones are summarized as
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.5535  0.9025  0.9491  0.9251  0.9847  0.9987
## Algorithmic parameters:
##        tuning.chi                bb        tuning.psi        refine.tol
##         1.548e+00         5.000e-01         4.685e+00         1.000e-07
##           rel.tol         scale.tol         solve.tol          zero.tol
##         1.000e-07         1.000e-10         1.000e-07         1.000e-10
##       eps.outlier             eps.x warn.limit.reject warn.limit.meanrw
##         5.464e-04         2.183e-11         5.000e-01         5.000e-01
##      nResample         max.it       best.r.s       k.fast.s          k.max
##            500             50              2              1            200
##    maxit.scale      trace.lev            mts     compute.rd fast.s.large.n
##            200              0           1000              0           2000
##                  psi           subsampling                   cov
##            "bisquare"         "nonsingular"         ".vcov.avar1"
## compute.outlier.stats
##                  "SM"
## seed : int(0)
```

5.2.2 Univariate models with failure to adapt as a predictor

```r
# failure to adapt ---> PHQ-9
fta_phq9 <- lmrob(phq9 ~ fta, data = IADQ)
summary(fta_phq9)
```

```
##
## Call:
## lmrob(formula = phq9 ~ fta, data = IADQ)
##  \--> method = "MM"
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.7089 -2.8307 -0.6481  3.2606 15.1693
```

```
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   4.8611     0.6654   7.306 8.48e-12 ***
## fta           0.9696     0.1169   8.294 2.43e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Robust residual standard error: 4.732
## Multiple R-squared:  0.3135, Adjusted R-squared:  0.3098
## Convergence in 10 IRWLS iterations
##
## Robustness weights:
##  9 weights are ~= 1. The remaining 174 ones are summarized as
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.2828  0.8799  0.9527  0.9093  0.9872  0.9986
## Algorithmic parameters:
##        tuning.chi                bb        tuning.psi        refine.tol
##         1.548e+00         5.000e-01         4.685e+00         1.000e-07
##           rel.tol         scale.tol         solve.tol          zero.tol
##         1.000e-07         1.000e-10         1.000e-07         1.000e-10
##       eps.outlier             eps.x warn.limit.reject warn.limit.meanrw
##         5.464e-04         2.183e-11         5.000e-01         5.000e-01
##      nResample         max.it       best.r.s       k.fast.s          k.max
##            500             50              2              1            200
##    maxit.scale      trace.lev            mts     compute.rd fast.s.large.n
##            200               0           1000              0           2000
##                  psi           subsampling                   cov
##            "bisquare"         "nonsingular"         ".vcov.avar1"
## compute.outlier.stats
##                  "SM"
## seed : int(0)
```

```r
# failure to adapt ---> GAD-7
fta_gad7 <- lmrob(gad7 ~ fta, data = IADQ)
summary(fta_gad7)
```

```
##
## Call:
## lmrob(formula = gad7 ~ fta, data = IADQ)
##  \--> method = "MM"
## Residuals:
##       Min        1Q    Median        3Q       Max
## -13.28591  -2.89911  -0.05383   2.98485  10.17825
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   4.8217     0.6241   7.726 7.33e-13 ***
## fta           1.0387     0.1127   9.213  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Robust residual standard error: 4.071
## Multiple R-squared:  0.3956, Adjusted R-squared:  0.3923
```

```
## Convergence in 11 IRWLS iterations
##
## Robustness weights:
##  16 weights are ~= 1. The remaining 167 ones are summarized as
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.2649  0.8665  0.9506  0.8974  0.9795  0.9972
## Algorithmic parameters:
##        tuning.chi                bb        tuning.psi        refine.tol
##         1.548e+00         5.000e-01         4.685e+00         1.000e-07
##           rel.tol         scale.tol         solve.tol          zero.tol
##         1.000e-07         1.000e-10         1.000e-07         1.000e-10
##       eps.outlier             eps.x warn.limit.reject warn.limit.meanrw
##         5.464e-04         2.183e-11         5.000e-01         5.000e-01
##      nResample         max.it       best.r.s       k.fast.s          k.max
##            500             50              2              1            200
##    maxit.scale      trace.lev            mts     compute.rd fast.s.large.n
##            200              0           1000              0           2000
##                  psi           subsampling                   cov
##            "bisquare"         "nonsingular"         ".vcov.avar1"
## compute.outlier.stats
##                  "SM"
## seed : int(0)
```

5.2.3 Univariate models with preoccupation and failure to adapt as predictors

```
# preoccupation, failure to adapt ---> PHQ-9
iadq_phq9 <- lmrob(phq9 ~ preoc + fta, data = IADQ)
summary(iadq_phq9)
```

```
##
## Call:
## lmrob(formula = phq9 ~ preoc + fta, data = IADQ)
##  \--> method = "MM"
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.8214 -3.0181 -0.5583  3.3240 15.1768
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   5.2168     0.7929   6.580 4.97e-10 ***
## preoc        -0.1048     0.1279  -0.820    0.414
## fta           1.0257     0.1363   7.527 2.40e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Robust residual standard error: 4.647
## Multiple R-squared:  0.3177, Adjusted R-squared:  0.3101
## Convergence in 10 IRWLS iterations
##
## Robustness weights:
##  7 weights are ~= 1. The remaining 176 ones are summarized as
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
```

```
##  0.2643  0.8747  0.9537  0.9075  0.9878  0.9989
## Algorithmic parameters:
##        tuning.chi                bb        tuning.psi        refine.tol
##         1.548e+00         5.000e-01         4.685e+00         1.000e-07
##           rel.tol         scale.tol         solve.tol          zero.tol
##         1.000e-07         1.000e-10         1.000e-07         1.000e-10
##       eps.outlier             eps.x warn.limit.reject warn.limit.meanrw
##         5.464e-04         2.183e-11         5.000e-01         5.000e-01
##      nResample         max.it       best.r.s       k.fast.s          k.max
##            500             50              2              1            200
##    maxit.scale      trace.lev            mts     compute.rd fast.s.large.n
##            200              0           1000              0           2000
##                  psi           subsampling                   cov
##            "bisquare"         "nonsingular"         ".vcov.avar1"
## compute.outlier.stats
##                  "SM"
## seed : int(0)
```

```
# preoccupation, failure to adapt ---> GAD-7
iadq_gad7 <- lmrob(gad7 ~ preoc + fta, data = IADQ)
summary(iadq_gad7)
```

```
##
## Call:
## lmrob(formula = gad7 ~ preoc + fta, data = IADQ)
##  \--> method = "MM"
## Residuals:
##       Min        1Q    Median        3Q       Max
## -13.56170  -2.68913  -0.05486   2.92728  10.32873
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   4.3453     0.7083   6.134 5.29e-09 ***
## preoc         0.1411     0.1394   1.012    0.313
## fta           0.9603     0.1454   6.606 4.31e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Robust residual standard error: 4.07
## Multiple R-squared:  0.3976, Adjusted R-squared:  0.3909
## Convergence in 11 IRWLS iterations
##
## Robustness weights:
##  10 weights are ~= 1. The remaining 173 ones are summarized as
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.2441  0.8687  0.9487  0.9017  0.9829  0.9989
## Algorithmic parameters:
##        tuning.chi                bb        tuning.psi        refine.tol
##         1.548e+00         5.000e-01         4.685e+00         1.000e-07
##           rel.tol         scale.tol         solve.tol          zero.tol
##         1.000e-07         1.000e-10         1.000e-07         1.000e-10
##       eps.outlier             eps.x warn.limit.reject warn.limit.meanrw
##         5.464e-04         2.183e-11         5.000e-01         5.000e-01
##      nResample         max.it       best.r.s       k.fast.s          k.max
```

```
##            500             50              2              1            200
##    maxit.scale      trace.lev            mts     compute.rd fast.s.large.n
##            200              0           1000              0           2000
##                    psi           subsampling                    cov
##            "bisquare"         "nonsingular"         ".vcov.avar1"
## compute.outlier.stats
##                   "SM"
## seed : int(0)
```

5.2.4 Univariate models with total symptoms scale as a predictor

```r
# total symptoms scale ---> PHQ-9
total_phq9 <- lmrob(phq9 ~ total, data = IADQ)
summary(total_phq9)
```

```
##
## Call:
## lmrob(formula = phq9 ~ total, data = IADQ)
##  \--> method = "MM"
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.6062 -3.6452 -0.6452  3.8743 14.2769
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  4.32041    0.80196   5.387 2.20e-07 ***
## total        0.48053    0.06828   7.038 3.89e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Robust residual standard error: 5.148
## Multiple R-squared:  0.2219, Adjusted R-squared:  0.2176
## Convergence in 9 IRWLS iterations
##
## Robustness weights:
##  9 weights are ~= 1. The remaining 174 ones are summarized as
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.4220  0.8907  0.9486  0.9142  0.9822  0.9989
## Algorithmic parameters:
##        tuning.chi                bb        tuning.psi        refine.tol
##         1.548e+00         5.000e-01         4.685e+00         1.000e-07
##           rel.tol         scale.tol         solve.tol          zero.tol
##         1.000e-07         1.000e-10         1.000e-07         1.000e-10
##       eps.outlier             eps.x warn.limit.reject warn.limit.meanrw
##         5.464e-04         4.366e-11         5.000e-01         5.000e-01
##      nResample         max.it       best.r.s       k.fast.s          k.max
##            500             50              2              1            200
##    maxit.scale      trace.lev            mts     compute.rd fast.s.large.n
##            200              0           1000              0           2000
##                    psi           subsampling                    cov
##            "bisquare"         "nonsingular"         ".vcov.avar1"
## compute.outlier.stats
```

```
##                   "SM"
## seed : int(0)
```

```
# total symptoms scale ---> PHQ-9
total_gad7 <- lmrob(gad7 ~ total, data = IADQ)
summary(total_gad7)
```

```
##
## Call:
## lmrob(formula = gad7 ~ total, data = IADQ)
##  \--> method = "MM"
## Residuals:
##       Min        1Q    Median        3Q       Max
## -13.07796  -3.12767   0.03694   3.64873  11.70463
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  3.73638    0.70993   5.263 3.98e-07 ***
## total        0.55590    0.06184   8.990 3.27e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Robust residual standard error: 4.589
## Multiple R-squared:  0.329,  Adjusted R-squared:  0.3253
## Convergence in 10 IRWLS iterations
##
## Robustness weights:
##  11 weights are ~= 1. The remaining 172 ones are summarized as
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.3969  0.8905  0.9427  0.9162  0.9840  0.9990
## Algorithmic parameters:
##        tuning.chi                bb        tuning.psi        refine.tol
##         1.548e+00         5.000e-01         4.685e+00         1.000e-07
##           rel.tol         scale.tol         solve.tol          zero.tol
##         1.000e-07         1.000e-10         1.000e-07         1.000e-10
##       eps.outlier             eps.x warn.limit.reject warn.limit.meanrw
##         5.464e-04         4.366e-11         5.000e-01         5.000e-01
##      nResample         max.it       best.r.s       k.fast.s          k.max
##            500             50              2              1            200
##    maxit.scale      trace.lev            mts     compute.rd fast.s.large.n
##            200              0           1000              0           2000
##                   psi           subsampling                   cov
##            "bisquare"         "nonsingular"         ".vcov.avar1"
## compute.outlier.stats
##                   "SM"
## seed : int(0)
```

5.2.5 Multivariate models

```
# preoccupation ---> PHQ-9, GAD-7
preoc_multi <- manova(cbind(phq9, gad7) ~ preoc, data = IADQ)
Anova(preoc_multi, type = "III")
```

```
##
## Type III MANOVA Tests: Pillai test statistic
##             Df test stat approx F num Df den Df    Pr(>F)
## (Intercept)  1   0.24749   29.599      2    180 7.695e-12 ***
## preoc        1   0.15778   16.860      2    180 1.942e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# failure to adapt ---> PHQ-9, GAD-7
fta_multi <- manova(cbind(phq9, gad7) ~ fta, data = IADQ)
Anova(fta_multi, type = "III")
```

```
##
## Type III MANOVA Tests: Pillai test statistic
##             Df test stat approx F num Df den Df    Pr(>F)
## (Intercept)  1   0.35277   49.055      2    180 < 2.2e-16 ***
## fta          1   0.36861   52.542      2    180 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# preoccupation, failure to adapt ---> PHQ-9, GAD-7
iadq_multi <- manova(cbind(phq9, gad7) ~ preoc + fta, data = IADQ)
Anova(iadq_multi, type = "III")
```

```
##
## Type III MANOVA Tests: Pillai test statistic
##             Df test stat approx F num Df den Df    Pr(>F)
## (Intercept)  1  0.235891   27.630      2    179 3.487e-11 ***
## preoc        1  0.027581    2.539      2    179   0.08182 .
## fta          1  0.271003   33.271      2    179 5.176e-13 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# total symptoms scale ---> PHQ-9, GAD-7
total_multi <- manova(cbind(phq9, gad7) ~ total, data = IADQ)
Anova(total_multi, type = "III")
```

```
##
## Type III MANOVA Tests: Pillai test statistic
##             Df test stat approx F num Df den Df    Pr(>F)
## (Intercept)  1   0.17813   19.506      2    180 2.150e-08 ***
## total        1   0.31811   41.986      2    180 1.082e-15 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```