**Symptom network as a prediction marker**

**for remission in first episode psychosis**

**Supplemental materials**

Included in this file are:

[Table S1. Global connectivity of the networks in the remitters and non-remitters at baseline and 6-month after adjusting baseline severity of the PANSS. 2](#_Toc45548344)

[Table S2. Correlation matrix of the network in the remitters at baseline 3](#_Toc45548345)

[Table S3. Correlation matrix of the network in the non-remitters at baseline 4](#_Toc45548346)

[Table S4. Correlation matrix of the network in the remitters at 6-month 5](#_Toc45548347)

[Table S5. Correlation matrix of the network in the non-remitters at 6-month 6](#_Toc45548348)

[Table S6. Centrality indices of single node in the remitters and non-remitters at baseline and 6-month 7](#_Toc45548349)

[Figure S1. Bootstrapped 95% confidence intervals (CI) for the estimated edge weights in the networks. 11](#_Toc38185864)

[Figure S2. Case-dropping bootstrap for the networks. 1](#_Toc38185865)5

[Figure S3. Bootstrapped difference tests of edge weights in the networks.](#_Toc38185866) 19

Figure S4. Bootstrapped difference tests of strength centrality in the network [2](#_Toc57643452)3

[R code 2](#_Toc38185868)4

Table S1. Global connectivity of the networks in the remitters and non-remitters at baseline and 6-month after adjusting baseline severity of the PANSS.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Characteristics** | **Baseline** | | ***p*-valuea** | **6-month** | | ***p-*valuea** | **Remitters** | | ***p*-valuea** | **Non-Remitters** | | ***p*-valuea** |
| **Remitters** | **Non-Remitters** | **Remitters** | **Non-Remitters** | **Baseline** | **6-month** | **Baseline** | **6-month** |
| **(N = 68)** | **(N = 68)** | **(N = 68)** | **(N = 68)** | **(N = 68)** | **(N = 68)** | **(N = 68)** | **(N = 68)** |
| Density | 0.377 | 0.511 | 0.028 | 0.533 | 0.422 | 0.063 | 0.377 | 0.533 | 0.005 | 0.511 | 0.422 | 0.176 |
| Global strength | 3.394 | 4.09 | 0.58 | 4.647 | 4.1 | 0.354 | 3.394 | 4.647 | 0.243 | 4.09 | 4.1 | 0.984 |
| Average clustering coefficient | 0.2666 | 0.3732 | 0.496 | 0.35 | 0.33 | 0.901 | 0.2666 | 0.35 | 0.649 | 0.373 | 0.33 | 0.825 |
| Modularity quality index (Q) | 0.3902 | 0.3428 | 0.736 | 0.1502 | 0.3407 | 0.179 | 0.3902 | 0.1502 | 0.214 | 0.342 | 0.34 | 0.993 |
| Average shortest path length | 1.8889 | 1.5111 | 0.625 | 1.4667 | 1.6 | 0.476 | 1.8889 | 1.4667 | 0.526 | 1.511 | 1.6 | 0.728 |

***a*** is the results of permutation test (global strength from NCT and the others from NetworkToolbox)

Table S2. Correlation matrix of the network in the remitters at baseline

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | P | N | G | CS | NS | PS | NO | PO | Em | Co |
| P |  | 0.000 | 0.611 | 0.022 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| N | 0.000 |  | 0.467 | 0.000 | 0.000 | -0.011 | 0.000 | 0.000 | 0.000 | 0.000 |
| G | 0.611 | 0.467 |  | 0.083 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| CS | 0.022 | 0.000 | 0.083 |  | 0.153 | -0.146 | 0.149 | -0.021 | 0.012 | 0.104 |
| NS | 0.000 | 0.000 | 0.000 | 0.153 |  | -0.048 | 0.274 | 0.000 | 0.000 | 0.322 |
| PS | 0.000 | -0.011 | 0.000 | -0.146 | -0.048 |  | 0.000 | 0.274 | 0.000 | -0.014 |
| NO | 0.000 | 0.000 | 0.000 | 0.149 | 0.274 | 0.000 |  | 0.000 | 0.119 | 0.083 |
| PO | 0.000 | 0.000 | 0.000 | -0.021 | 0.000 | 0.274 | 0.000 |  | 0.000 | 0.000 |
| Em | 0.000 | 0.000 | 0.000 | 0.012 | 0.000 | 0.000 | 0.119 | 0.000 |  | 0.482 |
| Co | 0.000 | 0.000 | 0.000 | 0.104 | 0.322 | -0.014 | 0.083 | 0.000 | 0.482 |  |

Names of the nodes ("P","N","G", "CS","NS","PS","NO","PO","Em", "Co") were "Positive symptoms", "Negative symptoms", "General psychopathology", "Depressive symptoms (in the CDSS)", "Negative-self", "Positive-self", "Negative-others", "Positive-other", "Emotional domain" and "Cognitive domain" respectively

Table S3. Correlation matrix of the network in the non-remitters at baseline

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | P | N | G | CS | NS | PS | NO | PO | Em | Co |
| P |  | 0.000 | 0.562 | 0.045 | 0.000 | 0.087 | 0.000 | 0.000 | 0.020 | 0.084 |
| N | 0.000 |  | 0.516 | 0.000 | 0.000 | -0.093 | 0.033 | 0.000 | 0.000 | 0.000 |
| G | 0.562 | 0.516 |  | 0.088 | 0.000 | 0.000 | 0.062 | 0.000 | 0.000 | 0.000 |
| CS | 0.045 | 0.000 | 0.088 |  | 0.236 | 0.000 | 0.060 | 0.000 | 0.067 | 0.000 |
| NS | 0.000 | 0.000 | 0.000 | 0.236 |  | -0.187 | 0.323 | 0.000 | 0.188 | 0.259 |
| PS | 0.087 | -0.093 | 0.000 | 0.000 | -0.187 |  | 0.000 | 0.315 | 0.079 | 0.000 |
| NO | 0.000 | 0.033 | 0.062 | 0.060 | 0.323 | 0.000 |  | -0.118 | 0.183 | 0.000 |
| PO | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.315 | -0.118 |  | 0.000 | 0.003 |
| Em | 0.020 | 0.000 | 0.000 | 0.067 | 0.188 | 0.079 | 0.183 | 0.000 |  | 0.477 |
| Co | 0.084 | 0.000 | 0.000 | 0.000 | 0.259 | 0.000 | 0.000 | 0.003 | 0.477 |  |

Names of the nodes ("P","N","G", "CS","NS","PS","NO","PO","Em", "Co") were "Positive symptoms", "Negative symptoms", "General psychopathology", "Depressive symptoms (in the CDSS)", "Negative-self", "Positive-self", "Negative-others", "Positive-other", "Emotional domain" and "Cognitive domain" respectively

Table S4. Correlation matrix of the network in the remitters at 6-month

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | P | N | G | CS | NS | PS | NO | PO | Em | Co |
| P |  | 0.126 | 0.408 | 0.000 | 0.000 | 0.000 | 0.026 | 0.000 | 0.016 | 0.000 |
| N | 0.126 |  | 0.474 | 0.000 | 0.000 | -0.021 | 0.000 | -0.047 | 0.000 | -0.098 |
| G | 0.408 | 0.474 |  | 0.162 | 0.000 | 0.000 | 0.048 | -0.007 | 0.000 | 0.000 |
| CS | 0.000 | 0.000 | 0.162 |  | 0.139 | -0.122 | 0.000 | 0.000 | 0.000 | 0.054 |
| NS | 0.000 | 0.000 | 0.000 | 0.139 |  | -0.165 | 0.299 | 0.000 | 0.000 | 0.377 |
| PS | 0.000 | -0.021 | 0.000 | -0.122 | -0.165 |  | 0.000 | 0.525 | 0.000 | 0.000 |
| NO | 0.026 | 0.000 | 0.048 | 0.000 | 0.299 | 0.000 |  | 0.000 | 0.146 | 0.000 |
| PO | 0.000 | -0.047 | -0.007 | 0.000 | 0.000 | 0.525 | 0.000 |  | 0.000 | 0.000 |
| Em | 0.016 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.146 | 0.000 |  | 0.546 |
| Co | 0.000 | -0.098 | 0.000 | 0.054 | 0.377 | 0.000 | 0.000 | 0.000 | 0.546 |  |

Names of the nodes ("P","N","G", "CS","NS","PS","NO","PO","Em", "Co") were "Positive symptoms", "Negative symptoms", "General psychopathology", "Depressive symptoms (in the CDSS)", "Negative-self", "Positive-self", "Negative-others", "Positive-other", "Emotional domain" and "Cognitive domain" respectively

Table S5. Correlation matrix of the network in the non-remitters at 6-month

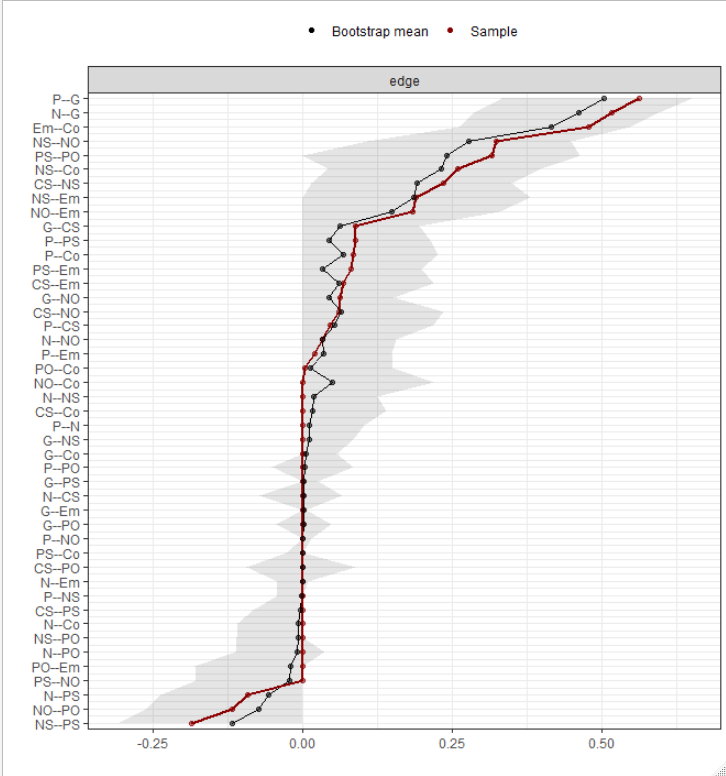
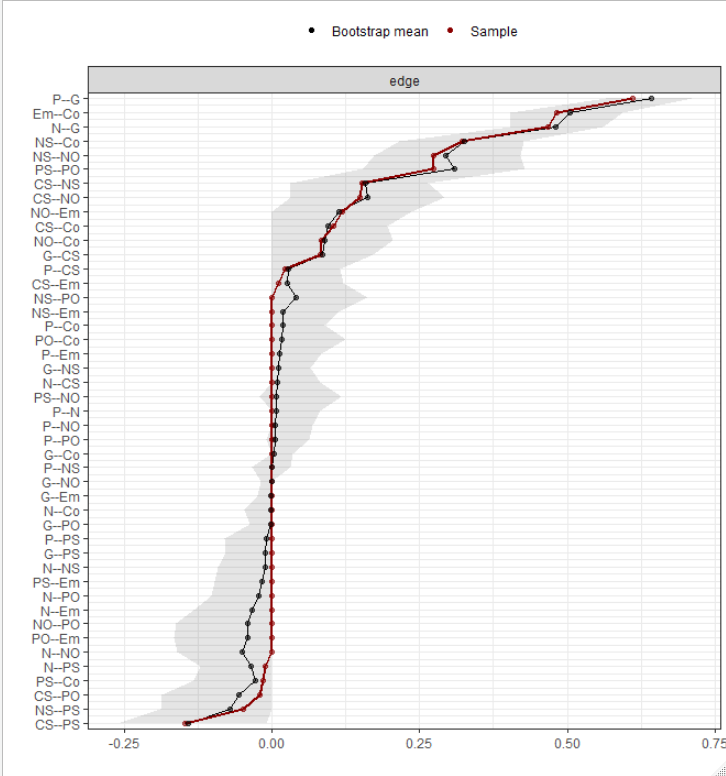
|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | P | N | G | CS | NS | PS | NO | PO | Em | Co |
| P |  | 0.000 | 0.446 | 0.000 | 0.000 | 0.000 | 0.021 | 0.000 | 0.056 | 0.000 |
| N | 0.000 |  | 0.476 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | -0.099 |
| G | 0.446 | 0.476 |  | 0.336 | 0.000 | 0.050 | 0.069 | 0.000 | 0.000 | 0.000 |
| CS | 0.000 | 0.000 | 0.336 |  | 0.243 | 0.000 | 0.088 | 0.000 | 0.000 | 0.000 |
| NS | 0.000 | 0.000 | 0.000 | 0.243 |  | -0.275 | 0.304 | 0.000 | 0.016 | 0.265 |
| PS | 0.000 | 0.000 | 0.050 | 0.000 | -0.275 |  | 0.000 | 0.423 | 0.000 | 0.000 |
| NO | 0.021 | 0.000 | 0.069 | 0.088 | 0.304 | 0.000 |  | -0.068 | 0.211 | 0.000 |
| PO | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.423 | -0.068 |  | -0.127 | 0.000 |
| Em | 0.056 | 0.000 | 0.000 | 0.000 | 0.016 | 0.000 | 0.211 | -0.127 |  | 0.526 |
| Co | 0.000 | -0.099 | 0.000 | 0.000 | 0.265 | 0.000 | 0.000 | 0.000 | 0.526 |  |

Names of the nodes ("P","N","G", "CS","NS","PS","NO","PO","Em", "Co") were "Positive symptoms", "Negative symptoms", "General psychopathology", "Depressive symptoms (in the CDSS)", "Negative-self", "Positive-self", "Negative-others", "Positive-other", "Emotional domain" and "Cognitive domain" respectively

Table S6. Comparison of nodal strength in the remitters and non-remitters at baseline and 6-month

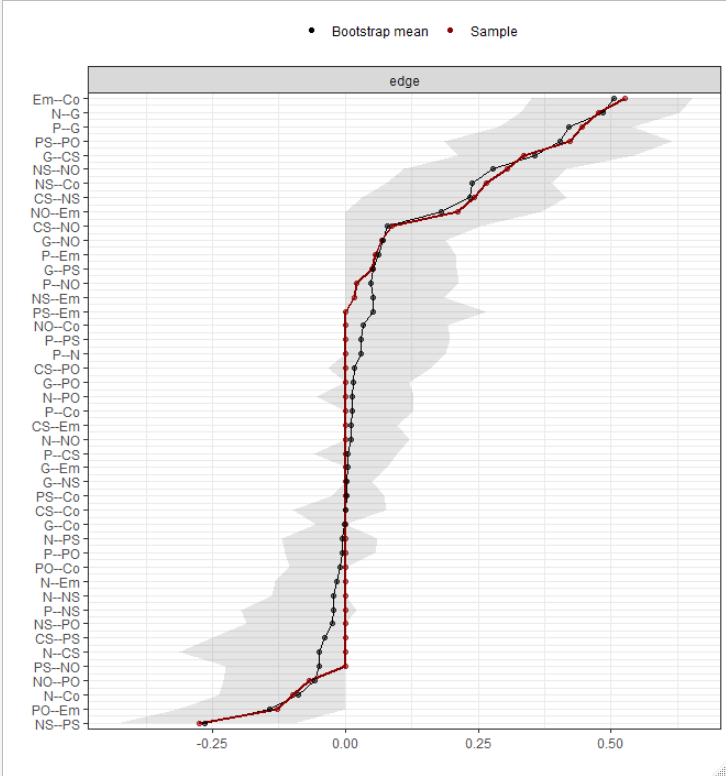
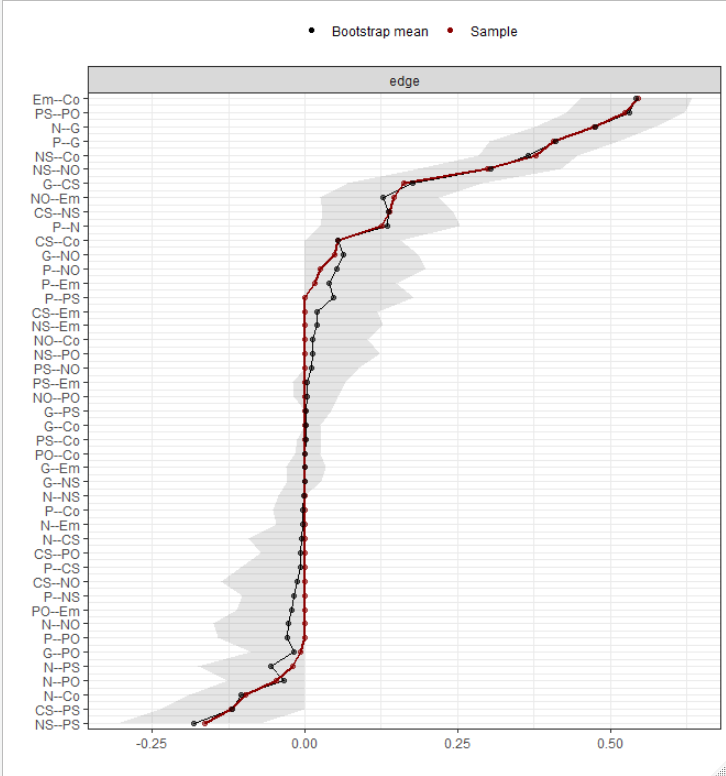
|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Node | Remitter | | |  | Non-remitter | | |
| R-B | R-6 | Change |  | NR-B | NR-6 | Change |
| P | -0.179 | -0.803 | -0.624 |  | -0.076 | -1.121 | -1.045 |
| N | -0.79 | 0.021 | 0.811 |  | -0.662 | -0.925 | -0.264 |
| G | 1.889 | 1.468 | -0.421 |  | 1.548 | 2.109 | 0.561 |
| CS | 0.042 | -1.237 | -1.279 |  | -1.213 | -0.578 | 0.635 |
| NS | 0.464 | 0.953 | 0.489 |  | 1.417 | 1.069 | -0.349 |
| PS | -0.732 | 0.309 | 1.041 |  | -0.211 | -0.274 | -0.063 |
| NO | -0.207 | -1.055 | -0.849 |  | -0.137 | -0.221 | -0.083 |
| PO | -1.509 | -0.792 | 0.717 |  | -1.436 | -0.76 | 0.676 |
| Em | -0.257 | -0.232 | 0.025 |  | 0.745 | 0.438 | -0.307 |
| Co | 1.279 | 1.368 | 0.089 |  | 0.025 | 0.263 | 0.239 |

Centrality index is shown as standardized z-scores. The remitters at baseline and 6-month (R-B and R-6) and the non-remitters at baseline and 6-month (NR-B and NR-6).



a)

b)

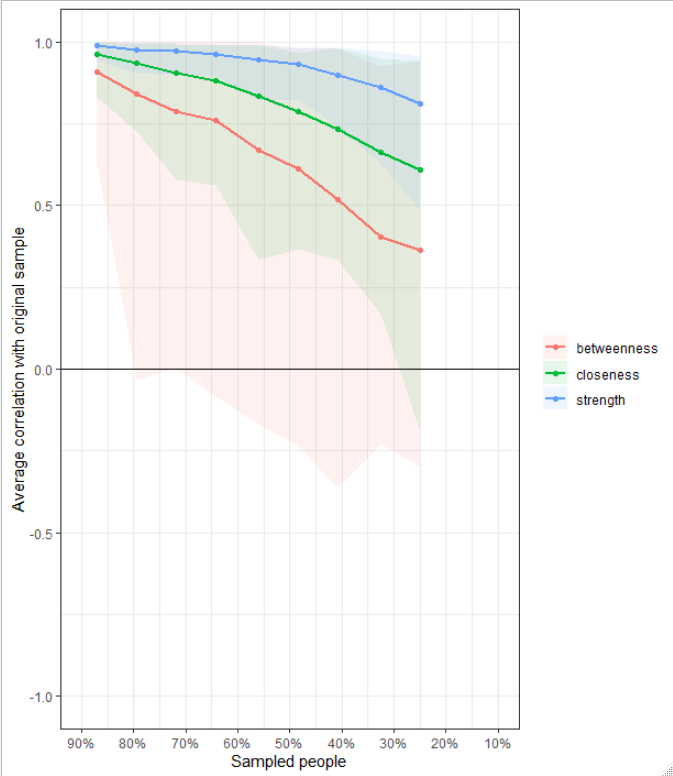


c)

d)

Figure S1. Bootstrapped 95% confidence intervals (CI) for the estimated edge weights in the networks.

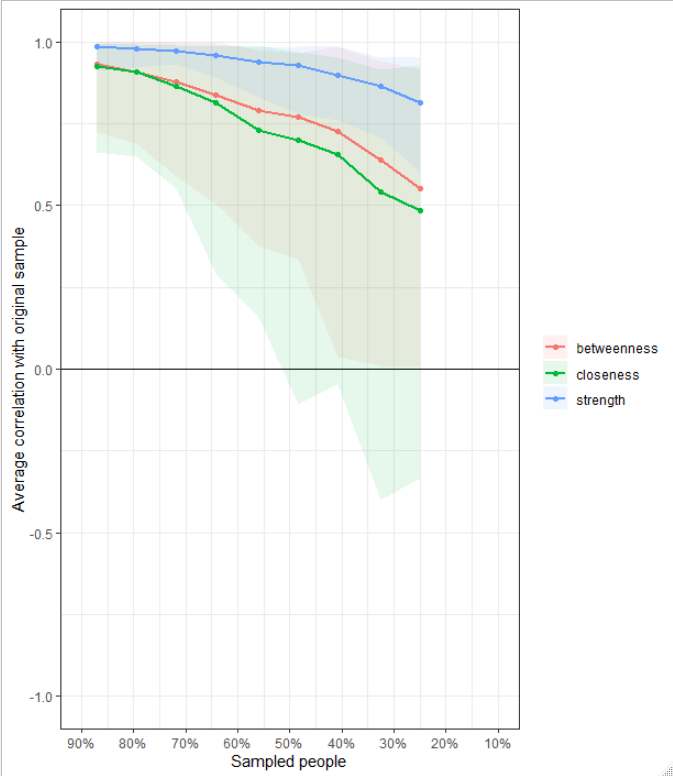
a) the remitters at baseline; b) non-remitters at baseline; c) remitters at 6-month; and d) non-remitters at 6-month. The red line indicates the sample values and the gray area the bootstrapped CIs. Each horizontal line represents one edge of the network, ordered from the edge with the highest edge-weight to the edge with the lowest edge-weight.



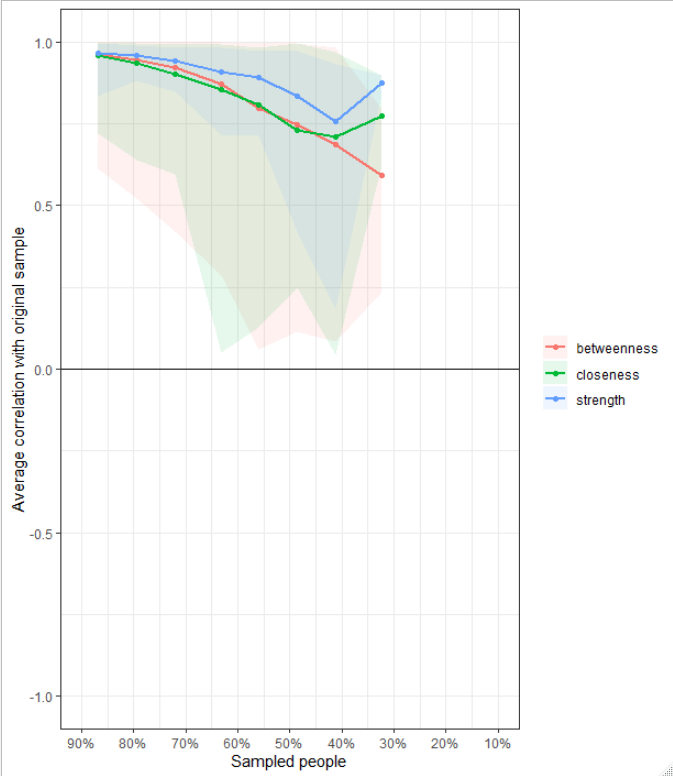
a)



b)



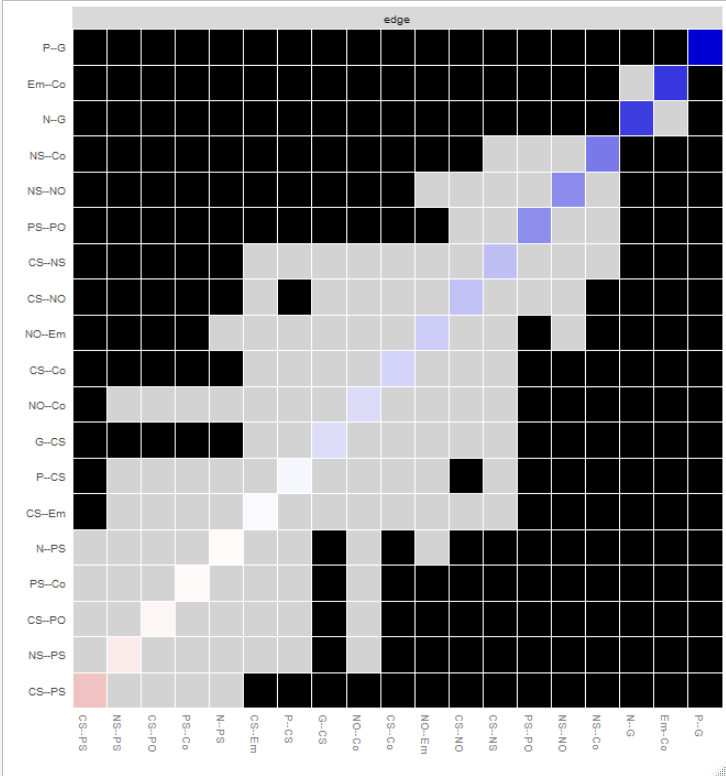
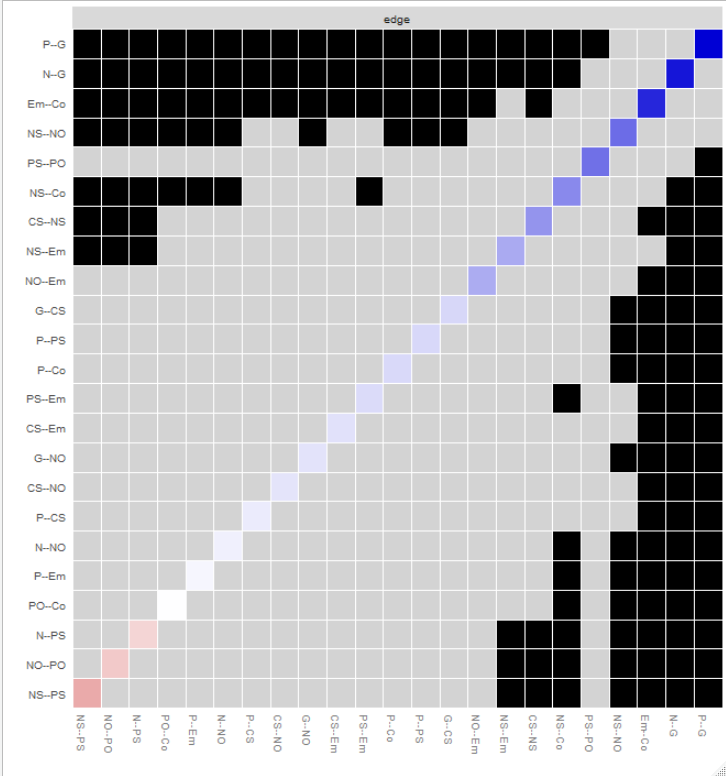
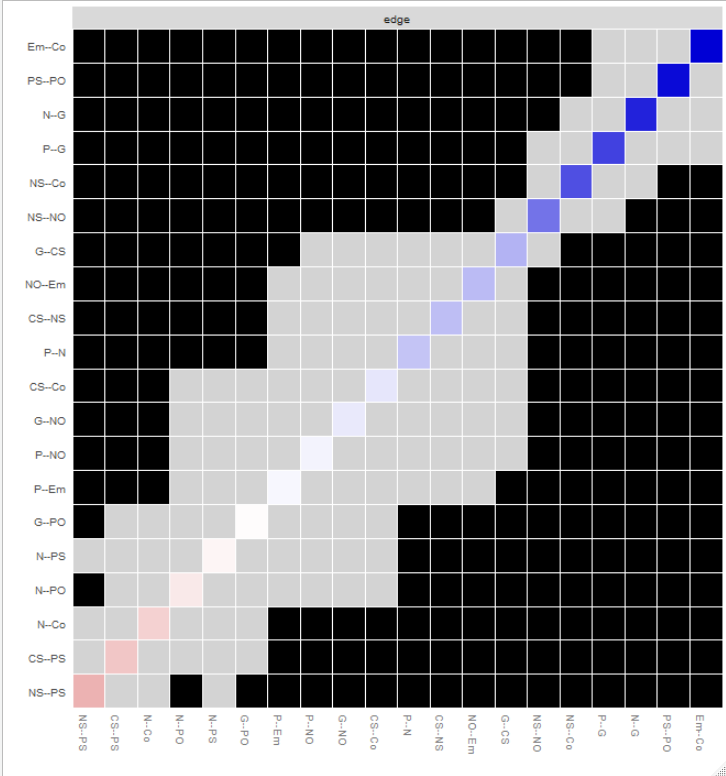
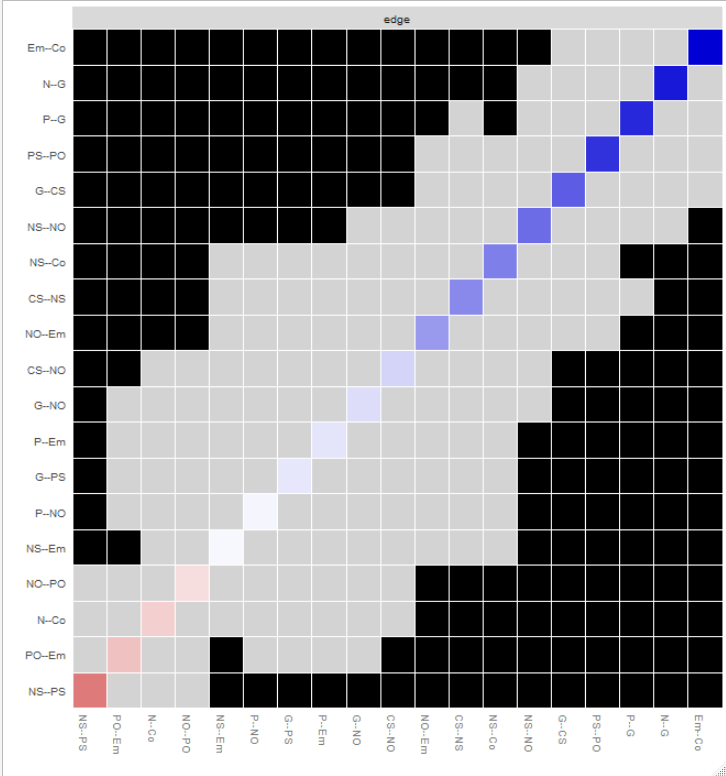
c)



d)

Figure S2. Case-dropping bootstrap for the networks.

a) the remitters at baseline; b) non-remitters at baseline; c) remitters at 6-month; and d) non-remitters at 6-month (Average correlations between the centrality measures estimated with the full sample and the centrality measures estimated with smaller samples)

a)

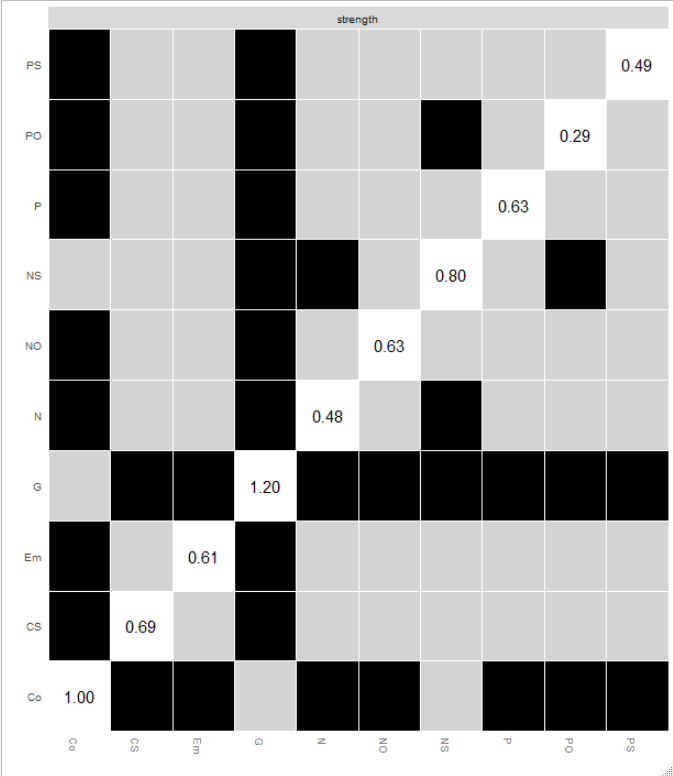
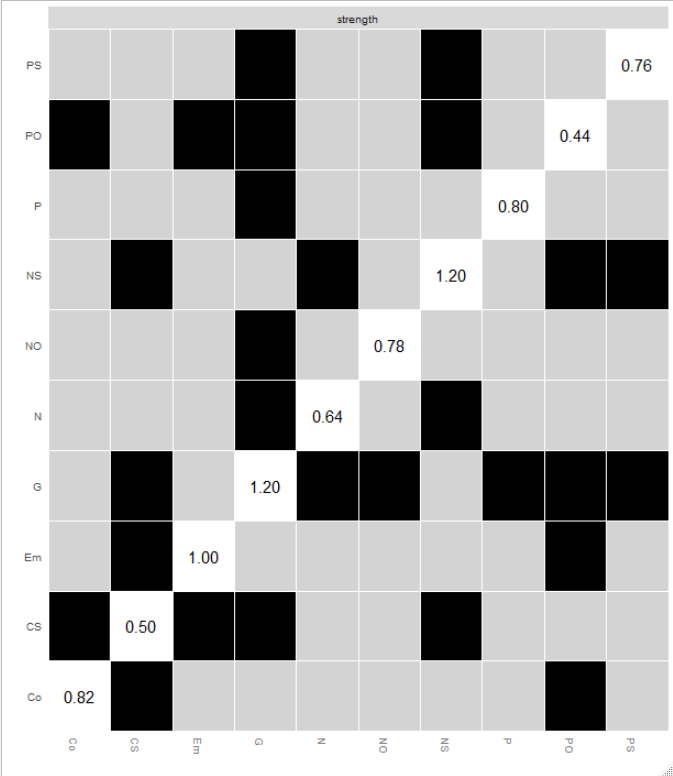
b)

c)

d)

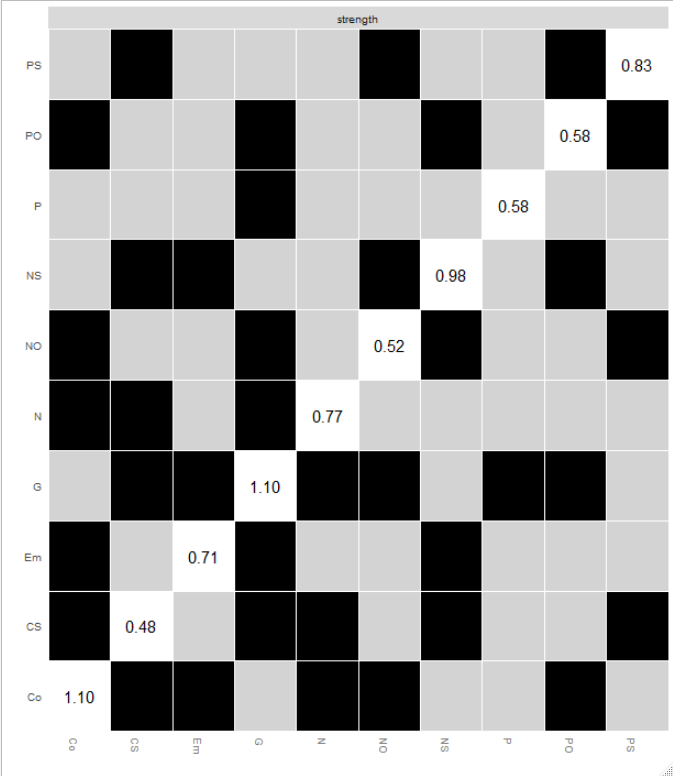
Figure S3. Bootstrapped difference tests of edge weights in the networks.

a) the remitters at baseline; b) non-remitters at baseline; c) remitters at 6-month; and d) non-remitters at 6-month. Black boxes indicate a significant difference between two edges (alpha = .05). Grey boxes indicate no significant difference.

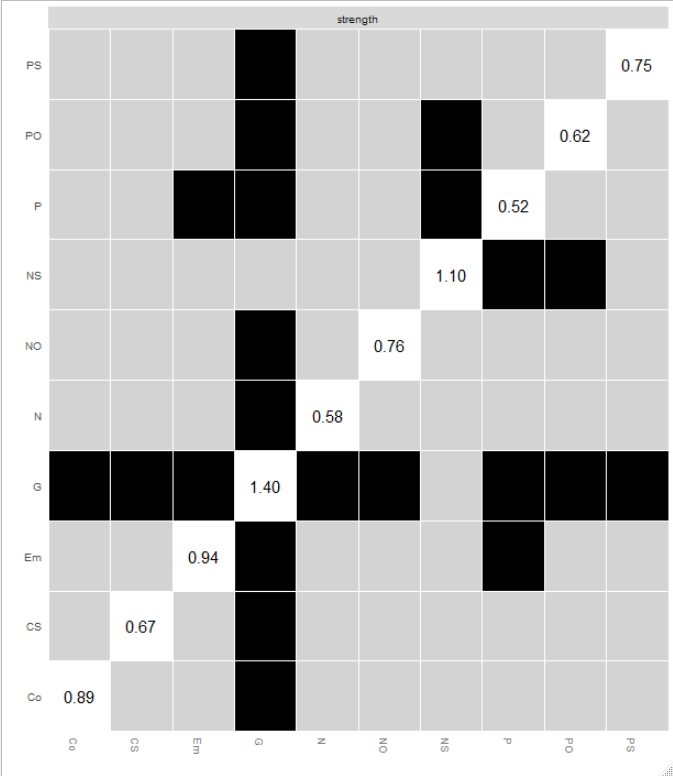
 

a)

b)



c)



d)

Figure S4. Bootstrapped difference tests of strength centrality in the networks.

a) the remitters at baseline; b) non-remitters at baseline; c) remitters at 6-month; and d) non-remitters at 6-month. Black boxes indicate a significant difference between the strength centrality of two nodes (alpha = 0.05). Grey boxes indicate no significant difference.

# R code

### Network analysis

##Required libraries

library("readxl")

library(qgraph)

library(huge)

library("psychTools")

library(reshape2)

library(NetworkComparisonTest)

library(data.table)

library("Deducer")

# Set the random seed:

set.seed(123)

#data

BS <- read\_excel("D:/Research/ ") # Baseline

TM <- read\_excel("D:/Research/ ") # 6 month

RB=subset(BS,RM=="1")

NRB=subset(BS,RM=="0")

R6=subset(TM,RM=="1")

NR6=subset(TM,RM=="0")

RB= RB[, c(2:10,11)] # remission group at baseline

NRB= NRB[, c(2:10,11)] # non-remission group at baseline

R6= R6[, c(2:10,11)] # remission group at 6 month

NR6= NR6[, c(2:10,11)] # non-remission group at 6 month

#Reset names

setnames (RB, old = c("PANSS-P-TO","PANSS-N-TO", "PANSS-G-TO", "CDSS TO", "BCSS-NS","BCSS-PS","BCSS-NO","BCSS-PO","BS-EM", "BS-CO"),

new = c("P","N","G", "CS","NS","PS","NO","PO","Em", "Co"))

setnames (NRB, old = c("PANSS-P-TO", "PANSS-N-TO", "PANSS-G-TO", "CDSS TO", "BCSS-NS","BCSS-PS","BCSS-NO","BCSS-PO","BS-EM", "BS-CO"),

new = c("P","N","G", "CS","NS","PS","NO","PO","Em", "Co"))

setnames (R6, old = c("PANSS-P-TO", "PANSS-N-TO", "PANSS-G-TO", "CDSS TO", "BCSS-NS","BCSS-PS","BCSS-NO","BCSS-PO","BS-EM", "BS-CO"),

new = c("P","N","G", "CS","NS","PS","NO","PO","Em", "Co"))

setnames (NR6, old = c("PANSS-P-TO", "PANSS-N-TO", "PANSS-G-TO", "CDSS TO", "BCSS-NS","BCSS-PS","BCSS-NO","BCSS-PO","BS-EM", "BS-CO"),

new = c("P","N","G", "CS","NS","PS","NO","PO","Em", "Co"))

#Nonparanormal Transformation

NRB1 <- huge.npn(NRB )

RB1<- huge.npn(RB)

R61 <- huge.npn(R6 )

NR61<- huge.npn(NR6)

# Estimate networks

library('bootnet')

net1 <- estimateNetwork(RB1,default = "EBICglasso",corMethod = "cor\_auto",tuning = 0.5)

net2 <- estimateNetwork(NRB1,default = "EBICglasso",corMethod = "cor\_auto",tuning = 0.5)

net3 <- estimateNetwork(R61,default = "EBICglasso",corMethod = "cor\_auto",tuning = 0.5)

net4 <- estimateNetwork(NR61,default = "EBICglasso",corMethod = "cor\_auto",tuning = 0.5)

#get matrices

net1$graph

net2$graph

net3$graph

net4$graph

#Plot

L <- averageLayout(net1,net2,net3,net4)

group.item1 <- list("PANSS" = 1:3,"CDSS" = 4,"BCSS" = 5:8,"BS " = 9:10)

n1=plot(net1, title="a)", groups = group.item1,cut = 0.03,negDashed=TRUE,layout = L)

n2=plot(net2, title="b)", groups = group.item1,cut = 0.03,negDashed=TRUE,layout = L)

n3=plot(net3, title="c)", groups = group.item1,cut = 0.03,negDashed=TRUE,layout = L)

n4=plot(net4, title="d)", groups = group.item1,cut = 0.03,negDashed=TRUE,layout = L)

#centrality

Cent1 <- centralityTable(net1, standardized = TRUE)

Cent2 <- centralityTable(net2, standardized = TRUE)

Cent3 <- centralityTable(net3, standardized = TRUE)

centralityPlot(Centrality = list("R-B" = net1,"NR-B" = net2),

include=c("Strength","Closeness", "Betweenness"),

labels = names(RB),decreasing=T)+ theme(legend.title = element\_blank())

#Stability

b1 <- bootnet(net1, nCores = 8,nBoots = 1000, type = 'nonparametric')

b2 <- bootnet(net1, nCores = 8,nBoots = 1000, type = 'case',

statistics=c('strength','closeness','betweenness'))

b3 <- bootnet(net2, nCores = 8,nBoots = 1000, type = 'nonparametric')

b4 <- bootnet(net2, nCores = 8,nBoots = 1000, type = 'case',

statistics=c('strength','closeness','betweenness'))

b5 <- bootnet(net3, nCores = 8,nBoots = 1000, type = 'nonparametric')

b6 <- bootnet(net3, nCores = 8,nBoots = 1000, type = 'case',

statistics=c('strength','closeness','betweenness'))

b7 <- bootnet(net4, nCores = 8,nBoots = 1000, type = 'nonparametric')

b8 <- bootnet(net4, nCores = 8,nBoots = 1000, type = 'case',

statistics=c('strength','closeness','betweenness'))

plot(b1, order="sample", plot="area", prop0=F)# confidence intervals

plot(b1, "edge", plot = "difference", onlyNonZero = TRUE, order = "sample") # difference of edges

plot(b1, "strength", plot = "difference") # node strength

plot(b2 ,statistics=c('strength','closeness','betweenness'))+ theme(legend.title = element\_blank())

corStability(b2 )

corStability(b4 )

corStability(b6 )

corStability(b8 )

##Network comparsion test

nct1<- NCT(net1, net2, it=1000,paired = FALSE,test.edges = TRUE,edges="all",

test.centrality=TRUE,centrality=c("strength","closeness","betweenness"))

nct2<- NCT(net3, net4, it=1000,paired = FALSE,test.edges = TRUE,edges="all",

test.centrality=TRUE,centrality=c("strength","closeness","betweenness"))

nct3<- NCT(net1, net3, it=1000,paired = TRUE,test.edges = TRUE,edges="all",

test.centrality=TRUE,centrality=c("strength","closeness","betweenness"))

nct4<- NCT(net2, net4, it=1000,paired = TRUE,test.edges = TRUE,edges="all",

test.centrality=TRUE,centrality=c("strength","closeness","betweenness"))

nct1

## Perform permutation test

library("NetworkToolbox")

perm.str <- network.permutation(RB1, NRB1, iter = 1000, network = "glasso",

measure = "strength", alternative = "two.tailed", ncores = 4)

#Average shortest path length

perm.aspl <- network.permutation(prev.perm = perm.str, measure = "ASPL", ncores = 4)

#Average clustering coefficient

perm.aspl <- network.permutation(prev.perm = perm.str, measure = "CC", ncores = 4)

# Modularity quality index

perm.aspl <- network.permutation(prev.perm = perm.str, measure = "Q", ncores = 4)

#smallworldness

perm.aspl <- network.permutation(prev.perm = perm.str, measure = "S", ncores = 4)

# Check results

perm.aspl$result

#density

g = as.igraph(n1, attributes=TRUE)

a=(degree(g))/(vcount(g)-1)

g = as.igraph(n2, attributes=TRUE)

b=(degree(g))/(vcount(g)-1)

perm.t.test(a,b,statistic=c("t","mean"),alternative=c("two.sided"), midp=TRUE, B=1000)

##Represent Node sizes represent the difference of centrality

#strength

Cent2 <- centralityTable(net1, standardized = TRUE)

Cent3 <- centralityTable(net3, standardized = TRUE)

table.data1 <- data.frame("Item" = Cent2[Cent2$measure == "Strength",3],

"Strength" = Cent2[Cent2$measure == "Strength",5])

table.data2 <- data.frame("Item" = Cent3[Cent3$measure == "Strength",3],

"Strength" = Cent3[Cent3$measure == "Strength",5])

data3 <- table.data1[,2]

data4 <- table.data2[,2]

data5=data4-data3

plot(net1, title="a)", groups = group.item1,cut = 0.03,negDashed=TRUE,layout = L,vsize =data3\*10,esize=14)

plot(net3, title="b)", groups = group.item1,cut = 0.03,negDashed=TRUE,layout = L,vsize =data4\*10,esize=14)

plot(net3, title="c)", groups = group.item1,cut = 0.03,negDashed=TRUE,layout = L,vsize =data5\*10,esize=14)

#Closeness

Cent2 <- centralityTable(net1, standardized = TRUE)

Cent3 <- centralityTable(net3, standardized = TRUE)

table.data1 <- data.frame("Item" = Cent2[Cent2$measure == "Closeness",3],

"Closeness" = Cent2[Cent2$measure == "Closeness",5])

table.data2 <- data.frame("Item" = Cent3[Cent3$measure == "Closeness",3],

"Closeness" = Cent3[Cent3$measure == "Closeness",5])

data3 <- table.data1[,2]

data4 <- table.data2[,2]

data5=data4-data3

plot(net1, title="a)", groups = group.item1,cut = 0.03,negDashed=TRUE,layout = L,vsize =data3\*10,esize=14)

plot(net3, title="b)", groups = group.item1,cut = 0.03,negDashed=TRUE,layout = L,vsize =data4\*10,esize=14)

plot(net3, title="c)", groups = group.item1,cut = 0.03,negDashed=TRUE,layout = L,vsize =data5\*10,esize=14)

#Betweenness

Cent2 <- centralityTable(net1, standardized = TRUE)

Cent3 <- centralityTable(net3, standardized = TRUE)

table.data1 <- data.frame("Item" = Cent2[Cent2$measure == "Betweenness",3],

"Betweenness" = Cent2[Cent2$measure == "Betweenness",5])

table.data2 <- data.frame("Item" = Cent3[Cent3$measure == "Betweenness",3],

"Betweenness" = Cent3[Cent3$measure == "Betweenness",5])

data3 <- table.data1[,2]

data4 <- table.data2[,2]

data5=data4-data3

plot(net1, title="a)", groups = group.item1,cut = 0.03,negDashed=TRUE,layout = L,vsize =data3\*10,esize=14)

plot(net3, title="b)", groups = group.item1,cut = 0.03,negDashed=TRUE,layout = L,vsize =data4\*10,esize=14)

plot(net3, title="c)", groups = group.item1,cut = 0.03,negDashed=TRUE,layout = L,vsize =data5\*10,esize=14)