SA_#14_Samson

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```r
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 4.2.3
```

```r
library(car)                # For Levene's test
```

```
## Warning: package 'car' was built under R version 4.2.3
```

```
## Loading required package: carData
```

```
## Warning: package 'carData' was built under R version 4.2.3
```

```r
library(dplyr)              # For data manipulation
```

```
## Warning: package 'dplyr' was built under R version 4.2.3
```

```
##
## Attaching package: 'dplyr'
```

```
## The following object is masked from 'package:car':
##
##     recode
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```r
library(stats)              # For ANOVA and Shapiro-Wilk test
library(tidyverse)          # For data wrangling
```

```
## Warning: package 'tidyverse' was built under R version 4.2.3
```

```
## Warning: package 'tibble' was built under R version 4.2.3
```

```
## Warning: package 'tidyr' was built under R version 4.2.3

## Warning: package 'readr' was built under R version 4.2.3

## Warning: package 'purrr' was built under R version 4.2.3

## Warning: package 'stringr' was built under R version 4.2.3

## Warning: package 'forcats' was built under R version 4.2.3

## Warning: package 'lubridate' was built under R version 4.2.3

## -- Attaching core tidyverse packages ----------------------- tidyverse 2.0.0 --
## v forcats   1.0.0      v stringr   1.5.0
## v lubridate 1.9.3      v tibble    3.2.1
## v purrr     1.0.2      v tidyr     1.3.0
## v readr     2.1.4

## -- Conflicts ----------------------------------------- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## x dplyr::recode() masks car::recode()
## x purrr::some()   masks car::some()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```r
library(DescTools)      # For Post-hoc Tukey Test
```

```
## Warning: package 'DescTools' was built under R version 4.2.3

##
## Attaching package: 'DescTools'
##
## The following object is masked from 'package:car':
##
##      Recode
```

```r
file_path <- "C:\\Users\\User\\OneDrive\\Personal docs\\FRESHMAN\\4th yr - 1st Sem\\Applied Multivariate
rat_data <- read.csv(file_path)

# Clean the data by removing the unnecessary "X" column
rat_data_cleaned <- rat_data %>% select(-X)

# Boxplot to visualize exploration time by stimuli type
ggplot(rat_data_cleaned, aes(x = Stimuli, y = Time, fill = Stimuli)) +
  geom_boxplot() +
  ggtitle("Boxplot of Exploration Time by Stimuli Type") +
  xlab("Stimuli Type") +
  ylab("Exploration Time (seconds)")
```

Boxplot of Exploration Time by Stimuli Type
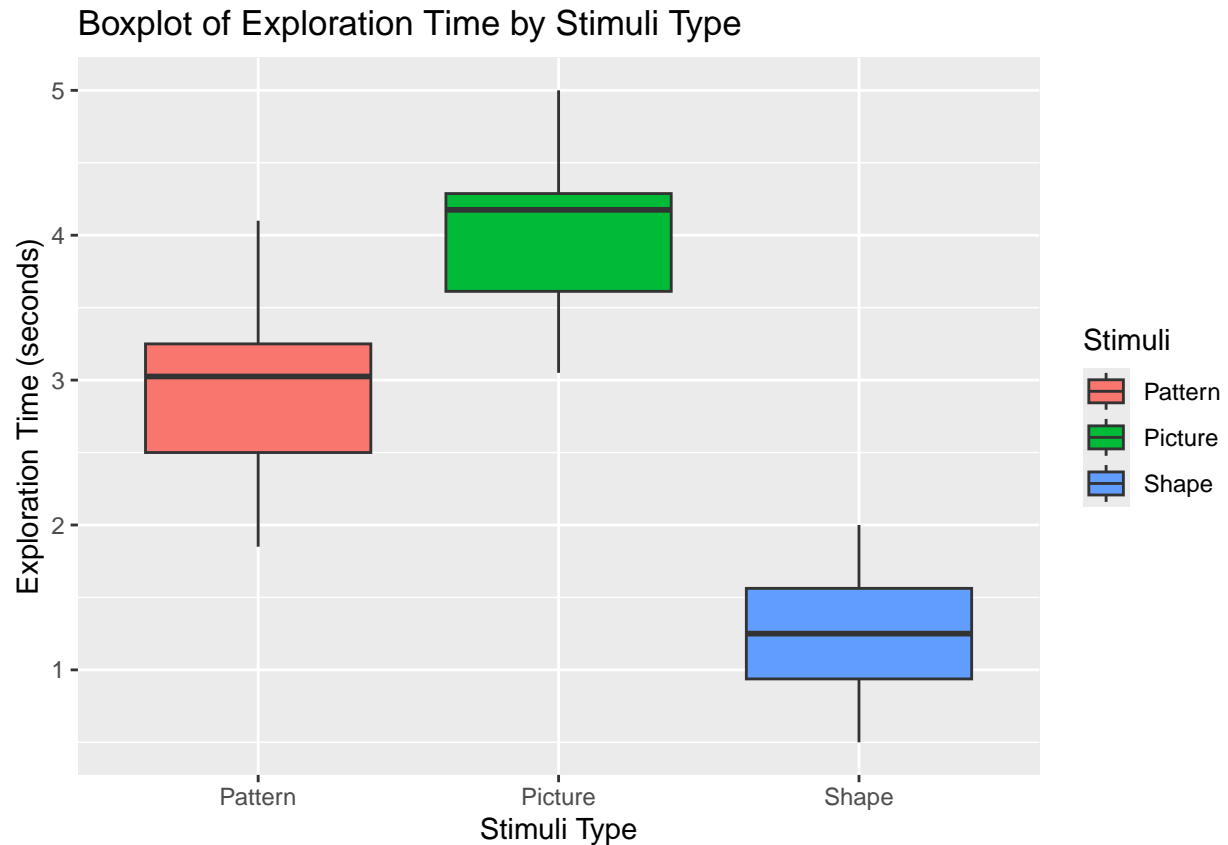

```r
# Shapiro-Wilk test for normality (for each group)
shapes_time <- subset(rat_data_cleaned, Stimuli == "Shape")$Time
patterns_time <- subset(rat_data_cleaned, Stimuli == "Pattern")$Time
pictures_time <- subset(rat_data_cleaned, Stimuli == "Picture")$Time

shapiro_shapes <- shapiro.test(shapes_time)
shapiro_patterns <- shapiro.test(patterns_time)
shapiro_pictures <- shapiro.test(pictures_time)

# Print Shapiro-Wilk results
cat("Shapiro-Wilk Test Results:\n")
```

```
## Shapiro-Wilk Test Results:
```

```r
print(shapiro_shapes)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  shapes_time
## W = 0.94374, p-value = 0.548
```

```r
print(shapiro_patterns)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  patterns_time
## W = 0.95005, p-value = 0.6377
```

```r
print(shapiro_pictures)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  pictures_time
## W = 0.91516, p-value = 0.2483
```

```r
# Levene's test for homogeneity of variances
levene_test <- leveneTest(Time ~ Stimuli, data = rat_data_cleaned)
```

```
## Warning in leveneTest.default(y = y, group = group, ...): group coerced to
## factor.
```

```r
cat("\nLevene's Test for Homogeneity of Variances:\n")
```

```
##
## Levene's Test for Homogeneity of Variances:
```

```r
print(levene_test)
```

```
## Levene's Test for Homogeneity of Variance (center = median)
##       Df F value Pr(>F)
## group  2  0.4313 0.6533
##       33
```

```r
# One-way ANOVA
anova_results <- aov(Time ~ Stimuli, data = rat_data_cleaned)
cat("\nOne-Way ANOVA Results:\n")
```

```
##
## One-Way ANOVA Results:
```

```r
summary(anova_results)
```

```
##             Df Sum Sq Mean Sq F value   Pr(>F)
## Stimuli      2  44.53  22.263   62.09 6.53e-12 ***
## Residuals   33  11.83   0.359
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
# Post-hoc Tukey HSD test if ANOVA is significant
if (summary(anova_results)[[1]][["Pr(>F)"]][1] < 0.05) {
  tukey_test <- TukeyHSD(anova_results)
  cat("\nTukey HSD Post-hoc Results:\n")
  print(tukey_test)
}
```

```
##
## Tukey HSD Post-hoc Results:
##    Tukey multiple comparisons of means
##      95% family-wise confidence level
##
## Fit: aov(formula = Time ~ Stimuli, data = rat_data_cleaned)
##
## $Stimuli
##                      diff        lwr        upr     p adj
## Picture-Pattern  1.066667  0.4668045  1.666529 0.0003414
## Shape-Pattern   -1.637500 -2.2373622 -1.037638 0.0000004
## Shape-Picture   -2.704167 -3.3040289 -2.104304 0.0000000
```