

OSC_Data_Analysis

Aarthi Ravi

18/06/2021

```
require("knitr")
```

```
## Loading required package: knitr
```

```
knitr::opts_chunk$set(echo = TRUE)
knitr::opts_chunk$set(tidy.opts=list(width.cutoff=50),tidy=TRUE)

library(data.table)
library(tidyverse)
```

```
## -- Attaching packages ----- tidyverse 1.3.0 --
```

```
## v ggplot2 3.3.3    v purrr  0.3.4
## v tibble  3.1.0    v dplyr  1.0.5
## v tidyr   1.1.3    v stringr 1.4.0
## v readr   1.4.0    v forcats 0.5.1
```

```
## -- Conflicts ----- tidyverse_conflicts() --
```

```
## x dplyr::between() masks data.table::between()
## x dplyr::filter()  masks stats::filter()
## x dplyr::first()   masks data.table::first()
## x dplyr::lag()     masks stats::lag()
## x dplyr::last()    masks data.table::last()
## x purrr::transpose() masks data.table::transpose()
```

```
library(magrittr)
```

```
##
```

```
## Attaching package: 'magrittr'
```

```
## The following object is masked from 'package:purrr':
```

```
##
```

```
##      set_names
```

```
## The following object is masked from 'package:tidyr':
```

```
##
```

```
##      extract
```

```
library(car)
```

```
## Loading required package: carData

##
## Attaching package: 'car'

## The following object is masked from 'package:dplyr':
##
##      recode

## The following object is masked from 'package:purrr':
##
##      some
```

```
library(gridExtra)
```

```
##
## Attaching package: 'gridExtra'

## The following object is masked from 'package:dplyr':
##
##      combine
```

```
library(psych)
```

```
##
## Attaching package: 'psych'

## The following object is masked from 'package:car':
##
##      logit

## The following objects are masked from 'package:ggplot2':
##
##      %+%, alpha
```

```
library(ggplot2)
library(multcomp)
```

```
## Warning: package 'multcomp' was built under R version 4.0.5

## Loading required package: mvtnorm

## Warning: package 'mvtnorm' was built under R version 4.0.5

## Loading required package: survival
```

```

## Loading required package: TH.data

## Warning: package 'TH.data' was built under R version 4.0.5

## Loading required package: MASS

##
## Attaching package: 'MASS'

## The following object is masked from 'package:dplyr':
##
##     select

##
## Attaching package: 'TH.data'

## The following object is masked from 'package:MASS':
##
##     geyser

library(plotly)

## Warning: package 'plotly' was built under R version 4.0.5

##
## Attaching package: 'plotly'

## The following object is masked from 'package:MASS':
##
##     select

## The following object is masked from 'package:ggplot2':
##
##     last_plot

## The following object is masked from 'package:stats':
##
##     filter

## The following object is masked from 'package:graphics':
##
##     layout

library(apaTables)

## Warning: package 'apaTables' was built under R version 4.0.5

```

```
library(dplyr)
```

Import Datasets - Full data and Data of correct trials only

```
data <- read.csv ("OSC_cleaned.csv")
data_ct <- read.csv ("OSC_cleaned_ct.csv")
```

Descriptives/ Preliminary Analyses

```
data1 <- select (data, ID, AGE, BIRTH_EXP, DIS, REAC_TIME, ACCURACY)
head (data1)
```

```
##   ID AGE BIRTH_EXP DIS REAC_TIME  ACCURACY
## 1  1  11          V  N 0.5485308 0.06299213
## 2  2  15          V  N 0.9695677 0.74803150
## 3  4  12          C  N 0.4761383 0.71666667
## 4  5   8          V  N 0.6655731 0.61403509
## 5  6  11          V  N 0.7001154 0.73437500
## 6  8  11          C  Y 0.4832422 0.58730159
```

```
summary (data1)
```

```
##           ID           AGE           BIRTH_EXP           DIS
## Min.      : 1.0      Min.      : 6.00      Length:311      Length:311
## 1st Qu.: 86.5      1st Qu.: 8.00      Class :character    Class :character
## Median :173.0      Median :10.00      Mode  :character    Mode  :character
## Mean     :182.9      Mean     :10.04
## 3rd Qu.:283.5      3rd Qu.:11.00
## Max.     :367.0      Max.     :16.00
## REAC_TIME      ACCURACY
## Min.      :0.3217      Min.      :0.06299
## 1st Qu.:0.5650      1st Qu.:0.65376
## Median :0.6955      Median :0.80469
## Mean     :0.7440      Mean     :0.77888
## 3rd Qu.:0.8836      3rd Qu.:0.91560
## Max.     :1.5945      Max.     :1.00000
```

```
describe (data1)
```

```
##           vars    n   mean    sd median trimmed   mad min   max range
## ID              1 311 182.91 109.76 173.0 182.30 146.78 1.00 367.00 366.00
## AGE              2 311 10.04  2.21  10.0  9.93  1.48 6.00 16.00 10.00
## BIRTH_EXP*       3 311  1.76  0.43   2.0  1.82  0.00 1.00  2.00  1.00
## DIS*             4 311  1.12  0.32   1.0  1.02  0.00 1.00  2.00  1.00
## REAC_TIME        5 311  0.74  0.24   0.7  0.72  0.22 0.32  1.59  1.27
## ACCURACY         6 311  0.78  0.16   0.8  0.79  0.17 0.06  1.00  0.94
```

```
##           skew kurtosis   se
## ID           0.07    -1.30 6.22
## AGE           0.44    -0.13 0.13
## BIRTH_EXP* -1.20    -0.55 0.02
## DIS*          2.39     3.73 0.02
## REAC_TIME     1.06     1.05 0.01
## ACCURACY     -0.83     0.63 0.01
```

Table : Number of Participants in each Group

Age_Group1 (6 to 8 yrs)	Age_Group2 (9 to 11 yrs)	Age_Group3 (12< yrs)	C- Vaginally_bornsec_born	Gen_dis
83	161	67	236	75
				36

Descriptives/ Preliminary Analyses Correct Trials

```
data2 <- select (data_ct, ID, AGE, BIRTH_EXP, DIS, REAC_TIME)
head (data2)
```

```
##   ID AGE BIRTH_EXP DIS REAC_TIME
## 1  1  11          V  N 0.4091609
## 2  2  15          V  N 0.9156219
## 3  4  12          C  N 0.5059130
## 4  5   8          V  N 0.6592565
## 5  6  11          V  N 0.7371474
## 6  8  11          C  Y 0.5288869
```

```
summary (data2)
```

```
##           ID           AGE           BIRTH_EXP           DIS
## Min.      : 1.0    Min.      : 6.00    Length:311    Length:311
## 1st Qu.: 86.5    1st Qu.: 8.00    Class :character    Class :character
## Median :173.0    Median :10.00    Mode  :character    Mode  :character
## Mean     :182.9    Mean     :10.04
## 3rd Qu.:283.5    3rd Qu.:11.00
## Max.     :367.0    Max.     :16.00
## REAC_TIME
## Min.      :0.3246
## 1st Qu.:0.5860
## Median :0.7149
## Mean     :0.7604
## 3rd Qu.:0.8992
## Max.     :1.5940
```

```
describe (data2)
```

```
##           vars    n    mean    sd median trimmed    mad min    max range
```

```
## ID          1 311 182.91 109.76 173.00 182.30 146.78 1.00 367.00 366.00
## AGE         2 311  10.04   2.21  10.00   9.93   1.48 6.00  16.00  10.00
## BIRTH_EXP*  3 311   1.76   0.43   2.00   1.82   0.00 1.00   2.00   1.00
## DIS*        4 311   1.12   0.32   1.00   1.02   0.00 1.00   2.00   1.00
## REAC_TIME   5 311   0.76   0.23   0.71   0.74   0.22 0.32   1.59   1.27
##              skew kurtosis   se
## ID          0.07    -1.30 6.22
## AGE          0.44    -0.13 0.13
## BIRTH_EXP* -1.20    -0.55 0.02
## DIS*        2.39     3.73 0.02
## REAC_TIME   0.99     0.91 0.01
```

Table : Number of Participants in Each Age Group and their Birth Experience

```
table(data1$BIRTH_EXP,data1$AGE_GROUPS)
```

```
##
##      1   2   3
## C  20  40  15
## V  63 121  52
```

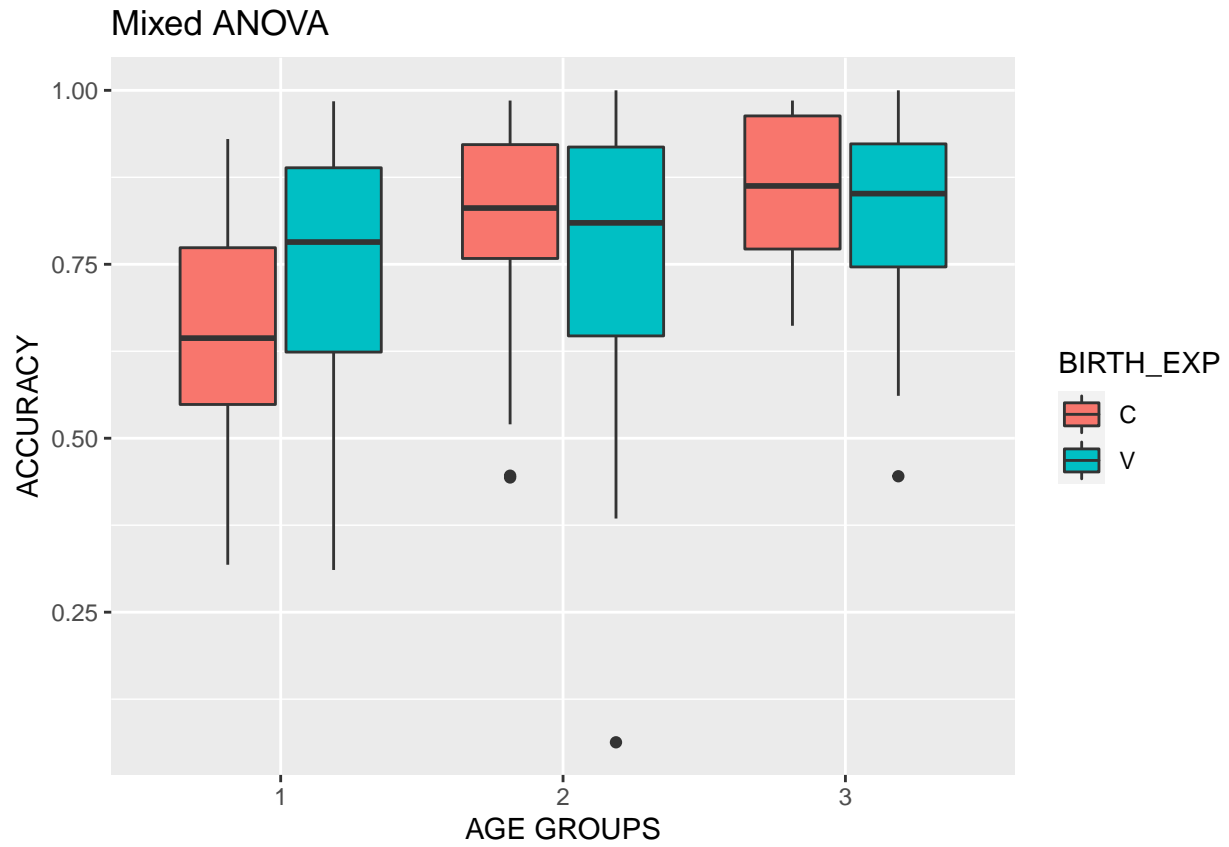
Table : Number of Participants with Disability and their Birth Experience

```
table(data1$BIRTH_EXP,data1$DIS)
```

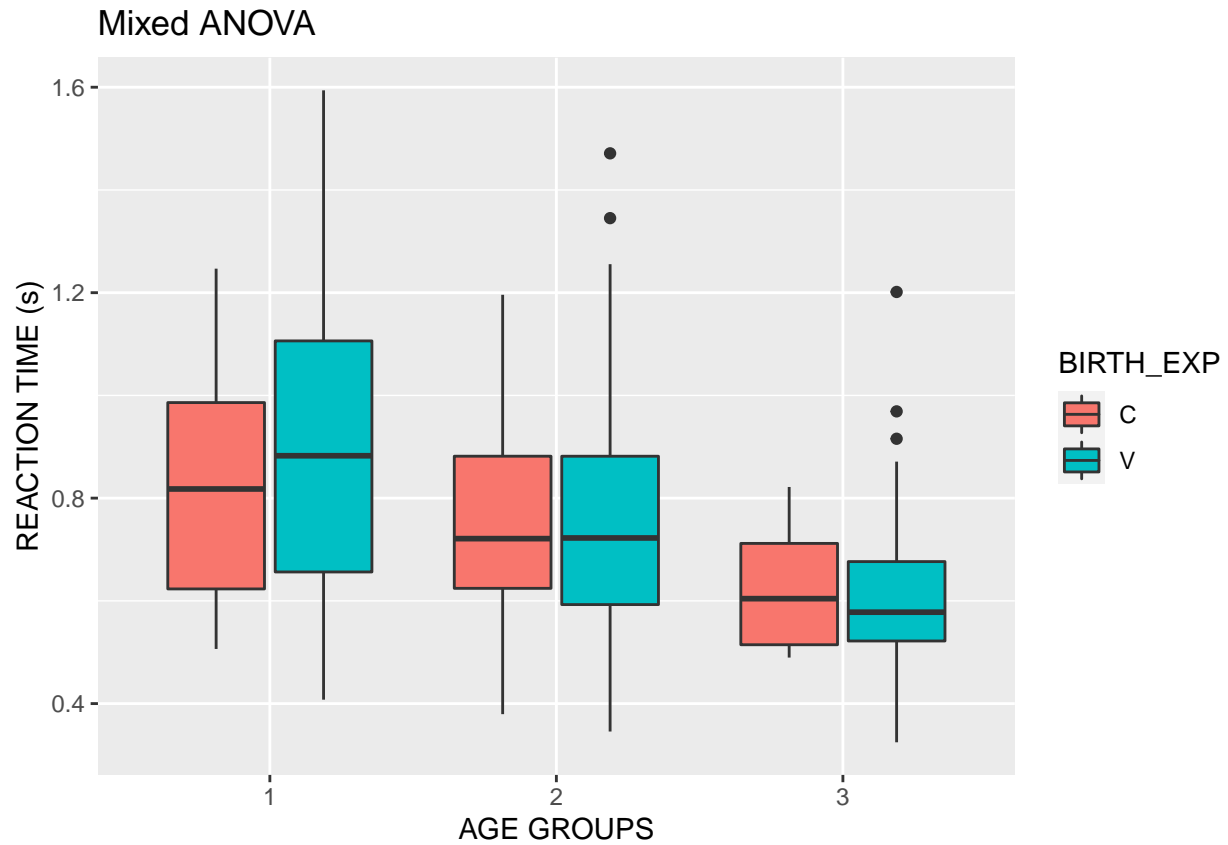
```
##
##      N   Y
## C   67   8
## V  208  28
```

Data Distribution Plots

```
# Boxplot for Accuracy in Trials and Birth Experience
qplot(AGE_GROUPS, ACCURACY, data=data1, fill = BIRTH_EXP, geom = 'boxplot', main = "Mixed ANOVA", xlab = "Age Groups", ylab = "Accuracy")
```

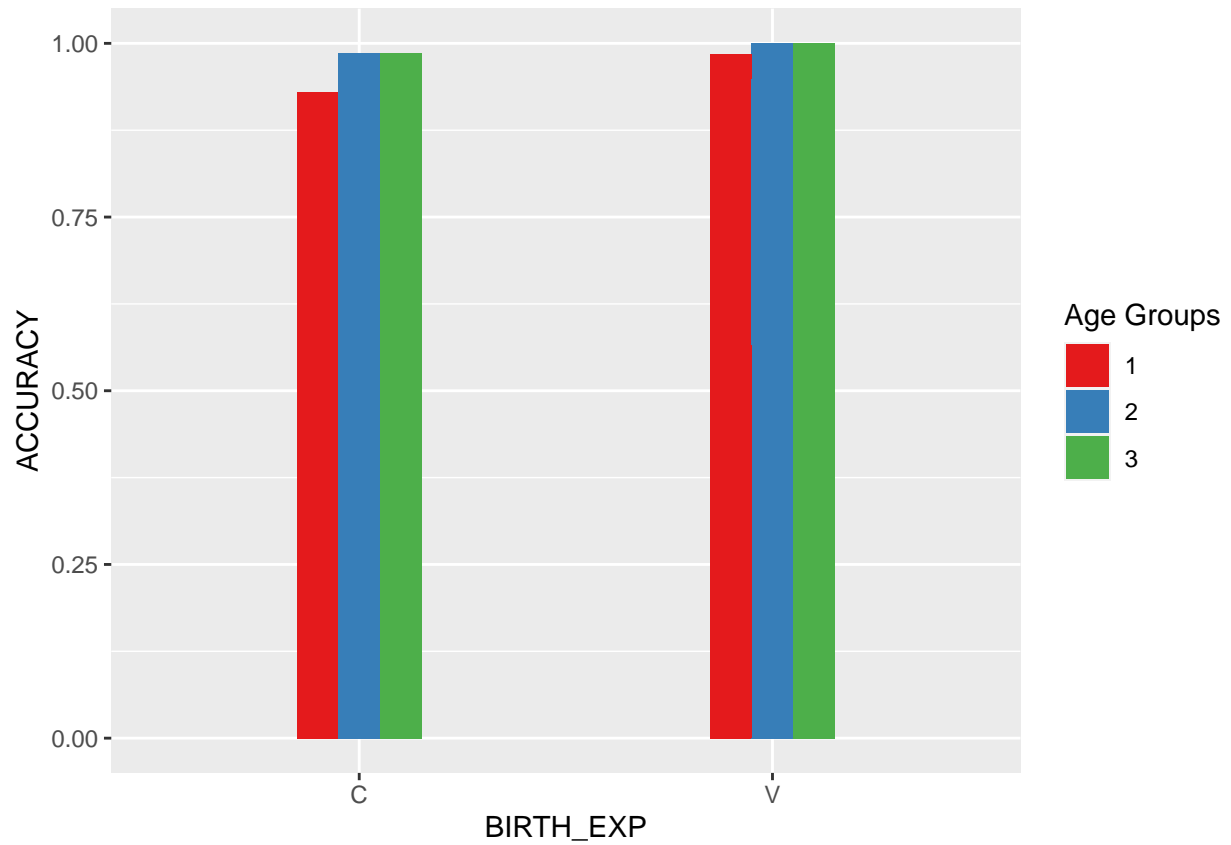


```
# Boxplot for Reaction Time in Correct Trials and Birth Experience
qplot(AGE_GROUPS, REAC_TIME, data=data2, fill = BIRTH_EXP, geom = 'boxplot', main = "Mixed ANOVA", xlab = "AGE GROUPS", ylab = "REAC_TIME")
```

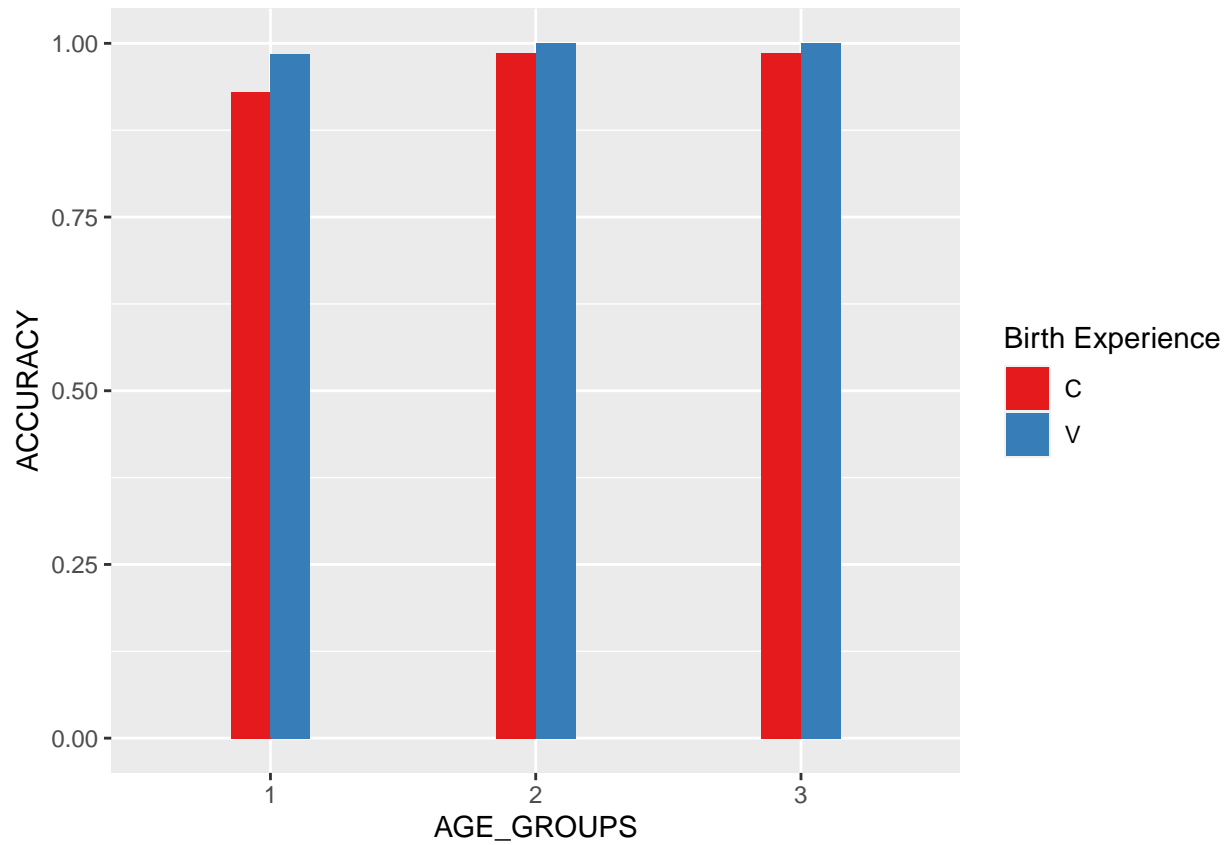


Bar Graph Accuracy vs Age-Groups

```
ggplot(data1, aes(BIRTH_EXP, ACCURACY, fill = AGE_GROUPS)) +  
  geom_bar(stat="identity", position = "dodge", width=0.3) +  
  scale_fill_brewer(palette = "Set1", labs(y="Age Groups"))
```

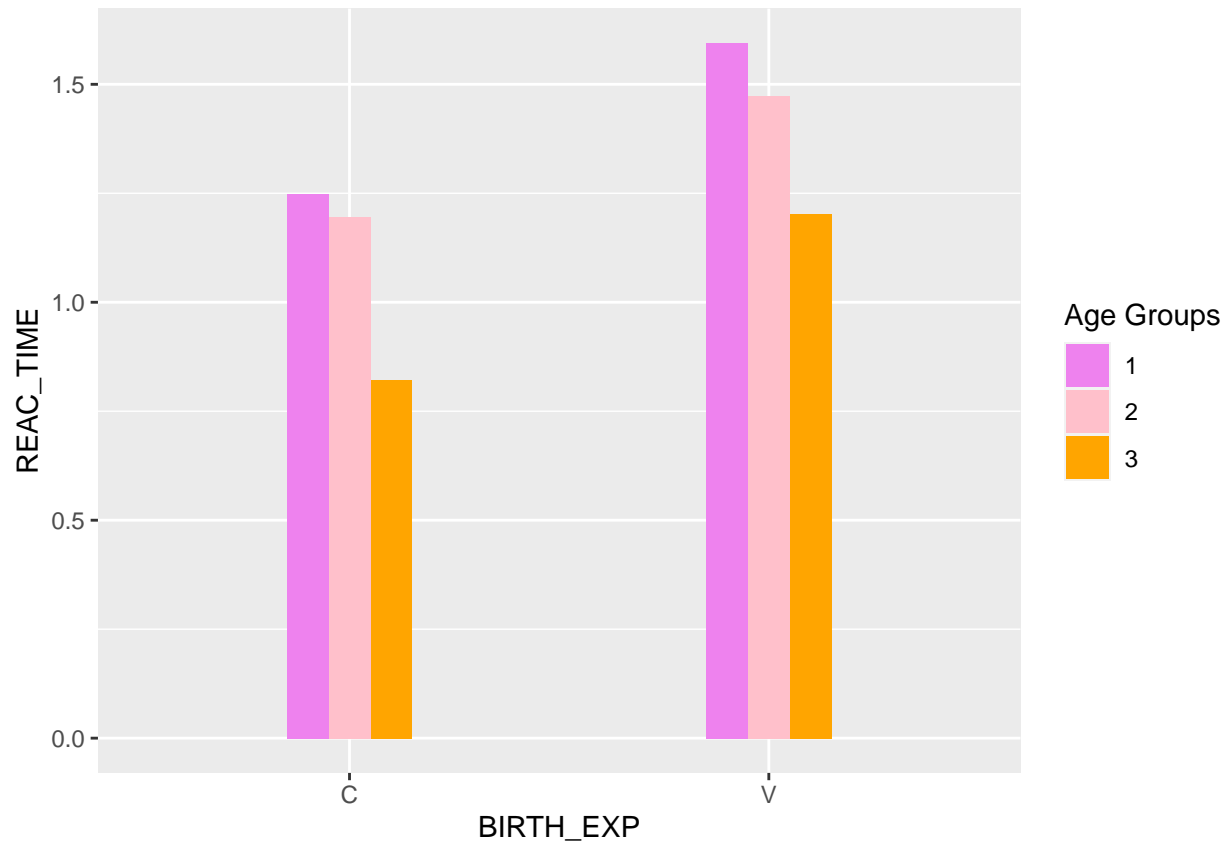



```
ggplot(data1, aes(AGE_GROUPS, ACCURACY, fill = BIRTH_EXP)) +  
  geom_bar(stat="identity", position = "dodge", width=0.3) +  
  scale_fill_brewer(palette = "Set1", labs(y="Birth Experience"))
```

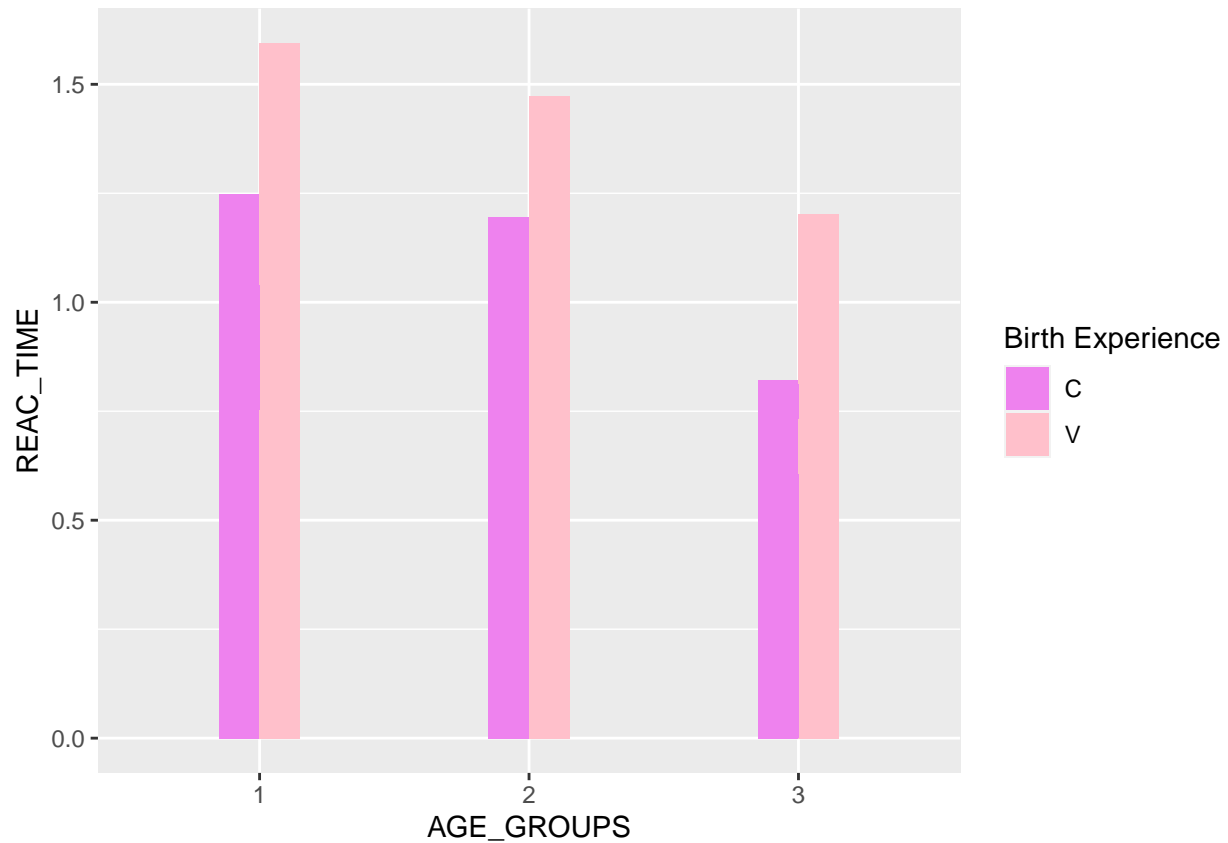


Bar Graph Reaction Time vs Age-Groups

```
ggplot(data2, aes(BIRTH_EXP, REAC_TIME, fill = AGE_GROUPS)) +  
  geom_bar(stat="identity", position = "dodge", width=0.3) +  
  scale_fill_manual(values = c("violet","pink", "orange"), labs(y="Age Groups"))
```



```
ggplot(data2, aes(AGE_GROUPS, REAC_TIME, fill = BIRTH_EXP)) +  
  geom_bar(stat="identity", position = "dodge", width=0.3) +  
  scale_fill_manual(values = c("violet", "pink" ), labs(y="Birth Experience"))
```

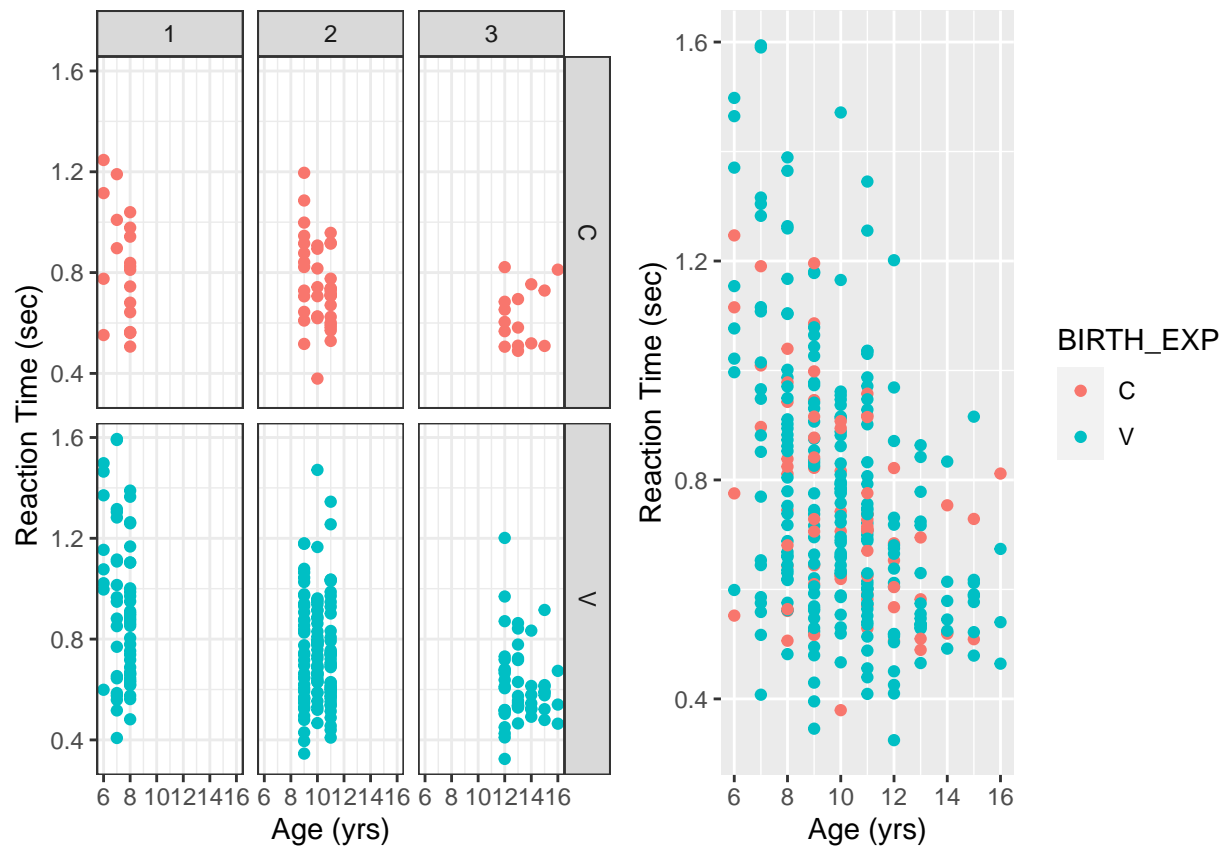


Scatterplot

```
aggregated <- ggplot(data2, aes(AGE, REAC_TIME, colour=BIRTH_EXP)) + geom_point() + labs(x = "Age (yrs)"

facetted <- data2 %>%
  ggplot(aes(x=AGE, y = REAC_TIME, color = BIRTH_EXP)) +
  geom_point() +
  facet_grid(cols = vars(AGE_GROUPS), rows = vars(BIRTH_EXP)) +
  labs(x = "Age (yrs)", y = "Reaction Time (sec)") +
  theme_bw() +
  theme(legend.position="none")

grid.arrange(facetted, aggregated, ncol = 2)
```



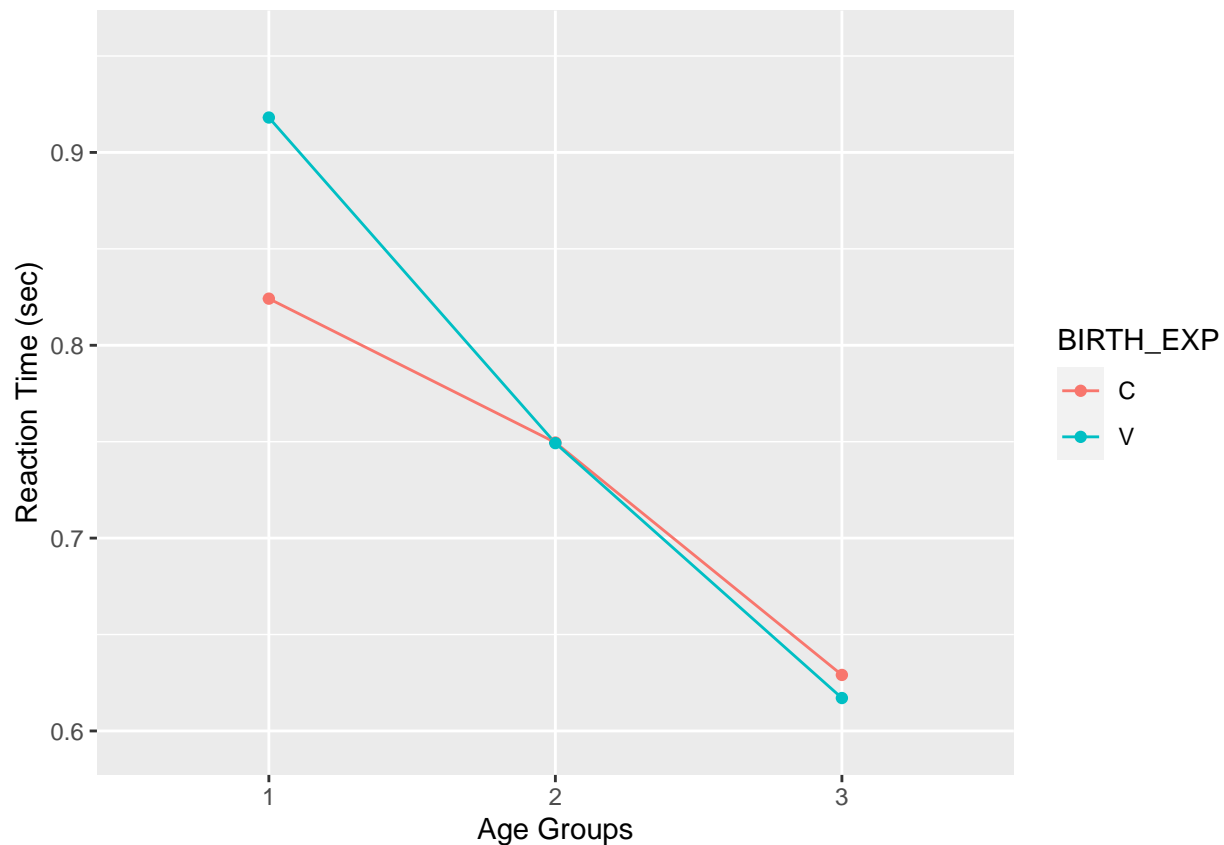
```
ggplot(data=data2, aes(x=AGE_GROUPS, y=REAC_TIME, group=BIRTH_EXP, color=BIRTH_EXP))+
  geom_line(stat='summary', fun.y='mean') +
  geom_point(stat='summary', fun.y='mean') +
  labs(x = "Age Groups", y = "Reaction Time (sec)")
```

```
## Warning: Ignoring unknown parameters: fun.y
```

```
## Warning: Ignoring unknown parameters: fun.y
```

```
## No summary function supplied, defaulting to 'mean_se()'
```

```
## No summary function supplied, defaulting to 'mean_se()'
```



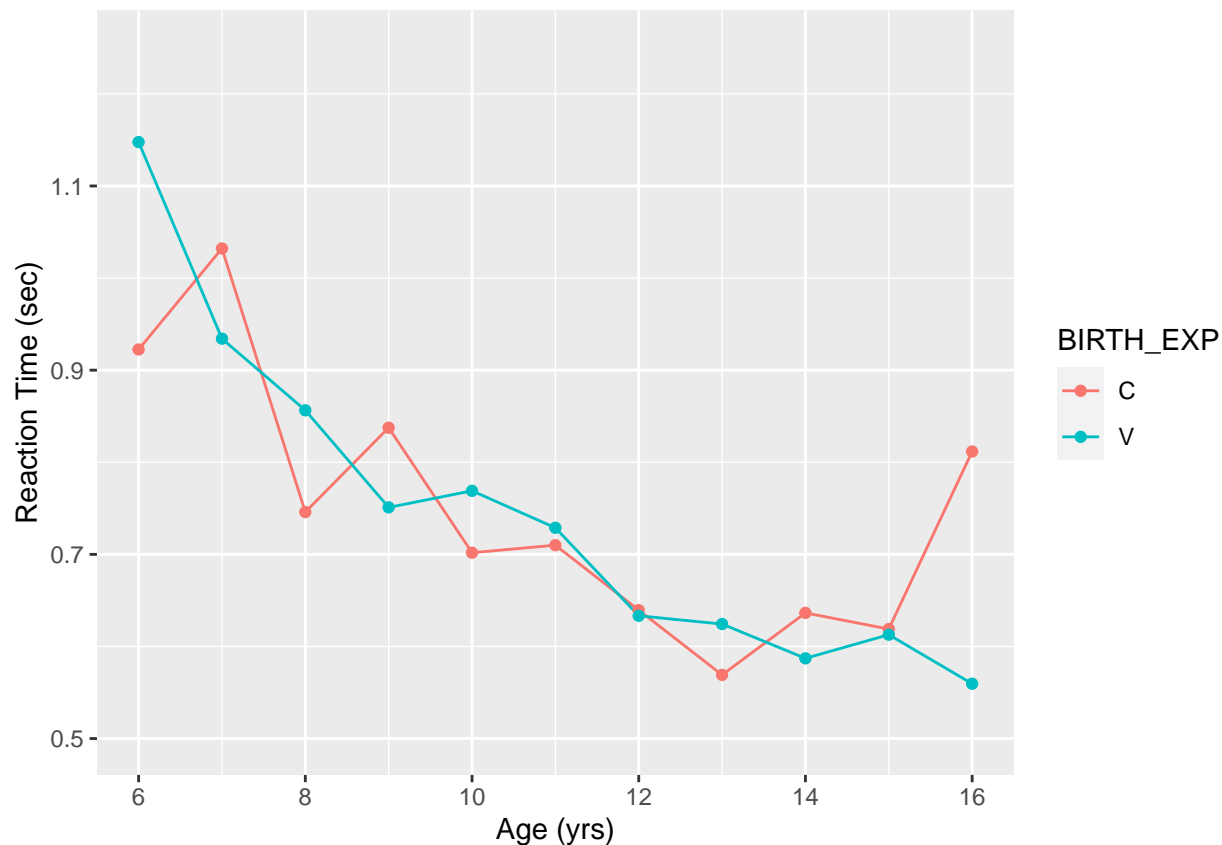
```
ggplot(data=data2, aes(x=AGE, y=REAC_TIME, group=BIRTH_EXP, color=BIRTH_EXP))+
  geom_line(stat='summary', fun.y='mean') +
  geom_point(stat='summary', fun.y='mean') +
  labs(x = "Age (yrs)", y = "Reaction Time (sec)")
```

```
## Warning: Ignoring unknown parameters: fun.y
```

```
## Warning: Ignoring unknown parameters: fun.y
```

```
## No summary function supplied, defaulting to 'mean_se()'
```

```
## No summary function supplied, defaulting to 'mean_se()'
```



#TWO-WAY ANOVA - ACCURACY

IV- Birth Experience and Age Groups, DV - Accuracy

```
model1 <- aov(ACCURACY~BIRTH_EXP+AGE_GROUPS, data = data1)
summary(model1)
```

```
##              Df Sum Sq Mean Sq F value    Pr(>F)
## BIRTH_EXP      1  0.002  0.00166    0.071 0.789440
## AGE_GROUPS      2  0.372  0.18589    8.004 0.000409 ***
## Residuals    307  7.130  0.02322
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
int_mod1 <- aov(ACCURACY~BIRTH_EXP*AGE_GROUPS, data= data1)
summary(int_mod1)
```

```
##              Df Sum Sq Mean Sq F value    Pr(>F)
## BIRTH_EXP      1  0.002  0.00166    0.073 0.78733
## AGE_GROUPS      2  0.372  0.18589    8.170 0.00035 ***
## BIRTH_EXP:AGE_GROUPS  2  0.190  0.09503    4.177 0.01624 *
## Residuals     305  6.940  0.02275
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
TukeyHSD(int_mod1)
```

```
## Tukey multiple comparisons of means
## 95% family-wise confidence level
##
## Fit: aov(formula = ACCURACY ~ BIRTH_EXP * AGE_GROUPS, data = data1)
##
## $BIRTH_EXP
##          diff          lwr          upr      p adj
## V-C 0.005398996 -0.03394596 0.04474395 0.7873261
##
## $AGE_GROUPS
##          diff          lwr          upr      p adj
## 2-1 0.05600062 0.007994807 0.10400644 0.0174463
## 3-1 0.09863081 0.040283598 0.15697802 0.0002523
## 3-2 0.04263019 -0.009019537 0.09427991 0.1282512
##
## $'BIRTH_EXP:AGE_GROUPS'
##          diff          lwr          upr      p adj
## V:1-C:1 0.09983958 -0.01119111 0.21087028 0.1056355
## C:2-C:1 0.15113087 0.03265772 0.26960401 0.0040182
## V:2-C:1 0.12533255 0.02091075 0.22975435 0.0085464
## C:3-C:1 0.20659902 0.05883704 0.35436100 0.0010701
## V:3-C:1 0.16524697 0.05142165 0.27907229 0.0005788
## C:2-V:1 0.05129128 -0.03616835 0.13875091 0.5448214
## V:2-V:1 0.02549297 -0.04171724 0.09270318 0.8860299
## C:3-V:1 0.10675944 -0.01752613 0.23104500 0.1384001
## V:3-V:1 0.06540739 -0.01564508 0.14645986 0.1914356
## V:2-C:2 -0.02579831 -0.10469878 0.05310215 0.9364222
## C:3-C:2 0.05546815 -0.07550884 0.18644515 0.8295773
## V:3-C:2 0.01411610 -0.07686507 0.10509728 0.9977870
## C:3-V:2 0.08126647 -0.03715227 0.19968521 0.3631388
## V:3-V:2 0.03991442 -0.03181842 0.11164725 0.6019624
## V:3-C:3 -0.04135205 -0.16814041 0.08543632 0.9370714
```

```
options(contrasts = c("contr.sum", "contr.poly"))
lm_output <- lm(ACCURACY ~ BIRTH_EXP*AGE_GROUPS, data = data1)
apa.aov.table(lm_output)
```

```
##
##
## ANOVA results using ACCURACY as the dependent variable
##
##
##          Predictor      SS df      MS      F      p partial_eta2
##          (Intercept) 117.63  1 117.63 5169.66 .000
##          BIRTH_EXP    0.01  1   0.01   0.25 .615          .00
##          AGE_GROUPS    0.54  2   0.27  11.78 .000          .07
## BIRTH_EXP x AGE_GROUPS 0.19  2   0.10   4.18 .016          .03
##          Error       6.94 305   0.02
## CI_90_partial_eta2
##
```

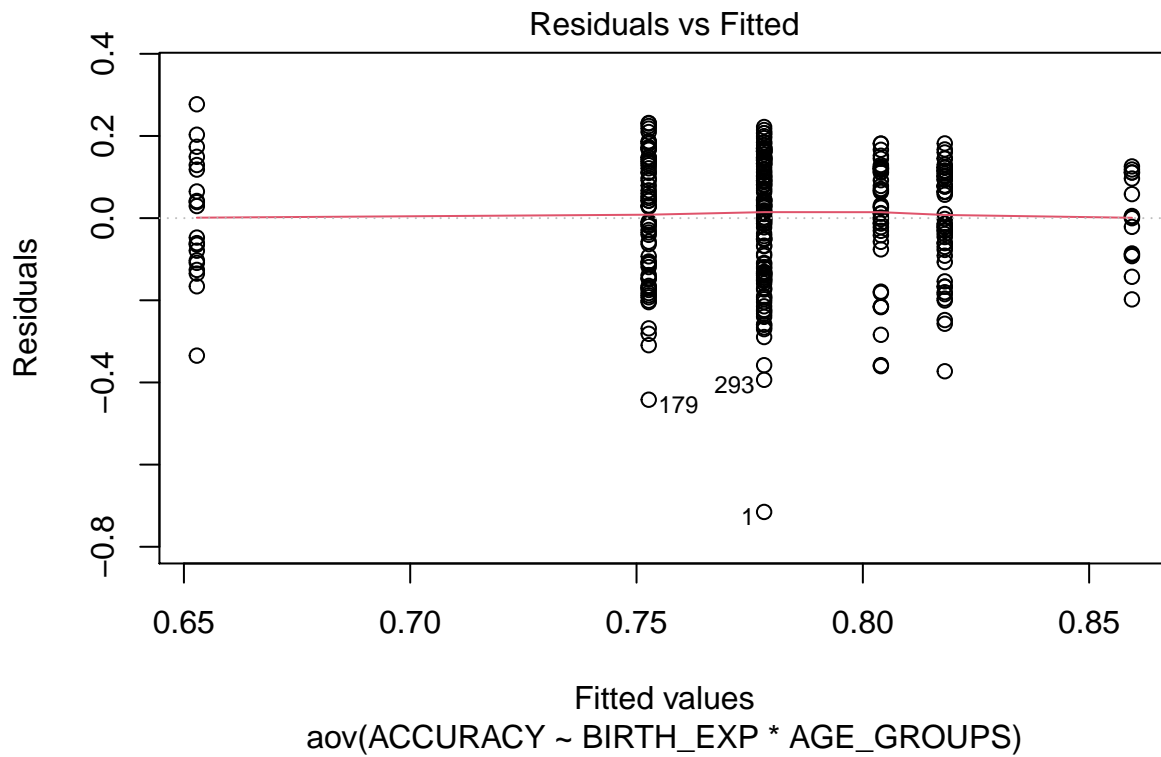


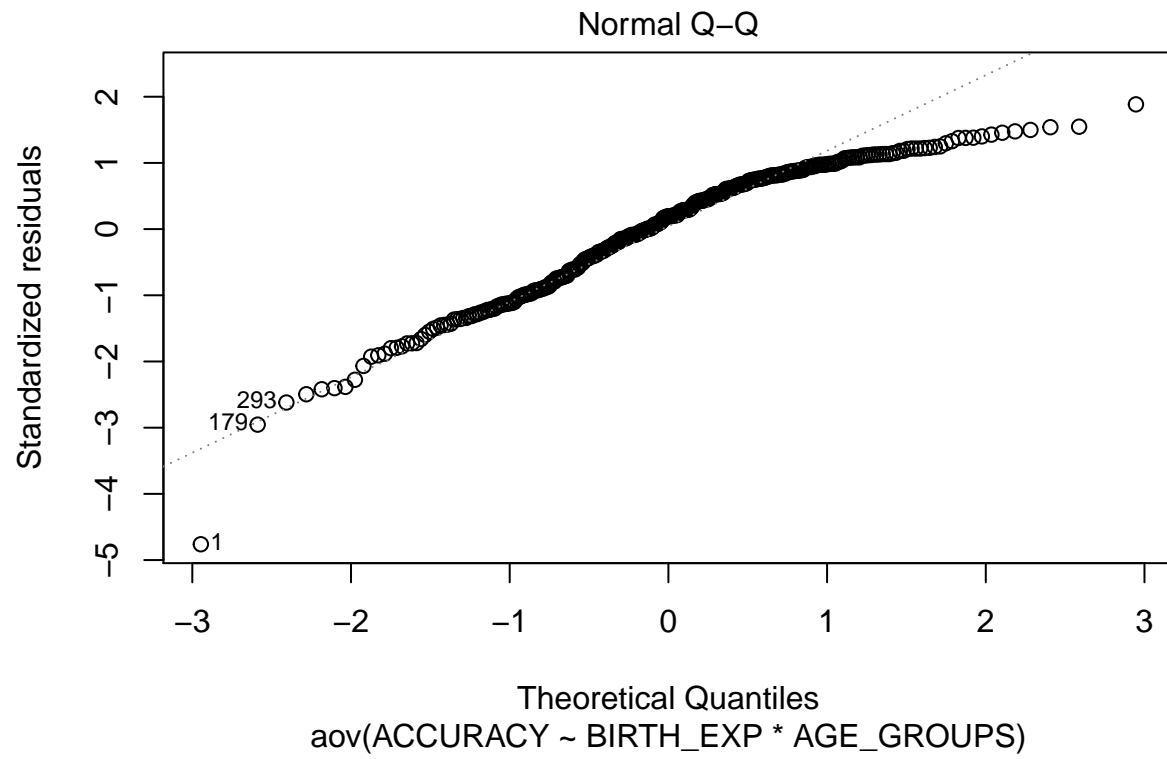
```
##          [.00, .01]
##          [.03, .12]
##          [.00, .06]
##
##
## Note: Values in square brackets indicate the bounds of the 90% confidence interval for partial eta-s
```

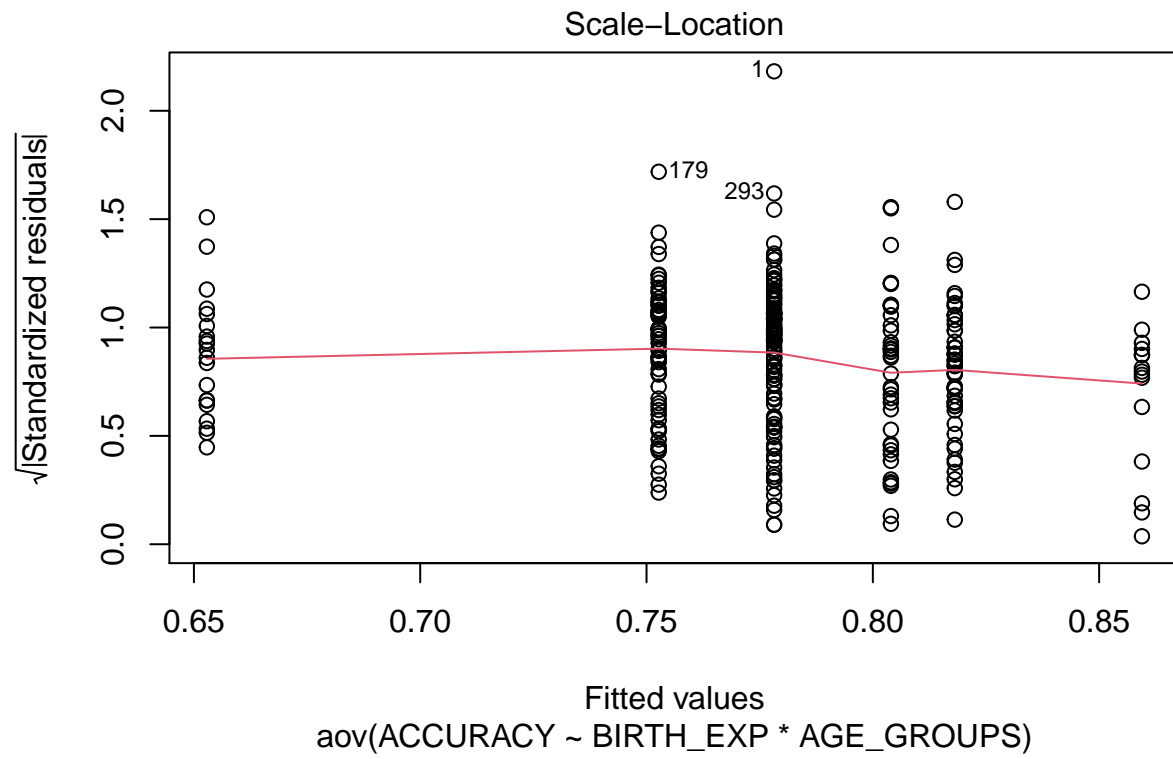
```
apa.2way.table(BIRTH_EXP, AGE_GROUPS, ACCURACY, data = data1)
```

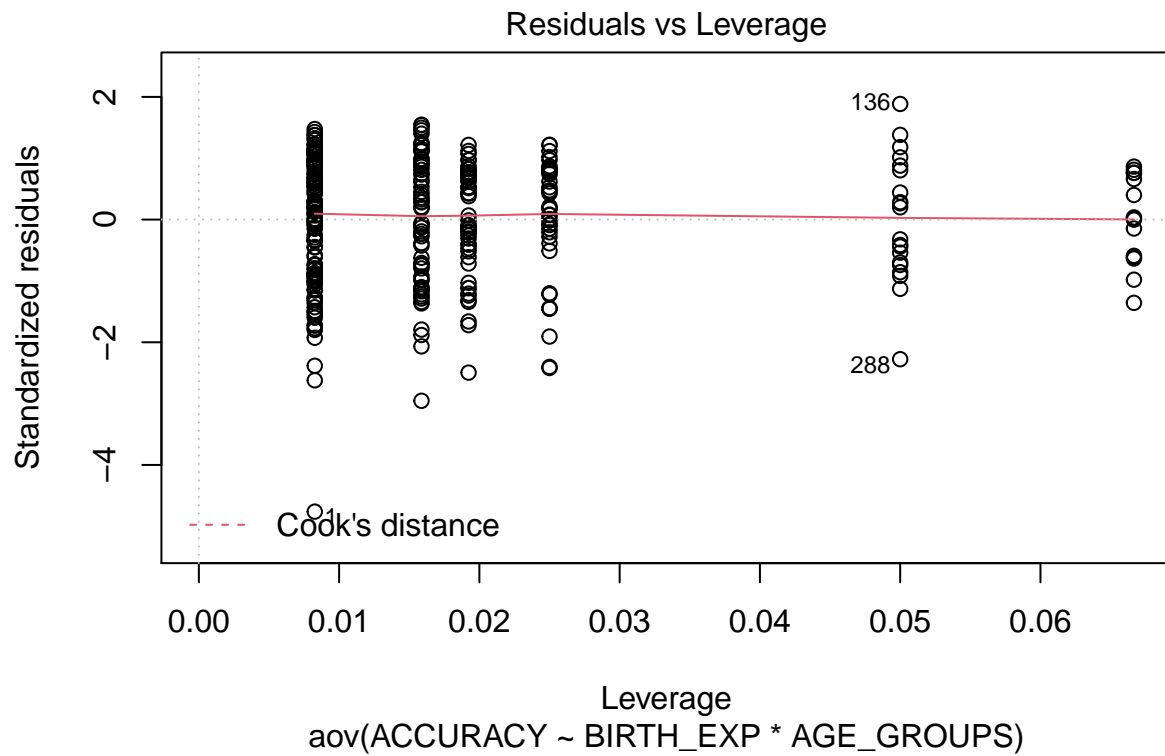
```
##
##
## Means and standard deviations for ACCURACY as a function of a 2(BIRTH_EXP) X 3(AGE_GROUPS) design
##
##          AGE_GROUPS
##          1          2          3
## BIRTH_EXP  M  SD  M  SD  M  SD
##          C    0.65 0.15 0.80 0.15 0.86 0.10
##          V    0.75 0.16 0.78 0.16 0.82 0.13
##
## Note. M and SD represent mean and standard deviation, respectively.
```

```
plot(int_mod1)
```

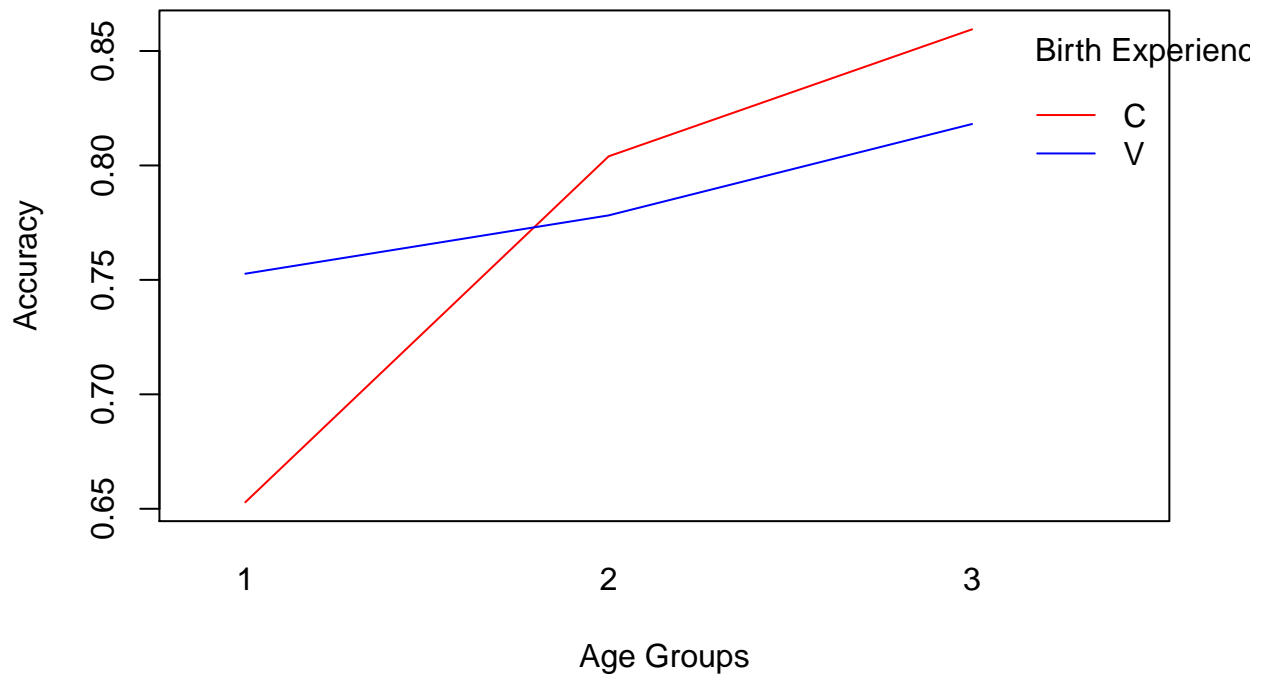








```
with (data1, {
  interaction.plot(AGE_GROUPS, BIRTH_EXP, ACCURACY, fun = mean,
    type = c("l", "p", "b", "o", "c"), legend = TRUE,
    trace.label = "Birth Experience",
    fixed = TRUE,
    col = c("red", "blue"),
    lty = 1,
    xlab = "Age Groups",
    ylab = "Accuracy")
})
```



#TWO-WAY ANOVA - REACTION TIME

IV- Birth Experience and Age Groups, DV - Reaction Time

```
model2 <- aov(REAC_TIME~ BIRTH_EXP+AGE_GROUPS, data = data2)
summary(model2)
```

```
##              Df Sum Sq Mean Sq F value    Pr(>F)
## BIRTH_EXP      1  0.022  0.0224    0.485    0.487
## AGE_GROUPS     2  2.865  1.4326   31.030 5.33e-13 ***
## Residuals    307 14.174  0.0462
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
int_mod2 <- aov (REAC_TIME~BIRTH_EXP*AGE_GROUPS, data= data2)
summary (int_mod2)
```

```
##              Df Sum Sq Mean Sq F value    Pr(>F)
## BIRTH_EXP      1  0.022  0.0224    0.486    0.486
## AGE_GROUPS     2  2.865  1.4326   31.062 5.27e-13 ***
## BIRTH_EXP:AGE_GROUPS 2  0.107  0.0535    1.159    0.315
## Residuals     305 14.067  0.0461
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
options(contrasts = c("contr.sum", "contr.poly"))
lm_output2 <- lm(REAC_TIME ~ BIRTH_EXP*AGE_GROUPS, data = data2)
apa.aov.table(lm_output2)
```

```
##
##
## ANOVA results using REAC_TIME as the dependent variable
##
##
```

	Predictor	SS	df	MS	F	p	partial_eta2
	(Intercept)	108.82	1	108.82	2359.33	.000	
	BIRTH_EXP	0.04	1	0.04	0.78	.378	.00
	AGE_GROUPS	1.63	2	0.81	17.70	.000	.10
	BIRTH_EXP x AGE_GROUPS	0.11	2	0.06	1.16	.315	.01
	Error	14.07	305	0.05			

```
## CI_90_partial_eta2
##
## [.00, .02]
## [.05, .16]
## [.00, .03]
##
##
## Note: Values in square brackets indicate the bounds of the 90% confidence interval for partial eta-s
```

```
apa.2way.table(BIRTH_EXP, AGE_GROUPS, REAC_TIME, data = data1)
```

```
##
##
## Means and standard deviations for REAC_TIME as a function of a 2(BIRTH_EXP) X 3(AGE_GROUPS) design
##
##
```

	AGE_GROUPS					
	1		2		3	
BIRTH_EXP	M	SD	M	SD	M	SD
C	0.79	0.22	0.73	0.17	0.62	0.11
V	0.90	0.30	0.73	0.21	0.61	0.16

```
##
## Note. M and SD represent mean and standard deviation, respectively.
```

```
plot(int_mod2)
```

