Illustrative Example

For the manuscript "Classification Accuracy of Multidimensional Tests: Quantifying the Impact of Noninvariance"

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```
library(lavaan)
```

```
## This is lavaan 0.6-8
## lavaan is FREE software! Please report any bugs.
```

```
library(tidyverse)
```

```
## -- Attaching packages -----------------------------------------------------------------------------

## v ggplot2 3.3.3     v purrr   0.3.4
## v tibble  3.1.0     v dplyr   1.0.5
## v tidyr   1.1.3     v stringr 1.4.0
## v readr   1.4.0     v forcats 0.5.1

## -- Conflicts --------------------------------------------------------------------------------------
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

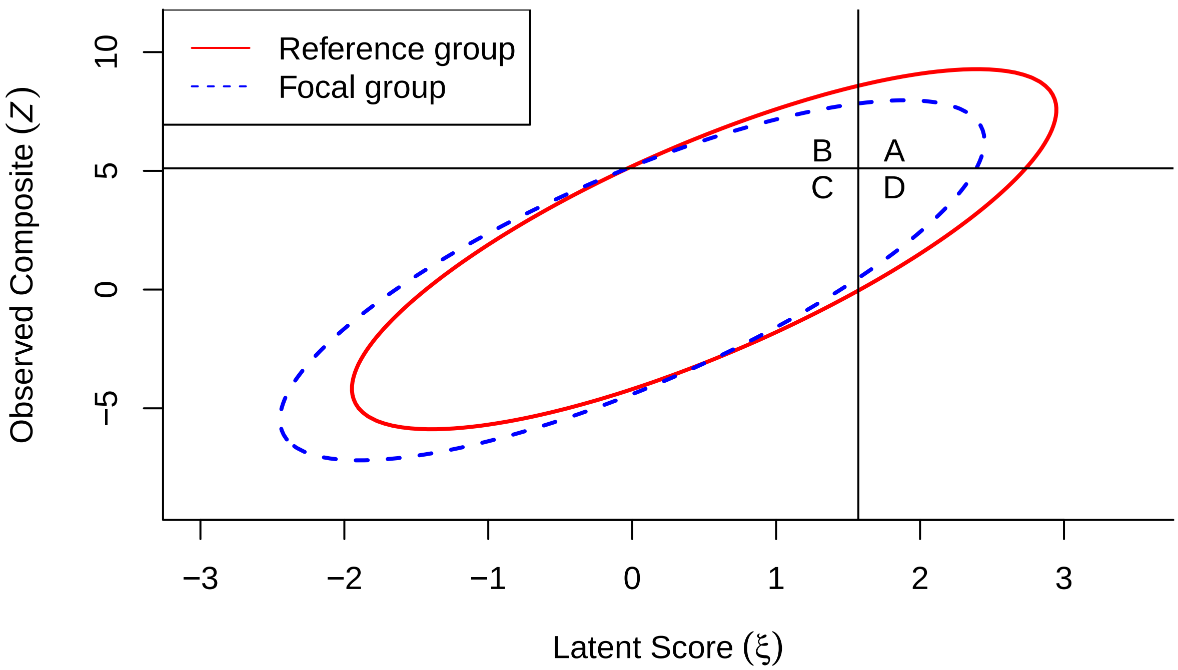
```
library(knitr)
library(kableExtra)
```

```
##
## Attaching package: 'kableExtra'

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

```
library(broom)
```

```
# Load the provided code `PartInv_multi.R`
source(here::here("PartInv_multi.R"))
```



Import data

The data are part of the supplemental materials by Oct et al. (2020),[1] and can be obtained at https://journals.sagepub.com/doi/suppl/10.1177/1073191119885018

```
data <- read.table(here::here("IPIPFFM.dat"),
                   header = TRUE)
```

Specify the model

Preliminary analysis showed eight pairs of unique factor covariances need to be freed: A2 and A5, E4 and E7, I2 and I10, I8 and I9, A9 and I9, C3 and E6, A2 and E7, E7 and N2.

```
model <- 'A =~  a2 + a5  + a7 + a9
          C =~  c3 + c4 + c8 + c9
```

[1] Ock, J., McAbee, S. T., Mulfinger, E., & Oswald, F. L. (2020). The practical effects of measurement invariance: Gender invariance in two Big Five personality measures. *Assessment, 27(4)*, 657-674. https://doi.org/10.1177/1073191119885018

```
          E =~ e1 + e4 + e6 + e7
          N =~ n1 + n2 + n6 + n8
          O =~ i2 + i8 + i9 + i10
          a2 ~~ a5
          e4 ~~ e7
          i2 ~~ i10
          i8 ~~ i9
          a9 ~~ i9
          c3 ~~ e6
          a2 ~~ e7
          e7 ~~ n2'
```

Conventional measurement invariance testing suggested the mini-IPIP scale support partial strict invariance across gender. Specifically, four items showed noninvariant intercepts across groups and three items showed noninvariant unique factor variance across groups. The results did not provide information on how these noninvariances may impact personnel selection using the mini-IPIP, so we demonstrated the MCAA framework in this example.

```
fit_strict <- cfa(model, data = data, group = "sex",
                  group.equal = c("loadings", "Intercepts", "residuals"),
                  group.partial = c("e6 ~ 1", "n1 ~ 1", "n2 ~ 1", "a2 ~ 1",
                                    "n2 ~~ n2", "n1 ~~ n1", "c8 ~~ c8"),
                  estimator = "MLR", std.lv = TRUE)
```

```
# Fit indices
knitr::kable(
  broom::glance(fit_strict) %>%
    select(AIC, BIC, cfi, chisq, npar, rmsea, srmr, tli, nobs),
  format = "markdown",
  digits = 3
)
```

AIC	BIC	cfi	chisq	npar	rmsea	srmr	tli	nobs
31033.99	31523.85	0.949	464.056	113	0.035	0.057	0.945	564

```
# extract parameter estimates
result <- lavInspect(fit_strict, what = "est")
```

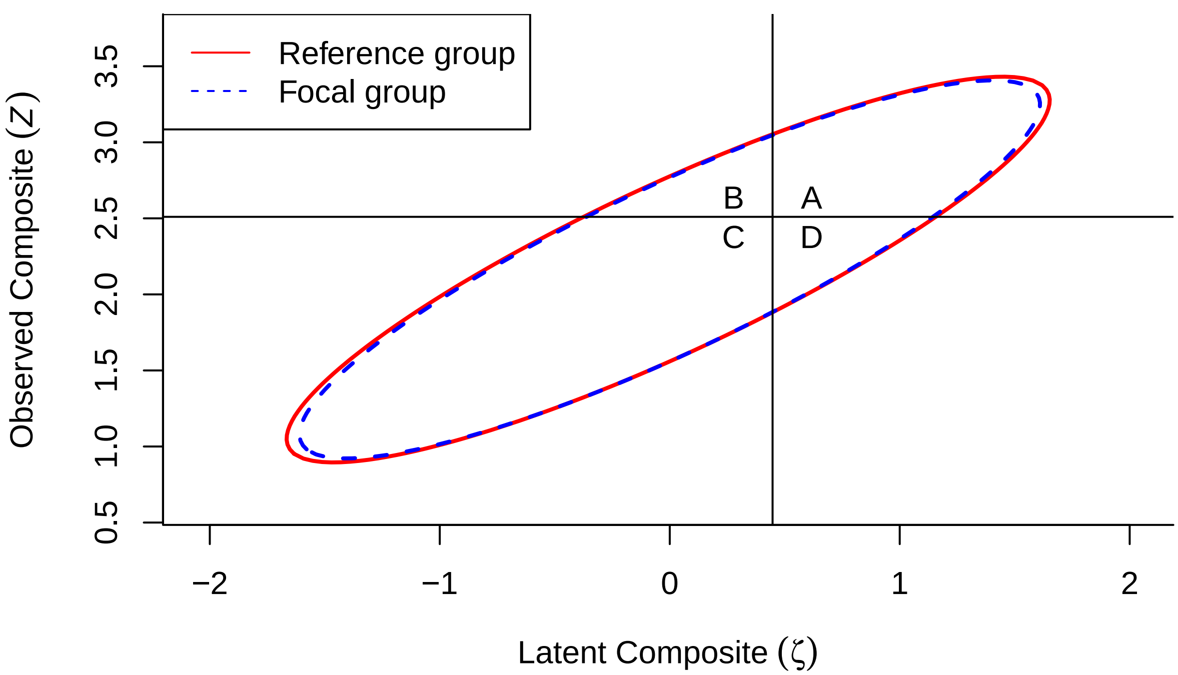
Step 1: Selection Parameters

Because the population sizes for females and for males are roughly equal, we used a mixing proportion(π_g) of 0.5. The weights for latent factors and items were calculated based on the predictive validities reported by previous study (Drasgow et al., 2012). The codes for obtaining the weights can be found in the supplementary materials. For the selection cutoff, we assume that the mini-IPIP is used to select the top 25% of the candidates.

Step 2: Selection Accuracy Under Strict Invariance

To establish the baseline information of using the mini-IPIP for selecting males and females, we first obtained the parameter estimates under full strict invariance. The codes for extracting parameter estimates from *lavaan* model object are provided in the supplementary materials. Our function enables researchers to visualize and quantify the impact of item bias on selection accuracy indices. From the table, we can conclude female candidates would be selected in a slightly higher proportion compared to male candidates if strict invariance holds.

```
strict <- PartInvMulti_we(propsel = .25,
             weights_item = c(0.008125, 0.008125, 0.008125, 0.008125,
                              0.044875, 0.044875, 0.044875, 0.044875,
                              0.117325, 0.117325, 0.117325, 0.117325,
                              -0.048775, -0.048775, -0.048775, -0.048775,
                              0.0309, 0.0309, 0.0309, 0.0309),
             weights_latent = c(0.0325, 0.1795, 0.4693, -0.1951, 0.1236),
             alpha_r = result[[2]]$alpha,
             alpha_f = result[[1]]$alpha,
             psi_r = result[[2]]$psi,
             psi_f = result[[1]]$psi,
             lambda_r = (result[[2]]$lambda + result[[1]]$lambda) / 2,
             nu_r = (result[[2]]$nu + result[[1]]$nu) / 2,
             Theta_r = (result[[2]]$theta + result[[1]]$theta) / 2)
```



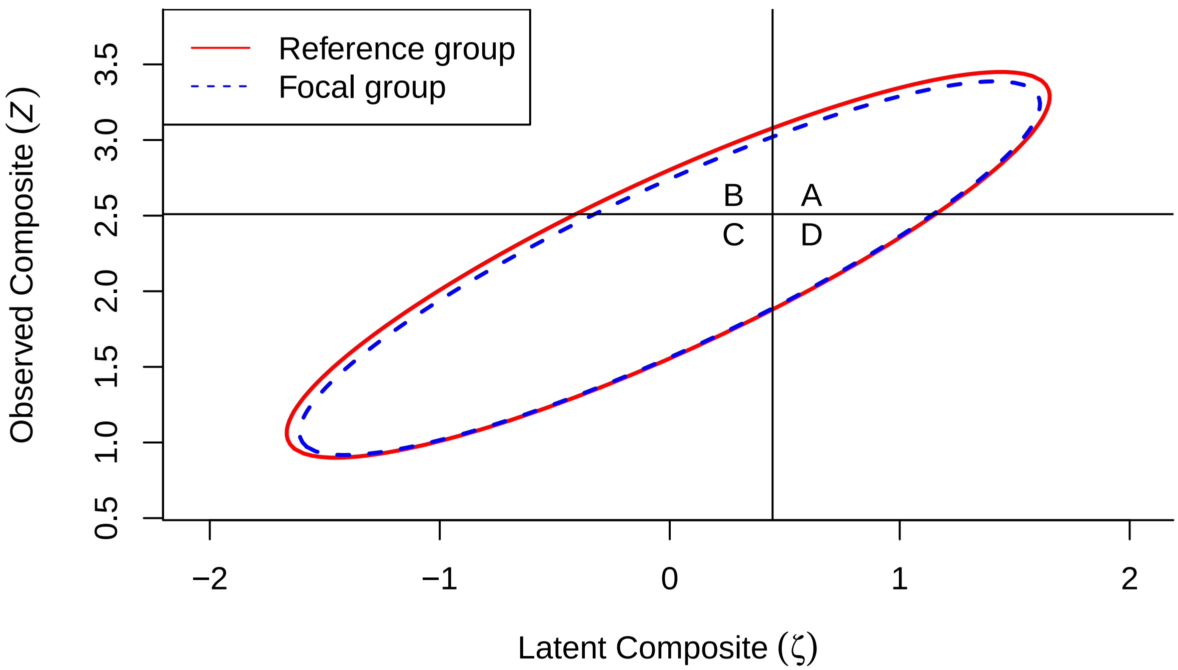
```r
strict[1:5]
```

```
## $propsel
## [1] 0.25
##
## $cutpt_xi
## [1] 0.4470718
##
## $cutpt_z
## [1] 2.509814
##
## $summary
##                      Reference Focal E_R.Focal.
## A (true positive)        0.188 0.184      0.188
## B (false positive)       0.063 0.064      0.063
## C (true negative)        0.685 0.688      0.685
## D (false negative)       0.063 0.064      0.063
## Proportion selected      0.252 0.248      0.252
## Success ratio            0.748 0.743      0.748
## Sensitivity              0.749 0.742      0.749
## Specificity              0.915 0.915      0.915
##
## $ai_ratio
## [1] 1
```

Step 3: Selection Accuracy Under Partial Strict Invariance

The selection accuracy of mini-IPIP under partial strict invariance can be obtained in the same way as in Step 2, except that `nu_r` and `nu_f` were different for males and for females, as well as `Theta_r` and `Theta_f`. The column E_F(Male) represents the expected proportion selected for male candidates based on the latent score distributions of the female candidates. The AI ratio for male candidates is estimated to be 0.935, indicating a slight disadvantage for male candidates when doing selection using the mini-IPIP.

```r
par_strict <- PartInvMulti_we(propsel = .25,
              weights_item = c(0.008125, 0.008125, 0.008125, 0.008125,
                                0.044875, 0.044875, 0.044875, 0.044875,
                                0.117325, 0.117325, 0.117325, 0.117325,
                                -0.048775, -0.048775, -0.048775, -0.048775,
                                0.0309, 0.0309, 0.0309, 0.0309),
              weights_latent = c(0.0325, 0.1795, 0.4693, -0.1951, 0.1236),
              alpha_r = result[[2]]$alpha,
              alpha_f = result[[1]]$alpha,
              psi_r = result[[2]]$psi,
              psi_f = result[[1]]$psi,
              lambda_r = result[[2]]$lambda,
              nu_r = result[[2]]$nu,
              nu_f = result[[1]]$nu,
              Theta_r = result[[2]]$theta,
              Theta_f = result[[1]]$theta)
```




```
par_strict[1:5]
```

```
## $propsel
## [1] 0.25
##
## $cutpt_xi
## [1] 0.4470718
##
## $cutpt_z
## [1] 2.509731
##
## $summary
##                        Reference Focal E_R.Focal.
## A (true positive)          0.191 0.182      0.186
## B (false positive)         0.070 0.058      0.058
## C (true negative)          0.679 0.694      0.691
## D (false negative)         0.061 0.066      0.066
## Proportion selected        0.260 0.240      0.243
## Success ratio              0.732 0.759      0.764
## Sensitivity                0.758 0.733      0.739
## Specificity                0.907 0.923      0.923
##
## $ai_ratio
## [1] 0.9354029
```

Step 4: Compare the Change in Selection Accuracy indices

Comparing the results in Steps 2 and 3, researchers can quantify the impact of item bias on selection accuracy indices. In this example, we see in the presence of item bias, male candidates are selected in a lower proportion compared to when strict invariance holds (24.0% as opposed to 24.8%), whereas female candidates are selected in a higher proportion compared to when strict invariance holds (26.0% as opposed to 25.2%).

Table 2: Impact of Item Bias on Selection Accuracy Indices

	Female	Male	E_F(Male)	Female	Male	E_F(Male)
Proportion selected	0.252	0.248	0.252	0.260	0.240	0.243
Success ratio	0.748	0.743	0.748	0.732	0.759	0.764
Sensitivity	0.749	0.742	0.749	0.758	0.733	0.739
Specificity	0.915	0.915	0.915	0.907	0.923	0.923

Note: The column E_F(Male) shows the expected proportion for male candidates if the latent distributions are the same for both genders.

Appendix: Parameter estimates

```r
# Show parameter estimates
parameterEstimates(fit_strict)
```

```
##     lhs op rhs block group label    est    se      z pvalue ci.lower ci.upper
## 1     A =~  a2     1     1  .p1.  0.322 0.055  5.878  0.000    0.215    0.429
## 2     A =~  a5     1     1  .p2.  0.655 0.060 10.841  0.000    0.537    0.773
## 3     A =~  a7     1     1  .p3.  0.645 0.054 11.912  0.000    0.539    0.751
## 4     A =~  a9     1     1  .p4.  0.745 0.056 13.284  0.000    0.636    0.855
## 5     C =~  c3     1     1  .p5.  0.570 0.052 10.947  0.000    0.468    0.672
## 6     C =~  c4     1     1  .p6.  0.341 0.049  7.037  0.000    0.246    0.436
## 7     C =~  c8     1     1  .p7.  0.398 0.049  8.100  0.000    0.301    0.494
## 8     C =~  c9     1     1  .p8.  0.745 0.081  9.170  0.000    0.586    0.905
## 9     E =~  e1     1     1  .p9.  0.657 0.050 13.147  0.000    0.559    0.755
## 10    E =~  e4     1     1 .p10.  0.803 0.069 11.594  0.000    0.667    0.939
## 11    E =~  e6     1     1 .p11.  0.799 0.062 12.841  0.000    0.677    0.920
## 12    E =~  e7     1     1 .p12.  0.686 0.062 10.993  0.000    0.564    0.808
## 13    N =~  n1     1     1 .p13.  0.507 0.057  8.964  0.000    0.396    0.618
## 14    N =~  n2     1     1 .p14.  0.824 0.063 13.080  0.000    0.701    0.948
## 15    N =~  n6     1     1 .p15.  0.600 0.053 11.245  0.000    0.495    0.704
## 16    N =~  n8     1     1 .p16.  0.825 0.064 12.803  0.000    0.699    0.952
## 17    O =~  i2     1     1 .p17.  0.512 0.081  6.356  0.000    0.354    0.670
## 18    O =~  i8     1     1 .p18.  0.425 0.080  5.344  0.000    0.269    0.581
## 19    O =~  i9     1     1 .p19.  0.485 0.075  6.457  0.000    0.338    0.632
## 20    O =~ i10     1     1 .p20.  0.570 0.091  6.273  0.000    0.392    0.748
## 21   a2 ~~  a5     1     1        0.172 0.041  4.221  0.000    0.092    0.252
## 22   e4 ~~  e7     1     1       -0.107 0.078 -1.379  0.168   -0.259    0.045
## 23   i2 ~~ i10     1     1        0.312 0.089  3.521  0.000    0.138    0.486
## 24   i8 ~~  i9     1     1        0.457 0.098  4.653  0.000    0.265    0.650
## 25   a9 ~~  i9     1     1        0.149 0.047  3.145  0.002    0.056    0.242
## 26   c3 ~~  e6     1     1       -0.232 0.074 -3.136  0.002   -0.377   -0.087
```

```
## 27   a2 ~~  e7     1     1         0.012 0.045   0.269  0.788   -0.076    0.100
## 28   e7 ~~  n2     1     1        -0.023 0.050  -0.451  0.652   -0.121    0.076
## 29   a2 ~~  a2     1     1 .p29.   0.544 0.050  10.946  0.000    0.447    0.641
## 30   a5 ~~  a5     1     1 .p30.   0.536 0.055   9.759  0.000    0.429    0.644
## 31   a7 ~~  a7     1     1 .p31.   0.410 0.053   7.704  0.000    0.306    0.515
## 32   a9 ~~  a9     1     1 .p32.   0.356 0.054   6.611  0.000    0.251    0.462
## 33   c3 ~~  c3     1     1 .p33.   0.935 0.074  12.559  0.000    0.789    1.081
## 34   c4 ~~  c4     1     1 .p34.   0.410 0.039  10.578  0.000    0.334    0.486
## 35   c8 ~~  c8     1     1         0.495 0.064   7.756  0.000    0.370    0.620
## 36   c9 ~~  c9     1     1 .p36.   0.925 0.115   8.019  0.000    0.699    1.151
## 37   e1 ~~  e1     1     1 .p37.   0.784 0.058  13.555  0.000    0.671    0.898
## 38   e4 ~~  e4     1     1 .p38.   0.991 0.090  11.035  0.000    0.815    1.168
## 39   e6 ~~  e6     1     1 .p39.   0.881 0.073  12.136  0.000    0.739    1.023
## 40   e7 ~~  e7     1     1 .p40.   0.612 0.069   8.919  0.000    0.477    0.746
## 41   n1 ~~  n1     1     1         0.663 0.083   7.966  0.000    0.500    0.826
## 42   n2 ~~  n2     1     1         0.570 0.092   6.221  0.000    0.390    0.749
## 43   n6 ~~  n6     1     1 .p43.   0.748 0.059  12.641  0.000    0.632    0.864
## 44   n8 ~~  n8     1     1 .p44.   0.652 0.075   8.691  0.000    0.505    0.799
## 45   i2 ~~  i2     1     1 .p45.   0.735 0.090   8.123  0.000    0.558    0.912
## 46   i8 ~~  i8     1     1 .p46.   1.182 0.094  12.529  0.000    0.997    1.367
## 47   i9 ~~  i9     1     1 .p47.   1.015 0.090  11.268  0.000    0.839    1.192
## 48  i10 ~~ i10     1     1 .p48.   0.786 0.122   6.449  0.000    0.547    1.024
## 49    A ~~   A     1     1         1.000 0.000      NA     NA    1.000    1.000
## 50    C ~~   C     1     1         1.000 0.000      NA     NA    1.000    1.000
## 51    E ~~   E     1     1         1.000 0.000      NA     NA    1.000    1.000
## 52    N ~~   N     1     1         1.000 0.000      NA     NA    1.000    1.000
## 53    O ~~   O     1     1         1.000 0.000      NA     NA    1.000    1.000
## 54    A ~~   C     1     1         0.031 0.098   0.313  0.754   -0.162    0.223
## 55    A ~~   E     1     1         0.398 0.091   4.383  0.000    0.220    0.576
## 56    A ~~   N     1     1        -0.191 0.097  -1.960  0.050   -0.381    0.000
## 57    A ~~   O     1     1         0.416 0.113   3.676  0.000    0.194    0.638
## 58    C ~~   E     1     1         0.052 0.106   0.485  0.627   -0.157    0.260
## 59    C ~~   N     1     1        -0.159 0.104  -1.523  0.128   -0.364    0.046
## 60    C ~~   O     1     1        -0.009 0.134  -0.070  0.944   -0.272    0.253
## 61    E ~~   N     1     1        -0.041 0.101  -0.405  0.685   -0.239    0.157
## 62    E ~~   O     1     1         0.672 0.103   6.503  0.000    0.470    0.875
## 63    N ~~   O     1     1        -0.059 0.129  -0.458  0.647   -0.311    0.194
## 64   a2 ~1         1     1         3.944 0.056  70.735  0.000    3.835    4.054
## 65   a5 ~1         1     1 .p65.   3.562 0.062  57.403  0.000    3.440    3.684
## 66   a7 ~1         1     1 .p66.   3.999 0.055  72.486  0.000    3.891    4.107
## 67   a9 ~1         1     1 .p67.   3.618 0.059  61.186  0.000    3.503    3.734
## 68   c3 ~1         1     1 .p68.   3.287 0.059  56.183  0.000    3.173    3.402
## 69   c4 ~1         1     1 .p69.   4.263 0.039 109.524  0.000    4.187    4.339
## 70   c8 ~1         1     1 .p70.   4.181 0.044  94.704  0.000    4.095    4.268
## 71   c9 ~1         1     1 .p71.   3.599 0.071  50.883  0.000    3.461    3.738
## 72   e1 ~1         1     1 .p72.   2.270 0.060  38.013  0.000    2.153    2.387
## 73   e4 ~1         1     1 .p73.   2.924 0.071  41.218  0.000    2.785    3.063
## 74   e6 ~1         1     1         3.012 0.078  38.552  0.000    2.859    3.165
## 75   e7 ~1         1     1 .p75.   3.091 0.061  50.674  0.000    2.971    3.210
## 76   n1 ~1         1     1         2.259 0.062  36.249  0.000    2.137    2.382
## 77   n2 ~1         1     1         2.460 0.072  33.974  0.000    2.318    2.602
## 78   n6 ~1         1     1 .p78.   2.324 0.058  39.856  0.000    2.209    2.438
## 79   n8 ~1         1     1 .p79.   2.279 0.071  31.976  0.000    2.139    2.418
## 80   i2 ~1         1     1 .p80.   3.972 0.055  72.365  0.000    3.864    4.079
```

```
## 81    i8 ~1          1      1 .p81.  3.590 0.062  57.626  0.000    3.468    3.712
## 82    i9 ~1          1      1 .p82.  3.615 0.061  59.144  0.000    3.495    3.735
## 83   i10 ~1          1      1 .p83.  4.072 0.063  64.852  0.000    3.948    4.195
## 84     A ~1          1      1         0.000 0.000      NA     NA    0.000    0.000
## 85     C ~1          1      1         0.000 0.000      NA     NA    0.000    0.000
## 86     E ~1          1      1         0.000 0.000      NA     NA    0.000    0.000
## 87     N ~1          1      1         0.000 0.000      NA     NA    0.000    0.000
## 88     O ~1          1      1         0.000 0.000      NA     NA    0.000    0.000
## 89     A =~  a2      2      2  .p1.  0.322 0.055   5.878  0.000    0.215    0.429
## 90     A =~  a5      2      2  .p2.  0.655 0.060  10.841  0.000    0.537    0.773
## 91     A =~  a7      2      2  .p3.  0.645 0.054  11.912  0.000    0.539    0.751
## 92     A =~  a9      2      2  .p4.  0.745 0.056  13.284  0.000    0.636    0.855
## 93     C =~  c3      2      2  .p5.  0.570 0.052  10.947  0.000    0.468    0.672
## 94     C =~  c4      2      2  .p6.  0.341 0.049   7.037  0.000    0.246    0.436
## 95     C =~  c8      2      2  .p7.  0.398 0.049   8.100  0.000    0.301    0.494
## 96     C =~  c9      2      2  .p8.  0.745 0.081   9.170  0.000    0.586    0.905
## 97     E =~  e1      2      2  .p9.  0.657 0.050  13.147  0.000    0.559    0.755
## 98     E =~  e4      2      2 .p10.  0.803 0.069  11.594  0.000    0.667    0.939
## 99     E =~  e6      2      2 .p11.  0.799 0.062  12.841  0.000    0.677    0.920
## 100    E =~  e7      2      2 .p12.  0.686 0.062  10.993  0.000    0.564    0.808
## 101    N =~  n1      2      2 .p13.  0.507 0.057   8.964  0.000    0.396    0.618
## 102    N =~  n2      2      2 .p14.  0.824 0.063  13.080  0.000    0.701    0.948
## 103    N =~  n6      2      2 .p15.  0.600 0.053  11.245  0.000    0.495    0.704
## 104    N =~  n8      2      2 .p16.  0.825 0.064  12.803  0.000    0.699    0.952
## 105    O =~  i2      2      2 .p17.  0.512 0.081   6.356  0.000    0.354    0.670
## 106    O =~  i8      2      2 .p18.  0.425 0.080   5.344  0.000    0.269    0.581
## 107    O =~  i9      2      2 .p19.  0.485 0.075   6.457  0.000    0.338    0.632
## 108    O =~ i10      2      2 .p20.  0.570 0.091   6.273  0.000    0.392    0.748
## 109   a2 ~~  a5      2      2         0.099 0.041   2.396  0.017    0.018    0.180
## 110   e4 ~~  e7      2      2        -0.083 0.068  -1.219  0.223   -0.216    0.050
## 111   i2 ~~ i10      2      2         0.275 0.101   2.722  0.006    0.077    0.474
## 112   i8 ~~  i9      2      2         0.580 0.090   6.437  0.000    0.403    0.757
## 113   a9 ~~  i9      2      2        -0.006 0.037  -0.148  0.882   -0.078    0.067
## 114   c3 ~~  e6      2      2        -0.030 0.059  -0.506  0.613   -0.144    0.085
## 115   a2 ~~  e7      2      2        -0.116 0.039  -2.980  0.003   -0.191   -0.040
## 116   e7 ~~  n2      2      2        -0.146 0.053  -2.783  0.005   -0.249   -0.043
## 117   a2 ~~  a2      2      2 .p29.  0.544 0.050  10.946  0.000    0.447    0.641
## 118   a5 ~~  a5      2      2 .p30.  0.536 0.055   9.759  0.000    0.429    0.644
## 119   a7 ~~  a7      2      2 .p31.  0.410 0.053   7.704  0.000    0.306    0.515
## 120   a9 ~~  a9      2      2 .p32.  0.356 0.054   6.611  0.000    0.251    0.462
## 121   c3 ~~  c3      2      2 .p33.  0.935 0.074  12.559  0.000    0.789    1.081
## 122   c4 ~~  c4      2      2 .p34.  0.410 0.039  10.578  0.000    0.334    0.486
## 123   c8 ~~  c8      2      2         0.705 0.093   7.606  0.000    0.523    0.886
## 124   c9 ~~  c9      2      2 .p36.  0.925 0.115   8.019  0.000    0.699    1.151
## 125   e1 ~~  e1      2      2 .p37.  0.784 0.058  13.555  0.000    0.671    0.898
## 126   e4 ~~  e4      2      2 .p38.  0.991 0.090  11.035  0.000    0.815    1.168
## 127   e6 ~~  e6      2      2 .p39.  0.881 0.073  12.136  0.000    0.739    1.023
## 128   e7 ~~  e7      2      2 .p40.  0.612 0.069   8.919  0.000    0.477    0.746
## 129   n1 ~~  n1      2      2         0.944 0.078  12.028  0.000    0.790    1.097
## 130   n2 ~~  n2      2      2         0.959 0.116   8.259  0.000    0.731    1.186
## 131   n6 ~~  n6      2      2 .p43.  0.748 0.059  12.641  0.000    0.632    0.864
## 132   n8 ~~  n8      2      2 .p44.  0.652 0.075   8.691  0.000    0.505    0.799
## 133   i2 ~~  i2      2      2 .p45.  0.735 0.090   8.123  0.000    0.558    0.912
## 134   i8 ~~  i8      2      2 .p46.  1.182 0.094  12.529  0.000    0.997    1.367
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## 135   i9 ~~   i9      2      2 .p47.  1.015 0.090  11.268  0.000    0.839    1.192
## 136 i10 ~~ i10      2      2 .p48.  0.786 0.122   6.449  0.000    0.547    1.024
## 137    A ~~    A      2      2        0.562 0.114   4.945  0.000    0.339    0.785
## 138    C ~~    C      2      2        1.455 0.251   5.797  0.000    0.963    1.947
## 139    E ~~    E      2      2        0.979 0.130   7.559  0.000    0.725    1.233
## 140    N ~~    N      2      2        1.114 0.167   6.657  0.000    0.786    1.442
## 141    O ~~    O      2      2        1.859 0.468   3.973  0.000    0.942    2.777
## 142    A ~~    C      2      2       -0.036 0.081  -0.443  0.658   -0.195    0.123
## 143    A ~~    E      2      2        0.135 0.065   2.093  0.036    0.009    0.262
## 144    A ~~    N      2      2       -0.159 0.078  -2.036  0.042   -0.313   -0.006
## 145    A ~~    O      2      2        0.294 0.109   2.703  0.007    0.081    0.507
## 146    C ~~    E      2      2        0.114 0.100   1.140  0.254   -0.082    0.311
## 147    C ~~    N      2      2       -0.310 0.118  -2.635  0.008   -0.541   -0.079
## 148    C ~~    O      2      2       -0.245 0.159  -1.538  0.124   -0.557    0.067
## 149    E ~~    N      2      2       -0.175 0.091  -1.929  0.054   -0.354    0.003
## 150    E ~~    O      2      2        0.455 0.137   3.308  0.001    0.185    0.724
## 151    N ~~    O      2      2       -0.055 0.131  -0.420  0.674   -0.311    0.201
## 152   a2 ~1           2      2        4.098 0.063  65.328  0.000    3.975    4.221
## 153   a5 ~1           2      2 .p65.  3.562 0.062  57.403  0.000    3.440    3.684
## 154   a7 ~1           2      2 .p66.  3.999 0.055  72.486  0.000    3.891    4.107
## 155   a9 ~1           2      2 .p67.  3.618 0.059  61.186  0.000    3.503    3.734
## 156   c3 ~1           2      2 .p68.  3.287 0.059  56.183  0.000    3.173    3.402
## 157   c4 ~1           2      2 .p69.  4.263 0.039 109.524  0.000    4.187    4.339
## 158   c8 ~1           2      2 .p70.  4.181 0.044  94.704  0.000    4.095    4.268
## 159   c9 ~1           2      2 .p71.  3.599 0.071  50.883  0.000    3.461    3.738
## 160   e1 ~1           2      2 .p72.  2.270 0.060  38.013  0.000    2.153    2.387
## 161   e4 ~1           2      2 .p73.  2.924 0.071  41.218  0.000    2.785    3.063
## 162   e6 ~1           2      2        3.428 0.089  38.528  0.000    3.253    3.602
## 163   e7 ~1           2      2 .p75.  3.091 0.061  50.674  0.000    2.971    3.210
## 164   n1 ~1           2      2        2.566 0.071  35.974  0.000    2.427    2.706
## 165   n2 ~1           2      2        2.699 0.094  28.652  0.000    2.515    2.884
## 166   n6 ~1           2      2 .p78.  2.324 0.058  39.856  0.000    2.209    2.438
## 167   n8 ~1           2      2 .p79.  2.279 0.071  31.976  0.000    2.139    2.418
## 168   i2 ~1           2      2 .p80.  3.972 0.055  72.365  0.000    3.864    4.079
## 169   i8 ~1           2      2 .p81.  3.590 0.062  57.626  0.000    3.468    3.712
## 170   i9 ~1           2      2 .p82.  3.615 0.061  59.144  0.000    3.495    3.735
## 171  i10 ~1           2      2 .p83.  4.072 0.063  64.852  0.000    3.948    4.195
## 172    A ~1           2      2        0.743 0.083   8.936  0.000    0.580    0.905
## 173    C ~1           2      2        0.140 0.115   1.219  0.223   -0.085    0.366
## 174    E ~1           2      2       -0.019 0.104  -0.186  0.853   -0.224    0.185
## 175    N ~1           2      2       -0.049 0.111  -0.444  0.657   -0.266    0.168
## 176    O ~1           2      2       -0.458 0.166  -2.764  0.006   -0.783   -0.133
```