## semmcci: Internal Tests

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## **Tests**

```
\#> test-semmcci-mc-latent-med-defined-none
#> Test passed
#> Test passed
#> Test passed
\#>\ test-semmcci-mc-latent-med-defined
#> Test passed
#> Test passed
#> Test passed
\#> test-semmcci-mc-latent-med-std-defined-none
#> Test passed
#> Test passed
#> Test passed
\#> test-semmcci-mc-latent-med-std-defined
#> Test passed
#> Test passed
#> Test passed
#> test-semmcci-mc-moment
#> Test passed
\#> test-semmcci-mc-simple-med-defined-equality
#> Test passed
#> Test passed
#> Test passed
\textit{\#> test-semmcci-mc-simple-med-defined-inequality}
#> Test passed
#> Test passed
#> Test passed
```

```
\#> test-semmcci-mc-simple-med-defined-mean structure
#> Test passed
#> Test passed
#> Test passed
\#> test-semmcci-mc-simple-med-defined-mi-amelia
#> Test passed
\#> test-semmcci-mc-simple-med-defined-mi-list
#> Test passed
\#> test-semmcci-mc-simple-med-defined-mi-mice
#> Test passed
\#> test-semmcci-mc-simple-med-defined-none
#> Test passed
#> Test passed
#> Test passed
\#> test-semmcci-mc-simple-med-defined
#> Test passed
#> Test passed
#> Test passed
\#>\ test-semmcci-mc-simple-med-std-defined-mean structure
#> Test passed
#> Test passed
#> Test passed
\textit{\#> test-semmcci-mc-simple-med-std-defined-none-random-x}
#> Test passed
#> Test passed
#> Test passed
\#> test-semmcci-mc-simple-med-std-defined-none
#> Test passed
#> Test passed
#> Test passed
\textit{\#> test-semmcci-mc-simple-med-std-defined}
#> Test passed
#> Test passed
#> Test passed
```

## #> test-semmcci-mc-methods #> Monte Carlo Confidence Intervals est #> se R 0.05% 0.5% 2.5% 97.5% 99.5% 99.95% #> visual=~x1 1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 #> visual=~x2 0.5535 0.1036 100 0.2905 0.3006 0.3393 0.7554 0.7776 0.7871 0.7294 0.1151 100 0.4492 0.4699 0.5257 1.0067 1.0294 1.0307 #> visual=~x3 1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 #> textual=~x4 #> textual=~x5 1.1131 0.0703 100 0.9292 0.9530 0.9972 1.2425 1.2831 1.3070 #> textual=~x6 0.9261 0.0518 100 0.7373 0.7705 0.8227 1.0097 1.0260 1.0300 #> speed=~x7 1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 1.1800 0.1541 100 0.8224 0.8245 0.9344 1.4488 1.5937 1.6411 #> speed=~x8 1.0815 0.1410 100 0.7107 0.7568 0.8409 1.3371 1.3696 1.3723 #> speed=~x9 #> x1~~x1 0.5491 0.1242 100 0.1970 0.2215 0.2815 0.8076 0.8556 0.8630 #> x2~~x2 1.1338 0.1003 100 0.8546 0.8746 0.9059 1.2873 1.3672 1.3739 #> x3~~x3 0.8443 0.1018 100 0.5149 0.5377 0.6188 1.0398 1.0842 1.0940 #> x4~~x4 0.3712 0.0456 100 0.2802 0.2834 0.2944 0.4500 0.4792 0.4979 #> x5~~x5 0.4463 0.0603 100 0.2583 0.2625 0.3292 0.5477 0.5838 0.5902 #> x6~~x6 0.3562 0.0403 100 0.2501 0.2554 0.2773 0.4368 0.4534 0.4548 #> x7~~x7 0.7994 0.0771 100 0.6097 0.6323 0.6738 0.9653 0.9765 0.9797 #> x8~~x8 0.4877 0.0763 100 0.3245 0.3269 0.3433 0.6452 0.6720 0.6744 #> x9~~x9 0.5661 0.0612 100 0.4070 0.4071 0.4278 0.6797 0.7136 0.7216 #> visual~~visual 0.8093 0.1484 100 0.5274 0.5389 0.5693 1.0824 1.1589 1.2070 #> textual~~textual 0.9795 0.1098 100 0.6739 0.7147 0.7719 1.1857 1.2017 1.2124 #> speed~~speed 0.3837 0.0754 100 0.2087 0.2142 0.2321 0.5412 0.5486 0.5524 #> visual~~textual 0.4082 0.0730 100 0.2226 0.2377 0.2894 0.5457 0.5788 0.5871 #> visual~~speed 0.2622 0.0527 100 0.1513 0.1530 0.1657 0.3692 0.4076 0.4180 0.1735 0.0395 100 0.0728 0.0817 0.0965 0.2550 0.2664 0.2715 #> textual~~speed #> Monte Carlo Confidence Intervals (Multiple Imputation Estimates) se R 0.05% 0.5% 2.5% 97.5% 99.5% 99.95% est #> visual=~x1 1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 #> visual=~x2 0.5535 0.0933 100 0.3237 0.3474 0.3880 0.7689 0.8001 0.8232 #> visual=~x3 0.7294 0.1070 100 0.5019 0.5171 0.5636 0.9352 0.9496 0.9569 #> textual=~x4 1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 1.1131 0.0664 100 0.9670 0.9681 1.0092 1.2316 1.2556 1.2676 #> textual=~x5 0.9261 0.0584 100 0.7974 0.7995 0.8121 1.0274 1.0387 1.0405 #> textual=~x6 #> speed=~x7 1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.1800 0.1771 100 0.7525 0.7587 0.7759 1.4897 1.6021 1.6345 #> speed=~x8 #> speed=~x9 1.0815 0.1735 100 0.6198 0.6925 0.7900 1.4403 1.4995 1.5133 #> x1~~x1 0.5491 0.1043 100 0.3002 0.3341 0.3774 0.7828 0.7999 0.8012 #> x2~~x2 1.1338 0.1020 100 0.8572 0.8836 0.9220 1.2941 1.3198 1.3260 #> x3~~x3 0.8443 0.0841 100 0.6825 0.6890 0.7032 1.0076 1.0621 1.0948 #> x4~~x4 0.3712 0.0477 100 0.2451 0.2565 0.2724 0.4573 0.4766 0.4910 0.4463 0.0605 100 0.3093 0.3103 0.3233 0.5676 0.5872 0.6004 #> x5~~x5 #> x6~~x6 0.3562 0.0463 100 0.2605 0.2638 0.2782 0.4489 0.4788 0.5023 #> x7~~x7 0.7994 0.0855 100 0.4949 0.5668 0.6580 0.9449 1.0476 1.0744

```
#> x8~~x8
                  0.4877 0.0622 100 0.3725 0.3738 0.3856 0.6224 0.6416 0.6452
                  0.5661 0.0789 100 0.3534 0.3590 0.3876 0.7031 0.7479 0.7834
#> x9~~x9
#> visual~~visual 0.8093 0.1295 100 0.3942 0.4494 0.5237 0.9762 1.0354 1.0571
#> textual~~textual 0.9795 0.1193 100 0.7305 0.7372 0.7579 1.2185 1.2778 1.3107
#> speed~~speed
               0.3837 0.0962 100 0.0800 0.1316 0.1973 0.5446 0.5900 0.5969
#> visual~~textual 0.4082 0.0726 100 0.2116 0.2283 0.2561 0.5429 0.5632 0.5722
#> visual~~speed
                  0.2622 0.0563 100 0.1421 0.1465 0.1680 0.3664 0.3848 0.3849
#> textual~~speed
                 0.1735 0.0494 100 0.0652 0.0755 0.0905 0.2801 0.2937 0.3004
#> Standardized Monte Carlo Confidence Intervals
                     est
                            se R 0.05% 0.5%
                                                 2.5% 97.5% 99.5% 99.95%
#> visual=~x1
                  0.7719 0.0582 100 0.6162 0.6247 0.6548 0.8881 0.9101 0.9174
#> visual=~x2
                  0.4236 0.0630 100 0.2841 0.2849 0.2937 0.5237 0.5398 0.5449
#> visual=~x3
                  0.5811 0.0610 100 0.4254 0.4286 0.4514 0.7232 0.7404 0.7443
                 0.8516 0.0227 100 0.7873 0.7914 0.8018 0.8909 0.8932 0.8940
#> textual=~x4
                  0.8551 0.0236 100 0.7902 0.7971 0.8116 0.8999 0.9155 0.9240
#> textual=~x5
#> textual=~x6
                  0.8380 0.0225 100 0.7771 0.7801 0.7942 0.8758 0.8867 0.8949
#> speed=~x7
                  0.5695 0.0454 100 0.4417 0.4437 0.4623 0.6493 0.6538 0.6570
#> speed=~x8
                  0.7230 0.0533 100 0.5745 0.5773 0.6046 0.8026 0.8375 0.8483
#> speed=~x9
                 0.6650 0.0521 100 0.5212 0.5259 0.5616 0.7562 0.7870 0.8033
#> x1~~x1
                 0.4042 0.0896 100 0.1585 0.1716 0.2111 0.5712 0.6096 0.6203
#> x2~~x2
                 0.8206 0.0522 100 0.7031 0.7086 0.7256 0.9137 0.9188 0.9193
#> x3~~x3
                 0.6623 0.0713 100 0.4460 0.4518 0.4769 0.7962 0.8163 0.8190
#> x4~~x4
                 0.2748 0.0384 100 0.2007 0.2022 0.2063 0.3572 0.3737 0.3802
#> x5~~x5
                 0.2689 0.0404 100 0.1462 0.1617 0.1901 0.3413 0.3645 0.3755
                 0.2977 0.0376 100 0.1991 0.2137 0.2330 0.3692 0.3914 0.3961
#> x6~~x6
#> x7~~x7
                 0.6757 0.0508 100 0.5684 0.5725 0.5785 0.7860 0.8032 0.8049
#> x8~~x8
                 0.4772 0.0754 100 0.2803 0.2985 0.3558 0.6345 0.6667 0.6699
#> x9~~x9
                  0.5578 0.0683 100 0.3547 0.3803 0.4282 0.6846 0.7234 0.7284
#> textual~~textual 1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
#> speed~~speed 1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000
#> visual~~textual 0.4585 0.0669 100 0.2822 0.3109 0.3588 0.5930 0.6164 0.6249
                  0.4705 0.0732 100 0.3222 0.3332 0.3685 0.6634 0.6855 0.6880
#> visual~~speed
#> Standardized Monte Carlo Confidence Intervals
                     est
                            se R 0.05% 0.5% 2.5% 97.5% 99.5% 99.95%
#> visual=~x1
                  0.7719 0.0539 100 0.5741 0.6008 0.6364 0.8409 0.8618 0.8719
#> visual=~x2
                  0.4236\ 0.0611\ 100\ 0.2749\ 0.2793\ 0.3029\ 0.5352\ 0.5904\ 0.6158
#> visual=~x3
                  0.5811 0.0547 100 0.4200 0.4224 0.4790 0.6783 0.7032 0.7172
                  0.8516 0.0231 100 0.7979 0.8026 0.8117 0.8944 0.9026 0.9047
#> textual=~x4
#> textual=~x5
                  0.8551 0.0226 100 0.7869 0.7981 0.8151 0.8978 0.9072 0.9093
                  0.8380 0.0243 100 0.7638 0.7659 0.7773 0.8768 0.8886 0.8888
#> textual=~x6
#> speed=~x7
                  0.5695 0.0655 100 0.2814 0.3585 0.4493 0.6705 0.7111 0.7392
                  0.7230 0.0521 100 0.5395 0.5500 0.5822 0.7728 0.7950 0.8072
#> speed=~x8
#> speed=~x9
                  0.6650 0.0591 100 0.5006 0.5018 0.5319 0.7628 0.8118 0.8256
                0.4042 0.0800 100 0.2397 0.2571 0.2929 0.5950 0.6381 0.6702
#> x1~~x1
```

```
#> x2~~x2
                 0.8206 0.0526 100 0.6206 0.6506 0.7135 0.9081 0.9220 0.9244
                 0.6623 0.0625 100 0.4856 0.5052 0.5399 0.7706 0.8216 0.8236
#> x3~~x3
                 0.2748 0.0392 100 0.1816 0.1853 0.2000 0.3411 0.3558 0.3634
#> x4~~x4
#> x5~~x5
                0.2689 0.0385 100 0.1732 0.1769 0.1939 0.3356 0.3629 0.3808
#> x6~~x6
                 0.2977 0.0404 100 0.2100 0.2104 0.2311 0.3958 0.4133 0.4166
#> x7~~x7
                0.6757 0.0710 100 0.4534 0.4933 0.5504 0.7981 0.8640 0.9194
#> x8~~x8
                0.4772 0.0710 100 0.3484 0.3678 0.4028 0.6610 0.6973 0.7090
#> x9~~x9
                 0.5578 0.0773 100 0.3184 0.3408 0.4181 0.7169 0.7482 0.7494
#> textual~~textual 1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000
#> speed~~speed 1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000
#> visual~~textual 0.4585 0.0623 100 0.3250 0.3368 0.3562 0.5971 0.6170 0.6190
#> textual~~speed 0.2830 0.0689 100 0.1129 0.1262 0.1535 0.4347 0.4742 0.4878
#> Monte Carlo Confidence Intervals
#> Monte Carlo Confidence Intervals (Multiple Imputation Estimates)
#> Standardized Monte Carlo Confidence Intervals
#> Standardized Monte Carlo Confidence Intervals
\#> test-semmcci-npd
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> test-semmcci-zzz-coverage
#> test-semmcci-zzz-heywood
#> lavaan 0.6.15 ended normally after 18 iterations
#>
#>
    Estimator
                                                 ML
#>
    Optimization method
                                             NLMINB
    Number of model parameters
                                                  8
#>
#>
    Number of observations
                                                 50
#>
#> Model Test User Model:
#>
                                              0.000
#>
    Test statistic
    Degrees of freedom
#>
#>
    P-value (Chi-square)
                                              1.000
#>
#> Parameter Estimates:
#>
#>
    Standard errors
                                            Standard
#> Information
                                            Expected
```

```
#>
#> Latent Variables:
               Estimate Std.Err z-value P(>|z|)
#>
#>
   eta1 =~
#>
                1.000
  y1
                0.991 0.152 6.524 0.000
#>
    y2
                0.901 0.138 6.537 0.000
   уЗ
#>
#>
   y4
                1.399 0.143 9.814 0.000
#>
#> Variances:
              Estimate Std.Err z-value P(>|z|)
#>
               0.000 0.055 0.000 1.000
#>
  .y1
                0.980 0.203 4.822 0.000
#> .y2
#>
    .уЗ
               0.807 0.167 4.820 0.000
                     0.176 3.960 0.000
#>
   .y4
               0.696
               0.980 0.204 4.815 0.000
#>
   eta1
#>
#> Standardized Monte Carlo Confidence Intervals
#> est se R 0.05% 0.5% 2.5% 97.5% 99.5% 99.95%
#> eta1=~y1 1.0000 NA 0 NA NA NA NA NA
#> eta1=~y2 0.7039 NA 0 NA NA NA NA
                                       NA
#> eta1=~y3 0.7047 NA 0 NA NA NA NA
                                       NA
#> eta1=~y4 0.8566 NA 0 NA NA NA NA NA
NA
#> eta1~~eta1 1.0000 NA 0 NA NA NA NA
#> [[1]]
#> [[1]][[1]]
#> [[1]][[1]]$value
#> [[1]][[1]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[1]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[2]]
#> [[1]][[2]]$value
#> [[1]][[2]]$value[[1]]
#> [1] TRUE
#>
```

```
#>
#> [[1]][[2]]$visible
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#>
#> [[1]][[3]]
#> [[1]][[3]]$value
#> [[1]][[3]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[3]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[4]]
#> [[1]][[4]]$value
#> [[1]][[4]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[4]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[5]]
#> [[1]][[5]]$value
#> [[1]][[5]]$value[[1]]
#> Monte Carlo Confidence Intervals
                                     se R 0.05% 0.5%
                                                                 2.5%
                            est
#> ses=~education
                         1.0000 0.0000 20000 1.0000 1.0000
                                                              1.0000
#> ses=~sei
                         5.2195 0.4226 20000 3.8900 4.1293 4.3905
#> alien67=~anomia67
                         1.0000 0.0000 20000 1.0000 1.0000 1.0000
                         0.9787 0.0614 20000 0.7692 0.8177 0.8582
#> alien67=~powerless67
                         1.0000 0.0000 20000 1.0000
#> alien71=~anomia71
                                                      1.0000
                                                              1.0000
                                                     0.7697
#> alien71=~powerless71
                         0.9221 0.0588 20000 0.7367
                                                               0.8064
#> alien71~alien67
                          0.6070 0.0510 20000 0.4424 0.4737 0.5061
#> alien71~ses
                         #> alien67~ses
                         -0.5750 0.0562 20000 -0.7731 -0.7205 -0.6865
#> anomia67~~anomia71
                         1.6229 0.3142 20000 0.5592 0.8237
                                                              1.0069
#> powerless67~~powerless71   0.3387   0.2598   20000   -0.5226   -0.3340   -0.1708
#> education~~education
                         2.8013 0.5062 20000 1.1528 1.4997
                                                              1.8166
#> sei~~sei
                         264.5971 18.0858 20000 203.3303 218.4079 228.8985
                      4.7307 0.4533 20000 3.2498 3.5630 3.8506
#> anomia67~~anomia67
#> powerless67~~powerless67 2.5634 0.4018 20000 1.2944 1.5456 1.7690
#> anomia71~~anomia71 4.3992 0.5116 20000 2.7155 3.0462 3.3949
```

```
#> powerless71~~powerless71 3.0699 0.4275 20000 1.6771 1.9761 2.2268
           6.7983 0.6450 20000 4.6753 5.1468 5.5541
#> ses~~ses
#> alien67~~alien67
                         4.8415 0.4680 20000 3.2711 3.6305 3.9353
#> alien71~~alien71
                         4.0832 0.4038 20000 2.7358 3.0300 3.2974
#>
                          97.5% 99.5% 99.95%
#> ses=~education
                        1.0000 1.0000 1.0000
#> ses=~sei
                        6.0543 6.3285 6.6037
#> alien67=~anomia67
                        1.0000 1.0000 1.0000
#> alien67=~powerless67
                         1.0986 1.1340
                                         1.1765
#> alien71=~anomia71
                         1.0000 1.0000 1.0000
                       1.0370 1.0721 1.1122
#> alien71=~powerless71
#> alien71~alien67
                         0.7056 0.7362 0.7682
                         -0.1234 -0.0920 -0.0540
#> alien71~ses
                        -0.4655 -0.4319 -0.4020
#> alien67~ses
                     2.2355 2.4242 2.6515
#> anomia67~~anomia71
#> powerless67~~powerless71     0.8483     1.0044
                                         1.1778
#> education~~education 3.7910 4.0927
                                        4.4747
#> sei~~sei
                       300.2449 311.3400 324.8932
#> anomia67~anomia67 5.6238 5.8925 6.1298
#> powerless67~~powerless67 3.3466 3.5964 3.8882
#> anomia71~~anomia71 5.3854 5.6930 6.0102
#> powerless71~~powerless71 3.9145 4.1804 4.5006
                    8.0557 8.4682 8.9722
#> ses~~ses
                         5.7598 6.0594
#> alien67~~alien67
                                         6.3755
#> alien71~~alien71
                         4.8829 5.1132 5.3753
#>
#>
#> [[1]][[5]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[6]]
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#>
#>
#> [[1]][[6]]$visible
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#>
#> [[1]][[7]]
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#>
```

```
#> [[1]][[7]]$visible
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#>
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#>
#>
#> [[1]][[8]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[9]]
#> [[1]][[9]]$value
#> [[1]][[9]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[9]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[10]]
#> [[1]][[10]]$value
#> [[1]][[10]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[10]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[11]]
#> [[1]][[11]]$value
#> [[1]][[11]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[11]]$visible
#> [1] TRUE
#>
#> [[1]][[12]]
```

```
#> [[1]][[12]]$value
#> [[1]][[12]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[12]]$visible
#> [1] TRUE
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#>
#> [[1]][[13]]
#> [[1]][[13]]$value
#> [[1]][[13]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[13]]$visible
#> [1] TRUE
#>
#> [[1]][[14]]
#> [[1]][[14]]$value
#> [[1]][[14]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[14]]$visible
#> [1] TRUE
#>
#> [[1]][[15]]
#> [[1]][[15]]$value
#> [[1]][[15]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[15]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[16]]
#> [[1]][[16]]$value
#> [[1]][[16]]$value[[1]]
#> [1] TRUE
#>
#>
```

```
#> [[1]][[16]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[17]]
#> [[1]][[17]]$value
#> [[1]][[17]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[17]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[18]]
#> [[1]][[18]]$value
#> [[1]][[18]]$value[[1]]
                             2.5% 97.5%
#> textual=~x4
                      0.8117434 0.8944356
#> textual="x4" 0.8117434 0.8944356

#> textual="x5" 0.8151063 0.8978305

#> textual="x6" 0.7773019 0.8768400

#> speed="x7" 0.4493226 0.6704943

#> speed="x8" 0.5822396 0.7728169

#> speed="x9" 0.5319057 0.7628094

#> x1""x1 0.2928733 0.5949577
#> x2~~x2
                      0.7134882 0.9080927
#> x3~~x3
                      0.5398644 0.7705771
#> x4~~x4
                    0.1999838 0.3410724
0.1938996 0.3355998
0.2311496 0.3957549
0.5504136 0.7981092
#> x5~~x5
#> x6~~x6
#> x7~~x7
#> visual~~visual 1.0000000 1.0000000
#> textual~~textual 1.0000000 1.0000000
#> speed~~speed 1.0000000 1.0000000
#> visual~~textual 0.3561609 0.5970586
#> visual~~speed     0.3363013 0.6505411
#> textual~~speed 0.1534887 0.4346520
#>
#>
#> [[1]][[18]]$visible
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#>
#> [[1]][[19]]
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#> [[1]][[19]]$value[[1]]$thetahatstar
#>
                      y1
                                   y2
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#> [1965,] -1.6101311805 -2.789348555 -3.5557724054
#> [1966,] 0.0375891594 0.527821738 0.3397918807
#> [1967,] -0.7201206960 -1.857327839 -1.9287150081
#> [1968,] -1.4805577694 -2.675414669 -3.3309684677
#> [1969,] -0.7496989237 -1.241677184 -1.6239381173
#> [1970,] -2.0699943468 -3.641327819 -4.6020252150
#> [1971,] 2.3146175575 3.710406592 4.9454011963
#> [1972,] 0.7635547647 0.742809459 1.3643653677
```

```
#> [1973,] -0.3707878753 -1.293218715 -1.1800471601
#> [1974,] 0.4688114055 0.339502542 0.7730079572
#> [1975,] 0.4396834816 0.462563942 0.8049799549
#> [1976,] 0.1090874295 0.097991561 0.1904110131
#> [1978,] -0.4666928251 -0.728691051 -0.9863494590
#> [1979,] 0.7120246906 1.742462762 1.8548741465
#> [1980,] -0.9516214366 -1.864751483 -2.2215115218
#> [1981,] 1.0061305782 1.279606068 1.9647521028
#> [1982,] -1.4522429655 -2.267627545 -3.0693557040
#> [1983,] 1.2794883430 3.003573372 3.2623533348
#> [1984,] -2.2488984445 -4.320143004 -5.2018289830
#> [1985,] 0.7677670861 1.040778995 1.5349786638
#> [1986,] 1.1801835597 1.724567706 2.4287277005
#> [1987,] 0.1364985191 -0.372818873 -0.0366879961
#> [1988,] 0.3667481550 0.190458332 0.5630238689
#> [1989,] -0.2209324188 -1.369396047 -1.0354556921
#> [1990,] -1.0399587887 -3.142045038 -3.0405108436
#> [1991,] 0.0558762394 -0.637704450 -0.2842227395
#> [1992,] 0.2091298506 -1.607450213 -0.6312869094
#> [1993,] 0.4156071092 0.849386683 0.9896276353
#> [1994,] 0.3494040221 0.959534909 0.9682013900
#> [1995,] -1.4343231258 -3.755723575 -3.8728410230
#> [1996,] 0.1872222947 0.513925649 0.5186696009
#> [1997,] -1.6529725621 -3.404237314 -3.9504322513
#> [1998,] 1.4015933736 3.364715211 3.6150344181
#> [1999,] 0.9553879919 1.642413083 2.1028198362
#> [2000,] 0.0264669930 -0.803897684 -0.4131257565
#> [[1]][[19]]$value[[1]]$decomposition
#> [1] "eigen"
#>
#>
#>
#> [[1]][[19]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[20]]
#> [[1]][[20]]$value
#> [[1]][[20]]$value[[1]]
#> [[1]][[20]]$value[[1]]$M
#> [1] 2
#>
#> [[1]][[20]]$value[[1]]$est
```

```
#> [1] 0 0 0
#>
#> [[1]][[20]]$value[[1]]$within
#> [,1] [,2] [,3]
#> [1,] 1 0 0
#> [2,] 0 1 0
#> [3,] 0 0 1
#> [[1]][[20]]$value[[1]]$between
#> [,1] [,2] [,3]
#> [1,] 0 0 0
             0
      0 0
#> [2,]
#> [3,] 0 0 0
#>
#> [[1]][[20]]$value[[1]]$total
#> [,1] [,2] [,3]
#> [1,] 1 0 0
#> [2,] 0 1 0
#> [3,] 0 0 1
#> [[1]][[20]]$value[[1]]$ariv
#> [1] NA
#>
#> [[1]][[20]]$value[[1]]$total_adi
#> [1] NA
#>
#>
#>
#> [[1]][[20]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[21]]
#> [[1]][[21]]$value
#> [[1]][[21]]$value[[1]]
          est se R 0.05% 0.5% 2.5% 97.5% 99.5% 99.95%
#> eta1=~y1 1.0000 NA 0 NA NA NA NA NA
#> eta1=~y2 0.7039 NA 0
                   NA NA NA NA
                                        NA
#> eta1=~y3 0.7047 NA 0
                   NA NA NA NA
                                        NA
#> eta1=~y4 0.8566 NA 0 NA NA NA NA
                                        NA
NA NA NA NA
                                        NA
                   NA NA
                           NA NA NA
                                        NA
NA NA NA NA
                                        NA
                                        NA
#> eta1~~eta1 1.0000 NA 0 NA NA NA NA NA
                                        NA
```

```
#>
#>
#> [[1]][[21]]$visible
#> [1] TRUE
```

## Environment

```
ls()
#> [1] "i" "root" "tex_file"
```

## Class

```
#> [[1]]
#> [1] "character"

#>
#> [[2]]
#> [1] "root_criterion"
#>
#> [[3]]
#> [1] "character"
```

## References

R Core Team. (2023). R: A language and environment for statistical computing. R Foundation for Statistical Computing. Vienna, Austria. https://www.R-project.org/