

Study 2 Analysis R Code (Final)

This document provides the R Code for:

- Reading the experimental data set for Study 2
- Generating the Random Effects Matrix
- Evaluating the experimental data by a linear mixed-effects model
- Displaying analytic plots of the mixed-effects model
- Evaluating R-squared, Marginal R-squared and Conditional R-squared for the mixed-effects model

NOTES:

- The required experimental dataset (Study2Data) is available <https://drive.google.com/open?id=1vGqSMbXr8vWLz3Ex94lyPPrGVKdvXLI> in the document entitled "Study2Data.csv."
- All lines beginning with "#" character are ignored by the R console and may be pasted directly in the console with functional lines of code.
- This code was prepared and implemented in R version 3.6.1 (2019-07-05)
- A working file path is required to read the CSV file for Study 2 Data unless the file is stored in the user's R working directory.
- See R project for details at <https://www.r-project.org/>.

```
### READ DATA
```

```
Study2Data<-read.csv("Insert Working File Path")
```

```
### COMPLETE DATA SET ADJUSTMENTS
```

```
Study2Data<-Study2Data[1:182,] # THIS ELIMINATES AN EMPTY ROW OF DATA
```

```
## THESE COMMANDS RESCALE DATA WITH SCALARS FROM STUDY 1 FACTOR DISTRIBUTIONS
```

```
Study2Data$SubjPsychFix<-Study2Data$SubjPsychFix*1.003629
```

```
Study2Data$SubjExtravFix<-Study2Data$SubjExtravFix*1.174861
```

```
Study2Data$SubjNeuroFix<-Study2Data$SubjNeuroFix*0.9528059
```

```
#RENAME DATA SET
```

```
Study2Dataredux<-Study2Data
```

```
# INSPECT DATA
```

```
summary(Study2Dataredux) # REPORTS THE R SUMMARY OF Study2Dataredux
```

```

#### ESTABLISH MATRIX OF TOTAL RUNS AND NUMBERED SUBJECT RUNS
SubjCount<-max(Study2Dataredux$SUBJECT) # READS THE NUMBER OF SUBJECTS
RunTotal<-dim(Study2Dataredux)[1] # READS THE TOTAL NUMBER OF EXPERIMENTAL RUNS
RunTotal # REPORTS THE NUMBER OF EXPERIMENTAL RUNS

RunCountMatrix <-matrix(nrow=dim(Study2Dataredux)[1],ncol = 1, byrow = TRUE,
    dimnames=list(c(1:RunTotal),"SubjRun")) ## CREATES FIRST REQUIRED MATRIX

# THIS LOOP CREATES RECORDS NUMBERED RUNS BY SUBJECT
# NOTE THAT EACH SUBJECT HAD BETWEEN 3 AND 13 RUNS
iSubjRun<-RunCountMatrix[1]<-1
for (i in 2:RunTotal-1)
    {
    RunCountMatrix[i]<-iSubjRun
    if(Study2Dataredux$SUBJECT[i]==Study2Dataredux$SUBJECT[i+1])
        {
        iSubjRun<-iSubjRun+1
        }
    else
        {
        iSubjRun<-1
        }
    }
RunCountMatrix[RunTotal]<-RunCountMatrix[i]+1

RunCountMatrix # REPORTS NUMBERED RUNS BY SUBJECT

#### ESTABLISH FIXED FACTOR DESIGN MATRIX (X MATRIX)

# THIS MATRIX IS NOT IMPLEMENTABLE AS IS FOR THIS EXPERIMENT BECAUSE SUBJECT PERSONALITY

```

```
# DATA IS PLANNED FOR IMPUTATION AS FIXED PERSONALITY FACTORS (COLUMNS 1 THROUGH 3) FOR  
# SCENARIOS 0A, 1B, 2B, 3B, 4B, 5B, 6B AND 7B
```

```
# NOTE THAT COLUMNS 1 THROUGH 3 ARE SET TO ZERO AS PLACEHOLDER VALUES FOR SCENARIOS  
# 0A, 1B, 2B, 3B, 4B, 5B, 6B AND 7B PERSONALITY FACTORS
```

```
# COLUMNS 1 THROUGH 3 WILL BE IGNORED BY THE XZ GENERATION LOOP BELOW
```

```
ExpDesignFactors<-c(0,0,0,0,0,0, # Run Version 1 // 0A
```

```
1,-1,1,-0.3333333333,1,-0.5, # Run Version 2 // 1A
```

```
0,0,0,-0.3333333333,1,-0.5, # Run Version 3 //1B
```

```
0,0,0,-0.3333333333,0,1, # Run Version 4 // 2A
```

```
0,0,0,-0.3333333333,0,1, # Run Version 5 // 2B
```

```
0,0.5,-0.5,-0.3333333333,0,-0.5,# Run Version 6 // 3A
```

```
0,0,0,-0.3333333333,0,-0.5,# Run Version 7 // 3B
```

```
1,0.5,0.5,0,1,-1, # Run Version 8 // 4A
```

```
0,0,0,0,1,-1, # Run Version 9 // 4B
```

```
1,1,-1,1,-1,1, # Run Version 10 // 5A
```

```
0,0,0,1,-1,1, # Run Version 11 // 5B
```

```
0,0,-0.5,-0.6666666667,-1,0, # Run Version 12 // 6A
```

```
0,0,0,-0.6666666667,-1,0) # Run Version 13 // 6B
```

```
# ASSIGN COLUMN AND ROW NAMES FOR X MATRIX
```

```
# AND READ DATA FROM ExpDesignFactors
```

```
DesignMatrix <-matrix(data = ExpDesignFactors, ncol = 6, nrow = 13, byrow = TRUE,
```

```
  dimnames =
```

```
list(c("0A","1A","1B","2A","2B","3A","3B","4A","4B","5A","5B","6A","6B"),c("Psycho","Extrav","Neuro",  
EnvStim","ProStruc","SocComp")))
```

```
ExpDesignFactors # REPORTS X MATRIX
```

```
### ESTABLISH FIXED // RANDOM EFFECTS MATRIX (XZ MATRIX)
```

```
# ASSIGN COLUMN AND ROW NAMES FOR XZ MATRIX
```

```
XZMatrix<-matrix(nrow=dim(Study2Dataredux)[1],ncol = 7, byrow = TRUE,
```

```
  dimnames=list(c(1:RunTotal),c("Intercept","P","E","N","C","S","G")))
```

```
#POPULATE XZ MATRIX VALUES
```

```
XZMatrix[,1]<-1 # SETS FIRST COLUMN OF XZ MATRIX AT 1 FOR THE INTERCEPT COEFFICIENT
```

```
# THIS LOOP READS RANDOM DATA AND FIXED FACTOR DATA INTO XZ MATRIC COLUMNS 2 THROUGH 7
```

```
# COLUMNS 5 THROUGH 7 DEPEND ONLY ON SCENARIO
```

```
# FOR SCENARIOS 0A, 1B, 2B, 3B, 4B, 5B, 6B AND 7B, COLUMNS 2 THROUGH 4 DEPEND ON SCENARIO
```

```
# AND SUBJECT PERSONALITY DATA (SubjPsychFix, SubjExtravFix and SubjNeuroFix)
```

```
# FOR ALL OTHER SCENARIOS, COLUMNS 2 THROUGH 4 DEPEND ONLY ON SCENARIO
```

```
for (i in 1:RunTotal)
```

```
{
```

```
  if(Study2Dataredux$SCENARIO[i]=="0A")
```

```
    {
```

```
      XZMatrix[i,2]<-Study2Dataredux[i,28]
```

```
      XZMatrix[i,3]<-Study2Dataredux[i,29]
```

```
      XZMatrix[i,4]<-Study2Dataredux[i,30]
```

```
      XZMatrix[i,5:7]<-DesignMatrix[1,4:6]
```

```
    }
```

```
  else if (Study2Dataredux$SCENARIO[i]=="1A")
```

```
    {
```

```
      XZMatrix[i,2:7]<-DesignMatrix[2,1:6]
```

```
    }
```

```
  else if (Study2Dataredux$SCENARIO[i]=="1B")
```

```
    {
```

```
      XZMatrix[i,2]<-Study2Dataredux[i,28]
```

```
      XZMatrix[i,3]<-Study2Dataredux[i,29]
```

```
      XZMatrix[i,4]<-Study2Dataredux[i,30]
```

```
      XZMatrix[i,5:7]<-DesignMatrix[3,4:6]
```

```
    }
```

```
  else if (Study2Dataredux$SCENARIO[i]=="2A")
```

```
    {
```

```

        XZMatrix[i,2:7]<-DesignMatrix[4,1:6]
    }
else if (Study2Dataredux$SCENARIO[i]=="2B")
    {
        XZMatrix[i,2]<-Study2Dataredux[i,28]
        XZMatrix[i,3]<-Study2Dataredux[i,29]
        XZMatrix[i,4]<-Study2Dataredux[i,30]
        XZMatrix[i,5:7]<-DesignMatrix[5,4:6]
    }
else if (Study2Dataredux$SCENARIO[i]=="3A")
    {
        XZMatrix[i,2:7]<-DesignMatrix[6,1:6]
    }
else if (Study2Dataredux$SCENARIO[i]=="3B")
    {
        XZMatrix[i,2]<-Study2Dataredux[i,28]
        XZMatrix[i,3]<-Study2Dataredux[i,29]
        XZMatrix[i,4]<-Study2Dataredux[i,30]
        XZMatrix[i,5:7]<-DesignMatrix[7,4:6]
    }
else if (Study2Dataredux$SCENARIO[i]=="4A")
    {
        XZMatrix[i,2:7]<-DesignMatrix[8,1:6]
    }
else if (Study2Dataredux$SCENARIO[i]=="4B")
    {
        XZMatrix[i,2]<-Study2Dataredux[i,28]
        XZMatrix[i,3]<-Study2Dataredux[i,29]
        XZMatrix[i,4]<-Study2Dataredux[i,30]
        XZMatrix[i,5:7]<-DesignMatrix[9,4:6]
    }
else if (Study2Dataredux$SCENARIO[i]=="5A")
    {

```

```

        XZMatrix[i,2:7]<-DesignMatrix[10,1:6]
    }
else if (Study2Dataredux$SCENARIO[i]=="5B")
    {
        XZMatrix[i,2]<-Study2Dataredux[i,28]
        XZMatrix[i,3]<-Study2Dataredux[i,29]
        XZMatrix[i,4]<-Study2Dataredux[i,30]
        XZMatrix[i,5:7]<-DesignMatrix[11,4:6]
    }
else if (Study2Dataredux$SCENARIO[i]=="6A")
    {
        XZMatrix[i,2:7]<-DesignMatrix[12,1:6]
    }
else
    {
        XZMatrix[i,2]<-Study2Dataredux[i,28]
        XZMatrix[i,3]<-Study2Dataredux[i,29]
        XZMatrix[i,4]<-Study2Dataredux[i,30]
        XZMatrix[i,5:7]<-DesignMatrix[13,4:6]
    }
}

XZMatrix # REPORTS XZMatrix
summary(XZMatrix) # REPORTS R SUMMARY OF XZMatrix

## CREATE SINGLE MATRIX TO SUPPORT ANALYSIS INCLUDING NUMBERED RUNS BY
# SUBJECT, ALL EXPERIMENTAL DATA AND THE XZ MATRIX

Study2Completeredux<-cbind(RunCountMatrix,Study2Dataredux,XZMatrix)
summary(Study2Completeredux) # REPORTS R SUMMARY OF Study2Completeredux

## RENAME DATA VECTORS TO MORE EFFICIENT NAMES FOR CODING
Dx<-Study2Completeredux$DxEffect
P<-Study2Completeredux$P

```

```
E<-Study2Completeredux$E
N<-Study2Completeredux$N
C<-Study2Completeredux$C
S<-Study2Completeredux$S
G<-Study2Completeredux$G
Subj<-Study2Completeredux$SUBJECT
Vers<-Study2Completeredux$VERSION
AGE<-Study2Completeredux$AGE
SubjPsychFix<-Study2Completeredux$SubjPsychFix
SubjExtravFix<-Study2Completeredux$SubjExtravFix
SubjNeuroFix<-Study2Completeredux$SubjNeuroFix
DXEXPLVL<-Study2Completeredux$DXEXPLVL
PERSKNOWLVL<-Study2Completeredux$PERSKNOWLVL
SPTEXPLVL<-Study2Completeredux$SPTEXPLVL
ProcCntrl<-Study2Completeredux$ProcCntrl
EnvCtrl<-Study2Completeredux$EnvCtrl
GrpCtrl<-Study2Completeredux$GrpCtrl
```

```
## INITIATE R PACKAGES FOR MODELLING AND ANALYSIS
```

```
library(lme4)
```

```
library(MuMIn)
```

```
library(psych)
```

```
library(miscTools)
```

```
### IMPLEMENT MIXED MODEL ANALYSIS WITH 2 RANDOM EFFECTS (Subj AND SubjPsychFix),
```

```
# 6 FIXED EFFECTS, 8 FIRST-LEVEL INTERACTIONS AND 3 SECOND-LEVEL INTERACTIONS
```

```
# CURRENT MODEL DOES NOT TRANSFORM RESPONSE OR PREDICTORS
```

```
# RESPONSE IS RE-CENTERED ON ZERO
```

```
Study2Modelmixedredux<-lmer((DxEffect-3)^(1/1)~
```

```
(1|Subj) # Random Effect
```

```
+P+E+N+C+S+G
+P*C
+P*S
+P*G
+E*C
+E*G
+N*C
+N*G
+C*G
+P*C*G
+E*C*G
+N*C*G
+(1|SubjPsychFix)
#+(1|SubjExtravFix) # REMOVED DUE TO OVERFIT
#+(1|SubjNeuroFix) # REMOVED DUE TO OVERFIT
#+E*(1|SubjExtravFix) # REMOVED DUE TO OVERFIT
#+N*(1|SubjNeuroFix) # REMOVED DUE TO OVERFIT
#+P*(1|SubjPsychFix) # REMOVED DUE TO OVERFIT
#+(1|SCENARIO) # REMOVED DUE TO OVERFIT
,data=Study2Completeredux)
```

REPORT RESULTS

```
summary(Study2Modelmixedredux) # REPORTS R SUMMARY OF Study2Modelmixedredux
plot(Study2Modelmixedredux) # PROVIDES ANALYTIC PLOTS R SUMMARY OF Study2Modelmixedredux
rSquared(Dx,residuals(Study2Modelmixedredux)) # REPORTS NAL R SQUARED
r.squaredGLMM(Study2Modelmixedredux) # REPORTS MARGINAL AND CONDITIONAL R SQUARED
```