captcha-new

```
knitr::opts_chunk$set(echo = TRUE, tidy.opts = list(width.cutoff = 60), tidy = TRUE)

library(Sleuth3) # example datasets from textbook, "The Statistical Sleuth - A Course in
# Methods of Data Analysis (3rd Edition)"
library(reshape2) # for formatting and aggregation of data frames
library(ggplot2) # for creating graphs
library(dplyr) # for data manipulation and clean-up
library(plotly) # for creating interactive web graphics from ggplot2 graphs
library(knitr) # required for generating PDF output
library(modeest) # required for `mfv()` function
#install.packages('nortest')
library(nortest)
```

time

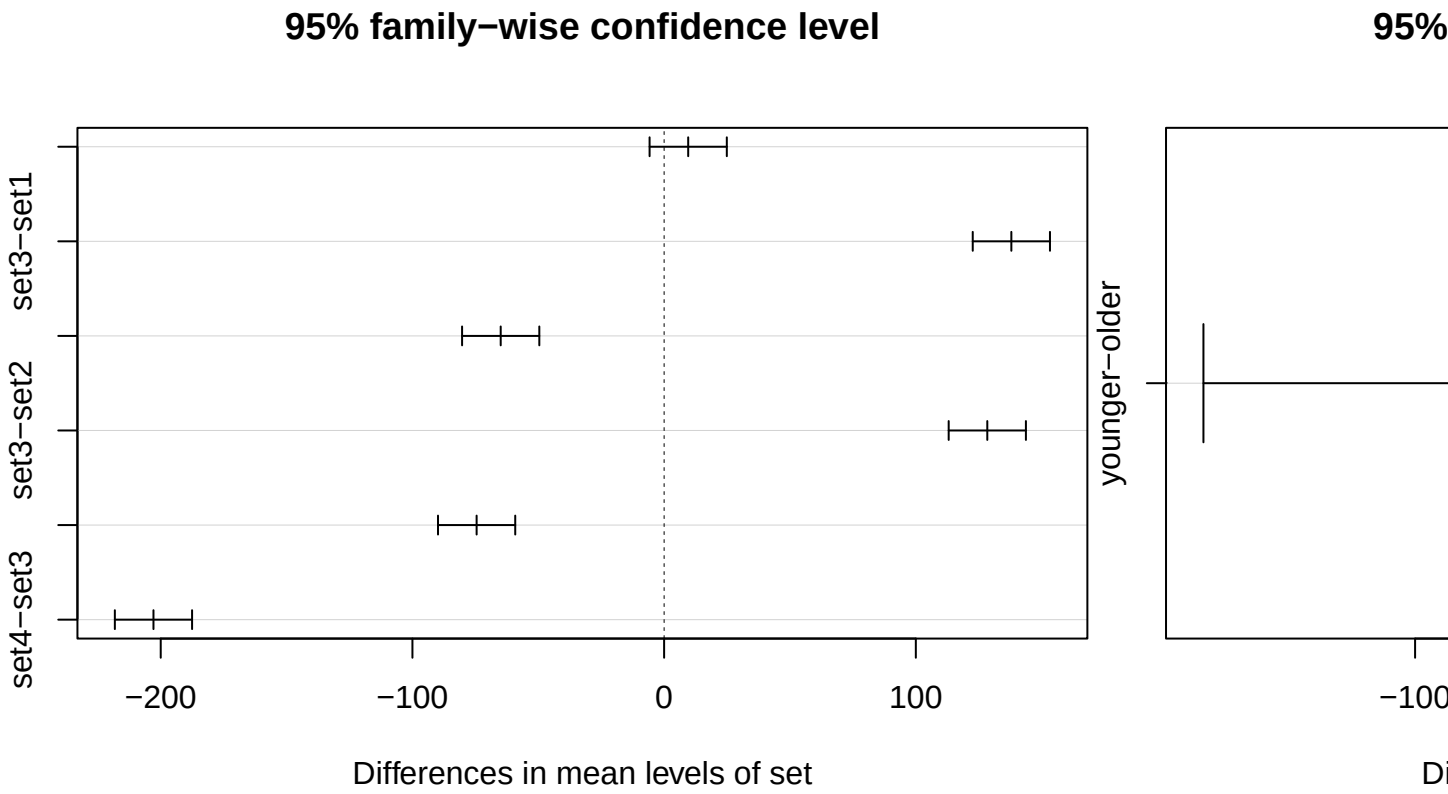
```
alltime <- read.csv("all-time.csv")
summary(aov(time ~ set + group + set:group, data=alltime))
```

```
##              Df  Sum Sq Mean Sq F value Pr(>F)
## set           3 1081700  360567   14380 <2e-16 ***
## group         1  455833  455833   18179 <2e-16 ***
## set:group     3  166061   55354    2208 <2e-16 ***
## Residuals   192    4814      25
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
model <- aov(time ~ set + group, data=alltime)
TukeyHSD(model)
```

```
##   Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = time ~ set + group, data = alltime)
##
## $set
##                   diff        lwr        upr    p adj
## set2-set1    9.564204   -5.77749   24.90590 0.372308
## set3-set1  137.957622  122.61593  153.29932 0.000000
## set4-set1  -64.928113  -80.26981  -49.58642 0.000000
## set3-set2  128.393419  113.05172  143.73511 0.000000
## set4-set2  -74.492317  -89.83401  -59.15062 0.000000
## set4-set3 -202.885735 -218.22743 -187.54404 0.000000
##
## $group
##                     diff       lwr       upr p adj
## younger-older -95.48125 -103.7376 -87.22488     0
```

```
re <- TukeyHSD(model)
plot(re)
```



accuracy

```
allaccuracy <- read.csv("all-grade.csv")
summary(aov(accurate ~ set + group + set:group, data=allaccuracy))
```

```
##              Df Sum Sq Mean Sq F value   Pr(>F)
## set           3  163.3   54.42  25.802 4.55e-14 ***
## group         1   19.2   19.22   9.113  0.00288 **
## set:group     3   56.4   18.79   8.910 1.48e-05 ***
## Residuals   192  405.0    2.11
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
model <- aov(accurate ~ set + group, data=allaccuracy)
TukeyHSD(model)
```

```
##   Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = accurate ~ set + group, data = allaccuracy)
##
## $set
##             diff        lwr        upr     p adj
## set2-set1 -0.60 -1.3971584  0.1971584 0.2106599
## set3-set1 -2.40 -3.1971584 -1.6028416 0.0000000
## set4-set1 -0.56 -1.3571584  0.2371584 0.2668617
## set3-set2 -1.80 -2.5971584 -1.0028416 0.0000001
```

```
## set4-set2  0.04 -0.7571584  0.8371584 0.9992124
## set4-set3  1.84  1.0428416  2.6371584 0.0000001
##
## $group
##               diff       lwr      upr     p adj
## younger-older 0.62 0.1909972 1.049003 0.0048382
```

```
re <- TukeyHSD(model)
plot(re)
```