Chap13

Anjali Krishnan and Richard Troise

```
library(xtable)
library(gmodels)
```

We collect the data for each subjects for all levels of Factor A and Factor B for each subject.

First, set working directory. 'data' is a table with two columns and same number of rows, and should be numeric. Columns have headers indicating the names of the variables. **User will also input desired variable names in double quotes**

```
data <- read.csv("chap13.csv", header = FALSE, skip = 1)
colnames(data) <- c("b1", "b2")
```

We now combine the observations into one long column (score)

```
colnames(data) <- c("V1", "V2")
score=c(data$V1,data$V2)
```

We now prepare the labels for the 4x5 scores according to the factor levels: a1 a2, a1 a2.....etc for Factor A

```
Age=gl(2,5*1,5*4*1, labels=c("a1","a2"))
```

b1 b2, b1 b2..... etc for Factor B

```
Phono_Sim=gl(2,2*5*1,5*4*1,labels=c("b1","b2"))
```

sub_1 sub_1....., sub_2 sub_2.....,sub_3 sub_3 ....,sub_4 sub_4 ....., sub_5 sub_5....etc for Subjects

```
Subject=gl(10,1,5*4*1, labels = c("sub_1", "sub_2", "sub_3",
                                  "sub_4", "sub_5", "sub_6", "sub_7", "sub_8", "sub_9",
                                  "sub_10"))
```

We now form a data frame with the dependent variable and the factors, then we print the data

```
data = data.frame(score = score, Age = factor(Age), Phono_Sim =
                    factor(Phono_Sim), Subject=factor(Subject))
knitr::kable(xtable(data))
```

score	Age	Phono_Sim	Subject
15	a1	b1	sub_1
23	a1	b1	sub_2
12	a1	b1	sub_3
16	a1	b1	sub_4
14	a1	b1	sub_5
39	a2	b1	sub_6
31	a2	b1	sub_7
40	a2	b1	sub_8
32	a2	b1	sub_9

score	Age	Phono_Sim	Subject
38	a2	b1	sub_10
13	a1	b2	sub_1
19	a1	b2	sub_2
10	a1	b2	sub_3
16	a1	b2	sub_4
12	a1	b2	sub_5
29	a2	b2	sub_6
15	a2	b2	sub_7
30	a2	b2	sub_8
26	a2	b2	sub_9
30	a2	b2	sub_10

We now perform an anova when "Subject" is considered as a random factor.

```
aov1 = aov(score ~ (Age * Phono_Sim) + Error(Subject / (Age *
                                                    Phono_Sim) + Age), data=data)
```

```
## Warning in aov(score ~ (Age * Phono_Sim) + Error(Subject/(Age * Phono_Sim) + :
## Error() model is singular
```

We now print the results

```
summary(aov1)
```

```
##
## Error: Subject
##           Df Sum Sq Mean Sq F value   Pr(>F)
## Age        1   1280    1280      32 0.000478 ***
## Residuals  8    320      40
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Error: Subject:Phono_Sim
##               Df Sum Sq Mean Sq F value   Pr(>F)
## Phono_Sim      1    180     180      45 0.000151 ***
## Age:Phono_Sim  1     80      80      20 0.002077 **
## Residuals      8     32       4
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
print(model.tables(aov(score ~ Age * Phono_Sim * Subject, data
                       = data), "means"), digits = 3)
```

```
## Tables of means
## Grand mean
##
## 23
##
##  Age
## Age
## a1 a2
## 15 31
##
##  Phono_Sim
```

```
## Phono_Sim
## b1 b2
## 26 20
##
##  Subject
## Subject
##  sub_1  sub_2  sub_3  sub_4  sub_5  sub_6  sub_7  sub_8  sub_9 sub_10
##     22     29     19     24     21     26     15     27     21     26
##
##  Age:Phono_Sim
##     Phono_Sim
## Age  b1 b2
##   a1 16 14
##   a2 36 26
##
##  Phono_Sim:Subject
##          Subject
## Phono_Sim sub_1 sub_2 sub_3 sub_4 sub_5 sub_6 sub_7 sub_8 sub_9 sub_10
##        b1 25    33    22    26    24    29    21    30    22    28
##        b2 19    25    16    22    18    23     9    24    20    24
```