Syntax & Output: Schizophrenia Disrupts Normal Covariation of Neural Activities Across Modalities of Perception

Kayla Donaldson, PhD

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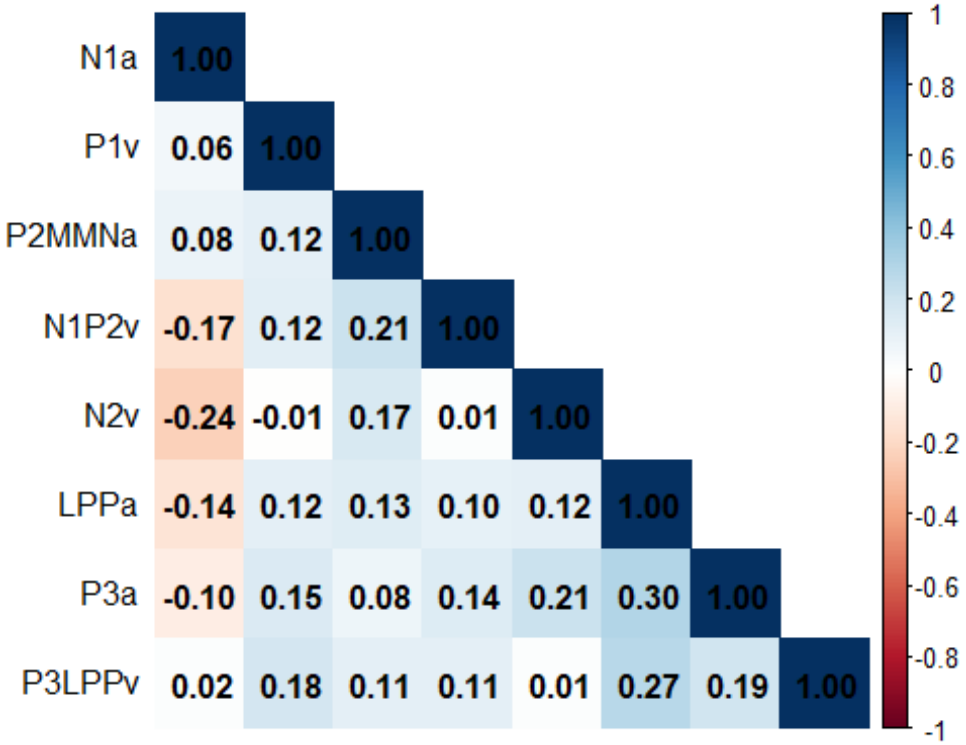
```
knitr::opts_chunk$set(echo = TRUE, warning = FALSE)

#################### NOTE ####################

# Syntax for analyses associated with Donaldson et al., Schizophrenia Disrupts
# Normal Covariation of Neural Activities Across Modalities of Perception

# Written by Kayla Donaldson

# Last Modified 12/30/2025 to clean up & annotate for JoPaCS Supplementary Information

#Packages used:
#library(tidyr)
#library(psych)
#library(ggplot2)
#library(readxl)
#library(reshape2)
#library(ggpubr)
#library(plotrix)
#library(plyr)
#library(dplyr)
#library(tidyverse)
#library(data.table)
#library(scatterplot3d)
#library(gridExtra)
#library(nlme)
#library(emmeans)
#library(corrplot)
#library(purrr)
#library(dplyr)
#library(GGally)

#################### SET UP ####################

# Set up working directory & load data

setwd("YourPathHere”)
data <- readxl::read_excel("data.xlsx")

# Create PO7/PO8 pooled average:

data$elec25 = as.numeric(data$elec25)
data$elec62 = as.numeric(data$elec62)
data <-  mutate(data, elec65 = rowMeans(select(data,c(elec25, elec62)), na.rm = TRUE))
numbers<-1:65
elec_num<-paste('elec',numbers, sep = '')
final<-reshape2::melt(data, measure.vars = elec_num, variable.name = "Elec")
```

```r
# Component Naming:

final$comps = final$FacNum
final$comps[final$StudyID=='PENS' & final$Task=="Dichotic" & final$FacNum=="1"] = "P3"
final$comps[final$StudyID=='PENS' & final$Task=="Dichotic" & final$FacNum=="2"] = "N1"
final$comps[final$StudyID=='PENS' & final$Task=="Dichotic" & final$FacNum=="3"] = "LPP"
final$comps[final$StudyID=='PENS' & final$Task=="Dichotic" & final$FacNum=="4"] = "MMN/P2
"

final$comps[final$StudyID=='NPG' & final$Task=="Dichotic" & final$FacNum=="1"] = "N1"
final$comps[final$StudyID=='NPG' & final$Task=="Dichotic" & final$FacNum=="2"] = "P3"
final$comps[final$StudyID=='NPG' & final$Task=="Dichotic" & final$FacNum=="3"] = "LPP"
final$comps[final$StudyID=='NPG' & final$Task=="Dichotic" & final$FacNum=="4"] = "MMN/P2"

final$comps[final$StudyID=='GTF' & final$Task=="Dichotic" & final$FacNum=="1"] = "N1"
final$comps[final$StudyID=='GTF' & final$Task=="Dichotic" & final$FacNum=="2"] = "MMN/P2"
final$comps[final$StudyID=='GTF' & final$Task=="Dichotic" & final$FacNum=="3"] = "P3"
final$comps[final$StudyID=='GTF' & final$Task=="Dichotic" & final$FacNum=="4"] = "LPP"

final$comps[final$StudyID=='PENS' & final$Task=="DSCPT" & final$FacNum=="1"] = "N1/P2"
final$comps[final$StudyID=='PENS' & final$Task=="DSCPT" & final$FacNum=="2"] = "LPP/P3"
final$comps[final$StudyID=='PENS' & final$Task=="DSCPT" & final$FacNum=="3"] = "P1"
final$comps[final$StudyID=='PENS' & final$Task=="DSCPT" & final$FacNum=="4"] = "N2"

final$comps[final$StudyID=='NPG' & final$Task=="DSCPT" & final$FacNum=="1"] = "N1/P2"
final$comps[final$StudyID=='NPG' & final$Task=="DSCPT" & final$FacNum=="2"] = "LPP/P3"
final$comps[final$StudyID=='NPG' & final$Task=="DSCPT" & final$FacNum=="3"] = "N2"
final$comps[final$StudyID=='NPG' & final$Task=="DSCPT" & final$FacNum=="4"] = "P1"

final$comps[final$StudyID=='GTF' & final$Task=="DSCPT" & final$FacNum=="1"] = "N1/P2"
final$comps[final$StudyID=='GTF' & final$Task=="DSCPT" & final$FacNum=="2"] = "N2"
final$comps[final$StudyID=='GTF' & final$Task=="DSCPT" & final$FacNum=="3"] = "P1"
final$comps[final$StudyID=='GTF' & final$Task=="DSCPT" & final$FacNum=="4"] = "LPP/P3"

# flip the sign on the N2 which output the wrong direction:

final$value <- final$value <- ifelse(final$comps == "N2", final$value * -1, final$value)

# Create summary data frames

allstud_Dich_P3 = final %>% filter(Task == "Dichotic" & comps == "P3" & Elec == "elec31"
) %>% group_by(SubID, StudyID, Task) %>% summarise(avg = mean(as.numeric(value)))

## `summarise()` has grouped output by 'SubID', 'StudyID'. You can override using
## the `.groups` argument.

allstud_Dich_LPP = final %>% filter(Task == "Dichotic" & comps == "LPP" & Elec == "elec31
" ) %>% group_by(SubID, StudyID, Task) %>% summarise(avg = mean(as.numeric(value)))

## `summarise()` has grouped output by 'SubID', 'StudyID'. You can override using
## the `.groups` argument.

allstud_Dich_N1 = final %>% filter(Task == "Dichotic" & comps == "N1" & Elec == "elec38"
) %>% group_by(SubID, StudyID, Task ) %>% summarise(avg = mean(as.numeric(value)))
```

```
## `summarise()` has grouped output by 'SubID', 'StudyID'. You can override using
## the `.groups` argument.

allstud_Dich_MMN_P2 = final %>% filter(Task == "Dichotic" & comps == "MMN/P2" & Elec == "
elec47" ) %>% group_by(SubID, StudyID, Task) %>% summarise(avg = mean(as.numeric(value)))

## `summarise()` has grouped output by 'SubID', 'StudyID'. You can override using
## the `.groups` argument.

allstud_DSCPT_LPP_P3 = final %>% filter(Task == "DSCPT" & comps == "LPP/P3" & Elec == "el
ec31") %>% group_by(SubID, StudyID, Task) %>% summarise(avg = mean(as.numeric(value)))

## `summarise()` has grouped output by 'SubID', 'StudyID'. You can override using
## the `.groups` argument.

allstud_DSCPT_N1P2 = final %>% filter(Task == "DSCPT" & comps == "N1/P2" & Elec == "elec2
9") %>% group_by(SubID, StudyID, Task) %>% summarise(avg = mean(as.numeric(value)))

## `summarise()` has grouped output by 'SubID', 'StudyID'. You can override using
## the `.groups` argument.

allstud_DSCPT_N2 = final %>% filter(Task == "DSCPT" & comps == "N2" & Elec == "elec29" )
%>% group_by(SubID, StudyID, Task) %>% summarise(avg = mean(as.numeric(value)))

## `summarise()` has grouped output by 'SubID', 'StudyID'. You can override using
## the `.groups` argument.

allstud_DSCPT_P1 = final %>% filter(Task == "DSCPT" & comps == "P1" & Elec == "elec65"  )
%>% group_by(SubID, StudyID, Task) %>% summarise(avg = mean(as.numeric(value)))

## `summarise()` has grouped output by 'SubID', 'StudyID'. You can override using
## the `.groups` argument.

# Reorganize so that the average across all trial types is now named with the component n
ame

allstud_Dich_LPP <- allstud_Dich_LPP %>% rename(DichoticLPP = avg)
allstud_Dich_MMN_P2 <- allstud_Dich_MMN_P2 %>% rename(DichoticP2MMN = avg)
allstud_Dich_N1 <- allstud_Dich_N1 %>% rename(DichoticN1 = avg)
allstud_Dich_P3 <- allstud_Dich_P3 %>% rename(DichoticP3 = avg)
allstud_DSCPT_LPP_P3 <- allstud_DSCPT_LPP_P3 %>% rename(DSCPTP3LPP = avg)
allstud_DSCPT_N1P2 <- allstud_DSCPT_N1P2 %>% rename(DSCPTN1P2 = avg)
allstud_DSCPT_P1 <- allstud_DSCPT_P1 %>% rename(DSCPTP1 = avg)
allstud_DSCPT_N2 <- allstud_DSCPT_N2 %>% rename(DSCPTN2 = avg)

# Remove a few rows with duplicates from data entry errors:

allstud_DSCPT_LPP_P3 <- allstud_DSCPT_LPP_P3[-68, ]
allstud_DSCPT_N1P2 <- allstud_DSCPT_N1P2[-68, ]
allstud_DSCPT_P1 <- allstud_DSCPT_P1[-68, ]
allstud_DSCPT_N2 <- allstud_DSCPT_N2[-68, ]

allstud_DSCPT_LPP_P3 <- allstud_DSCPT_LPP_P3[-96, ]
allstud_DSCPT_N1P2 <- allstud_DSCPT_N1P2[-96, ]
allstud_DSCPT_P1 <- allstud_DSCPT_P1[-96, ]
allstud_DSCPT_N2 <- allstud_DSCPT_N2[-96, ]
```

```
#################### CORRELATIONS ####################

# set up

dfs<-list(allstud_Dich_LPP,allstud_Dich_MMN_P2,allstud_Dich_N1,allstud_Dich_P3,allstud_DS
CPT_LPP_P3,allstud_DSCPT_N1P2,allstud_DSCPT_P1,allstud_DSCPT_N2)
allstud_forcor<- purrr::reduce(dfs,inner_join, by = "SubID")
compcor <- c("DichoticN1","DSCPTP1","DichoticP2MMN","DSCPTN1P2","DSCPTN2","DichoticLPP","
DichoticP3","DSCPTP3LPP")
cor_vars_all <- allstud_forcor[compcor]

# rename variables for better fit on plot

names(cor_vars_all)[names(cor_vars_all) == "DichoticLPP"] <- "LPPa"
names(cor_vars_all)[names(cor_vars_all) == "DichoticN1"] <- "N1a"
names(cor_vars_all)[names(cor_vars_all) == "DichoticP2MMN"] <- "P2MMNa"
names(cor_vars_all)[names(cor_vars_all) == "DichoticP3"] <- "P3a"
names(cor_vars_all)[names(cor_vars_all) == "DSCPTP3LPP"] <- "P3LPPv"
names(cor_vars_all)[names(cor_vars_all) == "DSCPTN1P2"] <- "N1P2v"
names(cor_vars_all)[names(cor_vars_all) == "DSCPTP1"] <- "P1v"
names(cor_vars_all)[names(cor_vars_all) == "DSCPTN2"] <- "N2v"

# make plot

cor_matrix_all <- cor(cor_vars_all,method = "pearson",use = "complete.obs")
corr_plot_all <- corrplot(cor_matrix_all, method = "color", tl.col = "black", type = "low
er", tl.pos = "l", tl.srt = 0, cl.pos = "r", addCoef.col = 'black')
```




```
corr_plot_all

## $corr
##                N1a          P1v      P2MMNa       N1P2v          N2v       LPPa
```

```
## N1a     1.00000000  0.057314973 0.08300510 -0.16996787 -0.238549876 -0.1407405
## P1v     0.05731497  1.000000000 0.11581555  0.12130611 -0.007275022  0.1192973
## P2MMNa  0.08300510  0.115815552 1.00000000  0.21074869  0.166937253  0.1310711
## N1P2v  -0.16996787  0.121306113 0.21074869  1.00000000  0.013843111  0.1032284
## N2v    -0.23854988 -0.007275022 0.16693725  0.01384311  1.000000000  0.1176196
## LPPa   -0.14074052  0.119297316 0.13107107  0.10322838  0.117619565  1.0000000
## P3a    -0.09901894  0.150738589 0.07763743  0.14469280  0.211126047  0.2990156
## P3LPPv  0.01634852  0.183116232 0.11365838  0.11409679  0.010054431  0.2700072
##                P3a     P3LPPv
## N1a    -0.09901894 0.01634852
## P1v     0.15073859 0.18311623
## P2MMNa  0.07763743 0.11365838
## N1P2v   0.14469280 0.11409679
## N2v     0.21112605 0.01005443
## LPPa    0.29901556 0.27000720
## P3a     1.00000000 0.19028308
## P3LPPv  0.19028308 1.00000000
##
## $corrPos
##     xName  yName x y         corr
## 1     N1a    N1a 1 8  1.000000000
## 2     N1a    P1v 1 7  0.057314973
## 3     N1a P2MMNa 1 6  0.083005095
## 4     N1a  N1P2v 1 5 -0.169967868
## 5     N1a    N2v 1 4 -0.238549876
## 6     N1a   LPPa 1 3 -0.140740517
## 7     N1a    P3a 1 2 -0.099018937
## 8     N1a P3LPPv 1 1  0.016348520
## 9     P1v    P1v 2 7  1.000000000
## 10    P1v P2MMNa 2 6  0.115815552
## 11    P1v  N1P2v 2 5  0.121306113
## 12    P1v    N2v 2 4 -0.007275022
## 13    P1v   LPPa 2 3  0.119297316
## 14    P1v    P3a 2 2  0.150738589
## 15    P1v P3LPPv 2 1  0.183116232
## 16 P2MMNa P2MMNa 3 6  1.000000000
## 17 P2MMNa  N1P2v 3 5  0.210748688
## 18 P2MMNa    N2v 3 4  0.166937253
## 19 P2MMNa   LPPa 3 3  0.131071066
## 20 P2MMNa    P3a 3 2  0.077637428
## 21 P2MMNa P3LPPv 3 1  0.113658382
## 22  N1P2v  N1P2v 4 5  1.000000000
## 23  N1P2v    N2v 4 4  0.013843111
## 24  N1P2v   LPPa 4 3  0.103228384
## 25  N1P2v    P3a 4 2  0.144692804
## 26  N1P2v P3LPPv 4 1  0.114096793
## 27    N2v    N2v 5 4  1.000000000
## 28    N2v   LPPa 5 3  0.117619565
## 29    N2v    P3a 5 2  0.211126047
## 30    N2v P3LPPv 5 1  0.010054431
## 31   LPPa   LPPa 6 3  1.000000000
## 32   LPPa    P3a 6 2  0.299015557
## 33   LPPa P3LPPv 6 1  0.270007199
## 34    P3a    P3a 7 2  1.000000000
## 35    P3a P3LPPv 7 1  0.190283081
```

```
## 36 P3LPPv P3LPPv 8 1  1.000000000
##
## $arg
## $arg$type
## [1] "lower"

# get statistical values
corr.test(cor_vars_all,method = "pearson",use = "complete.obs")

## Call:corr.test(x = cor_vars_all, use = "complete.obs", method = "pearson")
## Correlation matrix
##          N1a   P1v P2MMNa N1P2v   N2v  LPPa   P3a P3LPPv
## N1a     1.00  0.06   0.08 -0.17 -0.24 -0.14 -0.10   0.02
## P1v     0.06  1.00   0.12  0.12 -0.01  0.12  0.15   0.18
## P2MMNa  0.08  0.12   1.00  0.21  0.17  0.13  0.08   0.11
## N1P2v  -0.17  0.12   0.21  1.00  0.01  0.10  0.14   0.11
## N2v    -0.24 -0.01   0.17  0.01  1.00  0.12  0.21   0.01
## LPPa   -0.14  0.12   0.13  0.10  0.12  1.00  0.30   0.27
## P3a    -0.10  0.15   0.08  0.14  0.21  0.30  1.00   0.19
## P3LPPv  0.02  0.18   0.11  0.11  0.01  0.27  0.19   1.00
## Sample Size
## [1] 206
## Probability values (Entries above the diagonal are adjusted for multiple tests.)
##         N1a  P1v P2MMNa N1P2v  N2v LPPa  P3a P3LPPv
## N1a    0.00 1.00   1.00  0.31 0.01 0.74 1.00   1.00
## P1v    0.41 0.00   1.00  1.00 1.00 1.00 0.58   0.19
## P2MMNa 0.24 0.10   0.00  0.06 0.33 0.97 1.00   1.00
## N1P2v  0.01 0.08   0.00  0.00 1.00 1.00 0.68   1.00
## N2v    0.00 0.92   0.02  0.84 0.00 1.00 0.06   1.00
## LPPa   0.04 0.09   0.06  0.14 0.09 0.00 0.00   0.00
## P3a    0.16 0.03   0.27  0.04 0.00 0.00 0.00   0.14
## P3LPPv 0.82 0.01   0.10  0.10 0.89 0.00 0.01   0.00
##
##  To see confidence intervals of the correlations, print with the short=FALSE option

# Reorganize data with patient group as a factor

final$Group<-as.factor(final$Group)
final$Group =revalue(final$Group ,c("1" = "SCZ", "3" = "BP", '5'="CON", '6' = "SREL", '7'
= "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "Unknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 7, 8, 9, 10, 11

allstud_Dich_P3 = final %>% filter(Task == "Dichotic" & comps == "P3" & Elec == "elec31"
) %>% group_by(SubID, Group, Task) %>% summarise(avg = mean(as.numeric(value)))

## `summarise()` has grouped output by 'SubID', 'Group'. You can override using
## the `.groups` argument.

allstud_Dich_LPP = final %>% filter(Task == "Dichotic" & comps == "LPP" & Elec == "elec31
" ) %>% group_by(SubID, Group, Task) %>% summarise(avg = mean(as.numeric(value)))

## `summarise()` has grouped output by 'SubID', 'Group'. You can override using
## the `.groups` argument.

allstud_Dich_N1 = final %>% filter(Task == "Dichotic" & comps == "N1" & Elec == "elec38"
) %>% group_by(SubID, Group, Task ) %>% summarise(avg = mean(as.numeric(value)))
```

```
## `summarise()` has grouped output by 'SubID', 'Group'. You can override using
## the `.groups` argument.

allstud_Dich_MMN_P2 = final %>% filter(Task == "Dichotic" & comps == "MMN/P2" & Elec == "
elec47" ) %>% group_by(SubID, Group, Task) %>% summarise(avg = mean(as.numeric(value)))

## `summarise()` has grouped output by 'SubID', 'Group'. You can override using
## the `.groups` argument.

allstud_DSCPT_N1P2 = final %>% filter(Task == "DSCPT" & comps == "N1/P2" & Elec == "elec2
9" ) %>% group_by(SubID, Group, Task) %>% summarise(avg = mean(as.numeric(value)))

## `summarise()` has grouped output by 'SubID', 'Group'. You can override using
## the `.groups` argument.

allstud_DSCPT_LPP_P3 = final %>% filter(Task == "DSCPT" & comps == "LPP/P3" & Elec == "el
ec31") %>% group_by(SubID, Group, Task) %>% summarise(avg = mean(as.numeric(value)))

## `summarise()` has grouped output by 'SubID', 'Group'. You can override using
## the `.groups` argument.

allstud_DSCPT_N2 = final %>% filter(Task == "DSCPT" & comps == "N2" & Elec == "elec29" )
%>% group_by(SubID, Group, Task) %>% summarise(avg = mean(as.numeric(value)))

## `summarise()` has grouped output by 'SubID', 'Group'. You can override using
## the `.groups` argument.

allstud_DSCPT_P1 = final %>% filter(Task == "DSCPT" & comps == "P1" & Elec == "elec65"  )
%>% group_by(SubID, Group, Task) %>% summarise(avg = mean(as.numeric(value)))

## `summarise()` has grouped output by 'SubID', 'Group'. You can override using
## the `.groups` argument.

# Read in dataset containing ERP component amplitudes (rather than PCA scores)

data2 <- readxl::read_excel("DSCPT_NPG_finalscoresN1updates.xlsx")
data3 <- readxl::read_excel("DSCPT_PENS_finalscores_N1update.xlsx")
data4 <- readxl::read_excel("DSCPT_GTF_finalscoresN1updates.xlsx")
data5 <- readxl::read_excel("Dichotic_NPG_finalscores.xlsx")
data6 <- readxl::read_excel("Dichotic_PENS_finalscores.xlsx")
data7 <- readxl::read_excel("Dichotic_GTF_finalscores.xlsx")

# Scatter Plots of ERPs vs PCA scores

# Make dataframes from  PCA data looking at only the target condition and looking at each
study separately

GTF_Target_Dich_P3 = final %>% filter(Task == "Dichotic" & comps == "P3" & Elec == "elec3
1"  & TrialType == "1" & StudyID == "GTF") %>% group_by(SubID)
GTF_Target_Dich_LPP = final %>% filter(Task == "Dichotic" & comps == "LPP" & Elec == "ele
c31" & TrialType == "1" & StudyID == "GTF" ) %>% group_by(SubID)
GTF_Target_Dich_N1 = final %>% filter(Task == "Dichotic" & comps == "N1" & Elec == "elec4
8" & TrialType == "1" & StudyID == "GTF" ) %>% group_by(SubID)
GTF_Target_Dich_MMN_P2 = final %>% filter(Task == "Dichotic" & comps == "MMN/P2" & Elec =
= "elec47"  & TrialType == "1" & StudyID == "GTF") %>% group_by(SubID)

NPG_Target_Dich_P3 = final %>% filter(Task == "Dichotic" & comps == "P3" & Elec == "elec3
```

```
1"  & TrialType == "1" & StudyID == "NPG") %>% group_by(SubID)
NPG_Target_Dich_LPP = final %>% filter(Task == "Dichotic" & comps == "LPP" & Elec == "ele
c31" & TrialType == "1" & StudyID == "NPG" ) %>% group_by(SubID)
NPG_Target_Dich_N1 = final %>% filter(Task == "Dichotic" & comps == "N1" & Elec == "elec4
8" & TrialType == "1" & StudyID == "NPG" ) %>% group_by(SubID)
NPG_Target_Dich_MMN_P2 = final %>% filter(Task == "Dichotic" & comps == "MMN/P2" & Elec =
= "elec47"  & TrialType == "1" & StudyID == "NPG") %>% group_by(SubID)

PENS_Target_Dich_P3 = final %>% filter(Task == "Dichotic" & comps == "P3" & Elec == "elec
31"  & TrialType == "1" & StudyID == "PENS") %>% group_by(SubID)
PENS_Target_Dich_LPP = final %>% filter(Task == "Dichotic" & comps == "LPP" & Elec == "el
ec31" & TrialType == "1" & StudyID == "PENS" ) %>% group_by(SubID)
PENS_Target_Dich_N1 = final %>% filter(Task == "Dichotic" & comps == "N1" & Elec == "elec
48" & TrialType == "1" & StudyID == "PENS" ) %>% group_by(SubID)
PENS_Target_Dich_MMN_P2 = final %>% filter(Task == "Dichotic" & comps == "MMN/P2" & Elec
== "elec47"  & TrialType == "1" & StudyID == "PENS") %>% group_by(SubID)

GTF_Target_DSCPT_N1P2 = final %>% filter(Task == "DSCPT" & comps == "N1/P2" & Elec == "el
ec29" & TrialType == "1" & StudyID == "GTF") %>% group_by(SubID)
GTF_Target_DSCPT_LPP_P3 = final %>% filter(Task == "DSCPT" & comps == "LPP/P3" & Elec ==
"elec31" & TrialType == "1" & StudyID == "GTF") %>% group_by(SubID)
GTF_Target_DSCPT_N2 = final %>% filter(Task == "DSCPT" & comps == "N2" & Elec == "elec31"
& TrialType == "1" & StudyID == "GTF" ) %>% group_by(SubID)
GTF_Target_DSCPT_P1 = final %>% filter(Task == "DSCPT" & comps == "P1" & Elec == "elec65"
& TrialType == "1" & StudyID == "GTF" ) %>% group_by(SubID)

NPG_Target_DSCPT_N1P2 = final %>% filter(Task == "DSCPT" & comps == "N1/P2" & Elec == "el
ec29" & TrialType == "1" & StudyID == "NPG") %>% group_by(SubID)
NPG_Target_DSCPT_LPP_P3 = final %>% filter(Task == "DSCPT" & comps == "LPP/P3" & Elec ==
"elec31" & TrialType == "1" & StudyID == "NPG") %>% group_by(SubID)
NPG_Target_DSCPT_N2 = final %>% filter(Task == "DSCPT" & comps == "N2" & Elec == "elec31"
& TrialType == "1" & StudyID == "NPG" ) %>% group_by(SubID)
NPG_Target_DSCPT_P1 = final %>% filter(Task == "DSCPT" & comps == "P1" & Elec == "elec65"
& TrialType == "1" & StudyID == "NPG" ) %>% group_by(SubID)

PENS_Target_DSCPT_N1P2 = final %>% filter(Task == "DSCPT" & comps == "N1/P2" & Elec == "e
lec29" & TrialType == "1" & StudyID == "PENS") %>% group_by(SubID)
PENS_Target_DSCPT_LPP_P3 = final %>% filter(Task == "DSCPT" & comps == "LPP/P3" & Elec ==
"elec31" & TrialType == "1" & StudyID == "PENS") %>% group_by(SubID)
PENS_Target_DSCPT_N2 = final %>% filter(Task == "DSCPT" & comps == "N2" & Elec == "elec31
" & TrialType == "1" & StudyID == "PENS" ) %>% group_by(SubID)
PENS_Target_DSCPT_P1 = final %>% filter(Task == "DSCPT" & comps == "P1" & Elec == "elec65
" & TrialType == "1" & StudyID == "PENS" ) %>% group_by(SubID)

# Merge those dataframes with the one containing ERPs to correlate

GTF_DSCPT_PCandERPs_P2 = merge(GTF_Target_DSCPT_N1P2, data4, by="SubID", all=FALSE)
GTF_DSCPT_PCandERPs_P1 = merge(GTF_Target_DSCPT_P1, data4, by="SubID", all=FALSE)
GTF_DSCPT_PCandERPs_N2 = merge(GTF_Target_DSCPT_N2, data4, by="SubID", all=FALSE)
GTF_DSCPT_PCandERPs_N1 = merge(GTF_Target_DSCPT_N1P2, data4, by="SubID", all=FALSE)
GTF_DSCPT_PCandERPs_LPP_P3 = merge(GTF_Target_DSCPT_LPP_P3, data4, by="SubID", all=FALSE)

GTF_Dich_PCandERPs_P3 = merge(GTF_Target_Dich_P3, data7, by="SubID", all=FALSE)
GTF_Dich_PCandERPs_LPP = merge(GTF_Target_Dich_LPP, data7, by="SubID", all=FALSE)
GTF_Dich_PCandERPs_MMN_P2 = merge(GTF_Target_Dich_MMN_P2, data7, by="SubID", all=FALSE)
```

```
GTF_Dich_PCandERPs_N1 = merge(GTF_Target_Dich_N1, data7, by="SubID", all=FALSE)

NPG_DSCPT_PCandERPs_P2 = merge(NPG_Target_DSCPT_N1P2, data2, by="SubID", all=FALSE)
NPG_DSCPT_PCandERPs_P1 = merge(NPG_Target_DSCPT_P1, data2, by="SubID", all=FALSE)
NPG_DSCPT_PCandERPs_N2 = merge(NPG_Target_DSCPT_N2, data2, by="SubID", all=FALSE)
NPG_DSCPT_PCandERPs_N1 = merge(NPG_Target_DSCPT_N1P2, data2, by="SubID", all=FALSE)
NPG_DSCPT_PCandERPs_LPP_P3 = merge(NPG_Target_DSCPT_LPP_P3, data2, by="SubID", all=FALSE)

NPG_Dich_PCandERPs_P3 = merge(NPG_Target_Dich_P3, data5, by="SubID", all=FALSE)
NPG_Dich_PCandERPs_LPP = merge(NPG_Target_Dich_LPP, data5, by="SubID", all=FALSE)
NPG_Dich_PCandERPs_MMN_P2 = merge(NPG_Target_Dich_MMN_P2, data5, by="SubID", all=FALSE)
NPG_Dich_PCandERPs_N1 = merge(NPG_Target_Dich_N1, data5, by="SubID", all=FALSE)

PENS_DSCPT_PCandERPs_P2 = merge(PENS_Target_DSCPT_N1P2, data3, by="SubID", all=FALSE)
PENS_DSCPT_PCandERPs_P1 = merge(PENS_Target_DSCPT_P1, data3, by="SubID", all=FALSE)
PENS_DSCPT_PCandERPs_N2 = merge(PENS_Target_DSCPT_N2, data3, by="SubID", all=FALSE)
PENS_DSCPT_PCandERPs_N1 = merge(PENS_Target_DSCPT_N1P2, data3, by="SubID", all=FALSE)
PENS_DSCPT_PCandERPs_LPP_P3 = merge(PENS_Target_DSCPT_LPP_P3, data3, by="SubID", all=FALS
E)

PENS_Dich_PCandERPs_P3 = merge(PENS_Target_Dich_P3, data6, by="SubID", all=FALSE)
PENS_Dich_PCandERPs_LPP = merge(PENS_Target_Dich_LPP, data6, by="SubID", all=FALSE)
PENS_Dich_PCandERPs_MMN_P2 = merge(PENS_Target_Dich_MMN_P2, data6, by="SubID", all=FALSE)
PENS_Dich_PCandERPs_N1 = merge(PENS_Target_Dich_N1, data6, by="SubID", all=FALSE)

# Group as Factor

PENS_DSCPT_PCandERPs_P2$Group<-as.factor(PENS_DSCPT_PCandERPs_P2$Group)
PENS_DSCPT_PCandERPs_P2$Group =revalue(PENS_DSCPT_PCandERPs_P2$Group ,c("1" = "SCZ", "3"
= "BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" =
"Unknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

PENS_DSCPT_PCandERPs_P1$Group<-as.factor(PENS_DSCPT_PCandERPs_P1$Group)
PENS_DSCPT_PCandERPs_P1$Group =revalue(PENS_DSCPT_PCandERPs_P1$Group ,c("1" = "SCZ", "3"
= "BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" =
"Unknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

PENS_DSCPT_PCandERPs_N1$Group<-as.factor(PENS_DSCPT_PCandERPs_N1$Group)
PENS_DSCPT_PCandERPs_N1$Group =revalue(PENS_DSCPT_PCandERPs_N1$Group ,c("1" = "SCZ", "3"
= "BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" =
"Unknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

PENS_DSCPT_PCandERPs_N2$Group<-as.factor(PENS_DSCPT_PCandERPs_N2$Group)
PENS_DSCPT_PCandERPs_N2$Group =revalue(PENS_DSCPT_PCandERPs_N2$Group ,c("1" = "SCZ", "3"
= "BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" =
"Unknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

PENS_DSCPT_PCandERPs_LPP_P3$Group<-as.factor(PENS_DSCPT_PCandERPs_LPP_P3$Group)
PENS_DSCPT_PCandERPs_LPP_P3$Group =revalue(PENS_DSCPT_PCandERPs_LPP_P3$Group ,c("1" = "SC
```

```
Z", "3" = "BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other",
"10" = "Unknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

NPG_DSCPT_PCandERPs_P2$Group<-as.factor(NPG_DSCPT_PCandERPs_P2$Group)
NPG_DSCPT_PCandERPs_P2$Group =revalue(NPG_DSCPT_PCandERPs_P2$Group ,c("1" = "SCZ", "3" =
"BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "U
nknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

NPG_DSCPT_PCandERPs_P1$Group<-as.factor(NPG_DSCPT_PCandERPs_P1$Group)
NPG_DSCPT_PCandERPs_P1$Group =revalue(NPG_DSCPT_PCandERPs_P1$Group ,c("1" = "SCZ", "3" =
"BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "U
nknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

NPG_DSCPT_PCandERPs_N1$Group<-as.factor(NPG_DSCPT_PCandERPs_N1$Group)
NPG_DSCPT_PCandERPs_N1$Group =revalue(NPG_DSCPT_PCandERPs_N1$Group ,c("1" = "SCZ", "3" =
"BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "U
nknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

NPG_DSCPT_PCandERPs_N2$Group<-as.factor(NPG_DSCPT_PCandERPs_N2$Group)
NPG_DSCPT_PCandERPs_N2$Group =revalue(NPG_DSCPT_PCandERPs_N2$Group ,c("1" = "SCZ", "3" =
"BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "U
nknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

NPG_DSCPT_PCandERPs_LPP_P3$Group<-as.factor(NPG_DSCPT_PCandERPs_LPP_P3$Group)
NPG_DSCPT_PCandERPs_LPP_P3$Group =revalue(NPG_DSCPT_PCandERPs_LPP_P3$Group ,c("1" = "SCZ"
, "3" = "BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "
10" = "Unknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

GTF_DSCPT_PCandERPs_P2$Group<-as.factor(GTF_DSCPT_PCandERPs_P2$Group)
GTF_DSCPT_PCandERPs_P2$Group =revalue(GTF_DSCPT_PCandERPs_P2$Group ,c("1" = "SCZ", "3" =
"BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "U
nknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

GTF_DSCPT_PCandERPs_P1$Group<-as.factor(GTF_DSCPT_PCandERPs_P1$Group)
GTF_DSCPT_PCandERPs_P1$Group =revalue(GTF_DSCPT_PCandERPs_P1$Group ,c("1" = "SCZ", "3" =
"BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "U
nknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

GTF_DSCPT_PCandERPs_N1$Group<-as.factor(GTF_DSCPT_PCandERPs_N1$Group)
GTF_DSCPT_PCandERPs_N1$Group =revalue(GTF_DSCPT_PCandERPs_N1$Group ,c("1" = "SCZ", "3" =
"BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "U
nknown", "11" = "SZAD"))
```

```
## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

GTF_DSCPT_PCandERPs_N2$Group<-as.factor(GTF_DSCPT_PCandERPs_N2$Group)
GTF_DSCPT_PCandERPs_N2$Group =revalue(GTF_DSCPT_PCandERPs_N2$Group ,c("1" = "SCZ", "3" =
"BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "U
nknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

GTF_DSCPT_PCandERPs_LPP_P3$Group<-as.factor(GTF_DSCPT_PCandERPs_LPP_P3$Group)
GTF_DSCPT_PCandERPs_LPP_P3$Group =revalue(GTF_DSCPT_PCandERPs_LPP_P3$Group ,c("1" = "SCZ"
, "3" = "BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "
10" = "Unknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

PENS_Dich_PCandERPs_MMN_P2$Group<-as.factor(PENS_Dich_PCandERPs_MMN_P2$Group)
PENS_Dich_PCandERPs_MMN_P2$Group =revalue(PENS_Dich_PCandERPs_MMN_P2$Group ,c("1" = "SCZ"
, "3" = "BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "
10" = "Unknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

PENS_Dich_PCandERPs_LPP$Group<-as.factor(PENS_Dich_PCandERPs_LPP$Group)
PENS_Dich_PCandERPs_LPP$Group =revalue(PENS_Dich_PCandERPs_LPP$Group ,c("1" = "SCZ", "3"
= "BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" =
"Unknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

PENS_Dich_PCandERPs_N1$Group<-as.factor(PENS_Dich_PCandERPs_N1$Group)
PENS_Dich_PCandERPs_N1$Group =revalue(PENS_Dich_PCandERPs_N1$Group ,c("1" = "SCZ", "3" =
"BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "U
nknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

PENS_Dich_PCandERPs_P3$Group<-as.factor(PENS_Dich_PCandERPs_P3$Group)
PENS_Dich_PCandERPs_P3$Group =revalue(PENS_Dich_PCandERPs_P3$Group ,c("1" = "SCZ", "3" =
"BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "U
nknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

NPG_Dich_PCandERPs_MMN_P2$Group<-as.factor(NPG_Dich_PCandERPs_MMN_P2$Group)
NPG_Dich_PCandERPs_MMN_P2$Group =revalue(NPG_Dich_PCandERPs_MMN_P2$Group ,c("1" = "SCZ",
"3" = "BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10
" = "Unknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

NPG_Dich_PCandERPs_LPP$Group<-as.factor(NPG_Dich_PCandERPs_LPP$Group)
NPG_Dich_PCandERPs_LPP$Group =revalue(NPG_Dich_PCandERPs_LPP$Group ,c("1" = "SCZ", "3" =
"BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "U
nknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11
```

```
NPG_Dich_PCandERPs_N1$Group<-as.factor(NPG_Dich_PCandERPs_N1$Group)
NPG_Dich_PCandERPs_N1$Group =revalue(NPG_Dich_PCandERPs_N1$Group ,c("1" = "SCZ", "3" = "B
P", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "Unk
nown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

NPG_Dich_PCandERPs_P3$Group<-as.factor(NPG_Dich_PCandERPs_P3$Group)
NPG_Dich_PCandERPs_P3$Group =revalue(NPG_Dich_PCandERPs_P3$Group ,c("1" = "SCZ", "3" = "B
P", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "Unk
nown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

GTF_Dich_PCandERPs_MMN_P2$Group<-as.factor(GTF_Dich_PCandERPs_MMN_P2$Group)
GTF_Dich_PCandERPs_MMN_P2$Group =revalue(GTF_Dich_PCandERPs_MMN_P2$Group ,c("1" = "SCZ",
"3" = "BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10
" = "Unknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

GTF_Dich_PCandERPs_LPP$Group<-as.factor(GTF_Dich_PCandERPs_LPP$Group)
GTF_Dich_PCandERPs_LPP$Group =revalue(GTF_Dich_PCandERPs_LPP$Group ,c("1" = "SCZ", "3" =
"BP", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "U
nknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

GTF_Dich_PCandERPs_N1$Group<-as.factor(GTF_Dich_PCandERPs_N1$Group)
GTF_Dich_PCandERPs_N1$Group =revalue(GTF_Dich_PCandERPs_N1$Group ,c("1" = "SCZ", "3" = "B
P", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "Unk
nown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

GTF_Dich_PCandERPs_P3$Group<-as.factor(GTF_Dich_PCandERPs_P3$Group)
GTF_Dich_PCandERPs_P3$Group =revalue(GTF_Dich_PCandERPs_P3$Group ,c("1" = "SCZ", "3" = "B
P", '5'="CON", '6' = "SREL", '7' = "SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "Unk
nown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 1, 3, 5, 6, 7, 8, 9, 10, 11

# Create ERP PCA correlation matrices

names(PENS_DSCPT_PCandERPs_LPP_P3)[names(PENS_DSCPT_PCandERPs_LPP_P3) == "value"] <- "P3L
PP"
names(PENS_DSCPT_PCandERPs_N1)[names(PENS_DSCPT_PCandERPs_N1) == "value"] <- "N1"
names(PENS_DSCPT_PCandERPs_N2)[names(PENS_DSCPT_PCandERPs_N2) == "value"] <- "N2"
names(PENS_DSCPT_PCandERPs_P1)[names(PENS_DSCPT_PCandERPs_P1) == "value"] <- "P1"
names(PENS_DSCPT_PCandERPs_P2)[names(PENS_DSCPT_PCandERPs_P2) == "value"] <- "P2"

PENS_DSCPT_PCandERPs_N1$N1 <- as.numeric(PENS_DSCPT_PCandERPs_N1$N1)
selectedN1cols <- select(PENS_DSCPT_PCandERPs_N1, SubID, N1)
PENS_DSCPT_PCandERPs_P1$P1 <- as.numeric(PENS_DSCPT_PCandERPs_P1$P1)
selectedP1cols <- select(PENS_DSCPT_PCandERPs_P1, SubID, P1)
PENS_DSCPT_PCandERPs_N2$N2 <- as.numeric(PENS_DSCPT_PCandERPs_N2$N2)
selectedN2cols <- select(PENS_DSCPT_PCandERPs_N2, SubID, N2)
PENS_DSCPT_PCandERPs_P2$P2 <- as.numeric(PENS_DSCPT_PCandERPs_P2$P2)
```

```r
selectedP2cols <- select(PENS_DSCPT_PCandERPs_P2, SubID, P2)

PENS_DSCPT_ForCorr <- merge(PENS_DSCPT_PCandERPs_LPP_P3, selectedN1cols, by = "SubID")
PENS_DSCPT_ForCorr <- merge(PENS_DSCPT_ForCorr, selectedP1cols, by = "SubID")
PENS_DSCPT_ForCorr <- merge(PENS_DSCPT_ForCorr, selectedP2cols, by = "SubID")
PENS_DSCPT_ForCorr <- merge(PENS_DSCPT_ForCorr, selectedN2cols, by = "SubID")

PENS_DSCPT_ForCorr_Target <-select(PENS_DSCPT_ForCorr, -Group, -SubID, -TrialType, -comps
, -Elec, -FacNum, -Task, -StudyID)
PENS_DSCPT_ForCorr_Target <-select(PENS_DSCPT_ForCorr_Target, P3LPP, N1, P1, P2, N2, N1_t
arget_Oz_areaunderpeak, P1_target_Oz_areaunderpeak, N2_target_Oz_areaunderpeak, P2_target
_Oz_MeanAmp, P3LPP_target_Pz_areaunderpeak) #only vars we want in corr

PENS_DSCPT_ForCorr_Target$P3LPP <-as.numeric(PENS_DSCPT_ForCorr_Target$P3LPP)
PENS_DSCPT_ForCorr_Target$N1 <-as.numeric(PENS_DSCPT_ForCorr_Target$N1)
PENS_DSCPT_ForCorr_Target$P1 <-as.numeric(PENS_DSCPT_ForCorr_Target$P1)
PENS_DSCPT_ForCorr_Target$N2 <-as.numeric(PENS_DSCPT_ForCorr_Target$N2)
PENS_DSCPT_ForCorr_Target$P2 <-as.numeric(PENS_DSCPT_ForCorr_Target$P2)
PENS_DSCPT_ForCorr_Target$N1_target_Oz_areaunderpeak <-as.numeric(PENS_DSCPT_ForCorr_Targ
et$N1_target_Oz_areaunderpeak)
PENS_DSCPT_ForCorr_Target$N2_target_Oz_areaunderpeak <-as.numeric(PENS_DSCPT_ForCorr_Targ
et$N2_target_Oz_areaunderpeak)
PENS_DSCPT_ForCorr_Target$P1_target_Oz_areaunderpeak <-as.numeric(PENS_DSCPT_ForCorr_Targ
et$P1_target_Oz_areaunderpeak)
PENS_DSCPT_ForCorr_Target$P2_target_Oz_MeanAmp <-as.numeric(PENS_DSCPT_ForCorr_Target$P2_
target_Oz_MeanAmp)
PENS_DSCPT_ForCorr_Target$P3LPP_target_Pz_areaunderpeak <-as.numeric(PENS_DSCPT_ForCorr_T
arget$P3LPP_target_Pz_areaunderpeak)

cor(PENS_DSCPT_ForCorr_Target, method = "pearson")  # correlation coefficients
```

```
##                                    P3LPP          N1           P1          P2
## P3LPP                           1.00000000  0.05840374  0.059104562  0.05840374
## N1                              0.05840374  1.00000000  0.296665334  1.00000000
## P1                              0.05910456  0.29666533  1.000000000  0.29666533
## P2                              0.05840374  1.00000000  0.296665334  1.00000000
## N2                             -0.26912482 -0.05824325 -0.019066646 -0.05824325
## N1_target_Oz_areaunderpeak      0.05145303 -0.59256708  0.296057150 -0.59256708
## P1_target_Oz_areaunderpeak      0.08169998  0.36465000  0.863984906  0.36465000
## N2_target_Oz_areaunderpeak      0.15937297  0.03884205 -0.003316744  0.03884205
## P2_target_Oz_MeanAmp            0.14574018  0.89420930  0.152072957  0.89420930
## P3LPP_target_Pz_areaunderpeak   0.74338148  0.08520502  0.102821654  0.08520502
##                                         N2 N1_target_Oz_areaunderpeak
## P3LPP                          -0.26912482                0.051453027
## N1                             -0.05824325               -0.592567079
## P1                             -0.01906665                0.296057150
## P2                             -0.05824325               -0.592567079
## N2                              1.00000000               -0.083794632
## N1_target_Oz_areaunderpeak     -0.08379463                1.000000000
## P1_target_Oz_areaunderpeak      0.01936418                0.159595178
## N2_target_Oz_areaunderpeak     -0.85522469                0.136175752
## P2_target_Oz_MeanAmp           -0.06539882               -0.528460448
## P3LPP_target_Pz_areaunderpeak  -0.60414733               -0.003345983
##                                P1_target_Oz_areaunderpeak
## P3LPP                                          0.08169998
```

```
## N1                                          0.36465000
## P1                                          0.86398491
## P2                                          0.36465000
## N2                                          0.01936418
## N1_target_Oz_areaunderpeak                  0.15959518
## P1_target_Oz_areaunderpeak                  1.00000000
## N2_target_Oz_areaunderpeak                 -0.06264850
## P2_target_Oz_MeanAmp                        0.21295887
## P3LPP_target_Pz_areaunderpeak               0.13149948
##                               N2_target_Oz_areaunderpeak P2_target_Oz_MeanAmp
## P3LPP                                      0.159372974           0.14574018
## N1                                         0.038842050           0.89420930
## P1                                        -0.003316744           0.15207296
## P2                                         0.038842050           0.89420930
## N2                                        -0.855224687          -0.06539882
## N1_target_Oz_areaunderpeak                 0.136175752          -0.52846045
## P1_target_Oz_areaunderpeak                -0.062648503           0.21295887
## N2_target_Oz_areaunderpeak                 1.000000000           0.04319462
## P2_target_Oz_MeanAmp                       0.043194621           1.00000000
## P3LPP_target_Pz_areaunderpeak              0.377284028           0.09892018
##                               P3LPP_target_Pz_areaunderpeak
## P3LPP                                         0.743381476
## N1                                            0.085205020
## P1                                            0.102821654
## P2                                            0.085205020
## N2                                           -0.604147334
## N1_target_Oz_areaunderpeak                   -0.003345983
## P1_target_Oz_areaunderpeak                    0.131499477
## N2_target_Oz_areaunderpeak                    0.377284028
## P2_target_Oz_MeanAmp                          0.098920185
## P3LPP_target_Pz_areaunderpeak                 1.000000000
```

```
corr.test(PENS_DSCPT_ForCorr_Target, method = "pearson") #significance values
```

```
## Call:corr.test(x = PENS_DSCPT_ForCorr_Target, method = "pearson")
## Correlation matrix
##                               P3LPP    N1    P1    P2    N2
## P3LPP                          1.00  0.06  0.06  0.06 -0.27
## N1                             0.06  1.00  0.30  1.00 -0.06
## P1                             0.06  0.30  1.00  0.30 -0.02
## P2                             0.06  1.00  0.30  1.00 -0.06
## N2                            -0.27 -0.06 -0.02 -0.06  1.00
## N1_target_Oz_areaunderpeak     0.05 -0.59  0.30 -0.59 -0.08
## P1_target_Oz_areaunderpeak     0.08  0.36  0.86  0.36  0.02
## N2_target_Oz_areaunderpeak     0.16  0.04  0.00  0.04 -0.86
## P2_target_Oz_MeanAmp           0.15  0.89  0.15  0.89 -0.07
## P3LPP_target_Pz_areaunderpeak  0.74  0.09  0.10  0.09 -0.60
##                               N1_target_Oz_areaunderpeak
## P3LPP                                               0.05
## N1                                                 -0.59
## P1                                                  0.30
## P2                                                 -0.59
## N2                                                 -0.08
## N1_target_Oz_areaunderpeak                          1.00
## P1_target_Oz_areaunderpeak                          0.16
## N2_target_Oz_areaunderpeak                          0.14
```

```
## P2_target_Oz_MeanAmp                                -0.53
## P3LPP_target_Pz_areaunderpeak                        0.00
##                                P1_target_Oz_areaunderpeak
## P3LPP                                               0.08
## N1                                                  0.36
## P1                                                  0.86
## P2                                                  0.36
## N2                                                  0.02
## N1_target_Oz_areaunderpeak                          0.16
## P1_target_Oz_areaunderpeak                          1.00
## N2_target_Oz_areaunderpeak                         -0.06
## P2_target_Oz_MeanAmp                                0.21
## P3LPP_target_Pz_areaunderpeak                       0.13
##                                N2_target_Oz_areaunderpeak P2_target_Oz_MeanAmp
## P3LPP                                               0.16                 0.15
## N1                                                  0.04                 0.89
## P1                                                  0.00                 0.15
## P2                                                  0.04                 0.89
## N2                                                 -0.86                -0.07
## N1_target_Oz_areaunderpeak                          0.14                -0.53
## P1_target_Oz_areaunderpeak                         -0.06                 0.21
## N2_target_Oz_areaunderpeak                          1.00                 0.04
## P2_target_Oz_MeanAmp                                0.04                 1.00
## P3LPP_target_Pz_areaunderpeak                       0.38                 0.10
##                                P3LPP_target_Pz_areaunderpeak
## P3LPP                                                 0.74
## N1                                                    0.09
## P1                                                    0.10
## P2                                                    0.09
## N2                                                   -0.60
## N1_target_Oz_areaunderpeak                            0.00
## P1_target_Oz_areaunderpeak                            0.13
## N2_target_Oz_areaunderpeak                            0.38
## P2_target_Oz_MeanAmp                                  0.10
## P3LPP_target_Pz_areaunderpeak                         1.00
## Sample Size
## [1] 88
## Probability values (Entries above the diagonal are adjusted for multiple tests.)
##                                P3LPP   N1   P1   P2   N2
## P3LPP                           0.00 1.00 1.00 1.00 0.33
## N1                              0.59 0.00 0.16 0.00 1.00
## P1                              0.58 0.01 0.00 0.16 1.00
## P2                              0.59 0.00 0.01 0.00 1.00
## N2                              0.01 0.59 0.86 0.59 0.00
## N1_target_Oz_areaunderpeak      0.63 0.00 0.01 0.00 0.44
## P1_target_Oz_areaunderpeak      0.45 0.00 0.00 0.00 0.86
## N2_target_Oz_areaunderpeak      0.14 0.72 0.98 0.72 0.00
## P2_target_Oz_MeanAmp            0.18 0.00 0.16 0.00 0.54
## P3LPP_target_Pz_areaunderpeak   0.00 0.43 0.34 0.43 0.00
##                                N1_target_Oz_areaunderpeak
## P3LPP                                                1.00
## N1                                                   0.00
## P1                                                   0.16
## P2                                                   0.00
## N2                                                   1.00
```

```
## N1_target_Oz_areaunderpeak                          0.00
## P1_target_Oz_areaunderpeak                          0.14
## N2_target_Oz_areaunderpeak                          0.21
## P2_target_Oz_MeanAmp                                0.00
## P3LPP_target_Pz_areaunderpeak                       0.98
##                                P1_target_Oz_areaunderpeak
## P3LPP                                            1.00
## N1                                               0.02
## P1                                               0.00
## P2                                               0.02
## N2                                               1.00
## N1_target_Oz_areaunderpeak                       1.00
## P1_target_Oz_areaunderpeak                       0.00
## N2_target_Oz_areaunderpeak                       0.56
## P2_target_Oz_MeanAmp                             0.05
## P3LPP_target_Pz_areaunderpeak                    0.22
##                                N2_target_Oz_areaunderpeak P2_target_Oz_MeanAmp
## P3LPP                                            1.00                  1.00
## N1                                               1.00                  0.00
## P1                                               1.00                  1.00
## P2                                               1.00                  0.00
## N2                                               0.00                  1.00
## N1_target_Oz_areaunderpeak                       1.00                  0.00
## P1_target_Oz_areaunderpeak                       1.00                  1.00
## N2_target_Oz_areaunderpeak                       0.00                  1.00
## P2_target_Oz_MeanAmp                             0.69                  0.00
## P3LPP_target_Pz_areaunderpeak                    0.00                  0.36
##                                P3LPP_target_Pz_areaunderpeak
## P3LPP                                               0.00
## N1                                                  1.00
## P1                                                  1.00
## P2                                                  1.00
## N2                                                  0.00
## N1_target_Oz_areaunderpeak                          1.00
## P1_target_Oz_areaunderpeak                          1.00
## N2_target_Oz_areaunderpeak                          0.01
## P2_target_Oz_MeanAmp                                1.00
## P3LPP_target_Pz_areaunderpeak                       0.00
##
##  To see confidence intervals of the correlations, print with the short=FALSE option

names(NPG_DSCPT_PCandERPs_LPP_P3)[names(NPG_DSCPT_PCandERPs_LPP_P3) == "value"] <- "P3LPP
"
names(NPG_DSCPT_PCandERPs_N1)[names(NPG_DSCPT_PCandERPs_N1) == "value"] <- "N1"
names(NPG_DSCPT_PCandERPs_N2)[names(NPG_DSCPT_PCandERPs_N2) == "value"] <- "N2"
names(NPG_DSCPT_PCandERPs_P1)[names(NPG_DSCPT_PCandERPs_P1) == "value"] <- "P1"
names(NPG_DSCPT_PCandERPs_P2)[names(NPG_DSCPT_PCandERPs_P2) == "value"] <- "P2"

NPG_DSCPT_PCandERPs_N1$N1 <- as.numeric(NPG_DSCPT_PCandERPs_N1$N1)
selectedN1cols <- select(NPG_DSCPT_PCandERPs_N1, SubID, N1)
NPG_DSCPT_PCandERPs_P1$P1 <- as.numeric(NPG_DSCPT_PCandERPs_P1$P1)
selectedP1cols <- select(NPG_DSCPT_PCandERPs_P1, SubID, P1)
NPG_DSCPT_PCandERPs_N2$N2 <- as.numeric(NPG_DSCPT_PCandERPs_N2$N2)
selectedN2cols <- select(NPG_DSCPT_PCandERPs_N2, SubID, N2)
NPG_DSCPT_PCandERPs_P2$P2 <- as.numeric(NPG_DSCPT_PCandERPs_P2$P2)
selectedP2cols <- select(NPG_DSCPT_PCandERPs_P2, SubID, P2)
```

```r
NPG_DSCPT_ForCorr <- merge(NPG_DSCPT_PCandERPs_LPP_P3, selectedN1cols, by = "SubID")
NPG_DSCPT_ForCorr <- merge(NPG_DSCPT_ForCorr, selectedP1cols, by = "SubID")
NPG_DSCPT_ForCorr <- merge(NPG_DSCPT_ForCorr, selectedP2cols, by = "SubID")
NPG_DSCPT_ForCorr <- merge(NPG_DSCPT_ForCorr, selectedN2cols, by = "SubID")

NPG_DSCPT_ForCorr_Target <-select(NPG_DSCPT_ForCorr, -Group, -SubID, -TrialType, -comps,
-Elec, -FacNum, -Task, -StudyID)
NPG_DSCPT_ForCorr_Target <-select(NPG_DSCPT_ForCorr_Target, P3LPP, N1, P1, P2, N2, N1_tar
get_Oz_areaunderpeak, P1_target_Oz_areaunderpeak, N2_target_Oz_areaunderpeak, P2_target_O
z_MeanAmp, P3LPP_target_Pz_areaunderpeak) #only vars we want in corr

NPG_DSCPT_ForCorr_Target$P3LPP <-as.numeric(NPG_DSCPT_ForCorr_Target$P3LPP)
NPG_DSCPT_ForCorr_Target$N1 <-as.numeric(NPG_DSCPT_ForCorr_Target$N1)
NPG_DSCPT_ForCorr_Target$P1 <-as.numeric(NPG_DSCPT_ForCorr_Target$P1)
NPG_DSCPT_ForCorr_Target$N2 <-as.numeric(NPG_DSCPT_ForCorr_Target$N2)
NPG_DSCPT_ForCorr_Target$P2 <-as.numeric(NPG_DSCPT_ForCorr_Target$P2)
NPG_DSCPT_ForCorr_Target$N1_target_Oz_areaunderpeak <-as.numeric(NPG_DSCPT_ForCorr_Target
$N1_target_Oz_areaunderpeak)
NPG_DSCPT_ForCorr_Target$N2_target_Oz_areaunderpeak <-as.numeric(NPG_DSCPT_ForCorr_Target
$N2_target_Oz_areaunderpeak)
NPG_DSCPT_ForCorr_Target$P1_target_Oz_areaunderpeak <-as.numeric(NPG_DSCPT_ForCorr_Target
$P1_target_Oz_areaunderpeak)
NPG_DSCPT_ForCorr_Target$P2_target_Oz_MeanAmp <-as.numeric(NPG_DSCPT_ForCorr_Target$P2_ta
rget_Oz_MeanAmp)
NPG_DSCPT_ForCorr_Target$P3LPP_target_Pz_areaunderpeak <-as.numeric(NPG_DSCPT_ForCorr_Tar
get$P3LPP_target_Pz_areaunderpeak)

cor(NPG_DSCPT_ForCorr_Target, method = "pearson")  # correlation coefficients
```

```
##                                    P3LPP          N1          P1          P2
## P3LPP                           1.00000000  0.17318793  0.11013342  0.17318793
## N1                              0.17318793  1.00000000  0.05847927  1.00000000
## P1                              0.11013342  0.05847927  1.00000000  0.05847927
## P2                              0.17318793  1.00000000  0.05847927  1.00000000
## N2                             -0.51908799 -0.08167677 -0.14308668 -0.08167677
## N1_target_Oz_areaunderpeak      0.09981623 -0.30636954  0.45117700 -0.30636954
## P1_target_Oz_areaunderpeak      0.19525978  0.16572126  0.76358673  0.16572126
## N2_target_Oz_areaunderpeak      0.20319778 -0.04476207  0.01641714 -0.04476207
## P2_target_Oz_MeanAmp            0.22379851  0.97948513 -0.02987917  0.97948513
## P3LPP_target_Pz_areaunderpeak   0.75698102  0.22484007  0.22435710  0.22484007
##                                         N2 N1_target_Oz_areaunderpeak
## P3LPP                          -0.51908799                 0.09981623
## N1                             -0.08167677                -0.30636954
## P1                             -0.14308668                 0.45117700
## P2                             -0.08167677                -0.30636954
## N2                              1.00000000                -0.18843423
## N1_target_Oz_areaunderpeak     -0.18843423                 1.00000000
## P1_target_Oz_areaunderpeak     -0.15193081                 0.20273798
## N2_target_Oz_areaunderpeak     -0.73049644                 0.11727576
## P2_target_Oz_MeanAmp           -0.07725187                -0.34720478
## P3LPP_target_Pz_areaunderpeak  -0.78517418                 0.16619124
##                                P1_target_Oz_areaunderpeak
## P3LPP                                         0.19525978
## N1                                            0.16572126
```

```
## P1                                          0.76358673
## P2                                          0.16572126
## N2                                         -0.15193081
## N1_target_Oz_areaunderpeak                  0.20273798
## P1_target_Oz_areaunderpeak                  1.00000000
## N2_target_Oz_areaunderpeak                 -0.02721117
## P2_target_Oz_MeanAmp                        0.12369186
## P3LPP_target_Pz_areaunderpeak               0.25855642
##                               N2_target_Oz_areaunderpeak P2_target_Oz_MeanAmp
## P3LPP                                       0.20319778           0.22379851
## N1                                         -0.04476207           0.97948513
## P1                                          0.01641714          -0.02987917
## P2                                         -0.04476207           0.97948513
## N2                                         -0.73049644          -0.07725187
## N1_target_Oz_areaunderpeak                  0.11727576          -0.34720478
## P1_target_Oz_areaunderpeak                 -0.02721117           0.12369186
## N2_target_Oz_areaunderpeak                  1.00000000          -0.05695458
## P2_target_Oz_MeanAmp                       -0.05695458           1.00000000
## P3LPP_target_Pz_areaunderpeak               0.33057456           0.23031593
##                               P3LPP_target_Pz_areaunderpeak
## P3LPP                                            0.7569810
## N1                                               0.2248401
## P1                                               0.2243571
## P2                                               0.2248401
## N2                                              -0.7851742
## N1_target_Oz_areaunderpeak                       0.1661912
## P1_target_Oz_areaunderpeak                       0.2585564
## N2_target_Oz_areaunderpeak                       0.3305746
## P2_target_Oz_MeanAmp                             0.2303159
## P3LPP_target_Pz_areaunderpeak                    1.0000000
```

```
corr.test(NPG_DSCPT_ForCorr_Target, method = "pearson") #significance values
```

```
## Call:corr.test(x = NPG_DSCPT_ForCorr_Target, method = "pearson")
## Correlation matrix
##                               P3LPP    N1    P1    P2    N2
## P3LPP                          1.00  0.17  0.11  0.17 -0.52
## N1                             0.17  1.00  0.06  1.00 -0.08
## P1                             0.11  0.06  1.00  0.06 -0.14
## P2                             0.17  1.00  0.06  1.00 -0.08
## N2                            -0.52 -0.08 -0.14 -0.08  1.00
## N1_target_Oz_areaunderpeak     0.10 -0.31  0.45 -0.31 -0.19
## P1_target_Oz_areaunderpeak     0.20  0.17  0.76  0.17 -0.15
## N2_target_Oz_areaunderpeak     0.20 -0.04  0.02 -0.04 -0.73
## P2_target_Oz_MeanAmp           0.22  0.98 -0.03  0.98 -0.08
## P3LPP_target_Pz_areaunderpeak  0.76  0.22  0.22  0.22 -0.79
##                               N1_target_Oz_areaunderpeak
## P3LPP                                               0.10
## N1                                                 -0.31
## P1                                                  0.45
## P2                                                 -0.31
## N2                                                 -0.19
## N1_target_Oz_areaunderpeak                          1.00
## P1_target_Oz_areaunderpeak                          0.20
## N2_target_Oz_areaunderpeak                          0.12
## P2_target_Oz_MeanAmp                               -0.35
```

```
## P3LPP_target_Pz_areaunderpeak                        0.17
##                                P1_target_Oz_areaunderpeak
## P3LPP                                              0.20
## N1                                                 0.17
## P1                                                 0.76
## P2                                                 0.17
## N2                                                -0.15
## N1_target_Oz_areaunderpeak                         0.20
## P1_target_Oz_areaunderpeak                         1.00
## N2_target_Oz_areaunderpeak                        -0.03
## P2_target_Oz_MeanAmp                               0.12
## P3LPP_target_Pz_areaunderpeak                      0.26
##                                N2_target_Oz_areaunderpeak P2_target_Oz_MeanAmp
## P3LPP                                              0.20                 0.22
## N1                                                -0.04                 0.98
## P1                                                 0.02                -0.03
## P2                                                -0.04                 0.98
## N2                                                -0.73                -0.08
## N1_target_Oz_areaunderpeak                         0.12                -0.35
## P1_target_Oz_areaunderpeak                        -0.03                 0.12
## N2_target_Oz_areaunderpeak                         1.00                -0.06
## P2_target_Oz_MeanAmp                              -0.06                 1.00
## P3LPP_target_Pz_areaunderpeak                      0.33                 0.23
##                                P3LPP_target_Pz_areaunderpeak
## P3LPP                                                 0.76
## N1                                                    0.22
## P1                                                    0.22
## P2                                                    0.22
## N2                                                   -0.79
## N1_target_Oz_areaunderpeak                            0.17
## P1_target_Oz_areaunderpeak                            0.26
## N2_target_Oz_areaunderpeak                            0.33
## P2_target_Oz_MeanAmp                                  0.23
## P3LPP_target_Pz_areaunderpeak                         1.00
## Sample Size
## [1] 96
## Probability values (Entries above the diagonal are adjusted for multiple tests.)
##                                P3LPP   N1   P1   P2   N2
## P3LPP                           0.00 1.00 1.00 1.00 0.00
## N1                              0.09 0.00 1.00 0.00 1.00
## P1                              0.29 0.57 0.00 1.00 1.00
## P2                              0.09 0.00 0.57 0.00 1.00
## N2                              0.00 0.43 0.16 0.43 0.00
## N1_target_Oz_areaunderpeak      0.33 0.00 0.00 0.00 0.07
## P1_target_Oz_areaunderpeak      0.06 0.11 0.00 0.11 0.14
## N2_target_Oz_areaunderpeak      0.05 0.66 0.87 0.66 0.00
## P2_target_Oz_MeanAmp            0.03 0.00 0.77 0.00 0.45
## P3LPP_target_Pz_areaunderpeak   0.00 0.03 0.03 0.03 0.00
##                                N1_target_Oz_areaunderpeak
## P3LPP                                              1.00
## N1                                                 0.08
## P1                                                 0.00
## P2                                                 0.08
## N2                                                 1.00
## N1_target_Oz_areaunderpeak                         0.00
```

```
## P1_target_Oz_areaunderpeak                          0.05
## N2_target_Oz_areaunderpeak                          0.26
## P2_target_Oz_MeanAmp                                0.00
## P3LPP_target_Pz_areaunderpeak                       0.11
##                                P1_target_Oz_areaunderpeak
## P3LPP                                                1.00
## N1                                                   1.00
## P1                                                   0.00
## P2                                                   1.00
## N2                                                   1.00
## N1_target_Oz_areaunderpeak                           1.00
## P1_target_Oz_areaunderpeak                           0.00
## N2_target_Oz_areaunderpeak                           0.79
## P2_target_Oz_MeanAmp                                 0.23
## P3LPP_target_Pz_areaunderpeak                        0.01
##                                N2_target_Oz_areaunderpeak P2_target_Oz_MeanAmp
## P3LPP                                                1.00                 0.83
## N1                                                   1.00                 0.00
## P1                                                   1.00                 1.00
## P2                                                   1.00                 0.00
## N2                                                   0.00                 1.00
## N1_target_Oz_areaunderpeak                           1.00                 0.02
## P1_target_Oz_areaunderpeak                           1.00                 1.00
## N2_target_Oz_areaunderpeak                           0.00                 1.00
## P2_target_Oz_MeanAmp                                 0.58                 0.00
## P3LPP_target_Pz_areaunderpeak                        0.00                 0.02
##                                P3LPP_target_Pz_areaunderpeak
## P3LPP                                                 0.00
## N1                                                    0.83
## P1                                                    0.83
## P2                                                    0.83
## N2                                                    0.00
## N1_target_Oz_areaunderpeak                            1.00
## P1_target_Oz_areaunderpeak                            0.35
## N2_target_Oz_areaunderpeak                            0.04
## P2_target_Oz_MeanAmp                                  0.74
## P3LPP_target_Pz_areaunderpeak                         0.00
##
##  To see confidence intervals of the correlations, print with the short=FALSE option

names(GTF_DSCPT_PCandERPs_LPP_P3)[names(GTF_DSCPT_PCandERPs_LPP_P3) == "value"] <- "P3LPP
"
names(GTF_DSCPT_PCandERPs_N1)[names(GTF_DSCPT_PCandERPs_N1) == "value"] <- "N1"
names(GTF_DSCPT_PCandERPs_N2)[names(GTF_DSCPT_PCandERPs_N2) == "value"] <- "N2"
names(GTF_DSCPT_PCandERPs_P1)[names(GTF_DSCPT_PCandERPs_P1) == "value"] <- "P1"
names(GTF_DSCPT_PCandERPs_P2)[names(GTF_DSCPT_PCandERPs_P2) == "value"] <- "P2"

GTF_DSCPT_PCandERPs_N1$N1 <- as.numeric(GTF_DSCPT_PCandERPs_N1$N1)
selectedN1cols <- select(GTF_DSCPT_PCandERPs_N1, SubID, N1)
GTF_DSCPT_PCandERPs_P1$P1 <- as.numeric(GTF_DSCPT_PCandERPs_P1$P1)
selectedP1cols <- select(GTF_DSCPT_PCandERPs_P1, SubID, P1)
GTF_DSCPT_PCandERPs_N2$N2 <- as.numeric(GTF_DSCPT_PCandERPs_N2$N2)
selectedN2cols <- select(GTF_DSCPT_PCandERPs_N2, SubID, N2)
GTF_DSCPT_PCandERPs_P2$P2 <- as.numeric(GTF_DSCPT_PCandERPs_P2$P2)
selectedP2cols <- select(GTF_DSCPT_PCandERPs_P2, SubID, P2)
```

```r
GTF_DSCPT_ForCorr <- merge(GTF_DSCPT_PCandERPs_LPP_P3, selectedN1cols, by = "SubID")
GTF_DSCPT_ForCorr <- merge(GTF_DSCPT_ForCorr, selectedP1cols, by = "SubID")
GTF_DSCPT_ForCorr <- merge(GTF_DSCPT_ForCorr, selectedP2cols, by = "SubID")
GTF_DSCPT_ForCorr <- merge(GTF_DSCPT_ForCorr, selectedN2cols, by = "SubID")

GTF_DSCPT_ForCorr_Target <-select(GTF_DSCPT_ForCorr, -Group, -SubID, -TrialType, -comps,
-Elec, -FacNum, -Task, -StudyID)
GTF_DSCPT_ForCorr_Target <-select(GTF_DSCPT_ForCorr_Target, P3LPP, N1, P1, P2, N2, N1_tar
get_Oz_areaunderpeak, P1_target_Oz_areaunderpeak, N2_target_Oz_areaunderpeak, P2_target_O
z_MeanAmp, P3LPP_target_Pz_areaunderpeak) #only vars we want in corr

GTF_DSCPT_ForCorr_Target$P3LPP <-as.numeric(GTF_DSCPT_ForCorr_Target$P3LPP)
GTF_DSCPT_ForCorr_Target$N1 <-as.numeric(GTF_DSCPT_ForCorr_Target$N1)
GTF_DSCPT_ForCorr_Target$P1 <-as.numeric(GTF_DSCPT_ForCorr_Target$P1)
GTF_DSCPT_ForCorr_Target$N2 <-as.numeric(GTF_DSCPT_ForCorr_Target$N2)
GTF_DSCPT_ForCorr_Target$P2 <-as.numeric(GTF_DSCPT_ForCorr_Target$P2)
GTF_DSCPT_ForCorr_Target$N1_target_Oz_areaunderpeak <-as.numeric(GTF_DSCPT_ForCorr_Target
$N1_target_Oz_areaunderpeak)
GTF_DSCPT_ForCorr_Target$N2_target_Oz_areaunderpeak <-as.numeric(GTF_DSCPT_ForCorr_Target
$N2_target_Oz_areaunderpeak)
GTF_DSCPT_ForCorr_Target$P1_target_Oz_areaunderpeak <-as.numeric(GTF_DSCPT_ForCorr_Target
$P1_target_Oz_areaunderpeak)
GTF_DSCPT_ForCorr_Target$P2_target_Oz_MeanAmp <-as.numeric(GTF_DSCPT_ForCorr_Target$P2_ta
rget_Oz_MeanAmp)
GTF_DSCPT_ForCorr_Target$P3LPP_target_Pz_areaunderpeak <-as.numeric(GTF_DSCPT_ForCorr_Tar
get$P3LPP_target_Pz_areaunderpeak)

cor(GTF_DSCPT_ForCorr_Target, method = "pearson")  # correlation coefficients
```

```
##                                    P3LPP           N1          P1           P2
## P3LPP                           1.00000000  0.083124306  0.17234026  0.083124306
## N1                              0.08312431  1.000000000  0.15012453  1.000000000
## P1                              0.17234026  0.150124532  1.00000000  0.150124532
## P2                              0.08312431  1.000000000  0.15012453  1.000000000
## N2                             -0.34860593  0.005322406 -0.13452691  0.005322406
## N1_target_Oz_areaunderpeak     -0.07160961 -0.526698465  0.25612391 -0.526698465
## P1_target_Oz_areaunderpeak      0.20958715  0.217905875  0.74924332  0.217905875
## N2_target_Oz_areaunderpeak     -0.23922391 -0.042439812 -0.06963823 -0.042439812
## P2_target_Oz_MeanAmp            0.03620857  0.914755178 -0.02836877  0.914755178
## P3LPP_target_Pz_areaunderpeak   0.74572284  0.107613541  0.28378650  0.107613541
##                                          N2 N1_target_Oz_areaunderpeak
## P3LPP                          -0.348605932                -0.07160961
## N1                              0.005322406                -0.52669846
## P1                             -0.134526914                 0.25612391
## P2                              0.005322406                -0.52669846
## N2                              1.000000000                -0.02710571
## N1_target_Oz_areaunderpeak     -0.027105712                 1.00000000
## P1_target_Oz_areaunderpeak     -0.047211567                 0.06819291
## N2_target_Oz_areaunderpeak     -0.536500258                 0.16395303
## P2_target_Oz_MeanAmp            0.035342086                -0.44660888
## P3LPP_target_Pz_areaunderpeak -0.604476306                -0.16069898
##                                P1_target_Oz_areaunderpeak
## P3LPP                                         0.20958715
## N1                                            0.21790587
```

```
## P1                                          0.74924332
## P2                                          0.21790587
## N2                                         -0.04721157
## N1_target_Oz_areaunderpeak                  0.06819291
## P1_target_Oz_areaunderpeak                  1.00000000
## N2_target_Oz_areaunderpeak                 -0.27671843
## P2_target_Oz_MeanAmp                        0.09748859
## P3LPP_target_Pz_areaunderpeak               0.33968714
##                               N2_target_Oz_areaunderpeak P2_target_Oz_MeanAmp
## P3LPP                                      -0.239223906          0.036208568
## N1                                         -0.042439812          0.914755178
## P1                                         -0.069638225         -0.028368771
## P2                                         -0.042439812          0.914755178
## N2                                         -0.536500258          0.035342086
## N1_target_Oz_areaunderpeak                  0.163953025         -0.446608877
## P1_target_Oz_areaunderpeak                 -0.276718426          0.097488589
## N2_target_Oz_areaunderpeak                  1.000000000          0.008759512
## P2_target_Oz_MeanAmp                        0.008759512          1.000000000
## P3LPP_target_Pz_areaunderpeak              -0.172084883          0.039676317
##                               P3LPP_target_Pz_areaunderpeak
## P3LPP                                          0.74572284
## N1                                             0.10761354
## P1                                             0.28378650
## P2                                             0.10761354
## N2                                            -0.60447631
## N1_target_Oz_areaunderpeak                    -0.16069898
## P1_target_Oz_areaunderpeak                     0.33968714
## N2_target_Oz_areaunderpeak                    -0.17208488
## P2_target_Oz_MeanAmp                           0.03967632
## P3LPP_target_Pz_areaunderpeak                  1.00000000
```

```
corr.test(GTF_DSCPT_ForCorr_Target, method = "pearson") #significance values
```

```
## Call:corr.test(x = GTF_DSCPT_ForCorr_Target, method = "pearson")
## Correlation matrix
##                               P3LPP    N1    P1    P2    N2
## P3LPP                          1.00  0.08  0.17  0.08 -0.35
## N1                             0.08  1.00  0.15  1.00  0.01
## P1                             0.17  0.15  1.00  0.15 -0.13
## P2                             0.08  1.00  0.15  1.00  0.01
## N2                            -0.35  0.01 -0.13  0.01  1.00
## N1_target_Oz_areaunderpeak    -0.07 -0.53  0.26 -0.53 -0.03
## P1_target_Oz_areaunderpeak     0.21  0.22  0.75  0.22 -0.05
## N2_target_Oz_areaunderpeak    -0.24 -0.04 -0.07 -0.04 -0.54
## P2_target_Oz_MeanAmp           0.04  0.91 -0.03  0.91  0.04
## P3LPP_target_Pz_areaunderpeak  0.75  0.11  0.28  0.11 -0.60
##                               N1_target_Oz_areaunderpeak
## P3LPP                                          -0.07
## N1                                             -0.53
## P1                                              0.26
## P2                                             -0.53
## N2                                             -0.03
## N1_target_Oz_areaunderpeak                      1.00
## P1_target_Oz_areaunderpeak                      0.07
## N2_target_Oz_areaunderpeak                      0.16
## P2_target_Oz_MeanAmp                           -0.45
```

```
## P3LPP_target_Pz_areaunderpeak                       -0.16
##                                P1_target_Oz_areaunderpeak
## P3LPP                                            0.21
## N1                                               0.22
## P1                                               0.75
## P2                                               0.22
## N2                                              -0.05
## N1_target_Oz_areaunderpeak                       0.07
## P1_target_Oz_areaunderpeak                       1.00
## N2_target_Oz_areaunderpeak                      -0.28
## P2_target_Oz_MeanAmp                             0.10
## P3LPP_target_Pz_areaunderpeak                    0.34
##                                N2_target_Oz_areaunderpeak P2_target_Oz_MeanAmp
## P3LPP                                           -0.24                  0.04
## N1                                              -0.04                  0.91
## P1                                              -0.07                 -0.03
## P2                                              -0.04                  0.91
## N2                                              -0.54                  0.04
## N1_target_Oz_areaunderpeak                       0.16                 -0.45
## P1_target_Oz_areaunderpeak                      -0.28                  0.10
## N2_target_Oz_areaunderpeak                       1.00                  0.01
## P2_target_Oz_MeanAmp                             0.01                  1.00
## P3LPP_target_Pz_areaunderpeak                   -0.17                  0.04
##                                P3LPP_target_Pz_areaunderpeak
## P3LPP                                               0.75
## N1                                                  0.11
## P1                                                  0.28
## P2                                                  0.11
## N2                                                 -0.60
## N1_target_Oz_areaunderpeak                         -0.16
## P1_target_Oz_areaunderpeak                          0.34
## N2_target_Oz_areaunderpeak                         -0.17
## P2_target_Oz_MeanAmp                                0.04
## P3LPP_target_Pz_areaunderpeak                       1.00
## Sample Size
## [1] 93
## Probability values (Entries above the diagonal are adjusted for multiple tests.)
##                                P3LPP   N1   P1   P2   N2
## P3LPP                           0.00 1.00 1.00 1.00 0.02
## N1                              0.43 0.00 1.00 0.00 1.00
## P1                              0.10 0.15 0.00 1.00 1.00
## P2                              0.43 0.00 0.15 0.00 1.00
## N2                              0.00 0.96 0.20 0.96 0.00
## N1_target_Oz_areaunderpeak      0.50 0.00 0.01 0.00 0.80
## P1_target_Oz_areaunderpeak      0.04 0.04 0.00 0.04 0.65
## N2_target_Oz_areaunderpeak      0.02 0.69 0.51 0.69 0.00
## P2_target_Oz_MeanAmp            0.73 0.00 0.79 0.00 0.74
## P3LPP_target_Pz_areaunderpeak   0.00 0.30 0.01 0.30 0.00
##                                N1_target_Oz_areaunderpeak
## P3LPP                                             1.00
## N1                                                0.00
## P1                                                0.41
## P2                                                0.00
## N2                                                1.00
## N1_target_Oz_areaunderpeak                        0.00
```

```
## P1_target_Oz_areaunderpeak                          0.52
## N2_target_Oz_areaunderpeak                          0.12
## P2_target_Oz_MeanAmp                                0.00
## P3LPP_target_Pz_areaunderpeak                       0.12
##                                P1_target_Oz_areaunderpeak
## P3LPP                                               1.00
## N1                                                  1.00
## P1                                                  0.00
## P2                                                  1.00
## N2                                                  1.00
## N1_target_Oz_areaunderpeak                          1.00
## P1_target_Oz_areaunderpeak                          0.00
## N2_target_Oz_areaunderpeak                          0.01
## P2_target_Oz_MeanAmp                                0.35
## P3LPP_target_Pz_areaunderpeak                       0.00
##                                N2_target_Oz_areaunderpeak P2_target_Oz_MeanAmp
## P3LPP                                               0.63                 1.00
## N1                                                  1.00                 0.00
## P1                                                  1.00                 1.00
## P2                                                  1.00                 0.00
## N2                                                  0.00                 1.00
## N1_target_Oz_areaunderpeak                          1.00                 0.00
## P1_target_Oz_areaunderpeak                          0.23                 1.00
## N2_target_Oz_areaunderpeak                          0.00                 1.00
## P2_target_Oz_MeanAmp                                0.93                 0.00
## P3LPP_target_Pz_areaunderpeak                       0.10                 0.71
##                                P3LPP_target_Pz_areaunderpeak
## P3LPP                                                 0.00
## N1                                                    1.00
## P1                                                    0.19
## P2                                                    1.00
## N2                                                    0.00
## N1_target_Oz_areaunderpeak                            1.00
## P1_target_Oz_areaunderpeak                            0.03
## N2_target_Oz_areaunderpeak                            1.00
## P2_target_Oz_MeanAmp                                  1.00
## P3LPP_target_Pz_areaunderpeak                         0.00
##
##  To see confidence intervals of the correlations, print with the short=FALSE option

names(PENS_Dich_PCandERPs_LPP)[names(PENS_Dich_PCandERPs_LPP) == "value"] <- "LPP"
names(PENS_Dich_PCandERPs_MMN_P2)[names(PENS_Dich_PCandERPs_MMN_P2) == "value"] <- "P2MMN
"
names(PENS_Dich_PCandERPs_N1)[names(PENS_Dich_PCandERPs_N1) == "value"] <- "N1"
names(PENS_Dich_PCandERPs_P3)[names(PENS_Dich_PCandERPs_P3) == "value"] <- "P3"

selectedN1colsdi <- select(PENS_Dich_PCandERPs_N1, SubID, N1)
selectedP2MMNcolsdi <- select(PENS_Dich_PCandERPs_MMN_P2, SubID, P2MMN)
selectedP3colsdi <- select(PENS_Dich_PCandERPs_P3, SubID, P3)

PENS_Dich_ForCorr <- merge(PENS_Dich_PCandERPs_LPP, selectedN1colsdi, by = "SubID")
PENS_Dich_ForCorr <- merge(PENS_Dich_ForCorr, selectedP2MMNcolsdi, by = "SubID")
PENS_Dich_ForCorr <- merge(PENS_Dich_ForCorr, selectedP3colsdi, by = "SubID")

PENS_Dich_ForCorr_Target <-select(PENS_Dich_ForCorr, -Group, -SubID, -TrialType, -comps,
```

```
-Elec, -FacNum, -Task, -StudyID)
PENS_Dich_ForCorr_Target <-select(PENS_Dich_ForCorr_Target, LPP, N1, P3, P2MMN, N1_target
_attendedrare_pz_areaunderpeak, p2mmn_target_attendedrare_pz_areaunderpeak, p300_target_a
ttendedrare_pz_MeanAmp, lpp_target_attendedrare_pz_MeanAmp) #only vars we want in corr

cor(PENS_Dich_ForCorr_Target, method = "pearson")  # correlation coefficients

##                                                        LPP          N1          P3
## LPP                                             1.00000000  0.05358728  0.16526955
## N1                                              0.05358728  1.00000000 -0.37917049
## P3                                              0.16526955 -0.37917049  1.00000000
## P2MMN                                           0.10545922  0.13127882  0.02213632
## N1_target_attendedrare_pz_areaunderpeak        -0.02962485  0.86877890 -0.28622341
## p2mmn_target_attendedrare_pz_areaunderpeak      0.17276517  0.12957927  0.18366785
## p300_target_attendedrare_pz_MeanAmp             0.02414935 -0.38124674  0.97427617
## lpp_target_attendedrare_pz_MeanAmp              0.94091123 -0.08450785  0.43366487
##                                                      P2MMN
## LPP                                             0.10545922
## N1                                              0.13127882
## P3                                              0.02213632
## P2MMN                                           1.00000000
## N1_target_attendedrare_pz_areaunderpeak         0.25657410
## p2mmn_target_attendedrare_pz_areaunderpeak      0.85625422
## p300_target_attendedrare_pz_MeanAmp            -0.02594254
## lpp_target_attendedrare_pz_MeanAmp              0.12988743
##                                                N1_target_attendedrare_pz_areaunderpeak
## LPP                                                                         -0.02962485
## N1                                                                           0.86877890
## P3                                                                          -0.28622341
## P2MMN                                                                        0.25657410
## N1_target_attendedrare_pz_areaunderpeak                                      1.00000000
## p2mmn_target_attendedrare_pz_areaunderpeak                                   0.12342229
## p300_target_attendedrare_pz_MeanAmp                                         -0.27041722
## lpp_target_attendedrare_pz_MeanAmp                                          -0.13550596
##                                                p2mmn_target_attendedrare_pz_areaunderpeak
## LPP                                                                             0.1727652
## N1                                                                              0.1295793
## P3                                                                              0.1836678
## P2MMN                                                                           0.8562542
## N1_target_attendedrare_pz_areaunderpeak                                         0.1234223
## p2mmn_target_attendedrare_pz_areaunderpeak                                      1.0000000
## p300_target_attendedrare_pz_MeanAmp                                             0.1303317
## lpp_target_attendedrare_pz_MeanAmp                                              0.2484315
##                                                p300_target_attendedrare_pz_MeanAmp
## LPP                                                                     0.02414935
## N1                                                                     -0.38124674
## P3                                                                      0.97427617
## P2MMN                                                                  -0.02594254
## N1_target_attendedrare_pz_areaunderpeak                                -0.27041722
## p2mmn_target_attendedrare_pz_areaunderpeak                              0.13033168
## p300_target_attendedrare_pz_MeanAmp                                     1.00000000
## lpp_target_attendedrare_pz_MeanAmp                                      0.28893719
##                                                lpp_target_attendedrare_pz_MeanAmp
## LPP                                                                     0.94091123
## N1                                                                     -0.08450785
## P3                                                                      0.43366487
```

```
## P2MMN                                                          0.12988743
## N1_target_attendedrare_pz_areaunderpeak                       -0.13550596
## p2mmn_target_attendedrare_pz_areaunderpeak                     0.24843148
## p300_target_attendedrare_pz_MeanAmp                            0.28893719
## lpp_target_attendedrare_pz_MeanAmp                             1.00000000

corr.test(PENS_Dich_ForCorr_Target, method = "pearson") #significance values

## Call:corr.test(x = PENS_Dich_ForCorr_Target, method = "pearson")
## Correlation matrix
##                                                 LPP    N1    P3 P2MMN
## LPP                                            1.00  0.05  0.17  0.11
## N1                                             0.05  1.00 -0.38  0.13
## P3                                             0.17 -0.38  1.00  0.02
## P2MMN                                          0.11  0.13  0.02  1.00
## N1_target_attendedrare_pz_areaunderpeak       -0.03  0.87 -0.29  0.26
## p2mmn_target_attendedrare_pz_areaunderpeak     0.17  0.13  0.18  0.86
## p300_target_attendedrare_pz_MeanAmp            0.02 -0.38  0.97 -0.03
## lpp_target_attendedrare_pz_MeanAmp             0.94 -0.08  0.43  0.13
##                                               N1_target_attendedrare_pz_areaunderpeak
## LPP                                                                            -0.03
## N1                                                                              0.87
## P3                                                                             -0.29
## P2MMN                                                                           0.26
## N1_target_attendedrare_pz_areaunderpeak                                         1.00
## p2mmn_target_attendedrare_pz_areaunderpeak                                      0.12
## p300_target_attendedrare_pz_MeanAmp                                            -0.27
## lpp_target_attendedrare_pz_MeanAmp                                             -0.14
##                                               p2mmn_target_attendedrare_pz_areaunderpeak
## LPP                                                                                 0.17
## N1                                                                                  0.13
## P3                                                                                  0.18
## P2MMN                                                                               0.86
## N1_target_attendedrare_pz_areaunderpeak                                             0.12
## p2mmn_target_attendedrare_pz_areaunderpeak                                          1.00
## p300_target_attendedrare_pz_MeanAmp                                                 0.13
## lpp_target_attendedrare_pz_MeanAmp                                                  0.25
##                                               p300_target_attendedrare_pz_MeanAmp
## LPP                                                                          0.02
## N1                                                                          -0.38
## P3                                                                           0.97
## P2MMN                                                                       -0.03
## N1_target_attendedrare_pz_areaunderpeak                                     -0.27
## p2mmn_target_attendedrare_pz_areaunderpeak                                   0.13
## p300_target_attendedrare_pz_MeanAmp                                          1.00
## lpp_target_attendedrare_pz_MeanAmp                                           0.29
##                                               lpp_target_attendedrare_pz_MeanAmp
## LPP                                                                         0.94
## N1                                                                         -0.08
## P3                                                                          0.43
## P2MMN                                                                       0.13
## N1_target_attendedrare_pz_areaunderpeak                                    -0.14
## p2mmn_target_attendedrare_pz_areaunderpeak                                  0.25
## p300_target_attendedrare_pz_MeanAmp                                         0.29
## lpp_target_attendedrare_pz_MeanAmp                                          1.00
## Sample Size
```

```
## [1] 73
## Probability values (Entries above the diagonal are adjusted for multiple tests.)
##                                              LPP   N1   P3 P2MMN
## LPP                                         0.00 1.00 1.00  1.00
## N1                                          0.65 0.00 0.02  1.00
## P3                                          0.16 0.00 0.00  1.00
## P2MMN                                       0.37 0.27 0.85  0.00
## N1_target_attendedrare_pz_areaunderpeak     0.80 0.00 0.01  0.03
## p2mmn_target_attendedrare_pz_areaunderpeak  0.14 0.27 0.12  0.00
## p300_target_attendedrare_pz_MeanAmp         0.84 0.00 0.00  0.83
## lpp_target_attendedrare_pz_MeanAmp          0.00 0.48 0.00  0.27
##                                             N1_target_attendedrare_pz_areaunderpeak
## LPP                                                                            1.00
## N1                                                                             0.00
## P3                                                                             0.28
## P2MMN                                                                          0.51
## N1_target_attendedrare_pz_areaunderpeak                                        0.00
## p2mmn_target_attendedrare_pz_areaunderpeak                                     0.30
## p300_target_attendedrare_pz_MeanAmp                                            0.02
## lpp_target_attendedrare_pz_MeanAmp                                             0.25
##                                             p2mmn_target_attendedrare_pz_areaunderpeak
## LPP                                                                               1.00
## N1                                                                                1.00
## P3                                                                                1.00
## P2MMN                                                                             0.00
## N1_target_attendedrare_pz_areaunderpeak                                           1.00
## p2mmn_target_attendedrare_pz_areaunderpeak                                        0.00
## p300_target_attendedrare_pz_MeanAmp                                               0.27
## lpp_target_attendedrare_pz_MeanAmp                                                0.03
##                                             p300_target_attendedrare_pz_MeanAmp
## LPP                                                                        1.00
## N1                                                                         0.02
## P3                                                                         0.00
## P2MMN                                                                      1.00
## N1_target_attendedrare_pz_areaunderpeak                                    0.39
## p2mmn_target_attendedrare_pz_areaunderpeak                                 1.00
## p300_target_attendedrare_pz_MeanAmp                                        0.00
## lpp_target_attendedrare_pz_MeanAmp                                         0.01
##                                             lpp_target_attendedrare_pz_MeanAmp
## LPP                                                                       0.00
## N1                                                                        1.00
## P3                                                                        0.00
## P2MMN                                                                     1.00
## N1_target_attendedrare_pz_areaunderpeak                                   1.00
## p2mmn_target_attendedrare_pz_areaunderpeak                                0.58
## p300_target_attendedrare_pz_MeanAmp                                       0.28
## lpp_target_attendedrare_pz_MeanAmp                                        0.00
##
##  To see confidence intervals of the correlations, print with the short=FALSE option

names(NPG_Dich_PCandERPs_LPP)[names(NPG_Dich_PCandERPs_LPP) == "value"] <- "LPP"
names(NPG_Dich_PCandERPs_MMN_P2)[names(NPG_Dich_PCandERPs_MMN_P2) == "value"] <- "P2MMN"
names(NPG_Dich_PCandERPs_N1)[names(NPG_Dich_PCandERPs_N1) == "value"] <- "N1"
names(NPG_Dich_PCandERPs_P3)[names(NPG_Dich_PCandERPs_P3) == "value"] <- "P3"

selectedN1colsdi <- select(NPG_Dich_PCandERPs_N1, SubID, N1)
```

```r
selectedP2MMNcolsdi <- select(NPG_Dich_PCandERPs_MMN_P2, SubID, P2MMN)
selectedP3colsdi <- select(NPG_Dich_PCandERPs_P3, SubID, P3)

NPG_Dich_ForCorr <- merge(NPG_Dich_PCandERPs_LPP, selectedN1colsdi, by = "SubID")
NPG_Dich_ForCorr <- merge(NPG_Dich_ForCorr, selectedP2MMNcolsdi, by = "SubID")
NPG_Dich_ForCorr <- merge(NPG_Dich_ForCorr, selectedP3colsdi, by = "SubID")

NPG_Dich_ForCorr_Target <-select(NPG_Dich_ForCorr, -Group, -SubID, -TrialType, -comps, -E
lec, -FacNum, -Task, -StudyID)
NPG_Dich_ForCorr_Target <-select(NPG_Dich_ForCorr, LPP, N1, P3, P2MMN, N1_target_attended
rare_pz_areaunderpeak, p2mmn_target_attendedrare_pz_areaunderpeak, p300_target_attendedra
re_pz_MeanAmp, lpp_target_attendedrare_pz_MeanAmp) #only vars we want in corr

cor(NPG_Dich_ForCorr_Target, method = "pearson")  # correlation coefficients
```

```
##                                                        LPP          N1         P3
## LPP                                             1.00000000 -0.02797225  0.1630559
## N1                                             -0.02797225  1.00000000 -0.1236720
## P3                                              0.16305590 -0.12367197  1.0000000
## P2MMN                                           0.28571680  0.30994856 -0.0031105
## N1_target_attendedrare_pz_areaunderpeak        -0.11308215  0.93171551 -0.1714047
## p2mmn_target_attendedrare_pz_areaunderpeak      0.29185598  0.31728781  0.1383458
## p300_target_attendedrare_pz_MeanAmp             0.19892050 -0.08659450  0.9832804
## lpp_target_attendedrare_pz_MeanAmp              0.96643215 -0.03294055  0.1072263
##                                                      P2MMN
## LPP                                             0.285716803
## N1                                              0.309948555
## P3                                             -0.003110500
## P2MMN                                           1.000000000
## N1_target_attendedrare_pz_areaunderpeak         0.096799187
## p2mmn_target_attendedrare_pz_areaunderpeak      0.850323460
## p300_target_attendedrare_pz_MeanAmp            -0.001929419
## lpp_target_attendedrare_pz_MeanAmp              0.243562885
##                                                N1_target_attendedrare_pz_areaunderpeak
## LPP                                                                        -0.11308215
## N1                                                                          0.93171551
## P3                                                                         -0.17140471
## P2MMN                                                                       0.09679919
## N1_target_attendedrare_pz_areaunderpeak                                     1.00000000
## p2mmn_target_attendedrare_pz_areaunderpeak                                  0.08304022
## p300_target_attendedrare_pz_MeanAmp                                        -0.13088787
## lpp_target_attendedrare_pz_MeanAmp                                         -0.10170953
##                                                p2mmn_target_attendedrare_pz_areaunderpeak
## LPP                                                                           0.29185598
## N1                                                                            0.31728781
## P3                                                                            0.13834575
## P2MMN                                                                         0.85032346
## N1_target_attendedrare_pz_areaunderpeak                                       0.08304022
## p2mmn_target_attendedrare_pz_areaunderpeak                                    1.00000000
## p300_target_attendedrare_pz_MeanAmp                                           0.13950645
## lpp_target_attendedrare_pz_MeanAmp                                            0.25438488
##                                                p300_target_attendedrare_pz_MeanAmp
## LPP                                                                     0.198920504
## N1                                                                     -0.086594505
## P3                                                                      0.983280406
```

```
## P2MMN                                                          -0.001929419
## N1_target_attendedrare_pz_areaunderpeak                        -0.130887872
## p2mmn_target_attendedrare_pz_areaunderpeak                      0.139506446
## p300_target_attendedrare_pz_MeanAmp                             1.000000000
## lpp_target_attendedrare_pz_MeanAmp                              0.140719776
##                                                 lpp_target_attendedrare_pz_MeanAmp
## LPP                                                                    0.96643215
## N1                                                                    -0.03294055
## P3                                                                     0.10722625
## P2MMN                                                                  0.24356289
## N1_target_attendedrare_pz_areaunderpeak                               -0.10170953
## p2mmn_target_attendedrare_pz_areaunderpeak                             0.25438488
## p300_target_attendedrare_pz_MeanAmp                                    0.14071978
## lpp_target_attendedrare_pz_MeanAmp                                     1.00000000

corr.test(NPG_Dich_ForCorr_Target, method = "pearson") #significance values

## Call:corr.test(x = NPG_Dich_ForCorr_Target, method = "pearson")
## Correlation matrix
##                                                  LPP    N1    P3 P2MMN
## LPP                                             1.00 -0.03  0.16  0.29
## N1                                             -0.03  1.00 -0.12  0.31
## P3                                              0.16 -0.12  1.00  0.00
## P2MMN                                           0.29  0.31  0.00  1.00
## N1_target_attendedrare_pz_areaunderpeak        -0.11  0.93 -0.17  0.10
## p2mmn_target_attendedrare_pz_areaunderpeak      0.29  0.32  0.14  0.85
## p300_target_attendedrare_pz_MeanAmp             0.20 -0.09  0.98  0.00
## lpp_target_attendedrare_pz_MeanAmp              0.97 -0.03  0.11  0.24
##                                                 N1_target_attendedrare_pz_areaunderpeak
## LPP                                                                               -0.11
## N1                                                                                 0.93
## P3                                                                                -0.17
## P2MMN                                                                              0.10
## N1_target_attendedrare_pz_areaunderpeak                                            1.00
## p2mmn_target_attendedrare_pz_areaunderpeak                                         0.08
## p300_target_attendedrare_pz_MeanAmp                                               -0.13
## lpp_target_attendedrare_pz_MeanAmp                                                -0.10
##                                                 p2mmn_target_attendedrare_pz_areaunderpeak
## LPP                                                                                   0.29
## N1                                                                                    0.32
## P3                                                                                    0.14
## P2MMN                                                                                 0.85
## N1_target_attendedrare_pz_areaunderpeak                                               0.08
## p2mmn_target_attendedrare_pz_areaunderpeak                                            1.00
## p300_target_attendedrare_pz_MeanAmp                                                   0.14
## lpp_target_attendedrare_pz_MeanAmp                                                    0.25
##                                                 p300_target_attendedrare_pz_MeanAmp
## LPP                                                                            0.20
## N1                                                                            -0.09
## P3                                                                             0.98
## P2MMN                                                                          0.00
## N1_target_attendedrare_pz_areaunderpeak                                       -0.13
## p2mmn_target_attendedrare_pz_areaunderpeak                                     0.14
## p300_target_attendedrare_pz_MeanAmp                                            1.00
## lpp_target_attendedrare_pz_MeanAmp                                             0.14
##                                                 lpp_target_attendedrare_pz_MeanAmp
```

```
## LPP                                                                  0.97
## N1                                                                  -0.03
## P3                                                                   0.11
## P2MMN                                                                0.24
## N1_target_attendedrare_pz_areaunderpeak                             -0.10
## p2mmn_target_attendedrare_pz_areaunderpeak                           0.25
## p300_target_attendedrare_pz_MeanAmp                                  0.14
## lpp_target_attendedrare_pz_MeanAmp                                   1.00
## Sample Size
## [1] 99
## Probability values (Entries above the diagonal are adjusted for multiple tests.)
##                                            LPP   N1   P3 P2MMN
## LPP                                       0.00 1.00 1.00  0.09
## N1                                        0.78 0.00 1.00  0.04
## P3                                        0.11 0.22 0.00  1.00
## P2MMN                                     0.00 0.00 0.98  0.00
## N1_target_attendedrare_pz_areaunderpeak   0.27 0.00 0.09  0.34
## p2mmn_target_attendedrare_pz_areaunderpeak 0.00 0.00 0.17  0.00
## p300_target_attendedrare_pz_MeanAmp       0.05 0.39 0.00  0.98
## lpp_target_attendedrare_pz_MeanAmp        0.00 0.75 0.29  0.02
##                                           N1_target_attendedrare_pz_areaunderpeak
## LPP                                                                          1.00
## N1                                                                           0.00
## P3                                                                           1.00
## P2MMN                                                                        1.00
## N1_target_attendedrare_pz_areaunderpeak                                      0.00
## p2mmn_target_attendedrare_pz_areaunderpeak                                   0.41
## p300_target_attendedrare_pz_MeanAmp                                          0.20
## lpp_target_attendedrare_pz_MeanAmp                                           0.32
##                                           p2mmn_target_attendedrare_pz_areaunderpeak
## LPP                                                                             0.07
## N1                                                                              0.03
## P3                                                                              1.00
## P2MMN                                                                           0.00
## N1_target_attendedrare_pz_areaunderpeak                                         1.00
## p2mmn_target_attendedrare_pz_areaunderpeak                                      0.00
## p300_target_attendedrare_pz_MeanAmp                                             0.17
## lpp_target_attendedrare_pz_MeanAmp                                              0.01
##                                           p300_target_attendedrare_pz_MeanAmp
## LPP                                                                      0.87
## N1                                                                       1.00
## P3                                                                       0.00
## P2MMN                                                                    1.00
## N1_target_attendedrare_pz_areaunderpeak                                  1.00
## p2mmn_target_attendedrare_pz_areaunderpeak                               1.00
## p300_target_attendedrare_pz_MeanAmp                                      0.00
## lpp_target_attendedrare_pz_MeanAmp                                       0.16
##                                           lpp_target_attendedrare_pz_MeanAmp
## LPP                                                                     0.00
## N1                                                                      1.00
## P3                                                                      1.00
## P2MMN                                                                   0.29
## N1_target_attendedrare_pz_areaunderpeak                                 1.00
## p2mmn_target_attendedrare_pz_areaunderpeak                              0.22
## p300_target_attendedrare_pz_MeanAmp                                     1.00
```

```
## lpp_target_attendedrare_pz_MeanAmp                                    0.00
##
##  To see confidence intervals of the correlations, print with the short=FALSE option

names(GTF_Dich_PCandERPs_LPP)[names(GTF_Dich_PCandERPs_LPP) == "value"] <- "LPP"
names(GTF_Dich_PCandERPs_MMN_P2)[names(GTF_Dich_PCandERPs_MMN_P2) == "value"] <- "P2MMN"
names(GTF_Dich_PCandERPs_N1)[names(GTF_Dich_PCandERPs_N1) == "value"] <- "N1"
names(GTF_Dich_PCandERPs_P3)[names(GTF_Dich_PCandERPs_P3) == "value"] <- "P3"

selectedN1colsdi <- select(GTF_Dich_PCandERPs_N1, SubID, N1)
selectedP2MMNcolsdi <- select(GTF_Dich_PCandERPs_MMN_P2, SubID, P2MMN)
selectedP3colsdi <- select(GTF_Dich_PCandERPs_P3, SubID, P3)

GTF_Dich_ForCorr <- merge(GTF_Dich_PCandERPs_LPP, selectedN1colsdi, by = "SubID")
GTF_Dich_ForCorr <- merge(GTF_Dich_ForCorr, selectedP2MMNcolsdi, by = "SubID")
GTF_Dich_ForCorr <- merge(GTF_Dich_ForCorr, selectedP3colsdi, by = "SubID")

GTF_Dich_ForCorr_Target <-select(GTF_Dich_ForCorr, -Group, -SubID, -TrialType, -comps, -E
lec, -FacNum, -Task, -StudyID)
GTF_Dich_ForCorr_Target <-select(GTF_Dich_ForCorr_Target, LPP, N1, P3, P2MMN, N1_target_a
ttendedrare_pz_areaunderpeak, p2mmn_target_attendedrare_pz_areaunderpeak, p300_target_att
endedrare_pz_MeanAmp, lpp_target_attendedrare_pz_MeanAmp) #only vars we want in corr

cor(GTF_Dich_ForCorr_Target, method = "pearson")  # correlation coefficients

##                                                        LPP          N1         P3
## LPP                                             1.00000000 -0.05863047  0.1555370
## N1                                             -0.05863047  1.00000000 -0.1369682
## P3                                              0.15553701 -0.13696820  1.0000000
## P2MMN                                          -0.05711673  0.34429530  0.3174626
## N1_target_attendedrare_pz_areaunderpeak        -0.08293438  0.74294848 -0.2018953
## p2mmn_target_attendedrare_pz_areaunderpeak     -0.03638740  0.18022538  0.4254659
## p300_target_attendedrare_pz_MeanAmp             0.16061343 -0.08715448  0.9806882
## lpp_target_attendedrare_pz_MeanAmp              0.97498886 -0.07038045  0.1701027
##                                                     P2MMN
## LPP                                            -0.05711673
## N1                                              0.34429530
## P3                                              0.31746258
## P2MMN                                           1.00000000
## N1_target_attendedrare_pz_areaunderpeak         0.02908976
## p2mmn_target_attendedrare_pz_areaunderpeak      0.79830123
## p300_target_attendedrare_pz_MeanAmp             0.27627411
## lpp_target_attendedrare_pz_MeanAmp             -0.04275344
##                                                N1_target_attendedrare_pz_areaunderpeak
## LPP                                                                         -0.08293438
## N1                                                                           0.74294848
## P3                                                                          -0.20189531
## P2MMN                                                                        0.02908976
## N1_target_attendedrare_pz_areaunderpeak                                      1.00000000
## p2mmn_target_attendedrare_pz_areaunderpeak                                  -0.05268866
## p300_target_attendedrare_pz_MeanAmp                                         -0.16270816
## lpp_target_attendedrare_pz_MeanAmp                                          -0.11187163
##                                                p2mmn_target_attendedrare_pz_areaunderpeak
## LPP                                                                          -0.03638740
## N1                                                                            0.18022538
```

```
## P3                                                                  0.42546593
## P2MMN                                                               0.79830123
## N1_target_attendedrare_pz_areaunderpeak                            -0.05268866
## p2mmn_target_attendedrare_pz_areaunderpeak                          1.00000000
## p300_target_attendedrare_pz_MeanAmp                                 0.39929367
## lpp_target_attendedrare_pz_MeanAmp                                 -0.04957345
##                                                 p300_target_attendedrare_pz_MeanAmp
## LPP                                                                      0.16061343
## N1                                                                      -0.08715448
## P3                                                                       0.98068818
## P2MMN                                                                    0.27627411
## N1_target_attendedrare_pz_areaunderpeak                                 -0.16270816
## p2mmn_target_attendedrare_pz_areaunderpeak                               0.39929367
## p300_target_attendedrare_pz_MeanAmp                                      1.00000000
## lpp_target_attendedrare_pz_MeanAmp                                       0.17535433
##                                                 lpp_target_attendedrare_pz_MeanAmp
## LPP                                                                      0.97498886
## N1                                                                      -0.07038045
## P3                                                                       0.17010272
## P2MMN                                                                   -0.04275344
## N1_target_attendedrare_pz_areaunderpeak                                 -0.11187163
## p2mmn_target_attendedrare_pz_areaunderpeak                              -0.04957345
## p300_target_attendedrare_pz_MeanAmp                                      0.17535433
## lpp_target_attendedrare_pz_MeanAmp                                       1.00000000
```

```
corr.test(GTF_Dich_ForCorr_Target, method = "pearson") #significance values
```

```
## Call:corr.test(x = GTF_Dich_ForCorr_Target, method = "pearson")
## Correlation matrix
##                                                   LPP    N1    P3 P2MMN
## LPP                                              1.00 -0.06  0.16 -0.06
## N1                                              -0.06  1.00 -0.14  0.34
## P3                                               0.16 -0.14  1.00  0.32
## P2MMN                                           -0.06  0.34  0.32  1.00
## N1_target_attendedrare_pz_areaunderpeak         -0.08  0.74 -0.20  0.03
## p2mmn_target_attendedrare_pz_areaunderpeak      -0.04  0.18  0.43  0.80
## p300_target_attendedrare_pz_MeanAmp              0.16 -0.09  0.98  0.28
## lpp_target_attendedrare_pz_MeanAmp               0.97 -0.07  0.17 -0.04
##                                                 N1_target_attendedrare_pz_areaunderpeak
## LPP                                                                               -0.08
## N1                                                                                 0.74
## P3                                                                                -0.20
## P2MMN                                                                              0.03
## N1_target_attendedrare_pz_areaunderpeak                                            1.00
## p2mmn_target_attendedrare_pz_areaunderpeak                                        -0.05
## p300_target_attendedrare_pz_MeanAmp                                               -0.16
## lpp_target_attendedrare_pz_MeanAmp                                                -0.11
##                                                 p2mmn_target_attendedrare_pz_areaunderpeak
## LPP                                                                                  -0.04
## N1                                                                                    0.18
## P3                                                                                    0.43
## P2MMN                                                                                 0.80
## N1_target_attendedrare_pz_areaunderpeak                                              -0.05
## p2mmn_target_attendedrare_pz_areaunderpeak                                            1.00
## p300_target_attendedrare_pz_MeanAmp                                                   0.40
## lpp_target_attendedrare_pz_MeanAmp                                                   -0.05
```

```
##                                                p300_target_attendedrare_pz_MeanAmp
## LPP                                                                           0.16
## N1                                                                           -0.09
## P3                                                                            0.98
## P2MMN                                                                         0.28
## N1_target_attendedrare_pz_areaunderpeak                                      -0.16
## p2mmn_target_attendedrare_pz_areaunderpeak                                    0.40
## p300_target_attendedrare_pz_MeanAmp                                           1.00
## lpp_target_attendedrare_pz_MeanAmp                                            0.18
##                                                lpp_target_attendedrare_pz_MeanAmp
## LPP                                                                           0.97
## N1                                                                           -0.07
## P3                                                                            0.17
## P2MMN                                                                        -0.04
## N1_target_attendedrare_pz_areaunderpeak                                      -0.11
## p2mmn_target_attendedrare_pz_areaunderpeak                                   -0.05
## p300_target_attendedrare_pz_MeanAmp                                           0.18
## lpp_target_attendedrare_pz_MeanAmp                                            1.00
## Sample Size
## [1] 61
## Probability values (Entries above the diagonal are adjusted for multiple tests.)
##                                                 LPP   N1   P3 P2MMN
## LPP                                            0.00 1.00 1.00  1.00
## N1                                             0.65 0.00 1.00  0.14
## P3                                             0.23 0.29 0.00  0.27
## P2MMN                                          0.66 0.01 0.01  0.00
## N1_target_attendedrare_pz_areaunderpeak        0.53 0.00 0.12  0.82
## p2mmn_target_attendedrare_pz_areaunderpeak     0.78 0.16 0.00  0.00
## p300_target_attendedrare_pz_MeanAmp            0.22 0.50 0.00  0.03
## lpp_target_attendedrare_pz_MeanAmp             0.00 0.59 0.19  0.74
##                                                N1_target_attendedrare_pz_areaunderpeak
## LPP                                                                               1.00
## N1                                                                                0.00
## P3                                                                                1.00
## P2MMN                                                                             1.00
## N1_target_attendedrare_pz_areaunderpeak                                           0.00
## p2mmn_target_attendedrare_pz_areaunderpeak                                        0.69
## p300_target_attendedrare_pz_MeanAmp                                               0.21
## lpp_target_attendedrare_pz_MeanAmp                                                0.39
##                                                p2mmn_target_attendedrare_pz_areaunderpeak
## LPP                                                                                  1.00
## N1                                                                                   1.00
## P3                                                                                   0.02
## P2MMN                                                                                0.00
## N1_target_attendedrare_pz_areaunderpeak                                              1.00
## p2mmn_target_attendedrare_pz_areaunderpeak                                           0.00
## p300_target_attendedrare_pz_MeanAmp                                                  0.00
## lpp_target_attendedrare_pz_MeanAmp                                                   0.70
##                                                p300_target_attendedrare_pz_MeanAmp
## LPP                                                                           1.00
## N1                                                                            1.00
## P3                                                                            0.00
## P2MMN                                                                         0.62
## N1_target_attendedrare_pz_areaunderpeak                                       1.00
## p2mmn_target_attendedrare_pz_areaunderpeak                                    0.03
```

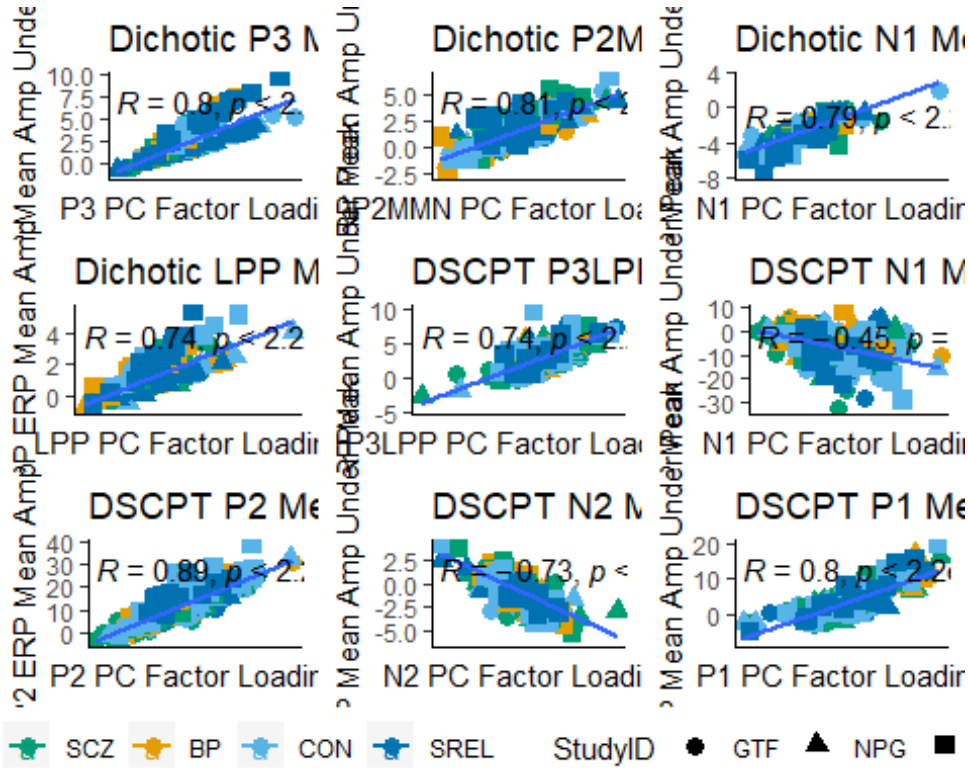
```
## p300_target_attendedrare_pz_MeanAmp                                    0.00
## lpp_target_attendedrare_pz_MeanAmp                                     0.18
##                                          lpp_target_attendedrare_pz_MeanAmp
## LPP                                                                       0
## N1                                                                        1
## P3                                                                        1
## P2MMN                                                                     1
## N1_target_attendedrare_pz_areaunderpeak                                   1
## p2mmn_target_attendedrare_pz_areaunderpeak                                1
## p300_target_attendedrare_pz_MeanAmp                                       1
## lpp_target_attendedrare_pz_MeanAmp                                        0
##
##  To see confidence intervals of the correlations, print with the short=FALSE option

# organize ERP - PCA data for plots

allstud_Dich = rbind(GTF_Dich_ForCorr,NPG_Dich_ForCorr,PENS_Dich_ForCorr)
allstud_DSCPT = rbind(GTF_DSCPT_ForCorr, NPG_DSCPT_ForCorr, PENS_DSCPT_ForCorr)

allstud_DSCPT <- allstud_DSCPT[-32, ] #remove a duplicate sub from data entry error

allstud_Dich_N1ERP <- select(allstud_Dich, Group, SubID, StudyID, Task, N1_target_attende
drare_pz_areaunderpeak)
allstud_Dich_P2ERP <- select(allstud_Dich, Group, SubID, StudyID, Task, p2mmn_target_atte
ndedrare_pz_areaunderpeak)
allstud_Dich_P3ERP <- select(allstud_Dich, Group, SubID, StudyID, Task, p300_target_atten
dedrare_pz_MeanAmp)
allstud_Dich_LPPERP <- select(allstud_Dich, Group, SubID, StudyID, Task, lpp_target_atten
dedrare_pz_MeanAmp)

names(allstud_Dich_N1ERP)[names(allstud_Dich_N1ERP) == "N1_target_attendedrare_pz_areaund
erpeak"] <- "value"
names(allstud_Dich_P2ERP)[names(allstud_Dich_P2ERP) == "p2mmn_target_attendedrare_pz_area
underpeak"] <- "value"
names(allstud_Dich_P3ERP)[names(allstud_Dich_P3ERP) == "p300_target_attendedrare_pz_MeanA
mp"] <- "value"
names(allstud_Dich_LPPERP)[names(allstud_Dich_LPPERP) == "lpp_target_attendedrare_pz_Mean
Amp"] <- "value"

allstud_DSCPT_N1ERP <- select(allstud_DSCPT, Group, SubID, StudyID, Task, N1_target_Oz_ar
eaunderpeak)
allstud_DSCPT_N2ERP<- select(allstud_DSCPT, Group, SubID, StudyID, Task, N2_target_Oz_are
aunderpeak)
allstud_DSCPT_P1ERP<- select(allstud_DSCPT, Group, SubID, StudyID, Task, P1_target_Oz_are
aunderpeak)
allstud_DSCPT_P2ERP<- select(allstud_DSCPT, Group, SubID, StudyID, Task, P2_target_Oz_Mea
nAmp)
allstud_DSCPT_P3LPPERP<- select(allstud_DSCPT, Group, SubID, StudyID, Task, P3LPP_target_
Pz_areaunderpeak)

names(allstud_DSCPT_N1ERP)[names(allstud_DSCPT_N1ERP) == "N1_target_Oz_areaunderpeak"] <-
"value"
names(allstud_DSCPT_N2ERP)[names(allstud_DSCPT_N2ERP) == "N2_target_Oz_areaunderpeak"] <-
"value"
names(allstud_DSCPT_P1ERP)[names(allstud_DSCPT_P1ERP) == "P1_target_Oz_areaunderpeak"] <-
```

```
"value"
names(allstud_DSCPT_P2ERP)[names(allstud_DSCPT_P2ERP) == "P2_target_Oz_MeanAmp"] <- "valu
e"
names(allstud_DSCPT_P3LPPERP)[names(allstud_DSCPT_P3LPPERP) == "P3LPP_target_Pz_areaunder
peak"] <- "value"

# one plot combining across three studies

figplot1 <-ggplot(allstud_Dich,aes(x=P3, y=p300_target_attendedrare_pz_MeanAmp, shape=Stu
dyID, col = Group, group = 1)) + geom_point(size = 3) +
  ggtitle("Dichotic P3 Mean Amp ERP & PC") +  xlab("P3 PC Factor Loading") + ylab("P3 ERP
Mean Amp Under Peak") + theme(panel.grid.major = element_blank(), axis.ticks.x = element_
blank(), axis.text.x=element_blank(), panel.grid.minor = element_blank(),

panel.background = element_blank(), axis.line = element_line(colour = "black")) +
  geom_smooth(method = lm, alpha=.1) + stat_cor(method ="pearson") + scale_color_manual(v
alues=c("#009E73","#E69F00","#56B4E9", "#0072B2", "#D55E00", "#CC79A7", "#999999", "#6822
9B", "#9B3E2F"))

figplot2 <-ggplot(allstud_Dich,aes(x=P2MMN, y=p2mmn_target_attendedrare_pz_areaunderpeak,
shape=StudyID,col = Group, group = 1)) + geom_point(size = 3) +
  ggtitle("Dichotic P2MMN Mean Amp ERP & PC") +  xlab("P2MMN PC Factor Loading") + ylab("
P2MMN ERP Mean Amp Under Peak") + theme(panel.grid.major = element_blank(), axis.ticks.x
= element_blank(), axis.text.x=element_blank(), panel.grid.minor = element_blank(),

panel.background = element_blank(), axis.line = element_line(colour = "black")) +
  geom_smooth(method = lm, alpha=.1) + stat_cor(method ="pearson") + scale_color_manual(v
alues=c("#009E73","#E69F00","#56B4E9", "#0072B2", "#D55E00", "#CC79A7", "#999999", "#6822
9B", "#9B3E2F"))

figplot3 <-ggplot(allstud_Dich,aes(x=N1, y=N1_target_attendedrare_pz_areaunderpeak,shape=
StudyID, col = Group, group = 1)) + geom_point(size = 3) +
  ggtitle("Dichotic N1 Mean Amp ERP & PC") +  xlab("N1 PC Factor Loading") + ylab("N1 ERP
Mean Amp Under Peak") + theme(panel.grid.major = element_blank(), axis.ticks.x = element_
blank(), axis.text.x=element_blank(), panel.grid.minor = element_blank(),

panel.background = element_blank(), axis.line = element_line(colour = "black")) +
  geom_smooth(method = lm, alpha=.1) + stat_cor(method ="pearson") + scale_color_manual(v
alues=c("#009E73","#E69F00","#56B4E9", "#0072B2", "#D55E00", "#CC79A7", "#999999", "#6822
9B", "#9B3E2F"))

figplot4 <-ggplot(allstud_Dich,aes(x=LPP, y=lpp_target_attendedrare_pz_MeanAmp,shape=Stud
yID, col = Group, group = 1)) + geom_point(size = 3) +
  ggtitle("Dichotic LPP Mean Amp ERP & PC") +  xlab("LPP PC Factor Loading") + ylab("LPP
ERP Mean Amp") + theme(panel.grid.major = element_blank(), axis.ticks.x = element_blank()
, axis.text.x=element_blank(), panel.grid.minor = element_blank(),

panel.background = element_blank(), axis.line = element_line(colour = "black")) +
  geom_smooth(method = lm, alpha=.1) + stat_cor(method ="pearson") + scale_color_manual(v
alues=c("#009E73","#E69F00","#56B4E9", "#0072B2", "#D55E00", "#CC79A7", "#999999", "#6822
9B", "#9B3E2F"))

figplot5 <-ggplot(allstud_DSCPT,aes(x=P3LPP, y=P3LPP_target_Pz_areaunderpeak, shape=Study
ID, col = Group, group = 1)) + geom_point(size = 3) +
  ggtitle("DSCPT P3LPP Mean Amp ERP & PC") +  xlab("P3LPP PC Factor Loading") + ylab("P3L
```

```
PP ERP Mean Amp Under Peak") + theme(panel.grid.major = element_blank(), axis.ticks.x = e
lement_blank(), axis.text.x=element_blank(), panel.grid.minor = element_blank(),

panel.background = element_blank(), axis.line = element_line(colour = "black")) +
  geom_smooth(method = lm, alpha=.1) + stat_cor(method ="pearson") + scale_color_manual(v
alues=c("#009E73","#E69F00","#56B4E9", "#0072B2", "#D55E00", "#CC79A7", "#999999", "#6822
9B", "#9B3E2F"))

figplot6 <-ggplot(allstud_DSCPT,aes(x=N1, y=N1_target_Oz_areaunderpeak, shape=StudyID,col
= Group, group = 1)) + geom_point(size = 3) +
  ggtitle("DSCPT N1 Mean Amp ERP & PC") +  xlab("N1 PC Factor Loading") + ylab("N1 ERP Me
an Amp Under Peak") + theme(panel.grid.major = element_blank(), axis.ticks.x = element_bl
ank(), axis.text.x=element_blank(), panel.grid.minor = element_blank(),

panel.background = element_blank(), axis.line = element_line(colour = "black")) +
  geom_smooth(method = lm, alpha=.1) + stat_cor(method ="pearson") + scale_color_manual(v
alues=c("#009E73","#E69F00","#56B4E9", "#0072B2", "#D55E00", "#CC79A7", "#999999", "#6822
9B", "#9B3E2F"))

figplot7 <-ggplot(allstud_DSCPT,aes(x=P2, y=P2_target_Oz_MeanAmp,shape=StudyID, col = Gro
up, group = 1)) + geom_point(size = 3) +
  ggtitle("DSCPT P2 Mean Amp ERP & PC") +  xlab("P2 PC Factor Loading") + ylab("P2 ERP Me
an Amp") + theme(panel.grid.major = element_blank(), axis.ticks.x = element_blank(), axis
.text.x=element_blank(), panel.grid.minor = element_blank(),

panel.background = element_blank(), axis.line = element_line(colour = "black")) +
  geom_smooth(method = lm, alpha=.1) + stat_cor(method ="pearson") + scale_color_manual(v
alues=c("#009E73","#E69F00","#56B4E9", "#0072B2", "#D55E00", "#CC79A7", "#999999", "#6822
9B", "#9B3E2F"))

figplot8 <-ggplot(allstud_DSCPT,aes(x=N2, y=N2_target_Oz_areaunderpeak,shape=StudyID, col
= Group, group = 1)) + geom_point(size = 3) +
  ggtitle("DSCPT N2 Mean Amp ERP & PC") +  xlab("N2 PC Factor Loading") + ylab("N2 ERP Me
an Amp Under Peak") + theme(panel.grid.major = element_blank(), axis.ticks.x = element_bl
ank(), axis.text.x=element_blank(), panel.grid.minor = element_blank(),

panel.background = element_blank(), axis.line = element_line(colour = "black")) +
  geom_smooth(method = lm, alpha=.1) + stat_cor(method ="pearson") + scale_color_manual(v
alues=c("#009E73","#E69F00","#56B4E9", "#0072B2", "#D55E00", "#CC79A7", "#999999", "#6822
9B", "#9B3E2F"))

figplot9 <-ggplot(allstud_DSCPT,aes(x=P1, y=P1_target_Oz_areaunderpeak,shape=StudyID, col
= Group, group = 1)) + geom_point(size = 3) +
  ggtitle("DSCPT P1 Mean Amp ERP & PC") +  xlab("P1 PC Factor Loading") + ylab("P1 ERP Me
an Amp Under Peak") + theme(panel.grid.major = element_blank(), axis.ticks.x = element_bl
ank(), axis.text.x=element_blank(), panel.grid.minor = element_blank(),

panel.background = element_blank(), axis.line = element_line(colour = "black")) +
  geom_smooth(method = lm, alpha=.1) + stat_cor(method ="pearson") + scale_color_manual(v
alues=c("#009E73","#E69F00","#56B4E9", "#0072B2", "#D55E00", "#CC79A7", "#999999", "#6822
9B", "#9B3E2F"))

ggarrange(figplot1, figplot2, figplot3, figplot4, figplot5, figplot6, figplot7, figplot8,
figplot9, ncol =3 , nrow = 3, common.legend = TRUE, legend = "bottom")
```

```
## `geom_smooth()` using formula = 'y ~ x'
```

```
## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
```




```
##################### GROUP DIFFERENCES ####################

# Set up

library("effectsize")
```

```
## Registered S3 methods overwritten by 'parameters':
##   method                           from
##   display.parameters_distribution  datawizard
##   plot.parameters_distribution     datawizard
##   print_md.parameters_distribution datawizard

##
## Attaching package: 'effectsize'

## The following object is masked from 'package:psych':
##
##     phi
```

```
library("rsq")
library("performance")
```

```r
library("parameters")

names(allstud_Dich)[names(allstud_Dich) == "LPP"] <- "DichoticLPP"
names(allstud_Dich)[names(allstud_Dich) == "N1"] <- "DichoticN1"
names(allstud_Dich)[names(allstud_Dich) == "P2MMN"] <- "DichoticP2MMN"
names(allstud_Dich)[names(allstud_Dich) == "P3"] <- "DichoticP3"
names(allstud_DSCPT)[names(allstud_DSCPT) == "P3LPP"] <- "DSCPTP3LPP"
names(allstud_DSCPT)[names(allstud_DSCPT) == "N1"] <- "DSCPTN1P2"
names(allstud_DSCPT)[names(allstud_DSCPT) == "P1"] <- "DSCPTP1"
names(allstud_DSCPT)[names(allstud_DSCPT) == "N2"] <- "DSCPTN2"

# one data frame for everything

allstudy_PCA_ERP <- merge(allstud_Dich, allstud_DSCPT, by = c("SubID","Group","StudyID"),
all = TRUE)
allstudy_PCA_ERP <- distinct(allstudy_PCA_ERP, SubID, .keep_all = TRUE)

# save out intermediate datafile

library("writexl")
write_xlsx(allstudy_PCA_ERP, "allstudy_PCA_ERP_Dich_AfterExclusions.xlsx")

# Anovas

aov_result1 <- aov(DichoticN1 ~ Group, data = allstudy_PCA_ERP)
summary(aov_result1)

##              Df Sum Sq Mean Sq F value Pr(>F)
## Group         3   3.05  1.0176   2.335 0.0748 .
## Residuals   216  94.13  0.4358
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 83 observations deleted due to missingness

aov_result2 <- aov(DSCPTN1P2 ~ Group, data = allstudy_PCA_ERP)
summary(aov_result2)

##              Df Sum Sq Mean Sq F value   Pr(>F)
## Group         3   39.7  13.224   7.005 0.000148 ***
## Residuals   272  513.4   1.888
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 27 observations deleted due to missingness

eta_squared(aov_result2, partial = TRUE)

## For one-way between subjects designs, partial eta squared is equivalent
##   to eta squared. Returning eta squared.

## # Effect Size for ANOVA
##
## Parameter | Eta2 |       95% CI
## ------------------------------
## Group     | 0.07 | [0.02, 1.00]
##
## - One-sided CIs: upper bound fixed at [1.00].
```

```r
aov_result3 <- aov(DSCPTP1 ~ Group, data = allstudy_PCA_ERP)
summary(aov_result3)
```

```
##              Df Sum Sq Mean Sq F value Pr(>F)
## Group         3   12.0   4.007   2.071  0.104
## Residuals   272  526.4   1.935
## 27 observations deleted due to missingness
```

```r
aov_result4 <- aov(DichoticP2MMN ~ Group, data = allstudy_PCA_ERP)
summary(aov_result4)
```

```
##              Df Sum Sq Mean Sq F value Pr(>F)
## Group         3    3.5   1.162   0.709  0.547
## Residuals   216  353.7   1.638
## 83 observations deleted due to missingness
```

```r
aov_result5 <- aov(DSCPTN2 ~ Group, data = allstudy_PCA_ERP)
summary(aov_result5)
```

```
##              Df Sum Sq Mean Sq F value Pr(>F)
## Group         3   9.11   3.037   3.018 0.0303 *
## Residuals   272 273.72   1.006
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 27 observations deleted due to missingness
```

```r
eta_squared(aov_result5, partial = TRUE)
```

```
## For one-way between subjects designs, partial eta squared is equivalent
##   to eta squared. Returning eta squared.
```

```
## # Effect Size for ANOVA
##
## Parameter | Eta2 |       95% CI
## ------------------------------
## Group     | 0.03 | [0.00, 1.00]
##
## - One-sided CIs: upper bound fixed at [1.00].
```

```r
aov_result6 <- aov(DichoticP3 ~ Group, data = allstudy_PCA_ERP)
summary(aov_result6)
```

```
##              Df Sum Sq Mean Sq F value   Pr(>F)
## Group         3   51.8  17.252   9.309 8.16e-06 ***
## Residuals   216  400.3   1.853
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 83 observations deleted due to missingness
```

```r
eta_squared(aov_result6, partial = TRUE)
```

```
## For one-way between subjects designs, partial eta squared is equivalent
##   to eta squared. Returning eta squared.
```

```
## # Effect Size for ANOVA
##
## Parameter | Eta2 |       95% CI
## ------------------------------
```

```
## Group     | 0.11 | [0.05, 1.00]
##
## - One-sided CIs: upper bound fixed at [1.00].
```

```
aov_result7 <- aov(DichoticLPP ~ Group, data = allstudy_PCA_ERP)
summary(aov_result7)
```

```
##              Df Sum Sq Mean Sq F value Pr(>F)
## Group         3    1.4  0.4556   0.268  0.849
## Residuals   216  367.7  1.7023
## 83 observations deleted due to missingness
```

```
aov_result8 <- aov(DSCPTP3LPP ~ Group, data = allstudy_PCA_ERP)
summary(aov_result8)
```

```
##              Df Sum Sq Mean Sq F value Pr(>F)
## Group         3   13.4   4.477   3.307 0.0207 *
## Residuals   272  368.3   1.354
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 27 observations deleted due to missingness
```

```
eta_squared(aov_result8, partial = TRUE)
```

```
## For one-way between subjects designs, partial eta squared is equivalent
##   to eta squared. Returning eta squared.
```

```
## # Effect Size for ANOVA
##
## Parameter | Eta2 |       95% CI
## ------------------------------
## Group     | 0.04 | [0.00, 1.00]
##
## - One-sided CIs: upper bound fixed at [1.00].
```

```
# follow up paired comps

pca_paired_comps_DSCPTN1P2 <- emmeans(aov_result2, pairwise ~ Group, adjust = "tukey")
print(pca_paired_comps_DSCPTN1P2)
```

```
## $emmeans
##  Group emmean    SE  df lower.CL upper.CL
##  SCZ     1.84 0.140 272     1.57     2.12
##  BP      1.79 0.179 272     1.44     2.14
##  CON     2.62 0.149 272     2.32     2.91
##  SREL    2.51 0.232 272     2.05     2.97
##
## Confidence level used: 0.95
##
## $contrasts
##  contrast   estimate    SE  df t.ratio p.value
##  SCZ - BP     0.0555 0.227 272   0.245  0.9948
##  SCZ - CON   -0.7710 0.204 272  -3.777  0.0011
##  SCZ - SREL  -0.6647 0.271 272  -2.453  0.0698
##  BP - CON    -0.8265 0.233 272  -3.550  0.0025
##  BP - SREL   -0.7202 0.293 272  -2.457  0.0692
##  CON - SREL   0.1063 0.276 272   0.385  0.9805
```

```
##
## P value adjustment: tukey method for comparing a family of 4 estimates
```

```
# cohens d of paired comps

emm <- emmeans(aov_result2, "Group")
pairwise_contrasts<-contrast(emm, method = "pairwise",adjust = "none") %>%
  as.data.frame()
pooled_sd <- sigma(aov_result2)
pairwise_contrasts <- pairwise_contrasts %>%
  mutate(
    cohens_d = estimate / pooled_sd
  )
pairwise_contrasts[, c("contrast", "estimate", "SE", "df", "p.value", "cohens_d")]
```

```
##     contrast    estimate        SE  df      p.value    cohens_d
## 1   SCZ - BP  0.05553603 0.2268370 272 0.8067742648  0.04042140
## 2  SCZ - CON -0.77098102 0.2041286 272 0.0001950328 -0.56115165
## 3 SCZ - SREL -0.66468135 0.2709134 272 0.0147756821 -0.48378239
## 4   BP - CON -0.82651705 0.2328141 272 0.0004535628 -0.60157305
## 5  BP - SREL -0.72021738 0.2931348 272 0.0146369877 -0.52420379
## 6 CON - SREL  0.10629966 0.2759374 272 0.7003672993  0.07736926
```

```
pca_paired_comps_DichoticP3 <- emmeans(aov_result6, pairwise ~ Group, adjust = "tukey")
print(pca_paired_comps_DichoticP3)
```

```
## $emmeans
##  Group emmean    SE  df lower.CL upper.CL
##  SCZ     2.04 0.182 216     1.68     2.40
##  BP      2.26 0.205 216     1.86     2.67
##  CON     3.18 0.170 216     2.84     3.51
##  SREL    3.00 0.182 216     2.64     3.36
##
## Confidence level used: 0.95
##
## $contrasts
##  contrast   estimate    SE  df t.ratio p.value
##  SCZ - BP     -0.221 0.274 216  -0.806  0.8517
##  SCZ - CON    -1.132 0.249 216  -4.543  0.0001
##  SCZ - SREL   -0.960 0.257 216  -3.731  0.0014
##  BP - CON     -0.911 0.267 216  -3.416  0.0042
##  BP - SREL    -0.739 0.274 216  -2.694  0.0379
##  CON - SREL    0.172 0.249 216   0.690  0.9007
##
## P value adjustment: tukey method for comparing a family of 4 estimates
```

```
emm <- emmeans(aov_result6, "Group")
pairwise_contrasts<-contrast(emm, method = "pairwise",adjust = "none") %>%
  as.data.frame()
pooled_sd <- sigma(aov_result2)
pairwise_contrasts <- pairwise_contrasts %>%
  mutate(
    cohens_d = estimate / pooled_sd
  )
pairwise_contrasts[, c("contrast", "estimate", "SE", "df", "p.value", "cohens_d")]
```

```
##     contrast   estimate        SE  df      p.value   cohens_d
## 1   SCZ - BP -0.2209739 0.2742499 216 4.212792e-01 -0.1608339
## 2  SCZ - CON -1.1317523 0.2490998 216 9.206969e-06 -0.8237358
## 3 SCZ - SREL -0.9597612 0.2572692 216 2.442016e-04 -0.6985537
## 4   BP - CON -0.9107784 0.2666013 216 7.584466e-04 -0.6629019
## 5  BP - SREL -0.7387873 0.2742499 216 7.618110e-03 -0.5377198
## 6 CON - SREL  0.1719911 0.2490998 216 4.906522e-01  0.1251822
```

```
pca_paired_comps_DSCPTP3LPP <- emmeans(aov_result8, pairwise ~ Group, adjust = "tukey")
print(pca_paired_comps_DSCPTP3LPP)
```

```
## $emmeans
##  Group emmean    SE  df lower.CL upper.CL
##  SCZ    0.933 0.118 272    0.700     1.17
##  BP     1.150 0.151 272    0.852     1.45
##  CON    1.236 0.126 272    0.987     1.48
##  SREL   1.636 0.197 272    1.249     2.02
##
## Confidence level used: 0.95
##
## $contrasts
##  contrast   estimate    SE  df t.ratio p.value
##  SCZ - BP    -0.2178 0.192 272  -1.134  0.6689
##  SCZ - CON   -0.3031 0.173 272  -1.753  0.2984
##  SCZ - SREL  -0.7032 0.229 272  -3.065  0.0127
##  BP - CON    -0.0853 0.197 272  -0.432  0.9728
##  BP - SREL   -0.4854 0.248 272  -1.955  0.2078
##  CON - SREL  -0.4001 0.234 272  -1.712  0.3194
##
## P value adjustment: tukey method for comparing a family of 4 estimates
```

```
emm <- emmeans(aov_result8, "Group")
pairwise_contrasts<-contrast(emm, method = "pairwise",adjust = "none") %>%
  as.data.frame()
pooled_sd <- sigma(aov_result2)
pairwise_contrasts <- pairwise_contrasts %>%
  mutate(
    cohens_d = estimate / pooled_sd
  )
pairwise_contrasts[, c("contrast", "estimate", "SE", "df", "p.value", "cohens_d")]
```

```
##     contrast    estimate        SE  df     p.value    cohens_d
## 1   SCZ - BP -0.21783467 0.1921139 272 0.257842005 -0.15854902
## 2  SCZ - CON -0.30310580 0.1728816 272 0.080684401 -0.22061285
## 3 SCZ - SREL -0.70321017 0.2294433 272 0.002396657 -0.51182524
## 4   BP - CON -0.08527113 0.1971760 272 0.665748394 -0.06206383
## 5  BP - SREL -0.48537550 0.2482631 272 0.051597085 -0.35327622
## 6 CON - SREL -0.40010437 0.2336983 272 0.088026241 -0.29121239
```

```
pca_paired_comps_DSCPTN2 <- emmeans(aov_result5, pairwise ~ Group, adjust = "tukey")
print(pca_paired_comps_DSCPTN2)
```

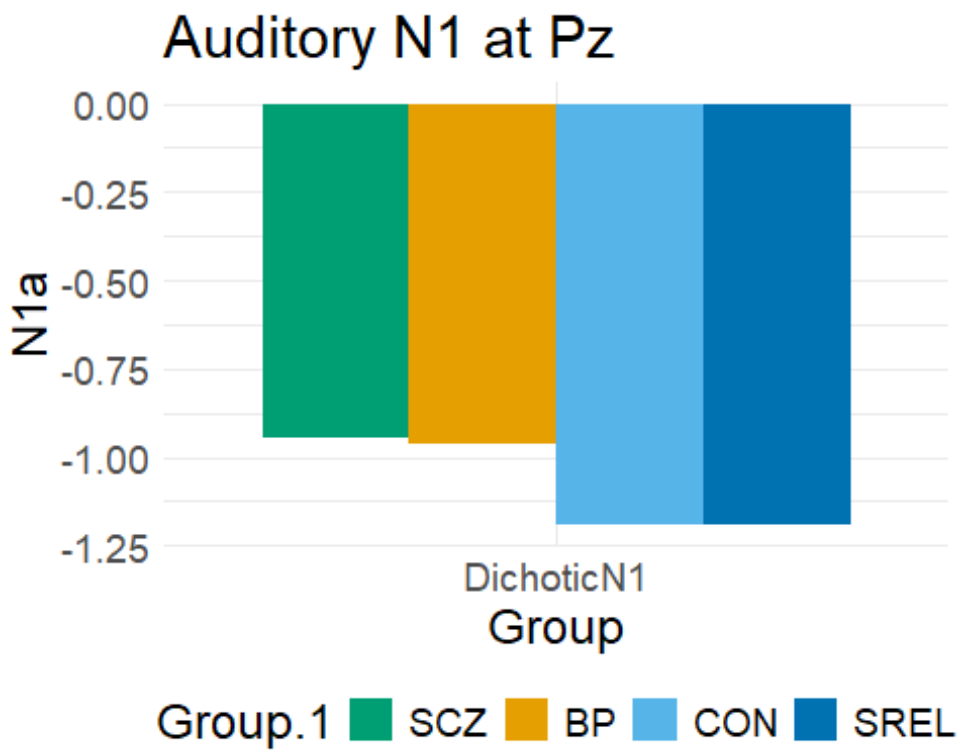
```
## $emmeans
##  Group emmean    SE  df lower.CL upper.CL
##  SCZ    -0.287 0.102 272   -0.488  -0.0865
##  BP     -0.513 0.131 272   -0.771  -0.2564
##  CON    -0.714 0.109 272   -0.929  -0.5002
```

```
##  SREL  -0.656 0.170 272   -0.989  -0.3218
##
## Confidence level used: 0.95
##
## $contrasts
##  contrast   estimate    SE  df t.ratio p.value
##  SCZ - BP     0.2264 0.166 272   1.367  0.5211
##  SCZ - CON    0.4273 0.149 272   2.867  0.0230
##  SCZ - SREL   0.3686 0.198 272   1.863  0.2464
##  BP - CON     0.2009 0.170 272   1.182  0.6389
##  BP - SREL    0.1422 0.214 272   0.664  0.9104
##  CON - SREL  -0.0587 0.201 272  -0.292  0.9914
##
## P value adjustment: tukey method for comparing a family of 4 estimates
```

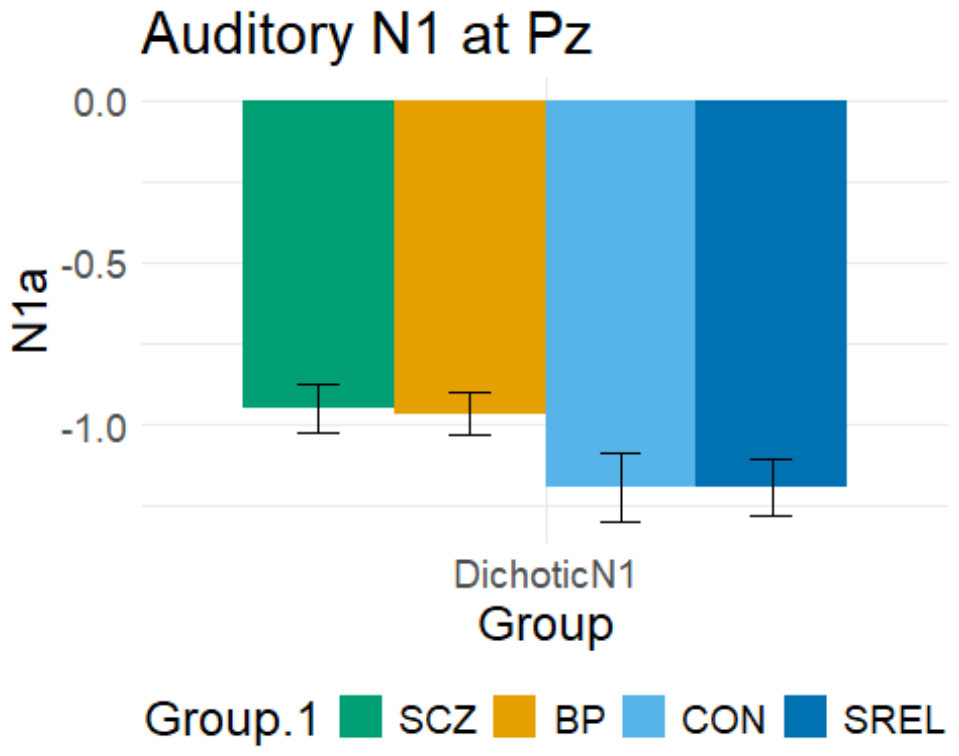
```
emm <- emmeans(aov_result5, "Group")
pairwise_contrasts<-contrast(emm, method = "pairwise",adjust = "none") %>%
  as.data.frame()
pooled_sd <- sigma(aov_result2)
pairwise_contrasts <- pairwise_contrasts %>%
  mutate(
    cohens_d = estimate / pooled_sd
  )
pairwise_contrasts[, c("contrast", "estimate", "SE", "df", "p.value", "cohens_d")]
```

```
##     contrast   estimate        SE  df     p.value    cohens_d
## 1   SCZ - BP  0.2264266 0.1656220 272 0.172713639  0.16480256
## 2  SCZ - CON  0.4273186 0.1490417 272 0.004466519  0.31102001
## 3 SCZ - SREL  0.3685865 0.1978038 272 0.063484365  0.26827238
## 4   BP - CON  0.2008920 0.1699860 272 0.238311414  0.14621745
## 5  BP - SREL  0.1421599 0.2140284 272 0.507118252  0.10346982
## 6 CON - SREL -0.0587321 0.2014720 272 0.770879662 -0.04274764
```

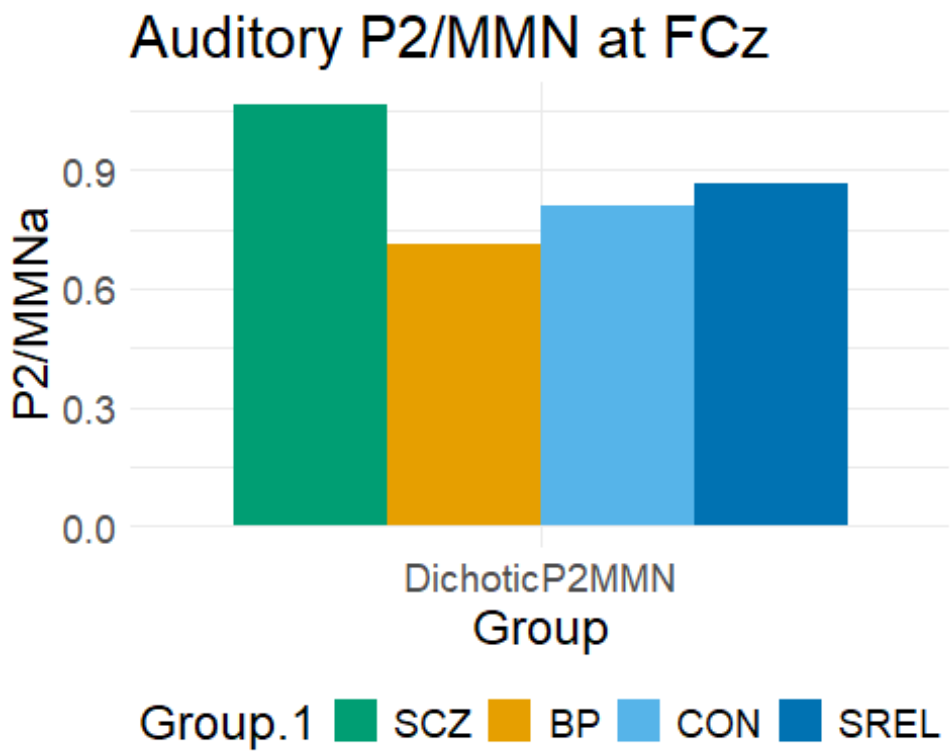
```
#Bar plots for figure 1:

group_colors = c("#009E73","#E69F00","#56B4E9", "#0072B2", "#D55E00", "#CC79A7", "#999999
", "#68229B", "#9B3E2F")

n1ameans<-allstudy_PCA_ERP[,2:34]
n1ameans<-n1ameans[-c(2:32)]
n1ameans<-na.omit(n1ameans)
n1ameans<-aggregate(n1ameans,by=list(n1ameans$Group),mean)
n1ameans<-n1ameans[-c(2)]
n1ameans<-melt(n1ameans,id="Group.1")

N1agrp <- ggplot(data = n1ameans,
                         aes(x =  variable,
                             y = value, fill = Group.1)) +
  geom_bar(position="dodge", stat = 'identity') + theme_minimal() + theme(legend.position
= "bottom") + labs(y= "N1a", x = "Group") + scale_fill_manual(values=c("#009E73","#E69F00
","#56B4E9", "#0072B2")) + theme(text = element_text(size = 18)) + ggtitle("Auditory N1 a
t Pz")
N1agrp
```



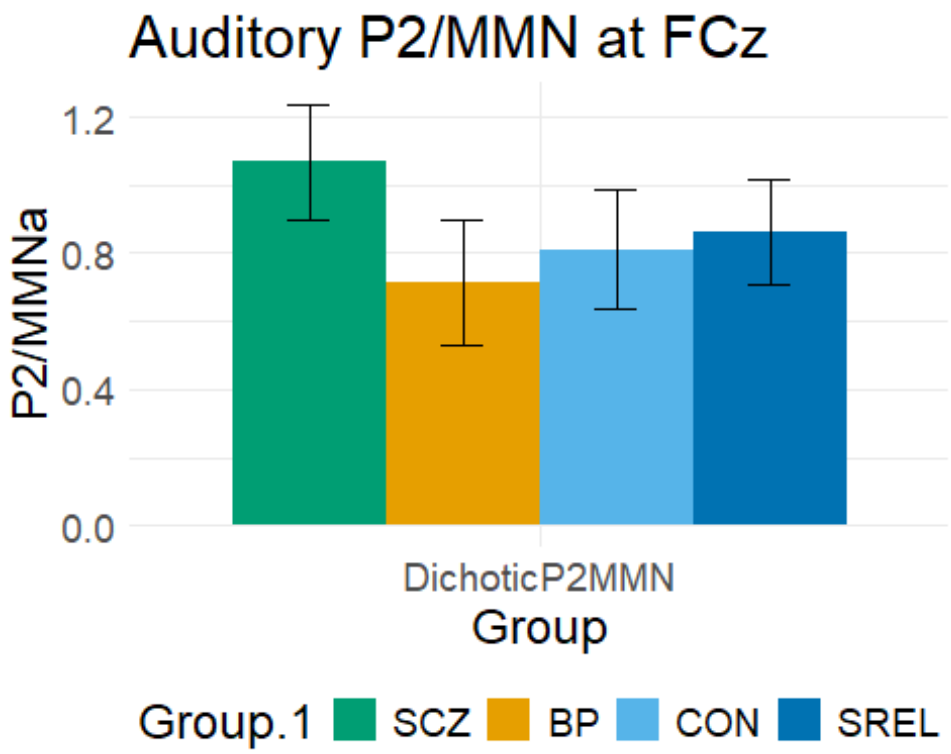

```
N1ase <- allstudy_PCA_ERP %>% group_by(Group) %>%
  summarize(se_dx = plotrix :: std.error(DichoticN1))

limits <- aes(ymax = n1ameans$value + N1ase$se_dx, ymin= n1ameans$value - N1ase$se_dx)

N1agrp <- N1agrp + geom_errorbar(limits,width=0.25,position = position_dodge(width = 0.9)
)
N1agrp
```



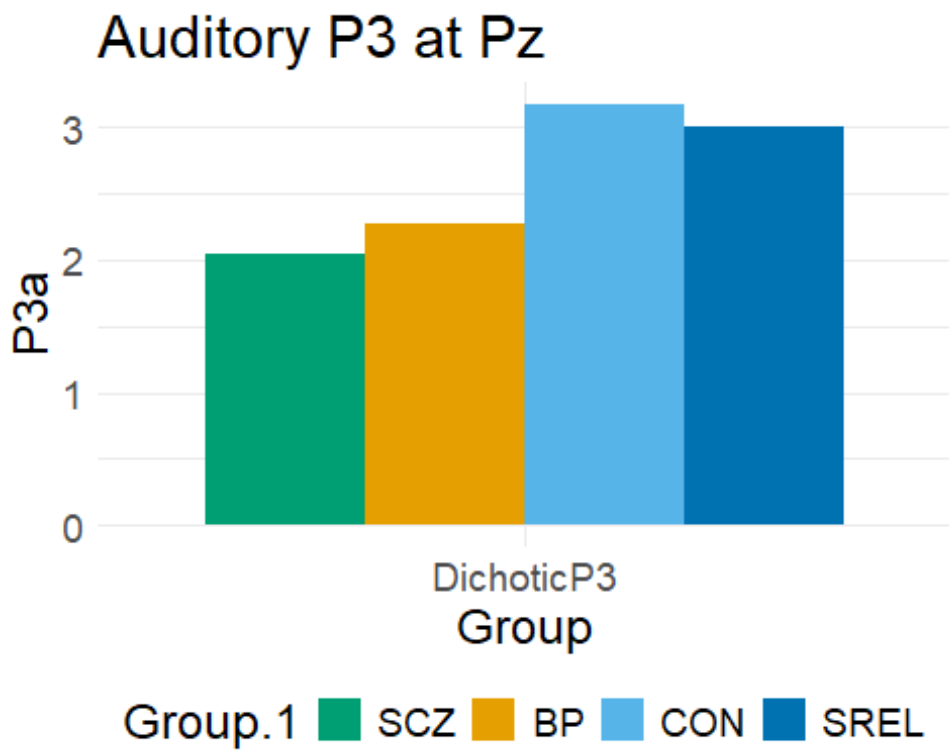
```
p2mmnameans<-allstudy_PCA_ERP[,2:35]
p2mmnameans<-p2mmnameans[-c(2:33)]
p2mmnameans<-na.omit(p2mmnameans)
p2mmnameans<-aggregate(p2mmnameans,by=list(p2mmnameans$Group),mean)
p2mmnameans<-p2mmnameans[-c(2)]
p2mmnameans<-melt(p2mmnameans,id="Group.1")

p2mmnagrp <- ggplot(data = p2mmnameans,
                aes(x =  variable,
                    y = value, fill = Group.1)) +
  geom_bar(position="dodge", stat = 'identity') + theme_minimal() + theme(legend.position
= "bottom") + labs(y= "P2/MMNa", x = "Group") + scale_fill_manual(values=c("#009E73","#E6
9F00","#56B4E9", "#0072B2")) + theme(text = element_text(size = 18)) + ggtitle("Auditory
P2/MMN at FCz")
p2mmnagrp
```



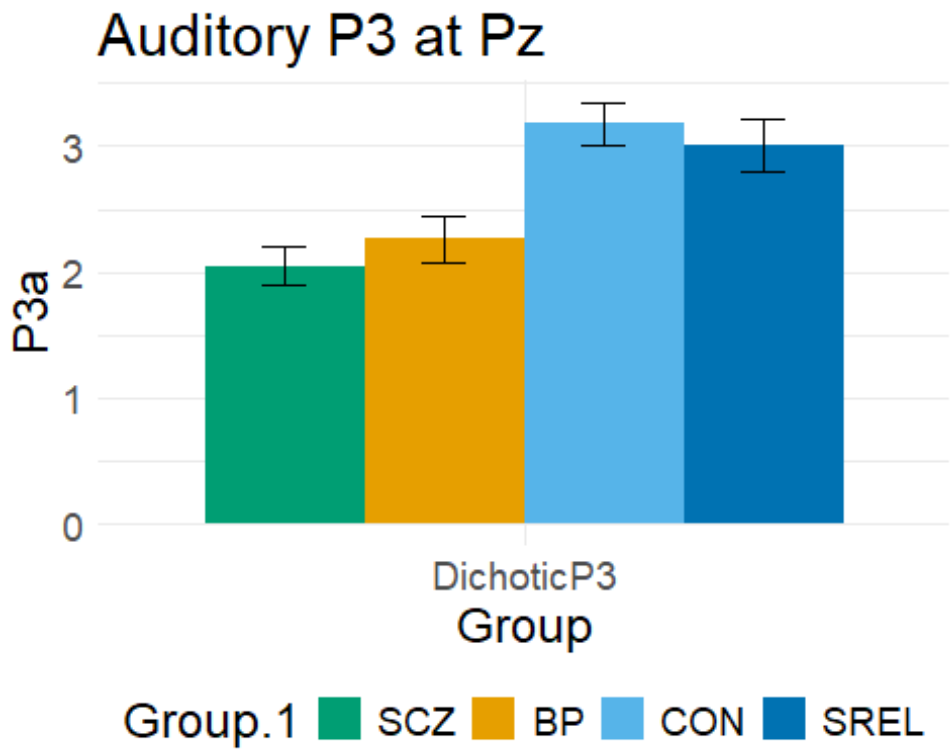

```
p2ase <- allstudy_PCA_ERP %>% group_by(Group) %>%
  summarize(se_dx = plotrix :: std.error(DichoticP2MMN))

limits <- aes(ymax = p2mmnameans$value + p2ase$se_dx, ymin= p2mmnameans$value - p2ase$se_
dx)

p2mmnagrp <- p2mmnagrp + geom_errorbar(limits,width=0.25,position = position_dodge(width
= 0.9))
p2mmnagrp
```



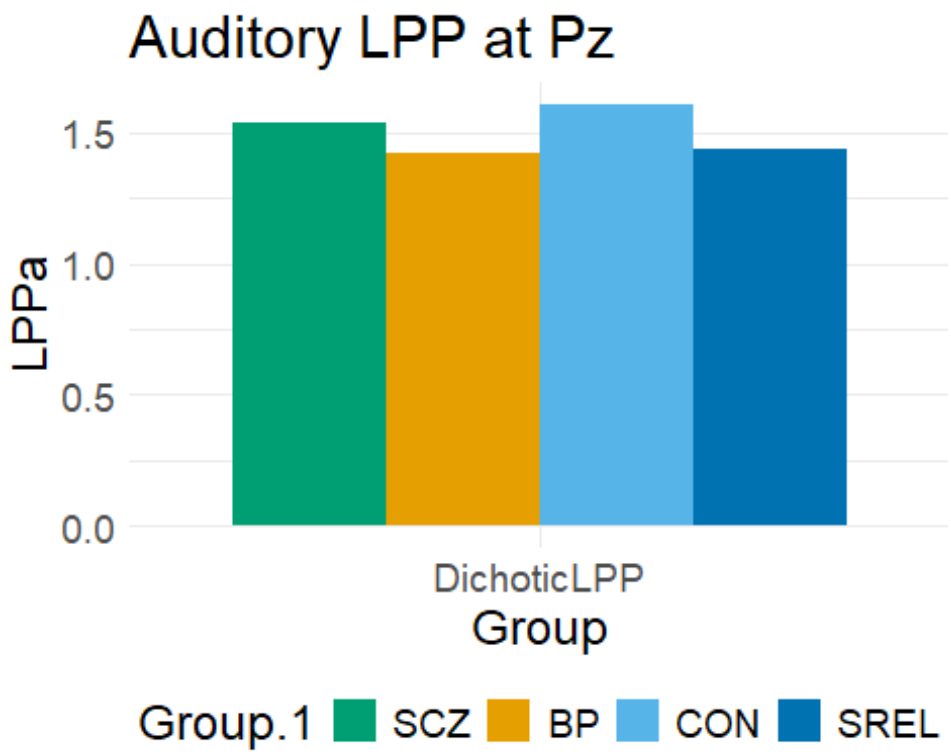

```
p3ameans<-allstudy_PCA_ERP[,2:36]
p3ameans<-p3ameans[-c(2:34)]
p3ameans<-na.omit(p3ameans)
p3ameans<-aggregate(p3ameans,by=list(p3ameans$Group),mean)
p3ameans<-p3ameans[-c(2)]
p3ameans<-melt(p3ameans,id="Group.1")

p3agrp <- ggplot(data = p3ameans,
                     aes(x =  variable,
                         y = value, fill = Group.1)) +
  geom_bar(position="dodge", stat = 'identity') + theme_minimal() + theme(legend.position
= "bottom") + labs(y= "P3a", x = "Group") + scale_fill_manual(values=c("#009E73","#E69F00
","#56B4E9", "#0072B2")) + theme(text = element_text(size = 18)) + ggtitle("Auditory P3 a
t Pz")
p3agrp
```



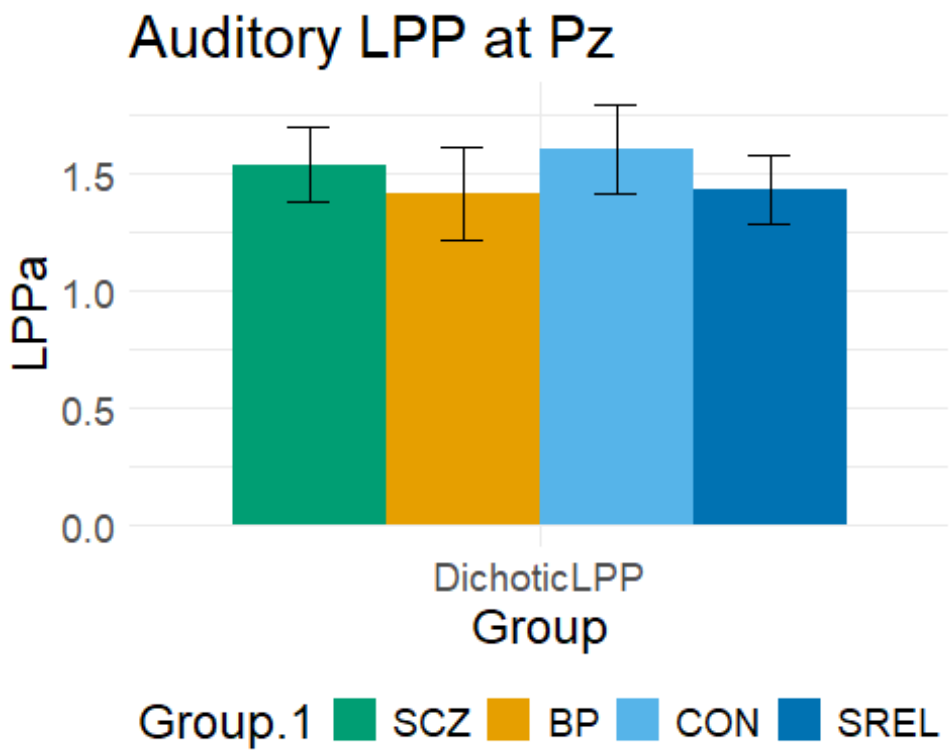

```
p3ase <- allstudy_PCA_ERP %>% group_by(Group) %>%
  summarize(se_dx = plotrix :: std.error(DichoticP3))

limits <- aes(ymax = p3ameans$value + p3ase$se_dx, ymin= p3ameans$value - p3ase$se_dx)

p3agrp <- p3agrp + geom_errorbar(limits,width=0.25,position = position_dodge(width = 0.9)
)
p3agrp
```



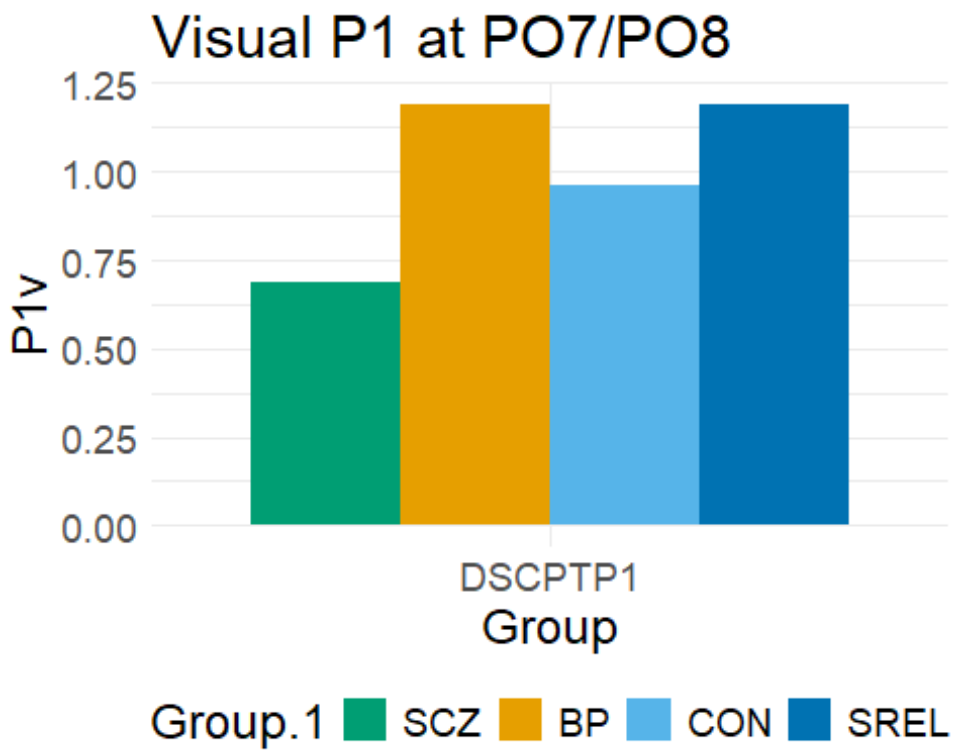
```
lppameans<-allstudy_PCA_ERP[,2:8]
lppameans<-lppameans[-c(2:6)]
lppameans<-na.omit(lppameans)
lppameans<-aggregate(lppameans,by=list(lppameans$Group),mean)
lppameans<-lppameans[-c(2)]
lppameans<-melt(lppameans,id="Group.1")

lppagrp <- ggplot(data = lppameans,
                  aes(x =  variable,
                      y = value, fill = Group.1)) +
  geom_bar(position="dodge", stat = 'identity') + theme_minimal() + theme(legend.position
= "bottom") + labs(y= "LPPa", x = "Group") + scale_fill_manual(values=c("#009E73","#E69F0
0","#56B4E9", "#0072B2")) + theme(text = element_text(size = 18)) + ggtitle("Auditory LPP
at Pz")
lppagrp
```



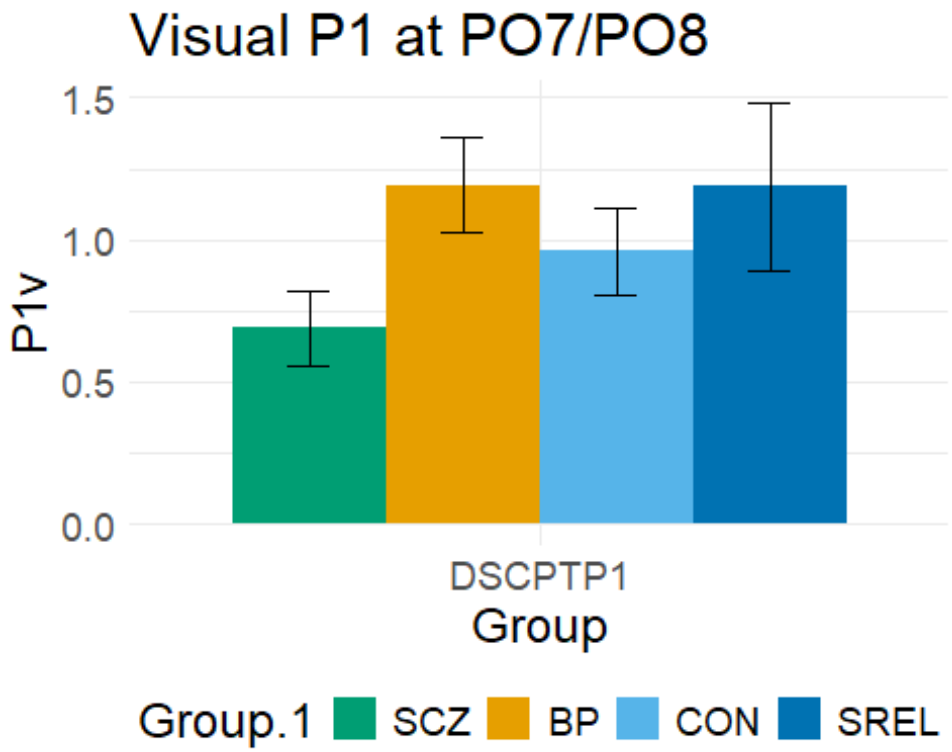

```
lppase <- allstudy_PCA_ERP %>% group_by(Group) %>%
  summarize(se_dx = plotrix :: std.error(DichoticLPP))

limits <- aes(ymax = lppameans$value + lppase$se_dx, ymin= lppameans$value - lppase$se_dx
)

lppagrp <- lppagrp + geom_errorbar(limits,width=0.25,position = position_dodge(width = 0.
9))
lppagrp
```



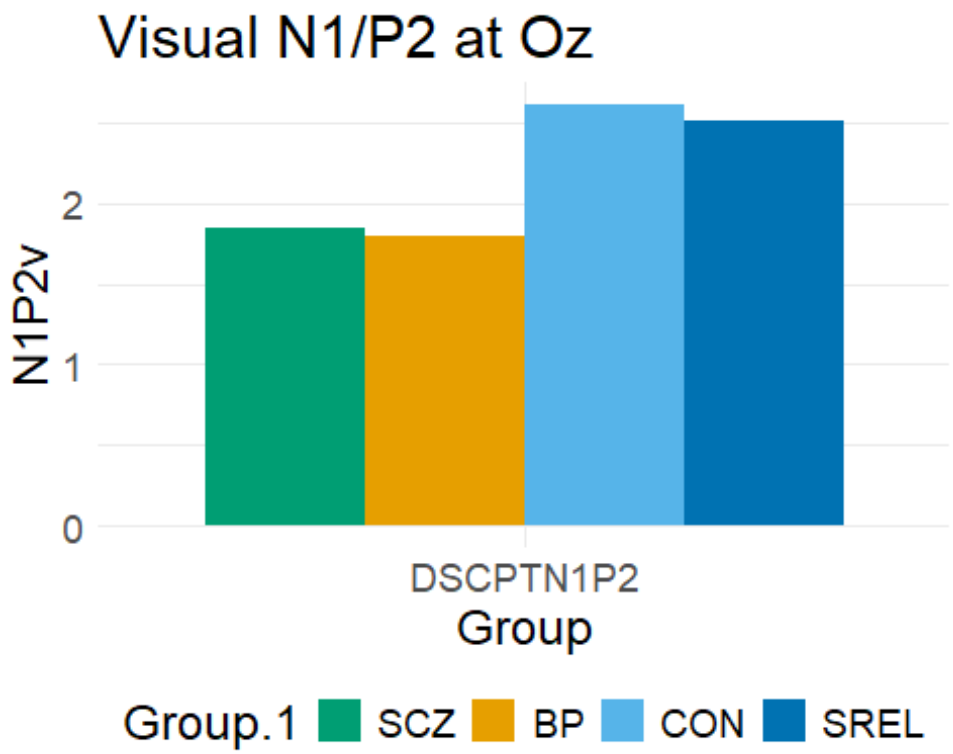

```
p1vmeans<-allstudy_PCA_ERP[,2:87]
p1vmeans<-p1vmeans[-c(2:85)]
p1vmeans<-na.omit(p1vmeans)
p1vmeans<-aggregate(p1vmeans,by=list(p1vmeans$Group),mean)
p1vmeans<-p1vmeans[-c(2)]
p1vmeans<-melt(p1vmeans,id="Group.1")

p1vgrp <- ggplot(data = p1vmeans,
                 aes(x =  variable,
                     y = value, fill = Group.1)) +
  geom_bar(position="dodge", stat = 'identity') + theme_minimal() + theme(legend.position
= "bottom") + labs(y= "P1v", x = "Group") + scale_fill_manual(values=c("#009E73","#E69F00
","#56B4E9", "#0072B2")) + theme(text = element_text(size = 18)) + ggtitle("Visual P1 at
PO7/PO8")
p1vgrp
```



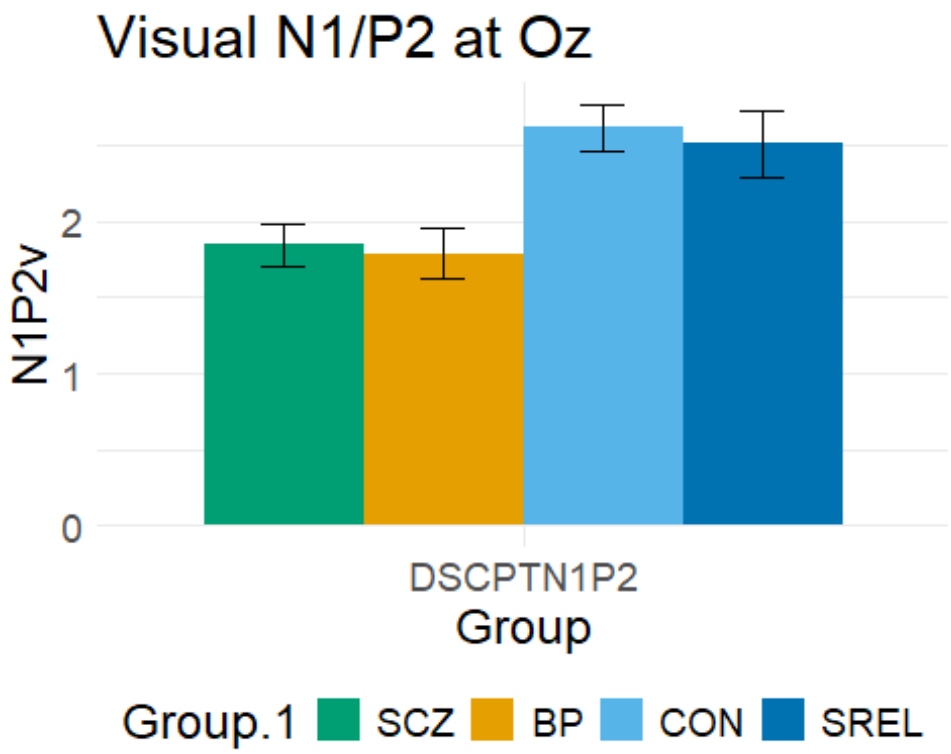

```
p1vse <- allstudy_PCA_ERP %>% group_by(Group) %>%
  summarize(se_dx = plotrix :: std.error(DSCPTP1))

limits <- aes(ymax = p1vmeans$value + p1vse$se_dx, ymin= p1vmeans$value - p1vse$se_dx)

p1vgrp <- p1vgrp + geom_errorbar(limits,width=0.25,position = position_dodge(width = 0.9)
)
p1vgrp
```



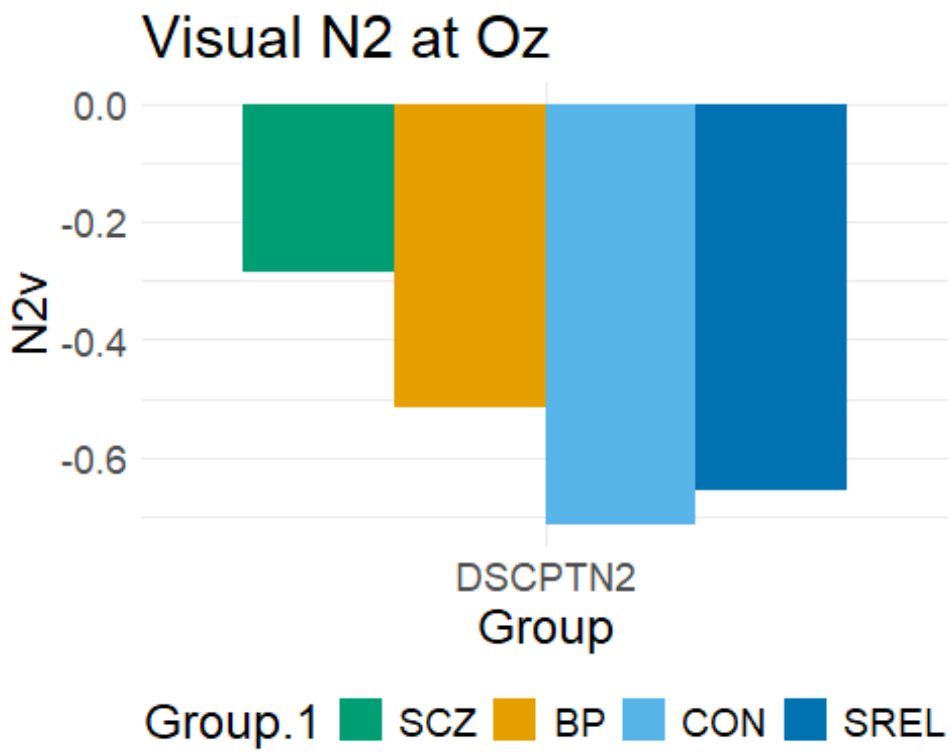
```
n1p2vmeans<-allstudy_PCA_ERP[,2:86]
n1p2vmeans<-n1p2vmeans[-c(2:84)]
n1p2vmeans<-na.omit(n1p2vmeans)
n1p2vmeans<-aggregate(n1p2vmeans,by=list(n1p2vmeans$Group),mean)
n1p2vmeans<-n1p2vmeans[-c(2)]
n1p2vmeans<-melt(n1p2vmeans,id="Group.1")

n1p2vgrp <- ggplot(data = n1p2vmeans,
                   aes(x =  variable,
                       y = value, fill = Group.1)) +
  geom_bar(position="dodge", stat = 'identity') + theme_minimal() + theme(legend.position
= "bottom") + labs(y= "N1P2v", x = "Group") + scale_fill_manual(values=c("#009E73","#E69F
00","#56B4E9", "#0072B2")) + theme(text = element_text(size = 18)) + ggtitle("Visual N1/P
2 at Oz")
n1p2vgrp
```



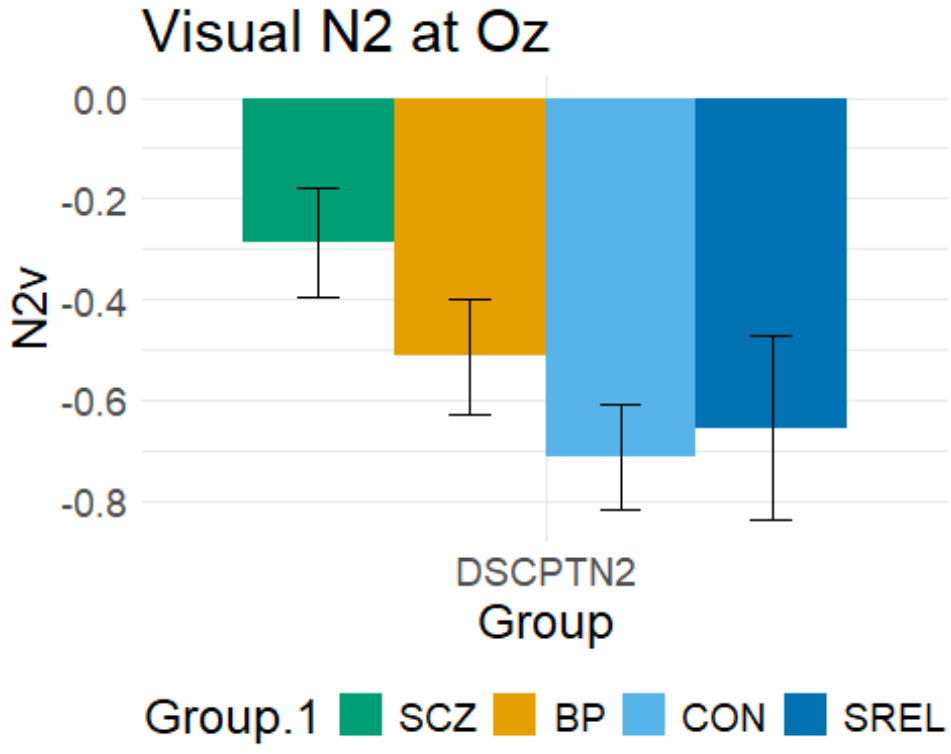

```
n1p2vse <- allstudy_PCA_ERP %>% group_by(Group) %>%
  summarize(se_dx = plotrix :: std.error(DSCPTN1P2))

limits <- aes(ymax = n1p2vmeans$value + n1p2vse$se_dx, ymin= n1p2vmeans$value - n1p2vse$s
e_dx)

n1p2vgrp <- n1p2vgrp + geom_errorbar(limits,width=0.25,position = position_dodge(width =
0.9))
n1p2vgrp
```



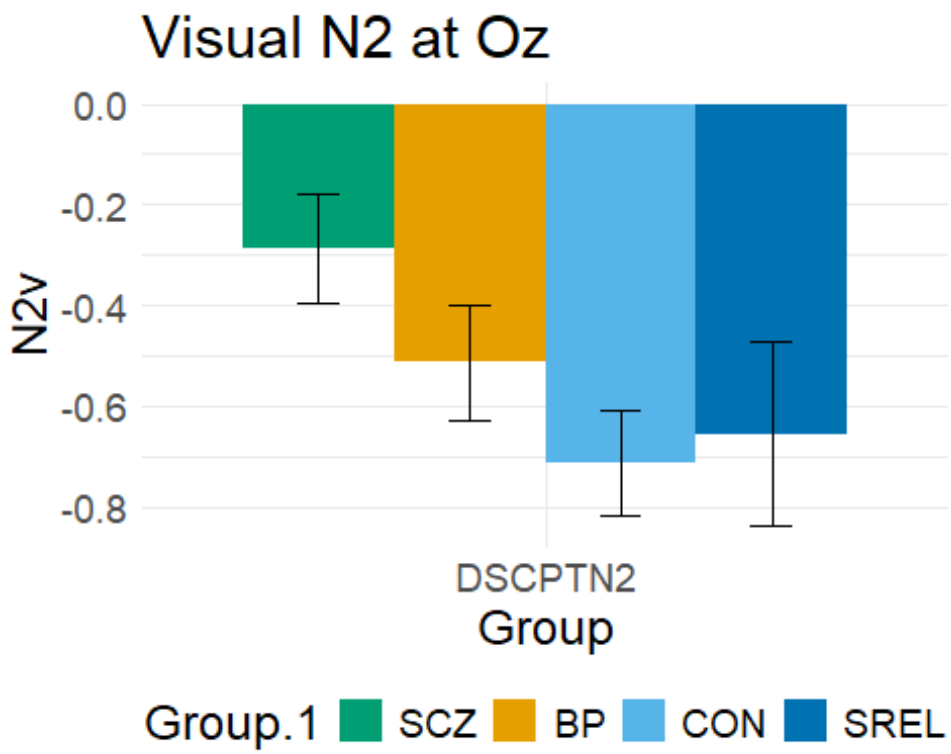

```
n2vmeans<-allstudy_PCA_ERP[,2:89]
n2vmeans<-n2vmeans[-c(2:87)]
n2vmeans<-na.omit(n2vmeans)
n2vmeans<-aggregate(n2vmeans,by=list(n2vmeans$Group),mean)
n2vmeans<-n2vmeans[-c(2)]
n2vmeans<-melt(n2vmeans,id="Group.1")

n2vgrp <- ggplot(data = n2vmeans,
                   aes(x =  variable,
                       y = value, fill = Group.1)) +
  geom_bar(position="dodge", stat = 'identity') + theme_minimal() + theme(legend.position
= "bottom") + labs(y= "N2v", x = "Group") + scale_fill_manual(values=c("#009E73","#E69F00
","#56B4E9", "#0072B2")) + theme(text = element_text(size = 18)) + ggtitle("Visual N2 at
Oz")
n2vgrp
```



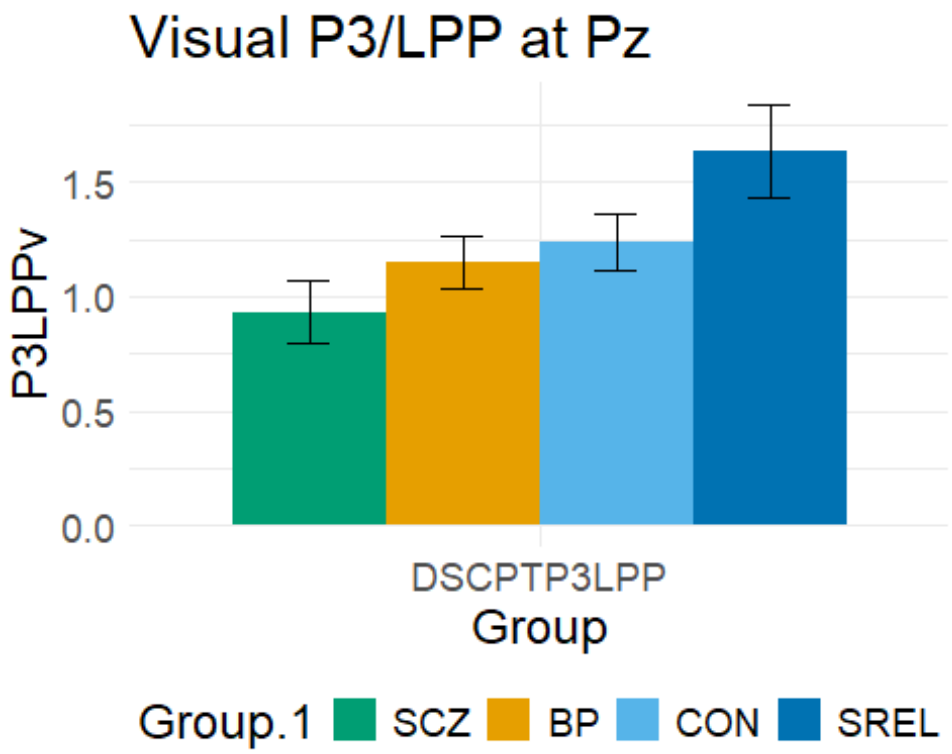

```
n2vse <- allstudy_PCA_ERP %>% group_by(Group) %>%
  summarize(se_dx = plotrix :: std.error(DSCPTN2))

limits <- aes(ymax = n2vmeans$value + n2vse$se_dx, ymin= n2vmeans$value - n2vse$se_dx)

n2vgrp <- n2vgrp + geom_errorbar(limits,width=0.25,position = position_dodge(width = 0.9)
)
n2vgrp
```



```
p3lppvmeans<-allstudy_PCA_ERP[,2:41]
p3lppvmeans<-p3lppvmeans[-c(2:39)]
p3lppvmeans<-na.omit(p3lppvmeans)
p3lppvmeans<-aggregate(p3lppvmeans,by=list(p3lppvmeans$Group),mean)
p3lppvmeans<-p3lppvmeans[-c(2)]
p3lppvmeans<-melt(p3lppvmeans,id="Group.1")

p3lppvgrp <- ggplot(data = p3lppvmeans,
                    aes(x =  variable,
                        y = value, fill = Group.1)) +
  geom_bar(position="dodge", stat = 'identity') + theme_minimal() + theme(legend.position
= "bottom") + labs(y= "P3LPPv", x = "Group") + scale_fill_manual(values=c("#009E73","#E69
F00","#56B4E9", "#0072B2")) + theme(text = element_text(size = 18)) + ggtitle("Visual P3/
LPP at Pz")
n2vgrp
```




```
p3lppvse <- allstudy_PCA_ERP %>% group_by(Group) %>%
  summarize(se_dx = plotrix :: std.error(DSCPTP3LPP))

limits <- aes(ymax = p3lppvmeans$value + p3lppvse$se_dx, ymin= p3lppvmeans$value - p3lppv
se$se_dx)

p3lppvgrp <- p3lppvgrp + geom_errorbar(limits,width=0.25,position = position_dodge(width
= 0.9))
p3lppvgrp
```




```
#################### REGRESSION MODELS ####################

pca_model1 <- lm(DichoticN1 ~ DSCPTN1P2 * Group + DSCPTP1 * Group + DSCPTN2 * Group + DSC
PTP3LPP * Group + StudyID, data = allstudy_PCA_ERP)
summary(pca_model1)

##
## Call:
## lm(formula = DichoticN1 ~ DSCPTN1P2 * Group + DSCPTP1 * Group +
##     DSCPTN2 * Group + DSCPTP3LPP * Group + StudyID, data = allstudy_PCA_ERP)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.7099 -0.4135  0.0338  0.3627  3.3235
##
## Coefficients:
##                        Estimate Std. Error t value Pr(>|t|)
## (Intercept)          -0.687518   0.183623  -3.744 0.000247 ***
## DSCPTN1P2            -0.056924   0.067940  -0.838 0.403277
## GroupBP               0.014974   0.270619   0.055 0.955939
## GroupCON             -0.133347   0.249215  -0.535 0.593298
## GroupSREL             0.099082   0.369343   0.268 0.788818
## DSCPTP1               0.128303   0.068613   1.870 0.063199 .
## DSCPTN2              -0.060451   0.085961  -0.703 0.482861
## DSCPTP3LPP           -0.022436   0.075485  -0.297 0.766659
## StudyIDNPG           -0.302768   0.127900  -2.367 0.019040 *
## StudyIDPENS          -0.238698   0.126473  -1.887 0.060808 .
## DSCPTN1P2:GroupBP     0.046027   0.099032   0.465 0.642689
## DSCPTN1P2:GroupCON    0.064791   0.087549   0.740 0.460285
## DSCPTN1P2:GroupSREL  -0.004597   0.128597  -0.036 0.971527
## GroupBP:DSCPTP1      -0.123168   0.102920  -1.197 0.233066
## GroupCON:DSCPTP1     -0.101499   0.088721  -1.144 0.254211
```

```
## GroupSREL:DSCPTP1    -0.196592   0.099273  -1.980 0.049272 *
## GroupBP:DSCPTN2      -0.008949   0.137887  -0.065 0.948326
## GroupCON:DSCPTN2     -0.113078   0.123432  -0.916 0.360897
## GroupSREL:DSCPTN2    -0.094872   0.151184  -0.628 0.531149
## GroupBP:DSCPTP3LPP   -0.089358   0.141395  -0.632 0.528248
## GroupCON:DSCPTP3LPP  -0.259632   0.104791  -2.478 0.014198 *
## GroupSREL:DSCPTP3LPP -0.164694   0.128315  -1.284 0.201050
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.643 on 171 degrees of freedom
##   (110 observations deleted due to missingness)
## Multiple R-squared:  0.1773, Adjusted R-squared:  0.07624
## F-statistic: 1.755 on 21 and 171 DF,  p-value: 0.02703

result1 <- anova(pca_model1)
print(result1)

## Analysis of Variance Table
##
## Response: DichoticN1
##                   Df Sum Sq Mean Sq F value   Pr(>F)
## DSCPTN1P2          1  0.757  0.7572  1.8315 0.177732
## Group              3  2.549  0.8497  2.0554 0.108011
## DSCPTP1            1  0.001  0.0009  0.0022 0.962435
## DSCPTN2            1  0.629  0.6294  1.5225 0.218936
## DSCPTP3LPP         1  4.630  4.6302 11.2005 0.001006 **
## StudyID            2  1.720  0.8598  2.0799 0.128098
## DSCPTN1P2:Group    3  0.152  0.0508  0.1229 0.946521
## Group:DSCPTP1      3  1.999  0.6662  1.6116 0.188515
## Group:DSCPTN2      3  0.178  0.0592  0.1432 0.933914
## Group:DSCPTP3LPP   3  2.618  0.8725  2.1106 0.100703
## Residuals        171 70.691  0.4134
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

pca_model2 <- lm(DichoticP2MMN ~ DSCPTN1P2 * Group + DSCPTP1 * Group + DSCPTN2 * Group +
DSCPTP3LPP * Group + StudyID, data = allstudy_PCA_ERP)
summary(pca_model2)

##
## Call:
## lm(formula = DichoticP2MMN ~ DSCPTN1P2 * Group + DSCPTP1 * Group +
##     DSCPTN2 * Group + DSCPTP3LPP * Group + StudyID, data = allstudy_PCA_ERP)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.63964 -0.82211 -0.05335  0.66356  2.72324
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)          0.71615    0.34650   2.067  0.04026 *
## DSCPTN1P2            0.36166    0.12820   2.821  0.00535 **
## GroupBP              0.39000    0.51066   0.764  0.44609
## GroupCON            -0.29874    0.47027  -0.635  0.52611
## GroupSREL            0.50435    0.69695   0.724  0.47027
```

```
## DSCPTP1               0.04212    0.12947   0.325  0.74534
## DSCPTN2              -0.33764    0.16221  -2.082  0.03888 *
## DSCPTP3LPP           -0.08665    0.14244  -0.608  0.54377
## StudyIDNPG           -0.26854    0.24135  -1.113  0.26741
## StudyIDPENS          -0.59976    0.23865  -2.513  0.01289 *
## DSCPTN1P2:GroupBP    -0.53517    0.18687  -2.864  0.00471 **
## DSCPTN1P2:GroupCON   -0.14908    0.16521  -0.902  0.36811
## DSCPTN1P2:GroupSREL  -0.33699    0.24266  -1.389  0.16673
## GroupBP:DSCPTP1       0.12925    0.19421   0.666  0.50662
## GroupCON:DSCPTP1      0.25187    0.16742   1.504  0.13431
## GroupSREL:DSCPTP1     0.14980    0.18733   0.800  0.42500
## GroupBP:DSCPTN2       0.26634    0.26019   1.024  0.30745
## GroupCON:DSCPTN2      0.29212    0.23292   1.254  0.21148
## GroupSREL:DSCPTN2     0.16434    0.28528   0.576  0.56532
## GroupBP:DSCPTP3LPP    0.10040    0.26681   0.376  0.70718
## GroupCON:DSCPTP3LPP  -0.07247    0.19774  -0.367  0.71444
## GroupSREL:DSCPTP3LPP -0.12005    0.24213  -0.496  0.62065
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.213 on 171 degrees of freedom
##   (110 observations deleted due to missingness)
## Multiple R-squared:  0.1949, Adjusted R-squared:  0.09599
## F-statistic: 1.971 on 21 and 171 DF,  p-value: 0.009647
```

```
result2 <- anova(pca_model2)
print(result2)
```

```
## Analysis of Variance Table
##
## Response: DichoticP2MMN
##                   Df  Sum Sq Mean Sq F value  Pr(>F)
## DSCPTN1P2          1   8.262  8.2624  5.6130 0.01894 *
## Group              3   5.343  1.7811  1.2100 0.30772
## DSCPTP1            1   8.293  8.2929  5.6337 0.01873 *
## DSCPTN2            1   4.676  4.6755  3.1763 0.07649 .
## DSCPTP3LPP         1   0.952  0.9524  0.6470 0.42230
## StudyID            2  10.819  5.4096  3.6750 0.02737 *
## DSCPTN1P2:Group    3  13.862  4.6207  3.1390 0.02682 *
## Group:DSCPTP1      3   3.375  1.1250  0.7643 0.51554
## Group:DSCPTN2      3   4.347  1.4492  0.9845 0.40148
## Group:DSCPTP3LPP   3   0.990  0.3300  0.2242 0.87949
## Residuals        171 251.714  1.4720
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
pca_model3 <- lm(DichoticP3 ~ DSCPTN1P2 * Group + DSCPTP1 * Group + DSCPTN2 * Group + DSC
PTP3LPP * Group + StudyID, data = allstudy_PCA_ERP)
summary(pca_model3)
```

```
##
## Call:
## lm(formula = DichoticP3 ~ DSCPTN1P2 * Group + DSCPTP1 * Group +
##     DSCPTN2 * Group + DSCPTP3LPP * Group + StudyID, data = allstudy_PCA_ERP)
##
## Residuals:
```

```
##     Min      1Q  Median      3Q     Max
## -3.1522 -0.8731 -0.0471  0.6596  4.2142
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)           1.939422   0.362123   5.356 2.72e-07 ***
## DSCPTN1P2            -0.216056   0.133984  -1.613  0.10869
## GroupBP              -0.790302   0.533688  -1.481  0.14049
## GroupCON             -0.048817   0.491477  -0.099  0.92100
## GroupSREL            -0.320862   0.728382  -0.441  0.66012
## DSCPTP1               0.306860   0.135311   2.268  0.02459 *
## DSCPTN2              -0.033434   0.169524  -0.197  0.84389
## DSCPTP3LPP           -0.067127   0.148864  -0.451  0.65262
## StudyIDNPG            0.161621   0.252231   0.641  0.52253
## StudyIDPENS           0.663234   0.249417   2.659  0.00858 **
## DSCPTN1P2:GroupBP     0.319460   0.195300   1.636  0.10373
## DSCPTN1P2:GroupCON    0.387345   0.172656   2.243  0.02615 *
## DSCPTN1P2:GroupSREL   0.123060   0.253606   0.485  0.62813
## GroupBP:DSCPTP1      -0.382510   0.202968  -1.885  0.06118 .
## GroupCON:DSCPTP1     -0.297819   0.174967  -1.702  0.09055 .
## GroupSREL:DSCPTP1     0.008415   0.195775   0.043  0.96577
## GroupBP:DSCPTN2      -0.244909   0.271926  -0.901  0.36904
## GroupCON:DSCPTN2     -0.074925   0.243419  -0.308  0.75861
## GroupSREL:DSCPTN2    -0.414027   0.298149  -1.389  0.16674
## GroupBP:DSCPTP3LPP    0.560048   0.278846   2.008  0.04617 *
## GroupCON:DSCPTP3LPP   0.441320   0.206659   2.136  0.03414 *
## GroupSREL:DSCPTP3LPP  0.332392   0.253050   1.314  0.19076
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.268 on 171 degrees of freedom
##   (110 observations deleted due to missingness)
## Multiple R-squared:  0.3089, Adjusted R-squared:  0.224
## F-statistic: 3.639 on 21 and 171 DF,  p-value: 1.245e-06
```

```
result3 <- anova(pca_model3)
print(result3)
```

```
## Analysis of Variance Table
##
## Response: DichoticP3
##                    Df  Sum Sq Mean Sq F value    Pr(>F)
## DSCPTN1P2           1   6.614  6.6136  4.1135  0.044094 *
## Group               3  39.222 13.0738  8.1317 4.298e-05 ***
## DSCPTP1             1  14.399 14.3986  8.9556  0.003176 **
## DSCPTN2             1   5.464  5.4636  3.3982  0.066997 .
## DSCPTP3LPP          1   7.886  7.8856  4.9047  0.028105 *
## StudyID             2  10.230  5.1150  3.1814  0.043996 *
## DSCPTN1P2:Group     3  10.615  3.5384  2.2008  0.089784 .
## Group:DSCPTP1       3   8.032  2.6774  1.6653  0.176343
## Group:DSCPTN2       3  10.336  3.4452  2.1429  0.096653 .
## Group:DSCPTP3LPP    3  10.084  3.3614  2.0907  0.103277
## Residuals         171 274.929  1.6078
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
pca_model4 <- lm(DichoticLPP ~ DSCPTN1P2 * Group + DSCPTP1 * Group + DSCPTN2 * Group + DS
CPTP3LPP * Group + StudyID, data = allstudy_PCA_ERP)
summary(pca_model4)

##
## Call:
## lm(formula = DichoticLPP ~ DSCPTN1P2 * Group + DSCPTP1 * Group +
##     DSCPTN2 * Group + DSCPTP3LPP * Group + StudyID, data = allstudy_PCA_ERP)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.4272 -0.6036 -0.0482  0.6754  3.8335
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)           1.082132   0.326361   3.316  0.00112 **
## DSCPTN1P2             0.242800   0.120752   2.011  0.04592 *
## GroupBP              -0.425316   0.480983  -0.884  0.37780
## GroupCON             -0.354761   0.442940  -0.801  0.42429
## GroupSREL             0.054124   0.656449   0.082  0.93439
## DSCPTP1               0.278252   0.121948   2.282  0.02374 *
## DSCPTN2               0.079831   0.152782   0.523  0.60199
## DSCPTP3LPP            0.006896   0.134163   0.051  0.95907
## StudyIDNPG           -0.225699   0.227321  -0.993  0.32218
## StudyIDPENS          -0.234842   0.224785  -1.045  0.29762
## DSCPTN1P2:GroupBP    -0.331070   0.176013  -1.881  0.06168 .
## DSCPTN1P2:GroupCON    0.026087   0.155605   0.168  0.86706
## DSCPTN1P2:GroupSREL  -0.378388   0.228561  -1.656  0.09965 .
## GroupBP:DSCPTP1      -0.144009   0.182923  -0.787  0.43222
## GroupCON:DSCPTP1     -0.402306   0.157688  -2.551  0.01161 *
## GroupSREL:DSCPTP1    -0.211385   0.176441  -1.198  0.23256
## GroupBP:DSCPTN2      -0.404880   0.245071  -1.652  0.10035
## GroupCON:DSCPTN2      0.436094   0.219380   1.988  0.04842 *
## GroupSREL:DSCPTN2     0.184038   0.268705   0.685  0.49433
## GroupBP:DSCPTP3LPP    0.686614   0.251308   2.732  0.00695 **
## GroupCON:DSCPTP3LPP   0.624178   0.186250   3.351  0.00099 ***
## GroupSREL:DSCPTP3LPP  0.499545   0.228059   2.190  0.02985 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.143 on 171 degrees of freedom
##   (110 observations deleted due to missingness)
## Multiple R-squared:  0.3275, Adjusted R-squared:  0.2449
## F-statistic: 3.966 on 21 and 171 DF,  p-value: 2.049e-07

result4 <- anova(pca_model4)
print(result4)

## Analysis of Variance Table
##
## Response: DichoticLPP
##                   Df  Sum Sq Mean Sq F value    Pr(>F)
## DSCPTN1P2          1   7.773   7.773  5.9525  0.015718 *
## Group              3   1.474   0.491  0.3763  0.770227
## DSCPTP1            1   3.667   3.667  2.8083  0.095605 .
## DSCPTN2            1   1.933   1.933  1.4801  0.225431
```

```
## DSCPTP3LPP         1  39.372  39.372 30.1493 1.426e-07 ***
## StudyID            2   1.630   0.815  0.6242  0.536912
## DSCPTN1P2:Group    3  11.252   3.751  2.8722  0.037895 *
## Group:DSCPTP1      3   9.157   3.052  2.3374  0.075416 .
## Group:DSCPTN2      3  14.216   4.739  3.6287  0.014200 *
## Group:DSCPTP3LPP   3  18.287   6.096  4.6677  0.003674 **
## Residuals        171 223.308   1.306
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
pca_model5 <- lm(DSCPTP1 ~ DichoticLPP * Group + DichoticP3 * Group + DichoticP2MMN * Gro
up + DichoticN1 * Group + StudyID, data = allstudy_PCA_ERP)
summary(pca_model5)
```

```
##
## Call:
## lm(formula = DSCPTP1 ~ DichoticLPP * Group + DichoticP3 * Group +
##     DichoticP2MMN * Group + DichoticN1 * Group + StudyID, data = allstudy_PCA_ERP)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.6054 -0.6795 -0.0333  0.7241  3.5045
##
## Coefficients:
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)             -0.07998    0.60571  -0.132   0.8951
## DichoticLPP              0.25131    0.16182   1.553   0.1223
## GroupBP                  0.33505    0.86937   0.385   0.7004
## GroupCON                 0.21209    0.75268   0.282   0.7785
## GroupSREL               -0.84085    0.91463  -0.919   0.3592
## DichoticP3               0.33163    0.17067   1.943   0.0536 .
## DichoticP2MMN           -0.07486    0.15270  -0.490   0.6246
## DichoticN1               0.51605    0.35257   1.464   0.1451
## StudyIDNPG               0.38465    0.27377   1.405   0.1618
## StudyIDPENS              0.40740    0.28022   1.454   0.1478
## DichoticLPP:GroupBP     -0.01619    0.23817  -0.068   0.9459
## DichoticLPP:GroupCON    -0.28653    0.20293  -1.412   0.1598
## DichoticLPP:GroupSREL   -0.18450    0.32045  -0.576   0.5655
## GroupBP:DichoticP3      -0.27430    0.24628  -1.114   0.2670
## GroupCON:DichoticP3     -0.34015    0.22447  -1.515   0.1315
## GroupSREL:DichoticP3    -0.15438    0.23468  -0.658   0.5115
## GroupBP:DichoticP2MMN    0.17537    0.23951   0.732   0.4651
## GroupCON:DichoticP2MMN   0.49308    0.21279   2.317   0.0217 *
## GroupSREL:DichoticP2MMN  0.60406    0.30585   1.975   0.0499 *
## GroupBP:DichoticN1      -0.65400    0.62063  -1.054   0.2935
## GroupCON:DichoticN1     -0.72507    0.42591  -1.702   0.0905 .
## GroupSREL:DichoticN1    -1.14197    0.57376  -1.990   0.0481 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.389 on 171 degrees of freedom
##   (110 observations deleted due to missingness)
## Multiple R-squared:  0.1842, Adjusted R-squared:  0.08399
## F-statistic: 1.838 on 21 and 171 DF,  p-value: 0.01827
```

```r
result5 <- anova(pca_model5)
print(result5)
```

```
## Analysis of Variance Table
##
## Response: DSCPTP1
##                       Df Sum Sq Mean Sq F value   Pr(>F)
## DichoticLPP            1   5.19  5.1874  2.6896 0.102841
## Group                  3   8.08  2.6928  1.3962 0.245702
## DichoticP3             1  13.78 13.7807  7.1452 0.008244 **
## DichoticP2MMN          1   9.73  9.7344  5.0472 0.025945 *
## DichoticN1             1   0.06  0.0617  0.0320 0.858228
## StudyID                2   5.49  2.7471  1.4244 0.243505
## DichoticLPP:Group      3   7.89  2.6295  1.3634 0.255710
## Group:DichoticP3       3   4.69  1.5631  0.8105 0.489682
## Group:DichoticP2MMN    3  10.63  3.5421  1.8366 0.142358
## Group:DichoticN1       3   8.91  2.9711  1.5405 0.205834
## Residuals            171 329.80  1.9287
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
pca_model6 <- lm(DSCPTN1P2 ~ DichoticLPP * Group + DichoticP3 * Group + DichoticP2MMN * G
roup + DichoticN1 * Group + StudyID, data = allstudy_PCA_ERP)
summary(pca_model6)
```

```
##
## Call:
## lm(formula = DSCPTN1P2 ~ DichoticLPP * Group + DichoticP3 * Group +
##     DichoticP2MMN * Group + DichoticN1 * Group + StudyID, data = allstudy_PCA_ERP)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.6537 -0.8826 -0.1167  0.8466  5.2518
##
## Coefficients:
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)               1.41241    0.57857   2.441   0.0157 *
## DichoticLPP               0.32983    0.15457   2.134   0.0343 *
## GroupBP                   0.60687    0.83043   0.731   0.4659
## GroupCON                  0.31056    0.71896   0.432   0.6663
## GroupSREL                 0.99841    0.87366   1.143   0.2547
## DichoticP3               -0.34507    0.16302  -2.117   0.0357 *
## DichoticP2MMN             0.33080    0.14586   2.268   0.0246 *
## DichoticN1               -0.45011    0.33678  -1.337   0.1832
## StudyIDNPG               -0.16489    0.26150  -0.631   0.5292
## StudyIDPENS              -0.11562    0.26767  -0.432   0.6663
## DichoticLPP:GroupBP      -0.36976    0.22750  -1.625   0.1059
## DichoticLPP:GroupCON     -0.02428    0.19384  -0.125   0.9005
## DichoticLPP:GroupSREL    -0.81497    0.30610  -2.662   0.0085 **
## GroupBP:DichoticP3        0.42307    0.23525   1.798   0.0739 .
## GroupCON:DichoticP3       0.34158    0.21441   1.593   0.1130
## GroupSREL:DichoticP3      0.44075    0.22416   1.966   0.0509 .
## GroupBP:DichoticP2MMN    -0.49095    0.22878  -2.146   0.0333 *
## GroupCON:DichoticP2MMN   -0.03816    0.20325  -0.188   0.8513
## GroupSREL:DichoticP2MMN  -0.09524    0.29215  -0.326   0.7448
## GroupBP:DichoticN1        0.56571    0.59283   0.954   0.3413
```

```
## GroupCON:DichoticN1      0.17356    0.40683   0.427   0.6702
## GroupSREL:DichoticN1     0.15310    0.54806   0.279   0.7803
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.327 on 171 degrees of freedom
##   (110 observations deleted due to missingness)
## Multiple R-squared:  0.2358, Adjusted R-squared:  0.1419
## F-statistic: 2.512 on 21 and 171 DF,  p-value: 0.0005969

result6 <- anova(pca_model6)
print(result6)

## Analysis of Variance Table
##
## Response: DSCPTN1P2
##                       Df  Sum Sq Mean Sq F value   Pr(>F)
## DichoticLPP            1   9.217  9.2172  5.2378 0.023325 *
## Group                  3  29.001  9.6670  5.4935 0.001258 **
## DichoticP3             1   0.078  0.0781  0.0444 0.833423
## DichoticP2MMN          1   9.208  9.2077  5.2324 0.023395 *
## DichoticN1             1   3.116  3.1156  1.7705 0.185093
## StudyID                2   0.172  0.0861  0.0489 0.952284
## DichoticLPP:Group      3  22.557  7.5190  4.2728 0.006141 **
## Group:DichoticP3       3   9.214  3.0714  1.7454 0.159591
## Group:DichoticP2MMN    3   8.665  2.8884  1.6414 0.181661
## Group:DichoticN1       3   1.607  0.5356  0.3044 0.822210
## Residuals            171 300.914  1.7597
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

pca_model7 <- lm(DSCPTN2 ~ DichoticLPP * Group + DichoticP3 * Group + DichoticP2MMN * Gro
up + DichoticN1 * Group + StudyID, data = allstudy_PCA_ERP)
summary(pca_model7)

##
## Call:
## lm(formula = DSCPTN2 ~ DichoticLPP * Group + DichoticP3 * Group +
##     DichoticP2MMN * Group + DichoticN1 * Group + StudyID, data = allstudy_PCA_ERP)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.3314 -0.6112 -0.0559  0.5991  4.1546
##
## Coefficients:
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)             -0.347169   0.453684  -0.765   0.4452
## DichoticLPP              0.156873   0.121205   1.294   0.1973
## GroupBP                  0.149435   0.651171   0.229   0.8188
## GroupCON                -0.459518   0.563769  -0.815   0.4162
## GroupSREL               -0.140783   0.685072  -0.206   0.8374
## DichoticP3              -0.023612   0.127834  -0.185   0.8537
## DichoticP2MMN           -0.273563   0.114373  -2.392   0.0178 *
## DichoticN1              -0.102397   0.264081  -0.388   0.6987
## StudyIDNPG               0.001746   0.205054   0.009   0.9932
## StudyIDPENS              0.241415   0.209887   1.150   0.2517
```

```
## DichoticLPP:GroupBP     -0.379515   0.178394  -2.127   0.0348 *
## DichoticLPP:GroupCON     0.046485   0.151995   0.306   0.7601
## DichoticLPP:GroupSREL    0.045421   0.240023   0.189   0.8501
## GroupBP:DichoticP3      -0.251508   0.184471  -1.363   0.1745
## GroupCON:DichoticP3     -0.235625   0.168127  -1.401   0.1629
## GroupSREL:DichoticP3    -0.189764   0.175777  -1.080   0.2819
## GroupBP:DichoticP2MMN    0.341144   0.179394   1.902   0.0589 .
## GroupCON:DichoticP2MMN   0.413925   0.159380   2.597   0.0102 *
## GroupSREL:DichoticP2MMN  0.069603   0.229086   0.304   0.7616
## GroupBP:DichoticN1      -0.377103   0.464862  -0.811   0.4184
## GroupCON:DichoticN1     -0.178326   0.319012  -0.559   0.5769
## GroupSREL:DichoticN1    -0.085152   0.429754  -0.198   0.8432
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.04 on 171 degrees of freedom
##   (110 observations deleted due to missingness)
## Multiple R-squared:  0.1809, Adjusted R-squared:  0.08033
## F-statistic: 1.799 on 21 and 171 DF,  p-value: 0.02202
```

```
result7 <- anova(pca_model7)
print(result7)
```

```
## Analysis of Variance Table
##
## Response: DSCPTN2
##                       Df  Sum Sq Mean Sq F value  Pr(>F)
## DichoticLPP            1   0.907  0.9065  0.8378 0.36131
## Group                  3   8.668  2.8893  2.6703 0.04918 *
## DichoticP3             1   4.930  4.9296  4.5559 0.03423 *
## DichoticP2MMN          1   3.957  3.9567  3.6568 0.05751 .
## DichoticN1             1   1.339  1.3389  1.2374 0.26754
## StudyID                2   3.274  1.6370  1.5129 0.22320
## DichoticLPP:Group      3   6.075  2.0250  1.8715 0.13625
## Group:DichoticP3       3   2.464  0.8214  0.7592 0.51847
## Group:DichoticP2MMN    3   8.462  2.8207  2.6069 0.05336 .
## Group:DichoticN1       3   0.794  0.2648  0.2448 0.86498
## Residuals            171 185.025  1.0820
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
pca_model8 <- lm(DSCPTP3LPP ~ DichoticLPP * Group + DichoticP3 * Group + DichoticP2MMN *
Group + DichoticN1 * Group + StudyID, data = allstudy_PCA_ERP)
summary(pca_model8)
```

```
##
## Call:
## lm(formula = DSCPTP3LPP ~ DichoticLPP * Group + DichoticP3 *
##     Group + DichoticP2MMN * Group + DichoticN1 * Group + StudyID,
##     data = allstudy_PCA_ERP)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -5.2419 -0.6057 -0.0513  0.5883  3.0610
##
## Coefficients:
```

```
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)                0.890856   0.493965   1.803   0.0731 .
## DichoticLPP                0.005917   0.131966   0.045   0.9643
## GroupBP                   -0.909346   0.708986  -1.283   0.2014
## GroupCON                  -0.844335   0.613824  -1.376   0.1708
## GroupSREL                 -0.395523   0.745897  -0.530   0.5966
## DichoticP3                -0.055493   0.139183  -0.399   0.6906
## DichoticP2MMN              0.147855   0.124527   1.187   0.2367
## DichoticN1                -0.094324   0.287528  -0.328   0.7433
## StudyIDNPG                -0.284100   0.223260  -1.273   0.2049
## StudyIDPENS               -0.129929   0.228523  -0.569   0.5704
## DichoticLPP:GroupBP        0.367834   0.194233   1.894   0.0599 .
## DichoticLPP:GroupCON       0.290412   0.165490   1.755   0.0811 .
## DichoticLPP:GroupSREL      0.664976   0.261334   2.545   0.0118 *
## GroupBP:DichoticP3         0.334434   0.200849   1.665   0.0977 .
## GroupCON:DichoticP3        0.197320   0.183055   1.078   0.2826
## GroupSREL:DichoticP3       0.158384   0.191384   0.828   0.4091
## GroupBP:DichoticP2MMN     -0.225352   0.195322  -1.154   0.2502
## GroupCON:DichoticP2MMN    -0.140722   0.173531  -0.811   0.4185
## GroupSREL:DichoticP2MMN   -0.206676   0.249426  -0.829   0.4085
## GroupBP:DichoticN1        -0.057930   0.506136  -0.114   0.9090
## GroupCON:DichoticN1       -0.311611   0.347336  -0.897   0.3709
## GroupSREL:DichoticN1       0.001726   0.467910   0.004   0.9971
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.133 on 171 degrees of freedom
##   (110 observations deleted due to missingness)
## Multiple R-squared:  0.259,  Adjusted R-squared:  0.168
## F-statistic: 2.846 on 21 and 171 DF,  p-value: 9.849e-05
```

```
result8 <- anova(pca_model8)
print(result8)
```

```
## Analysis of Variance Table
##
## Response: DSCPTP3LPP
##                       Df  Sum Sq Mean Sq F value    Pr(>F)
## DichoticLPP            1  27.477 27.4767 21.4212 7.259e-06 ***
## Group                  3  14.754  4.9181  3.8342   0.01087 *
## DichoticP3             1   6.824  6.8239  5.3200   0.02228 *
## DichoticP2MMN          1   0.199  0.1991  0.1552   0.69407
## DichoticN1             1   7.247  7.2469  5.6498   0.01856 *
## StudyID                2   2.260  1.1301  0.8811   0.41622
## DichoticLPP:Group      3   9.915  3.3050  2.5766   0.05548 .
## Group:DichoticP3       3   3.935  1.3115  1.0225   0.38412
## Group:DichoticP2MMN    3   2.568  0.8562  0.6675   0.57312
## Group:DichoticN1       3   1.491  0.4971  0.3876   0.76209
## Residuals            171 219.339  1.2827
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#################### CLINICAL SYMPTOMS ####################

# Read in additional clinical data & organize data frames
```

```
beh <- readxl::read_excel("DiSCPT_Merged_Clinical_Behavioral_w_missing_filled_fromdichoti
c_wexclusions.xlsx")
beh$Group<-as.factor(beh$Group)
beh$Group =revalue(beh$Group ,c("1" = "SCZ", "3" = "BP", '5'="CON", '6' = "SREL", '7' = "
SZBP REL", "8" = "BP REL", "9" = "Other", "10" = "Unknown", "11" = "SZAD"))

## The following `from` values were not present in `x`: 7, 8, 9, 10, 11

dscpt_beh <- beh[!is.na(beh$DSCPT_Dprime),]
dscpt_beh <- dscpt_beh[!is.na(dscpt_beh$Group),]
dichotic_beh <- beh[!is.na(beh$Dichotic_dprime),]
dichotic_beh <- dichotic_beh[!is.na(dichotic_beh$Group),]

beh_long <- beh %>%
  pivot_longer(cols = c(Dichotic_dprime, DSCPT_Dprime),
               names_to = "Task",
               values_to = "dprime") %>%
  mutate(Task = ifelse(Task == "Dichotic_dprime","Dichotic","DSCPT"))
beh_long <- beh_long[!is.na(beh_long$Group),]
beh_long <- beh_long[!is.na(beh_long$dprime),]
beh_long <- beh_long[!is.na(beh_long$Task),]
beh_long <- beh_long[!is.na(beh_long$DichoticBehStudy),]

allstudy_behpca <- merge(allstudy_PCA_ERP, beh_long, by = c("SubID","Group"), all = TRUE)

data_cog = readxl::read_excel("Updated_all_DiSCPTcog.xlsx")
allstudy_behpca_cog <- merge(allstudy_behpca,data_cog, by = "SubID")
allstudy_behpca <- distinct(allstudy_behpca, SubID, .keep_all = TRUE) #remove redundancie
s introduced by 2nd d' column

dscpt_new_clin <- readxl::read_excel("DiSCPT_AllDSCPTClin_New.xlsx")
names(dscpt_new_clin)[names(dscpt_new_clin) == "BPRS_Total"] <- "DSCPT_BPRS_Total"
names(dscpt_new_clin)[names(dscpt_new_clin) == "SANS_GlobalNegativeSx"] <- "DSCPT_SANS_Gl
obalNegativeSx"
names(dscpt_new_clin)[names(dscpt_new_clin) == "SAPS_GlobalPositiveSx"] <- "DSCPT_SAPS_Gl
obalPositiveSx"
names(dscpt_new_clin)[names(dscpt_new_clin) == "SPQ_cognitive_perceptual"] <- "DSCPT_SPQ_
cognitive_perceptual"
names(dscpt_new_clin)[names(dscpt_new_clin) == "SPQ_interpersonal"] <- "DSCPT_SPQ_interpe
rsonal"
names(dscpt_new_clin)[names(dscpt_new_clin) == "SPQ_disorganized"] <- "DSCPT_SPQ_disorgan
ized"
names(dscpt_new_clin)[names(dscpt_new_clin) == "SPQ_Total"] <- "DSCPT_SPQ_Total"

dichotic_new_clin <- readxl::read_excel("DiSCPT_AllDichoticClin_New.xlsx")
names(dichotic_new_clin)[names(dichotic_new_clin) == "BPRS_Total"] <- "dichotic_BPRS_Tota
l"
names(dichotic_new_clin)[names(dichotic_new_clin) == "SANS_GlobalNegativeSx"] <- "dichoti
c_SANS_GlobalNegativeSx"
names(dichotic_new_clin)[names(dichotic_new_clin) == "SAPS_GlobalPositiveSx"] <- "dichoti
c_SAPS_GlobalPositiveSx"
names(dichotic_new_clin)[names(dichotic_new_clin) == "SPQ_cognitive_perceptual"] <- "dich
otic_SPQ_cognitive_perceptual"
names(dichotic_new_clin)[names(dichotic_new_clin) == "SPQ_interpersonal"] <- "dichotic_SP
Q_interpersonal"
```

```r
names(dichotic_new_clin)[names(dichotic_new_clin) == "SPQ_disorganized"] <- "dichotic_SPQ_disorganized"
names(dichotic_new_clin)[names(dichotic_new_clin) == "SPQ_Total"] <- "dichotic_SPQ_Total"

Merged_All_New_Clin <- merge(dichotic_new_clin, dscpt_new_clin, by = "SubID")
Merged_All_New_Clin_Beh_EEG <- merge(Merged_All_New_Clin, allstudy_behpca, by = "SubID")

# drop one duplicated sub:
Merged_All_New_Clin_Beh_EEG <- Merged_All_New_Clin_Beh_EEG[c(-72,-70,-71), ]

# correlations between symptoms & PCA scores

clinicalcordatadscpt <- Merged_All_New_Clin_Beh_EEG[, c("SubID","DSCPTN1P2","DSCPTP1", "DSCPTN2","DSCPTP3LPP","dprime","DSCPT_BPRS_Total","DSCPT_SANS_GlobalNegativeSx","DSCPT_SAPS_GlobalPositiveSx","DSCPT_SPQ_cognitive_perceptual","DSCPT_SPQ_interpersonal","DSCPT_SPQ_disorganized","DSCPT_SPQ_Total")]
resultsdscpt <- corr.test(clinicalcordatadscpt, use = "complete.obs", method = "pearson")
#significance values
round(resultsdscpt$p, 3)
```

```
##                                SubID DSCPTN1P2 DSCPTP1 DSCPTN2 DSCPTP3LPP
## SubID                          0.000     1.000   1.000   1.000      1.000
## DSCPTN1P2                      0.393     0.000   0.005   1.000      1.000
## DSCPTP1                        0.859     0.000   0.000   1.000      1.000
## DSCPTN2                        0.401     0.234   0.980   0.000      0.000
## DSCPTP3LPP                     0.101     0.130   0.281   0.000      0.000
## dprime                         0.678     0.777   0.267   0.003      0.124
## DSCPT_BPRS_Total               0.005     0.773   0.793   0.138      0.097
## DSCPT_SANS_GlobalNegativeSx    0.002     0.717   0.323   0.011      0.921
## DSCPT_SAPS_GlobalPositiveSx    0.041     0.360   0.392   0.047      0.852
## DSCPT_SPQ_cognitive_perceptual 0.112     0.526   0.183   0.004      0.605
## DSCPT_SPQ_interpersonal        0.000     0.059   0.011   0.162      0.016
## DSCPT_SPQ_disorganized         0.013     0.186   0.004   0.501      0.005
## DSCPT_SPQ_Total                0.005     0.182   0.020   0.085      0.063
##                                dprime DSCPT_BPRS_Total
## SubID                           1.000            0.253
## DSCPTN1P2                       1.000            1.000
## DSCPTP1                         1.000            1.000
## DSCPTN2                         0.150            1.000
## DSCPTP3LPP                      1.000            1.000
## dprime                          0.000            1.000
## DSCPT_BPRS_Total                0.518            0.000
## DSCPT_SANS_GlobalNegativeSx     0.082            0.000
## DSCPT_SAPS_GlobalPositiveSx     0.325            0.000
## DSCPT_SPQ_cognitive_perceptual  0.024            0.000
## DSCPT_SPQ_interpersonal         0.002            0.005
## DSCPT_SPQ_disorganized          0.011            0.000
## DSCPT_SPQ_Total                 0.004            0.000
##                                DSCPT_SANS_GlobalNegativeSx
## SubID                                                0.114
## DSCPTN1P2                                            1.000
## DSCPTP1                                              1.000
## DSCPTN2                                              0.542
## DSCPTP3LPP                                           1.000
## dprime                                               1.000
```

```
## DSCPT_BPRS_Total                                    0.000
## DSCPT_SANS_GlobalNegativeSx                         0.000
## DSCPT_SAPS_GlobalPositiveSx                         0.000
## DSCPT_SPQ_cognitive_perceptual                      0.012
## DSCPT_SPQ_interpersonal                             0.260
## DSCPT_SPQ_disorganized                              0.110
## DSCPT_SPQ_Total                                     0.040
##                                 DSCPT_SAPS_GlobalPositiveSx
## SubID                                             1.000
## DSCPTN1P2                                         1.000
## DSCPTP1                                           1.000
## DSCPTN2                                           1.000
## DSCPTP3LPP                                        1.000
## dprime                                            1.000
## DSCPT_BPRS_Total                                  0.000
## DSCPT_SANS_GlobalNegativeSx                       0.000
## DSCPT_SAPS_GlobalPositiveSx                       0.000
## DSCPT_SPQ_cognitive_perceptual                    0.000
## DSCPT_SPQ_interpersonal                           0.057
## DSCPT_SPQ_disorganized                            0.087
## DSCPT_SPQ_Total                                   0.001
##                                 DSCPT_SPQ_cognitive_perceptual
## SubID                                                 1.000
## DSCPTN1P2                                             1.000
## DSCPTP1                                               1.000
## DSCPTN2                                               0.229
## DSCPTP3LPP                                            1.000
## dprime                                                1.000
## DSCPT_BPRS_Total                                      0.000
## DSCPT_SANS_GlobalNegativeSx                           0.585
## DSCPT_SAPS_GlobalPositiveSx                           0.000
## DSCPT_SPQ_cognitive_perceptual                        0.000
## DSCPT_SPQ_interpersonal                               0.000
## DSCPT_SPQ_disorganized                                0.000
## DSCPT_SPQ_Total                                       0.000
##                                 DSCPT_SPQ_interpersonal DSCPT_SPQ_disorganized
## SubID                                             0.006                 0.630
## DSCPTN1P2                                         1.000                 1.000
## DSCPTP1                                           0.542                 0.221
## DSCPTN2                                           1.000                 1.000
## DSCPTP3LPP                                        0.725                 0.253
## dprime                                            0.123                 0.562
## DSCPT_BPRS_Total                                  0.255                 0.003
## DSCPT_SANS_GlobalNegativeSx                       1.000                 1.000
## DSCPT_SAPS_GlobalPositiveSx                       1.000                 1.000
## DSCPT_SPQ_cognitive_perceptual                    0.000                 0.000
## DSCPT_SPQ_interpersonal                           0.000                 0.000
## DSCPT_SPQ_disorganized                            0.000                 0.000
## DSCPT_SPQ_Total                                   0.000                 0.000
##                                 DSCPT_SPQ_Total
## SubID                                     0.253
## DSCPTN1P2                                 1.000
## DSCPTP1                                   0.893
## DSCPTN2                                   1.000
## DSCPTP3LPP                                1.000
```

```
## dprime                                   0.221
## DSCPT_BPRS_Total                         0.000
## DSCPT_SANS_GlobalNegativeSx              1.000
## DSCPT_SAPS_GlobalPositiveSx              0.037
## DSCPT_SPQ_cognitive_perceptual           0.000
## DSCPT_SPQ_interpersonal                  0.000
## DSCPT_SPQ_disorganized                   0.000
## DSCPT_SPQ_Total                          0.000
```

```
clinicalcordatadichotic <- Merged_All_New_Clin_Beh_EEG[, c("SubID","DichoticLPP","DichoticN1","DichoticP2MMN","DichoticP3","dprime","dichotic_BPRS_Total","dichotic_SANS_GlobalNegativeSx","dichotic_SAPS_GlobalPositiveSx","dichotic_SPQ_cognitive_perceptual","dichotic_SPQ_interpersonal","dichotic_SPQ_disorganized","dichotic_SPQ_Total")]
resultsdichotic <- corr.test(clinicalcordatadichotic, use = "complete.obs", method = "pearson") #significance values
round(resultsdichotic$p, 3)
```

```
##                                  SubID DichoticLPP DichoticN1 DichoticP2MMN
## SubID                            0.000       1.000      1.000         1.000
## DichoticLPP                      0.197       0.000      1.000         0.007
## DichoticN1                       0.466       0.411      0.000         0.382
## DichoticP2MMN                    0.505       0.000      0.006         0.000
## DichoticP3                       0.018       0.357      0.167         0.215
## dprime                           0.637       0.551      0.347         0.331
## dichotic_BPRS_Total              0.003       0.005      0.083         0.323
## dichotic_SANS_GlobalNegativeSx   0.005       0.178      0.477         0.783
## dichotic_SAPS_GlobalPositiveSx   0.047       0.083      0.807         0.201
## dichotic_SPQ_cognitive_perceptual 0.610      0.302      0.706         0.018
## dichotic_SPQ_interpersonal       0.115       0.229      0.169         0.291
## dichotic_SPQ_disorganized        0.092       0.041      0.004         0.088
## dichotic_SPQ_Total               0.885       0.012      0.208         0.101
##                                  DichoticP3 dprime dichotic_BPRS_Total
## SubID                                 1.000  1.000               0.221
## DichoticLPP                           1.000  1.000               0.305
## DichoticN1                            1.000  1.000               1.000
## DichoticP2MMN                         1.000  1.000               1.000
## DichoticP3                            0.000  1.000               1.000
## dprime                                0.890  0.000               1.000
## dichotic_BPRS_Total                   0.453  0.503               0.000
## dichotic_SANS_GlobalNegativeSx        0.348  0.055               0.000
## dichotic_SAPS_GlobalPositiveSx        0.320  0.278               0.000
## dichotic_SPQ_cognitive_perceptual     0.632  0.949               0.001
## dichotic_SPQ_interpersonal            0.263  0.023               0.000
## dichotic_SPQ_disorganized             0.301  0.946               0.011
## dichotic_SPQ_Total                    0.041  0.258               0.130
##                                  dichotic_SANS_GlobalNegativeSx
## SubID                                                     0.316
## DichoticLPP                                               1.000
## DichoticN1                                                1.000
## DichoticP2MMN                                             1.000
## DichoticP3                                                1.000
## dprime                                                    1.000
## dichotic_BPRS_Total                                       0.000
## dichotic_SANS_GlobalNegativeSx                            0.000
## dichotic_SAPS_GlobalPositiveSx                            0.000
## dichotic_SPQ_cognitive_perceptual                         0.144
```

```
## dichotic_SPQ_interpersonal                                0.058
## dichotic_SPQ_disorganized                                 0.191
## dichotic_SPQ_Total                                        0.102
##                                  dichotic_SAPS_GlobalPositiveSx
## SubID                                                     1.000
## DichoticLPP                                               1.000
## DichoticN1                                                1.000
## DichoticP2MMN                                             1.000
## DichoticP3                                                1.000
## dprime                                                    1.000
## dichotic_BPRS_Total                                       0.000
## dichotic_SANS_GlobalNegativeSx                            0.000
## dichotic_SAPS_GlobalPositiveSx                            0.000
## dichotic_SPQ_cognitive_perceptual                         0.474
## dichotic_SPQ_interpersonal                                0.000
## dichotic_SPQ_disorganized                                 0.212
## dichotic_SPQ_Total                                        0.697
##                                  dichotic_SPQ_cognitive_perceptual
## SubID                                                        1.000
## DichoticLPP                                                  1.000
## DichoticN1                                                   1.000
## DichoticP2MMN                                                1.000
## DichoticP3                                                   1.000
## dprime                                                       1.000
## dichotic_BPRS_Total                                          0.043
## dichotic_SANS_GlobalNegativeSx                               1.000
## dichotic_SAPS_GlobalPositiveSx                               1.000
## dichotic_SPQ_cognitive_perceptual                            0.000
## dichotic_SPQ_interpersonal                                   0.593
## dichotic_SPQ_disorganized                                    0.001
## dichotic_SPQ_Total                                           0.006
##                                  dichotic_SPQ_interpersonal
## SubID                                                 1.000
## DichoticLPP                                           1.000
## DichoticN1                                            1.000
## DichoticP2MMN                                         1.000
## DichoticP3                                            1.000
## dprime                                                1.000
## dichotic_BPRS_Total                                   0.000
## dichotic_SANS_GlobalNegativeSx                        1.000
## dichotic_SAPS_GlobalPositiveSx                        0.006
## dichotic_SPQ_cognitive_perceptual                     1.000
## dichotic_SPQ_interpersonal                            0.000
## dichotic_SPQ_disorganized                             0.000
## dichotic_SPQ_Total                                    0.000
##                                  dichotic_SPQ_disorganized dichotic_SPQ_Total
## SubID                                                1.000              1.000
## DichoticLPP                                          1.000              0.693
## DichoticN1                                           0.259              1.000
## DichoticP2MMN                                        1.000              1.000
## DichoticP3                                           1.000              1.000
## dprime                                               1.000              1.000
## dichotic_BPRS_Total                                  0.681              1.000
## dichotic_SANS_GlobalNegativeSx                       1.000              1.000
## dichotic_SAPS_GlobalPositiveSx                       1.000              1.000
```

```
## dichotic_SPQ_cognitive_perceptual                    0.062             0.348
## dichotic_SPQ_interpersonal                           0.000             0.021
## dichotic_SPQ_disorganized                            0.000             0.000
## dichotic_SPQ_Total                                   0.000             0.000
```

```
# regressions to see if diagnosis predicts PCA scores over and above symptoms

diagnosis_DSCPTN1P2_sx <- lm(DSCPTN1P2 ~ Group + StudyID + WAIS_EstIQ + DSCPT_BPRS_Total
+ DSCPT_SPQ_cognitive_perceptual + DSCPT_SPQ_interpersonal + DSCPT_SPQ_disorganized + DSC
PT_SPQ_Total, data = Merged_All_New_Clin_Beh_EEG )
diagnosis_DSCPTN1P2_results_sx <- anova(diagnosis_DSCPTN1P2_sx)
print(diagnosis_DSCPTN1P2_results_sx)
```

```
## Analysis of Variance Table
##
## Response: DSCPTN1P2
##                                Df  Sum Sq Mean Sq F value    Pr(>F)
## Group                           3  30.431 10.1438  5.8682 0.0008302 ***
## StudyID                         2   4.221  2.1104  1.2209 0.2980331
## WAIS_EstIQ                      1   0.516  0.5157  0.2983 0.5857937
## DSCPT_BPRS_Total                1   0.005  0.0052  0.0030 0.9561537
## DSCPT_SPQ_cognitive_perceptual  1   0.139  0.1393  0.0806 0.7768945
## DSCPT_SPQ_interpersonal         1   1.624  1.6242  0.9396 0.3340155
## DSCPT_SPQ_disorganized          1   0.000  0.0002  0.0001 0.9905157
## Residuals                     143 247.191  1.7286
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
model_data <- model.frame(diagnosis_DSCPTN1P2_sx)
```

```
diagnosis_DSCPTP1_sx <- lm(DSCPTP1 ~ Group + StudyID + WAIS_EstIQ + DSCPT_BPRS_Total + DS
CPT_SPQ_cognitive_perceptual + DSCPT_SPQ_interpersonal + DSCPT_SPQ_disorganized + DSCPT_S
PQ_Total, data = Merged_All_New_Clin_Beh_EEG )
diagnosis_DSCPTP1_results_sx <- anova(diagnosis_DSCPTP1_sx)
print(diagnosis_DSCPTP1_results_sx)
```

```
## Analysis of Variance Table
##
## Response: DSCPTP1
##                                Df  Sum Sq Mean Sq F value  Pr(>F)
## Group                           3   8.848  2.9492  1.4366 0.23462
## StudyID                         2   2.319  1.1597  0.5649 0.56967
## WAIS_EstIQ                      1  12.849 12.8494  6.2594 0.01348 *
## DSCPT_BPRS_Total                1   0.099  0.0994  0.0484 0.82615
## DSCPT_SPQ_cognitive_perceptual  1   2.630  2.6299  1.2811 0.25958
## DSCPT_SPQ_interpersonal         1  10.942 10.9417  5.3300 0.02239 *
## DSCPT_SPQ_disorganized          1   0.597  0.5968  0.2907 0.59059
## Residuals                     143 293.555  2.0528
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
diagnosis_DSCPTN2_sx <- lm(DSCPTN2 ~ Group + StudyID + WAIS_EstIQ + DSCPT_BPRS_Total+ DSC
PT_SPQ_cognitive_perceptual + DSCPT_SPQ_interpersonal + DSCPT_SPQ_disorganized + DSCPT_SP
Q_Total, data = Merged_All_New_Clin_Beh_EEG )
diagnosis_DSCPTN2_results_sx <- anova(diagnosis_DSCPTN2_sx)
print(diagnosis_DSCPTN2_results_sx)
```

```
## Analysis of Variance Table
##
## Response: DSCPTN2
##                                 Df  Sum Sq Mean Sq F value  Pr(>F)
## Group                            3   6.876  2.2921  2.0236 0.11327
## StudyID                          2   5.933  2.9667  2.6193 0.07635 .
## WAIS_EstIQ                       1   1.550  1.5504  1.3688 0.24396
## DSCPT_BPRS_Total                 1   0.420  0.4203  0.3711 0.54338
## DSCPT_SPQ_cognitive_perceptual   1   2.568  2.5682  2.2674 0.13433
## DSCPT_SPQ_interpersonal          1   0.503  0.5033  0.4444 0.50610
## DSCPT_SPQ_disorganized           1   5.528  5.5276  4.8802 0.02876 *
## Residuals                      143 161.970  1.1327
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
diagnosis_DSCPTP3LPP_sx <- lm(DSCPTP3LPP ~ Group + StudyID + WAIS_EstIQ + DSCPT_BPRS_Tota
l + DSCPT_SPQ_cognitive_perceptual + DSCPT_SPQ_interpersonal + DSCPT_SPQ_disorganized + D
SCPT_SPQ_Total, data = Merged_All_New_Clin_Beh_EEG )
diagnosis_DSCPTP3LPP_results_sx <- anova(diagnosis_DSCPTP3LPP_sx)
print(diagnosis_DSCPTP3LPP_results_sx)
```

```
## Analysis of Variance Table
##
## Response: DSCPTP3LPP
##                                 Df  Sum Sq Mean Sq F value  Pr(>F)
## Group                            3   6.105  2.0349  1.3190 0.27059
## StudyID                          2   0.804  0.4018  0.2604 0.77109
## WAIS_EstIQ                       1   0.012  0.0121  0.0078 0.92968
## DSCPT_BPRS_Total                 1   2.333  2.3334  1.5124 0.22079
## DSCPT_SPQ_cognitive_perceptual   1   0.197  0.1975  0.1280 0.72103
## DSCPT_SPQ_interpersonal          1   5.444  5.4442  3.5287 0.06235 .
## DSCPT_SPQ_disorganized           1   2.967  2.9672  1.9232 0.16766
## Residuals                      143 220.622  1.5428
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
diagnosis_DichoticN1_sx <- lm(DichoticN1 ~ Group + StudyID + WAIS_EstIQ + DSCPT_BPRS_Tota
l + DSCPT_SPQ_cognitive_perceptual + DSCPT_SPQ_interpersonal + DSCPT_SPQ_disorganized + D
SCPT_SPQ_Total, data = Merged_All_New_Clin_Beh_EEG )
diagnosis_DichoticN1_results_sx <- anova(diagnosis_DichoticN1_sx)
print(diagnosis_DichoticN1_results_sx)
```

```
## Analysis of Variance Table
##
## Response: DichoticN1
##                                 Df Sum Sq Mean Sq F value  Pr(>F)
## Group                            3  2.990 0.99660  2.6014 0.05421 .
## StudyID                          2  1.789 0.89474  2.3355 0.10025
## WAIS_EstIQ                       1  0.912 0.91192  2.3804 0.12496
## DSCPT_BPRS_Total                 1  0.058 0.05777  0.1508 0.69832
## DSCPT_SPQ_cognitive_perceptual   1  0.652 0.65152  1.7006 0.19419
## DSCPT_SPQ_interpersonal          1  0.011 0.01118  0.0292 0.86457
## DSCPT_SPQ_disorganized           1  0.051 0.05072  0.1324 0.71647
## Residuals                      151 57.848 0.38310
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
diagnosis_DichoticP2MMN_sx <- lm(DichoticP2MMN ~ Group + StudyID + WAIS_EstIQ + DSCPT_BPRS_Total + DSCPT_SPQ_cognitive_perceptual + DSCPT_SPQ_interpersonal + DSCPT_SPQ_disorganized + DSCPT_SPQ_Total, data = Merged_All_New_Clin_Beh_EEG)
diagnosis_DichoticP2MMN_results_sx <- anova(diagnosis_DichoticP2MMN_sx)
print(diagnosis_DichoticP2MMN_results_sx)
```

```
## Analysis of Variance Table
##
## Response: DichoticP2MMN
##                                 Df  Sum Sq Mean Sq F value  Pr(>F)
## Group                            3   7.445  2.4816  1.4039 0.24392
## StudyID                          2   3.133  1.5664  0.8861 0.41438
## WAIS_EstIQ                       1   0.578  0.5778  0.3269 0.56836
## DSCPT_BPRS_Total                 1   0.124  0.1236  0.0699 0.79185
## DSCPT_SPQ_cognitive_perceptual   1   2.567  2.5675  1.4524 0.23002
## DSCPT_SPQ_interpersonal          1   5.838  5.8377  3.3024 0.07116 .
## DSCPT_SPQ_disorganized           1   0.847  0.8466  0.4789 0.48998
## Residuals                      151 266.922  1.7677
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
diagnosis_DichoticP3_sx <- lm(DichoticP3 ~ Group + StudyID + WAIS_EstIQ + DSCPT_BPRS_Total + DSCPT_SPQ_cognitive_perceptual + DSCPT_SPQ_interpersonal + DSCPT_SPQ_disorganized + DSCPT_SPQ_Total, data = Merged_All_New_Clin_Beh_EEG )
diagnosis_DichoticP3_results_sx <- anova(diagnosis_DichoticP3_sx)
print(diagnosis_DichoticP3_results_sx)
```

```
## Analysis of Variance Table
##
## Response: DichoticP3
##                                 Df  Sum Sq Mean Sq F value   Pr(>F)
## Group                            3  34.386 11.4621  5.7045 0.001001 **
## StudyID                          2   4.884  2.4420  1.2153 0.299497
## WAIS_EstIQ                       1   2.139  2.1386  1.0644 0.303872
## DSCPT_BPRS_Total                 1   0.230  0.2305  0.1147 0.735316
## DSCPT_SPQ_cognitive_perceptual   1   1.186  1.1864  0.5904 0.443447
## DSCPT_SPQ_interpersonal          1   0.098  0.0976  0.0486 0.825886
## DSCPT_SPQ_disorganized           1   0.658  0.6577  0.3273 0.568088
## Residuals                      151 303.406  2.0093
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
diagnosis_DichoticLPP_sx <- lm(DichoticLPP ~ Group + StudyID + WAIS_EstIQ + DSCPT_BPRS_Total + DSCPT_SPQ_cognitive_perceptual + DSCPT_SPQ_interpersonal + DSCPT_SPQ_disorganized + DSCPT_SPQ_Total, data = Merged_All_New_Clin_Beh_EEG )
diagnosis_DichoticLPP_results_sx <- anova(diagnosis_DichoticLPP_sx)
print(diagnosis_DichoticLPP_results_sx)
```

```
## Analysis of Variance Table
##
## Response: DichoticLPP
##                                 Df  Sum Sq Mean Sq F value  Pr(>F)
## Group                            3   1.131  0.3770  0.2193 0.88289
## StudyID                          2   5.811  2.9054  1.6901 0.18798
## WAIS_EstIQ                       1   0.922  0.9221  0.5364 0.46506
## DSCPT_BPRS_Total                 1   2.666  2.6660  1.5508 0.21495
## DSCPT_SPQ_cognitive_perceptual   1   0.060  0.0603  0.0351 0.85166
```

```
## DSCPT_SPQ_interpersonal          1  10.606 10.6064  6.1696 0.01409 *
## DSCPT_SPQ_disorganized           1   0.013  0.0126  0.0073 0.93198
## Residuals                      151 259.589  1.7191
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# probands only

Probands_Only <- subset(Merged_All_New_Clin_Beh_EEG, Group %in% c("SCZ", "BP"))
Probands_Only$SPQ_cognitive_perceptual <- as.numeric(Probands_Only$SPQ_cognitive_perceptu
al)
Probands_Only$BPRS_Total <- as.numeric(Probands_Only$BPRS_Total)
Probands_Only$SANS_GlobalNegativeSx <- as.numeric(Probands_Only$SANS_GlobalNegativeSx)
Probands_Only$SAPS_GlobalPositiveSx <- as.numeric(Probands_Only$SAPS_GlobalPositiveSx)
Probands_Only$SPQ_interpersonal <- as.numeric(Probands_Only$SPQ_interpersonal)
Probands_Only$SPQ_disorganized <- as.numeric(Probands_Only$SPQ_disorganized)
Probands_Only$SPQ_Total <- as.numeric(Probands_Only$SPQ_Total)

diagnosis_DSCPTN1P2_sx <- lm(DSCPTN1P2 ~ Group + StudyID + WAIS_EstIQ + BPRS_Total + SANS
_GlobalNegativeSx + SAPS_GlobalPositiveSx + SPQ_cognitive_perceptual + SPQ_interpersonal
+ SPQ_disorganized + SPQ_Total, data = Probands_Only )
diagnosis_DSCPTN1P2_results_sx <- anova(diagnosis_DSCPTN1P2_sx)
print(diagnosis_DSCPTN1P2_results_sx)
```

```
## Analysis of Variance Table
##
## Response: DSCPTN1P2
##                           Df  Sum Sq Mean Sq F value Pr(>F)
## Group                      1   0.000 0.00015  0.0001 0.9934
## StudyID                    2   0.546 0.27310  0.1291 0.8791
## WAIS_EstIQ                 1   0.008 0.00757  0.0036 0.9525
## BPRS_Total                 1   0.135 0.13540  0.0640 0.8009
## SANS_GlobalNegativeSx      1   1.184 1.18391  0.5597 0.4566
## SAPS_GlobalPositiveSx      1   0.697 0.69706  0.3296 0.5676
## SPQ_cognitive_perceptual   1   0.506 0.50643  0.2394 0.6260
## SPQ_interpersonal          1   0.115 0.11470  0.0542 0.8165
## SPQ_disorganized           1   1.336 1.33588  0.6316 0.4292
## SPQ_Total                  1   0.386 0.38571  0.1824 0.6705
## Residuals                 78 164.978 2.11511
```

```
diagnosis_DSCPTP1_sx <- lm(DSCPTP1 ~Group + StudyID + WAIS_EstIQ + BPRS_Total + SANS_Glob
alNegativeSx + SAPS_GlobalPositiveSx + SPQ_cognitive_perceptual + SPQ_interpersonal + SPQ
_disorganized + SPQ_Total, data = Probands_Only )
diagnosis_DSCPTP1_results_sx <- anova(diagnosis_DSCPTP1_sx)
print(diagnosis_DSCPTP1_results_sx)
```

```
## Analysis of Variance Table
##
## Response: DSCPTP1
##                           Df  Sum Sq Mean Sq F value  Pr(>F)
## Group                      1  10.350 10.3502  6.6671 0.01169 *
## StudyID                    2   8.355  4.1774  2.6909 0.07412 .
## WAIS_EstIQ                 1   4.062  4.0615  2.6162 0.10981
## BPRS_Total                 1   5.053  5.0533  3.2551 0.07506 .
## SANS_GlobalNegativeSx      1   2.698  2.6977  1.7377 0.19129
## SAPS_GlobalPositiveSx      1   3.634  3.6341  2.3409 0.13006
```

```
## SPQ_cognitive_perceptual  1   0.599  0.5987  0.3857 0.53640
## SPQ_interpersonal         1   2.919  2.9188  1.8801 0.17425
## SPQ_disorganized          1   1.222  1.2224  0.7874 0.37761
## SPQ_Total                 1   2.961  2.9614  1.9076 0.17118
## Residuals                78 121.089  1.5524
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
diagnosis_DSCPTN2_sx <- lm(DSCPTN2 ~ Group + StudyID + WAIS_EstIQ + BPRS_Total + SANS_Glo
balNegativeSx + SAPS_GlobalPositiveSx + SPQ_cognitive_perceptual + SPQ_interpersonal + SP
Q_disorganized + SPQ_Total, data = Probands_Only )
diagnosis_DSCPTN2_results_sx <- anova(diagnosis_DSCPTN2_sx)
print(diagnosis_DSCPTN2_results_sx)
```

```
## Analysis of Variance Table
##
## Response: DSCPTN2
##                           Df Sum Sq Mean Sq F value  Pr(>F)
## Group                      1  1.925  1.9249  1.8123 0.18214
## StudyID                    2  1.988  0.9938  0.9356 0.39669
## WAIS_EstIQ                 1  1.554  1.5538  1.4629 0.23012
## BPRS_Total                 1  0.184  0.1839  0.1732 0.67846
## SANS_GlobalNegativeSx      1  4.139  4.1390  3.8968 0.05192 .
## SAPS_GlobalPositiveSx      1  1.260  1.2603  1.1865 0.27938
## SPQ_cognitive_perceptual   1  1.640  1.6405  1.5445 0.21767
## SPQ_interpersonal          1  1.219  1.2185  1.1472 0.28744
## SPQ_disorganized           1  7.162  7.1621  6.7430 0.01124 *
## SPQ_Total                  1  1.607  1.6070  1.5129 0.22239
## Residuals                 78 82.848  1.0622
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
diagnosis_DSCPTP3LPP_sx <- lm(DSCPTP3LPP ~ Group + StudyID + WAIS_EstIQ + BPRS_Total + SA
NS_GlobalNegativeSx + SAPS_GlobalPositiveSx + SPQ_cognitive_perceptual + SPQ_interpersona
l + SPQ_disorganized + SPQ_Total, data = Probands_Only )
diagnosis_DSCPTP3LPP_results_sx <- anova(diagnosis_DSCPTP3LPP_sx)
print(diagnosis_DSCPTP3LPP_results_sx)
```

```
## Analysis of Variance Table
##
## Response: DSCPTP3LPP
##                           Df  Sum Sq Mean Sq F value  Pr(>F)
## Group                      1   0.678  0.6785  0.4410 0.50858
## StudyID                    2   0.989  0.4944  0.3214 0.72609
## WAIS_EstIQ                 1   0.033  0.0335  0.0218 0.88312
## BPRS_Total                 1   6.524  6.5237  4.2407 0.04280 *
## SANS_GlobalNegativeSx      1   0.678  0.6778  0.4406 0.50880
## SAPS_GlobalPositiveSx      1   0.039  0.0385  0.0251 0.87465
## SPQ_cognitive_perceptual   1   0.000  0.0003  0.0002 0.98844
## SPQ_interpersonal          1   5.938  5.9380  3.8600 0.05301 .
## SPQ_disorganized           1   8.432  8.4324  5.4815 0.02177 *
## SPQ_Total                  1   0.149  0.1491  0.0969 0.75640
## Residuals                 78 119.990  1.5383
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
diagnosis_DichoticN1_sx <- lm(DichoticN1 ~ Group + StudyID + WAIS_EstIQ + BPRS_Total + SA
NS_GlobalNegativeSx + SAPS_GlobalPositiveSx + SPQ_cognitive_perceptual + SPQ_interpersona
l + SPQ_disorganized + SPQ_Total, data = Probands_Only )
diagnosis_DichoticN1_results_sx <- anova(diagnosis_DichoticN1_sx)
print(diagnosis_DichoticN1_results_sx)
```

```
## Analysis of Variance Table
##
## Response: DichoticN1
##                           Df  Sum Sq Mean Sq F value  Pr(>F)
## Group                      1  0.0951 0.09506  0.3539 0.55386
## StudyID                    2  0.1413 0.07066  0.2631 0.76947
## WAIS_EstIQ                 1  0.0299 0.02994  0.1115 0.73950
## BPRS_Total                 1  0.2682 0.26815  0.9983 0.32121
## SANS_GlobalNegativeSx      1  0.0062 0.00616  0.0229 0.88003
## SAPS_GlobalPositiveSx      1  0.6637 0.66374  2.4711 0.12053
## SPQ_cognitive_perceptual   1  0.0104 0.01036  0.0386 0.84487
## SPQ_interpersonal          1  0.8600 0.85996  3.2016 0.07795 .
## SPQ_disorganized           1  0.0001 0.00008  0.0003 0.98596
## SPQ_Total                  1  0.0000 0.00003  0.0001 0.99209
## Residuals                 69 18.5336 0.26860
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
diagnosis_DichoticP2MMN_sx <- lm(DichoticP2MMN ~ Group + StudyID + WAIS_EstIQ + BPRS_Tota
l + SANS_GlobalNegativeSx + SAPS_GlobalPositiveSx + SPQ_cognitive_perceptual + SPQ_interp
ersonal + SPQ_disorganized + SPQ_Total, data = Probands_Only)
diagnosis_DichoticP2MMN_results_sx <- anova(diagnosis_DichoticP2MMN_sx)
print(diagnosis_DichoticP2MMN_results_sx)
```

```
## Analysis of Variance Table
##
## Response: DichoticP2MMN
##                           Df  Sum Sq Mean Sq F value  Pr(>F)
## Group                      1   6.638  6.6385  3.9082 0.05205 .
## StudyID                    2   3.191  1.5953  0.9392 0.39589
## WAIS_EstIQ                 1   0.180  0.1803  0.1061 0.74558
## BPRS_Total                 1   0.000  0.0000  0.0000 0.99901
## SANS_GlobalNegativeSx      1   1.537  1.5365  0.9046 0.34487
## SAPS_GlobalPositiveSx      1   0.028  0.0279  0.0165 0.89832
## SPQ_cognitive_perceptual   1   1.212  1.2120  0.7135 0.40119
## SPQ_interpersonal          1   3.611  3.6109  2.1258 0.14938
## SPQ_disorganized           1   3.897  3.8972  2.2943 0.13442
## SPQ_Total                  1   0.056  0.0559  0.0329 0.85654
## Residuals                 69 117.205  1.6986
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
diagnosis_DichoticP3_sx <- lm(DichoticP3 ~ Group + StudyID + WAIS_EstIQ + BPRS_Total + SA
NS_GlobalNegativeSx + SAPS_GlobalPositiveSx + SPQ_cognitive_perceptual + SPQ_interpersona
l + SPQ_disorganized + SPQ_Total, data = Probands_Only )
diagnosis_DichoticP3_results_sx <- anova(diagnosis_DichoticP3_sx)
print(diagnosis_DichoticP3_results_sx)
```

```
## Analysis of Variance Table
##
## Response: DichoticP3
```

```
##                           Df Sum Sq Mean Sq F value  Pr(>F)
## Group                      1  1.391  1.3906  1.0053 0.31954
## StudyID                    2  7.640  3.8202  2.7617 0.07018 .
## WAIS_EstIQ                 1  0.061  0.0609  0.0440 0.83438
## BPRS_Total                 1  2.395  2.3949  1.7313 0.19260
## SANS_GlobalNegativeSx      1  0.055  0.0546  0.0394 0.84316
## SAPS_GlobalPositiveSx      1  1.887  1.8871  1.3642 0.24683
## SPQ_cognitive_perceptual   1  1.847  1.8475  1.3356 0.25180
## SPQ_interpersonal          1  0.749  0.7488  0.5413 0.46437
## SPQ_disorganized           1  0.561  0.5606  0.4052 0.52650
## SPQ_Total                  1  1.384  1.3835  1.0002 0.32076
## Residuals                 69 95.446  1.3833
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
diagnosis_DichoticLPP_sx <- lm(DichoticLPP ~ Group + StudyID + WAIS_EstIQ + BPRS_Total +
SANS_GlobalNegativeSx + SAPS_GlobalPositiveSx + SPQ_cognitive_perceptual + SPQ_interperso
nal + SPQ_disorganized + SPQ_Total, data = Probands_Only )
diagnosis_DichoticLPP_results_sx <- anova(diagnosis_DichoticLPP_sx)
print(diagnosis_DichoticLPP_results_sx)
```

```
## Analysis of Variance Table
##
## Response: DichoticLPP
##                           Df  Sum Sq Mean Sq F value  Pr(>F)
## Group                      1   0.631  0.6313  0.4160 0.52107
## StudyID                    2   3.404  1.7018  1.1214 0.33169
## WAIS_EstIQ                 1   0.009  0.0091  0.0060 0.93865
## BPRS_Total                 1   4.391  4.3907  2.8933 0.09345 .
## SANS_GlobalNegativeSx      1   0.191  0.1912  0.1260 0.72374
## SAPS_GlobalPositiveSx      1   0.245  0.2447  0.1612 0.68926
## SPQ_cognitive_perceptual   1   0.676  0.6765  0.4458 0.50659
## SPQ_interpersonal          1   4.253  4.2530  2.8025 0.09864 .
## SPQ_disorganized           1   1.081  1.0811  0.7124 0.40157
## SPQ_Total                  1   0.651  0.6507  0.4288 0.51475
## Residuals                 69 104.711  1.5176
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
################ POLYGENIC RISK SCORES #################

# Read in PRS data

PRS_data <-readxl::read_excel("DiSCPT_PRS_Data.xlsx")

# merge with the pre-cog-merge data to avoid dropping subjects with missing cognitive

allstudy_behpca_precog <- merge(allstudy_PCA_ERP, beh_long, by = c("SubID","Group"), all
= TRUE)
allstudy_behpca_precog <- distinct(allstudy_behpca_precog, SubID, .keep_all = TRUE)

Merged_PRS_data <- merge(allstudy_behpca_precog, PRS_data, by = "SubID")

# PRS analyses using schizophrenia GWAS
```

```r
# Correlations to establish which components are most related to additive genetic varianc
e

prs_cor_dat <- Merged_PRS_data[, c("DSCPTN1P2","DSCPTP1", "DSCPTN2","DSCPTP3LPP","Dichoti
cLPP","DichoticN1","DichoticP2MMN","DichoticP3","plink_SCZ_0.5_PRS","PRSice_SCZ_best_PRS"
,"PC1","PC2","PC3","PC4","PC5","PC6")]
prs_cor_dat$PC1 <- as.numeric(prs_cor_dat$PC1)
prs_cor_dat$PC2 <- as.numeric(prs_cor_dat$PC2)
prs_cor_dat$PC3 <- as.numeric(prs_cor_dat$PC3)
prs_cor_dat$PC4 <- as.numeric(prs_cor_dat$PC4)
prs_cor_dat$PC5 <- as.numeric(prs_cor_dat$PC5)
prs_cor_dat$PC6 <- as.numeric(prs_cor_dat$PC6)

corr.test(prs_cor_dat, use = "complete.obs", method = "pearson") #significance values
```

```
## Call:corr.test(x = prs_cor_dat, use = "complete.obs", method = "pearson")
## Correlation matrix
##                     DSCPTN1P2 DSCPTP1 DSCPTN2 DSCPTP3LPP DichoticLPP DichoticN1
## DSCPTN1P2                1.00    0.07   -0.01       0.12        0.17      -0.11
## DSCPTP1                  0.07    1.00   -0.03       0.16        0.00      -0.06
## DSCPTN2                 -0.01   -0.03    1.00      -0.46        0.10       0.00
## DSCPTP3LPP               0.12    0.16   -0.46       1.00        0.25      -0.16
## DichoticLPP              0.17    0.00    0.10       0.25        1.00       0.01
## DichoticN1              -0.11   -0.06    0.00      -0.16        0.01       1.00
## DichoticP2MMN            0.17    0.22   -0.02       0.06        0.15       0.28
## DichoticP3               0.19    0.21   -0.19       0.14        0.17      -0.23
## plink_SCZ_0.5_PRS       -0.15   -0.28    0.10       0.03        0.02       0.09
## PRSice_SCZ_best_PRS     -0.22   -0.21    0.17      -0.09        0.01       0.05
## PC1                     -0.13   -0.32    0.01       0.02       -0.09       0.08
## PC2                     -0.06   -0.04   -0.06       0.24        0.06       0.01
## PC3                      0.08    0.00    0.01      -0.15        0.05       0.05
## PC4                      0.07    0.03   -0.03      -0.12        0.06       0.06
## PC5                     -0.03    0.02   -0.25       0.06       -0.06       0.00
## PC6                     -0.02    0.01    0.04       0.09       -0.05       0.14
##                     DichoticP2MMN DichoticP3 plink_SCZ_0.5_PRS
## DSCPTN1P2                    0.17       0.19             -0.15
## DSCPTP1                      0.22       0.21             -0.28
## DSCPTN2                     -0.02      -0.19              0.10
## DSCPTP3LPP                   0.06       0.14              0.03
## DichoticLPP                  0.15       0.17              0.02
## DichoticN1                   0.28      -0.23              0.09
## DichoticP2MMN                1.00       0.09             -0.18
## DichoticP3                   0.09       1.00             -0.20
## plink_SCZ_0.5_PRS           -0.18      -0.20              1.00
## PRSice_SCZ_best_PRS         -0.21      -0.16              0.84
## PC1                         -0.26      -0.18              0.82
## PC2                          0.01       0.04             -0.04
## PC3                          0.10       0.13             -0.08
## PC4                          0.12       0.10             -0.18
## PC5                          0.00      -0.01              0.05
## PC6                          0.00      -0.08              0.19
##                     PRSice_SCZ_best_PRS   PC1   PC2   PC3   PC4   PC5   PC6
## DSCPTN1P2                         -0.22 -0.13 -0.06  0.08  0.07 -0.03 -0.02
## DSCPTP1                           -0.21 -0.32 -0.04  0.00  0.03  0.02  0.01
## DSCPTN2                            0.17  0.01 -0.06  0.01 -0.03 -0.25  0.04
```

```
## DSCPTP3LPP                         -0.09  0.02  0.24 -0.15 -0.12  0.06  0.09
## DichoticLPP                         0.01 -0.09  0.06  0.05  0.06 -0.06 -0.05
## DichoticN1                          0.05  0.08  0.01  0.05  0.06  0.00  0.14
## DichoticP2MMN                      -0.21 -0.26  0.01  0.10  0.12  0.00  0.00
## DichoticP3                         -0.16 -0.18  0.04  0.13  0.10 -0.01 -0.08
## plink_SCZ_0.5_PRS                   0.84  0.82 -0.04 -0.08 -0.18  0.05  0.19
## PRSice_SCZ_best_PRS                 1.00  0.72 -0.09 -0.05 -0.16 -0.04  0.14
## PC1                                 0.72  1.00  0.03  0.09 -0.02 -0.01  0.17
## PC2                                -0.09  0.03  1.00  0.07  0.03  0.04  0.14
## PC3                                -0.05  0.09  0.07  1.00  0.96 -0.21 -0.48
## PC4                                -0.16 -0.02  0.03  0.96  1.00 -0.17 -0.55
## PC5                                -0.04 -0.01  0.04 -0.21 -0.17  1.00 -0.31
## PC6                                 0.14  0.17  0.14 -0.48 -0.55 -0.31  1.00
## Sample Size
##                     DSCPTN1P2 DSCPTP1 DSCPTN2 DSCPTP3LPP DichoticLPP DichoticN1
## DSCPTN1P2                 180     180     180         180         122        122
## DSCPTP1                   180     180     180         180         122        122
## DSCPTN2                   180     180     180         180         122        122
## DSCPTP3LPP                180     180     180         180         122        122
## DichoticLPP               122     122     122         122         140        140
## DichoticN1                122     122     122         122         140        140
## DichoticP2MMN             122     122     122         122         140        140
## DichoticP3                122     122     122         122         140        140
## plink_SCZ_0.5_PRS         180     180     180         180         140        140
## PRSice_SCZ_best_PRS       180     180     180         180         140        140
## PC1                       180     180     180         180         140        140
## PC2                       180     180     180         180         140        140
## PC3                       180     180     180         180         140        140
## PC4                       180     180     180         180         140        140
## PC5                       180     180     180         180         140        140
## PC6                       180     180     180         180         140        140
##                     DichoticP2MMN DichoticP3 plink_SCZ_0.5_PRS
## DSCPTN1P2                     122        122                180
## DSCPTP1                       122        122                180
## DSCPTN2                       122        122                180
## DSCPTP3LPP                    122        122                180
## DichoticLPP                   140        140                140
## DichoticN1                    140        140                140
## DichoticP2MMN                 140        140                140
## DichoticP3                    140        140                140
## plink_SCZ_0.5_PRS             140        140                198
## PRSice_SCZ_best_PRS           140        140                198
## PC1                           140        140                198
## PC2                           140        140                198
## PC3                           140        140                198
## PC4                           140        140                198
## PC5                           140        140                198
## PC6                           140        140                198
##                     PRSice_SCZ_best_PRS PC1 PC2 PC3 PC4 PC5 PC6
## DSCPTN1P2                           180 180 180 180 180 180 180
## DSCPTP1                             180 180 180 180 180 180 180
## DSCPTN2                             180 180 180 180 180 180 180
## DSCPTP3LPP                          180 180 180 180 180 180 180
## DichoticLPP                         140 140 140 140 140 140 140
## DichoticN1                          140 140 140 140 140 140 140
```

```
## DichoticP2MMN                       140 140 140 140 140 140 140
## DichoticP3                          140 140 140 140 140 140 140
## plink_SCZ_0.5_PRS                   198 198 198 198 198 198 198
## PRSice_SCZ_best_PRS                 198 198 198 198 198 198 198
## PC1                                 198 198 198 198 198 198 198
## PC2                                 198 198 198 198 198 198 198
## PC3                                 198 198 198 198 198 198 198
## PC4                                 198 198 198 198 198 198 198
## PC5                                 198 198 198 198 198 198 198
## PC6                                 198 198 198 198 198 198 198
## Probability values (Entries above the diagonal are adjusted for multiple tests.)
##                     DSCPTN1P2 DSCPTP1 DSCPTN2 DSCPTP3LPP DichoticLPP DichoticN1
## DSCPTN1P2                0.00    1.00    1.00       1.00        1.00       1.00
## DSCPTP1                  0.39    0.00    1.00       1.00        1.00       1.00
## DSCPTN2                  0.92    0.74    0.00       0.00        1.00       1.00
## DSCPTP3LPP               0.11    0.04    0.00       0.00        0.64       1.00
## DichoticLPP              0.07    0.98    0.28       0.01        0.00       1.00
## DichoticN1               0.21    0.55    0.98       0.08        0.91       0.00
## DichoticP2MMN            0.07    0.02    0.85       0.53        0.07       0.00
## DichoticP3               0.04    0.02    0.04       0.12        0.05       0.01
## plink_SCZ_0.5_PRS        0.04    0.00    0.17       0.73        0.85       0.28
## PRSice_SCZ_best_PRS      0.00    0.01    0.02       0.22        0.94       0.57
## PC1                      0.09    0.00    0.87       0.74        0.30       0.35
## PC2                      0.45    0.62    0.41       0.00        0.49       0.89
## PC3                      0.28    0.95    0.87       0.05        0.52       0.53
## PC4                      0.32    0.74    0.65       0.10        0.46       0.50
## PC5                      0.65    0.80    0.00       0.43        0.45       0.98
## PC6                      0.76    0.92    0.60       0.24        0.54       0.11
##                     DichoticP2MMN DichoticP3 plink_SCZ_0.5_PRS
## DSCPTN1P2                    1.00       1.00              1.00
## DSCPTP1                      1.00       1.00              0.02
## DSCPTN2                      1.00       1.00              1.00
## DSCPTP3LPP                   1.00       1.00              1.00
## DichoticLPP                  1.00       1.00              1.00
## DichoticN1                   0.09       0.63              1.00
## DichoticP2MMN                0.00       1.00              1.00
## DichoticP3                   0.29       0.00              1.00
## plink_SCZ_0.5_PRS            0.04       0.02              0.00
## PRSice_SCZ_best_PRS          0.01       0.06              0.00
## PC1                          0.00       0.03              0.00
## PC2                          0.95       0.61              0.60
## PC3                          0.26       0.13              0.24
## PC4                          0.17       0.23              0.01
## PC5                          0.97       0.91              0.46
## PC6                          1.00       0.33              0.01
##                     PRSice_SCZ_best_PRS  PC1  PC2 PC3  PC4  PC5  PC6
## DSCPTN1P2                          0.30 1.00 1.00   1 1.00 1.00 1.00
## DSCPTP1                            0.52 0.00 1.00   1 1.00 1.00 1.00
## DSCPTN2                            1.00 1.00 1.00   1 1.00 0.08 1.00
## DSCPTP3LPP                         1.00 1.00 0.13   1 1.00 1.00 1.00
## DichoticLPP                        1.00 1.00 1.00   1 1.00 1.00 1.00
## DichoticN1                         1.00 1.00 1.00   1 1.00 1.00 1.00
## DichoticP2MMN                      1.00 0.17 1.00   1 1.00 1.00 1.00
## DichoticP3                         1.00 1.00 1.00   1 1.00 1.00 1.00
## plink_SCZ_0.5_PRS                  0.00 0.00 1.00   1 1.00 1.00 0.84
```

```
## PRSice_SCZ_best_PRS                0.00 0.00 1.00   1 1.00 1.00 1.00
## PC1                                0.00 0.00 1.00   1 1.00 1.00 1.00
## PC2                                0.21 0.69 0.00   1 1.00 1.00 1.00
## PC3                                0.50 0.20 0.35   0 0.00 0.35 0.00
## PC4                                0.03 0.74 0.72   0 0.00 1.00 0.00
## PC5                                0.58 0.89 0.56   0 0.02 0.00 0.00
## PC6                                0.05 0.02 0.05   0 0.00 0.00 0.00
##
##  To see confidence intervals of the correlations, print with the short=FALSE option

# including group as a factor to test interactions, and prediction over and above ancestr
y PCs

prs_cor_dat <- Merged_PRS_data[, c("Group","DSCPTN1P2","DSCPTP1", "DSCPTN2","DSCPTP3LPP",
"DichoticLPP","DichoticN1","DichoticP2MMN","DichoticP3","plink_SCZ_0.5_PRS","PRSice_SCZ_b
est_PRS","PC1","PC2","PC3","PC4","PC5","PC6")]
prs_cor_dat$PC1 <- as.numeric(prs_cor_dat$PC1)
prs_cor_dat$PC2 <- as.numeric(prs_cor_dat$PC2)
prs_cor_dat$PC3 <- as.numeric(prs_cor_dat$PC3)
prs_cor_dat$PC4 <- as.numeric(prs_cor_dat$PC4)
prs_cor_dat$PC5 <- as.numeric(prs_cor_dat$PC5)
prs_cor_dat$PC6 <- as.numeric(prs_cor_dat$PC6)

prs_model1 <- lm(DSCPTN1P2 ~ PC1 + PC2 + PC3 + PC4 + PC5 + PRSice_SCZ_best_PRS*Group, dat
a = prs_cor_dat)
summary(prs_model1)

##
## Call:
## lm(formula = DSCPTN1P2 ~ PC1 + PC2 + PC3 + PC4 + PC5 + PRSice_SCZ_best_PRS *
##     Group, data = prs_cor_dat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.9244 -0.9394 -0.1729  0.8402  5.4450
##
## Coefficients:
##                                Estimate Std. Error t value Pr(>|t|)
## (Intercept)                  -3.870e+00  3.453e+00  -1.121   0.2640
## PC1                          -1.453e+00  3.797e+00  -0.383   0.7025
## PC2                          -5.379e+00  3.706e+00  -1.452   0.1485
## PC3                           3.566e+01  1.951e+01   1.827   0.0694 .
## PC4                          -1.566e+01  9.490e+00  -1.651   0.1007
## PC5                           2.627e+00  2.879e+00   0.912   0.3629
## PRSice_SCZ_best_PRS          -2.266e+03  1.341e+03  -1.690   0.0929 .
## GroupBP                       9.220e+00  5.647e+00   1.633   0.1044
## GroupCON                      9.379e-02  3.774e+00   0.025   0.9802
## GroupSREL                    -1.579e-02  5.392e+00  -0.003   0.9977
## PRSice_SCZ_best_PRS:GroupBP   3.579e+03  2.125e+03   1.685   0.0939 .
## PRSice_SCZ_best_PRS:GroupCON -1.728e+02  1.431e+03  -0.121   0.9040
## PRSice_SCZ_best_PRS:GroupSREL -2.031e+02  2.067e+03  -0.098   0.9218
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.442 on 167 degrees of freedom
##   (18 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.1615, Adjusted R-squared:  0.1012
## F-statistic:  2.68 on 12 and 167 DF,  p-value: 0.002537

anova(prs_model1)

## Analysis of Variance Table
##
## Response: DSCPTN1P2
##                            Df Sum Sq Mean Sq F value   Pr(>F)
## PC1                         1  13.08 13.0802  6.2902 0.013095 *
## PC2                         1   0.98  0.9774  0.4700 0.493925
## PC3                         1   1.66  1.6590  0.7978 0.373030
## PC4                         1   1.80  1.8028  0.8670 0.353144
## PC5                         1   2.58  2.5756  1.2386 0.267341
## PRSice_SCZ_best_PRS         1  15.33 15.3325  7.3733 0.007316 **
## Group                       3  24.48  8.1584  3.9233 0.009715 **
## PRSice_SCZ_best_PRS:Group   3   6.98  2.3267  1.1189 0.343040
## Residuals                 167 347.27  2.0795
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

prs_model2 <- lm(DSCPTP1 ~ PC1 + PC2 + PC3 + PC4 + PC5 +  PRSice_SCZ_best_PRS*Group, data
= prs_cor_dat)
summary(prs_model2)

##
## Call:
## lm(formula = DSCPTP1 ~ PC1 + PC2 + PC3 + PC4 + PC5 + PRSice_SCZ_best_PRS *
##     Group, data = prs_cor_dat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.6008 -0.6508 -0.1463  0.6519  4.1039
##
## Coefficients:
##                                Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      1.6022     3.0417   0.527  0.59907
## PC1                             -9.1519     3.3444  -2.737  0.00688 **
## PC2                             -5.0703     3.2642  -1.553  0.12224
## PC3                             35.3623    17.1889   2.057  0.04121 *
## PC4                            -17.2520     8.3593  -2.064  0.04058 *
## PC5                             -0.7804     2.5363  -0.308  0.75869
## PRSice_SCZ_best_PRS            303.9512  1181.4548   0.257  0.79729
## GroupBP                         -0.0346     4.9742  -0.007  0.99446
## GroupCON                        -1.4081     3.3246  -0.424  0.67246
## GroupSREL                      -12.3126     4.7498  -2.592  0.01038 *
## PRSice_SCZ_best_PRS:GroupBP   -154.0591  1871.4724  -0.082  0.93449
## PRSice_SCZ_best_PRS:GroupCON  -629.2119  1260.4896  -0.499  0.61831
## PRSice_SCZ_best_PRS:GroupSREL -4918.8972  1820.8848  -2.701  0.00762 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.27 on 167 degrees of freedom
##   (18 observations deleted due to missingness)
## Multiple R-squared:  0.1793, Adjusted R-squared:  0.1203
## F-statistic: 3.039 on 12 and 167 DF,  p-value: 0.0006859
```

```
anova(prs_model2)
```

```
## Analysis of Variance Table
##
## Response: DSCPTP1
##                             Df  Sum Sq Mean Sq F value    Pr(>F)
## PC1                          1  36.349  36.349 22.5272 4.429e-06 ***
## PC2                          1   0.057   0.057  0.0354   0.85096
## PC3                          1   0.192   0.192  0.1190   0.73058
## PC4                          1   4.812   4.812  2.9823   0.08603 .
## PC5                          1   0.285   0.285  0.1766   0.67482
## PRSice_SCZ_best_PRS          1   1.297   1.297  0.8037   0.37129
## Group                        3   3.635   1.212  0.7509   0.52327
## PRSice_SCZ_best_PRS:Group    3  12.225   4.075  2.5254   0.05935 .
## Residuals                  167 269.467   1.614
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
prs_model3 <- lm(DSCPTN2 ~ PC1 + PC2 + PC3 + PC4 + PC5 +  PRSice_SCZ_best_PRS*Group, data
= prs_cor_dat)
summary(prs_model3)
```

```
##
## Call:
## lm(formula = DSCPTN2 ~ PC1 + PC2 + PC3 + PC4 + PC5 + PRSice_SCZ_best_PRS *
##     Group, data = prs_cor_dat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.3926 -0.5041 -0.0538  0.5177  3.8910
##
## Coefficients:
##                                Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      3.7774     2.2150   1.705   0.0900 .
## PC1                             -3.7422     2.4355  -1.537   0.1263
## PC2                             -0.1471     2.3770  -0.062   0.9507
## PC3                              9.6926    12.5173   0.774   0.4398
## PC4                             -5.6704     6.0874  -0.932   0.3529
## PC5                             -1.8590     1.8470  -1.007   0.3156
## PRSice_SCZ_best_PRS           1572.4904   860.3602   1.828   0.0694 .
## GroupBP                         -4.0384     3.6223  -1.115   0.2665
## GroupCON                        -1.1077     2.4210  -0.458   0.6479
## GroupSREL                        0.1695     3.4589   0.049   0.9610
## PRSice_SCZ_best_PRS:GroupBP   -1453.1148  1362.8456  -1.066   0.2879
## PRSice_SCZ_best_PRS:GroupCON   -335.2372   917.9150  -0.365   0.7154
## PRSice_SCZ_best_PRS:GroupSREL   277.5921  1326.0066   0.209   0.8344
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.925 on 167 degrees of freedom
##   (18 observations deleted due to missingness)
## Multiple R-squared:  0.1007, Adjusted R-squared:  0.03613
## F-statistic: 1.559 on 12 and 167 DF,  p-value: 0.1081
```

```
anova(prs_model3)
```

```
## Analysis of Variance Table
##
## Response: DSCPTN2
##                             Df  Sum Sq Mean Sq F value  Pr(>F)
## PC1                          1   0.511  0.5107  0.5968 0.44090
## PC2                          1   0.549  0.5489  0.6414 0.42434
## PC3                          1   0.042  0.0415  0.0485 0.82595
## PC4                          1   3.012  3.0120  3.5200 0.06238 .
## PC5                          1   1.313  1.3132  1.5347 0.21715
## PRSice_SCZ_best_PRS          1   5.429  5.4286  6.3441 0.01272 *
## Group                        3   4.002  1.3341  1.5591 0.20127
## PRSice_SCZ_best_PRS:Group    3   1.152  0.3840  0.4488 0.71847
## Residuals                  167 142.900  0.8557
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
prs_model4 <- lm(DSCPTP3LPP ~ PC1 + PC2 + PC3 + PC4 + PC5 +  PRSice_SCZ_best_PRS*Group, d
ata = prs_cor_dat)
summary(prs_model4)
```

```
##
## Call:
## lm(formula = DSCPTP3LPP ~ PC1 + PC2 + PC3 + PC4 + PC5 + PRSice_SCZ_best_PRS *
##     Group, data = prs_cor_dat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.8778 -0.7151  0.0166  0.7243  2.9015
##
## Coefficients:
##                               Estimate Std. Error t value Pr(>|t|)
## (Intercept)                     -3.543      2.838  -1.249   0.2136
## PC1                              3.988      3.120   1.278   0.2030
## PC2                              7.193      3.045   2.362   0.0193 *
## PC3                            -22.515     16.037  -1.404   0.1622
## PC4                              8.338      7.799   1.069   0.2866
## PC5                              2.637      2.366   1.114   0.2668
## PRSice_SCZ_best_PRS          -1659.931   1102.299  -1.506   0.1340
## GroupBP                          6.071      4.641   1.308   0.1926
## GroupCON                         3.481      3.102   1.122   0.2634
## GroupSREL                        2.369      4.432   0.535   0.5937
## PRSice_SCZ_best_PRS:GroupBP   2144.327   1746.087   1.228   0.2211
## PRSice_SCZ_best_PRS:GroupCON  1189.759   1176.039   1.012   0.3132
## PRSice_SCZ_best_PRS:GroupSREL  628.753   1698.888   0.370   0.7118
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.185 on 167 degrees of freedom
##   (18 observations deleted due to missingness)
## Multiple R-squared:  0.1378, Adjusted R-squared:  0.07589
## F-statistic: 2.225 on 12 and 167 DF,  p-value: 0.01264
```

```
anova(prs_model4)
```

```
## Analysis of Variance Table
##
```

```
## Response: DSCPTP3LPP
##                             Df  Sum Sq Mean Sq F value   Pr(>F)
## PC1                          1   0.100  0.1005  0.0715 0.789469
## PC2                          1  12.250 12.2502  8.7215 0.003599 **
## PC3                          1   3.259  3.2590  2.3202 0.129593
## PC4                          1   4.213  4.2134  2.9997 0.085127 .
## PC5                          1   2.424  2.4237  1.7255 0.190782
## PRSice_SCZ_best_PRS          1   3.781  3.7813  2.6921 0.102730
## Group                        3   8.728  2.9094  2.0713 0.105950
## PRSice_SCZ_best_PRS:Group    3   2.748  0.9159  0.6521 0.582717
## Residuals                  167 234.568  1.4046
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
prs_model5 <- lm(DichoticP2MMN ~ PC1 + PC2 + PC3 + PC4 + PC5 +  PRSice_SCZ_best_PRS*Group
, data = prs_cor_dat)
summary(prs_model5)
```

```
##
## Call:
## lm(formula = DichoticP2MMN ~ PC1 + PC2 + PC3 + PC4 + PC5 + PRSice_SCZ_best_PRS *
##     Group, data = prs_cor_dat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.8101 -0.8205 -0.1136  0.7315  3.4203
##
## Coefficients:
##                                Estimate Std. Error t value Pr(>|t|)
## (Intercept)                     -0.2928     3.7966  -0.077    0.939
## PC1                             -5.7914     3.9435  -1.469    0.144
## PC2                              0.9507     3.0724   0.309    0.757
## PC3                             17.1197    18.7498   0.913    0.363
## PC4                             -5.2757     8.8942  -0.593    0.554
## PC5                              0.7060     1.8506   0.381    0.703
## PRSice_SCZ_best_PRS           -618.1957  1470.7682  -0.420    0.675
## GroupBP                         -2.3033     5.7109  -0.403    0.687
## GroupCON                        -2.0827     4.2388  -0.491    0.624
## GroupSREL                        3.5380     5.0521   0.700    0.485
## PRSice_SCZ_best_PRS:GroupBP   -698.2836  2156.4961  -0.324    0.747
## PRSice_SCZ_best_PRS:GroupCON  -578.2423  1606.2521  -0.360    0.719
## PRSice_SCZ_best_PRS:GroupSREL 1506.1626  1914.4914   0.787    0.433
##
## Residual standard error: 1.244 on 127 degrees of freedom
##   (58 observations deleted due to missingness)
## Multiple R-squared:  0.105,  Adjusted R-squared:  0.02045
## F-statistic: 1.242 on 12 and 127 DF,  p-value: 0.262
```

```
anova(prs_model5)
```

```
## Analysis of Variance Table
##
## Response: DichoticP2MMN
##                             Df  Sum Sq Mean Sq F value  Pr(>F)
## PC1                          1  10.877 10.8766  7.0336 0.00902 **
## PC2                          1   0.148  0.1478  0.0956 0.75770
```

```
## PC3                          1   3.227  3.2274  2.0871 0.15102
## PC4                          1   0.932  0.9318  0.6026 0.43903
## PC5                          1   0.170  0.1700  0.1099 0.74076
## PRSice_SCZ_best_PRS          1   0.003  0.0032  0.0021 0.96390
## Group                        3   5.397  1.7991  1.1634 0.32643
## PRSice_SCZ_best_PRS:Group    3   2.289  0.7631  0.4935 0.68744
## Residuals                  127 196.390  1.5464
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
prs_model6 <- lm(DichoticN1 ~ PC1 + PC2 + PC3 + PC4 + PC5 +  PRSice_SCZ_best_PRS*Group, d
ata = prs_cor_dat)
summary(prs_model6)
```

```
##
## Call:
## lm(formula = DichoticN1 ~ PC1 + PC2 + PC3 + PC4 + PC5 + PRSice_SCZ_best_PRS *
##     Group, data = prs_cor_dat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.6388 -0.4706 -0.0366  0.3820  3.9525
##
## Coefficients:
##                                Estimate Std. Error t value Pr(>|t|)
## (Intercept)                     -2.4045     2.1729  -1.107    0.271
## PC1                              0.9486     2.2569   0.420    0.675
## PC2                              1.0647     1.7584   0.605    0.546
## PC3                              3.9550    10.7309   0.369    0.713
## PC4                             -0.9865     5.0903  -0.194    0.847
## PC5                              1.4134     1.0591   1.335    0.184
## PRSice_SCZ_best_PRS           -576.9240   841.7488  -0.685    0.494
## GroupBP                          3.1617     3.2685   0.967    0.335
## GroupCON                         0.4753     2.4260   0.196    0.845
## GroupSREL                        3.3997     2.8914   1.176    0.242
## PRSice_SCZ_best_PRS:GroupBP   1223.8685  1234.2041   0.992    0.323
## PRSice_SCZ_best_PRS:GroupCON   275.6673   919.2889   0.300    0.765
## PRSice_SCZ_best_PRS:GroupSREL 1384.7467  1095.7002   1.264    0.209
##
## Residual standard error: 0.7117 on 127 degrees of freedom
##   (58 observations deleted due to missingness)
## Multiple R-squared:  0.05766,    Adjusted R-squared:  -0.03138
## F-statistic: 0.6475 on 12 and 127 DF,  p-value: 0.7979
```

```
anova(prs_model6)
```

```
## Analysis of Variance Table
##
## Response: DichoticN1
##                            Df Sum Sq Mean Sq F value Pr(>F)
## PC1                         1  0.380 0.37984  0.7499 0.3881
## PC2                         1  0.066 0.06642  0.1311 0.7179
## PC3                         1  0.254 0.25408  0.5016 0.4801
## PC4                         1  0.033 0.03282  0.0648 0.7995
## PC5                         1  0.765 0.76530  1.5109 0.2213
## PRSice_SCZ_best_PRS         1  0.043 0.04334  0.0856 0.7704
```

```
## Group                        3  1.246 0.41524  0.8198 0.4852
## PRSice_SCZ_best_PRS:Group    3  1.148 0.38276  0.7557 0.5210
## Residuals                  127 64.327 0.50651
```

```
prs_model7 <- lm(DichoticP3 ~ PC1 + PC2 + PC3 + PC4 + PC5 +  PRSice_SCZ_best_PRS*Group, d
ata = prs_cor_dat)
summary(prs_model7)
```

```
##
## Call:
## lm(formula = DichoticP3 ~ PC1 + PC2 + PC3 + PC4 + PC5 + PRSice_SCZ_best_PRS *
##     Group, data = prs_cor_dat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.1703 -0.9036 -0.0834  0.6942  4.0659
##
## Coefficients:
##                               Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      3.252      4.181   0.778   0.4382
## PC1                             -9.481      4.343  -2.183   0.0309 *
## PC2                             -1.106      3.384  -0.327   0.7443
## PC3                             47.630     20.649   2.307   0.0227 *
## PC4                            -19.936      9.795  -2.035   0.0439 *
## PC5                              3.473      2.038   1.704   0.0908 .
## PRSice_SCZ_best_PRS            401.217   1619.756   0.248   0.8048
## GroupBP                          2.755      6.289   0.438   0.6621
## GroupCON                         3.125      4.668   0.669   0.5045
## GroupSREL                        0.150      5.564   0.027   0.9785
## PRSice_SCZ_best_PRS:GroupBP   1025.783   2374.948   0.432   0.6665
## PRSice_SCZ_best_PRS:GroupCON   747.330   1768.965   0.422   0.6734
## PRSice_SCZ_best_PRS:GroupSREL -414.701   2108.428  -0.197   0.8444
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.37 on 127 degrees of freedom
##   (58 observations deleted due to missingness)
## Multiple R-squared:  0.2051, Adjusted R-squared:   0.13
## F-statistic:  2.73 on 12 and 127 DF,  p-value: 0.002547
```

```
anova(prs_model7)
```

```
## Analysis of Variance Table
##
## Response: DichoticP3
##                             Df  Sum Sq Mean Sq F value    Pr(>F)
## PC1                          1   7.038  7.0383  3.7527 0.0549439 .
## PC2                          1   0.414  0.4140  0.2208 0.6392674
## PC3                          1   1.704  1.7037  0.9084 0.3423525
## PC4                          1   2.897  2.8966  1.5444 0.2162528
## PC5                          1   5.029  5.0289  2.6813 0.1040064
## PRSice_SCZ_best_PRS          1   0.567  0.5675  0.3026 0.5832413
## Group                        3  42.828 14.2761  7.6117 0.0001013 ***
## PRSice_SCZ_best_PRS:Group    3   0.976  0.3253  0.1734 0.9141879
## Residuals                  127 238.193  1.8755
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
prs_model8 <- lm(DichoticLPP ~ PC1 + PC2 + PC3 + PC4 + PC5 +  PRSice_SCZ_best_PRS*Group,
data = prs_cor_dat)
summary(prs_model8)
```

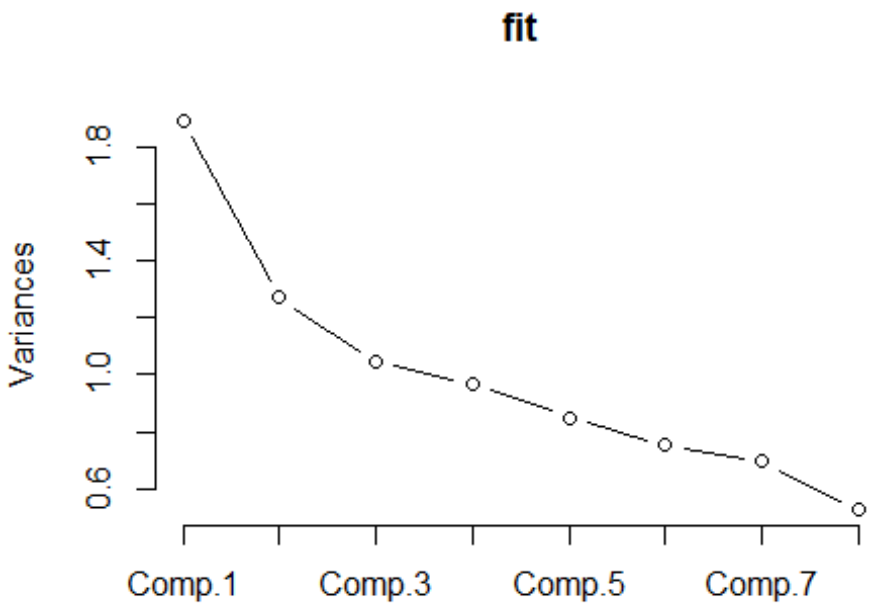
```
##
## Call:
## lm(formula = DichoticLPP ~ PC1 + PC2 + PC3 + PC4 + PC5 + PRSice_SCZ_best_PRS *
##     Group, data = prs_cor_dat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.4348 -0.9123 -0.2443  0.7881  5.4573
##
## Coefficients:
##                                Estimate Std. Error t value Pr(>|t|)
## (Intercept)                       6.611      4.183   1.580    0.117
## PC1                              -6.097      4.345  -1.403    0.163
## PC2                               4.712      3.385   1.392    0.166
## PC3                             -15.032     20.660  -0.728    0.468
## PC4                               8.843      9.800   0.902    0.369
## PC5                              -2.967      2.039  -1.455    0.148
## PRSice_SCZ_best_PRS            1958.931   1620.595   1.209    0.229
## GroupBP                          -1.567      6.293  -0.249    0.804
## GroupCON                         -1.328      4.671  -0.284    0.777
## GroupSREL                         3.225      5.567   0.579    0.563
## PRSice_SCZ_best_PRS:GroupBP    -701.443   2376.178  -0.295    0.768
## PRSice_SCZ_best_PRS:GroupCON   -577.564   1769.881  -0.326    0.745
## PRSice_SCZ_best_PRS:GroupSREL 1264.742   2109.520   0.600    0.550
##
## Residual standard error: 1.37 on 127 degrees of freedom
##   (58 observations deleted due to missingness)
## Multiple R-squared:  0.0697, Adjusted R-squared:  -0.0182
## F-statistic: 0.793 on 12 and 127 DF,  p-value: 0.657
```

```
anova(prs_model8)
```

```
## Analysis of Variance Table
##
## Response: DichoticLPP
##                             Df  Sum Sq Mean Sq F value  Pr(>F)
## PC1                          1   0.448  0.4479  0.2386 0.62608
## PC2                          1   1.160  1.1605  0.6181 0.43322
## PC3                          1   0.669  0.6688  0.3562 0.55167
## PC4                          1   0.247  0.2472  0.1317 0.71731
## PC5                          1   6.102  6.1021  3.2501 0.07379 .
## PRSice_SCZ_best_PRS          1   4.129  4.1289  2.1992 0.14056
## Group                        3   3.305  1.1016  0.5868 0.62477
## PRSice_SCZ_best_PRS:Group    3   1.805  0.6016  0.3204 0.81059
## Residuals                  127 238.440  1.8775
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
# plot the significant relationships

study_shapes <- c("GTF" = 16, "NPG" = 17, "PENS" = 15)

prs_dscptn1p2_reg <- ggplot(Merged_PRS_data, aes(x = PRSice_SCZ_best_PRS, y = DSCPTN1P2))
+
  geom_point(aes(color = Group, shape = StudyID),size = 3, alpha = 0.8) +
  geom_smooth(method = "lm", se = FALSE, color = "black",linewidth = 1, fullrange = TRUE)
+
 # stat_cor(method ="pearson", show.legend = F)+
  scale_color_manual(values = group_colors)+
  scale_shape_manual(values = study_shapes) +
  labs (x = "Polygenic Risk Score (PRSice)", y = "N1P2v") +
  theme_minimal(base_size = 14) +
  theme(
    panel.grid = element_blank(),
    panel.border = element_rect(color = "black", fill = NA, linewidth = 1),
    axis.line = element_line(color = "black", linewidth = 1),
    legend.position = "right",
    axis.title = element_text(face = "bold"),
    plot.title = element_text(face = "bold", hjust = 0.5)
  )

prs_dscptn2_reg <- ggplot(Merged_PRS_data, aes(x = PRSice_SCZ_best_PRS, y = DSCPTN2)) +
  geom_point(aes(color = Group, shape = StudyID),size = 3, alpha = 0.8) +
  geom_smooth(method = "lm", se = FALSE, color = "black",linewidth = 1, fullrange = TRUE)
+
  # stat_cor(method ="pearson", show.legend = F)+
  scale_color_manual(values = group_colors)+
  scale_shape_manual(values = study_shapes) +
  labs (x = "Polygenic Risk Score (PRSice)", y = "N2v") +
  theme_minimal(base_size = 14) +
  theme(
    panel.grid = element_blank(),
    panel.border = element_rect(color = "black", fill = NA, linewidth = 1),
    axis.line = element_line(color = "black", linewidth = 1),
    legend.position = "right",
    axis.title = element_text(face = "bold"),
    plot.title = element_text(face = "bold", hjust = 0.5)
  )

###################### PCA / Factor Analysis ######################

# Set up

library("FactoMineR")
library('corrr')

compcorpc <- c("SubID","DichoticN1","DSCPTP1","DichoticP2MMN","DSCPTN1P2","DSCPTN2","Dich
oticLPP","DichoticP3","DSCPTP3LPP")
PCA_subset <- allstud_forcor[compcorpc]
PCA_subset <- left_join(PCA_subset, allstudy_PCA_ERP %>% select(SubID, Group), by = "SubI
D")
PCA_subset <- distinct(PCA_subset, SubID, .keep_all = TRUE)
compcorpc <- c("SubID","Group","DichoticN1","DSCPTP1","DichoticP2MMN","DSCPTN1P2","DSCPTN
```

```
2","DichoticLPP","DichoticP3","DSCPTP3LPP")
PCA_subset <- PCA_subset[compcorpc]
id_vars <- PCA_subset[,c("SubID","Group")]
pca_vars <- PCA_subset[, !(names(PCA_subset) %in% c("SubID","Group"))]

# Run Omnibus Second-Level PCA for supplementary information

fit <- princomp(na.omit(pca_vars), cor=TRUE)
plot(fit,type="lines")
```




```
# Promax rotation:

fit1 <- principal(pca_vars, nfactors=3, rotate="promax")
fit1

## Principal Components Analysis
## Call: principal(r = pca_vars, nfactors = 3, rotate = "promax")
## Standardized loadings (pattern matrix) based upon correlation matrix
##                 RC1   RC2   RC3   h2   u2 com
## DichoticN1    -0.04  0.77  0.09 0.60 0.40 1.0
## DSCPTP1        0.44  0.33  0.23 0.39 0.61 2.4
## DichoticP2MMN -0.09  0.04  0.86 0.69 0.31 1.0
## DSCPTN1P2      0.00 -0.15  0.66 0.47 0.53 1.1
## DSCPTN2        0.03 -0.67  0.18 0.51 0.49 1.2
## DichoticLPP    0.72 -0.20 -0.10 0.54 0.46 1.2
## DichoticP3     0.63 -0.28 -0.05 0.49 0.51 1.4
## DSCPTP3LPP     0.71  0.21 -0.03 0.52 0.48 1.2
##
##                        RC1  RC2  RC3
## SS loadings           1.61 1.35 1.25
## Proportion Var        0.20 0.17 0.16
## Cumulative Var        0.20 0.37 0.53
```

```
## Proportion Explained  0.38 0.32 0.30
## Cumulative Proportion 0.38 0.70 1.00
##
##  With component correlations of
##       RC1   RC2   RC3
## RC1  1.00 -0.07  0.30
## RC2 -0.07  1.00 -0.05
## RC3  0.30 -0.05  1.00
##
## Mean item complexity =  1.3
## Test of the hypothesis that 3 components are sufficient.
##
## The root mean square of the residuals (RMSR) is  0.14
##  with the empirical chi square  233.22  with prob <  1e-46
##
## Fit based upon off diagonal values = 0.11
```

```
# Varimax rotation:

fit2 <- principal(pca_vars, nfactors=3, rotate="varimax", scores = TRUE)
fit2
```

```
## Principal Components Analysis
## Call: principal(r = pca_vars, nfactors = 3, rotate = "varimax", scores = TRUE)
## Standardized loadings (pattern matrix) based upon correlation matrix
##                 RC1   RC2  RC3   h2   u2 com
## DichoticN1    -0.04 -0.77 0.05 0.60 0.40 1.0
## DSCPTP1        0.47 -0.30 0.28 0.39 0.61 2.4
## DichoticP2MMN  0.04 -0.03 0.83 0.69 0.31 1.0
## DSCPTN1P2      0.10  0.16 0.66 0.47 0.53 1.2
## DSCPTN2        0.06  0.68 0.21 0.51 0.49 1.2
## DichoticLPP    0.69  0.23 0.01 0.54 0.46 1.2
## DichoticP3     0.62  0.31 0.05 0.49 0.51 1.5
## DSCPTP3LPP     0.70 -0.17 0.07 0.52 0.48 1.1
##
##                        RC1  RC2  RC3
## SS loadings           1.60 1.35 1.26
## Proportion Var        0.20 0.17 0.16
## Cumulative Var        0.20 0.37 0.53
## Proportion Explained  0.38 0.32 0.30
## Cumulative Proportion 0.38 0.70 1.00
##
## Mean item complexity =  1.3
## Test of the hypothesis that 3 components are sufficient.
##
## The root mean square of the residuals (RMSR) is  0.14
##  with the empirical chi square  233.22  with prob <  1e-46
##
## Fit based upon off diagonal values = 0.11
```

```
# Get the scores for each subject
scores <- fit2$scores
scores_df <- as.data.frame(scores)
final_df <- cbind(id_vars, scores_df)

# Get the loadings for each variable
```

```r
loadings_matrix <- fit2$loadings[1:8, 1:3]
loadings_df <- as.data.frame(loadings_matrix)

# Combine loadings with the subject info
expanded_df <- data.frame()

for (i in 1:nrow(loadings_df)) {
  for (j in 1:ncol(loadings_df)) {
    expanded_df <- rbind(expanded_df, data.frame(
      SubID = rep(id_vars$SubID, each = 1),
      Group = rep(id_vars$Group, each = 1),
      Variable = rep(rownames(loadings_df)[i], length(id_vars$SubID)),
      Factor = colnames(loadings_df)[j],
      Score = scores_df[, j] * loadings_df[i, j]
    ))
  }
}

expanded_df <- na.omit(expanded_df)

expanded_df$Variable[expanded_df$Variable=="DichoticLPP"] = "LPPa"
expanded_df$Variable[expanded_df$Variable=="DichoticN1"] = "N1a"
expanded_df$Variable[expanded_df$Variable=="DichoticP2MMN"] = "P2MMNa"
expanded_df$Variable[expanded_df$Variable=="DichoticP3"] = "P3a"
expanded_df$Variable[expanded_df$Variable=="DSCPTP1"] = "P1v"
expanded_df$Variable[expanded_df$Variable=="DSCPTN1P2"] = "N1P2v"
expanded_df$Variable[expanded_df$Variable=="DSCPTN2"] = "N2v"
expanded_df$Variable[expanded_df$Variable=="DSCPTP3LPP"] = "P3LPPv"

# create a factor score for each person adding only the variables that load > .4:

factor1 <- expanded_df %>%
  filter(Factor == "RC1", Variable %in% c("LPPa","P3a","P3LPPv","P1v")) %>%
  group_by(SubID) %>%
  summarise(fac1 = sum(Score, na.rm = TRUE))

factor2 <- expanded_df %>%
  filter(Factor == "RC2", Variable %in% c("N1a","N2v")) %>%
  group_by(SubID) %>%
  summarise(fac2 = sum(Score, na.rm = TRUE))

factor3 <- expanded_df %>%
  filter(Factor == "RC3", Variable %in% c("P2MMNa","N1P2v")) %>%
  group_by(SubID) %>%
  summarise(fac3 = sum(Score, na.rm = TRUE))

allfac_scores <- factor1 %>%
  full_join(factor2, by = "SubID") %>%
  full_join(factor3, by = "SubID")

grp_unique <- expanded_df %>%
  select(SubID, Group) %>%
  distinct(SubID, .keep_all = TRUE)
```

```r
allfac_scores <- allfac_scores %>%
  left_join(grp_unique %>% select(SubID, Group), by = "SubID")

# Run PCAs in each group for main text

# set up

pca_subset_hc <- PCA_subset[PCA_subset$Group %in% 'CON', ]
pca_subset_rel <- PCA_subset[PCA_subset$Group %in% 'SREL', ]
pca_subset_bp <- PCA_subset[PCA_subset$Group %in%  'BP', ]
pca_subset_sz <- PCA_subset[PCA_subset$Group %in%  'SCZ', ]
pca_subset_prorel <- PCA_subset[PCA_subset$Group != 'CON', ]
pca_subset_pro <- pca_subset_prorel[pca_subset_prorel$Group != 'SREL', ]

# remove extraneous vars

id_vars_hc <- pca_subset_hc[,c("SubID","Group")]
pca_vars_hc <- pca_subset_hc[, !(names(pca_subset_hc) %in% c("SubID","Group"))]

id_vars_sz <- pca_subset_sz[,c("SubID","Group")]
pca_vars_sz <- pca_subset_sz[, !(names(pca_subset_sz) %in% c("SubID","Group"))]

id_vars_prorel <- pca_subset_prorel[,c("SubID","Group")]
pca_vars_prorel <- pca_subset_prorel[, !(names(pca_subset_prorel) %in% c("SubID","Group")
)]

id_vars_pro <- pca_subset_pro[,c("SubID","Group")]
pca_vars_pro <- pca_subset_pro[, !(names(pca_subset_pro) %in% c("SubID","Group"))]

id_vars_rel <- pca_subset_rel[,c("SubID","Group")]
pca_vars_rel <- pca_subset_rel[, !(names(pca_subset_rel) %in% c("SubID","Group"))]

id_vars_bp <- pca_subset_bp[,c("SubID","Group")]
pca_vars_bp <- pca_subset_bp[, !(names(pca_subset_bp) %in% c("SubID","Group"))]

# HC Varimax rotation:

fithc <- principal(pca_vars_hc, nfactors=3, rotate="varimax", scores = TRUE)
fithc

## Principal Components Analysis
## Call: principal(r = pca_vars_hc, nfactors = 3, rotate = "varimax",
##     scores = TRUE)
## Standardized loadings (pattern matrix) based upon correlation matrix
##                  RC1   RC3   RC2   h2   u2 com
## DichoticN1    -0.10 -0.05  0.83 0.70 0.30 1.0
## DSCPTP1        0.27  0.13  0.73 0.62 0.38 1.3
## DichoticP2MMN -0.02  0.77  0.37 0.73 0.27 1.4
## DSCPTN1P2      0.24  0.49 -0.33 0.41 0.59 2.3
## DSCPTN2        0.01  0.77 -0.05 0.60 0.40 1.0
## DichoticLPP    0.77  0.07 -0.24 0.65 0.35 1.2
## DichoticP3     0.71  0.33  0.14 0.64 0.36 1.5
## DSCPTP3LPP     0.70 -0.19  0.24 0.58 0.42 1.4
##
##                        RC1  RC3  RC2
```

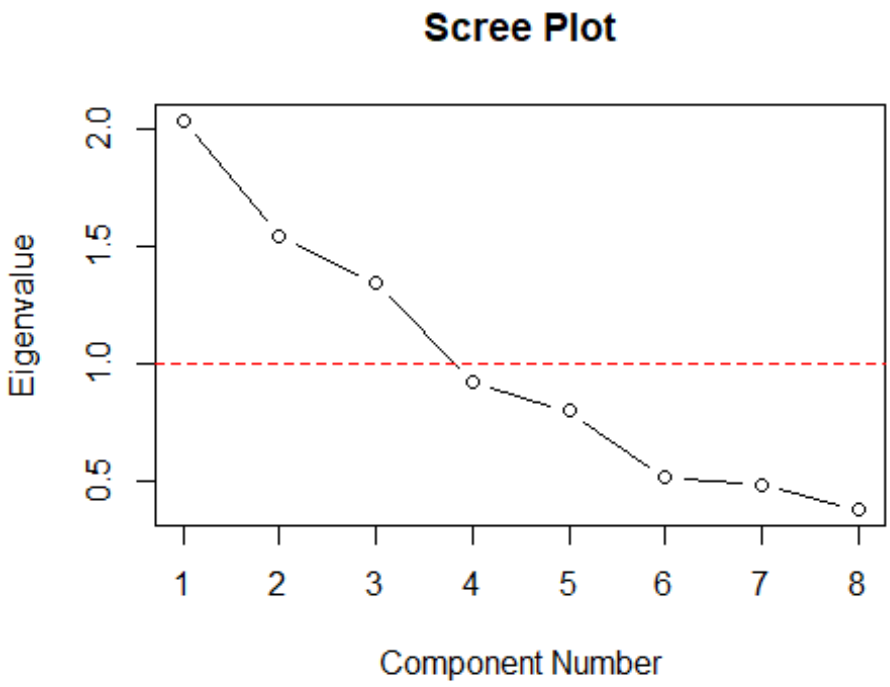
```
## SS loadings           1.72 1.60 1.59
## Proportion Var        0.22 0.20 0.20
## Cumulative Var        0.22 0.42 0.61
## Proportion Explained  0.35 0.33 0.32
## Cumulative Proportion 0.35 0.68 1.00
##
## Mean item complexity =  1.4
## Test of the hypothesis that 3 components are sufficient.
##
## The root mean square of the residuals (RMSR) is  0.12
##  with the empirical chi square  55.96  with prob <  9.6e-10
##
## Fit based upon off diagonal values = 0.65
```

```
# HC Promax rotation:

fithc <- principal(pca_vars_hc, nfactors=3, rotate="promax", scores = TRUE)
fithc
```

```
## Principal Components Analysis
## Call: principal(r = pca_vars_hc, nfactors = 3, rotate = "promax", scores = TRUE)
## Standardized loadings (pattern matrix) based upon correlation matrix
##                 RC1   RC3   RC2   h2   u2 com
## DichoticN1    -0.13  0.05  0.83 0.70 0.30 1.1
## DSCPTP1        0.24  0.16  0.72 0.62 0.38 1.3
## DichoticP2MMN -0.09  0.82  0.34 0.73 0.27 1.4
## DSCPTN1P2      0.23  0.43 -0.35 0.41 0.59 2.5
## DSCPTN2       -0.05  0.77 -0.08 0.60 0.40 1.0
## DichoticLPP    0.79 -0.07 -0.26 0.65 0.35 1.2
## DichoticP3     0.70  0.24  0.11 0.64 0.36 1.3
## DSCPTP3LPP     0.72 -0.28  0.24 0.58 0.42 1.5
##
##                        RC1  RC3  RC2
## SS loadings           1.75 1.59 1.58
## Proportion Var        0.22 0.20 0.20
## Cumulative Var        0.22 0.42 0.61
## Proportion Explained  0.36 0.32 0.32
## Cumulative Proportion 0.36 0.68 1.00
##
##  With component correlations of
##      RC1   RC3   RC2
## RC1 1.00  0.23  0.04
## RC3 0.23  1.00 -0.05
## RC2 0.04 -0.05  1.00
##
## Mean item complexity =  1.4
## Test of the hypothesis that 3 components are sufficient.
##
## The root mean square of the residuals (RMSR) is  0.12
##  with the empirical chi square  55.96  with prob <  9.6e-10
##
## Fit based upon off diagonal values = 0.65
```

```
# Scree Plot

eigenvalues <- fithc$values
```

```r
plot(eigenvalues, type = "b",
     xlab = "Component Number",
     ylab = "Eigenvalue",
     main = "Scree Plot")
abline(h = 1, col = "red", lty = 2)
```




```r
# Repeat for other groups

fitpro <- principal(pca_vars_pro, nfactors=3, rotate="varimax", scores = TRUE)
fitpro
```

```
## Principal Components Analysis
## Call: principal(r = pca_vars_pro, nfactors = 3, rotate = "varimax",
##     scores = TRUE)
## Standardized loadings (pattern matrix) based upon correlation matrix
##                  RC1   RC2   RC3   h2   u2 com
## DichoticN1      0.06 -0.70 -0.02 0.49 0.51 1.0
## DSCPTP1         0.04 -0.08  0.84 0.71 0.29 1.0
## DichoticP2MMN   0.74 -0.09 -0.19 0.59 0.41 1.2
## DSCPTN1P2       0.34 -0.08  0.37 0.26 0.74 2.1
## DSCPTN2         0.15  0.77 -0.20 0.66 0.34 1.2
## DichoticLPP     0.66  0.20  0.13 0.49 0.51 1.3
## DichoticP3     -0.12  0.52  0.49 0.52 0.48 2.1
## DSCPTP3LPP      0.67 -0.04  0.13 0.47 0.53 1.1
##
##                        RC1  RC2  RC3
## SS loadings           1.59 1.41 1.19
## Proportion Var        0.20 0.18 0.15
## Cumulative Var        0.20 0.37 0.52
## Proportion Explained  0.38 0.34 0.28
## Cumulative Proportion 0.38 0.72 1.00
##
```

```
## Mean item complexity =  1.4
## Test of the hypothesis that 3 components are sufficient.
##
## The root mean square of the residuals (RMSR) is  0.14
##  with the empirical chi square  118.95  with prob <  1.3e-22
##
## Fit based upon off diagonal values = -0.1
```

```
fitsz <- principal(pca_vars_sz, nfactors=3, rotate="varimax", scores = TRUE)
fitsz
```

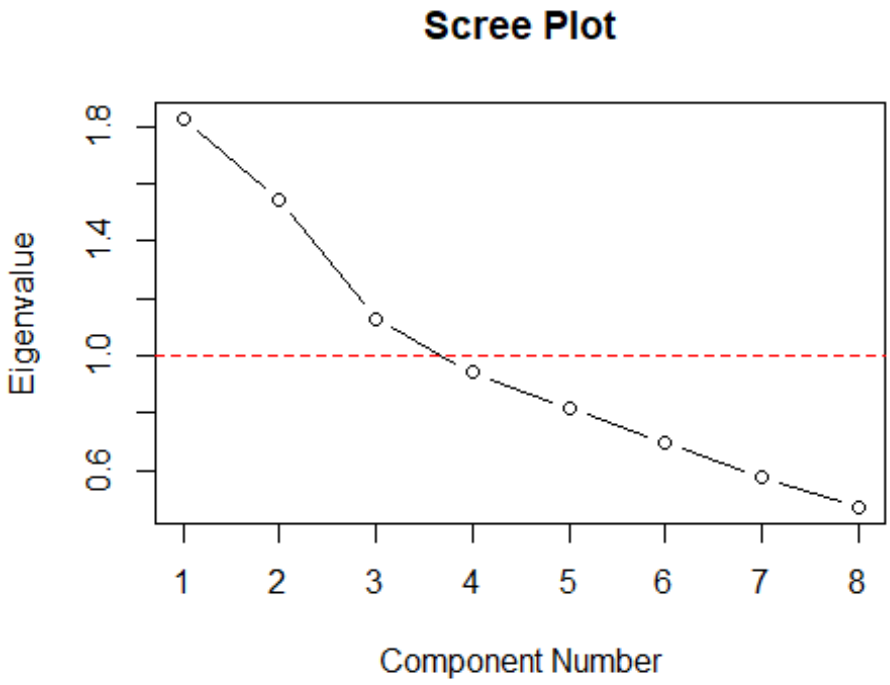
```
## Principal Components Analysis
## Call: principal(r = pca_vars_sz, nfactors = 3, rotate = "varimax",
##     scores = TRUE)
## Standardized loadings (pattern matrix) based upon correlation matrix
##                  RC1   RC2   RC3   h2   u2 com
## DichoticN1    -0.22 -0.76  0.07 0.64 0.36 1.2
## DSCPTP1       -0.06 -0.11  0.74 0.56 0.44 1.1
## DichoticP2MMN  0.71 -0.02 -0.02 0.50 0.50 1.0
## DSCPTN1P2      0.78  0.03  0.00 0.62 0.38 1.0
## DSCPTN2       -0.21  0.74 -0.04 0.59 0.41 1.2
## DichoticLPP    0.30  0.15  0.70 0.61 0.39 1.4
## DichoticP3    -0.29  0.58  0.41 0.59 0.41 2.3
## DSCPTP3LPP     0.53 -0.21  0.29 0.41 0.59 1.9
##
##                        RC1  RC2  RC3
## SS loadings           1.67 1.54 1.29
## Proportion Var        0.21 0.19 0.16
## Cumulative Var        0.21 0.40 0.56
## Proportion Explained  0.37 0.34 0.29
## Cumulative Proportion 0.37 0.71 1.00
##
## Mean item complexity =  1.4
## Test of the hypothesis that 3 components are sufficient.
##
## The root mean square of the residuals (RMSR) is  0.13
##  with the empirical chi square  65.21  with prob <  1.4e-11
##
## Fit based upon off diagonal values = 0.36
```

```
fitsz <- principal(pca_vars_sz, nfactors=3, rotate="promax", scores = TRUE)
fitsz
```

```
## Principal Components Analysis
## Call: principal(r = pca_vars_sz, nfactors = 3, rotate = "promax", scores = TRUE)
## Standardized loadings (pattern matrix) based upon correlation matrix
##                  RC1   RC2   RC3   h2   u2 com
## DichoticN1    -0.32 -0.81  0.11 0.64 0.36 1.3
## DSCPTP1       -0.15 -0.18  0.75 0.56 0.44 1.2
## DichoticP2MMN  0.72  0.05 -0.03 0.50 0.50 1.0
## DSCPTN1P2      0.80  0.11 -0.01 0.62 0.38 1.0
## DSCPTN2       -0.12  0.73 -0.07 0.59 0.41 1.1
## DichoticLPP    0.25  0.12  0.70 0.61 0.39 1.3
## DichoticP3    -0.27  0.52  0.40 0.59 0.41 2.4
## DSCPTP3LPP     0.49 -0.18  0.29 0.41 0.59 1.9
##
```

```
##                         RC1  RC2  RC3
## SS loadings           1.65 1.54 1.31
## Proportion Var        0.21 0.19 0.16
## Cumulative Var        0.21 0.40 0.56
## Proportion Explained  0.37 0.34 0.29
## Cumulative Proportion 0.37 0.71 1.00
##
##  With component correlations of
##       RC1   RC2  RC3
## RC1  1.00 -0.20 0.09
## RC2 -0.20  1.00 0.11
## RC3  0.09  0.11 1.00
##
## Mean item complexity =  1.4
## Test of the hypothesis that 3 components are sufficient.
##
## The root mean square of the residuals (RMSR) is  0.13
##  with the empirical chi square  65.21  with prob <  1.4e-11
##
## Fit based upon off diagonal values = 0.36
```

```
eigenvalues <- fitsz$values
plot(eigenvalues, type = "b",
     xlab = "Component Number",
     ylab = "Eigenvalue",
     main = "Scree Plot")
abline(h = 1, col = "red", lty = 2)
```




```
fitbp <- principal(pca_vars_bp, nfactors=3, rotate="varimax", scores = TRUE)
fitbp
```

```
## Principal Components Analysis
## Call: principal(r = pca_vars_bp, nfactors = 3, rotate = "varimax",
```

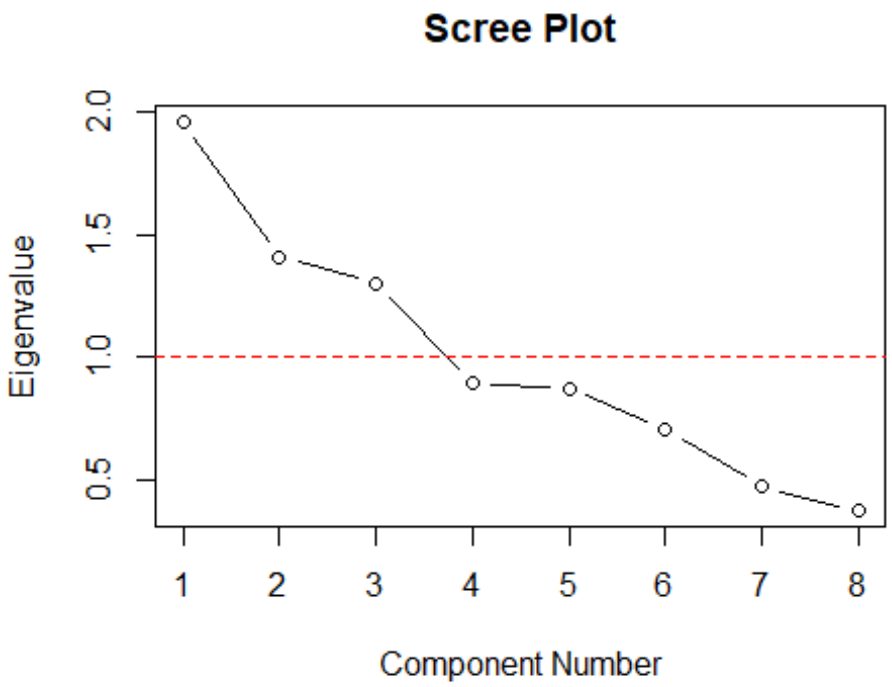
```
##     scores = TRUE)
## Standardized loadings (pattern matrix) based upon correlation matrix
##                 RC1   RC2   RC3   h2   u2 com
## DichoticN1     0.26 -0.01  0.80 0.72 0.28 1.2
## DSCPTP1        0.10  0.67  0.32 0.56 0.44 1.5
## DichoticP2MMN  0.74 -0.17  0.18 0.61 0.39 1.2
## DSCPTN1P2     -0.17  0.65 -0.03 0.45 0.55 1.1
## DSCPTN2        0.43  0.02 -0.68 0.65 0.35 1.7
## DichoticLPP    0.72 -0.02 -0.03 0.52 0.48 1.0
## DichoticP3     0.13  0.68 -0.23 0.53 0.47 1.3
## DSCPTP3LPP     0.76  0.23 -0.11 0.64 0.36 1.2
##
##                        RC1  RC2  RC3
## SS loadings           1.95 1.41 1.31
## Proportion Var        0.24 0.18 0.16
## Cumulative Var        0.24 0.42 0.58
## Proportion Explained  0.42 0.30 0.28
## Cumulative Proportion 0.42 0.72 1.00
##
## Mean item complexity =  1.3
## Test of the hypothesis that 3 components are sufficient.
##
## The root mean square of the residuals (RMSR) is  0.13
##  with the empirical chi square  45.85  with prob <  9.3e-08
##
## Fit based upon off diagonal values = 0.49
```

```
fitbp <- principal(pca_vars_bp, nfactors=3, rotate="promax", scores = TRUE)
fitbp
```

```
## Principal Components Analysis
## Call: principal(r = pca_vars_bp, nfactors = 3, rotate = "promax", scores = TRUE)
## Standardized loadings (pattern matrix) based upon correlation matrix
##                 RC1   RC2   RC3   h2   u2 com
## DichoticN1     0.28  0.03  0.82 0.72 0.28 1.2
## DSCPTP1        0.09  0.69  0.34 0.56 0.44 1.5
## DichoticP2MMN  0.75 -0.16  0.22 0.61 0.39 1.3
## DSCPTN1P2     -0.18  0.65 -0.02 0.45 0.55 1.2
## DSCPTN2        0.42 -0.03 -0.66 0.65 0.35 1.7
## DichoticLPP    0.72 -0.03  0.00 0.52 0.48 1.0
## DichoticP3     0.11  0.66 -0.22 0.53 0.47 1.3
## DSCPTP3LPP     0.75  0.22 -0.07 0.64 0.36 1.2
##
##                        RC1  RC2  RC3
## SS loadings           1.95 1.41 1.31
## Proportion Var        0.24 0.18 0.16
## Cumulative Var        0.24 0.42 0.58
## Proportion Explained  0.42 0.30 0.28
## Cumulative Proportion 0.42 0.72 1.00
##
##  With component correlations of
##       RC1   RC2   RC3
## RC1  1.00  0.03 -0.07
## RC2  0.03  1.00 -0.07
## RC3 -0.07 -0.07  1.00
##
```

```
## Mean item complexity =  1.3
## Test of the hypothesis that 3 components are sufficient.
##
## The root mean square of the residuals (RMSR) is  0.13
##  with the empirical chi square  45.85  with prob <  9.3e-08
##
## Fit based upon off diagonal values = 0.49
```

```
eigenvalues <- fitbp$values
plot(eigenvalues, type = "b",
     xlab = "Component Number",
     ylab = "Eigenvalue",
     main = "Scree Plot")
abline(h = 1, col = "red", lty = 2)
```




```
fitrel <- principal(pca_vars_rel, nfactors=3, rotate="varimax", scores = TRUE)
fitrel
```

```
## Principal Components Analysis
## Call: principal(r = pca_vars_rel, nfactors = 3, rotate = "varimax",
##     scores = TRUE)
## Standardized loadings (pattern matrix) based upon correlation matrix
##                  RC1   RC3   RC2   h2   u2 com
## DichoticN1    -0.86  0.07 -0.16 0.77 0.23 1.1
## DSCPTP1        0.43  0.17  0.61 0.59 0.41 2.0
## DichoticP2MMN  0.12 -0.25  0.78 0.68 0.32 1.3
## DSCPTN1P2     -0.16  0.21  0.68 0.53 0.47 1.3
## DSCPTN2        0.70  0.15  0.00 0.51 0.49 1.1
## DichoticLPP    0.57  0.67 -0.14 0.79 0.21 2.0
## DichoticP3     0.30  0.78 -0.02 0.70 0.30 1.3
## DSCPTP3LPP    -0.23  0.82  0.19 0.76 0.24 1.3
##
##                        RC1  RC3  RC2
```

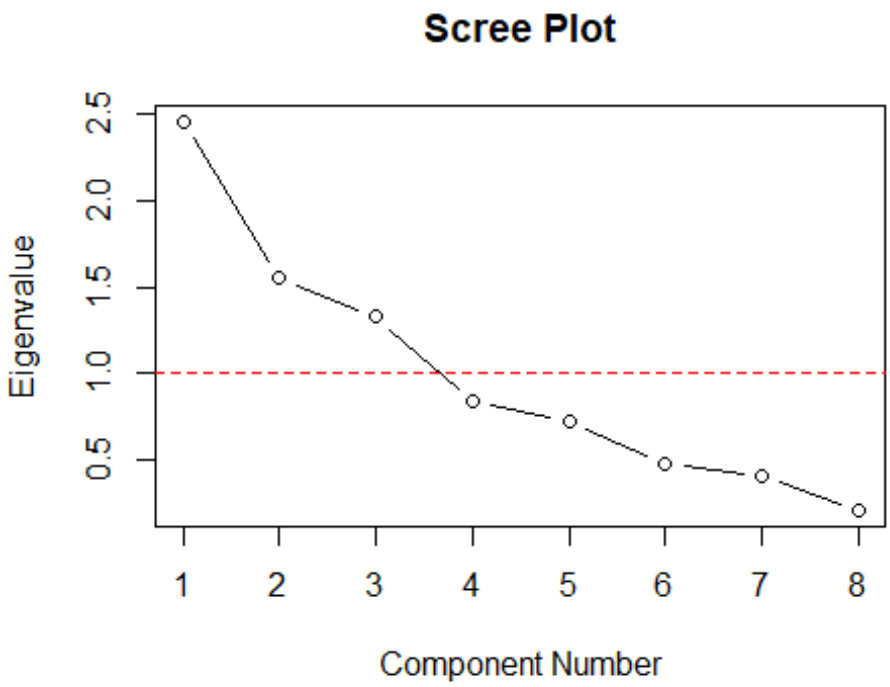
```
## SS loadings           1.91 1.90 1.52
## Proportion Var        0.24 0.24 0.19
## Cumulative Var        0.24 0.48 0.67
## Proportion Explained  0.36 0.36 0.29
## Cumulative Proportion 0.36 0.71 1.00
##
## Mean item complexity =  1.4
## Test of the hypothesis that 3 components are sufficient.
##
## The root mean square of the residuals (RMSR) is  0.11
##  with the empirical chi square  21.72  with prob <  0.0028
##
## Fit based upon off diagonal values = 0.82
```

```
fitrel <- principal(pca_vars_rel, nfactors=3, rotate="promax", scores = TRUE)
fitrel
```

```
## Principal Components Analysis
## Call: principal(r = pca_vars_rel, nfactors = 3, rotate = "promax",
##     scores = TRUE)
## Standardized loadings (pattern matrix) based upon correlation matrix
##                 RC3   RC1   RC2   h2   u2 com
## DichoticN1     0.17 -0.89 -0.16 0.77 0.23 1.1
## DSCPTP1        0.15  0.41  0.60 0.59 0.41 1.9
## DichoticP2MMN -0.24  0.16  0.79 0.68 0.32 1.3
## DSCPTN1P2      0.26 -0.20  0.66 0.53 0.47 1.5
## DSCPTN2        0.08  0.69 -0.02 0.51 0.49 1.0
## DichoticLPP    0.62  0.48 -0.20 0.79 0.21 2.1
## DichoticP3     0.77  0.18 -0.08 0.70 0.30 1.1
## DSCPTP3LPP     0.88 -0.36  0.13 0.76 0.24 1.4
##
##                        RC3  RC1  RC2
## SS loadings           1.93 1.89 1.51
## Proportion Var        0.24 0.24 0.19
## Cumulative Var        0.24 0.48 0.67
## Proportion Explained  0.36 0.35 0.28
## Cumulative Proportion 0.36 0.72 1.00
##
##  With component correlations of
##      RC3  RC1  RC2
## RC3 1.00 0.25 0.05
## RC1 0.25 1.00 0.01
## RC2 0.05 0.01 1.00
##
## Mean item complexity =  1.4
## Test of the hypothesis that 3 components are sufficient.
##
## The root mean square of the residuals (RMSR) is  0.11
##  with the empirical chi square  21.72  with prob <  0.0028
##
## Fit based upon off diagonal values = 0.82
```

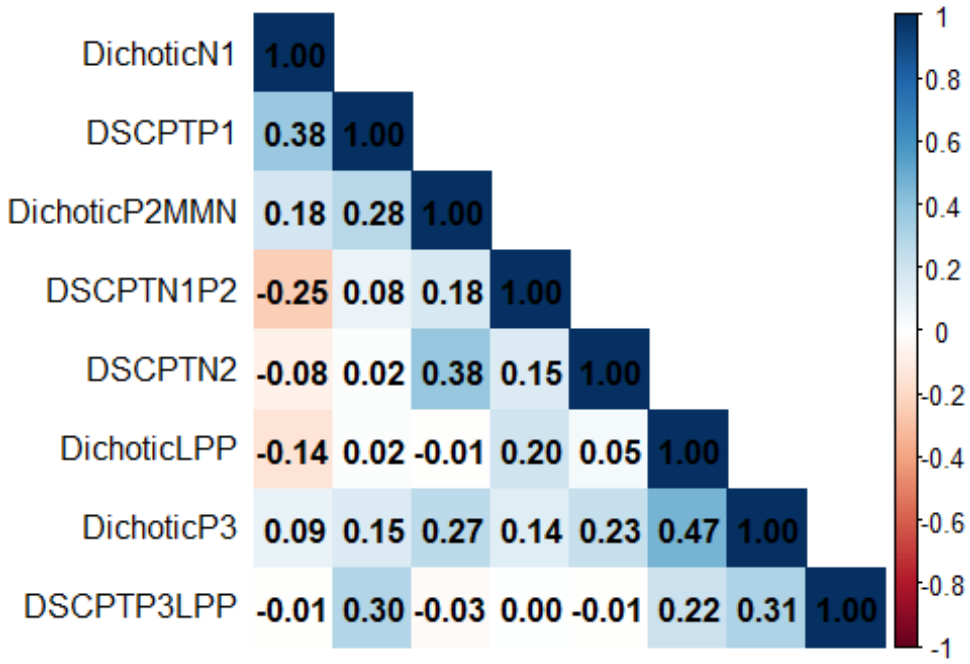
```
eigenvalues <- fitrel$values
plot(eigenvalues, type = "b",
     xlab = "Component Number",
     ylab = "Eigenvalue",
```

```
     main = "Scree Plot")
abline(h = 1, col = "red", lty = 2)
```

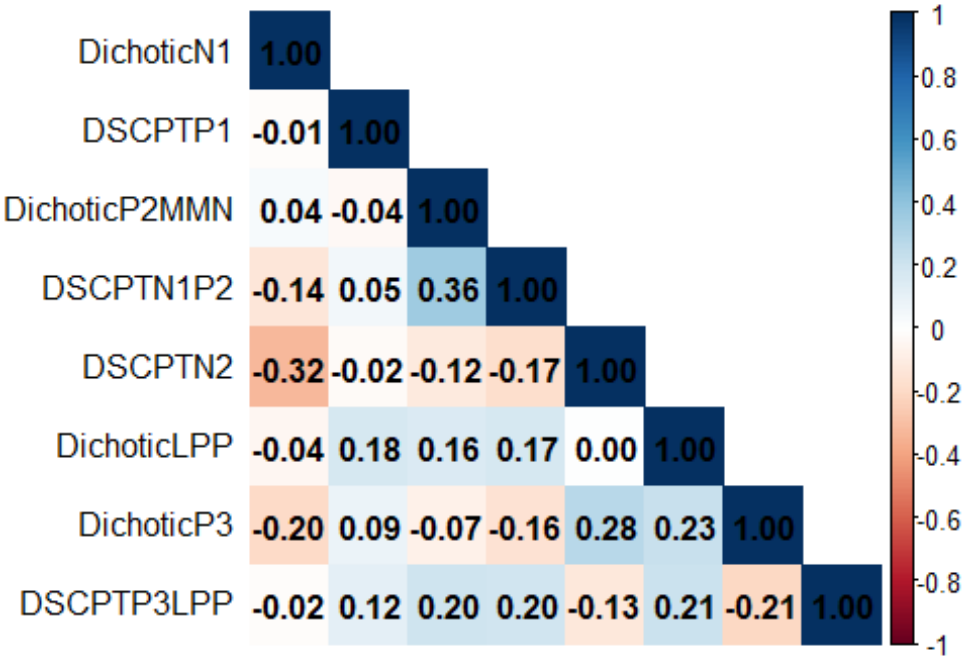



```
# compare groups statistically:

r1 <- cor(pca_vars_hc)
r2 <- cor(pca_vars_sz)
r3 <- cor(pca_vars_bp)
r4 <- cor(pca_vars_rel)

cortest.normal(R1 = r1, R2 = r2, n1 = nrow(pca_vars_hc), n2 = nrow(pca_vars_sz)) #con vs
sz

## Tests of correlation matrices
## Call:cortest.normal(R1 = r1, R2 = r2, n1 = nrow(pca_vars_hc), n2 = nrow(pca_vars_sz))
##  Chi Square value 48.42  with df =  28   with probability < 0.0096

cortest.normal(R1 = r1, R2 = r3, n1 = nrow(pca_vars_hc), n2 = nrow(pca_vars_bp)) #con vs
bp

## Tests of correlation matrices
## Call:cortest.normal(R1 = r1, R2 = r3, n1 = nrow(pca_vars_hc), n2 = nrow(pca_vars_bp))
##  Chi Square value 33.48  with df =  28   with probability < 0.22

cortest.normal(R1 = r1, R2 = r4, n1 = nrow(pca_vars_hc), n2 = nrow(pca_vars_rel)) #con vs
rel

## Tests of correlation matrices
## Call:cortest.normal(R1 = r1, R2 = r4, n1 = nrow(pca_vars_hc), n2 = nrow(pca_vars_rel))
##  Chi Square value 32.29  with df =  28   with probability < 0.26

cortest.normal(R1 = r3, R2 = r2, n1 = nrow(pca_vars_bp), n2 = nrow(pca_vars_sz)) #sz vs b
p
```

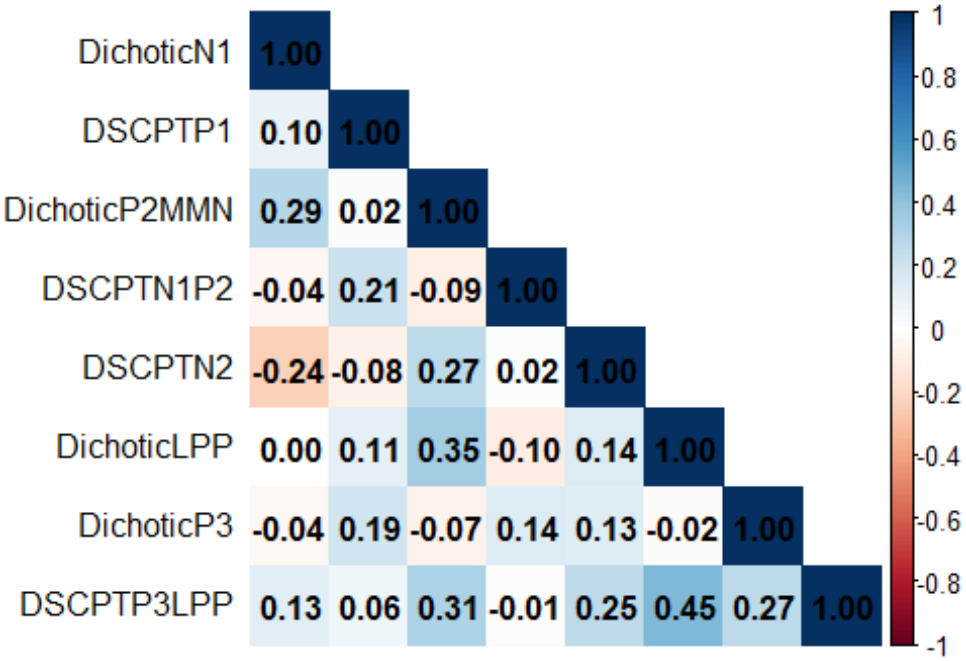
```
## Tests of correlation matrices
## Call:cortest.normal(R1 = r3, R2 = r2, n1 = nrow(pca_vars_bp), n2 = nrow(pca_vars_sz))
##  Chi Square value 33.99  with df =  28   with probability < 0.2

cortest.normal(R1 = r2, R2 = r4, n1 = nrow(pca_vars_sz), n2 = nrow(pca_vars_rel)) #rel vs
sz

## Tests of correlation matrices
## Call:cortest.normal(R1 = r2, R2 = r4, n1 = nrow(pca_vars_sz), n2 = nrow(pca_vars_rel))
##  Chi Square value 33.69  with df =  28   with probability < 0.21

cortest.normal(R1 = r3, R2 = r4, n1 = nrow(pca_vars_bp), n2 = nrow(pca_vars_rel)) #rel vs
bp

## Tests of correlation matrices
## Call:cortest.normal(R1 = r3, R2 = r4, n1 = nrow(pca_vars_bp), n2 = nrow(pca_vars_rel))
##  Chi Square value 36.99  with df =  28   with probability < 0.12

# grouped cor plots

corr_plot_hc <- corrplot(r1, method = "color", tl.col = "black", type = "lower", tl.pos =
"l", tl.srt = 0, cl.pos = "r", addCoef.col = 'black')
```



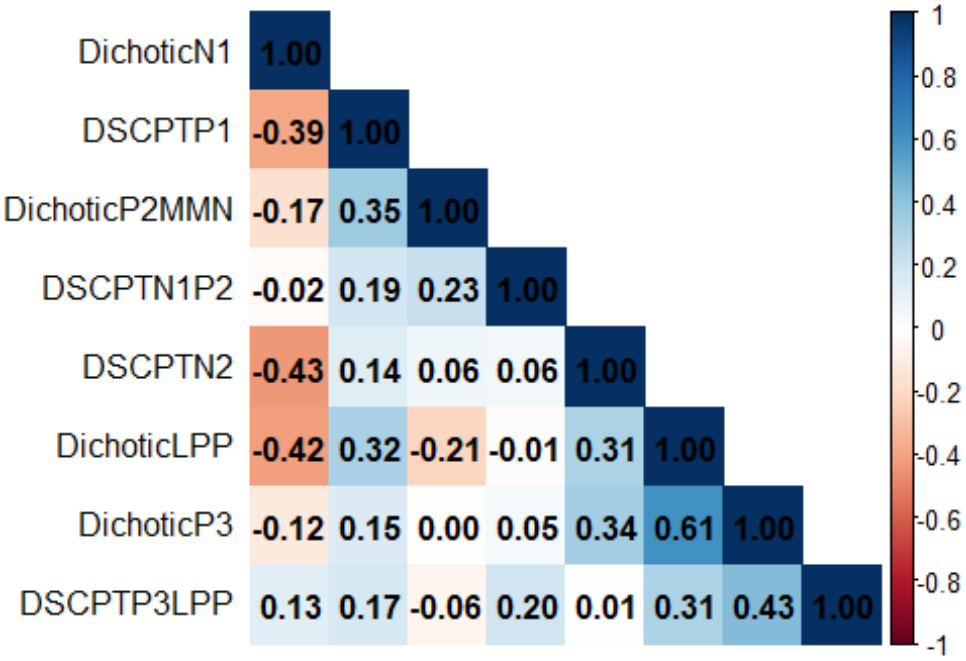

```
corr_plot_sz <- corrplot(r2, method = "color", tl.col = "black", type = "lower", tl.pos =
"l", tl.srt = 0, cl.pos = "r", addCoef.col = 'black')
```




```
corr_plot_bp <- corrplot(r3, method = "color", tl.col = "black", type = "lower", tl.pos =
"l", tl.srt = 0, cl.pos = "r", addCoef.col = 'black')
```




```
corr_plot_rel <- corrplot(r4, method = "color", tl.col = "black", type = "lower", tl.pos
= "l", tl.srt = 0, cl.pos = "r", addCoef.col = 'black')
```



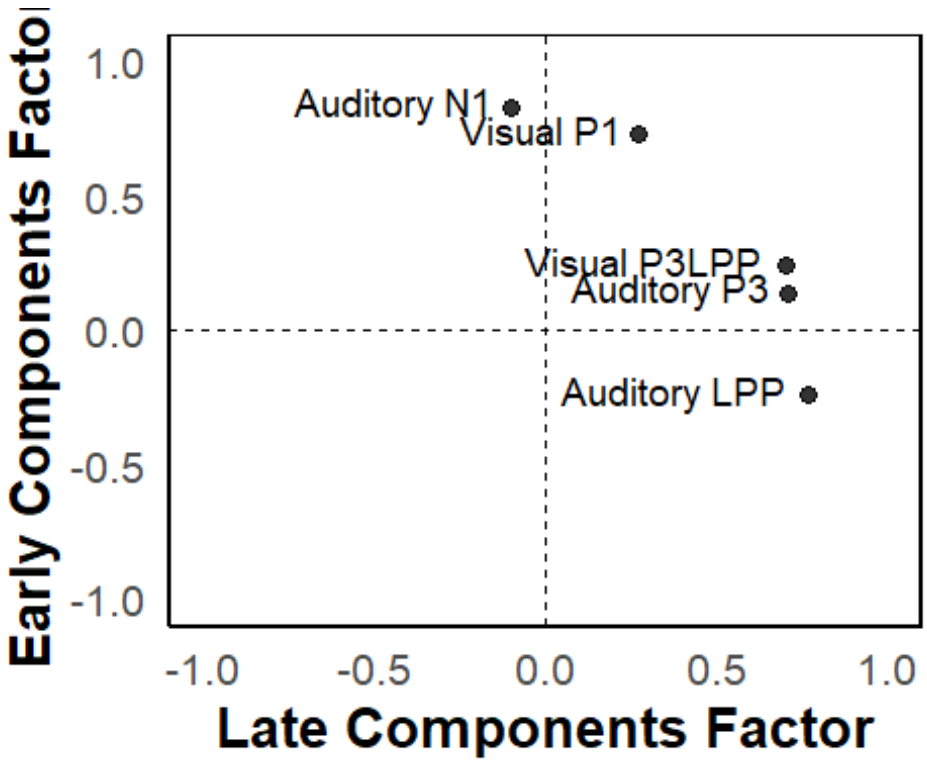

```r
# Get the scores for each subject

scoreshc <- fithc$scores
scoreshc_df <- as.data.frame(scoreshc)
final_hc_df <- cbind(id_vars_hc, scoreshc_df)

# get the loadings for each variable

loadingshc_matrix <- fithc$loadings[1:8, 1:3]
loadingshc_df <- as.data.frame(loadingshc_matrix)

# Combine loadings with the subject info

expanded_df_hc <- data.frame()

for (i in 1:nrow(loadingshc_df)) {
  for (j in 1:ncol(loadingshc_df)) {
    expanded_df_hc <- rbind(expanded_df_hc, data.frame(
      SubID = rep(id_vars_hc$SubID, each = 1),
      Variable = rep(rownames(loadingshc_df)[i], length(id_vars_hc$SubID)),
      Factor = colnames(loadingshc_df)[j],
      Score = scoreshc_df[, j] * loadingshc_df[i, j]
    ))
  }
}

expanded_df_hc <- na.omit(expanded_df_hc)

expanded_df_hc$Variable[expanded_df_hc$Variable=="DichoticLPP"] = "LPPa"
expanded_df_hc$Variable[expanded_df_hc$Variable=="DichoticN1"] = "N1a"
expanded_df_hc$Variable[expanded_df_hc$Variable=="DichoticP2MMN"] = "P2MMNa"
```

```r
expanded_df_hc$Variable[expanded_df_hc$Variable=="DichoticP3"] = "P3a"
expanded_df_hc$Variable[expanded_df_hc$Variable=="DSCPTP1"] = "P1v"
expanded_df_hc$Variable[expanded_df_hc$Variable=="DSCPTN1P2"] = "N1P2v"
expanded_df_hc$Variable[expanded_df_hc$Variable=="DSCPTN2"] = "N2v"
expanded_df_hc$Variable[expanded_df_hc$Variable=="DSCPTP3LPP"] = "P3LPPv"

# create a factor score for each person adding only the variables that load > .4:

factor1hc <- expanded_df_hc %>%
  filter(Factor == "RC1", Variable %in% c("LPPa","P3a","P3LPPv")) %>%
  group_by(SubID) %>%
  summarise(fac1hc = sum(Score, na.rm = TRUE))

factor2hc <- expanded_df_hc %>%
  filter(Factor == "RC2", Variable %in% c("N1a","P1v")) %>%
  group_by(SubID) %>%
  summarise(fac2hc = sum(Score, na.rm = TRUE))

factor3hc <- expanded_df_hc %>%
  filter(Factor == "RC3", Variable %in% c("P2MMNa","N1P2v","N2a")) %>%
  group_by(SubID) %>%
  summarise(fac3hc = sum(Score, na.rm = TRUE))

allfac_scoreshc <- factor1hc %>%
  full_join(factor2hc, by = "SubID") %>%
  full_join(factor3hc, by = "SubID")

# Repeat for other groups

scoressz <- fitsz$scores
scoressz_df <- as.data.frame(scoressz)
final_sz_df <- cbind(id_vars_sz, scoressz_df)

loadingssz_matrix <- fitsz$loadings[1:8, 1:3]
loadingssz_df <- as.data.frame(loadingssz_matrix)

expanded_df_sz <- data.frame()

for (i in 1:nrow(loadingssz_df)) {
  for (j in 1:ncol(loadingssz_df)) {
    expanded_df_sz <- rbind(expanded_df_sz, data.frame(
      SubID = rep(id_vars_sz$SubID, each = 1),
      Variable = rep(rownames(loadingssz_df)[i], length(id_vars_sz$SubID)),
      Factor = colnames(loadingssz_df)[j],
      Score = scoressz_df[, j] * loadingssz_df[i, j]
    ))
  }
}

expanded_df_sz <- na.omit(expanded_df_sz)

expanded_df_sz$Variable[expanded_df_sz$Variable=="DichoticLPP"] = "LPPa"
expanded_df_sz$Variable[expanded_df_sz$Variable=="DichoticN1"] = "N1a"
expanded_df_sz$Variable[expanded_df_sz$Variable=="DichoticP2MMN"] = "P2MMNa"
```

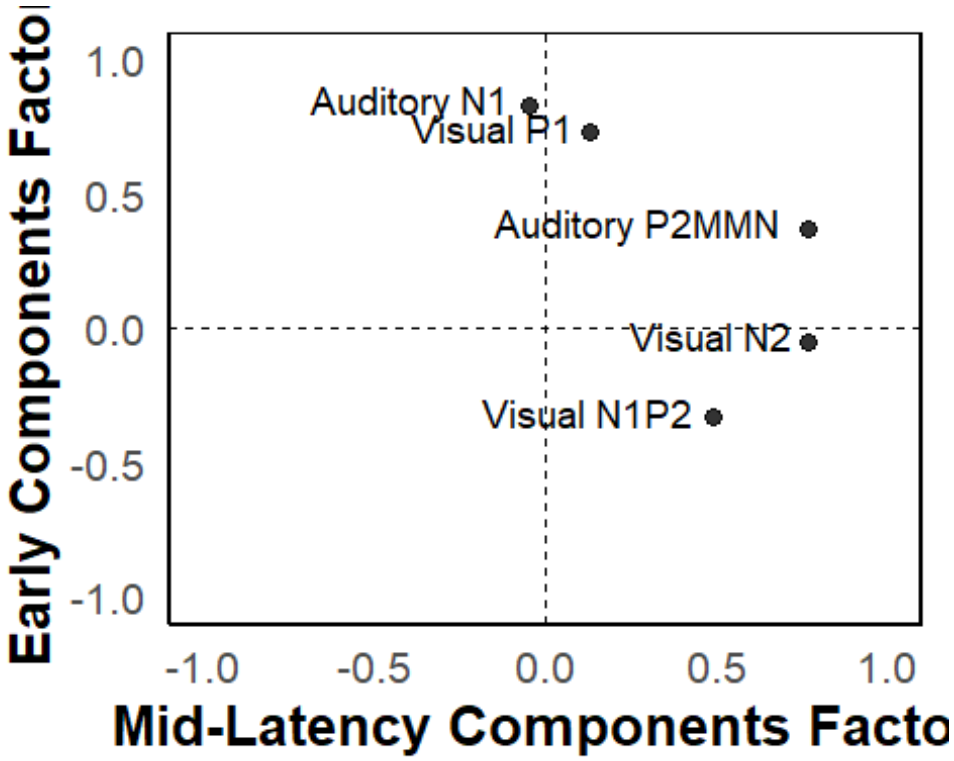
```
expanded_df_sz$Variable[expanded_df_sz$Variable=="DichoticP3"] = "P3a"
expanded_df_sz$Variable[expanded_df_sz$Variable=="DSCPTP1"] = "P1v"
expanded_df_sz$Variable[expanded_df_sz$Variable=="DSCPTN1P2"] = "N1P2v"
expanded_df_sz$Variable[expanded_df_sz$Variable=="DSCPTN2"] = "N2v"
expanded_df_sz$Variable[expanded_df_sz$Variable=="DSCPTP3LPP"] = "P3LPPv"

factor1sz <- expanded_df_sz %>%
  filter(Factor == "RC1", Variable %in% c("P2MMNa","N1P2v","P3LPPv")) %>%
  group_by(SubID) %>%
  summarise(fac1sz = sum(Score, na.rm = TRUE))

factor2sz <- expanded_df_sz %>%
  filter(Factor == "RC2", Variable %in% c("N1a","N2v","P3a")) %>%
  group_by(SubID) %>%
  summarise(fac2sz = sum(Score, na.rm = TRUE))

factor3sz <- expanded_df_sz %>%
  filter(Factor == "RC3", Variable %in% c("P1v","LPPa","P3a")) %>%
  group_by(SubID) %>%
  summarise(fac3sz = sum(Score, na.rm = TRUE))

allfac_scoressz <- factor1sz %>%
  full_join(factor2sz, by = "SubID") %>%
  full_join(factor3sz, by = "SubID")

scoresrel <- fitrel$scores
scoresrel_df <- as.data.frame(scoresrel)
final_rel_df <- cbind(id_vars_rel, scoresrel_df)

loadingsrel_matrix <- fitrel$loadings[1:8, 1:3]
loadingsrel_df <- as.data.frame(loadingsrel_matrix)

expanded_df_rel <- data.frame()

for (i in 1:nrow(loadingsrel_df)) {
  for (j in 1:ncol(loadingsrel_df)) {
    expanded_df_rel <- rbind(expanded_df_rel, data.frame(
      SubID = rep(id_vars_rel$SubID, each = 1),
      Variable = rep(rownames(loadingsrel_df)[i], length(id_vars_rel$SubID)),
      Factor = colnames(loadingsrel_df)[j],
      Score = scoresrel_df[, j] * loadingsrel_df[i, j]
    ))
  }
}

expanded_df_rel <- na.omit(expanded_df_rel)

expanded_df_rel$Variable[expanded_df_rel$Variable=="DichoticLPP"] = "LPPa"
expanded_df_rel$Variable[expanded_df_rel$Variable=="DichoticN1"] = "N1a"
expanded_df_rel$Variable[expanded_df_rel$Variable=="DichoticP2MMN"] = "P2MMNa"
expanded_df_rel$Variable[expanded_df_rel$Variable=="DichoticP3"] = "P3a"
expanded_df_rel$Variable[expanded_df_rel$Variable=="DSCPTP1"] = "P1v"
expanded_df_rel$Variable[expanded_df_rel$Variable=="DSCPTN1P2"] = "N1P2v"
expanded_df_rel$Variable[expanded_df_rel$Variable=="DSCPTN2"] = "N2v"
```

```r
expanded_df_rel$Variable[expanded_df_rel$Variable=="DSCPTP3LPP"] = "P3LPPv"

factor1rel <- expanded_df_rel %>%
  filter(Factor == "RC1", Variable %in% c("N1a","P1v","N2v","LPPa")) %>%
  group_by(SubID) %>%
  summarise(fac1rel = sum(Score, na.rm = TRUE))

factor2srel <- expanded_df_rel %>%
  filter(Factor == "RC2", Variable %in% c("P1v","P2MMNa","N1P2v")) %>%
  group_by(SubID) %>%
  summarise(fac2rel = sum(Score, na.rm = TRUE))

factor3rel <- expanded_df_rel %>%
  filter(Factor == "RC3", Variable %in% c("LPPa","P3a","P3LPPv")) %>%
  group_by(SubID) %>%
  summarise(fac3rel = sum(Score, na.rm = TRUE))

allfac_scoresrel <- factor1rel %>%
  full_join(factor2srel, by = "SubID") %>%
  full_join(factor3rel, by = "SubID")

scoresbp <- fitbp$scores
scoresbp_df <- as.data.frame(scoresbp)
finalbp_df <- cbind(id_vars_bp, scoresbp_df)

loadingsbp_matrix <- fitbp$loadings[1:8, 1:3]
loadingsbp_df <- as.data.frame(loadingsbp_matrix)

expanded_df_bp <- data.frame()

for (i in 1:nrow(loadingsbp_df)) {
  for (j in 1:ncol(loadingsbp_df)) {
    expanded_df_bp <- rbind(expanded_df_bp, data.frame(
      SubID = rep(id_vars_bp$SubID, each = 1),
      Variable = rep(rownames(loadingsbp_df)[i], length(id_vars_bp$SubID)),
      Factor = colnames(loadingsbp_df)[j],
      Score = scoresbp_df[, j] * loadingsbp_df[i, j]
    ))
  }
}

expanded_df_bp <- na.omit(expanded_df_bp)

expanded_df_bp$Variable[expanded_df_bp$Variable=="DichoticLPP"] = "LPPa"
expanded_df_bp$Variable[expanded_df_bp$Variable=="DichoticN1"] = "N1a"
expanded_df_bp$Variable[expanded_df_bp$Variable=="DichoticP2MMN"] = "P2MMNa"
expanded_df_bp$Variable[expanded_df_bp$Variable=="DichoticP3"] = "P3a"
expanded_df_bp$Variable[expanded_df_bp$Variable=="DSCPTP1"] = "P1v"
expanded_df_bp$Variable[expanded_df_bp$Variable=="DSCPTN1P2"] = "N1P2v"
expanded_df_bp$Variable[expanded_df_bp$Variable=="DSCPTN2"] = "N2v"
expanded_df_bp$Variable[expanded_df_bp$Variable=="DSCPTP3LPP"] = "P3LPPv"

factor1bp <- expanded_df_bp %>%
  filter(Factor == "RC1", Variable %in% c("P2MMNa","P3LPPv","N2v","LPPa")) %>%
```

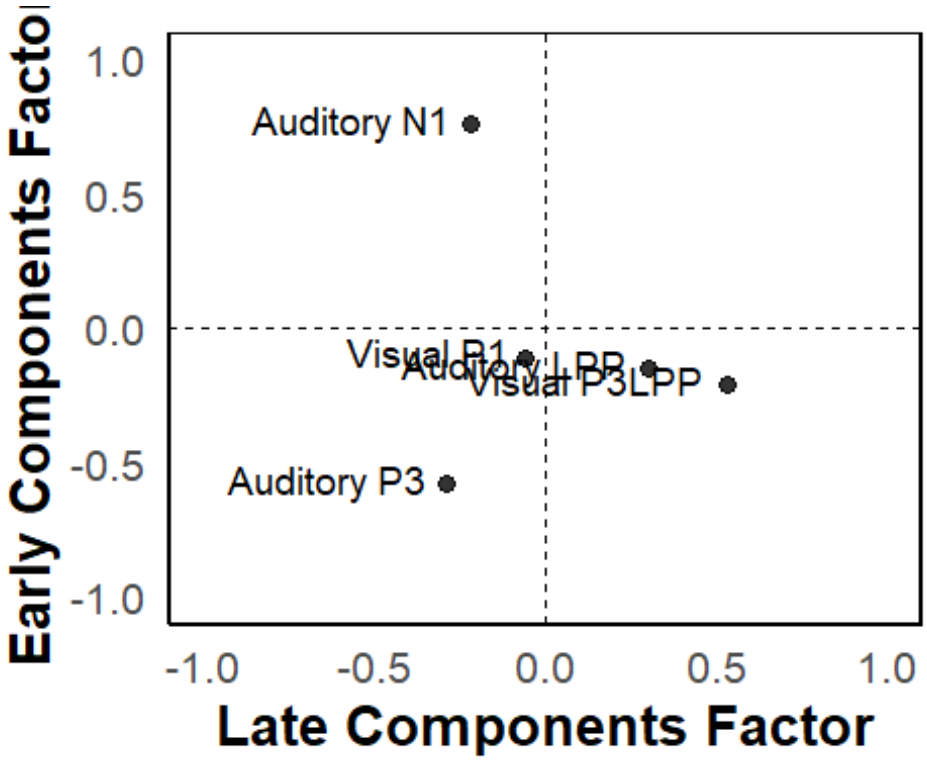
```r
  group_by(SubID) %>%
  summarise(fac1bp = sum(Score, na.rm = TRUE))

factor2sbp <- expanded_df_bp %>%
  filter(Factor == "RC2", Variable %in% c("P1v","P3a","N1P2v")) %>%
  group_by(SubID) %>%
  summarise(fac2bp = sum(Score, na.rm = TRUE))

factor3bp <- expanded_df_bp %>%
  filter(Factor == "RC3", Variable %in% c("N1a","N2v")) %>%
  group_by(SubID) %>%
  summarise(fac3bp = sum(Score, na.rm = TRUE))

allfac_scoresbp <- factor1bp %>%
  full_join(factor2sbp, by = "SubID") %>%
  full_join(factor3bp, by = "SubID")

# Create Coordinate Plots of PCA Scores for Each Group

# Set up

library(ggrepel)
RC1RC2HC <- readxl::read_excel("RC1RC2HC.xlsx")
RC2RC3HC <- readxl::read_excel("RC2RC3HC.xlsx")
AllRCHC <- readxl::read_excel("AllRCHC.xlsx")

## New names:
## • `` -> `...1`

RC1RC2HC$LabelGroup <- ifelse(RC1RC2HC$Comp %in% c("Auditory N1", "Visual P1"),
                              "Early Components", "Late Components")

# make plots
rc1rc2hc <- ggplot(RC1RC2HC, aes(x = RC1, y = RC2))+
  geom_point(size = 3, alpha = 0.8) +
 # geom_text_repel(aes(label = Comp, color = LabelGroup), size =8)+
  scale_color_manual(values = c("Early Components" = "blue", "Late Components" = "red"))+
  geom_text(aes(label = Comp), vjust = 0.3, hjust = 1.1, size = 5) +
  geom_hline(yintercept = 0, linetype = "dashed", color = "black") +
  geom_vline(xintercept = 0, linetype = "dashed", color = "black") +
  scale_x_continuous(limits = c(-1, 1)) +
  scale_y_continuous(limits = c(-1, 1)) +
  labs (x = "Late Components Factor", y = "Early Components Factor") +
  theme_minimal(base_size = 20) +
  theme(
    panel.grid = element_blank(),
    panel.border = element_rect(color = "black", fill = NA, linewidth = 1),
    axis.line = element_line(color = "black", linewidth = 1),
    legend.position = "right",
    axis.title = element_text(face = "bold"),
    plot.title = element_text(face = "bold", hjust = 0.5)
  )

print(rc1rc2hc)
```



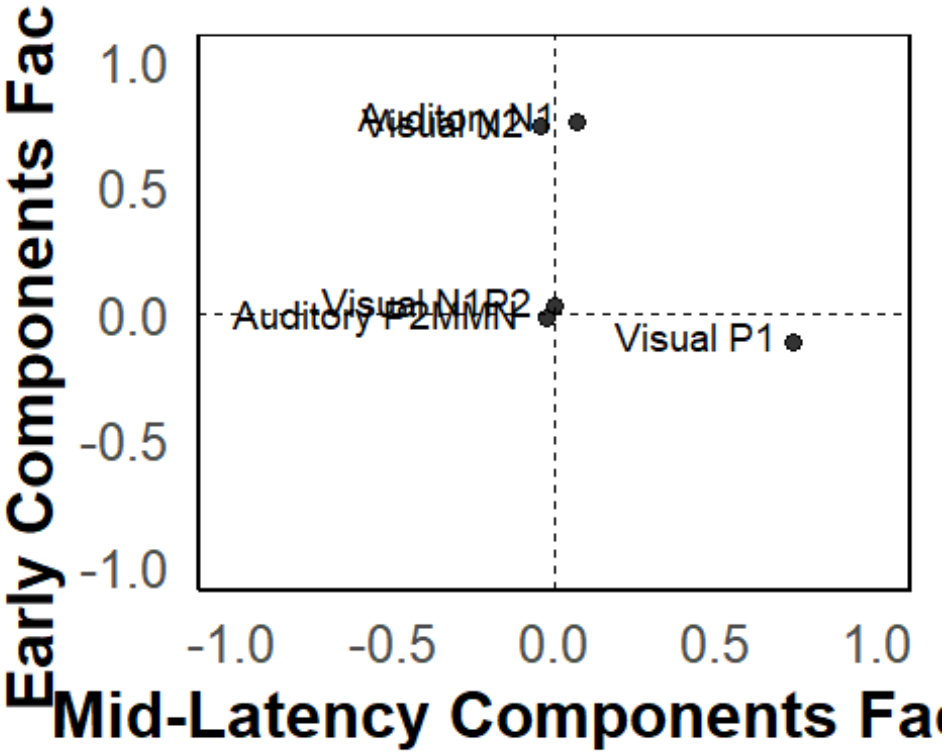

```
RC2RC3HC$LabelGroup <- ifelse(RC2RC3HC$Comp %in% c("Auditory N1", "Visual P1"),
                              "Early Components", "Mid-Latency Components")

rc2rc3hc <- ggplot(RC2RC3HC, aes(x = RC3, y = RC2))+
  geom_point(size = 3, alpha = 0.8) +
 # geom_text_repel(aes(label = Comp, color = LabelGroup), size =8)+
  scale_color_manual(values = c("Early Components" = "blue", "Mid-Latency Components" = "
darkorange1"))+
  geom_text(aes(label = Comp), vjust = 0.3, hjust = 1.1, size = 5) +
  geom_hline(yintercept = 0, linetype = "dashed", color = "black") +
  geom_vline(xintercept = 0, linetype = "dashed", color = "black") +
  scale_x_continuous(limits = c(-1, 1)) +
  scale_y_continuous(limits = c(-1, 1)) +
  labs (x = "Mid-Latency Components Factor", y = "Early Components Factor") +
  theme_minimal(base_size = 20) +
  theme(
    panel.grid = element_blank(),
    panel.border = element_rect(color = "black", fill = NA, linewidth = 1),
    axis.line = element_line(color = "black", linewidth = 1),
    legend.position = "right",
    axis.title = element_text(face = "bold"),
    plot.title = element_text(face = "bold", hjust = 0.5)
  )

print(rc2rc3hc)
```



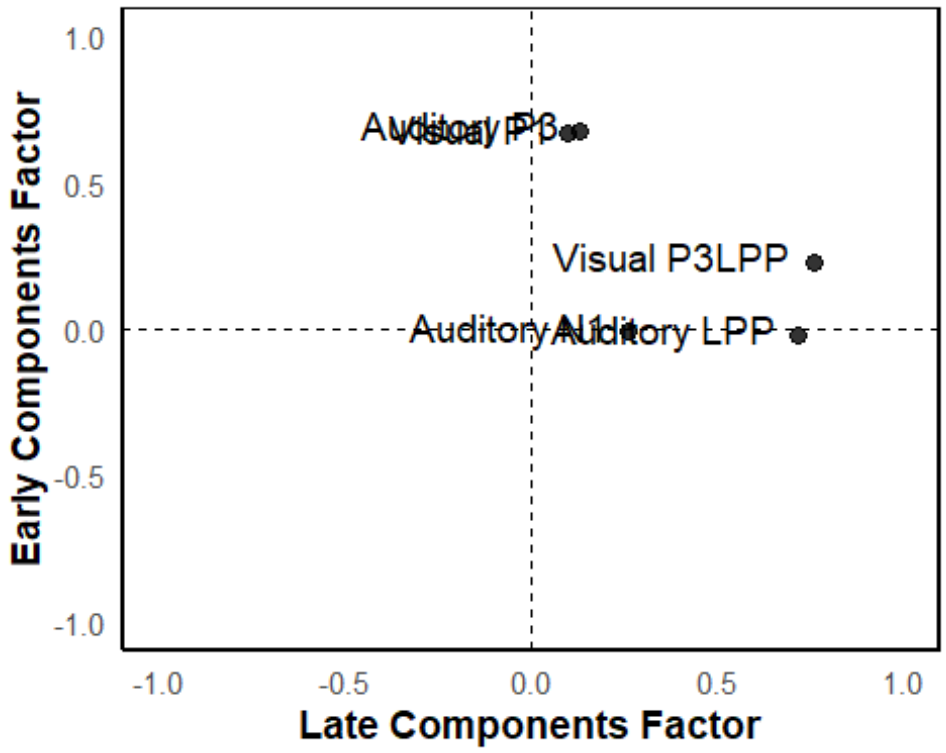

```
RC1RC2SZ <- readxl::read_excel("RC1RC2SZ.xlsx")

RC1RC2SZ$LabelGroup <- ifelse(RC1RC2SZ$Comp %in% c("Auditory N1", "Visual P1"),
                              "Early Components", "Late Components")

rc1rc2sz <- ggplot(RC1RC2SZ, aes(x = RC1, y = RC2))+
  geom_point(size = 3, alpha = 0.8) +
#  geom_text_repel(aes(label = Comp, color = LabelGroup), size =8)+
  scale_color_manual(values = c("Early Components" = "blue", "Late Components" = "red"))+
  geom_text(aes(label = Comp), vjust = 0.3, hjust = 1.1, size = 5) +
  geom_hline(yintercept = 0, linetype = "dashed", color = "black") +
  geom_vline(xintercept = 0, linetype = "dashed", color = "black") +
  scale_x_continuous(limits = c(-1, 1)) +
  scale_y_continuous(limits = c(-1, 1)) +
  labs (x = "Late Components Factor", y = "Early Components Factor") +
  theme_minimal(base_size = 20) +
  theme(
    panel.grid = element_blank(),
    panel.border = element_rect(color = "black", fill = NA, linewidth = 1),
    axis.line = element_line(color = "black", linewidth = 1),
    legend.position = "right",
    axis.title = element_text(face = "bold"),
    plot.title = element_text(face = "bold", hjust = 0.5)
  )

print(rc1rc2sz)
```



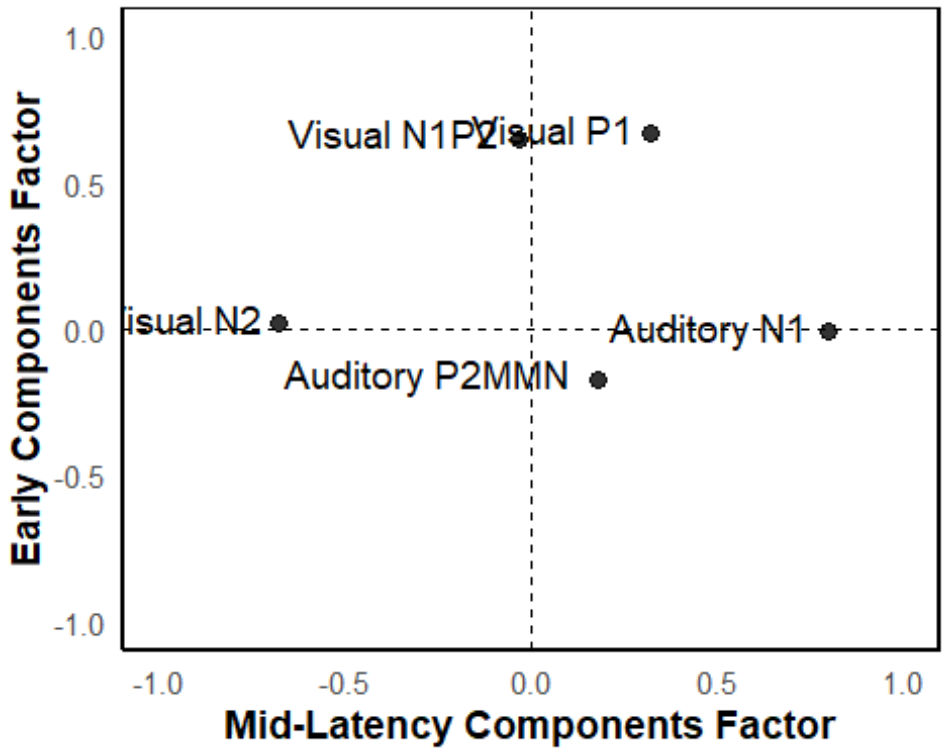

```
RC2RC3sz <- readxl::read_excel("RC2R3SZ.xlsx")

RC2RC3sz$LabelGroup <- ifelse(RC2RC3sz$Comp %in% c("Auditory N1", "Visual P1"),
                              "Early Components", "Mid-Latency Components")
rc2rc3sz <- ggplot(RC2RC3sz, aes(x = RC3, y = RC2))+
  geom_point(size = 3, alpha = 0.8) +
#  geom_text_repel(aes(label = Comp, color = LabelGroup), size =10)+
  scale_color_manual(values = c("Early Components" = "blue", "Mid-Latency Components" = "
darkorange1"))+
  geom_text(aes(label = Comp), vjust = 0.3, hjust = 1.1, size = 5) +
  geom_hline(yintercept = 0, linetype = "dashed", color = "black") +
  geom_vline(xintercept = 0, linetype = "dashed", color = "black") +
  scale_x_continuous(limits = c(-1, 1)) +
  scale_y_continuous(limits = c(-1, 1)) +
  labs (x = "Mid-Latency Components Factor", y = "Early Components Factor") +
  theme_minimal(base_size = 24) +
  theme(
    panel.grid = element_blank(),
    panel.border = element_rect(color = "black", fill = NA, linewidth = 1),
    axis.line = element_line(color = "black", linewidth = 1),
    legend.position = "right",
    axis.title = element_text(face = "bold"),
    plot.title = element_text(face = "bold", hjust = 0.5)
  )

print(rc2rc3sz)
```



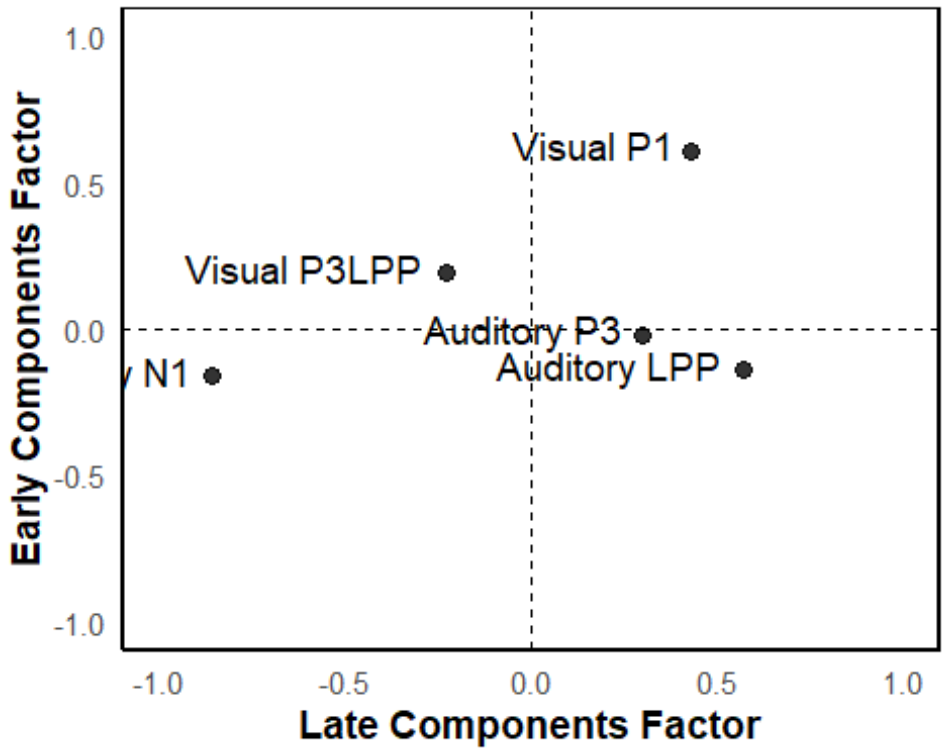

```
RC1RC2BP <- readxl::read_excel("RC1RC2BP.xlsx")

rc1rc2bp <- ggplot(RC1RC2BP, aes(x = RC1, y = RC2))+
  geom_point(size = 3, alpha = 0.8) +
 # geom_text_repel(aes(label = Comp), size =5)+
  geom_text(aes(label = Comp), vjust = 0.3, hjust = 1.1, size = 5) +
  geom_hline(yintercept = 0, linetype = "dashed", color = "black") +
  geom_vline(xintercept = 0, linetype = "dashed", color = "black") +
  scale_x_continuous(limits = c(-1, 1)) +
  scale_y_continuous(limits = c(-1, 1)) +
  labs (x = "Late Components Factor", y = "Early Components Factor") +
  theme_minimal(base_size = 14) +
  theme(
    panel.grid = element_blank(),
    panel.border = element_rect(color = "black", fill = NA, linewidth = 1),
    axis.line = element_line(color = "black", linewidth = 1),
    legend.position = "right",
    axis.title = element_text(face = "bold"),
    plot.title = element_text(face = "bold", hjust = 0.5)
  )

print(rc1rc2bp)
```



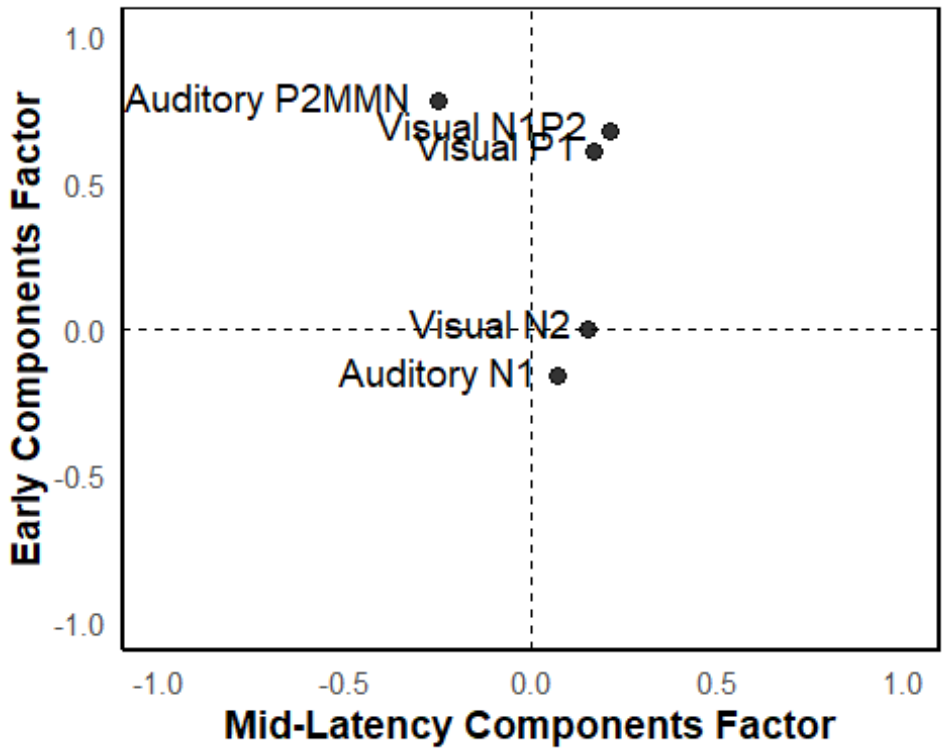

```r
RC2RC3bp <- readxl::read_excel("RC2R3BP.xlsx")

rc2rc3bp <- ggplot(RC2RC3bp, aes(x = RC3, y = RC2))+
  geom_point(size = 3, alpha = 0.8) +
 # geom_text_repel(aes(label = Comp), size =5) +
  geom_text(aes(label = Comp), vjust = 0.3, hjust = 1.1, size = 5) +
  geom_hline(yintercept = 0, linetype = "dashed", color = "black") +
  geom_vline(xintercept = 0, linetype = "dashed", color = "black") +
  scale_x_continuous(limits = c(-1, 1)) +
  scale_y_continuous(limits = c(-1, 1)) +
  labs (x = "Mid-Latency Components Factor", y = "Early Components Factor") +
  theme_minimal(base_size = 14) +
  theme(
    panel.grid = element_blank(),
    panel.border = element_rect(color = "black", fill = NA, linewidth = 1),
    axis.line = element_line(color = "black", linewidth = 1),
    legend.position = "right",
    axis.title = element_text(face = "bold"),
    plot.title = element_text(face = "bold", hjust = 0.5)
  )

print(rc2rc3bp)
```




```r
RC1RC2REL <- readxl::read_excel("RC1RC2REL.xlsx")

rc1rc2rel <- ggplot(RC1RC2REL, aes(x = RC1, y = RC2))+
  geom_point(size = 3, alpha = 0.8) +
 # geom_text_repel(aes(label = Comp), size =5) +
  geom_text(aes(label = Comp), vjust = 0.3, hjust = 1.1, size = 5) +
  geom_hline(yintercept = 0, linetype = "dashed", color = "black") +
  geom_vline(xintercept = 0, linetype = "dashed", color = "black") +
  scale_x_continuous(limits = c(-1, 1)) +
  scale_y_continuous(limits = c(-1, 1)) +
  labs (x = "Late Components Factor", y = "Early Components Factor") +
  theme_minimal(base_size = 14) +
  theme(
    panel.grid = element_blank(),
    panel.border = element_rect(color = "black", fill = NA, linewidth = 1),
    axis.line = element_line(color = "black", linewidth = 1),
    legend.position = "right",
    axis.title = element_text(face = "bold"),
    plot.title = element_text(face = "bold", hjust = 0.5)
  )

print(rc1rc2rel)
```




```
RC2RC3rel <- readxl::read_excel("RC2R3REL.xlsx")

rc2rc3rel <- ggplot(RC2RC3rel, aes(x = RC3, y = RC2))+
  geom_point(size = 3, alpha = 0.8) +
 # geom_text_repel(aes(label = Comp), size =5) +
   geom_text(aes(label = Comp), vjust = 0.3, hjust = 1.1, size = 5) +
  geom_hline(yintercept = 0, linetype = "dashed", color = "black") +
  geom_vline(xintercept = 0, linetype = "dashed", color = "black") +
  scale_x_continuous(limits = c(-1, 1)) +
  scale_y_continuous(limits = c(-1, 1)) +
  labs (x = "Mid-Latency Components Factor", y = "Early Components Factor") +
  theme_minimal(base_size = 14) +
  theme(
    panel.grid = element_blank(),
    panel.border = element_rect(color = "black", fill = NA, linewidth = 1),
    axis.line = element_line(color = "black", linewidth = 1),
    legend.position = "right",
    axis.title = element_text(face = "bold"),
    plot.title = element_text(face = "bold", hjust = 0.5)
  )

print(rc2rc3rel)
```




```
# Relationships between factors and clinical variables

# set up

facdat <- merge(allfac_scores, Merged_All_New_Clin_Beh_EEG, by = "SubID")

facdat <- facdat %>%
  rowwise() %>%
  mutate(BPRS_Total = mean(c(DSCPT_BPRS_Total, dichotic_BPRS_Total), na.rm = TRUE )) %>%
  mutate(SPQ_Total = mean(c(DSCPT_SPQ_Total, dichotic_SPQ_Total), na.rm = TRUE )) %>%
  mutate(SPQ_CP_Total = mean(c(DSCPT_SPQ_cognitive_perceptual, dichotic_SPQ_cognitive_per
ceptual), na.rm = TRUE )) %>%
  mutate(SPQ_I_Total = mean(c(DSCPT_SPQ_interpersonal, dichotic_SPQ_interpersonal), na.rm
= TRUE )) %>%
  mutate(SPQ_D_Total = mean(c(DSCPT_SPQ_disorganized, dichotic_SPQ_disorganized), na.rm =
TRUE )) %>%
  mutate(SANS_Total = mean(c(DSCPT_SANS_GlobalNegativeSx, dichotic_SANS_GlobalNegativeSx)
, na.rm = TRUE )) %>%
  mutate(SAPS_Total = mean(c(DSCPT_SAPS_GlobalPositiveSx, dichotic_SAPS_GlobalPositiveSx)
, na.rm = TRUE )) %>%
  ungroup()

allfac_scoreshc_sx <- allfac_scoreshc %>%
  left_join(select(facdat, SubID, SPQ_Total, SPQ_CP_Total, SPQ_I_Total, BPRS_Total, WAIS_
EstIQ, SPQ_D_Total), by = "SubID")

allfac_scoresrel_sx <- allfac_scoresrel %>%
  left_join(select(facdat, SubID, SPQ_Total, SPQ_CP_Total, SPQ_I_Total, BPRS_Total, WAIS_
EstIQ, SPQ_D_Total), by = "SubID")

allfac_scoressz_sx <- allfac_scoressz %>%
  left_join(select(facdat, SubID, SPQ_Total, SPQ_CP_Total, SPQ_I_Total, BPRS_Total, WAIS_
```

```
EstIQ, SPQ_D_Total, SANS_Total, SAPS_Total), by = "SubID")

allfac_scoresbp_sx <- allfac_scoresbp %>%
  left_join(select(facdat, SubID, SPQ_Total, SPQ_CP_Total, SPQ_I_Total, BPRS_Total, WAIS_
EstIQ, SPQ_D_Total, SANS_Total, SAPS_Total), by = "SubID")

corr.test(allfac_scoreshc_sx, use = "complete.obs", method = "pearson")

## Call:corr.test(x = allfac_scoreshc_sx, use = "complete.obs", method = "pearson")
## Correlation matrix
##              SubID fac1hc fac2hc fac3hc SPQ_Total SPQ_CP_Total SPQ_I_Total
## SubID         1.00   0.24  -0.04   0.08     -0.25        -0.27        0.01
## fac1hc        0.24   1.00   0.06   0.20     -0.27        -0.37       -0.06
## fac2hc       -0.04   0.06   1.00  -0.03      0.05        -0.01       -0.01
## fac3hc        0.08   0.20  -0.03   1.00     -0.15        -0.07       -0.14
## SPQ_Total    -0.25  -0.27   0.05  -0.15      1.00         0.70        0.67
## SPQ_CP_Total -0.27  -0.37  -0.01  -0.07      0.70         1.00        0.08
## SPQ_I_Total   0.01  -0.06  -0.01  -0.14      0.67         0.08        1.00
## BPRS_Total   -0.33  -0.23   0.02  -0.18      0.41         0.49        0.16
## WAIS_EstIQ    0.08   0.14   0.05  -0.01      0.05        -0.22        0.17
## SPQ_D_Total  -0.16  -0.18   0.22  -0.01      0.74         0.57        0.44
##              BPRS_Total WAIS_EstIQ SPQ_D_Total
## SubID             -0.33       0.08       -0.16
## fac1hc            -0.23       0.14       -0.18
## fac2hc             0.02       0.05        0.22
## fac3hc            -0.18      -0.01       -0.01
## SPQ_Total          0.41       0.05        0.74
## SPQ_CP_Total       0.49      -0.22        0.57
## SPQ_I_Total        0.16       0.17        0.44
## BPRS_Total         1.00      -0.12        0.35
## WAIS_EstIQ        -0.12       1.00       -0.10
## SPQ_D_Total        0.35      -0.10        1.00
## Sample Size
##              SubID fac1hc fac2hc fac3hc SPQ_Total SPQ_CP_Total SPQ_I_Total
## SubID           65     65     65     65        60           60          60
## fac1hc          65     65     65     65        60           60          60
## fac2hc          65     65     65     65        60           60          60
## fac3hc          65     65     65     65        60           60          60
## SPQ_Total       60     60     60     60        60           60          60
## SPQ_CP_Total    60     60     60     60        60           60          60
## SPQ_I_Total     60     60     60     60        60           60          60
## BPRS_Total      65     65     65     65        60           60          60
## WAIS_EstIQ      60     60     60     60        56           56          56
## SPQ_D_Total     60     60     60     60        60           60          60
##              BPRS_Total WAIS_EstIQ SPQ_D_Total
## SubID                65         60          60
## fac1hc               65         60          60
## fac2hc               65         60          60
## fac3hc               65         60          60
## SPQ_Total            60         56          60
## SPQ_CP_Total         60         56          60
## SPQ_I_Total          60         56          60
## BPRS_Total           65         60          60
## WAIS_EstIQ           60         60          56
## SPQ_D_Total          60         56          60
```

```
## Probability values (Entries above the diagonal are adjusted for multiple tests.)
##              SubID fac1hc fac2hc fac3hc SPQ_Total SPQ_CP_Total SPQ_I_Total
## SubID         0.00   1.00   1.00   1.00      1.00         1.00        1.00
## fac1hc        0.05   0.00   1.00   1.00      1.00         0.14        1.00
## fac2hc        0.75   0.66   0.00   1.00      1.00         1.00        1.00
## fac3hc        0.50   0.12   0.80   0.00      1.00         1.00        1.00
## SPQ_Total     0.05   0.04   0.71   0.26      0.00         0.00        0.00
## SPQ_CP_Total  0.04   0.00   0.94   0.57      0.00         0.00        1.00
## SPQ_I_Total   0.96   0.66   0.93   0.29      0.00         0.54        0.00
## BPRS_Total    0.01   0.07   0.85   0.15      0.00         0.00        0.23
## WAIS_EstIQ    0.53   0.28   0.69   0.92      0.71         0.11        0.21
## SPQ_D_Total   0.21   0.18   0.09   0.93      0.00         0.00        0.00
##              BPRS_Total WAIS_EstIQ SPQ_D_Total
## SubID              0.27       1.00        1.00
## fac1hc             1.00       1.00        1.00
## fac2hc             1.00       1.00        1.00
## fac3hc             1.00       1.00        1.00
## SPQ_Total          0.04       1.00        0.00
## SPQ_CP_Total       0.00       1.00        0.00
## SPQ_I_Total        1.00       1.00        0.02
## BPRS_Total         0.00       1.00        0.20
## WAIS_EstIQ         0.38       0.00        1.00
## SPQ_D_Total        0.01       0.47        0.00
##
##  To see confidence intervals of the correlations, print with the short=FALSE option
```

```
corr.test(allfac_scoresrel_sx, use = "complete.obs", method = "pearson")
```

```
## Call:corr.test(x = allfac_scoresrel_sx, use = "complete.obs", method = "pearson")
## Correlation matrix
##              SubID fac1rel fac2rel fac3rel SPQ_Total SPQ_CP_Total SPQ_I_Total
## SubID         1.00   -0.23    0.08   -0.32      0.02        -0.06       -0.09
## fac1rel      -0.23    1.00    0.18    0.40     -0.25        -0.40        0.00
## fac2rel       0.08    0.18    1.00    0.05      0.00        -0.20        0.21
## fac3rel      -0.32    0.40    0.05    1.00      0.03        -0.02        0.11
## SPQ_Total     0.02   -0.25    0.00    0.03      1.00         0.87        0.84
## SPQ_CP_Total -0.06   -0.40   -0.20   -0.02      0.87         1.00        0.53
## SPQ_I_Total  -0.09    0.00    0.21    0.11      0.84         0.53        1.00
## BPRS_Total   -0.11   -0.07    0.05    0.07      0.15         0.24        0.17
## WAIS_EstIQ   -0.08    0.01    0.00   -0.06     -0.04        -0.17        0.02
## SPQ_D_Total   0.33   -0.30   -0.07   -0.06      0.85         0.75        0.54
##              BPRS_Total WAIS_EstIQ SPQ_D_Total
## SubID             -0.11      -0.08        0.33
## fac1rel           -0.07       0.01       -0.30
## fac2rel            0.05       0.00       -0.07
## fac3rel            0.07      -0.06       -0.06
## SPQ_Total          0.15      -0.04        0.85
## SPQ_CP_Total       0.24      -0.17        0.75
## SPQ_I_Total        0.17       0.02        0.54
## BPRS_Total         1.00      -0.45       -0.03
## WAIS_EstIQ        -0.45       1.00        0.04
## SPQ_D_Total       -0.03       0.04        1.00
## Sample Size
##              SubID fac1rel fac2rel fac3rel SPQ_Total SPQ_CP_Total SPQ_I_Total
## SubID           31      31      31      31        25           25          25
## fac1rel         31      31      31      31        25           25          25
```

```
## fac2rel         31      31      31      31        25           25          25
## fac3rel         31      31      31      31        25           25          25
## SPQ_Total       25      25      25      25        25           25          25
## SPQ_CP_Total    25      25      25      25        25           25          25
## SPQ_I_Total     25      25      25      25        25           25          25
## BPRS_Total      25      25      25      25        25           25          25
## WAIS_EstIQ      25      25      25      25        25           25          25
## SPQ_D_Total     25      25      25      25        25           25          25
##              BPRS_Total WAIS_EstIQ SPQ_D_Total
## SubID                25         25          25
## fac1rel              25         25          25
## fac2rel              25         25          25
## fac3rel              25         25          25
## SPQ_Total            25         25          25
## SPQ_CP_Total         25         25          25
## SPQ_I_Total          25         25          25
## BPRS_Total           25         25          25
## WAIS_EstIQ           25         25          25
## SPQ_D_Total          25         25          25
## Probability values (Entries above the diagonal are adjusted for multiple tests.)
##              SubID fac1rel fac2rel fac3rel SPQ_Total SPQ_CP_Total SPQ_I_Total
## SubID         0.00    1.00    1.00    1.00      1.00         1.00        1.00
## fac1rel       0.22    0.00    1.00    1.00      1.00         1.00        1.00
## fac2rel       0.67    0.35    0.00    1.00      1.00         1.00        1.00
## fac3rel       0.08    0.03    0.81    0.00      1.00         1.00        1.00
## SPQ_Total     0.93    0.23    0.98    0.87      0.00         0.00        0.00
## SPQ_CP_Total  0.77    0.05    0.34    0.92      0.00         0.00        0.27
## SPQ_I_Total   0.66    1.00    0.32    0.61      0.00         0.01        0.00
## BPRS_Total    0.60    0.74    0.83    0.73      0.47         0.26        0.42
## WAIS_EstIQ    0.70    0.96    0.99    0.78      0.84         0.43        0.91
## SPQ_D_Total   0.10    0.14    0.72    0.79      0.00         0.00        0.01
##              BPRS_Total WAIS_EstIQ SPQ_D_Total
## SubID              1.00       1.00        1.00
## fac1rel            1.00       1.00        1.00
## fac2rel            1.00       1.00        1.00
## fac3rel            1.00       1.00        1.00
## SPQ_Total          1.00       1.00        0.00
## SPQ_CP_Total       1.00       1.00        0.00
## SPQ_I_Total        1.00       1.00        0.23
## BPRS_Total         0.00       0.95        1.00
## WAIS_EstIQ         0.02       0.00        1.00
## SPQ_D_Total        0.88       0.87        0.00
##
##  To see confidence intervals of the correlations, print with the short=FALSE option
```

```
corr.test(allfac_scoressz_sx, use = "complete.obs", method = "pearson")
```

```
## Call:corr.test(x = allfac_scoressz_sx, use = "complete.obs", method = "pearson")
## Correlation matrix
##              SubID fac1sz fac2sz fac3sz SPQ_Total SPQ_CP_Total SPQ_I_Total
## SubID         1.00   0.06   0.14  -0.19      0.21         0.25        0.41
## fac1sz        0.06   1.00  -0.26   0.17     -0.08        -0.01        0.11
## fac2sz        0.14  -0.26   1.00   0.11      0.16         0.13        0.14
## fac3sz       -0.19   0.17   0.11   1.00      0.21         0.12       -0.10
## SPQ_Total     0.21  -0.08   0.16   0.21      1.00         0.83        0.65
## SPQ_CP_Total  0.25  -0.01   0.13   0.12      0.83         1.00        0.48
```

```
## SPQ_I_Total   0.41   0.11   0.14  -0.10      0.65         0.48        1.00
## BPRS_Total   -0.03   0.02  -0.11  -0.07      0.32         0.49        0.16
## WAIS_EstIQ   -0.18  -0.13  -0.17   0.11      0.24         0.13        0.00
## SPQ_D_Total   0.14   0.02   0.06   0.08      0.76         0.56        0.59
## SANS_Total   -0.22  -0.01  -0.02  -0.01      0.13         0.16        0.15
## SAPS_Total   -0.05   0.01  -0.18   0.06      0.35         0.53        0.10
##              BPRS_Total WAIS_EstIQ SPQ_D_Total SANS_Total SAPS_Total
## SubID             -0.03      -0.18        0.14      -0.22      -0.05
## fac1sz             0.02      -0.13        0.02      -0.01       0.01
## fac2sz            -0.11      -0.17        0.06      -0.02      -0.18
## fac3sz            -0.07       0.11        0.08      -0.01       0.06
## SPQ_Total          0.32       0.24        0.76       0.13       0.35
## SPQ_CP_Total       0.49       0.13        0.56       0.16       0.53
## SPQ_I_Total        0.16       0.00        0.59       0.15       0.10
## BPRS_Total         1.00       0.07        0.28       0.47       0.81
## WAIS_EstIQ         0.07       1.00        0.21      -0.20       0.14
## SPQ_D_Total        0.28       0.21        1.00       0.25       0.18
## SANS_Total         0.47      -0.20        0.25       1.00       0.36
## SAPS_Total         0.81       0.14        0.18       0.36       1.00
## Sample Size
##              SubID fac1sz fac2sz fac3sz SPQ_Total SPQ_CP_Total SPQ_I_Total
## SubID           64     64     64     64        56           56          56
## fac1sz          64     64     64     64        56           56          56
## fac2sz          64     64     64     64        56           56          56
## fac3sz          64     64     64     64        56           56          56
## SPQ_Total       56     56     56     56        56           56          56
## SPQ_CP_Total    56     56     56     56        56           56          56
## SPQ_I_Total     56     56     56     56        56           56          56
## BPRS_Total      63     63     63     63        55           55          55
## WAIS_EstIQ      62     62     62     62        54           54          54
## SPQ_D_Total     56     56     56     56        56           56          56
## SANS_Total      64     64     64     64        56           56          56
## SAPS_Total      64     64     64     64        56           56          56
##              BPRS_Total WAIS_EstIQ SPQ_D_Total SANS_Total SAPS_Total
## SubID                63         62          56         64         64
## fac1sz               63         62          56         64         64
## fac2sz               63         62          56         64         64
## fac3sz               63         62          56         64         64
## SPQ_Total            55         54          56         56         56
## SPQ_CP_Total         55         54          56         56         56
## SPQ_I_Total          55         54          56         56         56
## BPRS_Total           63         61          55         63         63
## WAIS_EstIQ           61         62          54         62         62
## SPQ_D_Total          55         54          56         56         56
## SANS_Total           63         62          56         64         64
## SAPS_Total           63         62          56         64         64
## Probability values (Entries above the diagonal are adjusted for multiple tests.)
##              SubID fac1sz fac2sz fac3sz SPQ_Total SPQ_CP_Total SPQ_I_Total
## SubID         0.00   1.00   1.00   1.00      1.00         1.00        0.11
## fac1sz        0.62   0.00   1.00   1.00      1.00         1.00        1.00
## fac2sz        0.27   0.04   0.00   1.00      1.00         1.00        1.00
## fac3sz        0.14   0.19   0.39   0.00      1.00         1.00        1.00
## SPQ_Total     0.12   0.57   0.24   0.12      0.00         0.00        0.00
## SPQ_CP_Total  0.06   0.95   0.34   0.37      0.00         0.00        0.01
## SPQ_I_Total   0.00   0.41   0.30   0.45      0.00         0.00        0.00
```

```
## BPRS_Total    0.80   0.87   0.38   0.58      0.02         0.00        0.26
## WAIS_EstIQ    0.16   0.32   0.18   0.40      0.08         0.34        0.98
## SPQ_D_Total   0.32   0.89   0.65   0.56      0.00         0.00        0.00
## SANS_Total    0.08   0.95   0.90   0.92      0.33         0.25        0.26
## SAPS_Total    0.68   0.93   0.15   0.65      0.01         0.00        0.45
##              BPRS_Total WAIS_EstIQ SPQ_D_Total SANS_Total SAPS_Total
## SubID              1.00       1.00        1.00       1.00       1.00
## fac1sz             1.00       1.00        1.00       1.00       1.00
## fac2sz             1.00       1.00        1.00       1.00       1.00
## fac3sz             1.00       1.00        1.00       1.00       1.00
## SPQ_Total          0.85       1.00        0.00       1.00       0.49
## SPQ_CP_Total       0.01       1.00        0.00       1.00       0.00
## SPQ_I_Total        1.00       1.00        0.00       1.00       1.00
## BPRS_Total         0.00       1.00        1.00       0.01       0.00
## WAIS_EstIQ         0.60       0.00        1.00       1.00       1.00
## SPQ_D_Total        0.04       0.13        0.00       1.00       1.00
## SANS_Total         0.00       0.11        0.06       0.00       0.18
## SAPS_Total         0.00       0.27        0.18       0.00       0.00
##
##  To see confidence intervals of the correlations, print with the short=FALSE option
```

```
corr.test(allfac_scoresbp_sx, use = "complete.obs", method = "pearson")
```

```
## Call:corr.test(x = allfac_scoresbp_sx, use = "complete.obs", method = "pearson")
## Correlation matrix
##              SubID fac1bp fac2bp fac3bp SPQ_Total SPQ_CP_Total SPQ_I_Total
## SubID         1.00  -0.26   0.11   0.07      0.20         0.09        0.24
## fac1bp       -0.26   1.00   0.07  -0.01      0.06         0.12        0.04
## fac2bp        0.11   0.07   1.00  -0.04      0.03        -0.04       -0.01
## fac3bp        0.07  -0.01  -0.04   1.00      0.29         0.28        0.29
## SPQ_Total     0.20   0.06   0.03   0.29      1.00         0.93        0.84
## SPQ_CP_Total  0.09   0.12  -0.04   0.28      0.93         1.00        0.70
## SPQ_I_Total   0.24   0.04  -0.01   0.29      0.84         0.70        1.00
## BPRS_Total   -0.21   0.36   0.00   0.24      0.28         0.42        0.22
## WAIS_EstIQ    0.34   0.04   0.08   0.13      0.13        -0.03        0.24
## SPQ_D_Total   0.33   0.06   0.18   0.25      0.81         0.75        0.67
## SANS_Total   -0.07   0.06  -0.22  -0.06     -0.14        -0.05       -0.09
## SAPS_Total   -0.25   0.19  -0.01   0.03     -0.13        -0.09       -0.05
##              BPRS_Total WAIS_EstIQ SPQ_D_Total SANS_Total SAPS_Total
## SubID             -0.21       0.34        0.33      -0.07      -0.25
## fac1bp             0.36       0.04        0.06       0.06       0.19
## fac2bp             0.00       0.08        0.18      -0.22      -0.01
## fac3bp             0.24       0.13        0.25      -0.06       0.03
## SPQ_Total          0.28       0.13        0.81      -0.14      -0.13
## SPQ_CP_Total       0.42      -0.03        0.75      -0.05      -0.09
## SPQ_I_Total        0.22       0.24        0.67      -0.09      -0.05
## BPRS_Total         1.00      -0.38        0.26       0.36       0.56
## WAIS_EstIQ        -0.38       1.00        0.24      -0.24      -0.21
## SPQ_D_Total        0.26       0.24        1.00      -0.06      -0.01
## SANS_Total         0.36      -0.24       -0.06       1.00       0.63
## SAPS_Total         0.56      -0.21       -0.01       0.63       1.00
## Sample Size
##              SubID fac1bp fac2bp fac3bp SPQ_Total SPQ_CP_Total SPQ_I_Total
## SubID           46     46     46     46        42           42          42
## fac1bp          46     46     46     46        42           42          42
## fac2bp          46     46     46     46        42           42          42
```

```
## fac3bp          46     46     46     46        42           42          42
## SPQ_Total       42     42     42     42        42           42          42
## SPQ_CP_Total    42     42     42     42        42           42          42
## SPQ_I_Total     42     42     42     42        42           42          42
## BPRS_Total      46     46     46     46        42           42          42
## WAIS_EstIQ      44     44     44     44        40           40          40
## SPQ_D_Total     42     42     42     42        42           42          42
## SANS_Total      44     44     44     44        40           40          40
## SAPS_Total      44     44     44     44        40           40          40
##              BPRS_Total WAIS_EstIQ SPQ_D_Total SANS_Total SAPS_Total
## SubID                46         44          42         44         44
## fac1bp               46         44          42         44         44
## fac2bp               46         44          42         44         44
## fac3bp               46         44          42         44         44
## SPQ_Total            42         40          42         40         40
## SPQ_CP_Total         42         40          42         40         40
## SPQ_I_Total          42         40          42         40         40
## BPRS_Total           46         44          42         44         44
## WAIS_EstIQ           44         44          40         42         42
## SPQ_D_Total          42         40          42         40         40
## SANS_Total           44         42          40         44         44
## SAPS_Total           44         42          40         44         44
## Probability values (Entries above the diagonal are adjusted for multiple tests.)
##              SubID fac1bp fac2bp fac3bp SPQ_Total SPQ_CP_Total SPQ_I_Total
## SubID         0.00   1.00   1.00   1.00      1.00         1.00        1.00
## fac1bp        0.08   0.00   1.00   1.00      1.00         1.00        1.00
## fac2bp        0.48   0.64   0.00   1.00      1.00         1.00        1.00
## fac3bp        0.65   0.92   0.78   0.00      1.00         1.00        1.00
## SPQ_Total     0.19   0.71   0.83   0.06      0.00         0.00        0.00
## SPQ_CP_Total  0.57   0.46   0.82   0.07      0.00         0.00        0.00
## SPQ_I_Total   0.12   0.80   0.94   0.06      0.00         0.00        0.00
## BPRS_Total    0.16   0.01   0.98   0.10      0.07         0.01        0.15
## WAIS_EstIQ    0.02   0.81   0.61   0.40      0.43         0.86        0.14
## SPQ_D_Total   0.03   0.68   0.27   0.11      0.00         0.00        0.00
## SANS_Total    0.67   0.72   0.16   0.69      0.39         0.75        0.58
## SAPS_Total    0.10   0.21   0.93   0.85      0.42         0.59        0.77
##              BPRS_Total WAIS_EstIQ SPQ_D_Total SANS_Total SAPS_Total
## SubID              1.00       1.00        1.00       1.00          1
## fac1bp             0.74       1.00        1.00       1.00          1
## fac2bp             1.00       1.00        1.00       1.00          1
## fac3bp             1.00       1.00        1.00       1.00          1
## SPQ_Total          1.00       1.00        0.00       1.00          1
## SPQ_CP_Total       0.32       1.00        0.00       1.00          1
## SPQ_I_Total        1.00       1.00        0.00       1.00          1
## BPRS_Total         0.00       0.62        1.00       0.91          0
## WAIS_EstIQ         0.01       0.00        1.00       1.00          1
## SPQ_D_Total        0.10       0.14        0.00       1.00          1
## SANS_Total         0.02       0.13        0.70       0.00          0
## SAPS_Total         0.00       0.19        0.93       0.00          0
##
##  To see confidence intervals of the correlations, print with the short=FALSE option
```