Final Project

2023-05-03

```r
#First we need to make sure that the necessary packages

#Specify the packages that will be necessary here
necessarypackages=c("lubridate","psych","ggplot2","lme4","lmerTest","sjmisc","sjPlot","mgcv","lomb","bi



#check the names of the current packages that are installed
currentpackagenames=rownames(installed.packages())

#select the packages which are not yet installed
packagestoinstall=necessarypackages[!(necessarypackages%in%currentpackagenames)]

#if packages are not yet installed, install them via CRAN.
if(length(packagestoinstall)>0){
  install.packages(packagestoinstall)
}

#now load all packages using lapply
packageout=lapply(necessarypackages, library, character.only = TRUE)
```

```
##
## Attaching package: 'lubridate'
```

```
## The following objects are masked from 'package:base':
##
##     date, intersect, setdiff, union
```

```
##
## Attaching package: 'ggplot2'
```

```
## The following objects are masked from 'package:psych':
##
##     %+%, alpha
```

```
## Loading required package: Matrix
```

```
##
## Attaching package: 'lmerTest'
```

```
## The following object is masked from 'package:lme4':
##
##     lmer
```

```
## The following object is masked from 'package:stats':
##
##     step


## Loading required package: nlme


##
## Attaching package: 'nlme'


## The following object is masked from 'package:lme4':
##
##     lmList


## This is mgcv 1.8-42. For overview type 'help("mgcv-package")'.


## biwavelet 0.20.21 loaded.


##
## Attaching package: 'biwavelet'


## The following object is masked from 'package:ggplot2':
##
##     arrow
```

R Markdown

```r
fit_data = read.csv('daily_fitbit_sema_df_unprocessed.csv')


var.names.data <- tolower(colnames(fit_data))
colnames(fit_data)<-var.names.data


fit_data$id <- as.integer(factor(fit_data$id, levels = unique(fit_data$id)))


fit_data$date <- as.Date(fit_data$date)

for(i in 1:length(unique(fit_data$id))){
  tempdates=fit_data$date[fit_data$id==unique(fit_data$id)[i]]
  tempdates=as.numeric((tempdates-min(tempdates)))
  fit_data$day[fit_data$id==unique(fit_data$id)[i]]=tempdates
}


fit_data=fit_data[,c(colnames(fit_data)[1:3], "day", colnames(fit_data)[4:63])]


fit_data <- subset(fit_data, select = -c(step_goal, step_goal_label,x,date))


completed_data <- read.csv('Complete.csv')
```
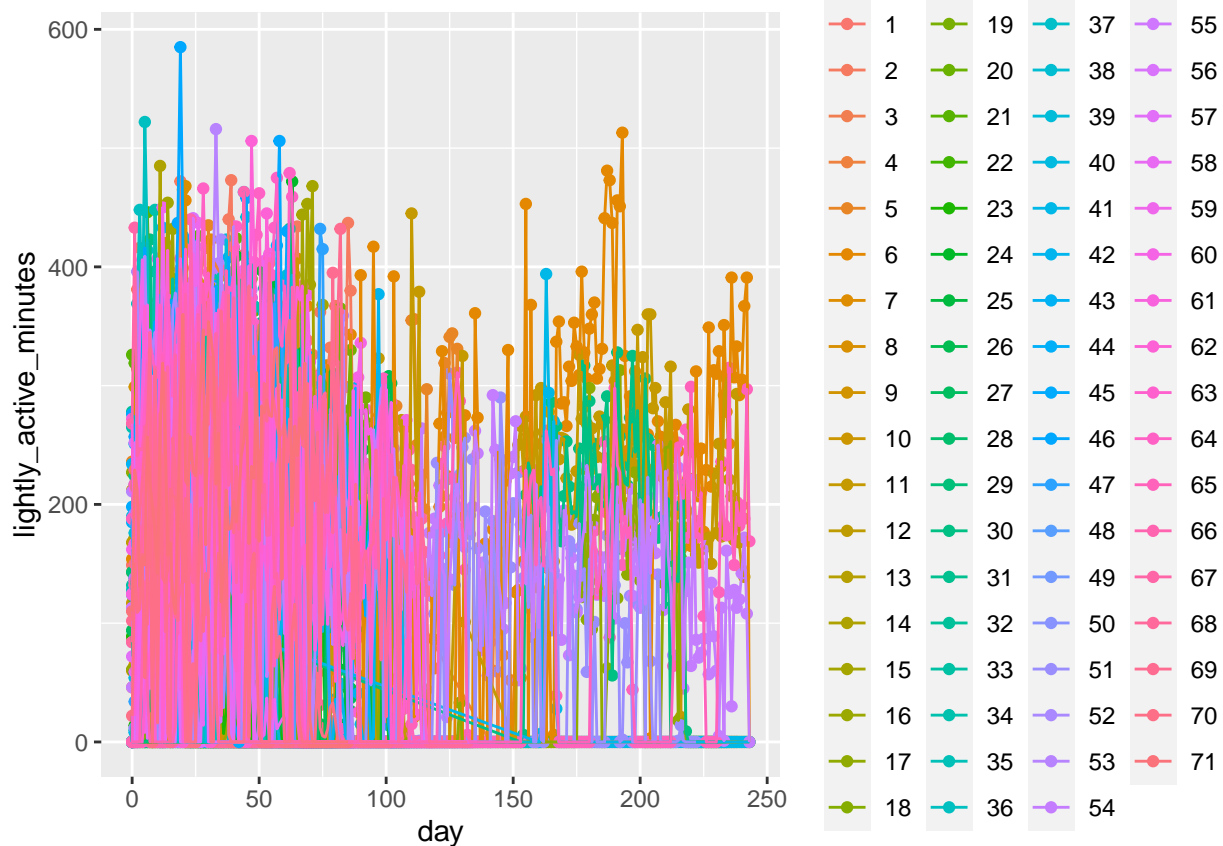
```
ggplot(data = completed_data, aes(x = day, y = lightly_active_minutes , group = id, color=factor(id)))
  geom_point() +
  geom_line()
```



```
lmer_data = completed_data
lmer_data <- subset(lmer_data, select = -c(activitytype, badgetype))
lmer_data$daySCALED=scale(lmer_data$day)
model1<- lmer(calories ~ . +(daySCALED | id), data = lmer_data)
```

```
## fixed-effect model matrix is rank deficient so dropping 2 columns / coefficients
```

```
## Warning: Some predictor variables are on very different scales: consider
## rescaling
```

```
## Warning: Some predictor variables are on very different scales: consider
## rescaling
```

```
summary(model1)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: calories ~ . + (daySCALED | id)
##    Data: lmer_data
##
```

```
## REML criterion at convergence: 100555.6
##
## Scaled residuals:
##      Min      1Q   Median      3Q      Max
## -11.6907  -0.3232   0.0159   0.3433   8.5697
##
## Random effects:
##  Groups   Name        Variance Std.Dev. Corr
##  id       (Intercept) 51051    225.9
##           daySCALED   26232    162.0    -0.04
##  Residual             44596    211.2
## Number of obs: 7410, groups:  id, 71
##
## Fixed effects:
##                                  Estimate Std. Error        df t value
## (Intercept)                     1.235e+03  2.859e+02 3.597e+03   4.320
## X                               2.062e-01  5.236e-02 8.717e+02   3.939
## id                             -2.249e+01  5.451e+00 6.610e+02  -4.126
## day                            -7.452e-01  3.670e-01 7.448e+01  -2.030
## nightly_temperature            -1.070e+01  2.620e+00 7.256e+03  -4.085
## nremhr                          3.212e-01  2.989e-01 7.243e+03   1.075
## rmssd                           4.042e-01  1.886e-01 7.292e+03   2.143
## spo2                            3.921e+00  2.481e+00 7.250e+03   1.580
## full_sleep_breathing_rate       1.710e+00  9.092e-01 7.268e+03   1.880
## stress_score                    9.027e-01  6.738e-01 7.221e+03   1.340
## sleep_points_percentage        -3.624e+01  1.076e+01 7.226e+03  -3.368
## exertion_points_percentage     -3.478e+01  3.803e+01 7.228e+03  -0.915
## responsiveness_points_percentage -6.868e+01  3.550e+01 7.226e+03  -1.935
## daily_temperature_variation     9.694e+00  3.135e+00 7.289e+03   3.092
## filtereddemographicvo2max       5.267e+00  7.594e-01 7.326e+03   6.936
## distance                        2.223e-02  4.583e-03 7.266e+03   4.851
## bpm                             9.683e-01  3.025e-01 7.232e+03   3.201
## lightly_active_minutes          2.843e+00  5.072e-02 7.299e+03  56.040
## moderately_active_minutes       4.073e+00  1.794e-01 7.264e+03  22.703
## very_active_minutes             9.803e+00  1.487e-01 7.268e+03  65.919
## sedentary_minutes               2.061e-01  2.029e-02 7.258e+03  10.160
## mindfulness_sessionFalse       -3.423e+02  3.306e+01 5.839e+03 -10.353
## mindfulness_sessionTrue        -3.511e+02  3.787e+01 6.675e+03  -9.271
## scl_avg                         1.593e-01  6.331e-01 7.281e+03   0.252
## resting_hr                     -2.944e+00  6.696e-01 7.297e+03  -4.397
## sleep_duration                 -2.178e-06  2.557e-06 7.220e+03  -0.852
## minutestofallasleep             1.432e+00  7.664e-01 7.221e+03   1.868
## minutesasleep                   2.061e-01  1.648e-01 7.225e+03   1.250
## minutesawake                    1.938e-01  2.536e-01 7.246e+03   0.764
## minutesafterwakeup              4.755e-01  9.134e-01 7.238e+03   0.521
## sleep_efficiency               -3.163e-01  8.125e-01 7.192e+03  -0.389
## sleep_deep_ratio                3.998e+00  9.230e+00 7.227e+03   0.433
## sleep_wake_ratio               -3.489e+00  1.432e+01 7.249e+03  -0.244
## sleep_light_ratio              -2.012e+01  1.650e+01 7.236e+03  -1.219
## sleep_rem_ratio                 6.326e+00  6.605e+00 7.229e+03   0.958
## steps                          -1.693e-02  3.260e-03 7.264e+03  -5.195
## minutes_in_default_zone_1       1.282e-01  3.636e-02 7.303e+03   3.525
## minutes_below_default_zone_1    1.027e-01  1.259e-02 7.269e+03   8.156
## minutes_in_default_zone_2       1.746e-01  1.429e-01 7.248e+03   1.222
```

```
## minutes_in_default_zone_3          -9.540e-03  4.087e-01  7.226e+03  -0.023
## age<30                              2.111e+02  2.818e+02  4.705e+01   0.749
## age>=30                             2.001e+02  2.884e+02  4.734e+01   0.694
## genderFEMALE                        1.753e+02  2.541e+02  4.988e+01   0.690
## genderMALE                          5.081e+02  2.416e+02  5.028e+01   2.103
## bmi<19                             -5.997e+02  1.904e+02  4.824e+01  -3.150
## bmi>=25                            -3.155e+02  1.980e+02  5.386e+01  -1.594
## bmi>=30                             1.539e+02  1.995e+02  4.783e+01   0.772
## bmi19.0                            -2.999e-01  2.150e+02  4.846e+01  -0.001
## bmi20.0                            -4.043e+02  1.860e+02  4.842e+01  -2.174
## bmi21.0                            -2.614e+02  1.859e+02  4.820e+01  -1.407
## bmi22.0                            -2.608e+02  1.918e+02  4.825e+01  -1.359
## bmi23.0                            -2.742e+02  1.922e+02  4.839e+01  -1.427
## bmi24.0                            -1.160e+02  1.810e+02  4.907e+01  -0.641
## bmi25.0                            -1.964e+00  2.361e+02  4.847e+01  -0.008
## bmi26.0                            -2.638e+01  2.046e+02  4.819e+01  -0.129
## bmi27.0                            -8.141e+01  2.121e+02  4.826e+01  -0.384
## bmi28.0                            -4.871e+01  2.303e+02  4.964e+01  -0.212
## min_goal                            1.044e-03  3.252e-03  7.245e+03   0.321
## max_goal                           -8.568e-04  2.606e-03  7.245e+03  -0.329
## alert                              -5.180e+00  8.041e+00  7.252e+03  -0.644
## happy                              -7.809e-01  6.352e+00  7.234e+03  -0.123
## neutral                             2.753e+00  6.247e+00  7.247e+03   0.441
## rested.relaxed                      1.256e+01  5.944e+00  7.239e+03   2.113
## sad                                -2.835e+01  1.084e+01  7.235e+03  -2.614
## tense.anxious                       4.998e+00  6.594e+00  7.235e+03   0.758
## tired                               9.445e+00  5.725e+00  7.236e+03   1.650
## entertainment                      -1.149e+01  9.134e+00  7.229e+03  -1.258
## gym                                -9.836e+01  3.205e+01  7.228e+03  -3.069
## home                               -6.852e+00  7.113e+00  7.229e+03  -0.963
## home_office                        -7.875e+00  1.135e+01  7.246e+03  -0.694
## other                              -3.113e+00  1.762e+01  7.221e+03  -0.177
## outdoors                            5.076e+00  8.128e+00  7.228e+03   0.624
## transit                            -3.042e+00  9.419e+00  7.226e+03  -0.323
## work.school                        -1.070e+00  6.494e+00  7.240e+03  -0.165
##                                     Pr(>|t|)
## (Intercept)                         1.60e-05 ***
## X                                   8.85e-05 ***
## id                                  4.16e-05 ***
## day                                 0.045904 *
## nightly_temperature                 4.46e-05 ***
## nremhr                              0.282544
## rmssd                               0.032142 *
## spo2                                0.114046
## full_sleep_breathing_rate          0.060103 .
## stress_score                        0.180384
## sleep_points_percentage             0.000760 ***
## exertion_points_percentage          0.360467
## responsiveness_points_percentage 0.053039 .
## daily_temperature_variation        0.001995 **
## filtereddemographicvo2max          4.39e-12 ***
## distance                           1.26e-06 ***
## bpm                                0.001375 **
## lightly_active_minutes              < 2e-16 ***
```

```
## moderately_active_minutes        < 2e-16 ***
## very_active_minutes              < 2e-16 ***
## sedentary_minutes                < 2e-16 ***
## mindfulness_sessionFalse         < 2e-16 ***
## mindfulness_sessionTrue          < 2e-16 ***
## scl_avg                          0.801398
## resting_hr                       1.11e-05 ***
## sleep_duration                   0.394487
## minutestofallasleep              0.061829 .
## minutesasleep                    0.211215
## minutesawake                     0.444704
## minutesafterwakeup               0.602695
## sleep_efficiency                 0.697066
## sleep_deep_ratio                 0.664913
## sleep_wake_ratio                 0.807549
## sleep_light_ratio                0.222848
## sleep_rem_ratio                  0.338176
## steps                            2.11e-07 ***
## minutes_in_default_zone_1        0.000426 ***
## minutes_below_default_zone_1     4.05e-16 ***
## minutes_in_default_zone_2        0.221779
## minutes_in_default_zone_3        0.981377
## age<30                           0.457466
## age>=30                          0.491063
## genderFEMALE                     0.493506
## genderMALE                       0.040500 *
## bmi<19                           0.002806 **
## bmi>=25                          0.116888
## bmi>=30                          0.444196
## bmi19.0                          0.998892
## bmi20.0                          0.034602 *
## bmi21.0                          0.165963
## bmi22.0                          0.180336
## bmi23.0                          0.160074
## bmi24.0                          0.524398
## bmi25.0                          0.993396
## bmi26.0                          0.897947
## bmi27.0                          0.702755
## bmi28.0                          0.833341
## min_goal                         0.748187
## max_goal                         0.742364
## alert                            0.519466
## happy                            0.902152
## neutral                          0.659516
## rested.relaxed                   0.034596 *
## sad                              0.008961 **
## tense.anxious                    0.448548
## tired                            0.099057 .
## entertainment                    0.208278
## gym                              0.002157 **
## home                             0.335462
## home_office                      0.487680
## other                            0.859783
## outdoors                         0.532346
```

```
## transit                       0.746717
## work.school                   0.869162
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1


##
## Correlation matrix not shown by default, as p = 74 > 12.
## Use print(x, correlation=TRUE)  or
##     vcov(x)         if you need it


## fit warnings:
## fixed-effect model matrix is rank deficient so dropping 2 columns / coefficients
## Some predictor variables are on very different scales: consider rescaling
```

Data appears stationary.

```
# Estimate the relationship between v1 and v2 using the mlVAR function
fit1 <- mlVAR(completed_data, vars = c("calories","very_active_minutes","moderately_active_minutes","lig


## Estimating temporal and between-subjects effects


##   |                                                                              |


## Estimating contemporaneous effects


##   |                                                                              |


## Computing random effects


##   |                                                                              |
```

```
# Display the summary of the fit
summary(fit1)


##
## mlVAR estimation completed. Input was:
##      - Variables: calories very_active_minutes moderately_active_minutes lightly_active_minutes seden
##      - Lags: 1
##      - Estimator: lmer
##      - Temporal: correlated
##
## Information indices:
##                     var      aic      bic
##                calories 14431.97 14652.80
##     very_active_minutes 18799.70 19020.53
## moderately_active_minutes 18209.95 18430.78
##   lightly_active_minutes 14242.20 14463.03
##        sedentary_minutes 12978.32 13199.15
##
##
## Temporal effects:
```

```
##                     from                               to lag  fixed    SE     P
##                 calories                         calories   1  0.518 0.064 0.000
##                 calories             very_active_minutes   1  0.263 0.063 0.000
##                 calories moderately_active_minutes         1  0.254 0.055 0.000
##                 calories           lightly_active_minutes   1  0.231 0.077 0.003
##                 calories               sedentary_minutes   1 -0.277 0.080 0.001
##      very_active_minutes                         calories   1 -0.123 0.027 0.000
##      very_active_minutes             very_active_minutes   1 -0.009 0.037 0.805
##      very_active_minutes moderately_active_minutes         1 -0.027 0.035 0.443
##      very_active_minutes           lightly_active_minutes   1 -0.035 0.031 0.253
##      very_active_minutes               sedentary_minutes   1  0.054 0.031 0.085
## moderately_active_minutes                         calories   1 -0.079 0.018 0.000
## moderately_active_minutes             very_active_minutes   1 -0.043 0.026 0.102
## moderately_active_minutes moderately_active_minutes         1 -0.008 0.026 0.748
## moderately_active_minutes           lightly_active_minutes   1 -0.059 0.018 0.001
## moderately_active_minutes               sedentary_minutes   1  0.066 0.018 0.000
##   lightly_active_minutes                         calories   1  0.031 0.040 0.430
##   lightly_active_minutes             very_active_minutes   1  0.018 0.048 0.710
##   lightly_active_minutes moderately_active_minutes         1  0.078 0.040 0.049
##   lightly_active_minutes           lightly_active_minutes   1  0.340 0.049 0.000
##   lightly_active_minutes               sedentary_minutes   1 -0.179 0.052 0.001
##        sedentary_minutes                         calories   1 -0.119 0.030 0.000
##        sedentary_minutes             very_active_minutes   1 -0.128 0.035 0.000
##        sedentary_minutes moderately_active_minutes         1 -0.109 0.032 0.001
##        sedentary_minutes           lightly_active_minutes   1 -0.099 0.030 0.001
##        sedentary_minutes               sedentary_minutes   1  0.248 0.034 0.000
## ran_SD
##  0.354
##  0.287
##  0.236
##  0.468
##  0.522
##  0.146
##  0.217
##  0.205
##  0.182
##  0.199
##  0.087
##  0.139
##  0.144
##  0.084
##  0.092
##  0.206
##  0.250
##  0.184
##  0.298
##  0.344
##  0.198
##  0.214
##  0.185
##  0.191
##  0.240
##
##
```

```
## Contemporaneous effects (posthoc estimated):
##                          v1                          v2 P 1->2 P 1<-2   pcor
##         very_active_minutes                    calories     0  0.000  0.665
##   moderately_active_minutes                    calories     0  0.000  0.517
##   moderately_active_minutes         very_active_minutes     0  0.029  0.146
##      lightly_active_minutes                    calories     0  0.000  0.793
##      lightly_active_minutes         very_active_minutes     0  0.000 -0.537
##      lightly_active_minutes   moderately_active_minutes     0  0.000 -0.281
##            sedentary_minutes                    calories     0  0.000  0.150
##            sedentary_minutes         very_active_minutes     0  0.000 -0.192
##            sedentary_minutes   moderately_active_minutes     0  0.000 -0.159
##            sedentary_minutes      lightly_active_minutes     0  0.000 -0.480
##   ran_SD_pcor     cor ran_SD_cor
##         0.251   0.896      0.160
##         0.269   0.910      0.139
##         0.442   0.883      0.147
##         0.216   0.868      0.170
##         0.268   0.648      0.237
##         0.324   0.710      0.219
##         0.266  -0.763      0.219
##         0.212  -0.659      0.179
##         0.221  -0.694      0.182
##         0.220  -0.798      0.155
##
##
## Between-subject effects:
##                          v1                          v2 P 1->2 P 1<-2   pcor
##         very_active_minutes                    calories 0.000  0.000  0.461
##   moderately_active_minutes                    calories 0.418  0.582 -0.064
##   moderately_active_minutes         very_active_minutes 0.000  0.000  0.455
##      lightly_active_minutes                    calories 0.083  0.085  0.187
##      lightly_active_minutes         very_active_minutes 0.007  0.001 -0.309
##      lightly_active_minutes   moderately_active_minutes 0.000  0.001  0.372
##            sedentary_minutes                    calories 0.886  0.403  0.041
##            sedentary_minutes         very_active_minutes 0.001  0.002 -0.335
##            sedentary_minutes   moderately_active_minutes 0.273  0.980 -0.046
##            sedentary_minutes      lightly_active_minutes 0.000  0.000 -0.784
##      cor
##    0.692
##    0.585
##    0.754
##    0.590
##    0.631
##    0.814
##   -0.603
##   -0.712
##   -0.811
##   -0.923
```

```r
# Plot the lagged associations of fit1
plot(fit1,"temporal",layout = "circle",nonsig="hide")
title("Lagged Associations")
```

Lagged Associations

calories — sedentary_minutes — very_active_minutes — lightly_active_minutes — moderately_active_minutes
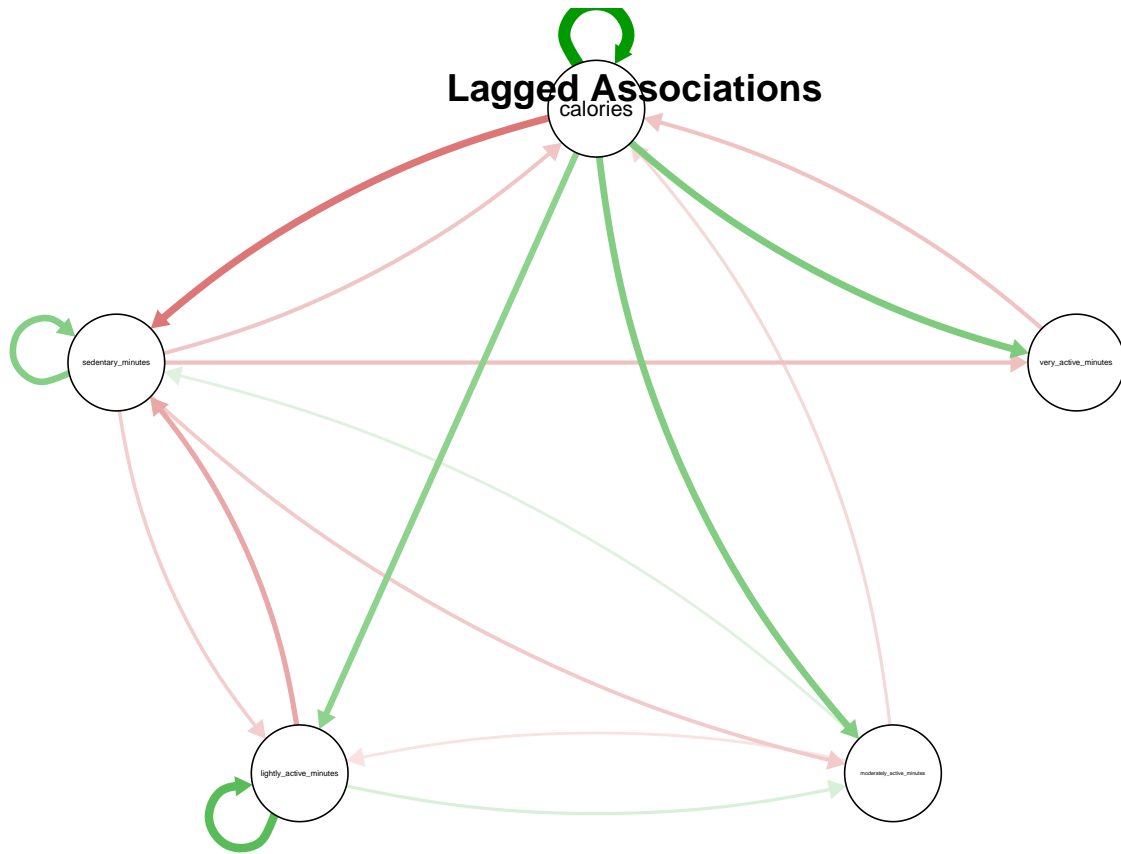
```r
# Plot the SD of random effects of lagged associations for fit1
plot(fit1,"temporal",layout = "circle",nonsig="hide",SD=TRUE)
title("SD of Random Effects of Lagged Associations")
```

SD of Random Effects of Lagged Associations
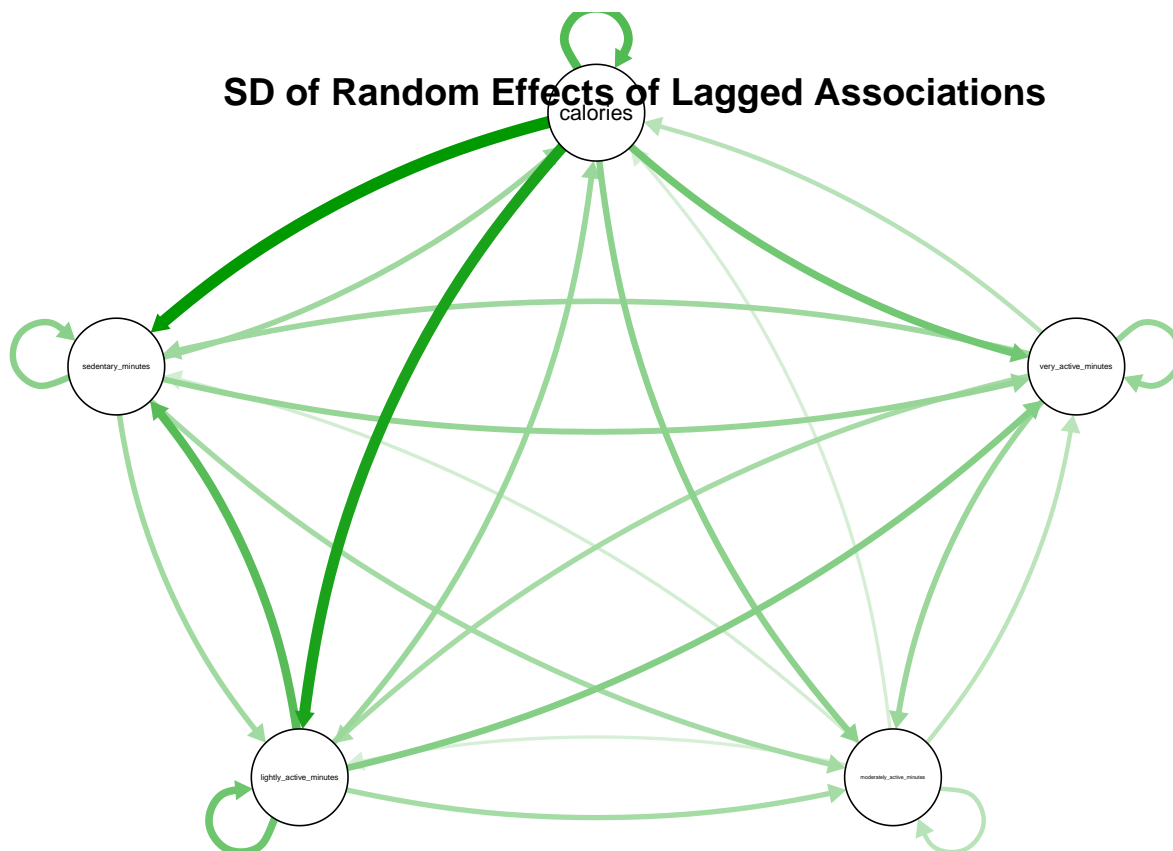

```
# Plot the contemporaneous associations of fit1
plot(fit1,"contemporaneous",layout = "circle",nonsig="hide")
title("Contemporaneous Associations")
```

Contemporaneous Associations
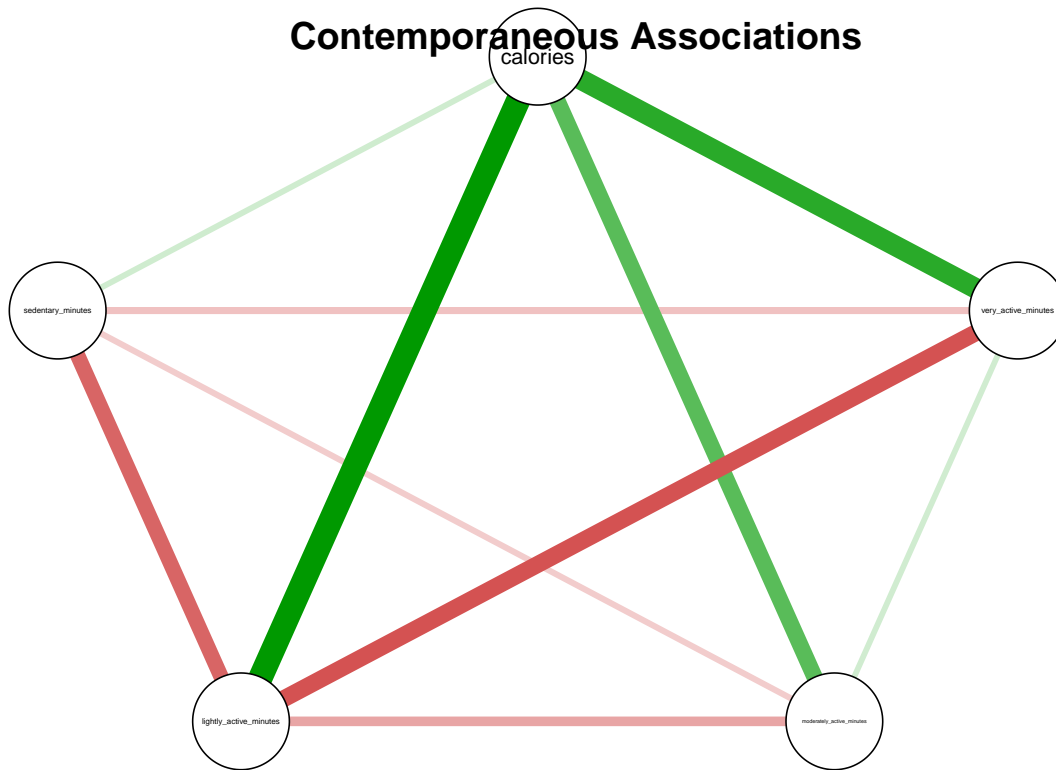

```
# Estimate the relationship between v1 and v2 using the mlVAR function
fit2 <- mlVAR(completed_data, vars = c("calories","moderately_active_minutes"), idvar = "id", lags = 1,
```

```
## Estimating temporal and between-subjects effects

##     |                                                                                 |

## Estimating contemporaneous effects

##     |                                                                                 |

## Computing random effects

##     |                                                                                 |
```

```
# Display the summary of the fit
summary(fit2)
```

```
##
## mlVAR estimation completed. Input was:
##      - Variables: calories moderately_active_minutes
##      - Lags: 1
##      - Estimator: lmer
##      - Temporal: correlated
##
## Information indices:
```

```
##                               var      aic      bic
##                         calories 14828.42 14904.33
##    moderately_active_minutes 18492.80 18568.72
##
##
## Temporal effects:
##                            from                            to lag  fixed    SE     P
##                        calories                      calories   1  0.611 0.037 0.000
##                        calories moderately_active_minutes   1  0.394 0.039 0.000
##   moderately_active_minutes                      calories   1 -0.134 0.018 0.000
##   moderately_active_minutes moderately_active_minutes   1 -0.031 0.027 0.262
##   ran_SD
##    0.268
##    0.263
##    0.093
##    0.166
##
##
## Contemporaneous effects (posthoc estimated):
##                            v1       v2 P 1->2 P 1<-2 pcor ran_SD_pcor  cor
##   moderately_active_minutes calories      0       0 0.74       0.142 0.74
##   ran_SD_cor
##        0.142
##
##
## Between-subject effects:
##                            v1       v2 P 1->2 P 1<-2  pcor   cor
##   moderately_active_minutes calories      0       0 0.549 0.549
```

```r
# Plot the lagged associations of fit1
plot(fit2,"temporal",layout = "circle",nonsig="hide")
title("Lagged Associations")
```
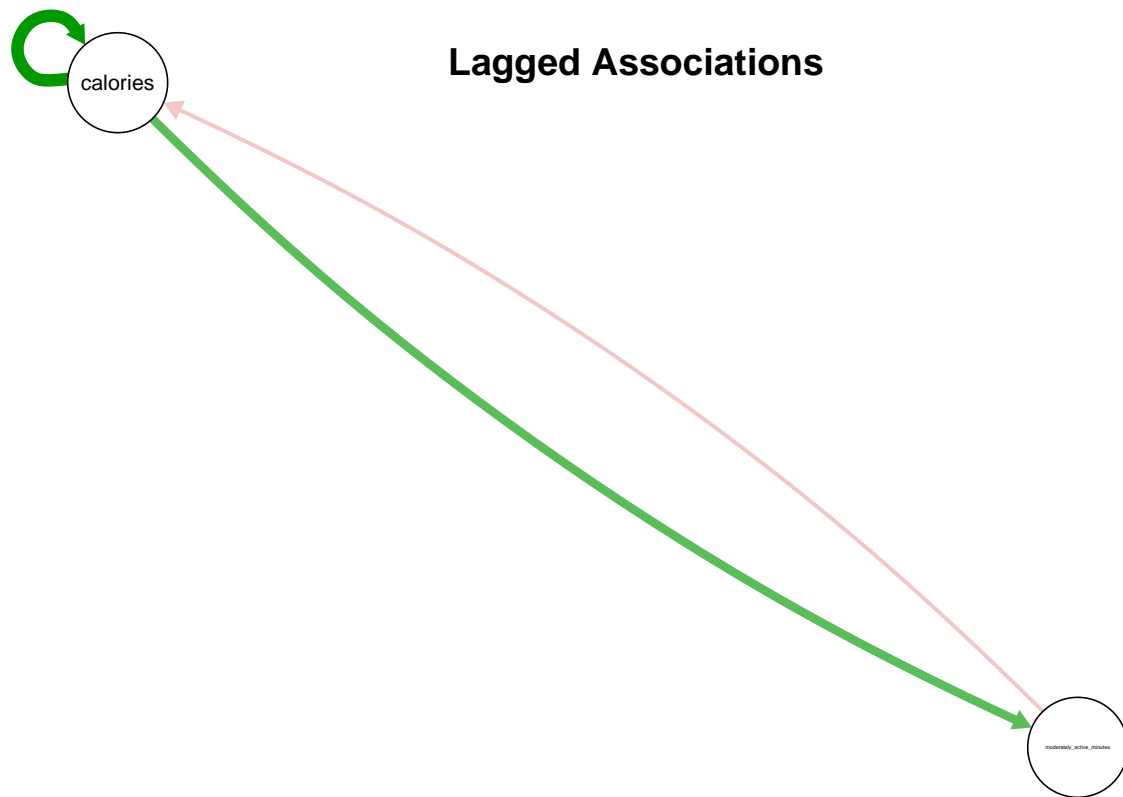
Lagged Associations


```
# Plot the SD of random effects of lagged associations for fit1
plot(fit2,"temporal",layout = "circle",nonsig="hide",SD=TRUE)
title("SD of Random Effects of Lagged Associations")
```

SD of Random Effects of Lagged Associations
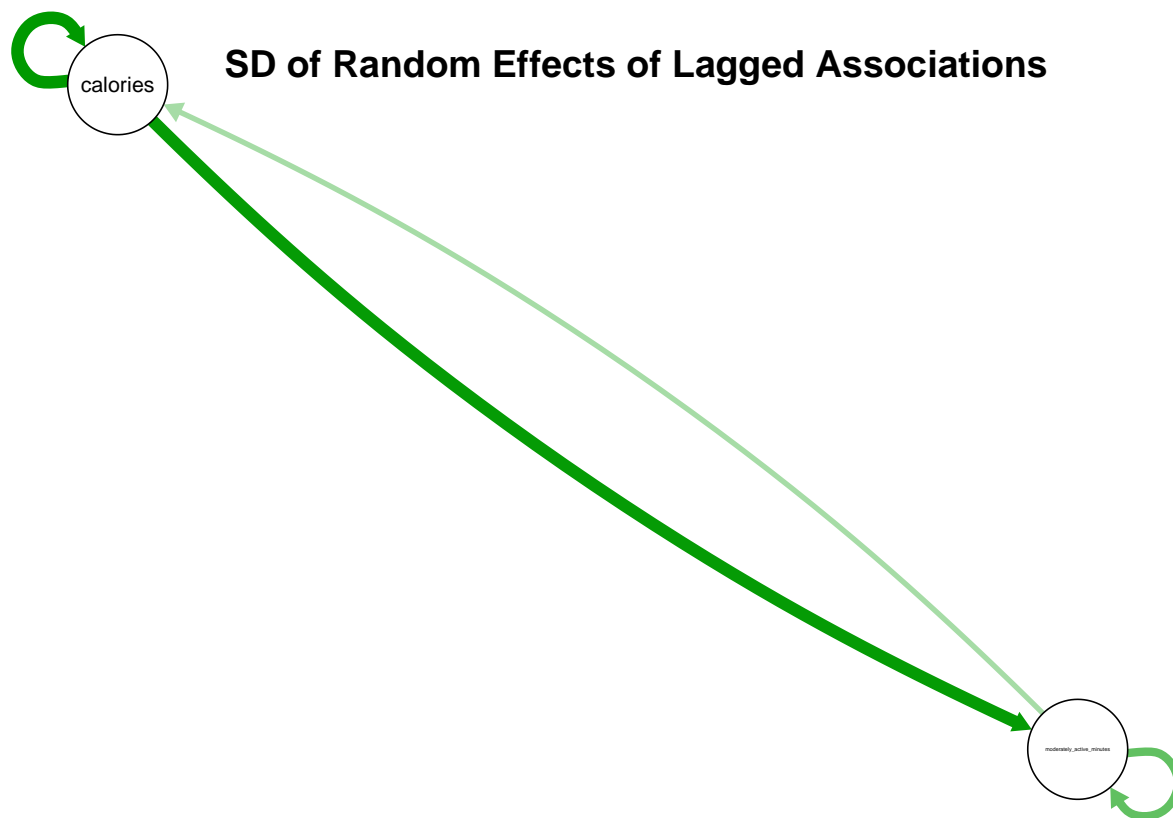
```r
# Plot the contemporaneous associations of fit1
plot(fit2,"contemporaneous",layout = "circle",nonsig="hide")
title("Contemporaneous Associations")
```

Contemporaneous Associations
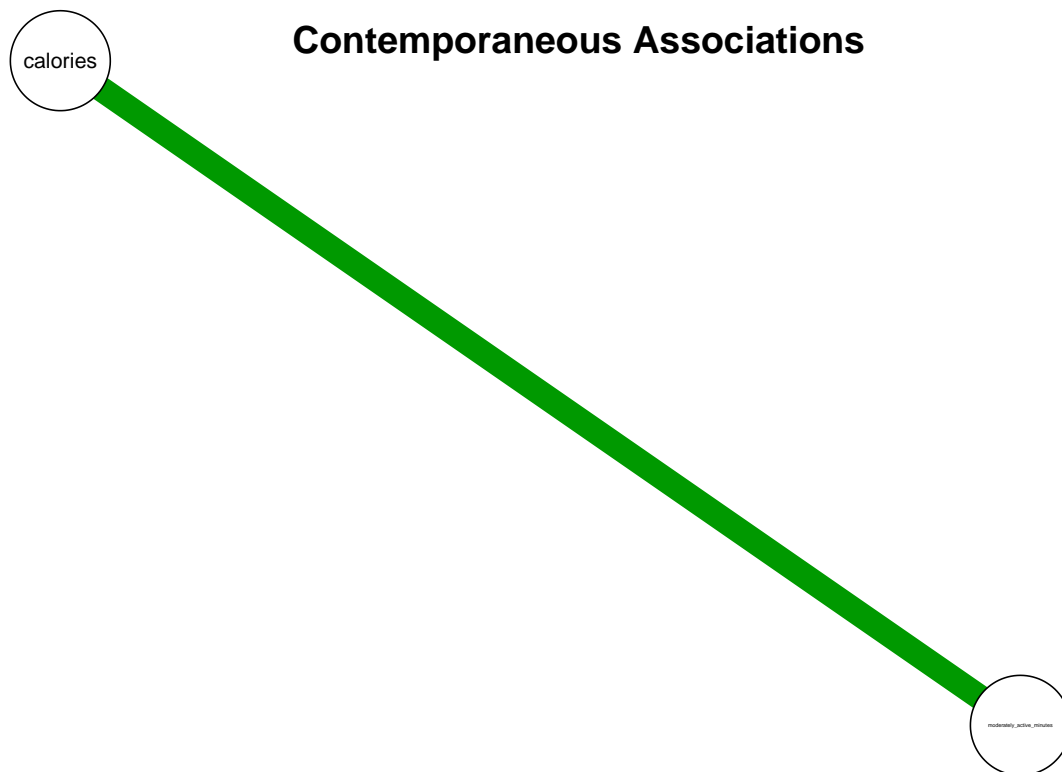

```r
# Estimate the relationship between v1 and v2 using the mlVAR function
fit3 <- mlVAR(completed_data, vars = c("calories","lightly_active_minutes"), idvar = "id", lags = 1, ter
```

```
## Estimating temporal and between-subjects effects
```

```
##   |                                                             |
```

```
## Estimating contemporaneous effects
```

```
##   |                                                             |
```

```
## Computing random effects
```

```
##   |                                                             |
```

```r
# Display the summary of the fit
summary(fit3)
```

```
##
## mlVAR estimation completed. Input was:
##      - Variables: calories lightly_active_minutes
##      - Lags: 1
##      - Estimator: lmer
##      - Temporal: correlated
##
## Information indices:
```

```
##                       var      aic      bic
##                  calories 14651.07 14726.98
##   lightly_active_minutes 14450.35 14526.26
##
##
## Temporal effects:
##                     from                       to lag fixed    SE     P ran_SD
##                 calories                 calories   1 0.216 0.037 0.000  0.244
##                 calories lightly_active_minutes   1 0.082 0.033 0.014  0.206
##   lightly_active_minutes                 calories   1 0.279 0.039 0.000  0.280
##   lightly_active_minutes lightly_active_minutes   1 0.499 0.034 0.000  0.232
##
##
## Contemporaneous effects (posthoc estimated):
##                     v1       v2 P 1->2 P 1<-2  pcor ran_SD_pcor    cor
##   lightly_active_minutes calories      0      0 0.787       0.164 0.787
##   ran_SD_cor
##       0.164
##
##
## Between-subject effects:
##                     v1       v2 P 1->2 P 1<-2  pcor   cor
##   lightly_active_minutes calories      0      0 0.481 0.481
```
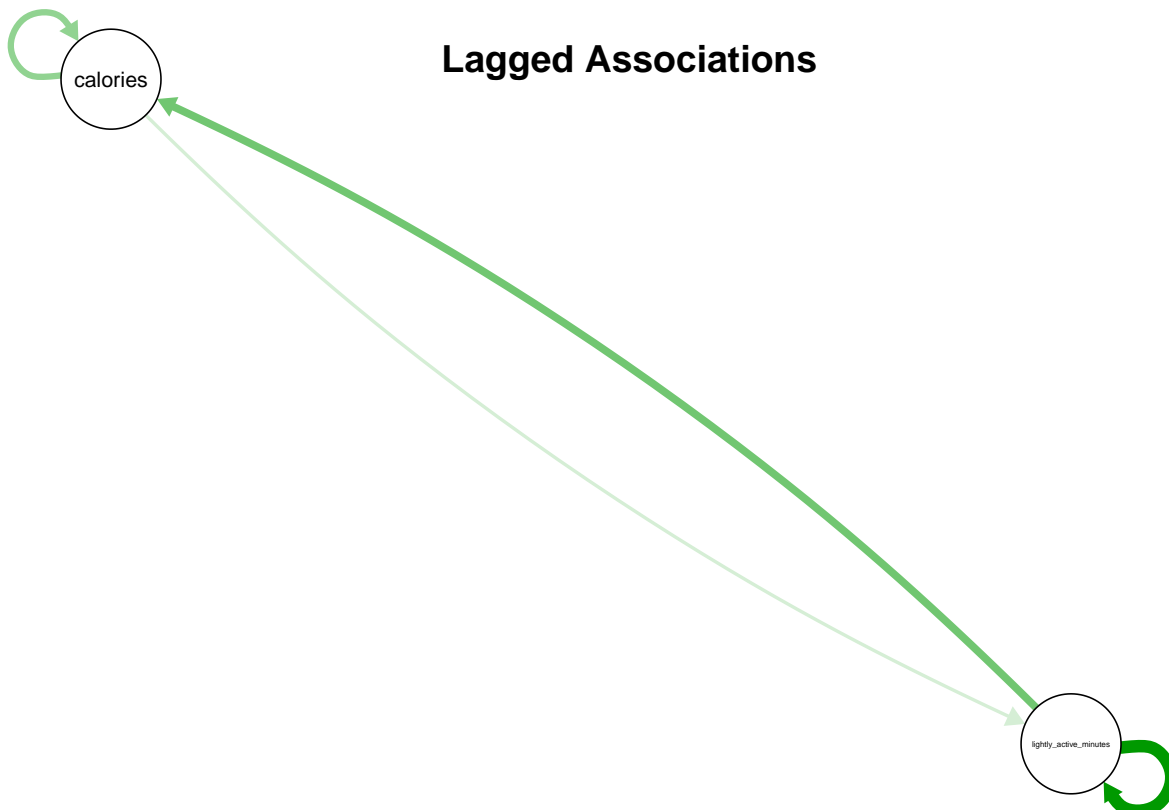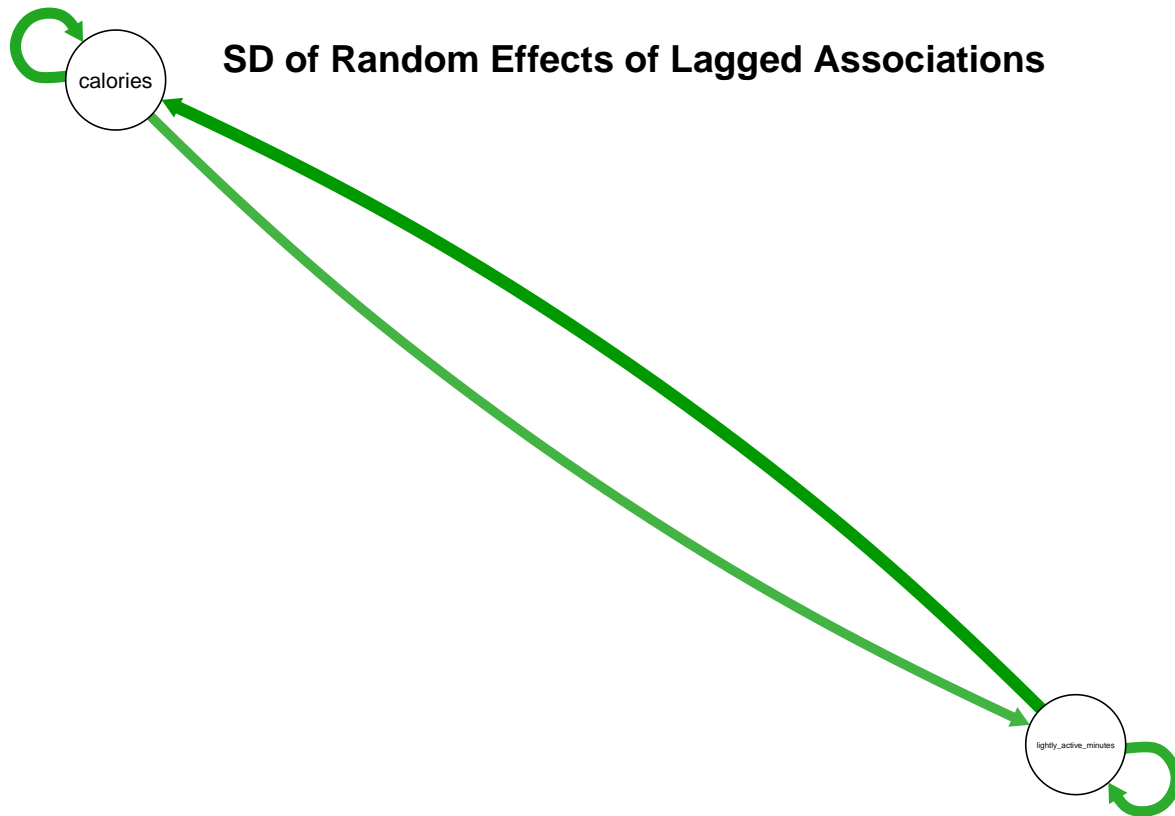
```r
# Plot the lagged associations of fit1
plot(fit3,"temporal",layout = "circle",nonsig="hide")
title("Lagged Associations")
```


Lagged Associations

```
# Plot the SD of random effects of lagged associations for fit1
plot(fit3,"temporal",layout = "circle",nonsig="hide",SD=TRUE)
title("SD of Random Effects of Lagged Associations")
```


SD of Random Effects of Lagged Associations

```
# Plot the contemporaneous associations of fit1
plot(fit3,"contemporaneous",layout = "circle",nonsig="hide")
title("Contemporaneous Associations")
```

Contemporaneous Associations

calories

lightly_active_minutes
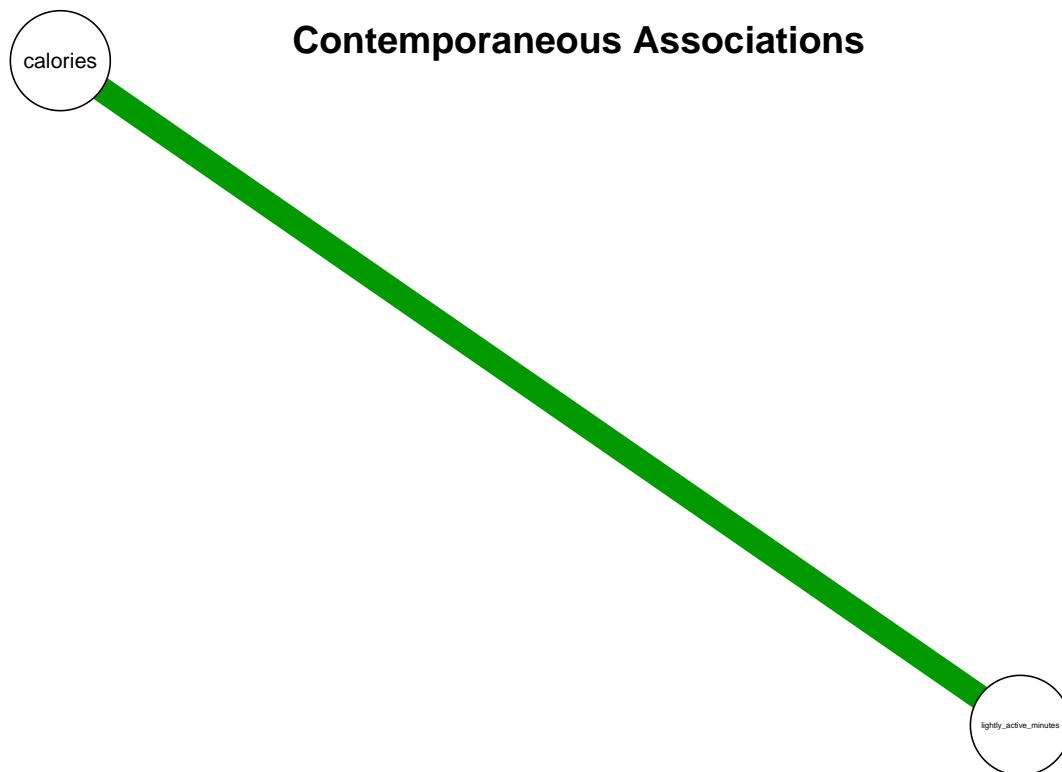
```r
# Estimate the relationship between v1 and v2 using the mlVAR function
fit4 <- mlVAR(completed_data, vars = c("calories","sedentary_minutes"), idvar = "id", lags = 1, temporal
```

```
## Estimating temporal and between-subjects effects
```

```
##   |                                                                     |
```

```
## Estimating contemporaneous effects
```

```
##   |                                                                     |
```

```
## Computing random effects
```

```
##   |                                                                     |
```

```r
# Display the summary of the fit
summary(fit4)
```

```
##
## mlVAR estimation completed. Input was:
##      - Variables: calories sedentary_minutes
##      - Lags: 1
##      - Estimator: lmer
##      - Temporal: correlated
##
## Information indices:
```

```
##                   var      aic      bic
##              calories 14677.97 14753.88
##     sedentary_minutes 13550.05 13625.96
##
##
## Temporal effects:
##                 from                to lag  fixed    SE P ran_SD
##             calories          calories   1  0.347 0.033 0  0.233
##             calories sedentary_minutes   1 -0.260 0.031 0  0.215
##    sedentary_minutes          calories   1 -0.163 0.032 0  0.226
##    sedentary_minutes sedentary_minutes   1  0.370 0.032 0  0.234
##
##
## Contemporaneous effects (posthoc estimated):
##                    v1       v2 P 1->2 P 1<-2   pcor ran_SD_pcor    cor ran_SD_cor
##    sedentary_minutes calories     0     0 -0.546       0.205 -0.546      0.205
##
##
## Between-subject effects:
##                    v1       v2 P 1->2 P 1<-2   pcor    cor
##    sedentary_minutes calories     0     0 -0.468 -0.468
```

```r
# Plot the lagged associations of fit1
plot(fit4,"temporal",layout = "circle",nonsig="hide")
title("Lagged Associations")
```
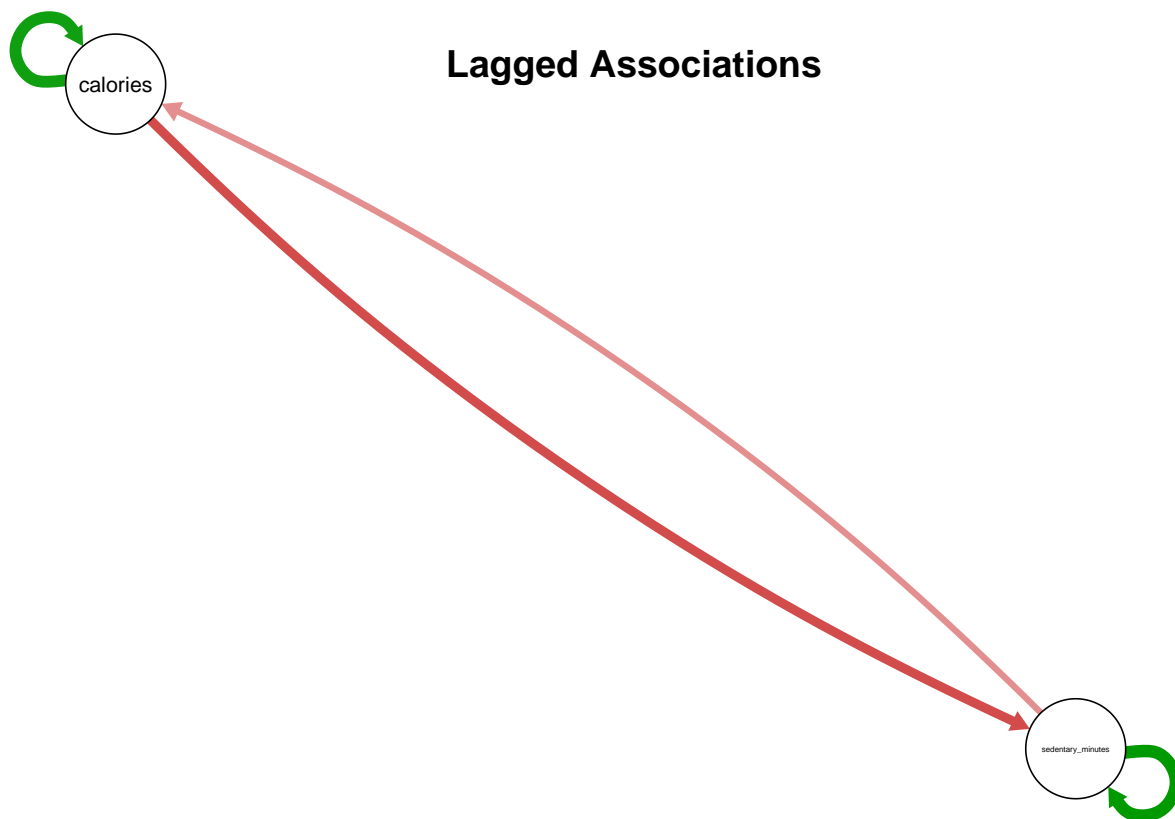

Lagged Associations

```r
# Plot the SD of random effects of lagged associations for fit1
plot(fit4,"temporal",layout = "circle",nonsig="hide",SD=TRUE)
title("SD of Random Effects of Lagged Associations")
```


SD of Random Effects of Lagged Associations
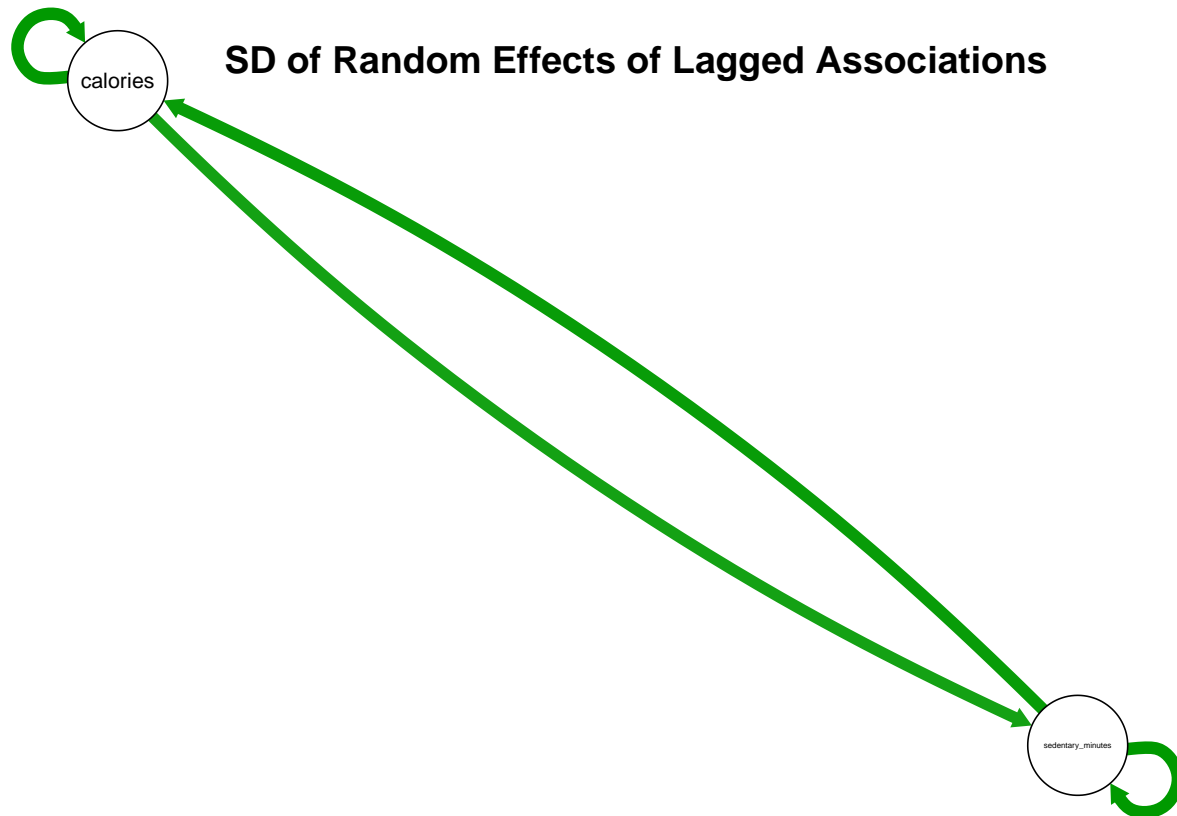
```r
# Plot the contemporaneous associations of fit1
plot(fit4,"contemporaneous",layout = "circle",nonsig="hide")
title("Contemporaneous Associations")
```

Contemporaneous Associations

calories

sedentary_minutes