Synthesizing Indirect Effects in Mediation Models with Meta-Analytic Methods: Supplementary Materials 2

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Contents

Data preparation

```
library("metaSEM")

## Check whether the correlation matrices are positive definite
is.pd(Cooke16$data)
```

```
##                    Ajzen and Sheikh (2013)
##                                       TRUE
##         Armitage, Norman, and Conner (2002)
##                                       TRUE
## Conner, Warren, Close, and Sparks (1999a) 1
##                                      FALSE
## Conner, Warren, Close, and Sparks (1999a) 2
##                                       TRUE
## Conner, Warren, Close, and Sparks (1999a) 3
##                                       TRUE
## Conner, Warren, Close, and Sparks (1999b) 1
```

```
##                                        TRUE
## Conner, Warren, Close, and Sparks (1999b) 2
##                                        TRUE
##   Conner, Warren, Close, and Sparks (1999c)
##                                        TRUE
##                     Cooke and French (2011a)
##                                        TRUE
##                     Cooke and French (2011b)
##                                        TRUE
##          Cooke, Sniehotta and Schuez (2007)
##                                        TRUE
##               Elliot and Ainsworth (2012) 1
##                                        TRUE
##               Elliot and Ainsworth (2012) 2
##                                        TRUE
##               Elliot and Ainsworth (2012) 3
##                                        TRUE
##               Elliot and Ainsworth (2012) 4
##                                        TRUE
##                      Gagnon, et al. (2012)
##                                        TRUE
##        Gardner, de Bruijn, and Lally (2012)
##                                        TRUE
##                    Glassman, et al. (2010a)
##                                        TRUE
##                    Glassman, et al. (2010b)
##                                        TRUE
##                    Glassman, et al. (2010c)
##                                        TRUE
##                    Glassman, et al. (2010d)
##                                        TRUE
##                       Hagger, et al. (2012)
##                                        TRUE
##                    Jamison and Myers (2008)
##                                        TRUE
##                   Johnston and White (2003)
##                                        TRUE
##                         Kim and Hong (2013)
##                                        TRUE
##                             Norman (2011) 1
##                                        TRUE
##                             Norman (2011) 2
##                                        TRUE
##                             Norman (2011) 3
##                                        TRUE
##                             Norman (2011) 4
##                                        TRUE
##      Norman, Armitage, and Quigley (2007) 1
##                                        TRUE
##      Norman, Armitage, and Quigley (2007) 2
##                                        TRUE
##                    Norman and Conner (2006)
##                                        TRUE
##         Norman, Conner, and Stride (2012) 1
```

```
##                                        TRUE
##          Norman, Conner, and Stride (2012) 2
##                                        TRUE
```

```r
## Drop the third study as the correlation matrix is not positive definite.
Cooke16 <- lapply(Cooke16, function(x) x[-3])
```

Illustration 1 with one mediator

```r
## Select ATT, Bi, and BEH for the illustration
obs.vars <- c("BEH", "BI", "ATT")

## Use new.df1 as the data set in illustration 1
new.df1 <- Cooke16
new.df1$data <- lapply(new.df1$data, function(x) x[obs.vars, obs.vars])

## Show the first few studies
head(new.df1)
```

```
## $data
## $data$`Ajzen and Sheikh (2013)`
##     BEH   BI  ATT
## BEH  NA   NA   NA
## BI   NA 1.00 0.68
## ATT  NA 0.68 1.00
##
## $data$`Armitage, Norman, and Conner (2002)`
##     BEH   BI  ATT
## BEH  NA   NA   NA
## BI   NA 1.00 0.61
## ATT  NA 0.61 1.00
##
## $data$`Conner, Warren, Close, and Sparks (1999a) 2`
##      BEH   BI  ATT
## BEH 1.00 0.35 0.13
## BI  0.35 1.00 0.39
## ATT 0.13 0.39 1.00
##
## $data$`Conner, Warren, Close, and Sparks (1999a) 3`
##      BEH   BI  ATT
## BEH 1.00 0.35 0.20
## BI  0.35 1.00 0.48
## ATT 0.20 0.48 1.00
##
## $data$`Conner, Warren, Close, and Sparks (1999b) 1`
##     BEH   BI  ATT
## BEH  NA   NA   NA
## BI   NA 1.00 0.52
## ATT  NA 0.52 1.00
##
## $data$`Conner, Warren, Close, and Sparks (1999b) 2`
##     BEH   BI  ATT
## BEH  NA   NA   NA
## BI   NA 1.00 0.62
```

```
## ATT  NA 0.62 1.00
##
## $data$`Conner, Warren, Close, and Sparks (1999c)`
##       BEH    BI   ATT
## BEH  1.00 -0.43 -0.20
## BI  -0.43  1.00  0.58
## ATT -0.20  0.58  1.00
##
## $data$`Cooke and French (2011a)`
##      BEH    BI   ATT
## BEH 1.00 0.700 0.560
## BI  0.70 1.000 0.775
## ATT 0.56 0.775 1.000
##
## $data$`Cooke and French (2011b)`
##     BEH   BI  ATT
## BEH  NA   NA   NA
## BI   NA 1.00 0.67
## ATT  NA 0.67 1.00
##
## $data$`Cooke, Sniehotta and Schuez (2007)`
##      BEH   BI  ATT
## BEH 1.00 0.56 0.43
## BI  0.56 1.00 0.72
## ATT 0.43 0.72 1.00
##
## $data$`Elliot and Ainsworth (2012) 1`
##     BEH BI ATT
## BEH  NA NA  NA
## BI   NA NA  NA
## ATT  NA NA   1
##
## $data$`Elliot and Ainsworth (2012) 2`
##     BEH BI ATT
## BEH  NA NA  NA
## BI   NA NA  NA
## ATT  NA NA   1
##
## $data$`Elliot and Ainsworth (2012) 3`
##     BEH BI ATT
## BEH  NA NA  NA
## BI   NA NA  NA
## ATT  NA NA   1
##
## $data$`Elliot and Ainsworth (2012) 4`
##     BEH BI ATT
## BEH  NA NA  NA
## BI   NA NA  NA
## ATT  NA NA   1
##
## $data$`Gagnon, et al. (2012)`
##       BEH    BI   ATT
## BEH  1.00 -0.41 -0.33
## BI  -0.41  1.00  0.74
```

```
## ATT -0.33  0.74  1.00
##
## $data$`Gardner, de Bruijn, and Lally (2012)`
##      BEH   BI  ATT
## BEH 1.00 0.93 0.29
## BI  0.93 1.00 0.33
## ATT 0.29 0.33 1.00
##
## $data$`Glassman, et al. (2010a)`
##      BEH   BI  ATT
## BEH 1.00 0.69 0.58
## BI  0.69 1.00 0.75
## ATT 0.58 0.75 1.00
##
## $data$`Glassman, et al. (2010b)`
##       BEH   BI   ATT
## BEH  1.00 0.21 -0.04
## BI   0.21 1.00  0.36
## ATT -0.04 0.36  1.00
##
## $data$`Glassman, et al. (2010c)`
##      BEH   BI  ATT
## BEH 1.00 0.59 0.51
## BI  0.59 1.00 0.82
## ATT 0.51 0.82 1.00
##
## $data$`Glassman, et al. (2010d)`
##      BEH   BI  ATT
## BEH 1.00 0.40 0.29
## BI  0.40 1.00 0.74
## ATT 0.29 0.74 1.00
##
## $data$`Hagger, et al. (2012)`
##      BEH   BI  ATT
## BEH 1.00 0.48 0.36
## BI  0.48 1.00 0.83
## ATT 0.36 0.83 1.00
##
## $data$`Jamison and Myers (2008)`
##      BEH   BI  ATT
## BEH 1.00 0.50 0.38
## BI  0.50 1.00 0.84
## ATT 0.38 0.84 1.00
##
## $data$`Johnston and White (2003)`
##       BEH    BI   ATT
## BEH 1.000 0.633 0.408
## BI  0.633 1.000 0.400
## ATT 0.408 0.400 1.000
##
## $data$`Kim and Hong (2013)`
##     BEH   BI  ATT
## BEH  NA   NA   NA
## BI   NA 1.00 0.48
```

```
## ATT  NA 0.48 1.00
##
## $data$`Norman (2011) 1`
##     BEH   BI  ATT
## BEH  NA   NA   NA
## BI   NA 1.00 0.33
## ATT  NA 0.33 1.00
##
## $data$`Norman (2011) 2`
##     BEH  BI ATT
## BEH  NA  NA  NA
## BI   NA 1.0 0.4
## ATT  NA 0.4 1.0
##
## $data$`Norman (2011) 3`
##     BEH  BI ATT
## BEH  NA  NA  NA
## BI   NA 1.0 0.3
## ATT  NA 0.3 1.0
##
## $data$`Norman (2011) 4`
##     BEH   BI  ATT
## BEH  NA   NA   NA
## BI   NA 1.00 0.33
## ATT  NA 0.33 1.00
##
## $data$`Norman, Armitage, and Quigley (2007) 1`
##       BEH    BI   ATT
## BEH 1.000 0.527 0.296
## BI  0.527 1.000 0.515
## ATT 0.296 0.515 1.000
##
## $data$`Norman, Armitage, and Quigley (2007) 2`
##       BEH    BI   ATT
## BEH 1.000 0.549 0.427
## BI  0.549 1.000 0.581
## ATT 0.427 0.581 1.000
##
## $data$`Norman and Conner (2006)`
##      BEH   BI  ATT
## BEH 1.00 0.52 0.53
## BI  0.52 1.00 0.81
## ATT 0.53 0.81 1.00
##
## $data$`Norman, Conner, and Stride (2012) 1`
##      BEH   BI  ATT
## BEH 1.00 0.60 0.28
## BI  0.60 1.00 0.35
## ATT 0.28 0.35 1.00
##
## $data$`Norman, Conner, and Stride (2012) 2`
##      BEH   BI  ATT
## BEH 1.00 0.56 0.36
## BI  0.56 1.00 0.45
```

```
## ATT 0.36 0.45 1.00
##
##
## $n
##  [1]   49  124  176  159  195  188  178  120  141  128  373  133  128  112  486
## [16]  176  289  315  137   94  398  172  122 1100  450  446  460  446  170  146
## [31]   62  147  153
##
## $MeanAge
##  [1] 19.80 26.00    NA    NA    NA    NA 20.28 20.40 20.10 21.95 20.00 20.00
## [13] 20.00 20.00 30.41 23.00 26.00 37.10 19.12 20.10 20.26 20.38 18.40 20.60
## [25] 13.60 13.60 15.70 15.70 19.91 19.91 21.00 24.70 24.70
##
## $Female
##  [1]  73.000  50.806  57.386  73.584  50.256  50.531  57.865  69.166  57.500
## [10]  75.000  61.100  61.100  61.100  61.100  53.703  42.045  79.930   0.000
## [19]  81.751  84.042  76.633  82.558  67.213  54.000   0.000 100.000   0.000
## [28] 100.000   0.000 100.000  75.000 100.000   0.000
```

```r
## Show the no. of studies per correlation
pattern.na(new.df1$data, show.na = FALSE)
```

```
##     BEH BI ATT
## BEH  19 19  19
## BI   19 29  29
## ATT  19 29  33
```

```r
## Show the total sample sizes per correlation
pattern.n(new.df1$data, new.df1$n)
```

```
##      BEH   BI  ATT
## BEH 3628 3628 3628
## BI  3628 7227 7227
## ATT 3628 7227 7973
```

Synthesizing indirect and direct effects

Caculation of indirect and direct effects

```r
## NA is not allowed in computing the indirect and direct effects.
## They are excluded in the parameter-based MASEM.
index1 <- sapply(new.df1$data, function(x) any(is.na(x)) )

## Calculate the indirect and direct effects and their sampling covariance matrices
IE.df1 <- indirectEffect(new.df1$data[!index1], new.df1$n[!index1])

## Add percentage of female participants to the data
IE.df1 <- data.frame(IE.df1, Female=new.df1$Female[!index1])

## No. of studies
nrow(IE.df1)
```

```
## [1] 19
```

```r
## Show the first few studies
head(IE.df1)
```

```
##                                              ind_eff      dir_eff     ind_var
## Conner, Warren, Close, and Sparks (1999a) 2  0.1375209 -0.007657921 0.001352739
## Conner, Warren, Close, and Sparks (1999a) 3  0.1594739  0.041856668 0.001989979
## Conner, Warren, Close, and Sparks (1999c)   -0.2690017  0.072966644 0.002292538
## Cooke and French (2011a)                     0.5282683  0.044844510 0.003867202
## Cooke, Sniehotta and Schuez (2007)           0.3824031  0.056844612 0.004779871
## Gagnon, et al. (2012)                       -0.2756333 -0.059758150 0.001880504
##                                               ind_dir_cov     dir_var Female
## Conner, Warren, Close, and Sparks (1999a) 2 -0.0007744299 0.005854732 57.386
## Conner, Warren, Close, and Sparks (1999a) 3 -0.0015432748 0.007338126 73.584
## Conner, Warren, Close, and Sparks (1999c)   -0.0015722567 0.006301951 57.865
## Cooke and French (2011a)                    -0.0039258651 0.011628855 69.166
## Cooke, Sniehotta and Schuez (2007)          -0.0046517676 0.012048089 75.000
## Gagnon, et al. (2012)                       -0.0019287195 0.004008990 53.703
```

Meta-analysis of indirect and direct effects

```
## Random-effects model
IE0 <- meta(y=cbind(ind_eff, dir_eff),
            v=cbind(ind_var, ind_dir_cov, dir_var),
            data=IE.df1,
            model.name = "Random")
summary(IE0)
```

```
##
## Call:
## meta(y = cbind(ind_eff, dir_eff), v = cbind(ind_var, ind_dir_cov,
##     dir_var), data = IE.df1, model.name = "Random")
##
## 95% confidence intervals: z statistic approximation (robust=FALSE)
## Coefficients:
##               Estimate  Std.Error     lbound     ubound z value  Pr(>|z|)
## Intercept1  0.2497685  0.0501497  0.1514768  0.3480602  4.9805 6.344e-07 ***
## Intercept2  0.0351886  0.0251948 -0.0141924  0.0845695  1.3967  0.162516
## Tau2_1_1    0.0445071  0.0153082  0.0145035  0.0745107  2.9074  0.003645 **
## Tau2_2_1    0.0047090  0.0052296 -0.0055409  0.0149589  0.9004  0.367888
## Tau2_2_2    0.0047973  0.0033894 -0.0018457  0.0114403  1.4154  0.156953
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Q statistic on the homogeneity of effect sizes: 707.8662
## Degrees of freedom of the Q statistic: 36
## P value of the Q statistic: 0
##
## Heterogeneity indices (based on the estimated Tau2):
##                               Estimate
## Intercept1: I2 (Q statistic)   0.9490
## Intercept2: I2 (Q statistic)   0.4695
##
## Number of studies (or clusters): 19
## Number of observed statistics: 38
## Number of estimated parameters: 5
## Degrees of freedom: 33
## -2 log likelihood: -34.34407
```

```
## OpenMx status1: 0 ("0" or "1": The optimization is considered fine.
## Other values may indicate problems.)
```

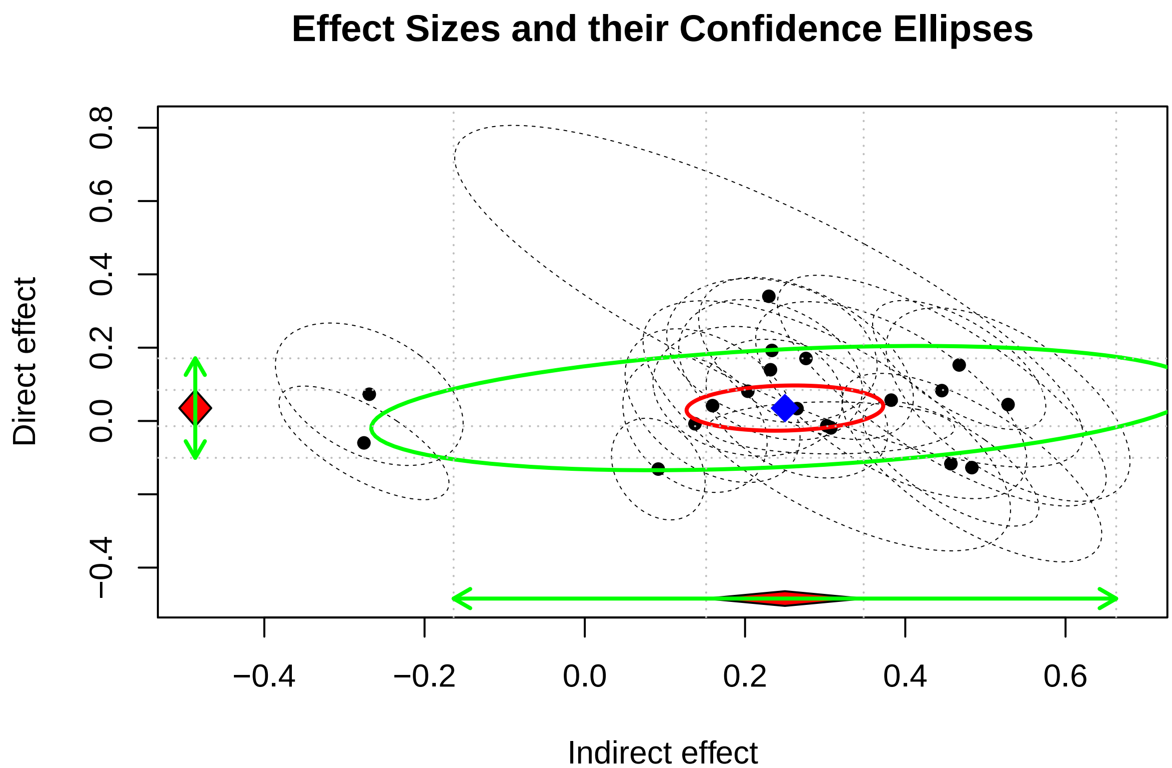
```r
## Variance-covariance matrix of the random effects
VarCorr(IE0)
```

```
##             [,1]        [,2]
## [1,] 0.044507083 0.004708957
## [2,] 0.004708957 0.004797293
```

```r
## Correlation matrix of the random effects
cov2cor(VarCorr(IE0))
```

```
##           [,1]      [,2]
## [1,] 1.0000000 0.3222642
## [2,] 0.3222642 1.0000000
```

```r
## Plot the effect sizes
plot(IE0, axis.labels = c("Indirect effect", "Direct effect"))
```




```r
## Mixed-effects model with Female as a moderator
IE1 <- meta(y=cbind(ind_eff, dir_eff),
            v=cbind(ind_var, ind_dir_cov, dir_var),
            x=Female,
            data=IE.df1,
            model.name = "Mixed")
summary(IE1)
```

```
##
## Call:
## meta(y = cbind(ind_eff, dir_eff), v = cbind(ind_var, ind_dir_cov,
##     dir_var), x = Female, data = IE.df1, model.name = "Mixed")
```

```
##
## 95% confidence intervals: z statistic approximation (robust=FALSE)
## Coefficients:
##                Estimate   Std.Error      lbound      ubound z value Pr(>|z|)
## Intercept1  0.12763207  0.10806877 -0.08417882  0.33944295  1.1810 0.237592
## Intercept2 -0.02709925  0.04800366 -0.12118470  0.06698619 -0.5645 0.572397
## Slope1_1    0.00195322  0.00157729 -0.00113821  0.00504465  1.2383 0.215591
## Slope2_1    0.00103470  0.00073467 -0.00040523  0.00247464  1.4084 0.159017
## Tau2_1_1    0.04080735  0.01407602  0.01321885  0.06839585  2.8991 0.003743 **
## Tau2_2_1    0.00321635  0.00461265 -0.00582428  0.01225698  0.6973 0.485622
## Tau2_2_2    0.00348242  0.00313327 -0.00265867  0.00962351  1.1114 0.266381
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Q statistic on the homogeneity of effect sizes: 707.8662
## Degrees of freedom of the Q statistic: 36
## P value of the Q statistic: 0
##
## Explained variances (R2):
##                              y1     y2
## Tau2 (no predictor)    0.044507 0.0048
## Tau2 (with predictors) 0.040807 0.0035
## R2                     0.083127 0.2741
##
## Number of studies (or clusters): 19
## Number of observed statistics: 38
## Number of estimated parameters: 7
## Degrees of freedom: 31
## -2 log likelihood: -37.29334
## OpenMx status1: 0 ("0" or "1": The optimization is considered fine.
## Other values may indicate problems.)
```

```
## Test the statistical significance betwen the models
anova(IE1, IE0)
```

```
##    base comparison ep  minus2LL df        AIC   diffLL diffdf         p
## 1 Mixed       <NA>  7 -37.29334 31  -99.29334       NA     NA        NA
## 2 Mixed     Random  5 -34.34407 33 -100.34407 2.949268      2 0.2288625
```

TSSEM

Stage 1 analysis

```
## Index of studies with no correlation
index2 <- sapply(new.df1$data, function(x) sum(is.na(x[lower.tri(x)]))==3 )

## No. of studies
sum(index2!=TRUE)
```

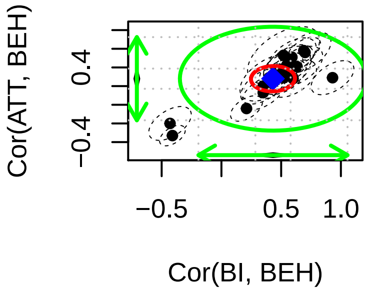
```
## [1] 29
```

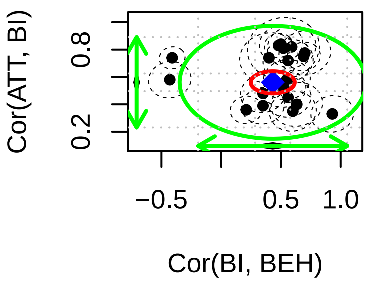
```
## Random-effects model
random1 <- tssem1(new.df1$data[!index2], new.df1$n[!index2], method="REM")
summary(random1)
```

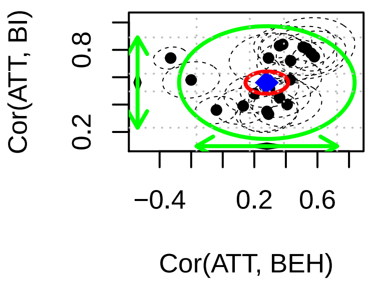
```
##
```

```
## Call:
## meta(y = ES, v = acovR, RE.constraints = Diag(paste0(RE.startvalues,
##     "*Tau2_", 1:no.es, "_", 1:no.es)), RE.lbound = RE.lbound,
##     I2 = I2, model.name = model.name, suppressWarnings = TRUE,
##     silent = silent, run = run)
##
## 95% confidence intervals: z statistic approximation (robust=FALSE)
## Coefficients:
##              Estimate Std.Error    lbound    ubound z value  Pr(>|z|)
## Intercept1 0.4315552 0.0751880 0.2841894 0.5789210  5.7397 9.485e-09 ***
## Intercept2 0.2794371 0.0552283 0.1711917 0.3876825  5.0597 4.200e-07 ***
## Intercept3 0.5608365 0.0329674 0.4962216 0.6254515 17.0118 < 2.2e-16 ***
## Tau2_1_1   0.1013277 0.0342280 0.0342421 0.1684134  2.9604 0.0030726 **
## Tau2_2_2   0.0516468 0.0181808 0.0160130 0.0872806  2.8407 0.0045011 **
## Tau2_3_3   0.0283479 0.0081748 0.0123256 0.0443701  3.4677 0.0005249 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Q statistic on the homogeneity of effect sizes: 1108.299
## Degrees of freedom of the Q statistic: 64
## P value of the Q statistic: 0
##
## Heterogeneity indices (based on the estimated Tau2):
##                              Estimate
## Intercept1: I2 (Q statistic)   0.9633
## Intercept2: I2 (Q statistic)   0.9278
## Intercept3: I2 (Q statistic)   0.9292
##
## Number of studies (or clusters): 29
## Number of observed statistics: 67
## Number of estimated parameters: 6
## Degrees of freedom: 61
## -2 log likelihood: -6.693942
## OpenMx status1: 0 ("0" or "1": The optimization is considered fine.
## Other values may indicate problems.)
```

```r
## Plot the effect sizes
plot(random1, axis.labels = c("Cor(BI, BEH)", "Cor(ATT, BEH)", "Cor(ATT, BI)"), main="")
```








```r
## Average correlation matrix under a random-effects model
vec2symMat(coef(random1, select="fixed"), diag = FALSE)
```

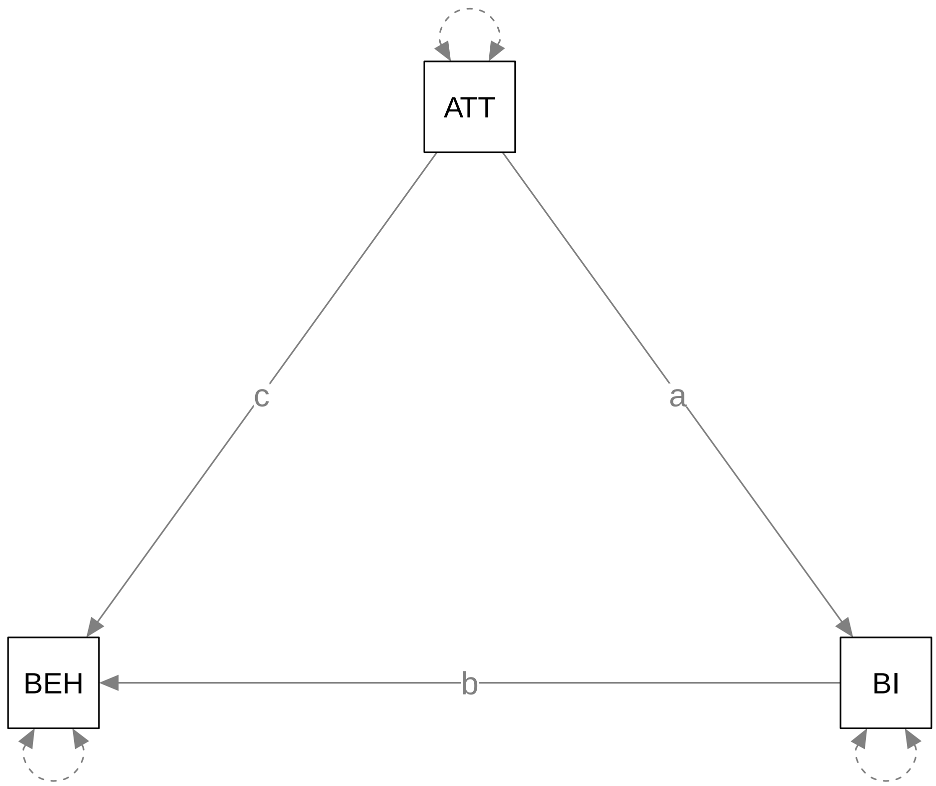
```
##           [,1]      [,2]      [,3]
## [1,] 1.0000000 0.4315552 0.2794371
## [2,] 0.4315552 1.0000000 0.5608365
## [3,] 0.2794371 0.5608365 1.0000000
```

```r
## Heterogeneity variances of the random-effects
coef(random1, select="random")
```

```
##   Tau2_1_1   Tau2_2_2   Tau2_3_3
## 0.10132774 0.05164683 0.02834788
```

Stage 2 analysis

```r
## Proposed model in lavaan syntax
model1 <- "BEH ~ c*ATT + b*BI
           BI ~ a*ATT
           ATT ~~ 1*ATT"
plot(model1)
```




```
## Convert the lavaan syntax to RAM specification used in metaSEM
RAM1 <- lavaan2RAM(model1, obs.variables=obs.vars)
RAM1
```

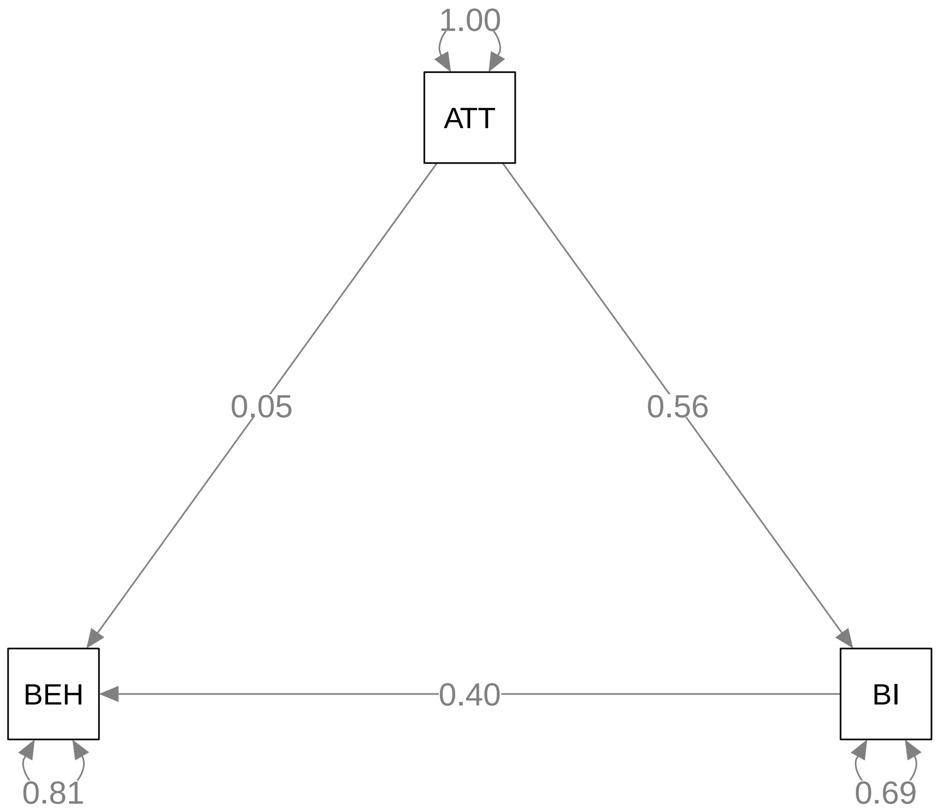
```
## $A
##     BEH BI    ATT
## BEH "0" "0*b" "0*c"
## BI  "0" "0"   "0*a"
## ATT "0" "0"   "0"
##
## $S
##     BEH            BI           ATT
## BEH "0*BEHWITHBEH" "0"          "0"
## BI  "0"            "0*BIWITHBI" "0"
## ATT "0"            "0"          "1"
##
## $F
##     BEH BI ATT
## BEH   1  0   0
## BI    0  1   0
## ATT   0  0   1
##
## $M
##   BEH BI ATT
## 1   0  0   0
```

```
## Request the likelihood-based confidence interval
## Indirect effect: ind = a*b
## Direct effect: dir = c
tssem.fit <- tssem2(random1, RAM=RAM1, intervals.type = "LB",
```

```r
                    mx.algebras = list(ind=mxAlgebra(a*b, name="ind"),
                                       dir=mxAlgebra(c, name="dir")))
summary(tssem.fit)
```

```
##
## Call:
## wls(Cov = pooledS, aCov = aCov, n = tssem1.obj$total.n, RAM = RAM,
##     Amatrix = Amatrix, Smatrix = Smatrix, Fmatrix = Fmatrix,
##     diag.constraints = diag.constraints, cor.analysis = cor.analysis,
##     intervals.type = intervals.type, mx.algebras = mx.algebras,
##     model.name = model.name, suppressWarnings = suppressWarnings,
##     silent = silent, run = run)
##
## 95% confidence intervals: Likelihood-based statistic
## Coefficients:
##    Estimate Std.Error    lbound    ubound z value Pr(>|z|)
## c  0.054569        NA -0.150185  0.249400      NA       NA
## b  0.400951        NA  0.171438  0.634456      NA       NA
## a  0.560837        NA  0.496222  0.625451      NA       NA
##
## mxAlgebras objects (and their 95% likelihood-based CIs):
##              lbound  Estimate    ubound
## ind[1,1]  0.09625022 0.2248678 0.3690801
## dir[1,1] -0.15018498 0.0545693 0.2494005
##
## Goodness-of-fit indices:
##                                             Value
## Sample size                               7227.00
## Chi-square of target model                   0.00
## DF of target model                           0.00
## p value of target model                      0.00
## Number of constraints imposed on "Smatrix"   0.00
## DF manually adjusted                         0.00
## Chi-square of independence model           342.92
## DF of independence model                     3.00
## RMSEA                                        0.00
## RMSEA lower 95% CI                           0.00
## RMSEA upper 95% CI                           0.00
## SRMR                                         0.00
## TLI                                          -Inf
## CFI                                          1.00
## AIC                                          0.00
## BIC                                          0.00
## OpenMx status1: 0 ("0" or "1": The optimization is considered fine.
## Other values indicate problems.)
```

```r
plot(tssem.fit)
```



OSMASEM

```r
## Prepare the data
my.df1 <- Cor2DataFrame(new.df1)

## Show the first few studies
head(my.df1)
```

```
## $data
##                                            BI_BEH ATT_BEH ATT_BI
## Ajzen and Sheikh (2013)                        NA      NA  0.680
## Armitage, Norman, and Conner (2002)            NA      NA  0.610
## Conner, Warren, Close, and Sparks (1999a) 2  0.350   0.130  0.390
## Conner, Warren, Close, and Sparks (1999a) 3  0.350   0.200  0.480
## Conner, Warren, Close, and Sparks (1999b) 1     NA      NA  0.520
## Conner, Warren, Close, and Sparks (1999b) 2     NA      NA  0.620
## Conner, Warren, Close, and Sparks (1999c)   -0.430  -0.200  0.580
## Cooke and French (2011a)                     0.700   0.560  0.775
## Cooke and French (2011b)                        NA      NA  0.670
## Cooke, Sniehotta and Schuez (2007)           0.560   0.430  0.720
## Elliot and Ainsworth (2012) 1                   NA      NA     NA
## Elliot and Ainsworth (2012) 2                   NA      NA     NA
## Elliot and Ainsworth (2012) 3                   NA      NA     NA
## Elliot and Ainsworth (2012) 4                   NA      NA     NA
## Gagnon, et al. (2012)                       -0.410  -0.330  0.740
## Gardner, de Bruijn, and Lally (2012)         0.930   0.290  0.330
## Glassman, et al. (2010a)                     0.690   0.580  0.750
## Glassman, et al. (2010b)                     0.210  -0.040  0.360
```

```
## Glassman, et al. (2010c)                       0.590   0.510  0.820
## Glassman, et al. (2010d)                       0.400   0.290  0.740
## Hagger, et al. (2012)                          0.480   0.360  0.830
## Jamison and Myers (2008)                       0.500   0.380  0.840
## Johnston and White (2003)                      0.633   0.408  0.400
## Kim and Hong (2013)                               NA      NA  0.480
## Norman (2011) 1                                   NA      NA  0.330
## Norman (2011) 2                                   NA      NA  0.400
## Norman (2011) 3                                   NA      NA  0.300
## Norman (2011) 4                                   NA      NA  0.330
## Norman, Armitage, and Quigley (2007) 1         0.527   0.296  0.515
## Norman, Armitage, and Quigley (2007) 2         0.549   0.427  0.581
## Norman and Conner (2006)                       0.520   0.530  0.810
## Norman, Conner, and Stride (2012) 1            0.600   0.280  0.350
## Norman, Conner, and Stride (2012) 2            0.560   0.360  0.450
##                                              C(BI_BEH BI_BEH) C(ATT_BEH BI_BEH)
## Ajzen and Sheikh (2013)                          0.0156789115      0.0084533454
## Armitage, Norman, and Conner (2002)              0.0061956999      0.0033404371
## Conner, Warren, Close, and Sparks (1999a) 2      0.0043651519      0.0023534888
## Conner, Warren, Close, and Sparks (1999a) 3      0.0048318651      0.0026051180
## Conner, Warren, Close, and Sparks (1999b) 1      0.0039398286      0.0021241743
## Conner, Warren, Close, and Sparks (1999b) 2      0.0040865252      0.0022032661
## Conner, Warren, Close, and Sparks (1999c)        0.0043161046      0.0023270441
## Cooke and French (2011a)                         0.0064022209      0.0034517825
## Cooke and French (2011b)                         0.0054487002      0.0029376879
## Cooke, Sniehotta and Schuez (2007)               0.0060020862      0.0032360500
## Elliot and Ainsworth (2012) 1                    0.0020596966      0.0011104937
## Elliot and Ainsworth (2012) 2                    0.0057764386      0.0031143869
## Elliot and Ainsworth (2012) 3                    0.0060020855      0.0032360514
## Elliot and Ainsworth (2012) 4                    0.0068595231      0.0036983373
## Gagnon, et al. (2012)                            0.0015807957      0.0008522925
## Gardner, de Bruijn, and Lally (2012)             0.0043651512      0.0023534886
## Glassman, et al. (2010a)                         0.0026583619      0.0014332661
## Glassman, et al. (2010b)                         0.0024389416      0.0013149643
## Glassman, et al. (2010c)                         0.0056077855      0.0030234590
## Glassman, et al. (2010d)                         0.0081730498      0.0044065314
## Hagger, et al. (2012)                            0.0019303178      0.0010407380
## Jamison and Myers (2008)                         0.0044666670      0.0024082207
## Johnston and White (2003)                        0.0062972699      0.0033951989
## Kim and Hong (2013)                              0.0006984243      0.0003765583
## Norman (2011) 1                                  0.0017072589      0.0009204748
## Norman (2011) 2                                  0.0017225714      0.0009287313
## Norman (2011) 3                                  0.0016701443      0.0009004644
## Norman (2011) 4                                  0.0017225704      0.0009287298
## Norman, Armitage, and Quigley (2007) 1           0.0045192161      0.0024365527
## Norman, Armitage, and Quigley (2007) 2           0.0052620985      0.0028370795
## Norman and Conner (2006)                         0.0123913951      0.0066808664
## Norman, Conner, and Stride (2012) 1              0.0052263057      0.0028177830
## Norman, Conner, and Stride (2012) 2              0.0050213499      0.0027072789
##                                              C(ATT_BI BI_BEH) C(ATT_BEH ATT_BEH)
## Ajzen and Sheikh (2013)                          0.0016097630       0.0185452020
## Armitage, Norman, and Conner (2002)              0.0006361178       0.0073283467
## Conner, Warren, Close, and Sparks (1999a) 2      0.0004481735       0.0051631531
## Conner, Warren, Close, and Sparks (1999a) 3      0.0004960885       0.0057151864
```

```
## Conner, Warren, Close, and Sparks (1999b) 1     0.0004045062       0.0046600771
## Conner, Warren, Close, and Sparks (1999b) 2     0.0004195660       0.0048335903
## Conner, Warren, Close, and Sparks (1999c)       0.0004431368       0.0051051399
## Cooke and French (2011a)                        0.0006573209       0.0075726238
## Cooke and French (2011b)                        0.0005594217       0.0064447867
## Cooke, Sniehotta and Schuez (2007)              0.0006162407       0.0070993375
## Elliot and Ainsworth (2012) 1                   0.0002114705       0.0024362336
## Elliot and Ainsworth (2012) 2                   0.0005930673       0.0068324385
## Elliot and Ainsworth (2012) 3                   0.0006162433       0.0070993395
## Elliot and Ainsworth (2012) 4                   0.0007042707       0.0081135251
## Gagnon, et al. (2012)                           0.0001623013       0.0018697843
## Gardner, de Bruijn, and Lally (2012)            0.0004481732       0.0051631534
## Glassman, et al. (2010a)                        0.0002729350       0.0031443421
## Glassman, et al. (2010b)                        0.0002504066       0.0028848093
## Glassman, et al. (2010c)                        0.0005757547       0.0066329549
## Glassman, et al. (2010d)                        0.0008391327       0.0096671780
## Hagger, et al. (2012)                           0.0001981865       0.0022832029
## Jamison and Myers (2008)                        0.0004585940       0.0052832269
## Johnston and White (2003)                       0.0006465459       0.0074484852
## Kim and Hong (2013)                             0.0000717080       0.0008261043
## Norman (2011) 1                                 0.0001752847       0.0020193661
## Norman (2011) 2                                 0.0001768576       0.0020374778
## Norman (2011) 3                                 0.0001714744       0.0019754670
## Norman (2011) 4                                 0.0001768567       0.0020374768
## Norman, Armitage, and Quigley (2007) 1          0.0004639909       0.0053453818
## Norman, Armitage, and Quigley (2007) 2          0.0005402618       0.0062240716
## Norman and Conner (2006)                        0.0012722294       0.0146566895
## Norman, Conner, and Stride (2012) 1             0.0005365876       0.0061817347
## Norman, Conner, and Stride (2012) 2             0.0005155431       0.0059393119
##                                             C(ATT_BI ATT_BEH) C(ATT_BI ATT_BI)
## Ajzen and Sheikh (2013)                           0.0042212648     0.0107216934
## Armitage, Norman, and Conner (2002)               0.0016680820     0.0042367984
## Conner, Warren, Close, and Sparks (1999a) 2       0.0011752391     0.0029850172
## Conner, Warren, Close, and Sparks (1999a) 3       0.0013008909     0.0033041687
## Conner, Warren, Close, and Sparks (1999b) 1       0.0010607298     0.0026941696
## Conner, Warren, Close, and Sparks (1999b) 2       0.0011002235     0.0027944839
## Conner, Warren, Close, and Sparks (1999c)         0.0011620332     0.0029514770
## Cooke and French (2011a)                          0.0017236845     0.0043780248
## Cooke and French (2011b)                          0.0014669649     0.0037259787
## Cooke, Sniehotta and Schuez (2007)                0.0016159559     0.0041043991
## Elliot and Ainsworth (2012) 1                     0.0005545368     0.0014084802
## Elliot and Ainsworth (2012) 2                     0.0015551998     0.0039500967
## Elliot and Ainsworth (2012) 3                     0.0016159582     0.0041044003
## Elliot and Ainsworth (2012) 4                     0.0018468030     0.0046907404
## Gagnon, et al. (2012)                             0.0004256009     0.0010809937
## Gardner, de Bruijn, and Lally (2012)              0.0011752392     0.0029850172
## Glassman, et al. (2010a)                          0.0007157159     0.0018178650
## Glassman, et al. (2010b)                          0.0006566404     0.0016678188
## Glassman, et al. (2010c)                          0.0015097955     0.0038347659
## Glassman, et al. (2010d)                          0.0022004478     0.0055889683
## Hagger, et al. (2012)                             0.0005197030     0.0013200072
## Jamison and Myers (2008)                          0.0012025692     0.0030544361
## Johnston and White (2003)                         0.0016954277     0.0043062551
## Kim and Hong (2013)                               0.0001880385     0.0004776028
```

```
## Norman (2011) 1                               0.0004596484     0.0011674732
## Norman (2011) 2                               0.0004637715     0.0011779440
## Norman (2011) 3                               0.0004496562     0.0011420933
## Norman (2011) 4                               0.0004637710     0.0011779439
## Norman, Armitage, and Quigley (2007) 1        0.0012167181     0.0030903709
## Norman, Armitage, and Quigley (2007) 2        0.0014167244     0.0035983757
## Norman and Conner (2006)                      0.0033361581     0.0084735948
## Norman, Conner, and Stride (2012) 1           0.0014070886     0.0035738984
## Norman, Conner, and Stride (2012) 2           0.0013519067     0.0034337446
##                                          MeanAge  Female
## Ajzen and Sheikh (2013)                    19.80  73.000
## Armitage, Norman, and Conner (2002)        26.00  50.806
## Conner, Warren, Close, and Sparks (1999a) 2   NA  57.386
## Conner, Warren, Close, and Sparks (1999a) 3   NA  73.584
## Conner, Warren, Close, and Sparks (1999b) 1   NA  50.256
## Conner, Warren, Close, and Sparks (1999b) 2   NA  50.531
## Conner, Warren, Close, and Sparks (1999c)  20.28  57.865
## Cooke and French (2011a)                   20.40  69.166
## Cooke and French (2011b)                   20.10  57.500
## Cooke, Sniehotta and Schuez (2007)         21.95  75.000
## Elliot and Ainsworth (2012) 1              20.00  61.100
## Elliot and Ainsworth (2012) 2              20.00  61.100
## Elliot and Ainsworth (2012) 3              20.00  61.100
## Elliot and Ainsworth (2012) 4              20.00  61.100
## Gagnon, et al. (2012)                      30.41  53.703
## Gardner, de Bruijn, and Lally (2012)       23.00  42.045
## Glassman, et al. (2010a)                   26.00  79.930
## Glassman, et al. (2010b)                   37.10   0.000
## Glassman, et al. (2010c)                   19.12  81.751
## Glassman, et al. (2010d)                   20.10  84.042
## Hagger, et al. (2012)                      20.26  76.633
## Jamison and Myers (2008)                   20.38  82.558
## Johnston and White (2003)                  18.40  67.213
## Kim and Hong (2013)                        20.60  54.000
## Norman (2011) 1                            13.60   0.000
## Norman (2011) 2                            13.60 100.000
## Norman (2011) 3                            15.70   0.000
## Norman (2011) 4                            15.70 100.000
## Norman, Armitage, and Quigley (2007) 1     19.91   0.000
## Norman, Armitage, and Quigley (2007) 2     19.91 100.000
## Norman and Conner (2006)                   21.00  75.000
## Norman, Conner, and Stride (2012) 1        24.70 100.000
## Norman, Conner, and Stride (2012) 2        24.70   0.000
##
## $n
##  [1]   49  124  176  159  195  188  178  120  141  128  373  133  128  112  486
## [16]  176  289  315  137   94  398  172  122 1100  450  446  460  446  170  146
## [31]   62  147  153
##
## $obslabels
## [1] "BEH" "BI"  "ATT"
##
## $ylabels
## [1] "BI_BEH"  "ATT_BEH" "ATT_BI"
```

```
##
## $vlabels
## [1] "C(BI_BEH BI_BEH)"   "C(ATT_BEH BI_BEH)"  "C(ATT_BI BI_BEH)"
## [4] "C(ATT_BEH ATT_BEH)" "C(ATT_BI ATT_BEH)"  "C(ATT_BI ATT_BI)"
```

```
## Fit a model without any moderator
osmasem.fit0 <- osmasem(model.name="No moderator", RAM=RAM1, data=my.df1)
## Rerun the model to remove non-convergence issue
osmasem.fit0 <- rerun(osmasem.fit0, extraTries=30)
```

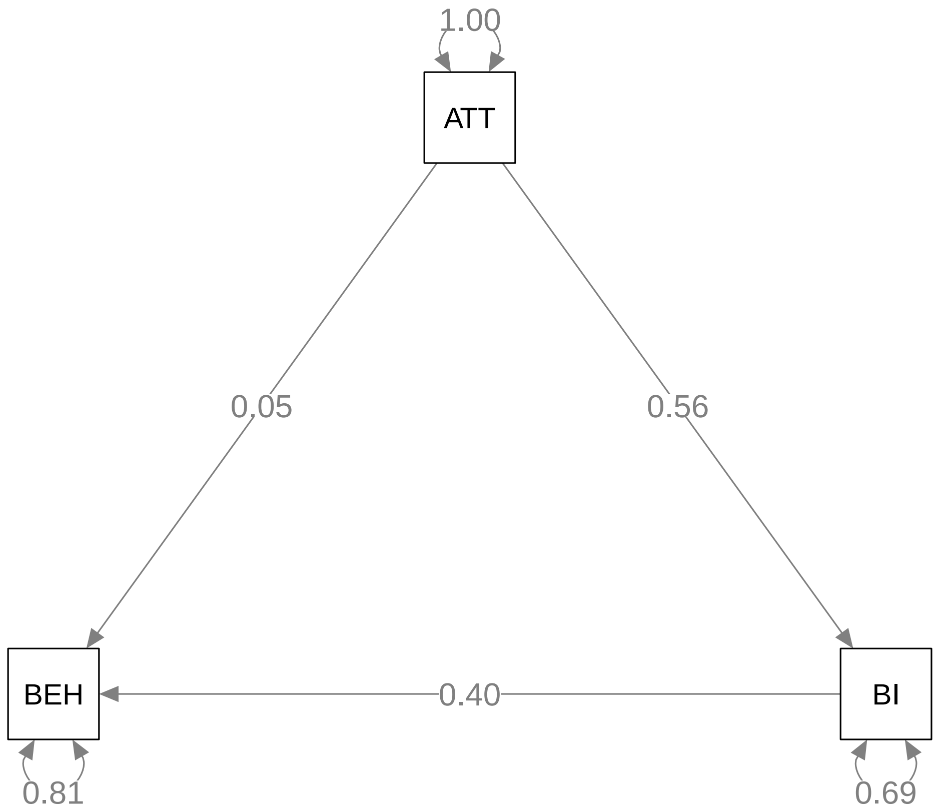
```
summary(osmasem.fit0)
```

```
## Summary of No moderator
##
## free parameters:
##      name  matrix row col    Estimate  Std.Error A     z value     Pr(>|z|)
## 1       b      A0 BEH  BI  0.40200342 0.11739592     3.4243388 6.162973e-04
## 2       c      A0 BEH ATT  0.05373356 0.10070978     0.5335486 5.936539e-01
## 3       a      A0  BI ATT  0.56043071 0.03285737    17.0564713 0.000000e+00
## 4 Tau1_1 vecTau1   1   1 -1.13860368 0.16762634    -6.7925105 1.101985e-11
## 5 Tau1_2 vecTau1   2   1 -1.48140009 0.17492935    -8.4685624 0.000000e+00
## 6 Tau1_3 vecTau1   3   1 -1.78527211 0.14415132   -12.3847084 0.000000e+00
##
## Model Statistics:
##                |  Parameters  |  Degrees of Freedom  |  Fit (-2lnL units)
##        Model:              6                     61              -6.866144
##    Saturated:              9                     58                     NA
## Independence:              6                     61                     NA
## Number of observations/statistics: 7973/67
##
## Information Criteria:
##       |  df Penalty  |  Parameters Penalty  |  Sample-Size Adjusted
## AIC:      -128.8661               5.133856               5.144401
## BIC:      -554.8789              47.036752              27.969934
## To get additional fit indices, see help(mxRefModels)
## timestamp: 2020-07-24 16:43:19
## Wall clock time: 0.1099315 secs
## optimizer:  SLSQP
## OpenMx version number: 2.17.4
## Need help?  See help(mxSummary)
```

```
## Get the heterogeneity of variances
VarCorr(osmasem.fit0)
```

```
##           Tau2_1     Tau2_2     Tau2_3
## Tau2_1 0.1025702 0.00000000 0.00000000
## Tau2_2 0.0000000 0.05167402 0.00000000
## Tau2_3 0.0000000 0.00000000 0.02814053
```

```
## Plot the fitted model
plot(osmasem.fit0)
```




```r
## Create A1 to represent the moderator on the A matrix
A1 <- create.modMatrix(RAM1, output="A", "Female")
A1
```

```
##     BEH BI               ATT
## BEH "0" "0*data.Female" "0*data.Female"
## BI  "0" "0"             "0*data.Female"
## ATT "0" "0"             "0"
```

```r
## Fit a model with female as a moderator
osmasem.fit1 <- osmasem(model.name="Female as a moderator", RAM=RAM1, Ax=A1, data=my.df1)
summary(osmasem.fit1)
```

```
## Summary of Female as a moderator
##
## free parameters:
##     name  matrix row col      Estimate    Std.Error A     z value     Pr(>|z|)
## 1       b      A0 BEH  BI  0.3420900219 0.2211690832      1.5467353 1.219271e-01
## 2       c      A0 BEH ATT -0.0388822661 0.1753486994     -0.2217425 8.245143e-01
## 3       a      A0  BI ATT  0.4298006665 0.0638184512      6.7347399 1.642242e-11
## 4     b_1      A1 BEH  BI  0.0009660419 0.0034802753      0.2775763 7.813376e-01
## 5     c_1      A1 BEH ATT  0.0014309961 0.0028430693      0.5033279 6.147338e-01
## 6     a_1      A1  BI ATT  0.0022226844 0.0009599093      2.3155150 2.058477e-02
## 7 Tau1_1 vecTau1   1   1 -1.1525879393 0.1681107915     -6.8561211 7.075451e-12
## 8 Tau1_2 vecTau1   2   1 -1.5526361409 0.1774113470     -8.7516169 0.000000e+00
## 9 Tau1_3 vecTau1   3   1 -1.8722560721 0.1461109588    -12.8139332 0.000000e+00
##
## Model Statistics:
##                |  Parameters  |  Degrees of Freedom  |  Fit (-2lnL units)
```

```
##        Model:              9                     58             -14.45558
##    Saturated:              9                     58                    NA
## Independence:              6                     61                    NA
## Number of observations/statistics: 7973/67
##
## Information Criteria:
##       |  df Penalty  |  Parameters Penalty  |  Sample-Size Adjusted
## AIC:      -130.4556               3.544419                 3.567023
## BIC:      -535.5169              66.398764                37.798536
## CFI: NA
## TLI: 1   (also known as NNFI)
## RMSEA:  0  [95% CI (NA, NA)]
## Prob(RMSEA <= 0.05): NA
## To get additional fit indices, see help(mxRefModels)
## timestamp: 2020-07-24 16:43:20
## Wall clock time: 1.183256 secs
## optimizer:  SLSQP
## OpenMx version number: 2.17.4
## Need help?  See help(mxSummary)
```

```
## Test the statistical significance between the models
anova(osmasem.fit1, osmasem.fit0)
```

```
##                     base   comparison ep   minus2LL df       AIC   diffLL diffdf
## 1 Female as a moderator         <NA>  9 -14.455581 58 -130.4556       NA     NA
## 2 Female as a moderator No moderator  6  -6.866144 61 -128.8661 7.589437      3
##            p
## 1         NA
## 2 0.05530442
```

```
## Get the R2 on the correlation coefficients
osmasemR2(osmasem.fit0, osmasem.fit1)
```

```
## $Tau2.0
##   Tau2_1_1   Tau2_2_2   Tau2_3_3
## 0.09974126 0.04481232 0.02364716
##
## $Tau2.1
##   Tau2_1_1   Tau2_2_2   Tau2_3_3
## 0.10257025 0.05167402 0.02814053
##
## $R2
## Tau2_1_1 Tau2_2_2 Tau2_3_3
##        0        0        0
```

Illustration 2 with one mediator and three independent variables

Synthesizing indirect and direct effects

```
## Check if there are any missing data in the correlation matrices
index3 <- sapply(Cooke16$data, function(x) any(is.na(x)))
new.df2 <- lapply(Cooke16, function(x) x[!index3])

## No. of studies
length(new.df2$data)
```

```
## [1] 19
```

```r
## Use new.df2 as the data set in illustration 2
## Display the first few cases
head(new.df2)
```

```
## $data
## $data$`Conner, Warren, Close, and Sparks (1999a) 2`
##        SN   ATT   PBC    BI   BEH
## SN   1.00  0.09 -0.13  0.23  0.03
## ATT  0.09  1.00 -0.13  0.39  0.13
## PBC -0.13 -0.13  1.00 -0.35 -0.62
## BI   0.23  0.39 -0.35  1.00  0.35
## BEH  0.03  0.13 -0.62  0.35  1.00
##
## $data$`Conner, Warren, Close, and Sparks (1999a) 3`
##        SN  ATT   PBC    BI   BEH
## SN   1.00 0.33 -0.31  0.51  0.29
## ATT  0.33 1.00  0.03  0.48  0.20
## PBC -0.31 0.03  1.00 -0.24 -0.21
## BI   0.51 0.48 -0.24  1.00  0.35
## BEH  0.29 0.20 -0.21  0.35  1.00
##
## $data$`Conner, Warren, Close, and Sparks (1999c)`
##          SN     ATT     PBC      BI     BEH
## SN   1.0000  0.1725  0.1375  0.2025 -0.1425
## ATT  0.1725  1.0000  0.2300  0.5800 -0.2000
## PBC  0.1375  0.2300  1.0000  0.3400 -0.4400
## BI   0.2025  0.5800  0.3400  1.0000 -0.4300
## BEH -0.1425 -0.2000 -0.4400 -0.4300  1.0000
##
## $data$`Cooke and French (2011a)`
##         SN    ATT   PBC    BI  BEH
## SN  1.0000 0.5475 0.430 0.490 0.39
## ATT 0.5475 1.0000 0.625 0.775 0.56
## PBC 0.4300 0.6250 1.000 0.710 0.54
## BI  0.4900 0.7750 0.710 1.000 0.70
## BEH 0.3900 0.5600 0.540 0.700 1.00
##
## $data$`Cooke, Sniehotta and Schuez (2007)`
##       SN  ATT  PBC   BI  BEH
## SN  1.00 0.66 0.41 0.47 0.33
## ATT 0.66 1.00 0.56 0.72 0.43
## PBC 0.41 0.56 1.00 0.56 0.29
## BI  0.47 0.72 0.56 1.00 0.56
## BEH 0.33 0.43 0.29 0.56 1.00
##
## $data$`Gagnon, et al. (2012)`
##        SN   ATT   PBC    BI   BEH
## SN   1.00  0.44  0.47  0.45 -0.25
## ATT  0.44  1.00  0.50  0.74 -0.33
## PBC  0.47  0.50  1.00  0.65 -0.36
## BI   0.45  0.74  0.65  1.00 -0.41
## BEH -0.25 -0.33 -0.36 -0.41  1.00
##
```

```
## $data$`Gardner, de Bruijn, and Lally (2012)`
##       SN  ATT  PBC   BI  BEH
## SN  1.00 0.47 0.24 0.27 0.24
## ATT 0.47 1.00 0.11 0.33 0.29
## PBC 0.24 0.11 1.00 0.19 0.19
## BI  0.27 0.33 0.19 1.00 0.93
## BEH 0.24 0.29 0.19 0.93 1.00
##
## $data$`Glassman, et al. (2010a)`
##       SN  ATT  PBC   BI  BEH
## SN  1.00 0.69 0.66 0.72 0.58
## ATT 0.69 1.00 0.72 0.75 0.58
## PBC 0.66 0.72 1.00 0.74 0.59
## BI  0.72 0.75 0.74 1.00 0.69
## BEH 0.58 0.58 0.59 0.69 1.00
##
## $data$`Glassman, et al. (2010b)`
##        SN   ATT  PBC   BI   BEH
## SN   1.00  0.32 0.27 0.54 -0.14
## ATT  0.32  1.00 0.21 0.36 -0.04
## PBC  0.27  0.21 1.00 0.51  0.29
## BI   0.54  0.36 0.51 1.00  0.21
## BEH -0.14 -0.04 0.29 0.21  1.00
##
## $data$`Glassman, et al. (2010c)`
##       SN   ATT   PBC   BI  BEH
## SN  1.00 0.600 0.120 0.44 0.21
## ATT 0.60 1.000 0.235 0.82 0.51
## PBC 0.12 0.235 1.000 0.33 0.16
## BI  0.44 0.820 0.330 1.00 0.59
## BEH 0.21 0.510 0.160 0.59 1.00
##
## $data$`Glassman, et al. (2010d)`
##        SN  ATT   PBC   BI   BEH
## SN  1.000 0.50 0.075 0.42 0.210
## ATT 0.500 1.00 0.080 0.74 0.290
## PBC 0.075 0.08 1.000 0.14 0.035
## BI  0.420 0.74 0.140 1.00 0.400
## BEH 0.210 0.29 0.035 0.40 1.000
##
## $data$`Hagger, et al. (2012)`
##        SN  ATT   PBC   BI  BEH
## SN  1.000 0.53 0.195 0.43 0.17
## ATT 0.530 1.00 0.270 0.83 0.36
## PBC 0.195 0.27 1.000 0.24 0.15
## BI  0.430 0.83 0.240 1.00 0.48
## BEH 0.170 0.36 0.150 0.48 1.00
##
## $data$`Jamison and Myers (2008)`
##        SN   ATT   PBC    BI   BEH
## SN   1.00  0.56 -0.26  0.46  0.20
## ATT  0.56  1.00 -0.39  0.84  0.38
## PBC -0.26 -0.39  1.00 -0.34 -0.27
## BI   0.46  0.84 -0.34  1.00  0.50
```

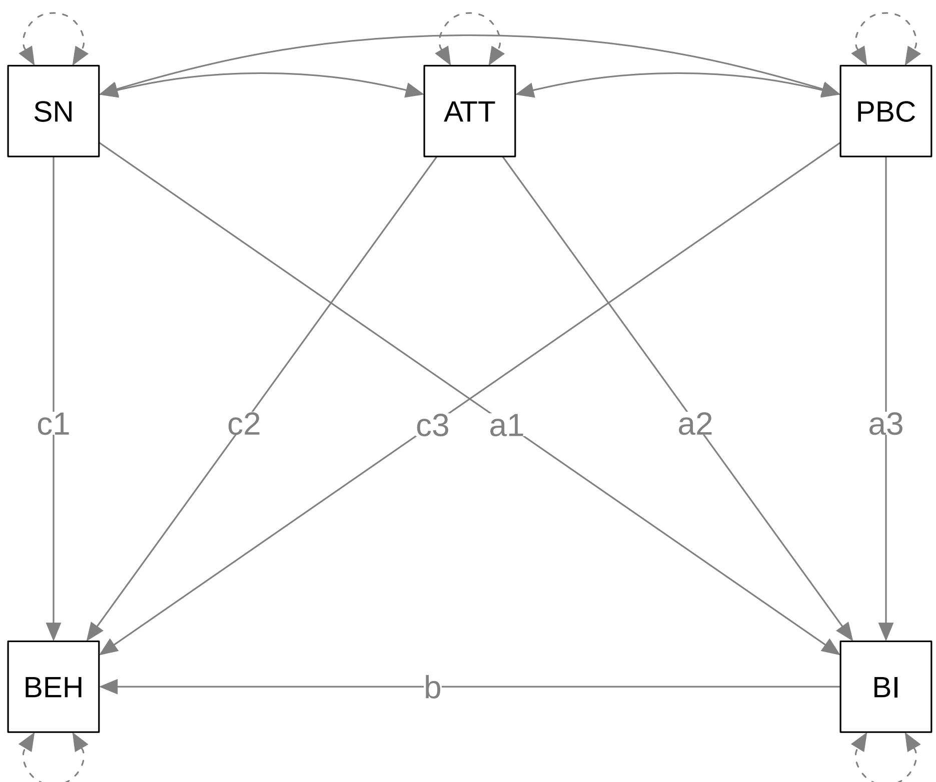
```
## BEH  0.20  0.38 -0.27  0.50  1.00
##
## $data$`Johnston and White (2003)`
##        SN   ATT   PBC    BI   BEH
## SN  1.000 0.407 0.077 0.436 0.383
## ATT 0.407 1.000 0.312 0.400 0.408
## PBC 0.077 0.312 1.000 0.212 0.195
## BI  0.436 0.400 0.212 1.000 0.633
## BEH 0.383 0.408 0.195 0.633 1.000
##
## $data$`Norman, Armitage, and Quigley (2007) 1`
##         SN    ATT    PBC     BI    BEH
## SN   1.000  0.014 -0.047  0.014  0.028
## ATT  0.014  1.000 -0.065  0.515  0.296
## PBC -0.047 -0.065  1.000 -0.448 -0.415
## BI   0.014  0.515 -0.448  1.000  0.527
## BEH  0.028  0.296 -0.415  0.527  1.000
##
## $data$`Norman, Armitage, and Quigley (2007) 2`
##         SN    ATT    PBC     BI    BEH
## SN   1.000 -0.052 -0.063 -0.131 -0.029
## ATT -0.052  1.000 -0.317  0.581  0.427
## PBC -0.063 -0.317  1.000 -0.462 -0.369
## BI  -0.131  0.581 -0.462  1.000  0.549
## BEH -0.029  0.427 -0.369  0.549  1.000
##
## $data$`Norman and Conner (2006)`
##         SN   ATT   PBC   BI   BEH
## SN   1.000 0.240 0.115 0.27 -0.01
## ATT  0.240 1.000 0.245 0.81  0.53
## PBC  0.115 0.245 1.000 0.36  0.25
## BI   0.270 0.810 0.360 1.00  0.52
## BEH -0.010 0.530 0.250 0.52  1.00
##
## $data$`Norman, Conner, and Stride (2012) 1`
##       SN  ATT  PBC   BI  BEH
## SN  1.00 0.32 0.24 0.34 0.23
## ATT 0.32 1.00 0.53 0.35 0.28
## PBC 0.24 0.53 1.00 0.44 0.45
## BI  0.34 0.35 0.44 1.00 0.60
## BEH 0.23 0.28 0.45 0.60 1.00
##
## $data$`Norman, Conner, and Stride (2012) 2`
##       SN  ATT  PBC   BI  BEH
## SN  1.00 0.30 0.28 0.23 0.33
## ATT 0.30 1.00 0.57 0.45 0.36
## PBC 0.28 0.57 1.00 0.53 0.26
## BI  0.23 0.45 0.53 1.00 0.56
## BEH 0.33 0.36 0.26 0.56 1.00
##
##
## $n
##  [1] 176 159 178 120 128 486 176 289 315 137  94 398 172 122 170 146  62 147 153
##
```

```
## $MeanAge
##  [1]    NA    NA 20.28 20.40 21.95 30.41 23.00 26.00 37.10 19.12 20.10 20.26
## [13] 20.38 18.40 19.91 19.91 21.00 24.70 24.70
##
## $Female
##  [1]  57.386  73.584  57.865  69.166  75.000  53.703  42.045  79.930   0.000
## [10]  81.751  84.042  76.633  82.558  67.213   0.000 100.000  75.000 100.000
## [19]   0.000
```

Caculation of indirect and direct effects

```r
## Calculate indirect and direct effects as effect sizes in each study
model2 <- "BEH ~ c1*SN + c2*ATT + c3*PBC + b*BI
           BI ~ a1*SN + a2*ATT + a3*PBC
           ## Indirect effects
           Ind1 := a1*b
           Ind2 := a2*b
           Ind3 := a3*b
           Dir1 := c1
           Dir2 := c2
           Dir3 := c3"

## Display the proposed model
plot(model2, edge.label.position=0.55)
```




```r
## Estimate the indirect and direct effects
IE.df2 <- mapply(function(x, y) {calEffSizes(model=model2, n=y, Cov=x)},
                 new.df2$data, new.df2$n,
                 SIMPLIFY = FALSE)
```

```r
## Rename the variances and covariances of the effect sizes from Cov1 to Cov21 for ease of reference
IE.df2 <- t(sapply(IE.df2,
                   function(x) { acov <- vech(x$VCOV)
                                 names(acov) <- paste0("Cov", 1:21)
                                 c(x$ES, acov)} ))

## Add female to the data
IE.df2 <- data.frame(IE.df2, Female=new.df2$Female)

## Show the first few studies
head(IE.df2)
```

```
##                                                     Ind1        Ind2        Ind3
## Conner, Warren, Close, and Sparks (1999a) 2  0.02768214  0.05763150 -0.04852717
## Conner, Warren, Close, and Sparks (1999a) 3  0.08165537  0.08851693 -0.03455561
## Conner, Warren, Close, and Sparks (1999c)   -0.03071066 -0.18804304 -0.07612933
## Cooke and French (2011a)                     0.02962507  0.32022628  0.22307775
## Cooke, Sniehotta and Schuez (2007)          -0.01384918  0.32807320  0.12404404
## Gagnon, et al. (2012)                       -0.01131869 -0.14267576 -0.09457764
##                                                     Dir1         Dir2
## Conner, Warren, Close, and Sparks (1999a) 2 -0.08319530 -0.003254514
## Conner, Warren, Close, and Sparks (1999a) 3  0.11467387  0.051294395
## Conner, Warren, Close, and Sparks (1999c)   -0.03938764  0.094151260
## Cooke and French (2011a)                     0.05184867  0.007632904
## Cooke, Sniehotta and Schuez (2007)           0.09089987  0.013473092
## Gagnon, et al. (2012)                       -0.04372465 -0.042279051
##                                                     Dir3         Cov1
## Conner, Warren, Close, and Sparks (1999a) 2 -0.57162053 2.441528e-04
## Conner, Warren, Close, and Sparks (1999a) 3 -0.11877667 1.299585e-03
## Conner, Warren, Close, and Sparks (1999c)   -0.33263706 5.195743e-04
## Cooke and French (2011a)                     0.07697655 1.466996e-03
## Cooke, Sniehotta and Schuez (2007)          -0.05690075 1.809555e-03
## Gagnon, et al. (2012)                       -0.14707459 7.736068e-05
##                                                     Cov2          Cov3
## Conner, Warren, Close, and Sparks (1999a) 2  2.425303e-04 -1.971018e-04
## Conner, Warren, Close, and Sparks (1999a) 3  1.013757e-03 -3.436959e-04
## Conner, Warren, Close, and Sparks (1999c)    2.148087e-04  6.659321e-05
## Cooke and French (2011a)                    -3.204326e-04  2.742337e-05
## Cooke, Sniehotta and Schuez (2007)          -1.315594e-03 -1.763148e-04
## Gagnon, et al. (2012)                        9.378475e-05  5.175624e-05
##                                                     Cov4          Cov5
## Conner, Warren, Close, and Sparks (1999a) 2 -1.208968e-04 -0.0002516952
## Conner, Warren, Close, and Sparks (1999a) 3 -1.022103e-03 -0.0011079914
## Conner, Warren, Close, and Sparks (1999c)   -4.657229e-05 -0.0002851647
## Cooke and French (2011a)                    -3.112028e-05 -0.0003363885
## Cooke, Sniehotta and Schuez (2007)          -7.845473e-06  0.0001858514
## Gagnon, et al. (2012)                       -8.924068e-06 -0.0001124908
##                                                     Cov6         Cov7
## Conner, Warren, Close, and Sparks (1999a) 2  2.119337e-04 0.0006472608
## Conner, Warren, Close, and Sparks (1999a) 3  4.325423e-04 0.0014521386
## Conner, Warren, Close, and Sparks (1999c)   -1.154491e-04 0.0022360586
## Cooke and French (2011a)                    -2.343368e-04 0.0055567517
## Cooke, Sniehotta and Schuez (2007)           7.027018e-05 0.0065862622
```

```
## Gagnon, et al. (2012)                      -7.456844e-05 0.0014890741
##                                                     Cov8          Cov9
## Conner, Warren, Close, and Sparks (1999a) 2 -0.0004263933 -0.0002516952
## Conner, Warren, Close, and Sparks (1999a) 3 -0.0005056331 -0.0011079914
## Conner, Warren, Close, and Sparks (1999c)    0.0006038800 -0.0002851647
## Cooke and French (2011a)                     0.0016150573 -0.0003363885
## Cooke, Sniehotta and Schuez (2007)           0.0009049938  0.0001858514
## Gagnon, et al. (2012)                        0.0009132051 -0.0001124908
##                                                    Cov10         Cov11
## Conner, Warren, Close, and Sparks (1999a) 2 -0.0005240048  0.0004412252
## Conner, Warren, Close, and Sparks (1999a) 3 -0.0012010968  0.0004688892
## Conner, Warren, Close, and Sparks (1999c)   -0.0017460794 -0.0007069013
## Cooke and French (2011a)                    -0.0036361242 -0.0025330164
## Cooke, Sniehotta and Schuez (2007)          -0.0044026349 -0.0016646304
## Gagnon, et al. (2012)                       -0.0014179822 -0.0009399592
##                                                   Cov12         Cov13
## Conner, Warren, Close, and Sparks (1999a) 2 0.0004958820  2.119337e-04
## Conner, Warren, Close, and Sparks (1999a) 3 0.0004305337  4.325423e-04
## Conner, Warren, Close, and Sparks (1999c)   0.0007707499 -1.154491e-04
## Cooke and French (2011a)                    0.0034145541 -2.343368e-04
## Cooke, Sniehotta and Schuez (2007)          0.0021108698  7.027018e-05
## Gagnon, et al. (2012)                       0.0006966680 -7.456844e-05
##                                                    Cov14         Cov15
## Conner, Warren, Close, and Sparks (1999a) 2  0.0004412252 -0.0003715227
## Conner, Warren, Close, and Sparks (1999a) 3  0.0004688892 -0.0001830469
## Conner, Warren, Close, and Sparks (1999c)   -0.0007069013 -0.0002861894
## Cooke and French (2011a)                    -0.0025330164 -0.0017645635
## Cooke, Sniehotta and Schuez (2007)          -0.0016646304 -0.0006293946
## Gagnon, et al. (2012)                       -0.0009399592 -0.0006230850
##                                                  Cov16         Cov17
## Conner, Warren, Close, and Sparks (1999a) 2 0.003543340 -2.786146e-06
## Conner, Warren, Close, and Sparks (1999a) 3 0.007785377 -1.188855e-03
## Conner, Warren, Close, and Sparks (1999c)   0.004204074 -3.332367e-04
## Cooke and French (2011a)                    0.006140863 -2.458427e-03
## Cooke, Sniehotta and Schuez (2007)          0.009441192 -6.100933e-03
## Gagnon, et al. (2012)                       0.002325759 -5.207775e-04
##                                                    Cov18       Cov19
## Conner, Warren, Close, and Sparks (1999a) 2  0.0001999014 0.003946448
## Conner, Warren, Close, and Sparks (1999a) 3  0.0017329780 0.007319927
## Conner, Warren, Close, and Sparks (1999c)   -0.0003139750 0.006052804
## Cooke and French (2011a)                    -0.0006460928 0.011808516
## Cooke, Sniehotta and Schuez (2007)          -0.0006254963 0.015835620
## Gagnon, et al. (2012)                       -0.0006977099 0.003824710
##                                                    Cov20       Cov21 Female
## Conner, Warren, Close, and Sparks (1999a) 2 -2.939011e-05 0.003824601 57.386
## Conner, Warren, Close, and Sparks (1999a) 3 -1.364476e-03 0.006215230 73.584
## Conner, Warren, Close, and Sparks (1999c)   -1.986152e-04 0.004545285 57.865
## Cooke and French (2011a)                    -1.372958e-03 0.008785378 69.166
## Cooke, Sniehotta and Schuez (2007)          -2.312658e-03 0.008386068 75.000
## Gagnon, et al. (2012)                        3.423119e-05 0.003114146 53.703
```

Meta-analysis of indirect and direct effects

```r
## Random-effects model with independent random effects
IE2 <- meta(y=IE.df2[, 1:6],
            v=IE.df2[, 7:27],
            RE.constraints = Diag(paste0("0.01*Tau2_", 1:6, "_", 1:6)))
summary(IE2)
```

```
##
## Call:
## meta(y = IE.df2[, 1:6], v = IE.df2[, 7:27], RE.constraints = Diag(paste0("0.01*Tau2_",
##     1:6, "_", 1:6)))
##
## 95% confidence intervals: z statistic approximation (robust=FALSE)
## Coefficients:
##               Estimate   Std.Error      lbound      ubound z value  Pr(>|z|)
## Intercept1  3.1042e-02  1.3407e-02  4.7646e-03  5.7320e-02  2.3153  0.020594
## Intercept2  1.7165e-01  3.9513e-02  9.4205e-02  2.4909e-01  4.3441 1.398e-05
## Intercept3  3.4531e-02  2.4391e-02 -1.3275e-02  8.2337e-02  1.4157  0.156858
## Intercept4  2.0104e-04  2.8001e-02 -5.4680e-02  5.5083e-02  0.0072  0.994272
## Intercept5  4.4803e-02  2.4769e-02 -3.7425e-03  9.3349e-02  1.8089  0.070472
## Intercept6 -5.2569e-02  4.6277e-02 -1.4327e-01  3.8133e-02 -1.1359  0.255978
## Tau2_1_1    2.3421e-03  1.1540e-03  8.0268e-05  4.6040e-03  2.0295  0.042406
## Tau2_2_2    2.5949e-02  9.4690e-03  7.3898e-03  4.4508e-02  2.7404  0.006137
## Tau2_3_3    9.9466e-03  3.8029e-03  2.4931e-03  1.7400e-02  2.6155  0.008909
## Tau2_4_4    9.8773e-03  4.6819e-03  7.0088e-04  1.9054e-02  2.1097  0.034887
## Tau2_5_5    4.0321e-03  3.2155e-03 -2.2701e-03  1.0334e-02  1.2540  0.209851
## Tau2_6_6    3.5371e-02  1.2945e-02  9.9989e-03  6.0742e-02  2.7324  0.006288
##
## Intercept1 *
## Intercept2 ***
## Intercept3
## Intercept4
## Intercept5 .
## Intercept6
## Tau2_1_1   *
## Tau2_2_2   **
## Tau2_3_3   **
## Tau2_4_4   *
## Tau2_5_5
## Tau2_6_6   **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Q statistic on the homogeneity of effect sizes: 1079.478
## Degrees of freedom of the Q statistic: 108
## P value of the Q statistic: 0
##
## Heterogeneity indices (based on the estimated Tau2):
##                               Estimate
## Intercept1: I2 (Q statistic)   0.7964
## Intercept2: I2 (Q statistic)   0.9308
## Intercept3: I2 (Q statistic)   0.9120
## Intercept4: I2 (Q statistic)   0.7028
```

```
## Intercept5: I2 (Q statistic)   0.4167
## Intercept6: I2 (Q statistic)   0.8950
##
## Number of studies (or clusters): 19
## Number of observed statistics: 114
## Number of estimated parameters: 12
## Degrees of freedom: 102
## -2 log likelihood: -161.655
## OpenMx status1: 0 ("0" or "1": The optimization is considered fine.
## Other values may indicate problems.)
```

```r
## Mixed-effects model with Female as a moderator
IE3 <- meta(y=IE.df2[, 1:6],
            v=IE.df2[, 7:27],
            x=IE.df2$Female,
            RE.constraints = Diag(paste0("0.01*Tau2_", 1:6, "_", 1:6)))
summary(IE3)
```

```
##
## Call:
## meta(y = IE.df2[, 1:6], v = IE.df2[, 7:27], x = IE.df2$Female,
##     RE.constraints = Diag(paste0("0.01*Tau2_", 1:6, "_", 1:6)))
##
## 95% confidence intervals: z statistic approximation (robust=FALSE)
## Coefficients:
##                Estimate   Std.Error      lbound      ubound z value Pr(>|z|)
## Intercept1  4.1405e-02  3.0063e-02 -1.7518e-02  1.0033e-01  1.3773 0.168430
## Intercept2  7.3998e-02  8.2471e-02 -8.7642e-02  2.3564e-01  0.8973 0.369579
## Intercept3  3.3729e-02  5.6534e-02 -7.7075e-02  1.4453e-01  0.5966 0.550763
## Intercept4 -4.4123e-02  6.0089e-02 -1.6190e-01  7.3650e-02 -0.7343 0.462772
## Intercept5  1.6583e-02  4.8229e-02 -7.7944e-02  1.1111e-01  0.3438 0.730963
## Intercept6 -9.7530e-02  1.0399e-01 -3.0134e-01  1.0628e-01 -0.9379 0.348294
## Slope1_1   -1.6668e-04  4.3613e-04 -1.0215e-03  6.8813e-04 -0.3822 0.702338
## Slope2_1    1.5636e-03  1.2109e-03 -8.0973e-04  3.9370e-03  1.2913 0.196611
## Slope3_1    1.4358e-05  8.1710e-04 -1.5871e-03  1.6158e-03  0.0176 0.985981
## Slope4_1    7.2436e-04  8.9149e-04 -1.0229e-03  2.4716e-03  0.8125 0.416488
## Slope5_1    4.7178e-04  7.3809e-04 -9.7485e-04  1.9184e-03  0.6392 0.522702
## Slope6_1    7.3627e-04  1.5183e-03 -2.2396e-03  3.7121e-03  0.4849 0.627727
## Tau2_1_1    2.3282e-03  1.1495e-03  7.5109e-05  4.5812e-03  2.0253 0.042836 *
## Tau2_2_2    2.3191e-02  8.5013e-03  6.5282e-03  3.9853e-02  2.7279 0.006374 **
## Tau2_3_3    9.9667e-03  3.8135e-03  2.4924e-03  1.7441e-02  2.6135 0.008961 **
## Tau2_4_4    9.3153e-03  4.5385e-03  4.1999e-04  1.8211e-02  2.0525 0.040121 *
## Tau2_5_5    3.6083e-03  3.1789e-03 -2.6223e-03  9.8389e-03  1.1351 0.256344
## Tau2_6_6    3.4603e-02  1.2666e-02  9.7780e-03  5.9429e-02  2.7319 0.006296 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Q statistic on the homogeneity of effect sizes: 1079.478
## Degrees of freedom of the Q statistic: 108
## P value of the Q statistic: 0
##
## Explained variances (R2):
##                                 y1        y2        y3        y4        y5     y6
## Tau2 (no predictor)    0.0202935 0.0224603 0.0279785 0.0261887 0.0316755 0.0293
## Tau2 (with predictors) 0.0023282 0.0231905 0.0099667 0.0093153 0.0036083 0.0346
```

```
## R2                    0.8852754 0.0000000 0.6437728 0.6443031 0.8860851 0.0000
##
## Number of studies (or clusters): 19
## Number of observed statistics: 114
## Number of estimated parameters: 18
## Degrees of freedom: 96
## -2 log likelihood: -164.8802
## OpenMx status1: 0 ("0" or "1": The optimization is considered fine.
## Other values may indicate problems.)
```

```
## Test the statistical significance betwen the models
anova(IE3, IE2)
```

```
##                     base            comparison ep  minus2LL  df       AIC
## 1 Meta analysis with ML                   <NA> 18 -164.8802  96 -356.8802
## 2 Meta analysis with ML Meta analysis with ML 12 -161.6550 102 -365.6550
##     diffLL diffdf         p
## 1       NA     NA        NA
## 2 3.225137      6 0.7801054
```

TSSEM

Stage 1 analysis

```
## Random-effects model
random1 <- tssem1(Cooke16$data, Cooke16$n)
summary(random1)
```

```
##
## Call:
## meta(y = ES, v = acovR, RE.constraints = Diag(paste0(RE.startvalues,
##     "*Tau2_", 1:no.es, "_", 1:no.es)), RE.lbound = RE.lbound,
##     I2 = I2, model.name = model.name, suppressWarnings = TRUE,
##     silent = silent, run = run)
##
## 95% confidence intervals: z statistic approximation (robust=FALSE)
## Coefficients:
##               Estimate  Std.Error     lbound     ubound z value  Pr(>|z|)
## Intercept1   0.4160785  0.0290461  0.3591492  0.4730079 14.3247 < 2.2e-16 ***
## Intercept2   0.1819517  0.0337283  0.1158454  0.2480580  5.3946 6.867e-08 ***
## Intercept3   0.4103473  0.0292481  0.3530220  0.4676726 14.0299 < 2.2e-16 ***
## Intercept4   0.1571081  0.0462777  0.0664055  0.2478108  3.3949 0.0006865 ***
## Intercept5   0.2520239  0.0454915  0.1628623  0.3411855  5.5400 3.024e-08 ***
## Intercept6   0.5622006  0.0325187  0.4984651  0.6259360 17.2885 < 2.2e-16 ***
## Intercept7   0.2788657  0.0536501  0.1737134  0.3840180  5.1979 2.016e-07 ***
## Intercept8   0.2978187  0.0586302  0.1829056  0.4127318  5.0796 3.782e-07 ***
## Intercept9   0.0348951  0.0780574 -0.1180947  0.1878849  0.4470 0.6548433
## Intercept10  0.4306069  0.0734985  0.2865525  0.5746613  5.8587 4.665e-09 ***
## Tau2_1_1     0.0237209  0.0068522  0.0102908  0.0371509  3.4618 0.0005366 ***
## Tau2_2_2     0.0321573  0.0090636  0.0143930  0.0499215  3.5480 0.0003882 ***
## Tau2_3_3     0.0207954  0.0064549  0.0081441  0.0334467  3.2217 0.0012745 **
## Tau2_4_4     0.0343873  0.0126286  0.0096357  0.0591389  2.7230 0.0064697 **
## Tau2_5_5     0.0630935  0.0168264  0.0301144  0.0960725  3.7497 0.0001771 ***
## Tau2_6_6     0.0271065  0.0079133  0.0115966  0.0426163  3.4254 0.0006138 ***
## Tau2_7_7     0.0483815  0.0171142  0.0148383  0.0819248  2.8270 0.0046990 **
```

```
## Tau2_8_8     0.0948256  0.0261755  0.0435227  0.1461286  3.6227 0.0002916 ***
## Tau2_9_9     0.1092995  0.0373008  0.0361912  0.1824078  2.9302 0.0033873 **
## Tau2_10_10   0.0965131  0.0326607  0.0324994  0.1605268  2.9550 0.0031264 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Q statistic on the homogeneity of effect sizes: 3122.601
## Degrees of freedom of the Q statistic: 252
## P value of the Q statistic: 0
##
## Heterogeneity indices (based on the estimated Tau2):
##                               Estimate
## Intercept1: I2 (Q statistic)    0.8895
## Intercept2: I2 (Q statistic)    0.8937
## Intercept3: I2 (Q statistic)    0.8769
## Intercept4: I2 (Q statistic)    0.8911
## Intercept5: I2 (Q statistic)    0.9456
## Intercept6: I2 (Q statistic)    0.9146
## Intercept7: I2 (Q statistic)    0.9211
## Intercept8: I2 (Q statistic)    0.9651
## Intercept9: I2 (Q statistic)    0.9628
## Intercept10: I2 (Q statistic)   0.9601
##
## Number of studies (or clusters): 33
## Number of observed statistics: 262
## Number of estimated parameters: 20
## Degrees of freedom: 242
## -2 log likelihood: -33.69944
## OpenMx status1: 0 ("0" or "1": The optimization is considered fine.
## Other values may indicate problems.)
```

```
## Average correlation matrix under a random-effects model
vec2symMat(coef(random1, select="fixed"), diag = FALSE)
```

```
##           [,1]      [,2]       [,3]      [,4]       [,5]
## [1,] 1.0000000 0.4160785 0.18195168 0.4103473 0.15710814
## [2,] 0.4160785 1.0000000 0.25202390 0.5622006 0.27886566
## [3,] 0.1819517 0.2520239 1.00000000 0.2978187 0.03489511
## [4,] 0.4103473 0.5622006 0.29781867 1.0000000 0.43060689
## [5,] 0.1571081 0.2788657 0.03489511 0.4306069 1.00000000
```

```
## Heterogeneity variances of the random-effects
coef(random1, select="random")
```

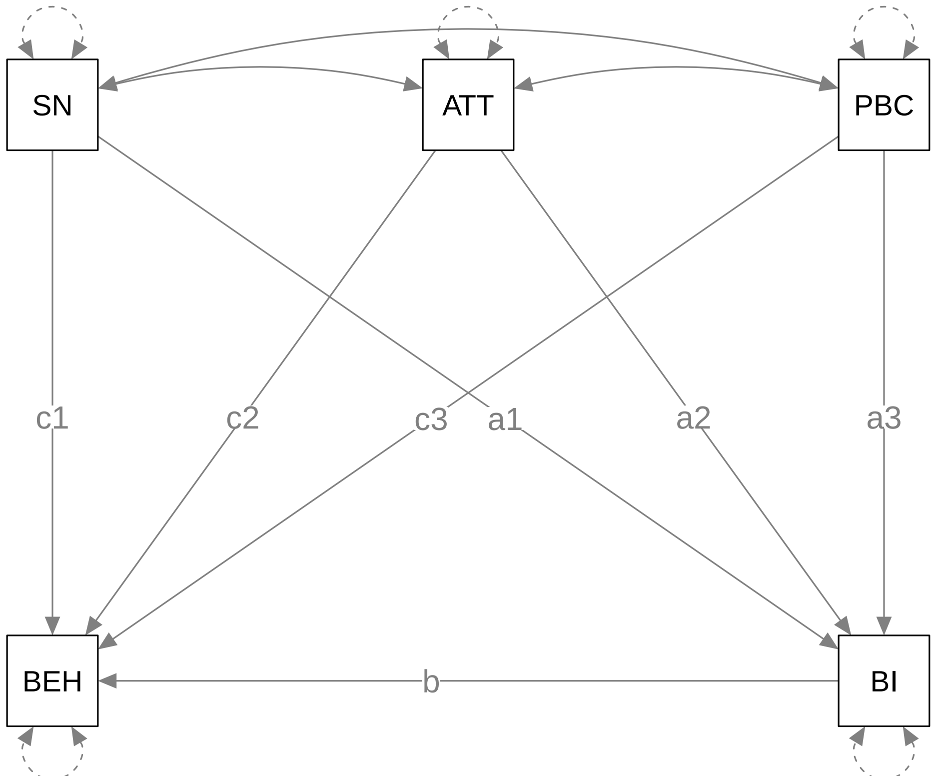
```
##   Tau2_1_1   Tau2_2_2   Tau2_3_3   Tau2_4_4   Tau2_5_5   Tau2_6_6   Tau2_7_7
## 0.02372086 0.03215729 0.02079544 0.03438732 0.06309347 0.02710645 0.04838155
##   Tau2_8_8   Tau2_9_9 Tau2_10_10
## 0.09482562 0.10929951 0.09651307
```

Stage 2 analysis

```
model3 <- "BEH ~ c1*SN + c2*ATT + c3*PBC + b*BI
           BI ~ a1*SN + a2*ATT + a3*PBC
           SN ~~ 1*SN
           ATT ~~ 1*ATT
```

```
           PBC ~~ 1*PBC
           SN ~~ ATT + PBC
           ATT ~~ PBC"

plot(model3, edge.label.position=0.55)
```




```
RAM3 <- lavaan2RAM(model3, obs.variables=c("SN", "ATT", "PBC", "BI", "BEH"))
RAM3
```

```
## $A
##     SN     ATT    PBC    BI    BEH
## SN  "0"    "0"    "0"    "0"   "0"
## ATT "0"    "0"    "0"    "0"   "0"
## PBC "0"    "0"    "0"    "0"   "0"
## BI  "0*a1" "0*a2" "0*a3" "0"   "0"
## BEH "0*c1" "0*c2" "0*c3" "0*b" "0"
##
## $S
##     SN             ATT            PBC            BI           BEH
## SN  "1"            "0*SNWITHATT"  "0*SNWITHPBC"  "0"          "0"
## ATT "0*SNWITHATT"  "1"            "0*ATTWITHPBC" "0"          "0"
## PBC "0*SNWITHPBC"  "0*ATTWITHPBC" "1"            "0"          "0"
## BI  "0"            "0"            "0"            "0*BIWITHBI" "0"
## BEH "0"            "0"            "0"            "0"          "0*BEHWITHBEH"
##
## $F
##     SN ATT PBC BI BEH
## SN   1   0   0  0   0
## ATT  0   1   0  0   0
```

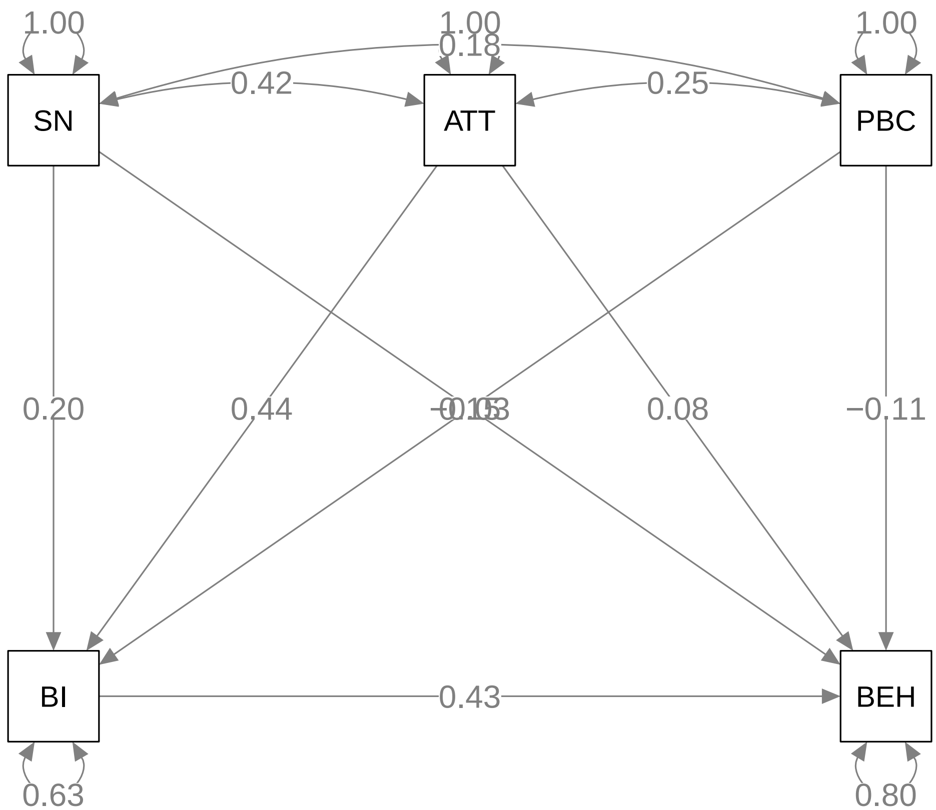
```
## PBC  0   0   1  0   0
## BI   0   0   0  1   0
## BEH  0   0   0  0   1
##
## $M
##   SN ATT PBC BI BEH
## 1  0   0   0  0   0
```

```r
tssem.fit <- tssem2(random1, RAM=RAM3, intervals.type = "LB",
                    mx.algebras = list(ind1=mxAlgebra(a1*b, name="ind1"),
                                       ind2=mxAlgebra(a2*b, name="ind2"),
                                       ind3=mxAlgebra(a3*b, name="ind3"),
                                       dir1=mxAlgebra(c1, name="dir1"),
                                       dir2=mxAlgebra(c2, name="dir2"),
                                       dir3=mxAlgebra(c3, name="dir3")))
summary(tssem.fit)
```

```
##
## Call:
## wls(Cov = pooledS, aCov = aCov, n = tssem1.obj$total.n, RAM = RAM,
##     Amatrix = Amatrix, Smatrix = Smatrix, Fmatrix = Fmatrix,
##     diag.constraints = diag.constraints, cor.analysis = cor.analysis,
##     intervals.type = intervals.type, mx.algebras = mx.algebras,
##     model.name = model.name, suppressWarnings = suppressWarnings,
##     silent = silent, run = run)
##
## 95% confidence intervals: Likelihood-based statistic
## Coefficients:
##             Estimate Std.Error    lbound    ubound z value Pr(>|z|)
## c2          0.075933        NA -0.128358  0.270753      NA       NA
## b           0.433331        NA  0.189551  0.685586      NA       NA
## c3         -0.107333        NA -0.296731  0.071623      NA       NA
## c1         -0.032773        NA -0.167496  0.097192      NA       NA
## a2          0.441373        NA  0.352050  0.529203      NA       NA
## a3          0.150310        NA  0.018040  0.278985      NA       NA
## a1          0.199353        NA  0.116707  0.277927      NA       NA
## SNWITHATT   0.416079        NA  0.359149  0.473007      NA       NA
## ATTWITHPBC  0.252024        NA  0.162863  0.341185      NA       NA
## SNWITHPBC   0.181952        NA  0.115846  0.248058      NA       NA
##
## mxAlgebras objects (and their 95% likelihood-based CIs):
##                 lbound    Estimate     ubound
## ind1[1,1]  0.034865256  0.08638570 0.15651080
## ind2[1,1]  0.083484620  0.19126055 0.31953272
## ind3[1,1]  0.007294678  0.06513389 0.15799060
## dir1[1,1] -0.167496012 -0.03277293 0.09719196
## dir2[1,1] -0.128357577  0.07593315 0.27075346
## dir3[1,1] -0.296730747 -0.10733291 0.07162278
##
## Goodness-of-fit indices:
##                                                Value
## Sample size                                  7973.00
## Chi-square of target model                      0.00
## DF of target model                              0.00
## p value of target model                         0.00
```

```
## Number of constraints imposed on "Smatrix"    0.00
## DF manually adjusted                           0.00
## Chi-square of independence model             765.24
## DF of independence model                      10.00
## RMSEA                                          0.00
## RMSEA lower 95% CI                             0.00
## RMSEA upper 95% CI                             0.00
## SRMR                                           0.00
## TLI                                            -Inf
## CFI                                            1.00
## AIC                                            0.00
## BIC                                            0.00
## OpenMx status1: 0 ("0" or "1": The optimization is considered fine.
## Other values indicate problems.)
```

```r
plot(tssem.fit)
```




```r
## A model without direct effects
model4 <- "BEH ~ BI
           BI ~ SN + ATT + PBC
           SN ~~ 1*SN
           ATT ~~ 1*ATT
           PBC ~~ 1*PBC
           SN ~~ ATT + PBC
           ATT ~~ PBC"

RAM4 <- lavaan2RAM(model4, obs.variables=c("SN", "ATT", "PBC", "BI", "BEH"))
RAM4
```

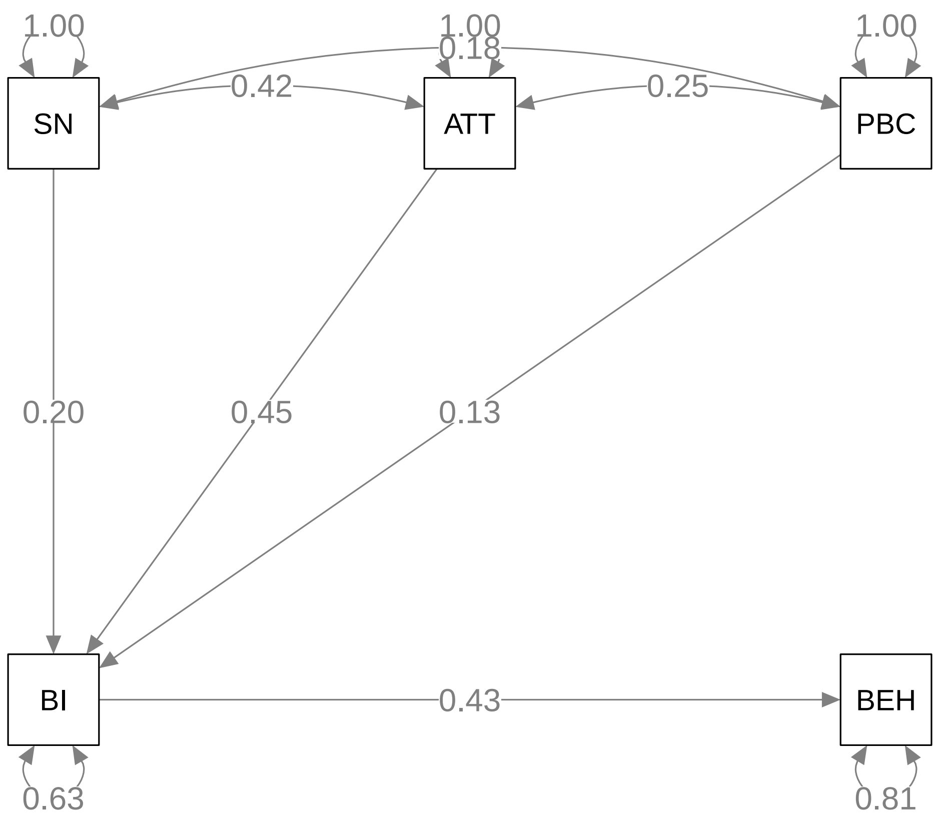
```
## $A
##     SN          ATT          PBC          BI           BEH
## SN  "0"         "0"          "0"          "0"          "0"
## ATT "0"         "0"          "0"          "0"          "0"
## PBC "0"         "0"          "0"          "0"          "0"
## BI  "0*BIONSN" "0*BIONATT" "0*BIONPBC" "0"          "0"
## BEH "0"         "0"          "0"          "0*BEHONBI" "0"
##
## $S
##     SN              ATT             PBC             BI            BEH
## SN  "1"             "0*SNWITHATT"  "0*SNWITHPBC"  "0"           "0"
## ATT "0*SNWITHATT" "1"             "0*ATTWITHPBC" "0"           "0"
## PBC "0*SNWITHPBC" "0*ATTWITHPBC" "1"             "0"           "0"
## BI  "0"             "0"             "0"             "0*BIWITHBI" "0"
## BEH "0"             "0"             "0"             "0"           "0*BEHWITHBEH"
##
## $F
##     SN ATT PBC BI BEH
## SN   1   0   0  0   0
## ATT  0   1   0  0   0
## PBC  0   0   1  0   0
## BI   0   0   0  1   0
## BEH  0   0   0  0   1
##
## $M
##   SN ATT PBC BI BEH
## 1  0   0   0  0   0
```

```
tssem.fit4 <- tssem2(random1, RAM=RAM4)
summary(tssem.fit4)
```

```
##
## Call:
## wls(Cov = pooledS, aCov = aCov, n = tssem1.obj$total.n, RAM = RAM,
##     Amatrix = Amatrix, Smatrix = Smatrix, Fmatrix = Fmatrix,
##     diag.constraints = diag.constraints, cor.analysis = cor.analysis,
##     intervals.type = intervals.type, mx.algebras = mx.algebras,
##     model.name = model.name, suppressWarnings = suppressWarnings,
##     silent = silent, run = run)
##
## 95% confidence intervals: z statistic approximation
## Coefficients:
##              Estimate Std.Error    lbound    ubound z value  Pr(>|z|)
## BEHONBI     0.4303231 0.0538476 0.3247837 0.5358626  7.9915 1.332e-15 ***
## BIONATT     0.4542752 0.0434294 0.3691552 0.5393951 10.4601 < 2.2e-16 ***
## BIONPBC     0.1276648 0.0640516 0.0021259 0.2532037  1.9932   0.04624 *
## BIONSN      0.1951472 0.0398699 0.1170035 0.2732908  4.8946 9.851e-07 ***
## SNWITHATT   0.4161169 0.0290455 0.3591889 0.4730450 14.3264 < 2.2e-16 ***
## ATTWITHPBC  0.2520209 0.0454910 0.1628603 0.3411816  5.5400 3.024e-08 ***
## SNWITHPBC   0.1816849 0.0337272 0.1155808 0.2477889  5.3869 7.168e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Goodness-of-fit indices:
##                                                Value
```

```
## Sample size                                   7973.0000
## Chi-square of target model                       1.9530
## DF of target model                               3.0000
## p value of target model                          0.5822
## Number of constraints imposed on "Smatrix"       0.0000
## DF manually adjusted                             0.0000
## Chi-square of independence model               765.2367
## DF of independence model                        10.0000
## RMSEA                                            0.0000
## RMSEA lower 95% CI                               0.0000
## RMSEA upper 95% CI                               0.0160
## SRMR                                             0.0302
## TLI                                              1.0046
## CFI                                              1.0000
## AIC                                             -4.0470
## BIC                                            -24.9985
## OpenMx status1: 0 ("0" or "1": The optimization is considered fine.
## Other values indicate problems.)
```

```r
plot(tssem.fit4)
```




```r
## A model with equal path coefficients and without direct effects
model5 <- "BEH ~ BI
           BI ~ a*SN + a*ATT + a*PBC
           SN ~~ 1*SN
           ATT ~~ 1*ATT
           PBC ~~ 1*PBC
           SN ~~ ATT + PBC
           ATT ~~ PBC"
```

```
RAM5 <- lavaan2RAM(model5, obs.variables=c("SN", "ATT", "PBC", "BI", "BEH"))
RAM5
```

```
## $A
##     SN    ATT   PBC   BI          BEH
## SN  "0"   "0"   "0"   "0"         "0"
## ATT "0"   "0"   "0"   "0"         "0"
## PBC "0"   "0"   "0"   "0"         "0"
## BI  "0*a" "0*a" "0*a" "0"         "0"
## BEH "0"   "0"   "0"   "0*BEHONBI" "0"
##
## $S
##     SN             ATT             PBC             BI           BEH
## SN  "1"            "0*SNWITHATT"   "0*SNWITHPBC"   "0"          "0"
## ATT "0*SNWITHATT"  "1"             "0*ATTWITHPBC"  "0"          "0"
## PBC "0*SNWITHPBC"  "0*ATTWITHPBC"  "1"             "0"          "0"
## BI  "0"            "0"             "0"             "0*BIWITHBI" "0"
## BEH "0"            "0"             "0"             "0"          "0*BEHWITHBEH"
##
## $F
##     SN ATT PBC BI BEH
## SN   1   0   0  0   0
## ATT  0   1   0  0   0
## PBC  0   0   1  0   0
## BI   0   0   0  1   0
## BEH  0   0   0  0   1
##
## $M
##   SN ATT PBC BI BEH
## 1  0   0   0  0   0
```

```
tssem.fit5 <- tssem2(random1, RAM=RAM5)
summary(tssem.fit5)
```

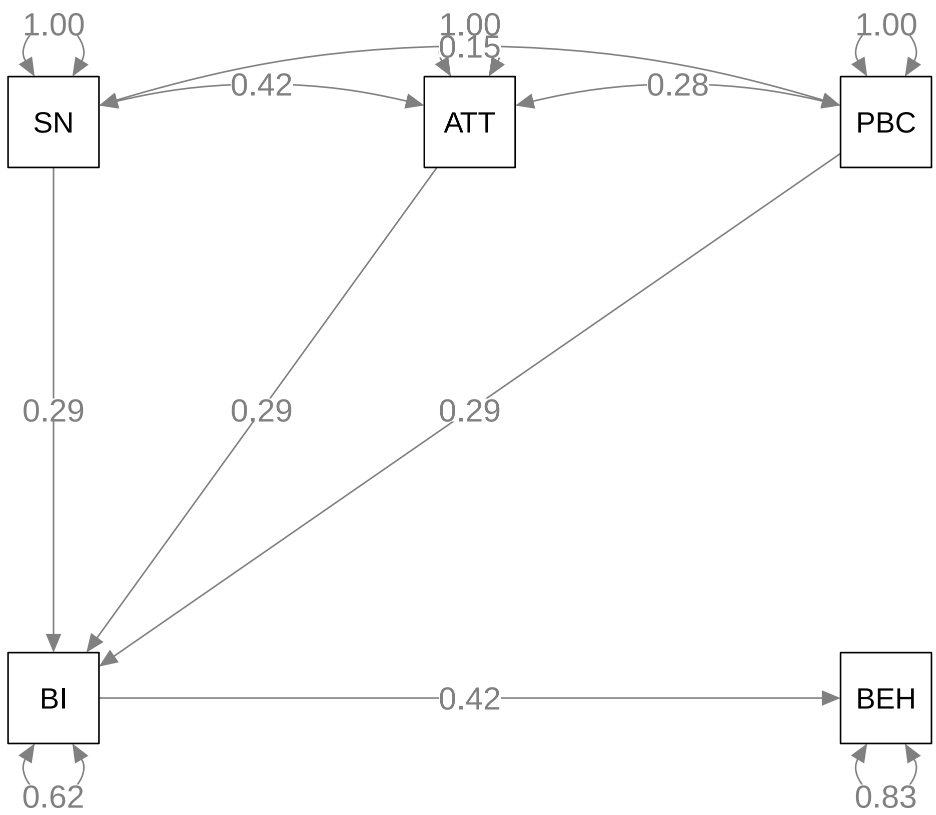
```
##
## Call:
## wls(Cov = pooledS, aCov = aCov, n = tssem1.obj$total.n, RAM = RAM,
##     Amatrix = Amatrix, Smatrix = Smatrix, Fmatrix = Fmatrix,
##     diag.constraints = diag.constraints, cor.analysis = cor.analysis,
##     intervals.type = intervals.type, mx.algebras = mx.algebras,
##     model.name = model.name, suppressWarnings = suppressWarnings,
##     silent = silent, run = run)
##
## 95% confidence intervals: z statistic approximation
## Coefficients:
##             Estimate Std.Error   lbound   ubound z value  Pr(>|z|)
## BEHONBI     0.416468  0.053693 0.311231 0.521706  7.7564 8.660e-15 ***
## a           0.285375  0.014233 0.257479 0.313272 20.0500 < 2.2e-16 ***
## SNWITHATT   0.423229  0.028798 0.366786 0.479671 14.6966 < 2.2e-16 ***
## ATTWITHPBC  0.277945  0.043261 0.193155 0.362735  6.4248 1.320e-10 ***
## SNWITHPBC   0.154051  0.033310 0.088764 0.219337  4.6247 3.751e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Goodness-of-fit indices:
##                                                Value
## Sample size                                7973.0000
## Chi-square of target model                   18.1156
## DF of target model                            5.0000
## p value of target model                       0.0028
## Number of constraints imposed on "Smatrix"    0.0000
## DF manually adjusted                          0.0000
## Chi-square of independence model            765.2367
## DF of independence model                     10.0000
## RMSEA                                         0.0181
## RMSEA lower 95% CI                            0.0096
## RMSEA upper 95% CI                            0.0275
## SRMR                                          0.0682
## TLI                                           0.9653
## CFI                                           0.9826
## AIC                                           8.1156
## BIC                                         -26.8034
## OpenMx status1: 0 ("0" or "1": The optimization is considered fine.
## Other values indicate problems.)
```

```
## Testing the significance of equal path coefficients
anova(tssem.fit4, tssem.fit5)
```

```
##                 base         comparison ep  minus2LL df AIC  diffLL diffdf
## 1 TSSEM2 Correlation               <NA>  7  1.952952 -7  NA      NA     NA
## 2 TSSEM2 Correlation TSSEM2 Correlation  5 18.115647 -5  NA 16.1627      2
##             p
## 1          NA
## 2 0.000309254
```

```
plot(tssem.fit5)
```



OSMASEM

```r
## Prepare the data
my.df2 <- Cor2DataFrame(Cooke16)

## Show the first few studies
head(my.df2)
```

```
## $data
##                                                ATT_SN  PBC_SN   BI_SN  BEH_SN
## Ajzen and Sheikh (2013)                        0.2700  0.2600  0.5100      NA
## Armitage, Norman, and Conner (2002)            0.4400  0.2400  0.4700      NA
## Conner, Warren, Close, and Sparks (1999a) 2  0.0900 -0.1300  0.2300  0.0300
## Conner, Warren, Close, and Sparks (1999a) 3  0.3300 -0.3100  0.5100  0.2900
## Conner, Warren, Close, and Sparks (1999b) 1  0.4800  0.3700  0.5150      NA
## Conner, Warren, Close, and Sparks (1999b) 2  0.5100  0.4450  0.5450      NA
## Conner, Warren, Close, and Sparks (1999c)    0.1725  0.1375  0.2025 -0.1425
## Cooke and French (2011a)                       0.5475  0.4300  0.4900  0.3900
## Cooke and French (2011b)                       0.5300  0.2500  0.4800      NA
## Cooke, Sniehotta and Schuez (2007)             0.6600  0.4100  0.4700  0.3300
## Elliot and Ainsworth (2012) 1                  0.6400  0.0800      NA      NA
## Elliot and Ainsworth (2012) 2                  0.4800  0.0600      NA      NA
## Elliot and Ainsworth (2012) 3                  0.6500  0.0100      NA      NA
## Elliot and Ainsworth (2012) 4                  0.5400  0.0500      NA      NA
## Gagnon, et al. (2012)                          0.4400  0.4700  0.4500 -0.2500
## Gardner, de Bruijn, and Lally (2012)           0.4700  0.2400  0.2700  0.2400
## Glassman, et al. (2010a)                       0.6900  0.6600  0.7200  0.5800
## Glassman, et al. (2010b)                       0.3200  0.2700  0.5400 -0.1400
```

```
## Glassman, et al. (2010c)                     0.6000  0.1200  0.4400  0.2100
## Glassman, et al. (2010d)                     0.5000  0.0750  0.4200  0.2100
## Hagger, et al. (2012)                        0.5300  0.1950  0.4300  0.1700
## Jamison and Myers (2008)                     0.5600 -0.2600  0.4600  0.2000
## Johnston and White (2003)                    0.4070  0.0770  0.4360  0.3830
## Kim and Hong (2013)                          0.2100  0.3200  0.6100      NA
## Norman (2011) 1                              0.4600  0.3700  0.4500      NA
## Norman (2011) 2                              0.4300  0.2800  0.5000      NA
## Norman (2011) 3                              0.4400  0.0700  0.4400      NA
## Norman (2011) 4                              0.4400  0.1500  0.4800      NA
## Norman, Armitage, and Quigley (2007) 1       0.0140 -0.0470  0.0140  0.0280
## Norman, Armitage, and Quigley (2007) 2      -0.0520 -0.0630 -0.1310 -0.0290
## Norman and Conner (2006)                     0.2400  0.1150  0.2700 -0.0100
## Norman, Conner, and Stride (2012) 1          0.3200  0.2400  0.3400  0.2300
## Norman, Conner, and Stride (2012) 2          0.3000  0.2800  0.2300  0.3300
##                                             PBC_ATT BI_ATT BEH_ATT BI_PBC
## Ajzen and Sheikh (2013)                       0.400  0.680      NA  0.480
## Armitage, Norman, and Conner (2002)           0.510  0.610      NA  0.530
## Conner, Warren, Close, and Sparks (1999a) 2  -0.130  0.390   0.130 -0.350
## Conner, Warren, Close, and Sparks (1999a) 3   0.030  0.480   0.200 -0.240
## Conner, Warren, Close, and Sparks (1999b) 1   0.520  0.520      NA  0.400
## Conner, Warren, Close, and Sparks (1999b) 2   0.690  0.620      NA  0.480
## Conner, Warren, Close, and Sparks (1999c)     0.230  0.580  -0.200  0.340
## Cooke and French (2011a)                      0.625  0.775   0.560  0.710
## Cooke and French (2011b)                      0.580  0.670      NA  0.640
## Cooke, Sniehotta and Schuez (2007)            0.560  0.720   0.430  0.560
## Elliot and Ainsworth (2012) 1                 0.050     NA      NA     NA
## Elliot and Ainsworth (2012) 2                 0.050     NA      NA     NA
## Elliot and Ainsworth (2012) 3                 0.030     NA      NA     NA
## Elliot and Ainsworth (2012) 4                -0.120     NA      NA     NA
## Gagnon, et al. (2012)                         0.500  0.740  -0.330  0.650
## Gardner, de Bruijn, and Lally (2012)          0.110  0.330   0.290  0.190
## Glassman, et al. (2010a)                      0.720  0.750   0.580  0.740
## Glassman, et al. (2010b)                      0.210  0.360  -0.040  0.510
## Glassman, et al. (2010c)                      0.235  0.820   0.510  0.330
## Glassman, et al. (2010d)                      0.080  0.740   0.290  0.140
## Hagger, et al. (2012)                         0.270  0.830   0.360  0.240
## Jamison and Myers (2008)                     -0.390  0.840   0.380 -0.340
## Johnston and White (2003)                     0.312  0.400   0.408  0.212
## Kim and Hong (2013)                           0.360  0.480      NA  0.430
## Norman (2011) 1                               0.310  0.330      NA  0.360
## Norman (2011) 2                               0.330  0.400      NA  0.420
## Norman (2011) 3                               0.100  0.300      NA  0.340
## Norman (2011) 4                               0.150  0.330      NA  0.460
## Norman, Armitage, and Quigley (2007) 1       -0.065  0.515   0.296 -0.448
## Norman, Armitage, and Quigley (2007) 2       -0.317  0.581   0.427 -0.462
## Norman and Conner (2006)                      0.245  0.810   0.530  0.360
## Norman, Conner, and Stride (2012) 1           0.530  0.350   0.280  0.440
## Norman, Conner, and Stride (2012) 2           0.570  0.450   0.360  0.530
##                                             BEH_PBC BEH_BI C(ATT_SN ATT_SN)
## Ajzen and Sheikh (2013)                          NA     NA     0.0142197045
## Armitage, Norman, and Conner (2002)              NA     NA     0.0056190894
## Conner, Warren, Close, and Sparks (1999a) 2  -0.620  0.350     0.0039588942
## Conner, Warren, Close, and Sparks (1999a) 3  -0.210  0.350     0.0043821693
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## Conner, Warren, Close, and Sparks (1999b) 1      NA     NA     0.0035731564
## Conner, Warren, Close, and Sparks (1999b) 2      NA     NA     0.0037062388
## Conner, Warren, Close, and Sparks (1999c)    -0.440 -0.430     0.0039144068
## Cooke and French (2011a)                      0.540  0.700     0.0058063781
## Cooke and French (2011b)                         NA     NA     0.0049416052
## Cooke, Sniehotta and Schuez (2007)            0.290  0.560     0.0054434779
## Elliot and Ainsworth (2012) 1                    NA     NA     0.0018680013
## Elliot and Ainsworth (2012) 2                    NA     NA     0.0052388466
## Elliot and Ainsworth (2012) 3                    NA     NA     0.0054434738
## Elliot and Ainsworth (2012) 4                    NA     NA     0.0062211159
## Gagnon, et al. (2012)                        -0.360 -0.410     0.0014336751
## Gardner, de Bruijn, and Lally (2012)          0.190  0.930     0.0039588933
## Glassman, et al. (2010a)                      0.590  0.690     0.0024109567
## Glassman, et al. (2010b)                      0.290  0.210     0.0022119535
## Glassman, et al. (2010c)                      0.160  0.590     0.0050858832
## Glassman, et al. (2010d)                      0.035  0.400     0.0074124006
## Hagger, et al. (2012)                         0.150  0.480     0.0017506695
## Jamison and Myers (2008)                     -0.270  0.500     0.0040509751
## Johnston and White (2003)                     0.195  0.633     0.0057111852
## Kim and Hong (2013)                              NA     NA     0.0006334239
## Norman (2011) 1                                  NA     NA     0.0015483678
## Norman (2011) 2                                  NA     NA     0.0015622566
## Norman (2011) 3                                  NA     NA     0.0015147118
## Norman (2011) 4                                  NA     NA     0.0015622563
## Norman, Armitage, and Quigley (2007) 1       -0.415  0.527     0.0040986317
## Norman, Armitage, and Quigley (2007) 2       -0.369  0.549     0.0047723746
## Norman and Conner (2006)                      0.250  0.520     0.0112381687
## Norman, Conner, and Stride (2012) 1           0.450  0.600     0.0047399021
## Norman, Conner, and Stride (2012) 2           0.260  0.560     0.0045540128
##                                             C(PBC_SN ATT_SN) C(BI_SN ATT_SN)
## Ajzen and Sheikh (2013)                         0.0036828227    0.0060704448
## Armitage, Norman, and Conner (2002)             0.0014553248    0.0023988194
## Conner, Warren, Close, and Sparks (1999a) 2     0.0010253320    0.0016900659
## Conner, Warren, Close, and Sparks (1999a) 3     0.0011349553    0.0018707631
## Conner, Warren, Close, and Sparks (1999b) 1     0.0009254288    0.0015253941
## Conner, Warren, Close, and Sparks (1999b) 2     0.0009599108    0.0015822164
## Conner, Warren, Close, and Sparks (1999c)       0.0010138041    0.0016710689
## Cooke and French (2011a)                        0.0015038201    0.0024787622
## Cooke and French (2011b)                        0.0012798565    0.0021095929
## Cooke, Sniehotta and Schuez (2007)              0.0014098242    0.0023238387
## Elliot and Ainsworth (2012) 1                   0.0004837959    0.0007974550
## Elliot and Ainsworth (2012) 2                   0.0013568369    0.0022364874
## Elliot and Ainsworth (2012) 3                   0.0014098181    0.0023238337
## Elliot and Ainsworth (2012) 4                   0.0016112293    0.0026558135
## Gagnon, et al. (2012)                           0.0003713148    0.0006120418
## Gardner, de Bruijn, and Lally (2012)            0.0010253264    0.0016900635
## Glassman, et al. (2010a)                        0.0006244277    0.0010292483
## Glassman, et al. (2010b)                        0.0005728802    0.0009442903
## Glassman, et al. (2010c)                        0.0013172133    0.0021711842
## Glassman, et al. (2010d)                        0.0019197676    0.0031643822
## Hagger, et al. (2012)                           0.0004534173    0.0007473687
## Jamison and Myers (2008)                        0.0010491918    0.0017293849
## Johnston and White (2003)                       0.0014791556    0.0024381205
## Kim and Hong (2013)                             0.0001640528    0.0002704112
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## Norman (2011) 1                                0.0004010196    0.0006610035
## Norman (2011) 2                                0.0004046185    0.0006669346
## Norman (2011) 3                                0.0003923043    0.0006466388
## Norman (2011) 4                                0.0004046266    0.0006669328
## Norman, Armitage, and Quigley (2007) 1         0.0010615315    0.0017497286
## Norman, Armitage, and Quigley (2007) 2         0.0012360244    0.0020373489
## Norman and Conner (2006)                       0.0029106405    0.0047976252
## Norman, Conner, and Stride (2012) 1            0.0012276091    0.0020234831
## Norman, Conner, and Stride (2012) 2            0.0011794530    0.0019441167
##                                            C(BEH_SN ATT_SN) C(PBC_ATT ATT_SN)
## Ajzen and Sheikh (2013)                        0.0032278263      0.0026271732
## Armitage, Norman, and Conner (2002)            0.0012755300      0.0010381733
## Conner, Warren, Close, and Sparks (1999a) 2    0.0008986488      0.0007314295
## Conner, Warren, Close, and Sparks (1999a) 3    0.0009947296      0.0008096317
## Conner, Warren, Close, and Sparks (1999b) 1    0.0008110939      0.0006601605
## Conner, Warren, Close, and Sparks (1999b) 2    0.0008412995      0.0006847477
## Conner, Warren, Close, and Sparks (1999c)      0.0008885423      0.0007232042
## Cooke and French (2011a)                       0.0013180216      0.0010727654
## Cooke and French (2011b)                       0.0011217309      0.0009129973
## Cooke, Sniehotta and Schuez (2007)             0.0012356480      0.0010057086
## Elliot and Ainsworth (2012) 1                  0.0004240293      0.0003451251
## Elliot and Ainsworth (2012) 2                  0.0011892074      0.0009679175
## Elliot and Ainsworth (2012) 3                  0.0012356406      0.0010057047
## Elliot and Ainsworth (2012) 4                  0.0014121637      0.0011493839
## Gagnon, et al. (2012)                          0.0003254403      0.0002648816
## Gardner, de Bruijn, and Lally (2012)           0.0008986521      0.0007314261
## Glassman, et al. (2010a)                       0.0005472802      0.0004454440
## Glassman, et al. (2010b)                       0.0005021031      0.0004086687
## Glassman, et al. (2010c)                       0.0011544799      0.0009396462
## Glassman, et al. (2010d)                       0.0016825916      0.0013694847
## Hagger, et al. (2012)                          0.0003973973      0.0003234498
## Jamison and Myers (2008)                       0.0009195716      0.0007484575
## Johnston and White (2003)                      0.0012964049      0.0010551640
## Kim and Hong (2013)                            0.0001437850      0.0001170295
## Norman (2011) 1                                0.0003514716      0.0002860707
## Norman (2011) 2                                0.0003546291      0.0002886392
## Norman (2011) 3                                0.0003438383      0.0002798545
## Norman (2011) 4                                0.0003546152      0.0002886118
## Norman, Armitage, and Quigley (2007) 1         0.0009303864      0.0007572566
## Norman, Armitage, and Quigley (2007) 2         0.0010833181      0.0008817315
## Norman and Conner (2006)                       0.0025510420      0.0020763380
## Norman, Conner, and Stride (2012) 1            0.0010759411      0.0008757243
## Norman, Conner, and Stride (2012) 2            0.0010337311      0.0008413680
##                                            C(BI_ATT ATT_SN) C(BEH_ATT ATT_SN)
## Ajzen and Sheikh (2013)                        0.0044061739      1.260582e-03
## Armitage, Norman, and Conner (2002)            0.0017411646      4.981546e-04
## Conner, Warren, Close, and Sparks (1999a) 2    0.0012267192      3.509545e-04
## Conner, Warren, Close, and Sparks (1999a) 3    0.0013578714      3.884676e-04
## Conner, Warren, Close, and Sparks (1999b) 1    0.0011071906      3.167600e-04
## Conner, Warren, Close, and Sparks (1999b) 2    0.0011484356      3.285594e-04
## Conner, Warren, Close, and Sparks (1999c)      0.0012129267      3.469990e-04
## Cooke and French (2011a)                       0.0017991867      5.147345e-04
## Cooke and French (2011b)                       0.0015312294      4.380796e-04
## Cooke, Sniehotta and Schuez (2007)             0.0016867351      4.825626e-04
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## Elliot and Ainsworth (2012) 1              0.0005788275      1.655991e-04
## Elliot and Ainsworth (2012) 2              0.0016233366      4.644318e-04
## Elliot and Ainsworth (2012) 3              0.0016867298      4.825542e-04
## Elliot and Ainsworth (2012) 4              0.0019276948      5.514946e-04
## Gagnon, et al. (2012)                      0.0004442454      1.270973e-04
## Gardner, de Bruijn, and Lally (2012)       0.0012267167      3.509522e-04
## Glassman, et al. (2010a)                   0.0007470714      2.137328e-04
## Glassman, et al. (2010b)                   0.0006854034      1.960870e-04
## Glassman, et al. (2010c)                   0.0015759335      4.508662e-04
## Glassman, et al. (2010d)                   0.0022968370      6.571137e-04
## Hagger, et al. (2012)                      0.0005424713      1.551986e-04
## Jamison and Myers (2008)                   0.0012552604      3.591352e-04
## Johnston and White (2003)                  0.0017696815      5.062798e-04
## Kim and Hong (2013)                        0.0001962744      5.615181e-05
## Norman (2011) 1                            0.0004797834      1.372619e-04
## Norman (2011) 2                            0.0004840887      1.384977e-04
## Norman (2011) 3                            0.0004693577      1.342846e-04
## Norman (2011) 4                            0.0004840865      1.385013e-04
## Norman, Armitage, and Quigley (2007) 1     0.0012700266      3.633553e-04
## Norman, Armitage, and Quigley (2007) 2     0.0014787930      4.230829e-04
## Norman and Conner (2006)                   0.0034823148      9.962816e-04
## Norman, Conner, and Stride (2012) 1        0.0014687251      4.201934e-04
## Norman, Conner, and Stride (2012) 2        0.0014111154      4.036995e-04
##                                          C(BI_PBC ATT_SN) C(BEH_PBC ATT_SN)
## Ajzen and Sheikh (2013)                      1.610168e-03      9.190542e-04
## Armitage, Norman, and Conner (2002)          6.362897e-04      3.631965e-04
## Conner, Warren, Close, and Sparks (1999a) 2  4.482874e-04      2.558702e-04
## Conner, Warren, Close, and Sparks (1999a) 3  4.962121e-04      2.832225e-04
## Conner, Warren, Close, and Sparks (1999b) 1  4.046040e-04      2.309432e-04
## Conner, Warren, Close, and Sparks (1999b) 2  4.196772e-04      2.395439e-04
## Conner, Warren, Close, and Sparks (1999c)    4.432395e-04      2.529849e-04
## Cooke and French (2011a)                     6.574860e-04      3.752815e-04
## Cooke and French (2011b)                     5.595686e-04      3.193949e-04
## Cooke, Sniehotta and Schuez (2007)           6.163810e-04      3.518164e-04
## Elliot and Ainsworth (2012) 1                2.115218e-04      1.207343e-04
## Elliot and Ainsworth (2012) 2                5.932293e-04      3.386108e-04
## Elliot and Ainsworth (2012) 3                6.163772e-04      3.518118e-04
## Elliot and Ainsworth (2012) 4                7.044432e-04      4.020816e-04
## Gagnon, et al. (2012)                        1.623439e-04      9.266387e-05
## Gardner, de Bruijn, and Lally (2012)         4.482778e-04      2.558710e-04
## Glassman, et al. (2010a)                     2.730099e-04      1.558304e-04
## Glassman, et al. (2010b)                     2.504663e-04      1.429599e-04
## Glassman, et al. (2010c)                     5.758964e-04      3.287163e-04
## Glassman, et al. (2010d)                     8.393413e-04      4.790865e-04
## Hagger, et al. (2012)                        1.982401e-04      1.131526e-04
## Jamison and Myers (2008)                     4.587259e-04      2.618433e-04
## Johnston and White (2003)                    6.466924e-04      3.691123e-04
## Kim and Hong (2013)                          7.172542e-05      4.093946e-05
## Norman (2011) 1                              1.753289e-04      1.000741e-04
## Norman (2011) 2                              1.769047e-04      1.009771e-04
## Norman (2011) 3                              1.715218e-04      9.790521e-05
## Norman (2011) 4                              1.768935e-04      1.009668e-04
## Norman, Armitage, and Quigley (2007) 1       4.641187e-04      2.649202e-04
## Norman, Armitage, and Quigley (2007) 2       5.404039e-04      3.084585e-04
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## Norman and Conner (2006)                          1.272572e-03      7.263673e-04
## Norman, Conner, and Stride (2012) 1               5.367223e-04      3.063513e-04
## Norman, Conner, and Stride (2012) 2               5.156589e-04      2.943218e-04
##                                              C(BEH_BI ATT_SN) C(PBC_SN PBC_SN)
## Ajzen and Sheikh (2013)                           7.995052e-04     0.0184732696
## Armitage, Norman, and Conner (2002)               3.159440e-04     0.0072999302
## Conner, Warren, Close, and Sparks (1999a) 2       2.225800e-04     0.0051431268
## Conner, Warren, Close, and Sparks (1999a) 3       2.463732e-04     0.0056930198
## Conner, Warren, Close, and Sparks (1999b) 1       2.008988e-04     0.0046420016
## Conner, Warren, Close, and Sparks (1999b) 2       2.083799e-04     0.0048148842
## Conner, Warren, Close, and Sparks (1999c)         2.200729e-04     0.0050853360
## Cooke and French (2011a)                          3.264537e-04     0.0075432547
## Cooke and French (2011b)                          2.778404e-04     0.0064197966
## Cooke, Sniehotta and Schuez (2007)                3.060534e-04     0.0070717943
## Elliot and Ainsworth (2012) 1                     1.050255e-04     0.0024267827
## Elliot and Ainsworth (2012) 2                     2.945549e-04     0.0068059485
## Elliot and Ainsworth (2012) 3                     3.060421e-04     0.0070717924
## Elliot and Ainsworth (2012) 4                     3.497693e-04     0.0080820539
## Gagnon, et al. (2012)                             8.060833e-05     0.0018625325
## Gardner, de Bruijn, and Lally (2012)              2.225821e-04     0.0051431188
## Glassman, et al. (2010a)                          1.355554e-04     0.0031321504
## Glassman, et al. (2010b)                          1.243622e-04     0.0028736178
## Glassman, et al. (2010c)                          2.859511e-04     0.0066072255
## Glassman, et al. (2010d)                          4.167582e-04     0.0096296839
## Hagger, et al. (2012)                             9.843107e-05     0.0022743508
## Jamison and Myers (2008)                          2.277766e-04     0.0052627461
## Johnston and White (2003)                         3.210926e-04     0.0074195854
## Kim and Hong (2013)                               3.561302e-05     0.0008228979
## Norman (2011) 1                                   8.705434e-05     0.0020115349
## Norman (2011) 2                                   8.783971e-05     0.0020295779
## Norman (2011) 3                                   8.516779e-05     0.0019678066
## Norman (2011) 4                                   8.783680e-05     0.0020295895
## Norman, Armitage, and Quigley (2007) 1            2.304553e-04     0.0053246568
## Norman, Armitage, and Quigley (2007) 2            2.683311e-04     0.0061999387
## Norman and Conner (2006)                          6.318740e-04     0.0145998641
## Norman, Conner, and Stride (2012) 1               2.664974e-04     0.0061577571
## Norman, Conner, and Stride (2012) 2               2.560329e-04     0.0059162575
##                                              C(BI_SN PBC_SN) C(BEH_SN PBC_SN)
## Ajzen and Sheikh (2013)                          0.0046689206     6.390200e-05
## Armitage, Norman, and Conner (2002)              0.0018449934     2.527506e-05
## Conner, Warren, Close, and Sparks (1999a) 2      0.0012998692     1.778256e-05
## Conner, Warren, Close, and Sparks (1999a) 3      0.0014388492     1.968542e-05
## Conner, Warren, Close, and Sparks (1999b) 1      0.0011732186     1.605726e-05
## Conner, Warren, Close, and Sparks (1999b) 2      0.0012169220     1.666711e-05
## Conner, Warren, Close, and Sparks (1999c)        0.0012852579     1.757414e-05
## Cooke and French (2011a)                         0.0019064765     2.608745e-05
## Cooke and French (2011b)                         0.0016225438     2.221786e-05
## Cooke, Sniehotta and Schuez (2007)               0.0017873169     2.445553e-05
## Elliot and Ainsworth (2012) 1                    0.0006133377     8.384954e-06
## Elliot and Ainsworth (2012) 2                    0.0017201377     2.355350e-05
## Elliot and Ainsworth (2012) 3                    0.0017873136     2.445036e-05
## Elliot and Ainsworth (2012) 4                    0.0020426481     2.794656e-05
## Gagnon, et al. (2012)                            0.0004707362     6.443709e-06
## Gardner, de Bruijn, and Lally (2012)             0.0012998638     1.778512e-05
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## Glassman, et al. (2010a)                       0.0007916215     1.083852e-05
## Glassman, et al. (2010b)                       0.0007262743     9.935901e-06
## Glassman, et al. (2010c)                       0.0016699057     2.285101e-05
## Glassman, et al. (2010d)                       0.0024337980     3.330785e-05
## Hagger, et al. (2012)                          0.0005748214     7.871222e-06
## Jamison and Myers (2008)                       0.0013301153     1.822178e-05
## Johnston and White (2003)                      0.0018752132     2.564476e-05
## Kim and Hong (2013)                            0.0002079789     2.844242e-06
## Norman (2011) 1                                0.0005083938     6.955614e-06
## Norman (2011) 2                                0.0005129570     7.025147e-06
## Norman (2011) 3                                0.0004973446     6.808836e-06
## Norman (2011) 4                                0.0005129589     7.017404e-06
## Norman, Armitage, and Quigley (2007) 1         0.0013457598     1.843070e-05
## Norman, Armitage, and Quigley (2007) 2         0.0015669740     2.145310e-05
## Norman and Conner (2006)                       0.0036899817     5.054556e-05
## Norman, Conner, and Stride (2012) 1            0.0015563103     2.130120e-05
## Norman, Conner, and Stride (2012) 2            0.0014952588     2.044481e-05
##                                             C(PBC_ATT PBC_SN) C(BI_ATT PBC_SN)
## Ajzen and Sheikh (2013)                          0.0068545542     1.938240e-03
## Armitage, Norman, and Conner (2002)              0.0027086676     7.659356e-04
## Conner, Warren, Close, and Sparks (1999a) 2      0.0019083709     5.396236e-04
## Conner, Warren, Close, and Sparks (1999a) 3      0.0021124103     5.973132e-04
## Conner, Warren, Close, and Sparks (1999b) 1      0.0017224275     4.870446e-04
## Conner, Warren, Close, and Sparks (1999b) 2      0.0017865734     5.051902e-04
## Conner, Warren, Close, and Sparks (1999c)        0.0018869248     5.335516e-04
## Cooke and French (2011a)                         0.0027989478     7.914498e-04
## Cooke and French (2011b)                         0.0023820914     6.735843e-04
## Cooke, Sniehotta and Schuez (2007)               0.0026240047     7.419775e-04
## Elliot and Ainsworth (2012) 1                    0.0009004647     2.546184e-04
## Elliot and Ainsworth (2012) 2                    0.0025253751     7.140996e-04
## Elliot and Ainsworth (2012) 3                    0.0026240037     7.419726e-04
## Elliot and Ainsworth (2012) 4                    0.0029988651     8.479726e-04
## Gagnon, et al. (2012)                            0.0006910988     1.954211e-04
## Gardner, de Bruijn, and Lally (2012)             0.0019083653     5.396195e-04
## Glassman, et al. (2010a)                         0.0011621973     3.286340e-04
## Glassman, et al. (2010b)                         0.0010662611     3.015012e-04
## Glassman, et al. (2010c)                         0.0024516261     6.932375e-04
## Glassman, et al. (2010d)                         0.0035731212     1.010361e-03
## Hagger, et al. (2012)                            0.0008439075     2.386323e-04
## Jamison and Myers (2008)                         0.0019527662     5.521876e-04
## Johnston and White (2003)                        0.0027530496     7.784605e-04
## Kim and Hong (2013)                              0.0003053375     8.633892e-05
## Norman (2011) 1                                  0.0007463866     2.110538e-04
## Norman (2011) 2                                  0.0007530836     2.129495e-04
## Norman (2011) 3                                  0.0007301608     2.064678e-04
## Norman (2011) 4                                  0.0007530773     2.129468e-04
## Norman, Armitage, and Quigley (2007) 1           0.0019757362     5.586819e-04
## Norman, Armitage, and Quigley (2007) 2           0.0023005095     6.505144e-04
## Norman and Conner (2006)                         0.0054173397     1.531863e-03
## Norman, Conner, and Stride (2012) 1              0.0022848525     6.460813e-04
## Norman, Conner, and Stride (2012) 2              0.0021952311     6.207280e-04
##                                             C(BEH_ATT PBC_SN) C(BI_PBC PBC_SN)
## Ajzen and Sheikh (2013)                          1.958601e-04     0.0071886775
## Armitage, Norman, and Conner (2002)              7.742205e-05     0.0028406988
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## Conner, Warren, Close, and Sparks (1999a) 2      5.452482e-05     0.0020013950
## Conner, Warren, Close, and Sparks (1999a) 3      6.034669e-05     0.0022153760
## Conner, Warren, Close, and Sparks (1999b) 1      4.921569e-05     0.0018063861
## Conner, Warren, Close, and Sparks (1999b) 2      5.105420e-05     0.0018736668
## Conner, Warren, Close, and Sparks (1999c)        5.390123e-05     0.0019789010
## Cooke and French (2011a)                         7.997565e-05     0.0029353798
## Cooke and French (2011b)                         6.807706e-05     0.0024982037
## Cooke, Sniehotta and Schuez (2007)               7.497179e-05     0.0027519083
## Elliot and Ainsworth (2012) 1                    2.572521e-05     0.0009443586
## Elliot and Ainsworth (2012) 2                    7.216964e-05     0.0026484707
## Elliot and Ainsworth (2012) 3                    7.496525e-05     0.0027519084
## Elliot and Ainsworth (2012) 4                    8.567738e-05     0.0031450447
## Gagnon, et al. (2012)                            1.974876e-05     0.0007247861
## Gardner, de Bruijn, and Lally (2012)             5.452175e-05     0.0020013859
## Glassman, et al. (2010a)                         3.321142e-05     0.0012188472
## Glassman, et al. (2010b)                         3.046209e-05     0.0011182352
## Glassman, et al. (2010c)                         7.004779e-05     0.0025711290
## Glassman, et al. (2010d)                         1.020980e-04     0.0037472908
## Hagger, et al. (2012)                            2.411722e-05     0.0008850430
## Jamison and Myers (2008)                         5.581334e-05     0.0020479510
## Johnston and White (2003)                        7.864418e-05     0.0028872459
## Kim and Hong (2013)                              8.723005e-06     0.0003202214
## Norman (2011) 1                                  2.132598e-05     0.0007827679
## Norman (2011) 2                                  2.152352e-05     0.0007897919
## Norman (2011) 3                                  2.086618e-05     0.0007657525
## Norman (2011) 4                                  2.151856e-05     0.0007897938
## Norman, Armitage, and Quigley (2007) 1           5.646505e-05     0.0020720409
## Norman, Armitage, and Quigley (2007) 2           6.574614e-05     0.0024126435
## Norman and Conner (2006)                         1.548322e-04     0.0056814035
## Norman, Conner, and Stride (2012) 1              6.528753e-05     0.0023962276
## Norman, Conner, and Stride (2012) 2              6.270328e-05     0.0023022385
##                                             C(BEH_PBC PBC_SN) C(BEH_BI PBC_SN)
## Ajzen and Sheikh (2013)                          0.0023233246    -1.323077e-04
## Armitage, Norman, and Conner (2002)              0.0009181094    -5.226890e-05
## Conner, Warren, Close, and Sparks (1999a) 2      0.0006468300    -3.684690e-05
## Conner, Warren, Close, and Sparks (1999a) 3      0.0007159852    -4.078906e-05
## Conner, Warren, Close, and Sparks (1999b) 1      0.0005838139    -3.324875e-05
## Conner, Warren, Close, and Sparks (1999b) 2      0.0006055446    -3.448705e-05
## Conner, Warren, Close, and Sparks (1999c)        0.0006395551    -3.643694e-05
## Cooke and French (2011a)                         0.0009486919    -5.403542e-05
## Cooke and French (2011b)                         0.0008074109    -4.597475e-05
## Cooke, Sniehotta and Schuez (2007)               0.0008893895    -5.065856e-05
## Elliot and Ainsworth (2012) 1                    0.0003052097    -1.738832e-05
## Elliot and Ainsworth (2012) 2                    0.0008559748    -4.874222e-05
## Elliot and Ainsworth (2012) 3                    0.0008893875    -5.066916e-05
## Elliot and Ainsworth (2012) 4                    0.0010164508    -5.789852e-05
## Gagnon, et al. (2012)                            0.0002342466    -1.333987e-05
## Gardner, de Bruijn, and Lally (2012)             0.0006468304    -3.684545e-05
## Glassman, et al. (2010a)                         0.0003939257    -2.243167e-05
## Glassman, et al. (2010b)                         0.0003614010    -2.058738e-05
## Glassman, et al. (2010c)                         0.0008309683    -4.733066e-05
## Glassman, et al. (2010d)                         0.0012110999    -6.897660e-05
## Hagger, et al. (2012)                            0.0002860428    -1.628783e-05
## Jamison and Myers (2008)                         0.0006618945    -3.768121e-05
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## Johnston and White (2003)                       0.0009331252    -5.315992e-05
## Kim and Hong (2013)                             0.0001034929    -5.895598e-06
## Norman (2011) 1                                 0.0002529844    -1.440917e-05
## Norman (2011) 2                                 0.0002552595    -1.453291e-05
## Norman (2011) 3                                 0.0002474875    -1.409297e-05
## Norman (2011) 4                                 0.0002552603    -1.453717e-05
## Norman, Armitage, and Quigley (2007) 1          0.0006696800    -3.812558e-05
## Norman, Armitage, and Quigley (2007) 2          0.0007797552    -4.439897e-05
## Norman and Conner (2006)                        0.0018362121    -1.045388e-04
## Norman, Conner, and Stride (2012) 1             0.0007744444    -4.410498e-05
## Norman, Conner, and Stride (2012) 2             0.0007440562    -4.239526e-05
##                                              C(BI_SN BI_SN) C(BEH_SN BI_SN)
## Ajzen and Sheikh (2013)                        0.0128821901    0.0052231926
## Armitage, Norman, and Conner (2002)            0.0050905566    0.0020640213
## Conner, Warren, Close, and Sparks (1999a) 2    0.0035865170    0.0014541753
## Conner, Warren, Close, and Sparks (1999a) 3    0.0039699827    0.0016096563
## Conner, Warren, Close, and Sparks (1999b) 1    0.0032370633    0.0013124935
## Conner, Warren, Close, and Sparks (1999b) 2    0.0033576196    0.0013613802
## Conner, Warren, Close, and Sparks (1999c)      0.0035462125    0.0014378291
## Cooke and French (2011a)                       0.0052602252    0.0021327958
## Cooke and French (2011b)                       0.0044767960    0.0018151569
## Cooke, Sniehotta and Schuez (2007)             0.0049314605    0.0019994993
## Elliot and Ainsworth (2012) 1                  0.0016922955    0.0006861548
## Elliot and Ainsworth (2012) 2                  0.0047460778    0.0019243420
## Elliot and Ainsworth (2012) 3                  0.0049314572    0.0019994956
## Elliot and Ainsworth (2012) 4                  0.0056359530    0.0022851364
## Gagnon, et al. (2012)                          0.0012988226    0.0005266191
## Gardner, de Bruijn, and Lally (2012)           0.0035865148    0.0014541782
## Glassman, et al. (2010a)                       0.0021841807    0.0008855950
## Glassman, et al. (2010b)                       0.0020038958    0.0008124942
## Glassman, et al. (2010c)                       0.0046075010    0.0018681492
## Glassman, et al. (2010d)                       0.0067151849    0.0027227263
## Hagger, et al. (2012)                          0.0015860007    0.0006430575
## Jamison and Myers (2008)                       0.0036699391    0.0014880176
## Johnston and White (2003)                      0.0051739868    0.0020978262
## Kim and Hong (2013)                            0.0005738425    0.0002326678
## Norman (2011) 1                                0.0014027264    0.0005687443
## Norman (2011) 2                                0.0014153103    0.0005738514
## Norman (2011) 3                                0.0013722371    0.0005563873
## Norman (2011) 4                                0.0014153012    0.0005738334
## Norman, Armitage, and Quigley (2007) 1         0.0037131132    0.0015055210
## Norman, Armitage, and Quigley (2007) 2         0.0043234806    0.0017529938
## Norman and Conner (2006)                       0.0101811035    0.0041280271
## Norman, Conner, and Stride (2012) 1            0.0042940657    0.0017410643
## Norman, Conner, and Stride (2012) 2            0.0041256630    0.0016727669
##                                              C(PBC_ATT BI_SN) C(BI_ATT BI_SN)
## Ajzen and Sheikh (2013)                          0.0018944041    0.0034495404
## Armitage, Norman, and Conner (2002)              0.0007486133    0.0013631410
## Conner, Warren, Close, and Sparks (1999a) 2      0.0005274185    0.0009603824
## Conner, Warren, Close, and Sparks (1999a) 3      0.0005838140    0.0010630634
## Conner, Warren, Close, and Sparks (1999b) 1      0.0004760302    0.0008668061
## Conner, Warren, Close, and Sparks (1999b) 2      0.0004937610    0.0008990896
## Conner, Warren, Close, and Sparks (1999c)        0.0005214869    0.0009495819
## Cooke and French (2011a)                         0.0007735520    0.0014085604
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## Cooke and French (2011b)                          0.0006583484    0.0011987831
## Cooke, Sniehotta and Schuez (2007)                0.0007251993    0.0013205251
## Elliot and Ainsworth (2012) 1                     0.0002488619    0.0004531562
## Elliot and Ainsworth (2012) 2                     0.0006979522    0.0012708933
## Elliot and Ainsworth (2012) 3                     0.0007251967    0.0013205202
## Elliot and Ainsworth (2012) 4                     0.0008287983    0.0015091673
## Gagnon, et al. (2012)                             0.0001910020    0.0003477949
## Gardner, de Bruijn, and Lally (2012)              0.0005274147    0.0009603793
## Glassman, et al. (2010a)                          0.0003212039    0.0005848743
## Glassman, et al. (2010b)                          0.0002946829    0.0005365939
## Glassman, et al. (2010c)                          0.0006775609    0.0012337790
## Glassman, et al. (2010d)                          0.0009875097    0.0017981662
## Hagger, et al. (2012)                             0.0002332347    0.0004246948
## Jamison and Myers (2008)                          0.0005397046    0.0009827314
## Johnston and White (2003)                         0.0007608568    0.0013854608
## Kim and Hong (2013)                               0.0000843871    0.0001536601
## Norman (2011) 1                                   0.0002062797    0.0003756159
## Norman (2011) 2                                   0.0002081337    0.0003789880
## Norman (2011) 3                                   0.0002017980    0.0003674550
## Norman (2011) 4                                   0.0002081195    0.0003789797
## Norman, Armitage, and Quigley (2007) 1            0.0005460480    0.0009942916
## Norman, Armitage, and Quigley (2007) 2            0.0006358026    0.0011577303
## Norman and Conner (2006)                          0.0014972216    0.0027262689
## Norman, Conner, and Stride (2012) 1               0.0006314702    0.0011498483
## Norman, Conner, and Stride (2012) 2               0.0006066894    0.0011047448
##                                               C(BEH_ATT BI_SN) C(BI_PBC BI_SN)
## Ajzen and Sheikh (2013)                           1.503402e-03    2.020781e-03
## Armitage, Norman, and Conner (2002)               5.941086e-04    7.985498e-04
## Conner, Warren, Close, and Sparks (1999a) 2       4.185551e-04    5.626050e-04
## Conner, Warren, Close, and Sparks (1999a) 3       4.633027e-04    6.227577e-04
## Conner, Warren, Close, and Sparks (1999b) 1       3.777763e-04    5.077852e-04
## Conner, Warren, Close, and Sparks (1999b) 2       3.918493e-04    5.266939e-04
## Conner, Warren, Close, and Sparks (1999c)         4.138414e-04    5.562733e-04
## Cooke and French (2011a)                          6.138846e-04    8.251536e-04
## Cooke and French (2011b)                          5.224651e-04    7.022651e-04
## Cooke, Sniehotta and Schuez (2007)                5.755182e-04    7.735714e-04
## Elliot and Ainsworth (2012) 1                     1.974970e-04    2.654646e-04
## Elliot and Ainsworth (2012) 2                     5.538924e-04    7.445094e-04
## Elliot and Ainsworth (2012) 3                     5.755125e-04    7.735707e-04
## Elliot and Ainsworth (2012) 4                     6.577282e-04    8.840876e-04
## Gagnon, et al. (2012)                             1.515794e-04    2.037436e-04
## Gardner, de Bruijn, and Lally (2012)              4.185529e-04    5.625942e-04
## Glassman, et al. (2010a)                          2.549034e-04    3.426300e-04
## Glassman, et al. (2010b)                          2.338594e-04    3.143405e-04
## Glassman, et al. (2010c)                          5.377122e-04    7.227581e-04
## Glassman, et al. (2010d)                          7.836879e-04    1.053385e-03
## Hagger, et al. (2012)                             1.850934e-04    2.487932e-04
## Jamison and Myers (2008)                          4.283093e-04    5.757036e-04
## Johnston and White (2003)                         6.038091e-04    8.116128e-04
## Kim and Hong (2013)                               6.696798e-05    9.001704e-05
## Norman (2011) 1                                   1.637010e-04    2.200394e-04
## Norman (2011) 2                                   1.651756e-04    2.220175e-04
## Norman (2011) 3                                   1.601494e-04    2.152603e-04
## Norman (2011) 4                                   1.651705e-04    2.219929e-04
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## Norman, Armitage, and Quigley (2007) 1         4.333449e-04    5.824725e-04
## Norman, Armitage, and Quigley (2007) 2         5.045753e-04    6.782123e-04
## Norman and Conner (2006)                       1.188191e-03    1.597096e-03
## Norman, Conner, and Stride (2012) 1            5.011342e-04    6.735957e-04
## Norman, Conner, and Stride (2012) 2            4.814628e-04    6.471650e-04
##                                             C(BEH_PBC BI_SN) C(BEH_BI BI_SN)
## Ajzen and Sheikh (2013)                        1.047218e-03    5.971826e-04
## Armitage, Norman, and Conner (2002)            4.138437e-04    2.359945e-04
## Conner, Warren, Close, and Sparks (1999a) 2    2.915494e-04    1.662485e-04
## Conner, Warren, Close, and Sparks (1999a) 3    3.227237e-04    1.840252e-04
## Conner, Warren, Close, and Sparks (1999b) 1    2.631499e-04    1.500584e-04
## Conner, Warren, Close, and Sparks (1999b) 2    2.729473e-04    1.556435e-04
## Conner, Warren, Close, and Sparks (1999c)      2.882655e-04    1.643764e-04
## Cooke and French (2011a)                       4.276145e-04    2.438370e-04
## Cooke and French (2011b)                       3.639348e-04    2.075303e-04
## Cooke, Sniehotta and Schuez (2007)             4.008810e-04    2.286022e-04
## Elliot and Ainsworth (2012) 1                  1.375709e-04    7.844672e-05
## Elliot and Ainsworth (2012) 2                  3.858289e-04    2.200148e-04
## Elliot and Ainsworth (2012) 3                  4.008798e-04    2.285935e-04
## Elliot and Ainsworth (2012) 4                  4.581540e-04    2.612529e-04
## Gagnon, et al. (2012)                          1.055863e-04    6.020962e-05
## Gardner, de Bruijn, and Lally (2012)           2.915502e-04    1.662513e-04
## Glassman, et al. (2010a)                       1.775611e-04    1.012520e-04
## Glassman, et al. (2010b)                       1.628975e-04    9.288990e-05
## Glassman, et al. (2010c)                       3.745543e-04    2.135851e-04
## Glassman, et al. (2010d)                       5.458951e-04    3.112896e-04
## Hagger, et al. (2012)                          1.289321e-04    7.352154e-05
## Jamison and Myers (2008)                       2.983549e-04    1.701372e-04
## Johnston and White (2003)                      4.205911e-04    2.398354e-04
## Kim and Hong (2013)                            4.664859e-05    2.660030e-05
## Norman (2011) 1                                1.140288e-04    6.502270e-05
## Norman (2011) 2                                1.150584e-04    6.561146e-05
## Norman (2011) 3                                1.115563e-04    6.361508e-05
## Norman (2011) 4                                1.150453e-04    6.561469e-05
## Norman, Armitage, and Quigley (2007) 1         3.018622e-04    1.721390e-04
## Norman, Armitage, and Quigley (2007) 2         3.514718e-04    2.004272e-04
## Norman and Conner (2006)                       8.276627e-04    4.719748e-04
## Norman, Conner, and Stride (2012) 1            3.490745e-04    1.990575e-04
## Norman, Conner, and Stride (2012) 2            3.353690e-04    1.912383e-04
##                                             C(BEH_SN BEH_SN) C(PBC_ATT BEH_SN)
## Ajzen and Sheikh (2013)                        0.0198100195      4.625441e-04
## Armitage, Norman, and Conner (2002)            0.0078281646      1.827986e-04
## Conner, Warren, Close, and Sparks (1999a) 2    0.0055152765      1.287664e-04
## Conner, Warren, Close, and Sparks (1999a) 3    0.0061049637      1.425422e-04
## Conner, Warren, Close, and Sparks (1999b) 1    0.0049778991      1.162249e-04
## Conner, Warren, Close, and Sparks (1999b) 2    0.0051632907      1.205596e-04
## Conner, Warren, Close, and Sparks (1999c)      0.0054533035      1.273133e-04
## Cooke and French (2011a)                       0.0080890811      1.888672e-04
## Cooke and French (2011b)                       0.0068843331      1.607467e-04
## Cooke, Sniehotta and Schuez (2007)             0.0075835202      1.770634e-04
## Elliot and Ainsworth (2012) 1                  0.0026023860      6.075868e-05
## Elliot and Ainsworth (2012) 2                  0.0072984307      1.704248e-04
## Elliot and Ainsworth (2012) 3                  0.0075835118      1.770565e-04
## Elliot and Ainsworth (2012) 4                  0.0086668712      2.023543e-04
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## Gagnon, et al. (2012)                          0.0019973069     4.663678e-05
## Gardner, de Bruijn, and Lally (2012)           0.0055152843     1.287730e-04
## Glassman, et al. (2010a)                       0.0033587911     7.842920e-05
## Glassman, et al. (2010b)                       0.0030815560     7.194691e-05
## Glassman, et al. (2010c)                       0.0070853326     1.654298e-04
## Glassman, et al. (2010d)                       0.0103264937     2.411152e-04
## Hagger, et al. (2012)                          0.0024389209     5.694901e-05
## Jamison and Myers (2008)                       0.0056435611     1.317908e-04
## Johnston and White (2003)                      0.0079564698     1.857509e-04
## Kim and Hong (2013)                            0.0008824418     2.060291e-05
## Norman (2011) 1                                0.0021570875     5.036313e-05
## Norman (2011) 2                                0.0021764390     5.082110e-05
## Norman (2011) 3                                0.0021102000     4.927210e-05
## Norman (2011) 4                                0.0021764365     5.080840e-05
## Norman, Armitage, and Quigley (2007) 1         0.0057099536     1.333333e-04
## Norman, Armitage, and Quigley (2007) 2         0.0066485694     1.552450e-04
## Norman and Conner (2006)                       0.0156563061     3.655979e-04
## Norman, Conner, and Stride (2012) 1            0.0066033359     1.541789e-04
## Norman, Conner, and Stride (2012) 2            0.0063443612     1.481119e-04
##                                             C(BI_ATT BEH_SN) C(BEH_ATT BEH_SN)
## Ajzen and Sheikh (2013)                        1.975762e-03     0.0075792726
## Armitage, Norman, and Conner (2002)            7.807610e-04     0.0029950516
## Conner, Warren, Close, and Sparks (1999a) 2    5.500618e-04     0.0021101262
## Conner, Warren, Close, and Sparks (1999a) 3    6.088727e-04     0.0023357372
## Conner, Warren, Close, and Sparks (1999b) 1    4.964692e-04     0.0019045300
## Conner, Warren, Close, and Sparks (1999b) 2    5.149627e-04     0.0019754678
## Conner, Warren, Close, and Sparks (1999c)      5.438703e-04     0.0020864086
## Cooke and French (2011a)                       8.067596e-04     0.0030948590
## Cooke and French (2011b)                       6.866143e-04     0.0026339315
## Cooke, Sniehotta and Schuez (2007)             7.563432e-04     0.0029014389
## Elliot and Ainsworth (2012) 1                  2.595489e-04     0.0009956661
## Elliot and Ainsworth (2012) 2                  7.279206e-04     0.0027923668
## Elliot and Ainsworth (2012) 3                  7.563356e-04     0.0029014280
## Elliot and Ainsworth (2012) 4                  8.643828e-04     0.0033159179
## Gagnon, et al. (2012)                          1.992037e-04     0.0007641666
## Gardner, de Bruijn, and Lally (2012)           5.500663e-04     0.0021101331
## Glassman, et al. (2010a)                       3.349924e-04     0.0012850653
## Glassman, et al. (2010b)                       3.073371e-04     0.0011789944
## Glassman, et al. (2010c)                       7.066579e-04     0.0027108306
## Glassman, et al. (2010d)                       1.029918e-03     0.0039508923
## Hagger, et al. (2012)                          2.432480e-04     0.0009331255
## Jamison and Myers (2008)                       5.628749e-04     0.0021592198
## Johnston and White (2003)                      7.935251e-04     0.0030441150
## Kim and Hong (2013)                            8.800967e-05     0.0003376182
## Norman (2011) 1                                2.151346e-04     0.0008252938
## Norman (2011) 2                                2.170696e-04     0.0008327025
## Norman (2011) 3                                2.104646e-04     0.0008073596
## Norman (2011) 4                                2.170599e-04     0.0008326997
## Norman, Armitage, and Quigley (2007) 1         5.694971e-04     0.0021846221
## Norman, Armitage, and Quigley (2007) 2         6.631025e-04     0.0025437302
## Norman and Conner (2006)                       1.561510e-03     0.0059900770
## Norman, Conner, and Stride (2012) 1            6.585842e-04     0.0025264189
## Norman, Conner, and Stride (2012) 2            6.327420e-04     0.0024273244
##                                             C(BI_PBC BEH_SN) C(BEH_PBC BEH_SN)
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## Ajzen and Sheikh (2013)                         4.771723e-04      0.0044112897
## Armitage, Norman, and Conner (2002)             1.885762e-04      0.0017431925
## Conner, Warren, Close, and Sparks (1999a) 2     1.328425e-04      0.0012281325
## Conner, Warren, Close, and Sparks (1999a) 3     1.470470e-04      0.0013594460
## Conner, Warren, Close, and Sparks (1999b) 1     1.198993e-04      0.0011084765
## Conner, Warren, Close, and Sparks (1999b) 2     1.243670e-04      0.0011497603
## Conner, Warren, Close, and Sparks (1999c)       1.313369e-04      0.0012143254
## Cooke and French (2011a)                        1.948371e-04      0.0018012693
## Cooke and French (2011b)                        1.658277e-04      0.0015330052
## Cooke, Sniehotta and Schuez (2007)              1.826552e-04      0.0016886897
## Elliot and Ainsworth (2012) 1                   6.267992e-05      0.0005794987
## Elliot and Ainsworth (2012) 2                   1.758095e-04      0.0016252212
## Elliot and Ainsworth (2012) 3                   1.826492e-04      0.0016886847
## Elliot and Ainsworth (2012) 4                   2.087522e-04      0.0019299328
## Gagnon, et al. (2012)                           4.811144e-05      0.0004447619
## Gardner, de Bruijn, and Lally (2012)            1.328375e-04      0.0012281399
## Glassman, et al. (2010a)                        8.090828e-05      0.0007479379
## Glassman, et al. (2010b)                        7.422096e-05      0.0006861976
## Glassman, et al. (2010c)                        1.706561e-04      0.0015777583
## Glassman, et al. (2010d)                        2.487358e-04      0.0022995071
## Hagger, et al. (2012)                           5.874890e-05      0.0005430996
## Jamison and Myers (2008)                        1.359531e-04      0.0012567200
## Johnston and White (2003)                       1.916259e-04      0.0017717261
## Kim and Hong (2013)                             2.125428e-05      0.0001965028
## Norman (2011) 1                                 5.195454e-05      0.0004803374
## Norman (2011) 2                                 5.242747e-05      0.0004846525
## Norman (2011) 3                                 5.083065e-05      0.0004699016
## Norman (2011) 4                                 5.241070e-05      0.0004846234
## Norman, Armitage, and Quigley (2007) 1          1.375471e-04      0.0012715005
## Norman, Armitage, and Quigley (2007) 2          1.601487e-04      0.0014805047
## Norman and Conner (2006)                        3.771525e-04      0.0034863603
## Norman, Conner, and Stride (2012) 1             1.590547e-04      0.0014704274
## Norman, Conner, and Stride (2012) 2             1.527961e-04      0.0014127469
##                                             C(BEH_BI BEH_SN) C(PBC_ATT PBC_ATT)
## Ajzen and Sheikh (2013)                         0.0076865179       0.0175371436
## Armitage, Norman, and Conner (2002)             0.0030374217       0.0069300092
## Conner, Warren, Close, and Sparks (1999a) 2     0.0021399804       0.0048825008
## Conner, Warren, Close, and Sparks (1999a) 3     0.0023687875       0.0054045258
## Conner, Warren, Close, and Sparks (1999b) 1     0.0019314777       0.0044067687
## Conner, Warren, Close, and Sparks (1999b) 2     0.0020034250       0.0045708736
## Conner, Warren, Close, and Sparks (1999c)       0.0021159328       0.0048276368
## Cooke and French (2011a)                        0.0031386457       0.0071610026
## Cooke and French (2011b)                        0.0026711973       0.0060944778
## Cooke, Sniehotta and Schuez (2007)              0.0029424908       0.0067134315
## Elliot and Ainsworth (2012) 1                   0.0010097535       0.0023038114
## Elliot and Ainsworth (2012) 2                   0.0028318723       0.0064610635
## Elliot and Ainsworth (2012) 3                   0.0029424804       0.0067134312
## Elliot and Ainsworth (2012) 4                   0.0033628356       0.0076724970
## Gagnon, et al. (2012)                           0.0007749778       0.0017681498
## Gardner, de Bruijn, and Lally (2012)            0.0021399911       0.0048824957
## Glassman, et al. (2010a)                        0.0013032479       0.0029734309
## Glassman, et al. (2010b)                        0.0011956766       0.0027279982
## Glassman, et al. (2010c)                        0.0027491869       0.0062724064
## Glassman, et al. (2010d)                        0.0040067926       0.0091417062
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## Hagger, et al. (2012)                           0.0009463276       0.0021590995
## Jamison and Myers (2008)                        0.0021897686       0.0049960579
## Johnston and White (2003)                       0.0030871892       0.0070435982
## Kim and Hong (2013)                             0.0003423963       0.0007811996
## Norman (2011) 1                                 0.0008369717       0.0019096008
## Norman (2011) 2                                 0.0008444837       0.0019267300
## Norman (2011) 3                                 0.0008187822       0.0018680887
## Norman (2011) 4                                 0.0008444905       0.0019267076
## Norman, Armitage, and Quigley (2007) 1          0.0022155299       0.0050548343
## Norman, Armitage, and Quigley (2007) 2          0.0025797198       0.0058857584
## Norman and Conner (2006)                        0.0060748266       0.0138600208
## Norman, Conner, and Stride (2012) 1             0.0025621659       0.0058457149
## Norman, Conner, and Stride (2012) 2             0.0024616722       0.0056164509
##                                             C(BI_ATT PBC_ATT)
## Ajzen and Sheikh (2013)                          0.0038692624
## Armitage, Norman, and Conner (2002)              0.0015289988
## Conner, Warren, Close, and Sparks (1999a) 2      0.0010772369
## Conner, Warren, Close, and Sparks (1999a) 3      0.0011924100
## Conner, Warren, Close, and Sparks (1999b) 1      0.0009722738
## Conner, Warren, Close, and Sparks (1999b) 2      0.0010084889
## Conner, Warren, Close, and Sparks (1999c)        0.0010651261
## Cooke and French (2011a)                         0.0015799520
## Cooke and French (2011b)                         0.0013446455
## Cooke, Sniehotta and Schuez (2007)               0.0014811976
## Elliot and Ainsworth (2012) 1                    0.0005082930
## Elliot and Ainsworth (2012) 2                    0.0014255289
## Elliot and Ainsworth (2012) 3                    0.0014811938
## Elliot and Ainsworth (2012) 4                    0.0016927964
## Gagnon, et al. (2012)                            0.0003901129
## Gardner, de Bruijn, and Lally (2012)             0.0010772356
## Glassman, et al. (2010a)                         0.0006560396
## Glassman, et al. (2010b)                         0.0006018833
## Glassman, et al. (2010c)                         0.0013838961
## Glassman, et al. (2010d)                         0.0020169591
## Hagger, et al. (2012)                            0.0004763703
## Jamison and Myers (2008)                         0.0011023054
## Johnston and White (2003)                        0.0015540342
## Kim and Hong (2013)                              0.0001723575
## Norman (2011) 1                                  0.0004213200
## Norman (2011) 2                                  0.0004251016
## Norman (2011) 3                                  0.0004121631
## Norman (2011) 4                                  0.0004250927
## Norman, Armitage, and Quigley (2007) 1           0.0011152708
## Norman, Armitage, and Quigley (2007) 2           0.0012985967
## Norman and Conner (2006)                         0.0030579902
## Norman, Conner, and Stride (2012) 1              0.0012897540
## Norman, Conner, and Stride (2012) 2              0.0012391578
##                                             C(BEH_ATT PBC_ATT)
## Ajzen and Sheikh (2013)                           -2.239399e-04
## Armitage, Norman, and Conner (2002)               -8.847181e-05
## Conner, Warren, Close, and Sparks (1999a) 2       -6.235403e-05
## Conner, Warren, Close, and Sparks (1999a) 3       -6.902271e-05
## Conner, Warren, Close, and Sparks (1999b) 1       -5.627614e-05
## Conner, Warren, Close, and Sparks (1999b) 2       -5.836029e-05
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## Conner, Warren, Close, and Sparks (1999c)        -6.166131e-05
## Cooke and French (2011a)                         -9.144147e-05
## Cooke and French (2011b)                         -7.781779e-05
## Cooke, Sniehotta and Schuez (2007)               -8.573104e-05
## Elliot and Ainsworth (2012) 1                    -2.942413e-05
## Elliot and Ainsworth (2012) 2                    -8.249311e-05
## Elliot and Ainsworth (2012) 3                    -8.573913e-05
## Elliot and Ainsworth (2012) 4                    -9.798454e-05
## Gagnon, et al. (2012)                            -2.257669e-05
## Gardner, de Bruijn, and Lally (2012)             -6.235179e-05
## Glassman, et al. (2010a)                         -3.796536e-05
## Glassman, et al. (2010b)                         -3.484044e-05
## Glassman, et al. (2010c)                         -8.010196e-05
## Glassman, et al. (2010d)                         -1.167315e-04
## Hagger, et al. (2012)                            -2.756824e-05
## Jamison and Myers (2008)                         -6.377861e-05
## Johnston and White (2003)                        -8.996967e-05
## Kim and Hong (2013)                              -9.978487e-06
## Norman (2011) 1                                  -2.438607e-05
## Norman (2011) 2                                  -2.459931e-05
## Norman (2011) 3                                  -2.385262e-05
## Norman (2011) 4                                  -2.460600e-05
## Norman, Armitage, and Quigley (2007) 1           -6.453704e-05
## Norman, Armitage, and Quigley (2007) 2           -7.514546e-05
## Norman and Conner (2006)                         -1.769507e-04
## Norman, Conner, and Stride (2012) 1              -7.464873e-05
## Norman, Conner, and Stride (2012) 2              -7.174473e-05
##                                             C(BI_PBC PBC_ATT)
## Ajzen and Sheikh (2013)                          0.0081139985
## Armitage, Norman, and Conner (2002)              0.0032063474
## Conner, Warren, Close, and Sparks (1999a) 2      0.0022590118
## Conner, Warren, Close, and Sparks (1999a) 3      0.0025005385
## Conner, Warren, Close, and Sparks (1999b) 1      0.0020389009
## Conner, Warren, Close, and Sparks (1999b) 2      0.0021148370
## Conner, Warren, Close, and Sparks (1999c)        0.0022336242
## Cooke and French (2011a)                         0.0033132192
## Cooke and French (2011b)                         0.0028197678
## Cooke, Sniehotta and Schuez (2007)               0.0031061328
## Elliot and Ainsworth (2012) 1                    0.0010659165
## Elliot and Ainsworth (2012) 2                    0.0029893791
## Elliot and Ainsworth (2012) 3                    0.0031061326
## Elliot and Ainsworth (2012) 4                    0.0035498709
## Gagnon, et al. (2012)                            0.0008180799
## Gardner, de Bruijn, and Lally (2012)             0.0022590050
## Glassman, et al. (2010a)                         0.0013757358
## Glassman, et al. (2010b)                         0.0012621742
## Glassman, et al. (2010c)                         0.0029020827
## Glassman, et al. (2010d)                         0.0042296415
## Hagger, et al. (2012)                            0.0009989638
## Jamison and Myers (2008)                         0.0023115585
## Johnston and White (2003)                        0.0032588901
## Kim and Hong (2013)                              0.0003614412
## Norman (2011) 1                                  0.0008835245
## Norman (2011) 2                                  0.0008914523
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## Norman (2011) 3                                 0.0008643189
## Norman (2011) 4                                 0.0008914417
## Norman, Armitage, and Quigley (2007) 1          0.0023387507
## Norman, Armitage, and Quigley (2007) 2          0.0027231958
## Norman and Conner (2006)                        0.0064126995
## Norman, Conner, and Stride (2012) 1             0.0027046677
## Norman, Conner, and Stride (2012) 2             0.0025985800
##                                              C(BEH_PBC PBC_ATT)
## Ajzen and Sheikh (2013)                           0.0040479693
## Armitage, Norman, and Conner (2002)               0.0015996157
## Conner, Warren, Close, and Sparks (1999a) 2       0.0011269845
## Conner, Warren, Close, and Sparks (1999a) 3       0.0012474804
## Conner, Warren, Close, and Sparks (1999b) 1       0.0010171817
## Conner, Warren, Close, and Sparks (1999b) 2       0.0010550486
## Conner, Warren, Close, and Sparks (1999c)         0.0011143172
## Cooke and French (2011a)                          0.0016529204
## Cooke and French (2011b)                          0.0014067501
## Cooke, Sniehotta and Schuez (2007)                0.0015496048
## Elliot and Ainsworth (2012) 1                     0.0005317731
## Elliot and Ainsworth (2012) 2                     0.0014913703
## Elliot and Ainsworth (2012) 3                     0.0015496024
## Elliot and Ainsworth (2012) 4                     0.0017709810
## Gagnon, et al. (2012)                             0.0004081306
## Gardner, de Bruijn, and Lally (2012)              0.0011269891
## Glassman, et al. (2010a)                          0.0006863395
## Glassman, et al. (2010b)                          0.0006296792
## Glassman, et al. (2010c)                          0.0014478102
## Glassman, et al. (2010d)                          0.0021101196
## Hagger, et al. (2012)                             0.0004983712
## Jamison and Myers (2008)                          0.0011532178
## Johnston and White (2003)                         0.0016258057
## Kim and Hong (2013)                               0.0001803186
## Norman (2011) 1                                   0.0004407784
## Norman (2011) 2                                   0.0004447373
## Norman (2011) 3                                   0.0004311990
## Norman (2011) 4                                   0.0004447181
## Norman, Armitage, and Quigley (2007) 1            0.0011667799
## Norman, Armitage, and Quigley (2007) 2            0.0013585732
## Norman and Conner (2006)                          0.0031992271
## Norman, Conner, and Stride (2012) 1               0.0013493238
## Norman, Conner, and Stride (2012) 2               0.0012963872
##                                              C(BEH_BI PBC_ATT) C(BI_ATT BI_ATT)
## Ajzen and Sheikh (2013)                          1.520359e-04     0.0107216968
## Armitage, Norman, and Conner (2002)              6.008679e-05     0.0042368120
## Conner, Warren, Close, and Sparks (1999a) 2      4.231407e-05     0.0029850175
## Conner, Warren, Close, and Sparks (1999a) 3      4.684153e-05     0.0033041657
## Conner, Warren, Close, and Sparks (1999b) 1      3.819799e-05     0.0026941674
## Conner, Warren, Close, and Sparks (1999b) 2      3.962159e-05     0.0027945012
## Conner, Warren, Close, and Sparks (1999c)        4.183742e-05     0.0029514690
## Cooke and French (2011a)                         6.207125e-05     0.0043780256
## Cooke and French (2011b)                         5.283304e-05     0.0037259846
## Cooke, Sniehotta and Schuez (2007)               5.819215e-05     0.0041043975
## Elliot and Ainsworth (2012) 1                    1.996592e-05     0.0014084807
## Elliot and Ainsworth (2012) 2                    5.601636e-05     0.0039501065
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## Elliot and Ainsworth (2012) 3                   5.818154e-05     0.0041043927
## Elliot and Ainsworth (2012) 4                   6.650182e-05     0.0046907358
## Gagnon, et al. (2012)                           1.532869e-05     0.0010809955
## Gardner, de Bruijn, and Lally (2012)            4.232052e-05     0.0029850157
## Glassman, et al. (2010a)                        2.577871e-05     0.0018178687
## Glassman, et al. (2010b)                        2.364393e-05     0.0016678185
## Glassman, et al. (2010c)                        5.436747e-05     0.0038347687
## Glassman, et al. (2010d)                        7.924692e-05     0.0055889712
## Hagger, et al. (2012)                           1.871770e-05     0.0013200099
## Jamison and Myers (2008)                        4.332486e-05     0.0030544471
## Johnston and White (2003)                       6.103808e-05     0.0043062442
## Kim and Hong (2013)                             6.770391e-06     0.0004776015
## Norman (2011) 1                                 1.655218e-05     0.0011674731
## Norman (2011) 2                                 1.670534e-05     0.0011779461
## Norman (2011) 3                                 1.619498e-05     0.0011420970
## Norman (2011) 4                                 1.669814e-05     0.0011779365
## Norman, Armitage, and Quigley (2007) 1          4.383065e-05     0.0030903813
## Norman, Armitage, and Quigley (2007) 2          5.103064e-05     0.0035983851
## Norman and Conner (2006)                        1.201809e-04     0.0084736136
## Norman, Conner, and Stride (2012) 1             5.067325e-05     0.0035738986
## Norman, Conner, and Stride (2012) 2             4.866584e-05     0.0034337407
##                                              C(BEH_ATT BI_ATT) C(BI_PBC BI_ATT)
## Ajzen and Sheikh (2013)                         0.0042212779     0.0023375302
## Armitage, Norman, and Conner (2002)             0.0016681010     0.0009237145
## Conner, Warren, Close, and Sparks (1999a) 2     0.0011752375     0.0006507898
## Conner, Warren, Close, and Sparks (1999a) 3     0.0013008823     0.0007203654
## Conner, Warren, Close, and Sparks (1999b) 1     0.0010607273     0.0005873760
## Conner, Warren, Close, and Sparks (1999b) 2     0.0011002381     0.0006092590
## Conner, Warren, Close, and Sparks (1999c)       0.0011620205     0.0006434664
## Cooke and French (2011a)                        0.0017236832     0.0009544924
## Cooke and French (2011b)                        0.0014669710     0.0008123398
## Cooke, Sniehotta and Schuez (2007)              0.0016159553     0.0008948269
## Elliot and Ainsworth (2012) 1                   0.0005545373     0.0003070725
## Elliot and Ainsworth (2012) 2                   0.0015552130     0.0008612049
## Elliot and Ainsworth (2012) 3                   0.0016159475     0.0008948228
## Elliot and Ainsworth (2012) 4                   0.0018467959     0.0010226612
## Gagnon, et al. (2012)                           0.0004256034     0.0002356788
## Gardner, de Bruijn, and Lally (2012)            0.0011752378     0.0006507829
## Glassman, et al. (2010a)                        0.0007157195     0.0003963337
## Glassman, et al. (2010b)                        0.0006566400     0.0003636125
## Glassman, et al. (2010c)                        0.0015097978     0.0008360469
## Glassman, et al. (2010d)                        0.0022004539     0.0012185012
## Hagger, et al. (2012)                           0.0005197054     0.0002877897
## Jamison and Myers (2008)                        0.0012025838     0.0006659367
## Johnston and White (2003)                       0.0016954133     0.0009388282
## Kim and Hong (2013)                             0.0001880360     0.0001041253
## Norman (2011) 1                                 0.0004596476     0.0002545304
## Norman (2011) 2                                 0.0004637744     0.0002568165
## Norman (2011) 3                                 0.0004496611     0.0002490006
## Norman (2011) 4                                 0.0004637632     0.0002568139
## Norman, Armitage, and Quigley (2007) 1          0.0012167307     0.0006737704
## Norman, Armitage, and Quigley (2007) 2          0.0014167377     0.0007845187
## Norman and Conner (2006)                        0.0033361859     0.0018474247
## Norman, Conner, and Stride (2012) 1             0.0014070890     0.0007791763
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## Norman, Conner, and Stride (2012) 2            0.0013518913     0.0007486066
##                                             C(BEH_PBC BI_ATT) C(BEH_BI BI_ATT)
## Ajzen and Sheikh (2013)                          1.513468e-03     1.609785e-03
## Armitage, Norman, and Conner (2002)              5.980821e-04     6.361330e-04
## Conner, Warren, Close, and Sparks (1999a) 2      4.213584e-04     4.481688e-04
## Conner, Warren, Close, and Sparks (1999a) 3      4.664027e-04     4.960823e-04
## Conner, Warren, Close, and Sparks (1999b) 1      3.803057e-04     4.045053e-04
## Conner, Warren, Close, and Sparks (1999b) 2      3.944704e-04     4.195645e-04
## Conner, Warren, Close, and Sparks (1999c)        4.166131e-04     4.431261e-04
## Cooke and French (2011a)                         6.179985e-04     6.573173e-04
## Cooke and French (2011b)                         5.259622e-04     5.594260e-04
## Cooke, Sniehotta and Schuez (2007)               5.793676e-04     6.162403e-04
## Elliot and Ainsworth (2012) 1                    1.988198e-04     2.114708e-04
## Elliot and Ainsworth (2012) 2                    5.576041e-04     5.930795e-04
## Elliot and Ainsworth (2012) 3                    5.793624e-04     6.162305e-04
## Elliot and Ainsworth (2012) 4                    6.621321e-04     7.042648e-04
## Gagnon, et al. (2012)                            1.525946e-04     1.623035e-04
## Gardner, de Bruijn, and Lally (2012)             4.213617e-04     4.481730e-04
## Glassman, et al. (2010a)                         2.566128e-04     2.729390e-04
## Glassman, et al. (2010b)                         2.354244e-04     2.504062e-04
## Glassman, et al. (2010c)                         5.413135e-04     5.757573e-04
## Glassman, et al. (2010d)                         7.889411e-04     8.391383e-04
## Hagger, et al. (2012)                            1.863338e-04     1.981885e-04
## Jamison and Myers (2008)                         4.311764e-04     4.586084e-04
## Johnston and White (2003)                        6.078516e-04     6.465344e-04
## Kim and Hong (2013)                              6.741717e-05     7.170745e-05
## Norman (2011) 1                                  1.647985e-04     1.752841e-04
## Norman (2011) 2                                  1.662816e-04     1.768605e-04
## Norman (2011) 3                                  1.612213e-04     1.714789e-04
## Norman (2011) 4                                  1.662741e-04     1.768538e-04
## Norman, Armitage, and Quigley (2007) 1           4.362494e-04     4.640057e-04
## Norman, Armitage, and Quigley (2007) 2           5.079516e-04     5.402732e-04
## Norman and Conner (2006)                         1.196148e-03     1.272259e-03
## Norman, Conner, and Stride (2012) 1              5.044877e-04     5.365889e-04
## Norman, Conner, and Stride (2012) 2              4.846886e-04     5.155355e-04
##                                             C(BEH_ATT BEH_ATT)
## Ajzen and Sheikh (2013)                           0.0185452198
## Armitage, Norman, and Conner (2002)               0.0073283627
## Conner, Warren, Close, and Sparks (1999a) 2       0.0051631487
## Conner, Warren, Close, and Sparks (1999a) 3       0.0057151781
## Conner, Warren, Close, and Sparks (1999b) 1       0.0046600766
## Conner, Warren, Close, and Sparks (1999b) 2       0.0048336376
## Conner, Warren, Close, and Sparks (1999c)         0.0051051283
## Cooke and French (2011a)                          0.0075726223
## Cooke and French (2011b)                          0.0064447916
## Cooke, Sniehotta and Schuez (2007)                0.0070993410
## Elliot and Ainsworth (2012) 1                     0.0024362312
## Elliot and Ainsworth (2012) 2                     0.0068324496
## Elliot and Ainsworth (2012) 3                     0.0070993310
## Elliot and Ainsworth (2012) 4                     0.0081135204
## Gagnon, et al. (2012)                             0.0018697862
## Gardner, de Bruijn, and Lally (2012)              0.0051631538
## Glassman, et al. (2010a)                          0.0031443443
## Glassman, et al. (2010b)                          0.0028848102
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## Glassman, et al. (2010c)                            0.0066329585
## Glassman, et al. (2010d)                            0.0096671860
## Hagger, et al. (2012)                               0.0022832041
## Jamison and Myers (2008)                            0.0052832359
## Johnston and White (2003)                           0.0074484758
## Kim and Hong (2013)                                 0.0008261005
## Norman (2011) 1                                     0.0020193648
## Norman (2011) 2                                     0.0020374804
## Norman (2011) 3                                     0.0019754708
## Norman (2011) 4                                     0.0020374877
## Norman, Armitage, and Quigley (2007) 1              0.0053453942
## Norman, Armitage, and Quigley (2007) 2              0.0062240817
## Norman and Conner (2006)                            0.0146567100
## Norman, Conner, and Stride (2012) 1                 0.0061817329
## Norman, Conner, and Stride (2012) 2                 0.0059392975
##                                               C(BI_PBC BEH_ATT)
## Ajzen and Sheikh (2013)                             4.851054e-04
## Armitage, Norman, and Conner (2002)                 1.917100e-04
## Conner, Warren, Close, and Sparks (1999a) 2         1.350528e-04
## Conner, Warren, Close, and Sparks (1999a) 3         1.494845e-04
## Conner, Warren, Close, and Sparks (1999b) 1         1.218931e-04
## Conner, Warren, Close, and Sparks (1999b) 2         1.264377e-04
## Conner, Warren, Close, and Sparks (1999c)           1.335205e-04
## Cooke and French (2011a)                            1.980793e-04
## Cooke and French (2011b)                            1.685840e-04
## Cooke, Sniehotta and Schuez (2007)                  1.856922e-04
## Elliot and Ainsworth (2012) 1                       6.372215e-05
## Elliot and Ainsworth (2012) 2                       1.787290e-04
## Elliot and Ainsworth (2012) 3                       1.856839e-04
## Elliot and Ainsworth (2012) 4                       2.122187e-04
## Gagnon, et al. (2012)                               4.891082e-05
## Gardner, de Bruijn, and Lally (2012)                1.350450e-04
## Glassman, et al. (2010a)                            8.225194e-05
## Glassman, et al. (2010b)                            7.545407e-05
## Glassman, et al. (2010c)                            1.734923e-04
## Glassman, et al. (2010d)                            2.528718e-04
## Hagger, et al. (2012)                               5.972527e-05
## Jamison and Myers (2008)                            1.382098e-04
## Johnston and White (2003)                           1.948103e-04
## Kim and Hong (2013)                                 2.160667e-05
## Norman (2011) 1                                     5.281942e-05
## Norman (2011) 2                                     5.329914e-05
## Norman (2011) 3                                     5.167593e-05
## Norman (2011) 4                                     5.329205e-05
## Norman, Armitage, and Quigley (2007) 1              1.398320e-04
## Norman, Armitage, and Quigley (2007) 2              1.628147e-04
## Norman and Conner (2006)                            3.834165e-04
## Norman, Conner, and Stride (2012) 1                 1.616974e-04
## Norman, Conner, and Stride (2012) 2                 1.553335e-04
##                                              C(BEH_PBC BEH_ATT)
## Ajzen and Sheikh (2013)                             0.0052224578
## Armitage, Norman, and Conner (2002)                 0.0020637321
## Conner, Warren, Close, and Sparks (1999a) 2         0.0014539715
## Conner, Warren, Close, and Sparks (1999a) 3         0.0016094214
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## Conner, Warren, Close, and Sparks (1999b) 1       0.0013123076
## Conner, Warren, Close, and Sparks (1999b) 2       0.0013611973
## Conner, Warren, Close, and Sparks (1999c)         0.0014376246
## Cooke and French (2011a)                          0.0021324996
## Cooke and French (2011b)                          0.0018148982
## Cooke, Sniehotta and Schuez (2007)                0.0019992152
## Elliot and Ainsworth (2012) 1                     0.0006860554
## Elliot and Ainsworth (2012) 2                     0.0019240692
## Elliot and Ainsworth (2012) 3                     0.0019992088
## Elliot and Ainsworth (2012) 4                     0.0022848132
## Gagnon, et al. (2012)                             0.0005265459
## Gardner, de Bruijn, and Lally (2012)              0.0014539747
## Glassman, et al. (2010a)                          0.0008854705
## Glassman, et al. (2010b)                          0.0008123783
## Glassman, et al. (2010c)                          0.0018678836
## Glassman, et al. (2010d)                          0.0027223501
## Hagger, et al. (2012)                             0.0006429664
## Jamison and Myers (2008)                          0.0014878031
## Johnston and White (2003)                         0.0020975227
## Kim and Hong (2013)                               0.0002326348
## Norman (2011) 1                                   0.0005686654
## Norman (2011) 2                                   0.0005737714
## Norman (2011) 3                                   0.0005563081
## Norman (2011) 4                                   0.0005737769
## Norman, Armitage, and Quigley (2007) 1            0.0015053064
## Norman, Armitage, and Quigley (2007) 2            0.0017527480
## Norman and Conner (2006)                          0.0041274442
## Norman, Conner, and Stride (2012) 1               0.0017408141
## Norman, Conner, and Stride (2012) 2               0.0016725304
##                                             C(BEH_BI BEH_ATT) C(BI_PBC BI_PBC)
## Ajzen and Sheikh (2013)                          0.0084533660     0.0157511574
## Armitage, Norman, and Conner (2002)              0.0033404515     0.0062242562
## Conner, Warren, Close, and Sparks (1999a) 2      0.0023534830     0.0043852663
## Conner, Warren, Close, and Sparks (1999a) 3      0.0026051108     0.0048541291
## Conner, Warren, Close, and Sparks (1999b) 1      0.0021241742     0.0039579825
## Conner, Warren, Close, and Sparks (1999b) 2      0.0022033000     0.0041053811
## Conner, Warren, Close, and Sparks (1999c)        0.0023270337     0.0043359878
## Cooke and French (2011a)                         0.0034517797     0.0064317250
## Cooke and French (2011b)                         0.0029376915     0.0054738155
## Cooke, Sniehotta and Schuez (2007)               0.0032360524     0.0060297339
## Elliot and Ainsworth (2012) 1                    0.0011104916     0.0020691933
## Elliot and Ainsworth (2012) 2                    0.0031143959     0.0058030671
## Elliot and Ainsworth (2012) 3                    0.0032360423     0.0060297335
## Elliot and Ainsworth (2012) 4                    0.0036983323     0.0068911287
## Gagnon, et al. (2012)                            0.0008522942     0.0015880813
## Gardner, de Bruijn, and Lally (2012)             0.0023534897     0.0043852602
## Glassman, et al. (2010a)                         0.0014332683     0.0026706161
## Glassman, et al. (2010b)                         0.0013149654     0.0024501772
## Glassman, et al. (2010c)                         0.0030234620     0.0056336223
## Glassman, et al. (2010d)                         0.0044065377     0.0082107124
## Hagger, et al. (2012)                            0.0010407388     0.0019392168
## Jamison and Myers (2008)                         0.0024082301     0.0044872591
## Johnston and White (2003)                        0.0033951882     0.0063262760
## Kim and Hong (2013)                              0.0003765563     0.0007016413
```

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## Norman (2011) 1                                 0.0009204739     0.0017151261
## Norman (2011) 2                                 0.0009287339     0.0017305122
## Norman (2011) 3                                 0.0009004687     0.0016778424
## Norman (2011) 4                                 0.0009287455     0.0017304976
## Norman, Armitage, and Quigley (2007) 1          0.0024365632     0.0045400476
## Norman, Armitage, and Quigley (2007) 2          0.0028370896     0.0052863511
## Norman and Conner (2006)                        0.0066808886     0.0124485158
## Norman, Conner, and Stride (2012) 1             0.0028177812     0.0052503886
## Norman, Conner, and Stride (2012) 2             0.0027072662     0.0050444775
##                                            C(BEH_PBC BI_PBC) C(BEH_BI BI_PBC)
## Ajzen and Sheikh (2013)                         0.0062536321    -6.854586e-04
## Armitage, Norman, and Conner (2002)             0.0024712037    -2.708617e-04
## Conner, Warren, Close, and Sparks (1999a) 2     0.0017410627    -1.908487e-04
## Conner, Warren, Close, and Sparks (1999a) 3     0.0019272103    -2.112572e-04
## Conner, Warren, Close, and Sparks (1999b) 1     0.0015714235    -1.722500e-04
## Conner, Warren, Close, and Sparks (1999b) 2     0.0016299408    -1.786618e-04
## Conner, Warren, Close, and Sparks (1999c)       0.0017214907    -1.887125e-04
## Cooke and French (2011a)                        0.0025535619    -2.799089e-04
## Cooke and French (2011b)                        0.0021732534    -2.382139e-04
## Cooke, Sniehotta and Schuez (2007)              0.0023939565    -2.624176e-04
## Elliot and Ainsworth (2012) 1                   0.0008215249    -9.005613e-05
## Elliot and Ainsworth (2012) 2                   0.0023039767    -2.525376e-04
## Elliot and Ainsworth (2012) 3                   0.0023939522    -2.624283e-04
## Elliot and Ainsworth (2012) 4                   0.0027359557    -2.999047e-04
## Gagnon, et al. (2012)                           0.0006305116    -6.911027e-05
## Gardner, de Bruijn, and Lally (2012)            0.0017410594    -1.908526e-04
## Glassman, et al. (2010a)                        0.0010603078    -1.162192e-04
## Glassman, et al. (2010b)                        0.0009727815    -1.066343e-04
## Glassman, et al. (2010c)                        0.0022366916    -2.451796e-04
## Glassman, et al. (2010d)                        0.0032598732    -3.573223e-04
## Hagger, et al. (2012)                           0.0007699219    -8.439162e-05
## Jamison and Myers (2008)                        0.0017815694    -1.952685e-04
## Johnston and White (2003)                       0.0025116874    -2.753324e-04
## Kim and Hong (2013)                             0.0002785689    -3.053722e-05
## Norman (2011) 1                                 0.0006809493    -7.464304e-05
## Norman (2011) 2                                 0.0006870620    -7.530738e-05
## Norman (2011) 3                                 0.0006661494    -7.301634e-05
## Norman (2011) 4                                 0.0006870405    -7.531318e-05
## Norman, Armitage, and Quigley (2007) 1          0.0018025264    -1.975665e-04
## Norman, Armitage, and Quigley (2007) 2          0.0020988256    -2.300510e-04
## Norman and Conner (2006)                        0.0049424079    -5.417145e-04
## Norman, Conner, and Stride (2012) 1             0.0020845433    -2.284928e-04
## Norman, Conner, and Stride (2012) 2             0.0020027706    -2.195525e-04
##                                            C(BEH_PBC BEH_PBC)
## Ajzen and Sheikh (2013)                          0.0203967536
## Armitage, Norman, and Conner (2002)              0.0080600162
## Conner, Warren, Close, and Sparks (1999a) 2      0.0056786344
## Conner, Warren, Close, and Sparks (1999a) 3      0.0062857822
## Conner, Warren, Close, and Sparks (1999b) 1      0.0051253364
## Conner, Warren, Close, and Sparks (1999b) 2      0.0053162057
## Conner, Warren, Close, and Sparks (1999c)        0.0056148239
## Cooke and French (2011a)                         0.0083286674
## Cooke and French (2011b)                         0.0070882358
## Cooke, Sniehotta and Schuez (2007)               0.0078081251
```

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## Elliot and Ainsworth (2012) 1                    0.0026794675
## Elliot and Ainsworth (2012) 2                    0.0075145970
## Elliot and Ainsworth (2012) 3                    0.0078081185
## Elliot and Ainsworth (2012) 4                    0.0089235730
## Gagnon, et al. (2012)                            0.0020564636
## Gardner, de Bruijn, and Lally (2012)             0.0056786351
## Glassman, et al. (2010a)                         0.0034582744
## Glassman, et al. (2010b)                         0.0031728254
## Glassman, et al. (2010c)                         0.0072951824
## Glassman, et al. (2010d)                         0.0106323542
## Hagger, et al. (2012)                            0.0025111584
## Jamison and Myers (2008)                         0.0058107106
## Johnston and White (2003)                        0.0081921229
## Kim and Hong (2013)                              0.0009085793
## Norman (2011) 1                                  0.0022209783
## Norman (2011) 2                                  0.0022409015
## Norman (2011) 3                                  0.0021726988
## Norman (2011) 4                                  0.0022408934
## Norman, Armitage, and Quigley (2007) 1           0.0058790701
## Norman, Armitage, and Quigley (2007) 2           0.0068454895
## Norman and Conner (2006)                         0.0161200309
## Norman, Conner, and Stride (2012) 1              0.0067989142
## Norman, Conner, and Stride (2012) 2              0.0065322705
##                                             C(BEH_BI BEH_PBC) C(BEH_BI BEH_BI)
## Ajzen and Sheikh (2013)                          0.0061872694     0.0156789264
## Armitage, Norman, and Conner (2002)              0.0024449785     0.0061957105
## Conner, Warren, Close, and Sparks (1999a) 2      0.0017225808     0.0043651460
## Conner, Warren, Close, and Sparks (1999a) 3      0.0019067537     0.0048318624
## Conner, Warren, Close, and Sparks (1999b) 1      0.0015547466     0.0039398285
## Conner, Warren, Close, and Sparks (1999b) 2      0.0016126579     0.0040865620
## Conner, Warren, Close, and Sparks (1999c)        0.0017032212     0.0043160965
## Cooke and French (2011a)                         0.0025264577     0.0064022183
## Cooke and French (2011b)                         0.0021501835     0.0054487032
## Cooke, Sniehotta and Schuez (2007)               0.0023685554     0.0060020880
## Elliot and Ainsworth (2012) 1                    0.0008127984     0.0020596951
## Elliot and Ainsworth (2012) 2                    0.0022795212     0.0057764446
## Elliot and Ainsworth (2012) 3                    0.0023685480     0.0060020811
## Elliot and Ainsworth (2012) 4                    0.0027069169     0.0068595191
## Gagnon, et al. (2012)                            0.0006238196     0.0015807970
## Gardner, de Bruijn, and Lally (2012)             0.0017225864     0.0043651548
## Glassman, et al. (2010a)                         0.0010490528     0.0026583632
## Glassman, et al. (2010b)                         0.0009624605     0.0024389430
## Glassman, et al. (2010c)                         0.0022129591     0.0056077893
## Glassman, et al. (2010d)                         0.0032252787     0.0081730544
## Hagger, et al. (2012)                            0.0007617480     0.0019303183
## Jamison and Myers (2008)                         0.0017626583     0.0044666733
## Johnston and White (2003)                        0.0024850311     0.0062972614
## Kim and Hong (2013)                              0.0002756130     0.0006984219
## Norman (2011) 1                                  0.0006737222     0.0017072583
## Norman (2011) 2                                  0.0006797688     0.0017225734
## Norman (2011) 3                                  0.0006590802     0.0016701478
## Norman (2011) 4                                  0.0006797726     0.0017225919
## Norman, Armitage, and Quigley (2007) 1           0.0017833955     0.0045192226
## Norman, Armitage, and Quigley (2007) 2           0.0020765509     0.0052621059
```

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## Norman and Conner (2006)                        0.0048899485     0.0123914110
## Norman, Conner, and Stride (2012) 1             0.0020624171     0.0052263033
## Norman, Conner, and Stride (2012) 2             0.0019815203     0.0050213478
##                                              MeanAge  Female
## Ajzen and Sheikh (2013)                        19.80  73.000
## Armitage, Norman, and Conner (2002)            26.00  50.806
## Conner, Warren, Close, and Sparks (1999a) 2       NA  57.386
## Conner, Warren, Close, and Sparks (1999a) 3       NA  73.584
## Conner, Warren, Close, and Sparks (1999b) 1       NA  50.256
## Conner, Warren, Close, and Sparks (1999b) 2       NA  50.531
## Conner, Warren, Close, and Sparks (1999c)      20.28  57.865
## Cooke and French (2011a)                       20.40  69.166
## Cooke and French (2011b)                       20.10  57.500
## Cooke, Sniehotta and Schuez (2007)             21.95  75.000
## Elliot and Ainsworth (2012) 1                  20.00  61.100
## Elliot and Ainsworth (2012) 2                  20.00  61.100
## Elliot and Ainsworth (2012) 3                  20.00  61.100
## Elliot and Ainsworth (2012) 4                  20.00  61.100
## Gagnon, et al. (2012)                          30.41  53.703
## Gardner, de Bruijn, and Lally (2012)           23.00  42.045
## Glassman, et al. (2010a)                       26.00  79.930
## Glassman, et al. (2010b)                       37.10   0.000
## Glassman, et al. (2010c)                       19.12  81.751
## Glassman, et al. (2010d)                       20.10  84.042
## Hagger, et al. (2012)                          20.26  76.633
## Jamison and Myers (2008)                       20.38  82.558
## Johnston and White (2003)                      18.40  67.213
## Kim and Hong (2013)                            20.60  54.000
## Norman (2011) 1                                13.60   0.000
## Norman (2011) 2                                13.60 100.000
## Norman (2011) 3                                15.70   0.000
## Norman (2011) 4                                15.70 100.000
## Norman, Armitage, and Quigley (2007) 1         19.91   0.000
## Norman, Armitage, and Quigley (2007) 2         19.91 100.000
## Norman and Conner (2006)                       21.00  75.000
## Norman, Conner, and Stride (2012) 1            24.70 100.000
## Norman, Conner, and Stride (2012) 2            24.70   0.000
##
## $n
##  [1]   49  124  176  159  195  188  178  120  141  128  373  133  128  112  486
## [16]  176  289  315  137   94  398  172  122 1100  450  446  460  446  170  146
## [31]   62  147  153
##
## $obslabels
## [1] "SN"  "ATT" "PBC" "BI"  "BEH"
##
## $ylabels
##  [1] "ATT_SN"  "PBC_SN"  "BI_SN"   "BEH_SN"  "PBC_ATT" "BI_ATT"  "BEH_ATT"
##  [8] "BI_PBC"  "BEH_PBC" "BEH_BI"
##
## $vlabels
##  [1] "C(ATT_SN ATT_SN)"   "C(PBC_SN ATT_SN)"   "C(BI_SN ATT_SN)"
##  [4] "C(BEH_SN ATT_SN)"   "C(PBC_ATT ATT_SN)"  "C(BI_ATT ATT_SN)"
##  [7] "C(BEH_ATT ATT_SN)"  "C(BI_PBC ATT_SN)"   "C(BEH_PBC ATT_SN)"
```

```
## [10] "C(BEH_BI ATT_SN)"   "C(PBC_SN PBC_SN)"   "C(BI_SN PBC_SN)"
## [13] "C(BEH_SN PBC_SN)"   "C(PBC_ATT PBC_SN)"  "C(BI_ATT PBC_SN)"
## [16] "C(BEH_ATT PBC_SN)"  "C(BI_PBC PBC_SN)"   "C(BEH_PBC PBC_SN)"
## [19] "C(BEH_BI PBC_SN)"   "C(BI_SN BI_SN)"     "C(BEH_SN BI_SN)"
## [22] "C(PBC_ATT BI_SN)"   "C(BI_ATT BI_SN)"    "C(BEH_ATT BI_SN)"
## [25] "C(BI_PBC BI_SN)"    "C(BEH_PBC BI_SN)"   "C(BEH_BI BI_SN)"
## [28] "C(BEH_SN BEH_SN)"   "C(PBC_ATT BEH_SN)"  "C(BI_ATT BEH_SN)"
## [31] "C(BEH_ATT BEH_SN)"  "C(BI_PBC BEH_SN)"   "C(BEH_PBC BEH_SN)"
## [34] "C(BEH_BI BEH_SN)"   "C(PBC_ATT PBC_ATT)" "C(BI_ATT PBC_ATT)"
## [37] "C(BEH_ATT PBC_ATT)" "C(BI_PBC PBC_ATT)"  "C(BEH_PBC PBC_ATT)"
## [40] "C(BEH_BI PBC_ATT)"  "C(BI_ATT BI_ATT)"   "C(BEH_ATT BI_ATT)"
## [43] "C(BI_PBC BI_ATT)"   "C(BEH_PBC BI_ATT)"  "C(BEH_BI BI_ATT)"
## [46] "C(BEH_ATT BEH_ATT)" "C(BI_PBC BEH_ATT)"  "C(BEH_PBC BEH_ATT)"
## [49] "C(BEH_BI BEH_ATT)"  "C(BI_PBC BI_PBC)"   "C(BEH_PBC BI_PBC)"
## [52] "C(BEH_BI BI_PBC)"   "C(BEH_PBC BEH_PBC)" "C(BEH_BI BEH_PBC)"
## [55] "C(BEH_BI BEH_BI)"
```

```
## Fit a model without any moderator
osmasem.fit3 <- osmasem(model.name="No moderator", RAM=RAM3, data=my.df2)
summary(osmasem.fit3)
```

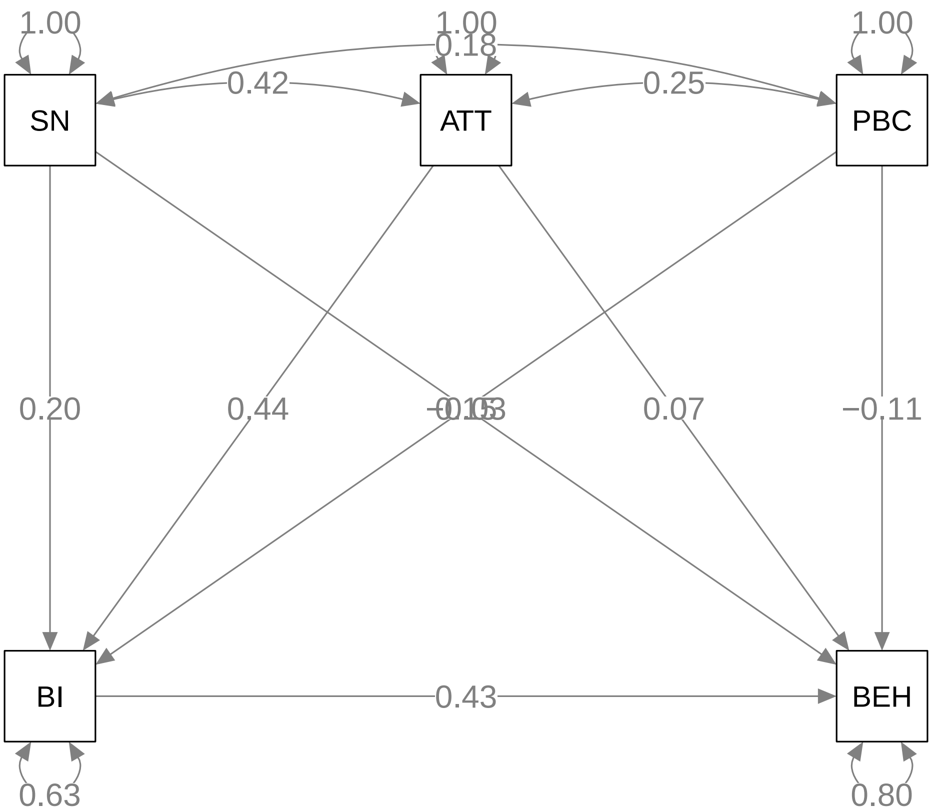
```
## Summary of No moderator
##
## free parameters:
##          name  matrix row col    Estimate  Std.Error A     z value     Pr(>|z|)
## 1          a1      A0  BI  SN  0.19919340 0.04063305     4.9022511 9.474464e-07
## 2          c1      A0 BEH  SN -0.02942747 0.06599860    -0.4458803 6.556837e-01
## 3          a2      A0  BI ATT  0.44145246 0.04477761     9.8587763 0.000000e+00
## 4          c2      A0 BEH ATT  0.07484521 0.10023622     0.7466883 4.552518e-01
## 5          a3      A0  BI PBC  0.15017924 0.06586133     2.2802341 2.259381e-02
## 6          c3      A0 BEH PBC -0.10543122 0.09128416    -1.1549783 2.480993e-01
## 7           b      A0 BEH  BI  0.43253282 0.12486703     3.4639475 5.323105e-04
## 8    SNWITHATT     S0 ATT  SN  0.41588438 0.02877127    14.4548512 0.000000e+00
## 9    SNWITHPBC     S0 PBC  SN  0.18203856 0.03355914     5.4244103 5.814619e-08
## 10 ATTWITHPBC      S0 PBC ATT  0.25193568 0.04523749     5.5691786 2.559431e-08
## 11     Tau1_1 vecTau1   1   1 -1.88169876 0.14479431   -12.9956682 0.000000e+00
## 12     Tau1_2 vecTau1   2   1 -1.72435260 0.14108213   -12.2223320 0.000000e+00
## 13     Tau1_3 vecTau1   3   1 -1.94019664 0.15309372   -12.6732610 0.000000e+00
## 14     Tau1_4 vecTau1   4   1 -1.70304133 0.18322758    -9.2946780 0.000000e+00
## 15     Tau1_5 vecTau1   5   1 -1.38758781 0.13345790   -10.3971953 0.000000e+00
## 16     Tau1_6 vecTau1   6   1 -1.80144623 0.14409381   -12.5018987 0.000000e+00
## 17     Tau1_7 vecTau1   7   1 -1.51579606 0.17568466    -8.6279362 0.000000e+00
## 18     Tau1_8 vecTau1   8   1 -1.18548990 0.13780904    -8.6024105 0.000000e+00
## 19     Tau1_9 vecTau1   9   1 -1.12835895 0.17093124    -6.6012446 4.077205e-11
## 20    Tau1_10 vecTau1  10   1 -1.16508910 0.16782865    -6.9421348 3.862244e-12
##
## Model Statistics:
##                |  Parameters  |  Degrees of Freedom  |  Fit (-2lnL units)
##        Model:             20                    242             -35.96173
##    Saturated:             65                    197                    NA
## Independence:             20                    242                    NA
## Number of observations/statistics: 7973/262
##
## Information Criteria:
##       |  df Penalty  |  Parameters Penalty  |  Sample-Size Adjusted
```

```
## AIC:      -519.9617               4.038271                 4.143905
## BIC:     -2210.0452             143.714593                80.158533
## To get additional fit indices, see help(mxRefModels)
## timestamp: 2020-07-24 16:43:33
## Wall clock time: 1.357054 secs
## optimizer:  SLSQP
## OpenMx version number: 2.17.4
## Need help?  See help(mxSummary)
```

```
## Get the heterogeneity variances
diag(VarCorr(osmasem.fit3))
```

```
##     Tau2_1     Tau2_2     Tau2_3     Tau2_4     Tau2_5     Tau2_6     Tau2_7
## 0.02320477 0.03178677 0.02064271 0.03317089 0.06233853 0.02724480 0.04823877
##     Tau2_8     Tau2_9    Tau2_10
## 0.09338918 0.10469354 0.09727841
```

```
## Plot the fitted model
plot(osmasem.fit3)
```




```
## Create A2 to represent the moderator on the A matrix
A2 <- create.modMatrix(RAM3, output="A", "Female")
A2
```

```
##     SN              ATT             PBC             BI              BEH
## SN  "0"             "0"             "0"             "0"             "0"
## ATT "0"             "0"             "0"             "0"             "0"
## PBC "0"             "0"             "0"             "0"             "0"
## BI  "0*data.Female" "0*data.Female" "0*data.Female" "0"             "0"
## BEH "0*data.Female" "0*data.Female" "0*data.Female" "0*data.Female" "0"
```

```r
## Fit a model with female as a moderator
osmasem.fit4 <- osmasem(RAM=RAM3, Ax=A2, data=my.df2)
summary(osmasem.fit4)
```

```
## Summary of osmasem
##
## free parameters:
##           name  matrix row col      Estimate   Std.Error A      z value
## 1           a1      A0  BI  SN  0.2228522907 0.079875051     2.79001124
## 2           c1      A0 BEH  SN -0.0739426587 0.142032704    -0.52060305
## 3           a2      A0  BI ATT  0.2885422177 0.087902791     3.28251487
## 4           c2      A0 BEH ATT  0.0027898701 0.179536099     0.01553933
## 5           a3      A0  BI PBC  0.2029908464 0.132082306     1.53685117
## 6           c3      A0 BEH PBC -0.1349892878 0.204228711    -0.66097116
## 7            b      A0 BEH  BI  0.3877469888 0.243603899     1.59171093
## 8    SNWITHATT      S0 ATT  SN  0.4161848096 0.028840073    14.43078208
## 9    SNWITHPBC      S0 PBC  SN  0.1821824656 0.033523118     5.43453216
## 10 ATTWITHPBC      S0 PBC ATT  0.2520758157 0.045192696     5.57779990
## 11        a1_1      A1  BI  SN -0.0003971967 0.001193271    -0.33286377
## 12        c1_1      A1 BEH  SN  0.0007514202 0.002068747     0.36322478
## 13        a2_1      A1  BI ATT  0.0025994676 0.001314186     1.97800605
## 14        c2_1      A1 BEH ATT  0.0010901565 0.002858653     0.38135317
## 15        a3_1      A1  BI PBC -0.0008993385 0.001973798    -0.45563856
## 16        c3_1      A1 BEH PBC  0.0005184383 0.002956726     0.17534201
## 17         b_1      A1 BEH  BI  0.0007106012 0.003784647     0.18775893
## 18      Tau1_1 vecTau1   1   1 -1.8788969786 0.144559715   -12.99737610
## 19      Tau1_2 vecTau1   2   1 -1.7255662025 0.141120479   -12.22761015
## 20      Tau1_3 vecTau1   3   1 -1.9438142840 0.153140031   -12.69305137
## 21      Tau1_4 vecTau1   4   1 -1.7532492090 0.186956805    -9.37783042
## 22      Tau1_5 vecTau1   5   1 -1.3886406208 0.133466311   -10.40442795
## 23      Tau1_6 vecTau1   6   1 -1.8882645272 0.145991888   -12.93403730
## 24      Tau1_7 vecTau1   7   1 -1.5892484482 0.178465993    -8.90504920
## 25      Tau1_8 vecTau1   8   1 -1.1870153652 0.137835239    -8.61184249
## 26      Tau1_9 vecTau1   9   1 -1.1338644844 0.171000648    -6.63076134
## 27     Tau1_10 vecTau1  10   1 -1.1799573558 0.168419231    -7.00607257
##        Pr(>|z|)
## 1  5.270621e-03
## 2  6.026433e-01
## 3  1.028856e-03
## 4  9.876019e-01
## 5  1.243298e-01
## 6  5.086308e-01
## 7  1.114497e-01
## 8  0.000000e+00
## 9  5.494039e-08
## 10 2.435796e-08
## 11 7.392371e-01
## 12 7.164370e-01
## 13 4.792802e-02
## 14 7.029412e-01
## 15 6.486499e-01
## 16 8.608109e-01
## 17 8.510656e-01
## 18 0.000000e+00
```

```
## 19 0.000000e+00
## 20 0.000000e+00
## 21 0.000000e+00
## 22 0.000000e+00
## 23 0.000000e+00
## 24 0.000000e+00
## 25 0.000000e+00
## 26 3.339595e-11
## 27 2.450928e-12
##
## Model Statistics:
##                |  Parameters  |  Degrees of Freedom  |  Fit (-2lnL units)
##        Model:             27                    235             -45.54204
##    Saturated:             65                    197                    NA
## Independence:             20                    242                    NA
## Number of observations/statistics: 7973/262
##
## Information Criteria:
##       |  df Penalty  |  Parameters Penalty  |  Sample-Size Adjusted
## AIC:       -515.542              8.457959                 8.648268
## BIC:      -2156.739            197.020994               111.220313
## To get additional fit indices, see help(mxRefModels)
## timestamp: 2020-07-24 16:43:44
## Wall clock time: 11.12509 secs
## optimizer:  SLSQP
## OpenMx version number: 2.17.4
## Need help?  See help(mxSummary)
```

```
## Test the statistical significance between the models
anova(osmasem.fit4, osmasem.fit3)
```

```
##      base   comparison ep  minus2LL  df       AIC   diffLL diffdf       p
## 1 osmasem         <NA> 27 -45.54204 235 -515.5420       NA     NA      NA
## 2 osmasem No moderator 20 -35.96173 242 -519.9617 9.580312      7 0.21363
```

```
## Get the R2 on the correlation coefficients
osmasemR2(osmasem.fit3, osmasem.fit4)
```

```
## $Tau2.0
##   Tau2_1_1   Tau2_2_2   Tau2_3_3   Tau2_4_4   Tau2_5_5   Tau2_6_6   Tau2_7_7
## 0.02333516 0.03170971 0.02049389 0.03000178 0.06220740 0.02290205 0.04164821
##   Tau2_8_8   Tau2_9_9 Tau2_10_10
## 0.09310469 0.10354707 0.09442828
##
## $Tau2.1
##   Tau2_1_1   Tau2_2_2   Tau2_3_3   Tau2_4_4   Tau2_5_5   Tau2_6_6   Tau2_7_7
## 0.02320477 0.03178677 0.02064271 0.03317089 0.06233853 0.02724480 0.04823877
##   Tau2_8_8   Tau2_9_9 Tau2_10_10
## 0.09338918 0.10469354 0.09727841
##
## $R2
##    Tau2_1_1    Tau2_2_2    Tau2_3_3    Tau2_4_4    Tau2_5_5    Tau2_6_6
## 0.005587883 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000
##    Tau2_7_7    Tau2_8_8    Tau2_9_9  Tau2_10_10
## 0.000000000 0.000000000 0.000000000 0.000000000
```

```r
sessionInfo()
```

```
## R version 4.0.2 (2020-06-22)
## Platform: x86_64-pc-linux-gnu (64-bit)
## Running under: Ubuntu 20.04 LTS
##
## Matrix products: default
## BLAS:   /usr/lib/x86_64-linux-gnu/blas/libblas.so.3.9.0
## LAPACK: /usr/lib/x86_64-linux-gnu/lapack/liblapack.so.3.9.0
##
## locale:
##  [1] LC_CTYPE=en_SG.UTF-8       LC_NUMERIC=C
##  [3] LC_TIME=en_SG.UTF-8        LC_COLLATE=en_SG.UTF-8
##  [5] LC_MONETARY=en_SG.UTF-8    LC_MESSAGES=en_SG.UTF-8
##  [7] LC_PAPER=en_SG.UTF-8       LC_NAME=C
##  [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_SG.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
## [1] metaSEM_1.2.4.1 OpenMx_2.17.4
##
## loaded via a namespace (and not attached):
##   [1] nlme_3.1-147        RColorBrewer_1.1-2  mi_1.0
##   [4] tools_4.0.2         backports_1.1.8     R6_2.4.1
##   [7] d3Network_0.5.2.1   rpart_4.1-15        Hmisc_4.4-0
##  [10] colorspace_1.4-1    nnet_7.3-14         tidyselect_1.1.0
##  [13] gridExtra_2.3       mnormt_2.0.1        compiler_4.0.2
##  [16] fdrtool_1.2.15      qgraph_1.6.5        htmlTable_1.13.3
##  [19] regsem_1.5.2        scales_1.1.0        checkmate_2.0.0
##  [22] psych_1.9.12.31     mvtnorm_1.1-1       pbapply_1.4-2
##  [25] sem_3.1-9           stringr_1.4.0       digest_0.6.25
##  [28] pbivnorm_0.6.0      foreign_0.8-80      minqa_1.2.4
##  [31] rmarkdown_2.3       base64enc_0.1-3     jpeg_0.1-8.1
##  [34] pkgconfig_2.0.3     htmltools_0.4.0     lme4_1.1-23
##  [37] lisrelToR_0.1.4     htmlwidgets_1.5.1   rlang_0.4.7
##  [40] huge_1.3.4.1        rstudioapi_0.11     generics_0.0.2
##  [43] gtools_3.8.2        acepack_1.4.1       dplyr_1.0.0
##  [46] zip_2.0.4           magrittr_1.5        Formula_1.2-3
##  [49] Matrix_1.2-18       Rcpp_1.0.5          munsell_0.5.0
##  [52] abind_1.4-5         rockchalk_1.8.144   lifecycle_0.2.0
##  [55] whisker_0.4         stringi_1.4.6       yaml_2.2.1
##  [58] carData_3.0-4       MASS_7.3-51.6       plyr_1.8.6
##  [61] matrixcalc_1.0-3    lavaan_0.6-6        grid_4.0.2
##  [64] parallel_4.0.2      crayon_1.3.4        lattice_0.20-41
##  [67] semPlot_1.1.2       kutils_1.70         splines_4.0.2
##  [70] tmvnsim_1.0-2       knitr_1.28          pillar_1.4.4
##  [73] igraph_1.2.5        rjson_0.2.20        boot_1.3-25
##  [76] corpcor_1.6.9       BDgraph_2.62        reshape2_1.4.4
##  [79] stats4_4.0.2        XML_3.99-0.3        glue_1.4.1
##  [82] evaluate_0.14       latticeExtra_0.6-29 data.table_1.12.8
##  [85] png_0.1-7           vctrs_0.3.2         nloptr_1.2.2.1
```

```
##  [88] gtable_0.3.0        purrr_0.3.4         ggplot2_3.3.2
##  [91] xfun_0.13           openxlsx_4.1.5      xtable_1.8-4
##  [94] coda_0.19-3         Rsolnp_1.16         glasso_1.11
##  [97] survival_3.1-12     truncnorm_1.0-8     tibble_3.0.1
## [100] arm_1.11-1          ellipse_0.4.2       cluster_2.1.0
## [103] statmod_1.4.34      ellipsis_0.3.1
```