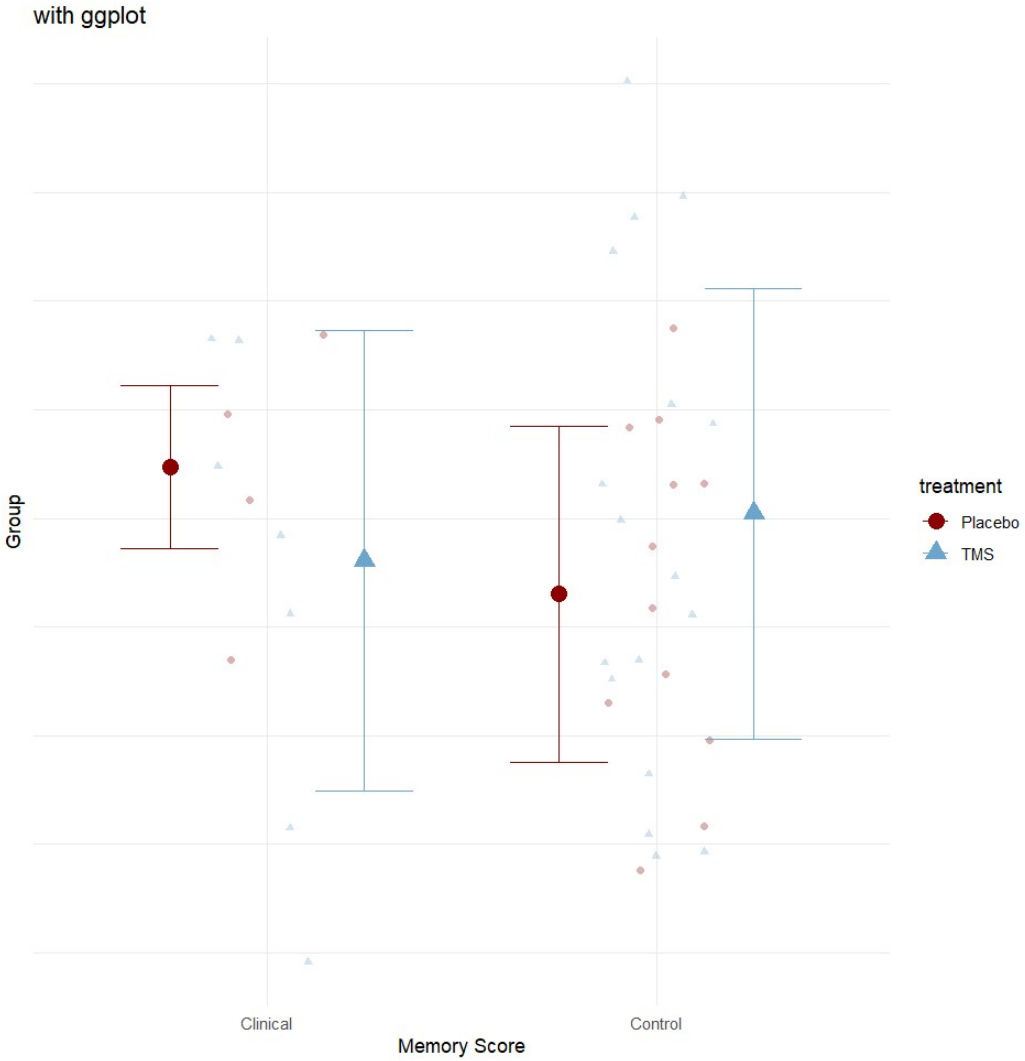
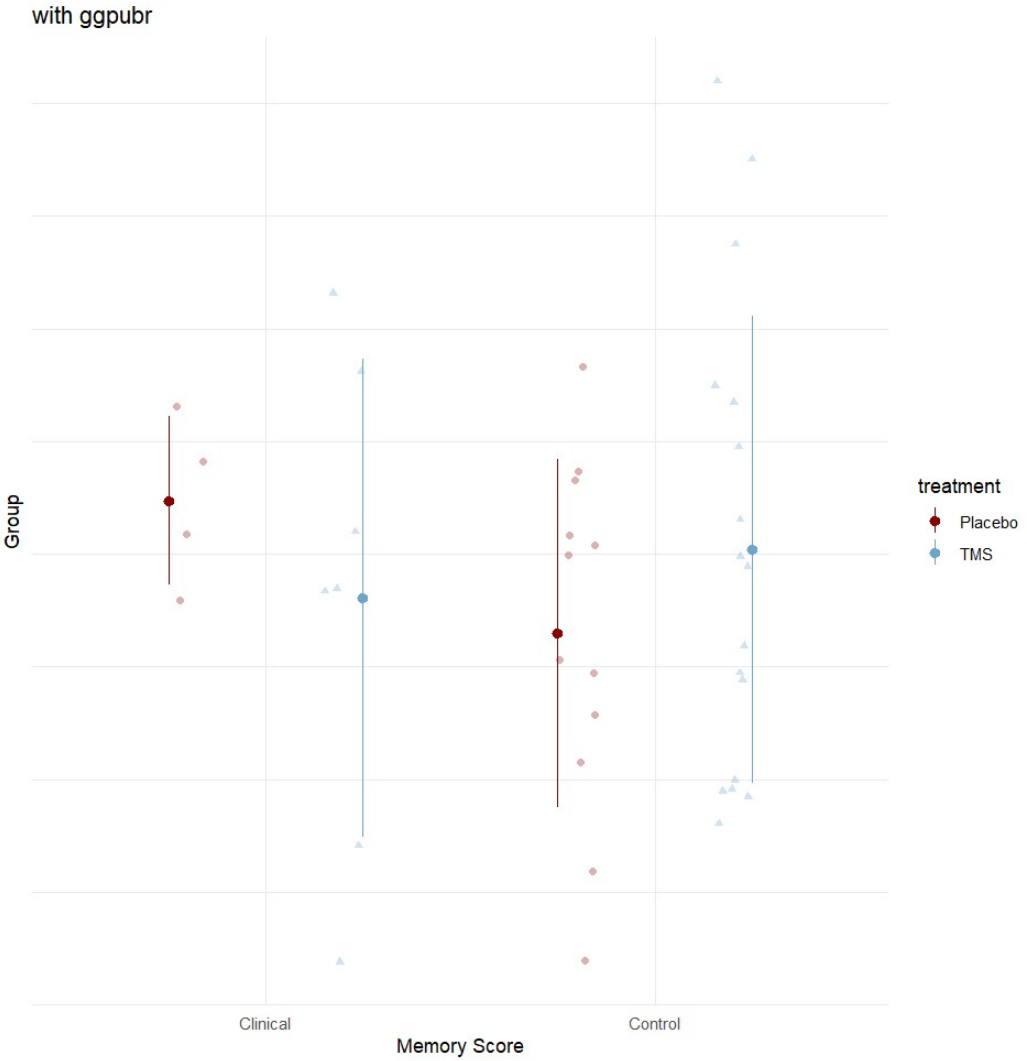
```r
# R course for beginners
# Week 5 part 1
# assignment by Amir Mano, id 205779788

#### prepare workspace ----
rm(list = ls()) #or Ctrl + Shift + F10 & Ctrl + L

# import packages
library(tidyverse)

#### creating and saving variables ----
N = 40
df <- data.frame(
  sub_id = seq(1,N),
  age = runif(N, 18, 60),
  gender = factor(sample(c('M','F'), N, replace=T)),
  group = factor(sample(c('Control','Clinical'), N, replace=T)),
  treatment = factor(sample(c('Placebo','TMS'), N, replace=T)),
  memory_score = rnorm(N, 70, 10)
)
df <- df |>
  mutate(memory_score = if_else(memory_score > 100, 100, memory_score),
         memory_score = if_else(memory_score < 0, 0, memory_score))
save(df, file='HW_5_1.RData')
```

```
# R course for beginners
# Week 5 part 2
# assignment by Amir Mano, id 205779788

#### prepare workspace ----
rm(list = ls()) #or Ctrl + Shift + F10 & Ctrl + L
load('HW_5_1.RData')

# import packages
library(tidyverse)
library(ggplot2)
library(ggpubr)
library(patchwork)

#### descriptive statistics ----
cat('Age statistics:\n', summary(df)[c(1,6,4,3) ,2],'\n')
cat('Female numbers:\n', df$sub_id[df$gender=='F'],'\n')
cat('Male numbers:\n', df$sub_id[df$gender=='M'],'\n')

df_summary <- df |>
  group_by(group, treatment) |>
  summarise(
    mean = mean(memory_score),
    sd   = sd(memory_score)
  )
print(df_summary[,1:3])


#### plotting ----
# with ggplot
plot1 <- ggplot(df, aes(x = group, y = memory_score, color = treatment, shape=treatment))
+

  geom_jitter(position = position_jitter(width = 0.15, height = 5), size = 1.5, alpha =
0.3) +
  geom_point(data = df_summary, aes(x = group, y = mean, group = treatment, color =
treatment),
             position = position_dodge(1), size = 4) +
  geom_errorbar(data = df_summary,aes(x = group, y = mean, group = treatment, ymin = mean
- sd, ymax = mean + sd, color = treatment),
                position = position_dodge(1), width = 0.5) +

  labs(x = 'Memory Score', y = 'Group', title = 'with ggplot') +
  theme_minimal() +
  scale_color_manual(values=c("darkred", "skyblue3")) +
  theme(axis.ticks.y = element_blank(), axis.text.y = element_blank())

# with ggpubr
plot2 <- ggerrorplot(df,  x = "group",   y = "memory_score",   color = "treatment",
shape="treatment", desc_stat = "mean_sd",
            add = "jitter",  add.params = list(alpha = 0.3), position = position_dodge(1))
+
  labs(x = 'Memory Score', y = 'Group', title = 'with ggpubr') +
  theme_minimal() +
  scale_color_manual(values=c("darkred", "skyblue3")) +
  theme(axis.ticks.y = element_blank(), axis.text.y = element_blank())

  plot1 + plot2
```


with ggplot
Group
Clinical
Control
Memory Score
treatment
Placebo
TMS


with ggpubr
Group
Clinical
Control
Memory Score
treatment
Placebo
TMS

```
# R course for beginners
# Week 5 part 3
# assignment by Amir Mano, id 205779788

#### prepare workspace ----
rm(list = ls()) #or Ctrl + Shift + F10 & Ctrl + L
load('HW_5_1.RData')

# import packages
library(tidyverse)
library(effectsize)

# prepare variables
if(df$group[1]=='Clinical')
{
  contrasts(df$group)<- c(1,0)
}
if(df$treatment[1]=='TMS')
{
  contrasts(df$group)<- c(1,0)
}

#### ANOVA ----
#linear regression
model = lm(memory_score ~ group*treatment, data = df)

print(model)
summary(model)

# Results
# Coefficients:
#   (Intercept)              group1         treatmentTMS  group1:treatmentTMS
#        66.504               5.868                3.705               -8.011
```