

BRSM Project

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Introduction

Data Analysis

Importing Libraries and Data Preprocessing

```
# import libraries
library(readxl)
library(ggplot2)
library(car)
library(ppcor)
library(psych)
library(reshape2)
library(haven)
library(dplyr)
library(zoo)
```

```
data1 <- read_sav("data/EEfRT Data for OSF_Long.sav")
data2 <- read_sav("data/EEfRT Data for OSF_Wide.sav")

data <- full_join(data2, data1, by = "ID", copy = FALSE)
summary(data)
```

```
##          ID          EEfRT_ProportionHardTasksSelected SCID_CurrentDepression
## Min.      :1500    Min.      :0.1429                Min.      :1.000
## 1st Qu.:1520    1st Qu.:0.2917                1st Qu.:1.000
```

```

## Median :1536      Median :0.4800                Median :1.000
## Mean   :1541      Mean    :0.5235                Mean    :1.385
## 3rd Qu.:1562      3rd Qu.:0.7222                3rd Qu.:1.000
## Max.   :1590      Max.    :1.0000                Max.    :3.000
## NA's   :1259      NA's    :1603                NA's    :1603
## SCID_LifetimeDepression SCID_CurrentMania SCID_LifetimeMania      Age.x
## Length:4008          Min.    :1.000      Length:4008          Min.    :18.00
## Class :character      1st Qu.:1.000      Class :character      1st Qu.:25.00
## Mode  :character      Median :1.000      Mode  :character      Median :35.00
##                               Mean    :1.042                Mean    :35.56
##                               3rd Qu.:1.000                3rd Qu.:45.00
##                               Max.    :3.000                Max.    :60.00
##                               NA's    :1603                NA's    :1603
##      Gender.x      YearsofEducation EmploymentStatus CurrentlyEmployed
## Min.    :1.000      Min.    :10.00      Min.    :1.000      Min.    :1.000
## 1st Qu.:1.000      1st Qu.:14.00      1st Qu.:2.000      1st Qu.:1.000
## Median :2.000      Median :16.00      Median :4.000      Median :1.000
## Mean    :1.567      Mean    :15.23      Mean    :4.936      Mean    :1.915
## 3rd Qu.:2.000      3rd Qu.:16.00      3rd Qu.:9.000      3rd Qu.:3.000
## Max.    :2.000      Max.    :19.00      Max.    :9.000      Max.    :3.000
## NA's    :1603      NA's    :1603      NA's    :1603      NA's    :1653
## NumberDepressiveEpisodes HospitalizationsforDepression AgeofFirstMDE
## Min.    : 0.000          Min.    :0.0000          Min.    : 0.00
## 1st Qu.: 2.000          1st Qu.:0.0000          1st Qu.:13.00
## Median : 5.000          Median :0.0000          Median :16.00
## Mean    : 9.007          Mean    :0.6031          Mean    :15.79
## 3rd Qu.:13.000          3rd Qu.:1.0000          3rd Qu.:18.00
## Max.    :30.000          Max.    :6.0000          Max.    :43.00
## NA's    :1853          NA's    :1753          NA's    :1603
## NumberManicEpisodes HospitalizationsforMania AgeofFirstManicEpisode
## Min.    : 0.000          Min.    : 0.00          Min.    :13.00
## 1st Qu.: 2.000          1st Qu.: 0.00          1st Qu.:17.00
## Median : 5.000          Median : 1.00          Median :19.00
## Mean    : 8.027          Mean    : 1.85          Mean    :21.13
## 3rd Qu.:10.000          3rd Qu.: 2.00          3rd Qu.:23.00
## Max.    :30.000          Max.    :10.00          Max.    :38.00
## NA's    :1753          NA's    :1703          NA's    :1653
## ComorbidAnxietyDisorder LifetimeSubstanceDisorder LithiumDosage
## Min.    :1.000          Min.    :1.000          Min.    : 0.0
## 1st Qu.:1.000          1st Qu.:1.000          1st Qu.: 0.0
## Median :3.000          Median :3.000          Median : 0.0
## Mean    :2.164          Mean    :2.186          Mean    : 269.2
## 3rd Qu.:3.000          3rd Qu.:3.000          3rd Qu.: 579.0
## Max.    :3.000          Max.    :3.000          Max.    :1785.0
## NA's    :1603          NA's    :1653          NA's    :1603
## ImipramineEquivDosage AnticonvulstantDosage RisperidoneEquivDosage
## Min.    : 0.00          Min.    : 0.00          Min.    : 0.000
## 1st Qu.: 0.00          1st Qu.: 0.00          1st Qu.: 0.000
## Median : 0.00          Median : 0.00          Median : 0.000
## Mean    : 63.06          Mean    : 66.27          Mean    : 1.813
## 3rd Qu.:101.25          3rd Qu.: 0.00          3rd Qu.: 1.360
## Max.    :327.38          Max.    :1200.00          Max.    :15.200
## NA's    :1603          NA's    :1740          NA's    :1603
## LamotrigineDosage Reverse_Digit_Span      ASRM      BDI

```

```
## Min. : 0.00 Min. :3.000 Min. : 0.000 Min. : 0.000
## 1st Qu.: 0.00 1st Qu.:4.000 1st Qu.: 2.000 1st Qu.: 2.000
## Median : 0.00 Median :5.000 Median : 3.000 Median : 3.000
## Mean : 49.54 Mean :5.352 Mean : 3.344 Mean : 3.667
## 3rd Qu.: 0.00 3rd Qu.:6.000 3rd Qu.: 5.000 3rd Qu.: 5.000
## Max. :400.00 Max. :8.000 Max. :13.000 Max. :12.000
## NA's :1603 NA's :1603 NA's :1603 NA's :1603
## MHRSD WASSUP_FinSuccess WASSUP_PopFame YMRS
## Min. :0.000 Min. : 4.000 Min. : 7.00 Min. :0.000
## 1st Qu.:1.000 1st Qu.: 4.000 1st Qu.: 8.00 1st Qu.:0.000
## Median :2.333 Median : 7.000 Median :10.00 Median :2.000
## Mean :2.988 Mean : 7.769 Mean :11.62 Mean :1.767
## 3rd Qu.:4.667 3rd Qu.:10.667 3rd Qu.:13.00 3rd Qu.:3.000
## Max. :8.909 Max. :20.000 Max. :35.00 Max. :7.000
## NA's :1696 NA's :1603 NA's :1603 NA's :1696
## Q_MCL_SES Task_Selected Trial_Number Reward_Level
## Min. : 1.000 Min. :0.0000 Min. : 1.00 Min. :1.240
## 1st Qu.: 4.000 1st Qu.:0.0000 1st Qu.:13.00 1st Qu.:1.960
## Median : 5.000 Median :0.0000 Median :25.00 Median :2.680
## Mean : 5.378 Mean :0.4925 Mean :24.69 Mean :2.683
## 3rd Qu.: 7.000 3rd Qu.:1.0000 3rd Qu.:37.00 3rd Qu.:3.400
## Max. :10.000 Max. :1.0000 Max. :50.00 Max. :4.120
## NA's :1603 NA's :1259 NA's :1259 NA's :1259
## Bonus Age.y Gender.y Q_WASSUP_FinSuccess
## Min. :0.0000 Min. :18.00 Min. :1.000 Min. : 4.000
## 1st Qu.:0.0000 1st Qu.:25.00 1st Qu.:1.000 1st Qu.: 4.000
## Median :1.0000 Median :35.00 Median :2.000 Median : 7.000
## Mean :0.6879 Mean :35.58 Mean :1.552 Mean : 7.769
## 3rd Qu.:1.0000 3rd Qu.:45.00 3rd Qu.:2.000 3rd Qu.:10.667
## Max. :1.0000 Max. :60.00 Max. :2.000 Max. :20.000
## NA's :1259 NA's :1359 NA's :1359 NA's :1603
```

```
#removed between subject rows
```

```
new_data <- data %>% filter(ID == unique(data$ID))
```

```
#created array without NA values
```

```
filtered_new_data <- na.omit(data$EEfRT_ProportionHardTasksSelected)
```

```
#removed subject ID with NA values for the task and lifetime substance use
```

```
data_update <- new_data[c(-42, -43, -44, -45, -46, -47), ]
```

```
data_update <- subset(data_update, !(is.na(LifetimeSubstanceDisorder)))
```

```
#assigned comorbid conditions as factored variables
```

```
data_update$ComorbidAnxietyDisorder <- as.factor(
  data_update$ComorbidAnxietyDisorder
)
```

```
data_update$LifetimeSubstanceDisorder <- as.factor(
  data_update$LifetimeSubstanceDisorder
)
```

```
#SCID was used to assess comorbidity
```

```
#There were only 2 factor levels for both comorbidities
```

```
 #(1 = no presence, 3 = presence)
```

```
#These factor levels were assigned as (1 = 0, 3 = 1)
```

```
levels(data_update$ComorbidAnxietyDisorder)
```

```
## [1] "1" "3"
levels(data_update$LifetimeSubstanceDisorder)

## [1] "1" "3"
levels(data_update$ComorbidAnxietyDisorder) <- c(0, 1)
levels(data_update$LifetimeSubstanceDisorder) <- c(0, 1)

#Removed extra columns
data_update <- subset(data_update, select = -c(7, 8, 39))

#Renamed columns
data_update <- data_update %>% rename(
  Age = Age.y,
  Gender = Gender.y
)

#converted to factored variable for analyses
data_update$Gender <- as.factor(data_update$Gender)
levels(data_update$Gender)

## [1] "1" "2"
```

Normality Tests

```
shapiro.test(data_update$EEfRT_ProportionHardTasksSelected)

##
##  Shapiro-Wilk normality test
##
## data:  data_update$EEfRT_ProportionHardTasksSelected
## W = 0.95185, p-value = 0.08782
shapiro.test(data_update$Reward_Level)

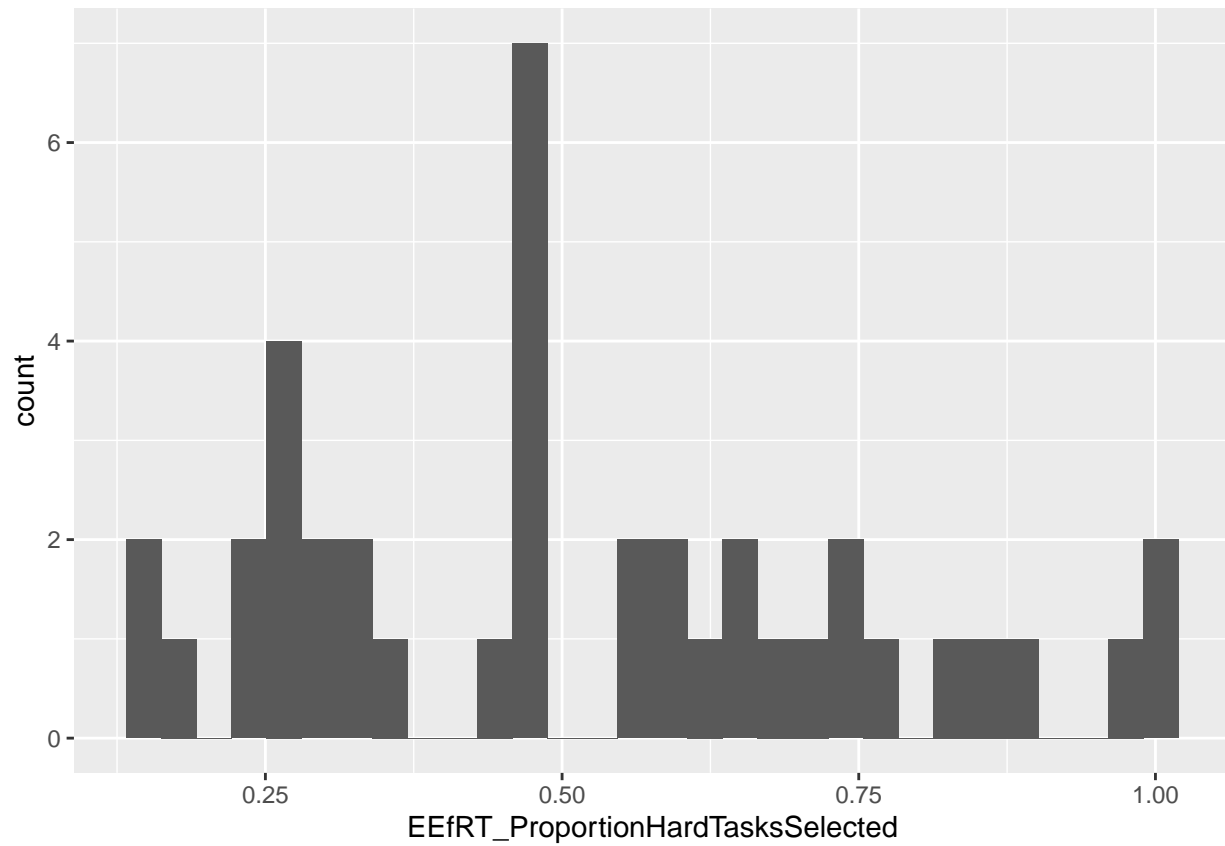
##
##  Shapiro-Wilk normality test
##
## data:  data_update$Reward_Level
## W = 0.9573, p-value = 0.1354
shapiro.test(data_update$WASSUP_FinSuccess)

##
##  Shapiro-Wilk normality test
##
## data:  data_update$WASSUP_FinSuccess
## W = 0.8656, p-value = 0.0002202
shapiro.test(data_update$WASSUP_PopFame)

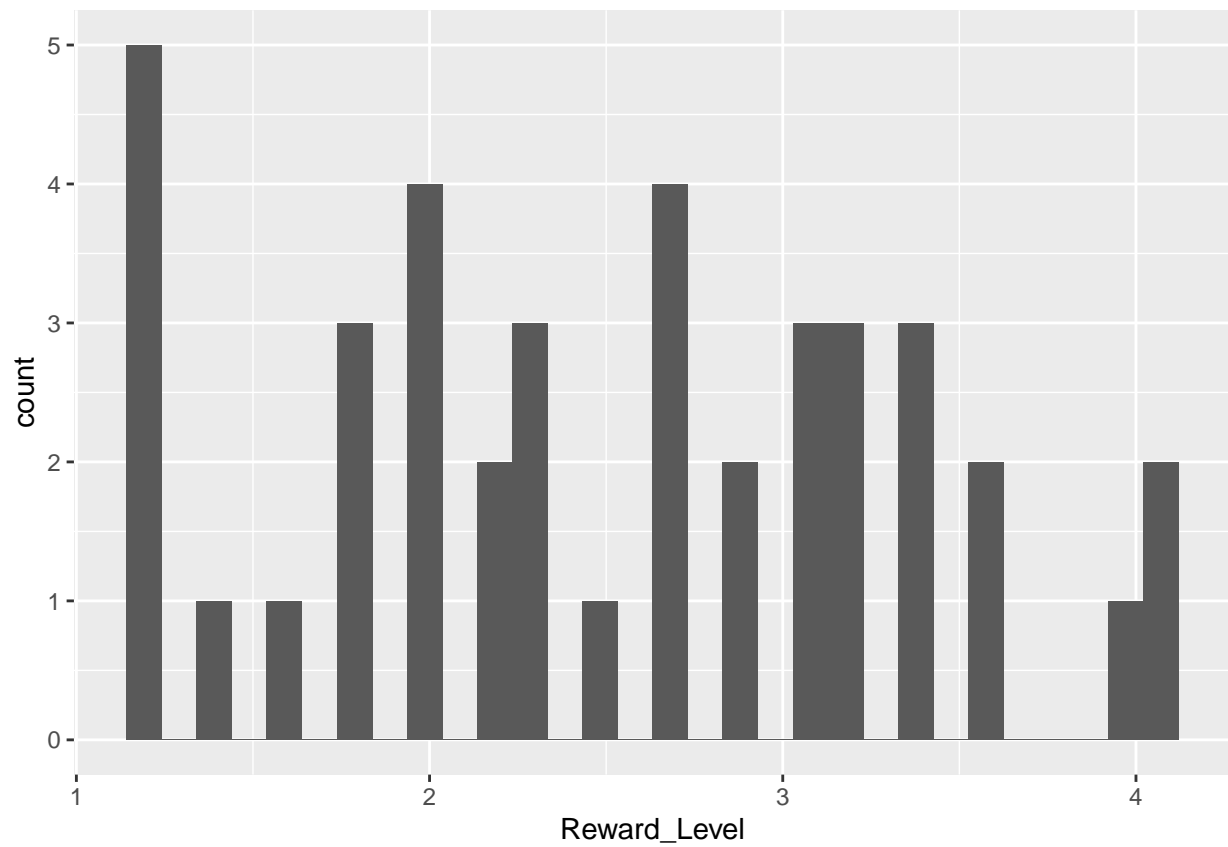
##
##  Shapiro-Wilk normality test
##
## data:  data_update$WASSUP_PopFame
## W = 0.76591, p-value = 1.418e-06
```

Plotting the data to visualize the normality/abnormality

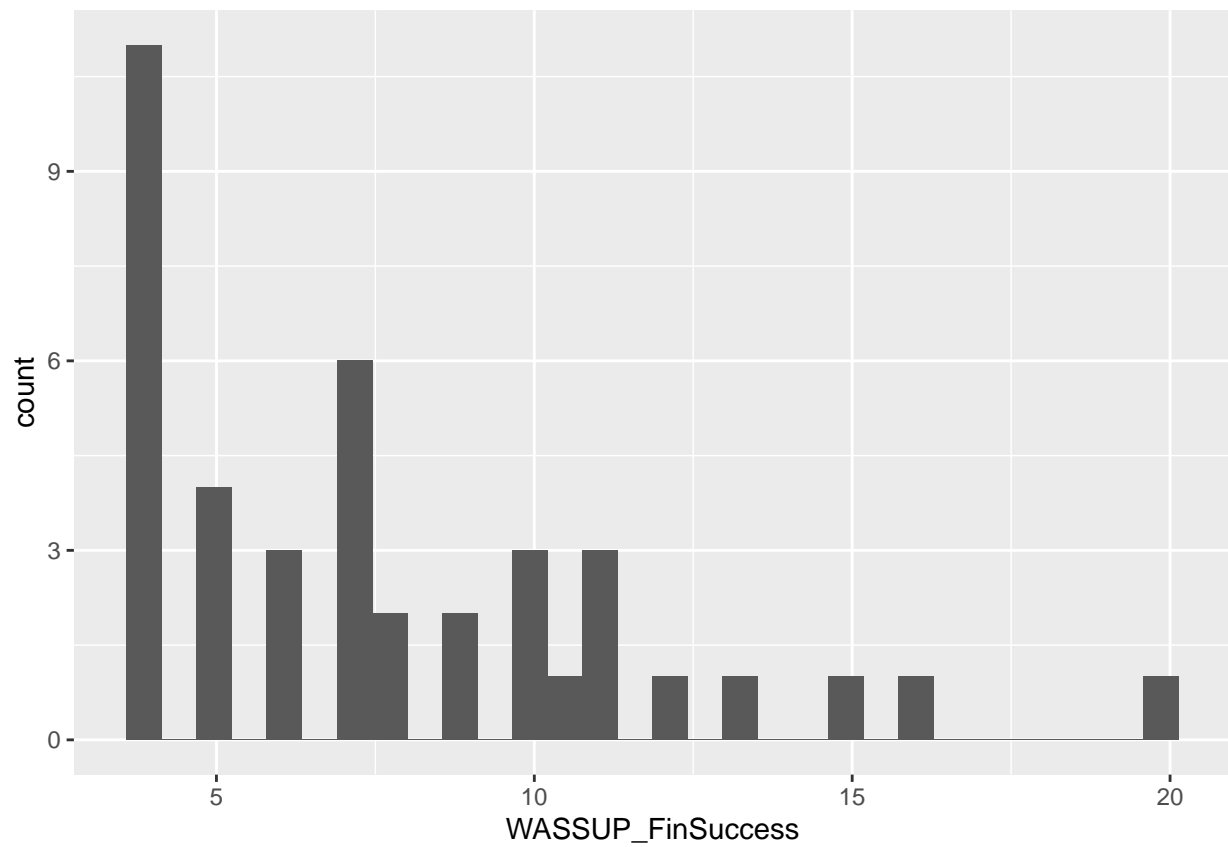
```
ggplot(data_update, aes(x = EEfRT_ProportionHardTasksSelected)) +  
  geom_histogram()
```



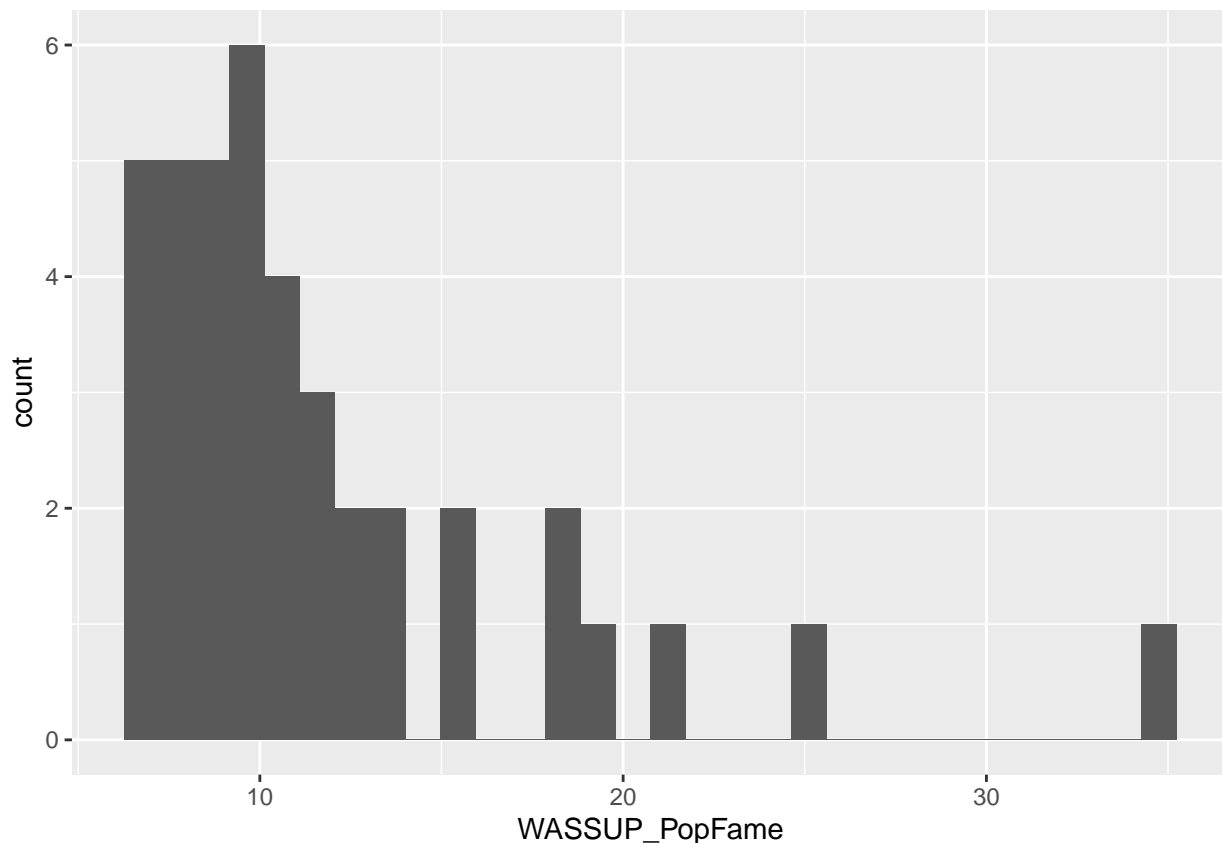
```
ggplot(data_update, aes(x = Reward_Level)) +  
  geom_histogram()
```



```
ggplot(data_update, aes(x = WASSUP_FinSuccess)) +  
  geom_histogram()
```



```
ggplot(data_update, aes(x = WASSUP_PopFame)) +  
  geom_histogram()
```



```
# filter all the data from data_update where comorbid anxiety disorder is 1
data_update_anxiety <- data_update[data_update$ComorbidAnxietyDisorder == 1, ]
data_update_substance <- data_update[data_update$LifetimeSubstanceDisorder == 1, ]
data_update_both <- data_update[data_update$ComorbidAnxietyDisorder == 1 &
  data_update$LifetimeSubstanceDisorder == 1, ]
data_update_neither <- data_update[data_update$ComorbidAnxietyDisorder == 0 &
  data_update$LifetimeSubstanceDisorder == 0, ]
```

```
head(data_update_neither, 10)
```

```
## # A tibble: 6 x 36
##       ID EefRT_~1 SCID_~2 SCID_~3 SCID_~4 SCID_~5 Years~6 Emplo~7 Curre~8 Numbe~9
##   <dbl>   <dbl> <dbl>+1 <chr>   <dbl>+1 <chr>       <dbl> <dbl>+1 <dbl>+1 <dbl>
## 1  1508   0.722 1 [No]  3      1 [No]  3          16 3 [Hom~ 1 [No]    4
## 2  1516   0.553 1 [No]  3      1 [No]  3          16 9 [Une~ 1 [No]    1
## 3  1523   0.778 1 [No]  2      1 [No]  3          13 4 [Stu~ 1 [No]    0
## 4  1534   0.889 1 [No]  3      1 [No]  3          18 1 [Ful~ 3 [Yes]    2
## 5  1547    1     1 [No]  3      1 [No]  3          16 9 [Une~ 1 [No]    1
## 6  1558   0.571 2      3      1 [No]  3          14 2 [Par~ 3 [Yes]   12
## # ... with 26 more variables: HospitalizationsforDepression <dbl>,
## #   AgeofFirstMDE <dbl>, NumberManicEpisodes <dbl>,
## #   HospitalizationsforMania <dbl>, AgeofFirstManicEpisode <dbl>,
## #   ComorbidAnxietyDisorder <fct>, LifetimeSubstanceDisorder <fct>,
## #   LithiumDosage <dbl>, ImipramineEquivDosage <dbl>,
## #   AnticonvulsantDosage <dbl>, RisperidoneEquivDosage <dbl>,
## #   LamotrigineDosage <dbl>, Reverse_Digit_Span <dbl>, ASRM <dbl>, ...
```



```
head(data_update_anxiety, 10)
```

```
## # A tibble: 10 x 36
##       ID EEfRT~1 SCID_~2 SCID_~3 SCID_~4 SCID_~5 Years~6 Emplo~7 Curre~8 Numbe~9
##   <dbl> <dbl> <dbl+1> <chr> <dbl+1> <chr> <dbl> <dbl+1> <dbl+1> <dbl>
## 1 1500 0.468 1 [No] 3 1 [No] 3 16 2 [Par~ 3 [Yes] 5
## 2 1507 0.18 3 [Yes] ? 3 [Yes] 3 15 2 [Par~ 3 [Yes] NA
## 3 1509 0.689 1 [No] 3 1 [No] 3 16 9 [Une~ 1 [No] 13
## 4 1512 0.36 1 [No] 3 1 [No] 3 16 6 [Dis~ 1 [No] 12
## 5 1515 0.75 3 [Yes] 3 1 [No] 3 11 4 [Stu~ 1 [No] 3
## 6 1520 0.469 1 [No] 3 1 [No] 3 16 9 [Une~ 1 [No] 12
## 7 1521 0.292 2 3 1 [No] 3 16 9 [Une~ 1 [No] 28
## 8 1522 0.24 1 [No] 3 1 [No] 3 14 9 [Une~ 1 [No] 10
## 9 1527 0.977 1 [No] 3 1 [No] 3 17 9 [Une~ 1 [No] 2
## 10 1535 0.48 1 [No] 3 1 [No] 3 16 2 [Par~ 3 [Yes] 30
## # ... with 26 more variables: HospitalizationsforDepression <dbl>,
## # AgeofFirstMDE <dbl>, NumberManicEpisodes <dbl>,
## # HospitalizationsforMania <dbl>, AgeofFirstManicEpisode <dbl>,
## # ComorbidAnxietyDisorder <fct>, LifetimeSubstanceDisorder <fct>,
## # LithiumDosage <dbl>, ImipramineEquivDosage <dbl>,
## # AnticonvulstantDosage <dbl>, RisperidoneEquivDosage <dbl>,
## # LamotrigineDosage <dbl>, Reverse_Digit_Span <dbl>, ASRM <dbl>, ...
```

```
head(data_update_substance, 10)
```

```
## # A tibble: 10 x 36
##       ID EEfRT~1 SCID_~2 SCID_~3 SCID_~4 SCID_~5 Years~6 Emplo~7 Curre~8 Numbe~9
##   <dbl> <dbl> <dbl+1> <chr> <dbl+1> <chr> <dbl> <dbl+1> <dbl+1> <dbl>
## 1 1500 0.468 1 [No] 3 1 [No] 3 16 2 [Par~ 3 [Yes] 5
## 2 1507 0.18 3 [Yes] ? 3 [Yes] 3 15 2 [Par~ 3 [Yes] NA
## 3 1509 0.689 1 [No] 3 1 [No] 3 16 9 [Une~ 1 [No] 13
## 4 1511 0.479 1 [No] 3 1 [No] 3 13 1 [Ful~ 3 [Yes] 3
## 5 1512 0.36 1 [No] 3 1 [No] 3 16 6 [Dis~ 1 [No] 12
## 6 1515 0.75 3 [Yes] 3 1 [No] 3 11 4 [Stu~ 1 [No] 3
## 7 1518 0.26 1 [No] 1 1 [No] 3 14 2 [Par~ 3 [Yes] 0
## 8 1520 0.469 1 [No] 3 1 [No] 3 16 9 [Une~ 1 [No] 12
## 9 1521 0.292 2 3 1 [No] 3 16 9 [Une~ 1 [No] 28
## 10 1527 0.977 1 [No] 3 1 [No] 3 17 9 [Une~ 1 [No] 2
## # ... with 26 more variables: HospitalizationsforDepression <dbl>,
## # AgeofFirstMDE <dbl>, NumberManicEpisodes <dbl>,
## # HospitalizationsforMania <dbl>, AgeofFirstManicEpisode <dbl>,
## # ComorbidAnxietyDisorder <fct>, LifetimeSubstanceDisorder <fct>,
## # LithiumDosage <dbl>, ImipramineEquivDosage <dbl>,
## # AnticonvulstantDosage <dbl>, RisperidoneEquivDosage <dbl>,
## # LamotrigineDosage <dbl>, Reverse_Digit_Span <dbl>, ASRM <dbl>, ...
```

```
head(data_update_both, 10)
```

```
## # A tibble: 10 x 36
##       ID EEfRT~1 SCID_~2 SCID_~3 SCID_~4 SCID_~5 Years~6 Emplo~7 Curre~8 Numbe~9
##   <dbl> <dbl> <dbl+1> <chr> <dbl+1> <chr> <dbl> <dbl+1> <dbl+1> <dbl>
## 1 1500 0.468 1 [No] 3 1 [No] 3 16 2 [Par~ 3 [Yes] 5
## 2 1507 0.18 3 [Yes] ? 3 [Yes] 3 15 2 [Par~ 3 [Yes] NA
## 3 1509 0.689 1 [No] 3 1 [No] 3 16 9 [Une~ 1 [No] 13
## 4 1512 0.36 1 [No] 3 1 [No] 3 16 6 [Dis~ 1 [No] 12
```

```
## 5 1515 0.75 3 [Yes] 3 1 [No] 3 11 4 [Stu~ 1 [No] 3
## 6 1520 0.469 1 [No] 3 1 [No] 3 16 9 [Une~ 1 [No] 12
## 7 1521 0.292 2 3 1 [No] 3 16 9 [Une~ 1 [No] 28
## 8 1527 0.977 1 [No] 3 1 [No] 3 17 9 [Une~ 1 [No] 2
## 9 1549 0.6 3 [Yes] ? 1 [No] 3 14 9 [Une~ 1 [No] NA
## 10 1550 0.458 1 [No] 1 1 [No] 3 19 6 [Dis~ 1 [No] 0
## # ... with 26 more variables: HospitalizationsforDepression <dbl>,
## # AgeofFirstMDE <dbl>, NumberManicEpisodes <dbl>,
## # HospitalizationsforMania <dbl>, AgeofFirstManicEpisode <dbl>,
## # ComorbidAnxietyDisorder <fct>, LifetimeSubstanceDisorder <fct>,
## # LithiumDosage <dbl>, ImipramineEquivDosage <dbl>,
## # AnticonvulstantDosage <dbl>, RisperidoneEquivDosage <dbl>,
## # LamotrigineDosage <dbl>, Reverse_Digit_Span <dbl>, ASRM <dbl>, ...
```

Exploratory Correlation Tests

#Correlation tests

```
cor.test(
  data_update$EEfRT_ProportionHardTasksSelected, data_update$Reward_Level
)
```

```
##
## Pearson's product-moment correlation
##
## data: data_update$EEfRT_ProportionHardTasksSelected and data_update$Reward_Level
## t = -0.34918, df = 38, p-value = 0.7289
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## -0.3616910 0.2595279
## sample estimates:
## cor
## -0.05655354
```

```
cor.test(
  data_update$EEfRT_ProportionHardTasksSelected, data_update$LithiumDosage
)
```

```
##
## Pearson's product-moment correlation
##
## data: data_update$EEfRT_ProportionHardTasksSelected and data_update$LithiumDosage
## t = -0.81276, df = 38, p-value = 0.4214
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## -0.4249228 0.1884676
## sample estimates:
## cor
## -0.130716
```

```
cor.test(
  data_update$EEfRT_ProportionHardTasksSelected, data_update$WASSUP_FinSuccess
)
```

```
##
## Pearson's product-moment correlation
##
```

```
## data: data_update$EEfRT_ProportionHardTasksSelected and data_update$WASSUP_FinSuccess
## t = 1.5521, df = 38, p-value = 0.1289
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## -0.07288566 0.51639921
## sample estimates:
## cor
## 0.2441674
```

```
cor.test(
  data_update$EEfRT_ProportionHardTasksSelected, data_update$Age
)
```

```
##
## Pearson's product-moment correlation
##
## data: data_update$EEfRT_ProportionHardTasksSelected and data_update$Age
## t = -0.85504, df = 38, p-value = 0.3979
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## -0.4304759 0.1819044
## sample estimates:
## cor
## -0.1373902
```

```
cor.test(
  data_update$EEfRT_ProportionHardTasksSelected,
  as.numeric(data_update$Gender)
)
```

```
##
## Pearson's product-moment correlation
##
## data: data_update$EEfRT_ProportionHardTasksSelected and as.numeric(data_update$Gender)
## t = -1.3748, df = 38, p-value = 0.1772
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## -0.4955848 0.1006538
## sample estimates:
## cor
## -0.2176809
```

```
cor.test(
  data_update$WASSUP_FinSuccess, data_update$WASSUP_PopFame
)
```

```
##
## Pearson's product-moment correlation
##
## data: data_update$WASSUP_FinSuccess and data_update$WASSUP_PopFame
## t = 5.8269, df = 38, p-value = 9.836e-07
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## 0.4776301 0.8224497
## sample estimates:
## cor
```

```
## 0.6869332
```

Correlation Heatmap

Correlation Heatmap

```
# Removed the ID column
data_update_1 <- data_update[, -1]

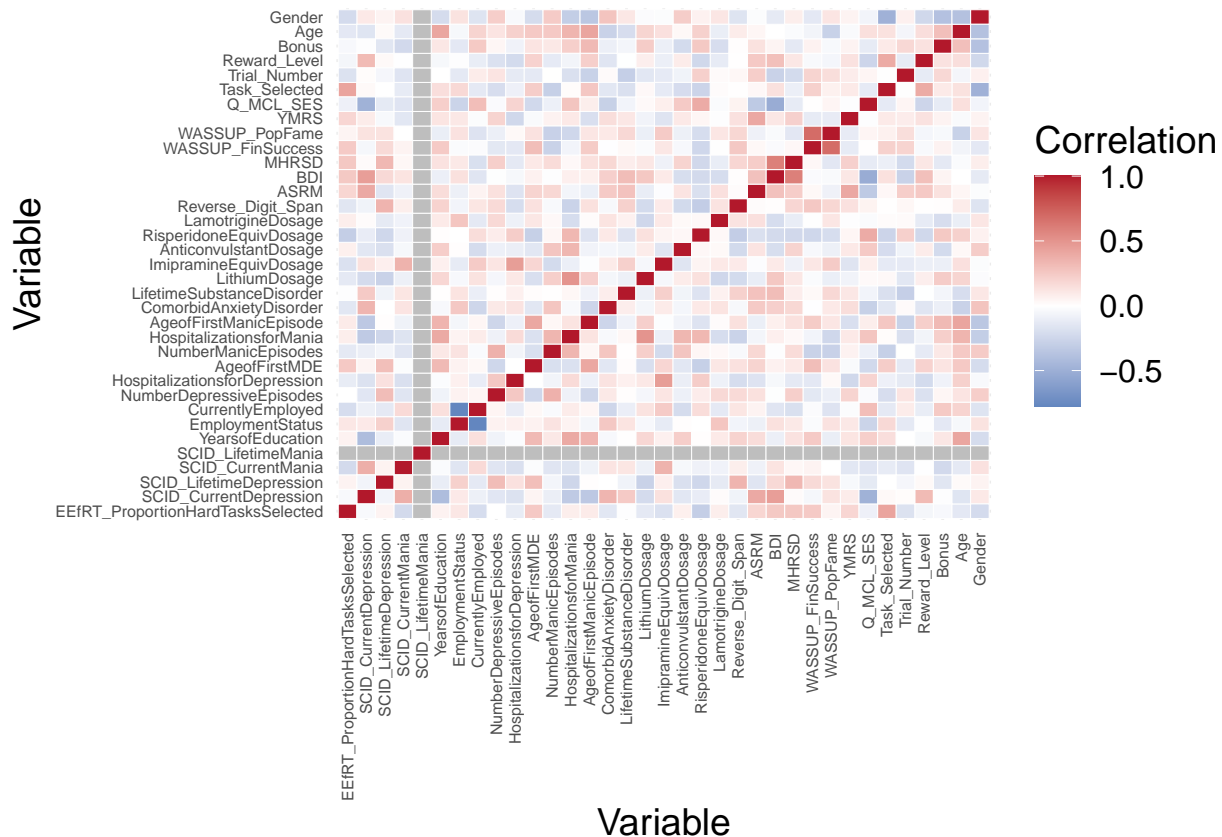
# Converted all the NAs to -1
data_update_1[is.na(data_update_1)] <- -1

# Converted each element in the data frame to numeric
data_update_1 <- as.data.frame(lapply(data_update_1, as.numeric))
data_update_1 <- na.aggregate(data_update_1, FUN = median)

cor_data <- cor(data_update_1)

melt_data_update <- melt(cor_data, varnames = c("Variable1", "Variable2"))
melt_data_update <- melt_data_update[order(-melt_data_update$value), ]

# Plotting heatmap with sorted variables
ggplot(melt_data_update, aes(x = Variable1, y = Variable2)) +
  geom_tile(aes(fill = value), color = "white") +
  scale_fill_gradient2(low = "#2166ac", mid = "white", high = "#b2182b",
    midpoint = 0, na.value = "gray") +
  theme_minimal() +
  theme(
    axis.text.x = element_text(angle = 90, hjust = 1, vjust = 0.5, size = 5.5),
    axis.text.y = element_text(angle = 0, hjust = 1, vjust = 0.5, size = 5.5),
    axis.title.x = element_text(size = 14),
    axis.title.y = element_text(size = 14),
    legend.text = element_text(size = 12),
    legend.title = element_text(size = 14)
  ) +
  labs(
    x = "Variable",
    y = "Variable",
    fill = "Correlation"
  )
)
```



None of the correlation tests were significant. Correlation between EEfRT proportion and Reward Level $r = -0.056$, $p > .01$ had a negative and weak relationship. Similarly, correlation between EEfRT proportion and Lithium Dosage $r = -0.13$, $p > .01$ had a negative and weak relationship. Additionally, correlation between EEfRT proportion and Age $r = -0.137$, $p > .01$ had a negative and weak relationship.

Exploratory T-tests

#Independent sample t-tests

```
t.test(EEfRT_ProportionHardTasksSelected ~ Gender, data_update)
```

```
##
## Welch Two Sample t-test
##
## data: EEfRT_ProportionHardTasksSelected by Gender
## t = 1.33, df = 29.957, p-value = 0.1936
## alternative hypothesis: true difference in means between group 1 and group 2 is not equal to 0
## 95 percent confidence interval:
## -0.05714131 0.27049558
## sample estimates:
## mean in group 1 mean in group 2
## 0.5825924 0.4759152
```

```
t.test(Reward_Level ~ Gender, data_update)
```

```
##
## Welch Two Sample t-test
##
## data: Reward_Level by Gender
```

```

## t = 1.508, df = 34.108, p-value = 0.1408
## alternative hypothesis: true difference in means between group 1 and group 2 is not equal to 0
## 95 percent confidence interval:
## -0.1399776 0.9456042
## sample estimates:
## mean in group 1 mean in group 2
##      2.754118      2.351304

#Independent sample t-tests of DVs with IV = Comorbid Anxiety Disorder
t.test(EEfRT_ProportionHardTasksSelected ~ ComorbidAnxietyDisorder, data_update)

##
## Welch Two Sample t-test
##
## data: EEfRT_ProportionHardTasksSelected by ComorbidAnxietyDisorder
## t = 0.88641, df = 27.265, p-value = 0.3831
## alternative hypothesis: true difference in means between group 0 and group 1 is not equal to 0
## 95 percent confidence interval:
## -0.09596934 0.24207387
## sample estimates:
## mean in group 0 mean in group 1
##      0.5669107      0.4938584

t.test(WASSUP_PopFame ~ ComorbidAnxietyDisorder, data_update)

##
## Welch Two Sample t-test
##
## data: WASSUP_PopFame by ComorbidAnxietyDisorder
## t = -0.70835, df = 37.805, p-value = 0.4831
## alternative hypothesis: true difference in means between group 0 and group 1 is not equal to 0
## 95 percent confidence interval:
## -4.484291 2.159847
## sample estimates:
## mean in group 0 mean in group 1
##      11.27778      12.44000

t.test(WASSUP_FinSuccess ~ ComorbidAnxietyDisorder, data_update)

##
## Welch Two Sample t-test
##
## data: WASSUP_FinSuccess by ComorbidAnxietyDisorder
## t = 0.025821, df = 34.267, p-value = 0.9795
## alternative hypothesis: true difference in means between group 0 and group 1 is not equal to 0
## 95 percent confidence interval:
## -2.416793 2.479015
## sample estimates:
## mean in group 0 mean in group 1
##      7.711111      7.680000

#Independent sample t-tests of DVs with IV = Lifetime Substance use Disorder
t.test(
  EEfRT_ProportionHardTasksSelected ~ LifetimeSubstanceDisorder, data_update
)

##

```

```

## Welch Two Sample t-test
##
## data: EEfRT_ProportionHardTasksSelected by LifetimeSubstanceDisorder
## t = 0.063453, df = 23.012, p-value = 0.95
## alternative hypothesis: true difference in means between group 0 and group 1 is not equal to 0
## 95 percent confidence interval:
## -0.1742804 0.1853108
## sample estimates:
## mean in group 0 mean in group 1
## 0.5248379 0.5193227
t.test(WASSUP_PopFame ~ LifetimeSubstanceDisorder, data_update)

##
## Welch Two Sample t-test
##
## data: WASSUP_PopFame by LifetimeSubstanceDisorder
## t = -1.3806, df = 37.505, p-value = 0.1756
## alternative hypothesis: true difference in means between group 0 and group 1 is not equal to 0
## 95 percent confidence interval:
## -5.121516 0.969501
## sample estimates:
## mean in group 0 mean in group 1
## 10.65476 12.73077
t.test(WASSUP_FinSuccess ~ LifetimeSubstanceDisorder, data_update)

##
## Welch Two Sample t-test
##
## data: WASSUP_FinSuccess by LifetimeSubstanceDisorder
## t = -0.17366, df = 27.33, p-value = 0.8634
## alternative hypothesis: true difference in means between group 0 and group 1 is not equal to 0
## 95 percent confidence interval:
## -2.838490 2.395266
## sample estimates:
## mean in group 0 mean in group 1
## 7.547619 7.769231

# create a data frame with the p-values of the t-tests
p_values <- data.frame(
  IV = c("Gender", "Gender", "Gender", "Gender",
    "Comorbid Anxiety", "Comorbid Anxiety",
    "Comorbid Anxiety", "Comorbid Anxiety", # nolint
    "Lifetime Substance Use", "Lifetime Substance Use",
    "Lifetime Substance Use", "Lifetime Substance Use",
    "0.05", "0.05", "0.05", "0.05"
  ), # nolint
  DV = c("EEfRT", "Reward_Level", "WASSUP Fin", "WASSUP Pop",
    "EEfRT", "WASSUP Pop", "WASSUP Fin", "Reward_Level", # nolint
    "EEfRT", "WASSUP Pop", "WASSUP Fin", "Reward_Level",
    "EEfRT", "WASSUP Pop", "WASSUP Fin", "Reward_Level"), # nolint
  p_value = c(t.test(EEfRT_ProportionHardTasksSelected ~ Gender, data_update)$p.value, # nolint
    t.test(Reward_Level ~ Gender, data_update)$p.value, # nolint
    t.test(WASSUP_FinSuccess ~ Gender, data_update)$p.value, # nolint
    t.test(WASSUP_PopFame ~ Gender, data_update)$p.value, # nolint

```

```

t.test(EEfRT_ProportionHardTasksSelected ~ ComorbidAnxietyDisorder, data_update)$p.value,
t.test(WASSUP_PopFame ~ ComorbidAnxietyDisorder, data_update)$p.value, # nolint
t.test(WASSUP_FinSuccess ~ ComorbidAnxietyDisorder, data_update)$p.value, # nolint
t.test(Reward_Level ~ ComorbidAnxietyDisorder, data_update)$p.value, # nolint
t.test(EEfRT_ProportionHardTasksSelected ~ LifetimeSubstanceDisorder, data_update)$p.value,
t.test(WASSUP_PopFame ~ LifetimeSubstanceDisorder, data_update)$p.value, # nolint
t.test(WASSUP_FinSuccess ~ LifetimeSubstanceDisorder, data_update)$p.value, # nolint
t.test(Reward_Level ~ LifetimeSubstanceDisorder, data_update)$p.value, # nolint
0.05, 0.05, 0.05, 0.05) # nolint
)

```

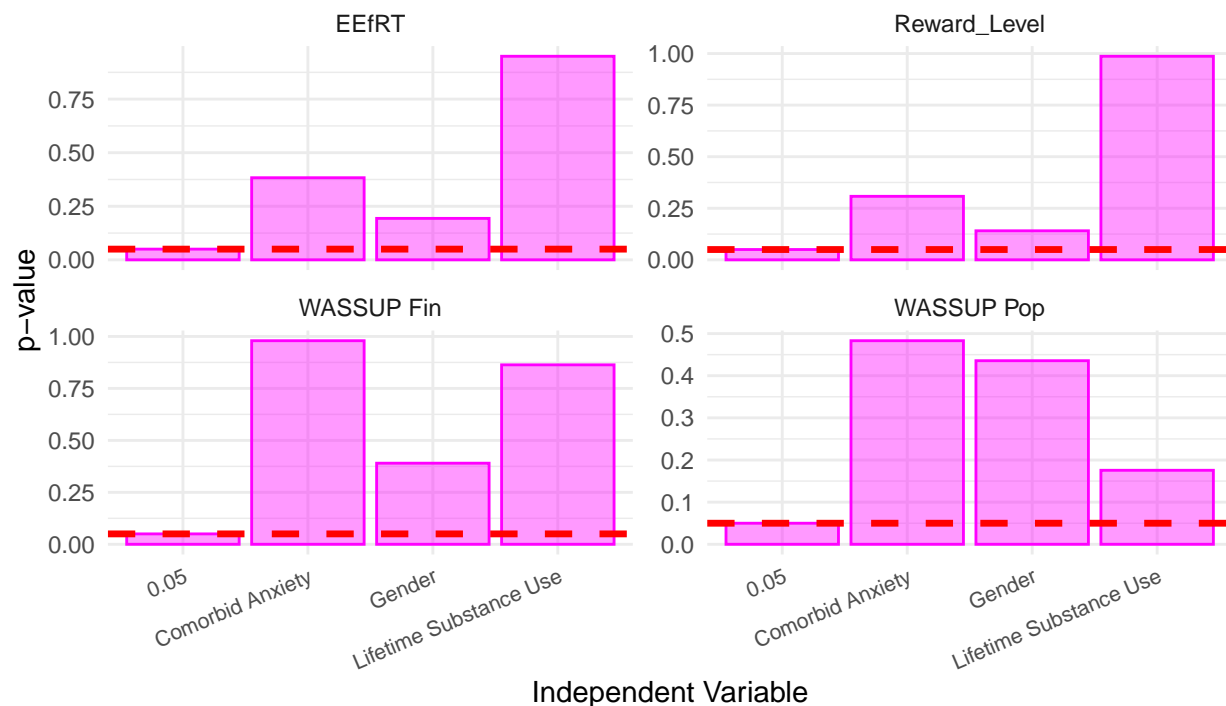
```

ggplot(p_values, aes(x = IV, y = p_value)) +
  geom_bar(stat = "identity", fill = "magenta", alpha = 0, color = "magenta", size = 0.5) +
  geom_bar(stat = "identity", fill = "magenta", alpha = 0.4) +
  geom_hline(yintercept = 0.05, color = "red", linetype = "dashed", size = 1.2) +
  facet_wrap(~DV, nrow = 3, scales = "free_y") +
  labs(title = "Support for Null Hypothesis",
       subtitle = "p-values for Independent Samples t-tests",
       x = "Independent Variable",
       y = "p-value",
       caption = "Source: data_update") +
  theme_minimal() +
  theme(axis.text.x = element_text(size = 8, angle = 23, hjust = 1))

```

Support for Null Hypothesis

p-values for Independent Samples t-tests



Source: data_update

```

ggplot(
  p_values, aes(x = p_value, y = reorder(IV, p_value))) +
  geom_point(aes(color = p_value), size = 3, alpha = 0.8) +

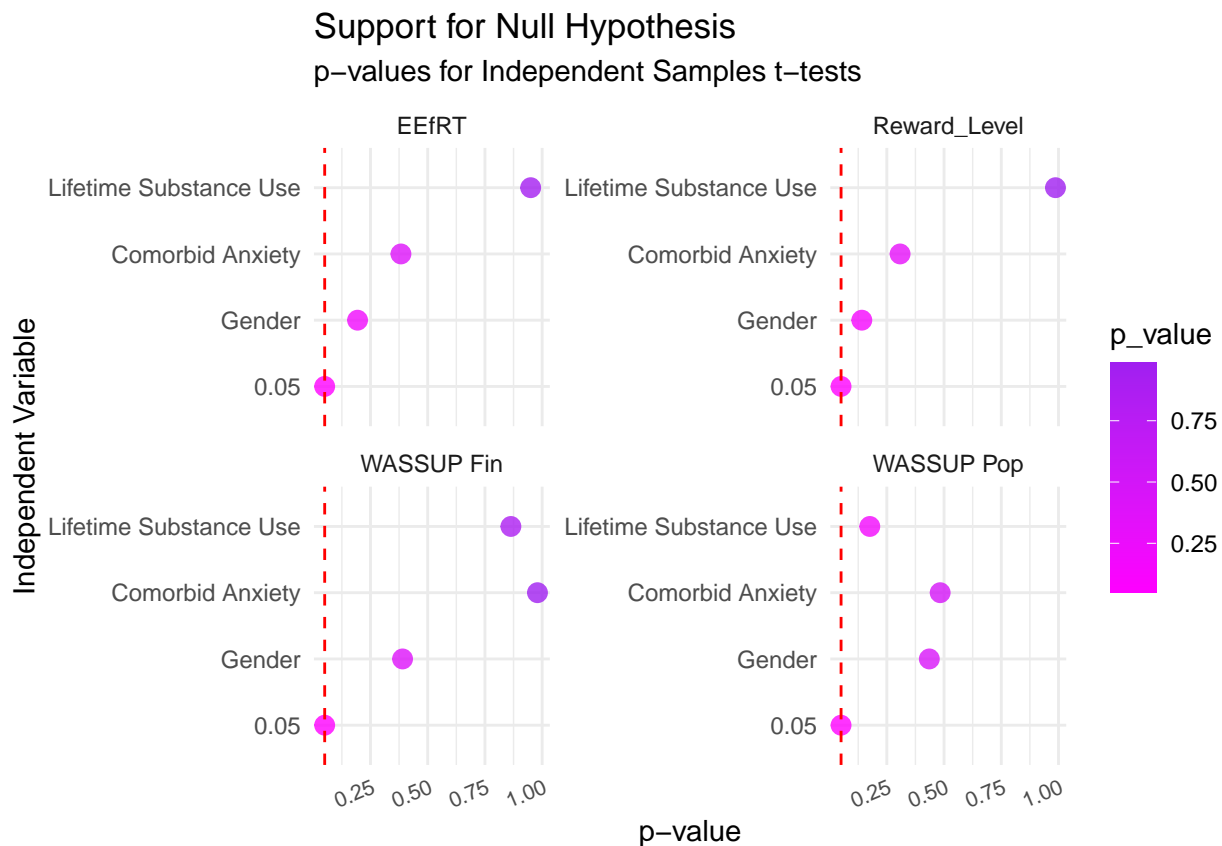
```



```

facet_wrap(~DV, nrow = 3, scales = "free_y") +
scale_color_gradient(low = "magenta", high = "purple") +
labs(
  title = "Support for Null Hypothesis",
  subtitle = "p-values for Independent Samples t-tests",
  x = "p-value",
  y = "Independent Variable"
) +
theme_minimal() +
theme(axis.text.x = element_text(size = 8, angle = 23, hjust = 1)) +
geom_vline(xintercept = 0.05, color = "red", linetype = "dashed"
)

```



None of the t-tests were significant. A t-test between EEfRT and Gender did not exhibit any significant difference between males ($M = 0.582$) and females ($M = 0.476$) on the EEfRT proportion $t(30) = 1.33$, $p = 0.193$. A t-test between Reward Level and Gender did not exhibit any significant difference between males ($M = 2.754$) and females ($M = 2.351$) on the Reward level, $t(34) = 1.508$, $p = 0.14$.

ANOVA and Tukey HSD

```

#Interaction between ComorbidAnxietyDisorder
#and LifetimeSubstanceDisorder on EEfRT_ProportionHardTasksS
modell1 <- aov(
  EEfRT_ProportionHardTasksSelected ~
  ComorbidAnxietyDisorder * LifetimeSubstanceDisorder,
  data = data_update
)

```

```
summary(model1)
```

```
##                                Df Sum Sq Mean Sq F value
## ComorbidAnxietyDisorder        1  0.0500   0.0500   1.044
## LifetimeSubstanceDisorder      1  0.0000   0.0000   0.000
## ComorbidAnxietyDisorder:LifetimeSubstanceDisorder  1  0.5727   0.5727  11.954
## Residuals                      36  1.7248   0.0479
##                                Pr(>F)
## ComorbidAnxietyDisorder        0.31366
## LifetimeSubstanceDisorder      0.99446
## ComorbidAnxietyDisorder:LifetimeSubstanceDisorder 0.00142 **
## Residuals
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
TukeyHSD(model1)
```

```
## Tukey multiple comparisons of means
## 95% family-wise confidence level
##
## Fit: aov(formula = EEfRT_ProportionHardTasksSelected ~ ComorbidAnxietyDisorder * LifetimeSubstanceDisorder, data = data_update)
##
## $ComorbidAnxietyDisorder
##      diff      lwr      upr      p adj
## 1-0 -0.07305227 -0.2180372  0.07193269  0.3136571
##
## $LifetimeSubstanceDisorder
##      diff      lwr      upr      p adj
## 1-0  0.0005056264 -0.1466537  0.147665  0.9944786
##
## $`ComorbidAnxietyDisorder:LifetimeSubstanceDisorder`
##      diff      lwr      upr      p adj
## 1:0-0:0 -0.3979742 -0.71634764 -0.079600688  0.0094274
## 0:1-0:0 -0.3089017 -0.61960237  0.001799034  0.0518157
## 1:1-0:0 -0.1927081 -0.47264321  0.087226936  0.2656569
## 0:1-1:0  0.0890725 -0.19737939  0.375524392  0.8362771
## 1:1-1:0  0.2052660 -0.04748564  0.458017699  0.1461689
## 1:1-0:1  0.1161935 -0.12682223  0.359209291  0.5765149
```

```
#Interaction between ComorbidAnxietyDisorder
# and LifetimeSubstanceDisorder on WASSUP_PopFame
```

```
model2 <- aov(
  WASSUP_PopFame ~ ComorbidAnxietyDisorder * LifetimeSubstanceDisorder,
  data = data_update
)
summary(model2)
```

```
##                                Df Sum Sq Mean Sq F value
## ComorbidAnxietyDisorder        1  12.7    12.66   0.399
## LifetimeSubstanceDisorder      1  35.9    35.92   1.133
## ComorbidAnxietyDisorder:LifetimeSubstanceDisorder  1  14.9    14.87   0.469
## Residuals                      36 1141.2    31.70
##                                Pr(>F)
## ComorbidAnxietyDisorder        0.531
## LifetimeSubstanceDisorder      0.294
```

```
## ComorbidAnxietyDisorder:LifetimeSubstanceDisorder 0.498
## Residuals
TukeyHSD(model2)

## Tukey multiple comparisons of means
## 95% family-wise confidence level
##
## Fit: aov(formula = WASSUP_PopFame ~ ComorbidAnxietyDisorder * LifetimeSubstanceDisorder, data = data)
##
## $ComorbidAnxietyDisorder
##      diff      lwr      upr      p adj
## 1-0 1.162222 -2.567181 4.891625 0.5313606
##
## $LifetimeSubstanceDisorder
##      diff      lwr      upr      p adj
## 1-0 1.98022 -1.805115 5.765554 0.2957763
##
## $`ComorbidAnxietyDisorder:LifetimeSubstanceDisorder`
##      diff      lwr      upr      p adj
## 1:0-0:0 -0.6527778 -8.842200 7.536644 0.9964401
## 0:1-0:0 0.4166667 -7.575391 8.408724 0.9989932
## 1:1-0:0 2.3839869 -4.816696 9.584670 0.8091792
## 0:1-1:0 1.0694444 -6.298869 8.437757 0.9794103
## 1:1-1:0 3.0367647 -3.464688 9.538217 0.5949397
## 1:1-0:1 1.9673203 -4.283699 8.218339 0.8313366

#Interaction between ComorbidAnxietyDisorder
# and LifetimeSubstanceDisorder on WASSUP_FinSuccess
model3 <- aov(
  WASSUP_FinSuccess ~ ComorbidAnxietyDisorder * LifetimeSubstanceDisorder,
  data = data_update
)
summary(model3)

##              Df Sum Sq Mean Sq F value
## ComorbidAnxietyDisorder      1    0.0    0.009    0.001
## LifetimeSubstanceDisorder      1    0.5    0.460    0.029
## ComorbidAnxietyDisorder:LifetimeSubstanceDisorder      1    4.8    4.763    0.302
## Residuals                36  567.1   15.752
##              Pr(>F)
## ComorbidAnxietyDisorder      0.981
## LifetimeSubstanceDisorder      0.865
## ComorbidAnxietyDisorder:LifetimeSubstanceDisorder      0.586
## Residuals

TukeyHSD(model3)

## Tukey multiple comparisons of means
## 95% family-wise confidence level
##
## Fit: aov(formula = WASSUP_FinSuccess ~ ComorbidAnxietyDisorder * LifetimeSubstanceDisorder, data = data)
##
## $ComorbidAnxietyDisorder
##      diff      lwr      upr      p adj
## 1-0 -0.03111111 -2.659996 2.597774 0.9809842
```

```
##
## $LifetimeSubstanceDisorder
##      diff      lwr      upr      p adj
## 1-0 0.2241758 -2.444136 2.892487 0.8656586
##
## $`ComorbidAnxietyDisorder:LifetimeSubstanceDisorder`
##      diff      lwr      upr      p adj
## 1:0-0:0 -0.9861111 -6.758898 4.786676 0.9672110
## 0:1-0:0 -0.6666667 -6.300330 4.966997 0.9886095
## 1:1-0:0 -0.1699346 -5.245752 4.905883 0.9997321
## 0:1-1:0  0.3194444 -4.874537 5.513426 0.9983524
## 1:1-1:0  0.8161765 -3.766748 5.399101 0.9631138
## 1:1-0:1  0.4967320 -3.909660 4.903124 0.9901157
```

Linear Regression

```
reg1.model <- lm(
  EEfRT_ProportionHardTasksSelected ~
  ComorbidAnxietyDisorder + WASSUP_FinSuccess,
  data = data_update
)

summary(reg1.model)

##
## Call:
## lm(formula = EEfRT_ProportionHardTasksSelected ~ ComorbidAnxietyDisorder +
##      WASSUP_FinSuccess, data = data_update)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.35822 -0.20385  0.02754  0.13803  0.50909
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.44661     0.09975   4.477 6.99e-05 ***
## ComorbidAnxietyDisorder1 -0.07257     0.07888  -0.920   0.364
## WASSUP_FinSuccess      0.01560     0.01010   1.545   0.131
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2415 on 37 degrees of freedom
## Multiple R-squared:  0.08065,    Adjusted R-squared:  0.03095
## F-statistic: 1.623 on 2 and 37 DF,  p-value: 0.2111

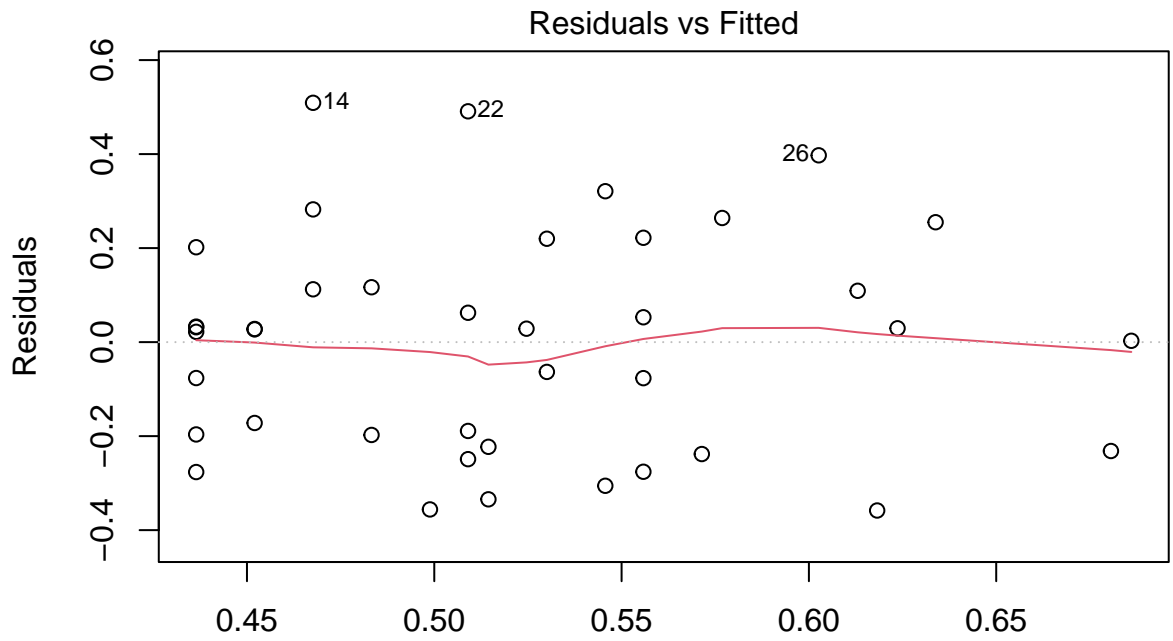
vif(reg1.model)

## ComorbidAnxietyDisorder      WASSUP_FinSuccess
##              1.000016              1.000016

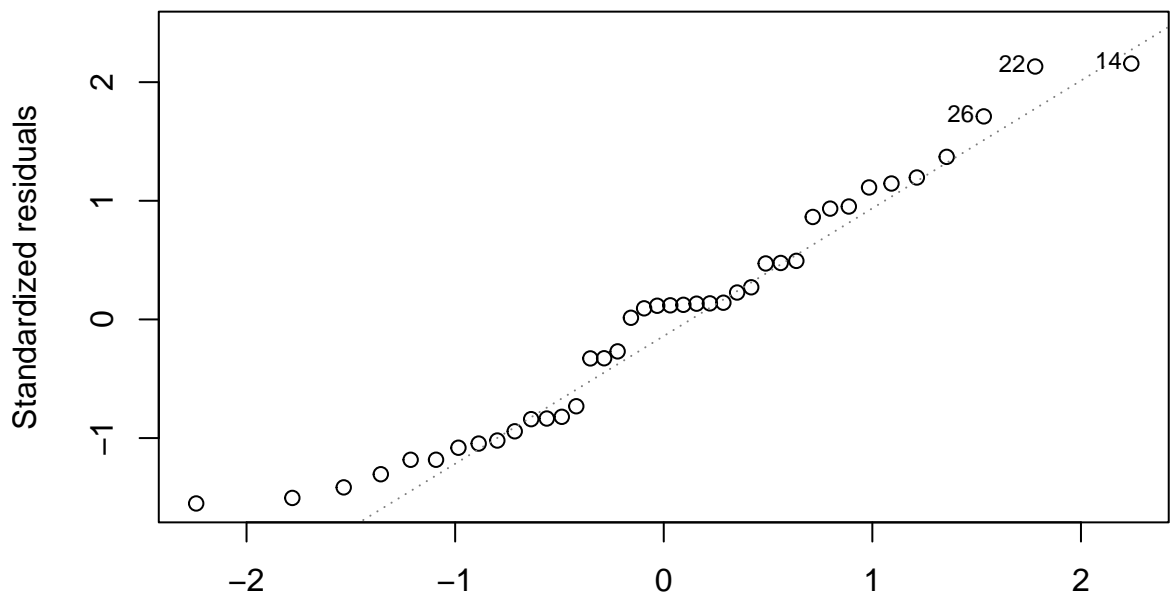
ncvTest(reg1.model)

## Non-constant Variance Score Test
## Variance formula: ~ fitted.values
## Chisquare = 0.1755459, Df = 1, p = 0.67523
```

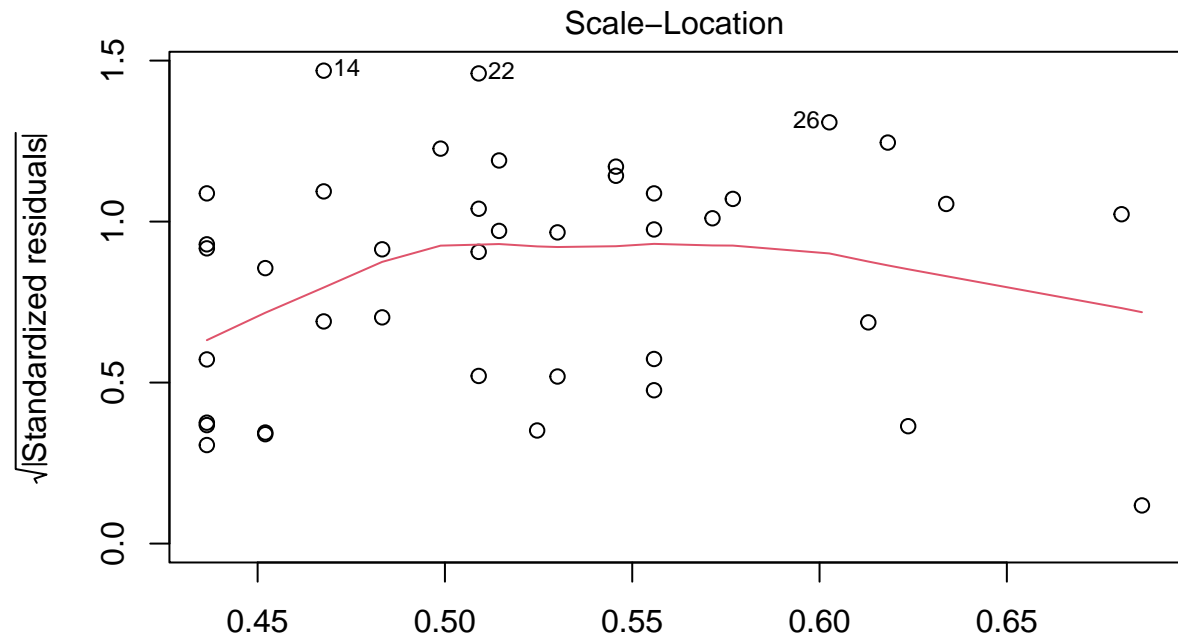
```
plot(reg1.model)
```



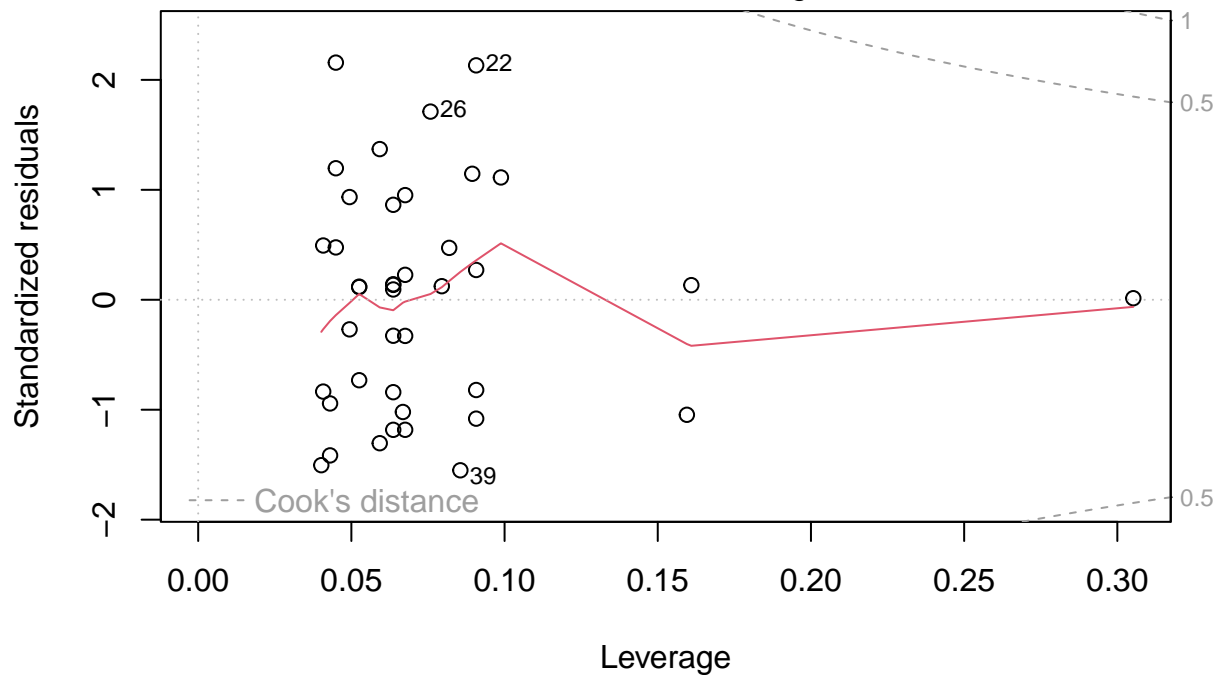
Im(EefRT_ProportionHardTasksSelected ~ ComorbidAnxietyDisorder + WASSUP_Fin
Normal Q-Q



Im(EefRT_ProportionHardTasksSelected ~ ComorbidAnxietyDisorder + WASSUP_Fin



lm(EEfRT_ProportionHardTasksSelected ~ ComorbidAnxietyDisorder + WASSUP_Fin
Residuals vs Leverage



lm(EEfRT_ProportionHardTasksSelected ~ ComorbidAnxietyDisorder + WASSUP_Fin

```
AIC(reg1.model)
```

```
## [1] 4.731775
```

```
reg3.model <- lm(  
  EEfRT_ProportionHardTasksSelected ~ WASSUP_FinSuccess + ComorbidAnxietyDisorder,  
  data = data_update
```

```

)

summary(reg3.model)

##
## Call:
## lm(formula = EEfRT_ProportionHardTasksSelected ~ WASSUP_FinSuccess +
##      ComorbidAnxietyDisorder, data = data_update)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.35822 -0.20385  0.02754  0.13803  0.50909
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.44661    0.09975   4.477 6.99e-05 ***
## WASSUP_FinSuccess      0.01560    0.01010   1.545   0.131
## ComorbidAnxietyDisorder1 -0.07257    0.07888  -0.920   0.364
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2415 on 37 degrees of freedom
## Multiple R-squared:  0.08065,    Adjusted R-squared:  0.03095
## F-statistic: 1.623 on 2 and 37 DF,  p-value: 0.2111

vif(reg3.model)

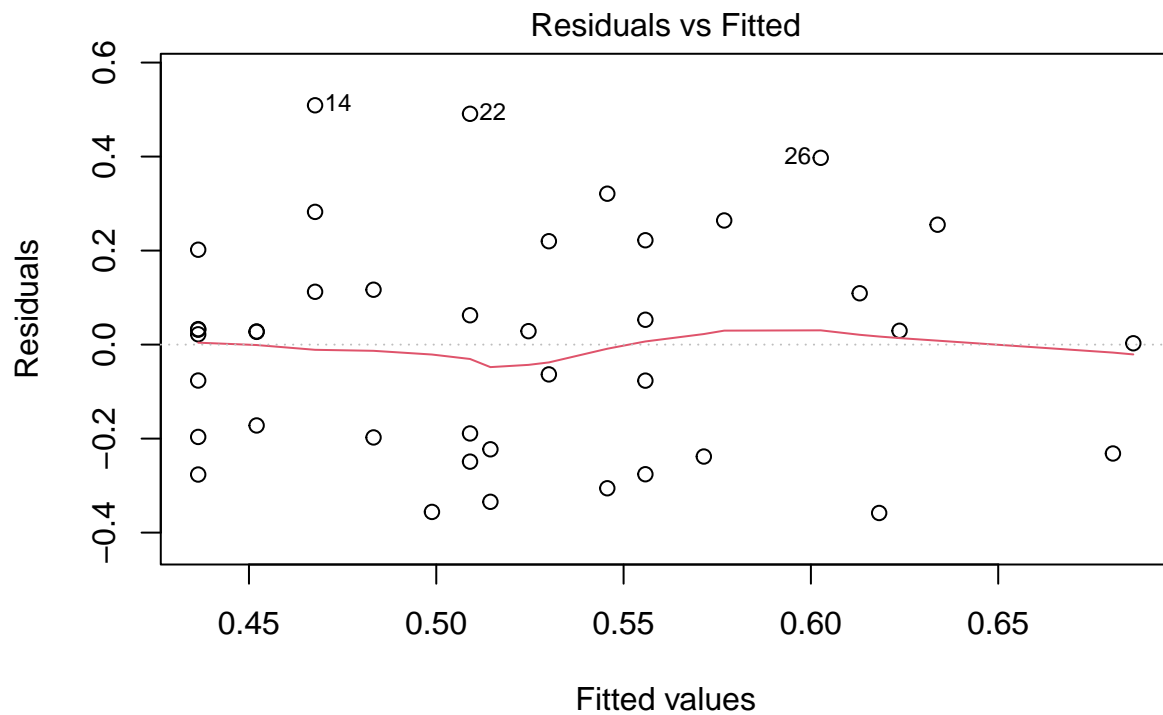
##      WASSUP_FinSuccess ComorbidAnxietyDisorder
##      1.000016          1.000016

ncvTest(reg3.model)

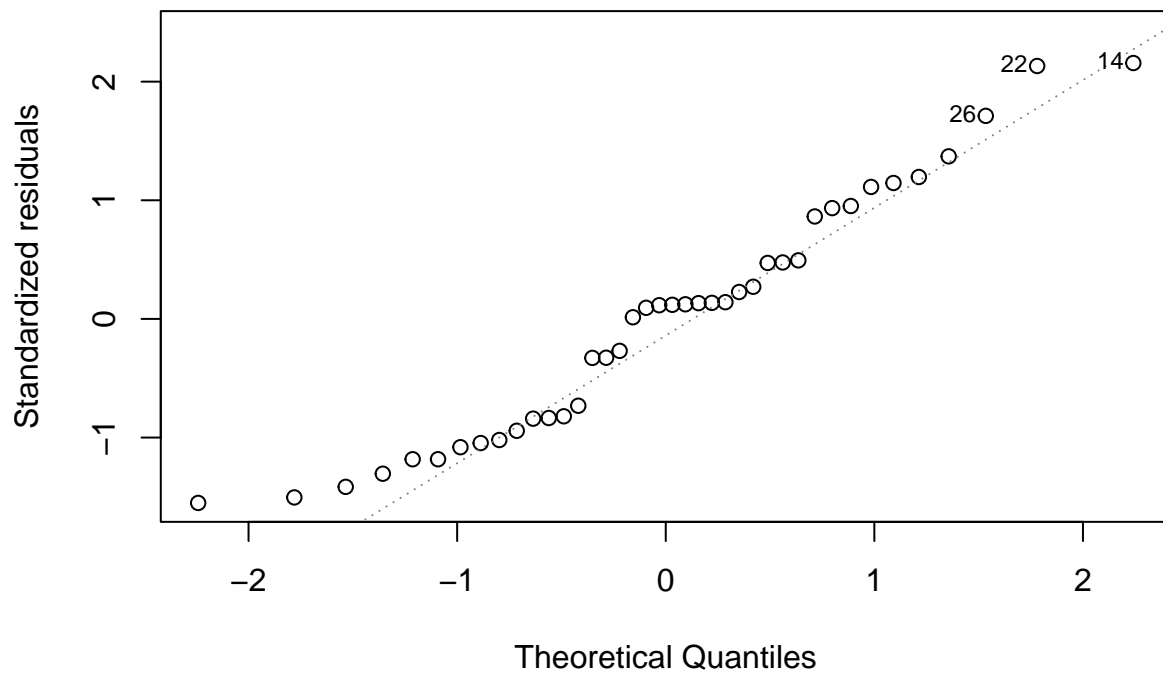
## Non-constant Variance Score Test
## Variance formula: ~ fitted.values
## Chisquare = 0.1755459, Df = 1, p = 0.67523

plot(reg3.model)

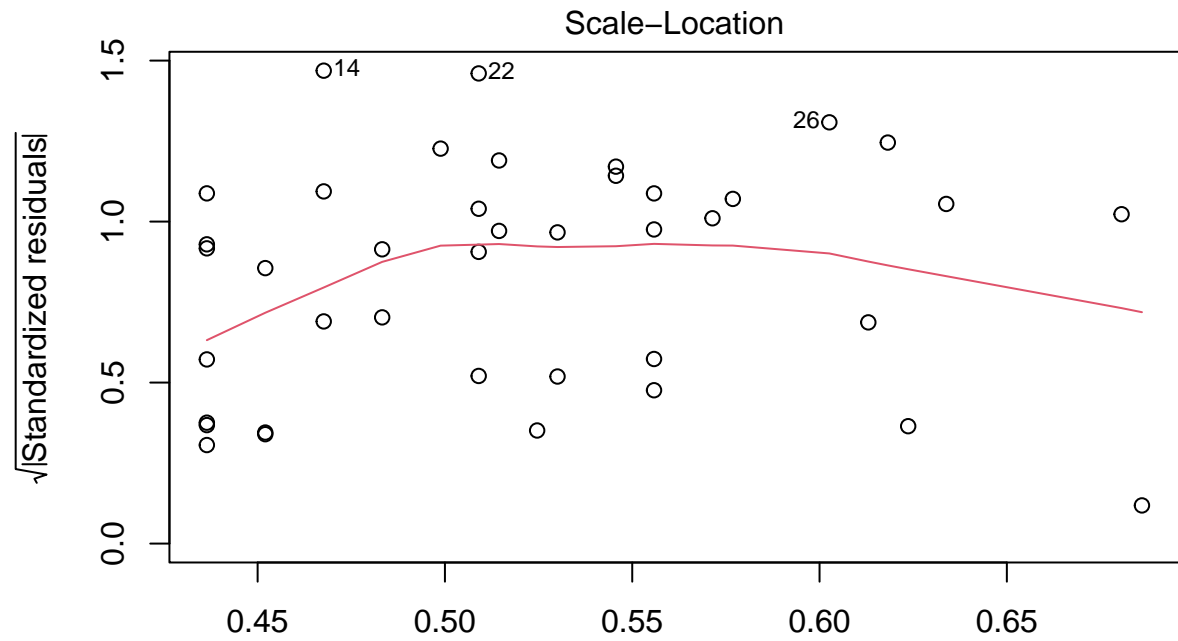
```



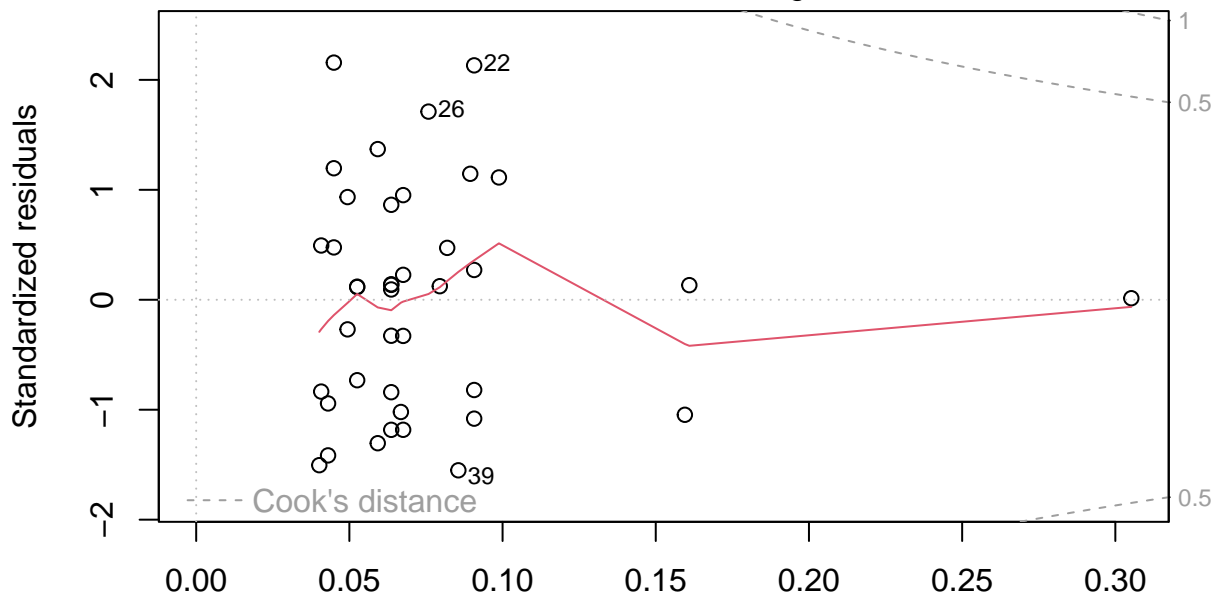
Im(EEfRT_ProportionHardTasksSelected ~ WASSUP_FinSuccess + ComorbidAnxietyI
Normal Q-Q



Im(EEfRT_ProportionHardTasksSelected ~ WASSUP_FinSuccess + ComorbidAnxietyI



lm(EEfRT_ProportionHardTasksSelected ~ WASSUP_FinSuccess + ComorbidAnxietyI
Residuals vs Leverage



lm(EEfRT_ProportionHardTasksSelected ~ WASSUP_FinSuccess + ComorbidAnxietyI

```
AIC(reg3.model)
```

```
## [1] 4.731775
```

```
# BEST FIT MODEL
```

```
reg.model4 <- lm(  
  EEfRT_ProportionHardTasksSelected ~ LifetimeSubstanceDisorder +
```

```

    WASSUP_FinSuccess,
    data = data_update_anxiety
)

summary(reg.model4)

##
## Call:
## lm(formula = EEfRT_ProportionHardTasksSelected ~ LifetimeSubstanceDisorder +
##     WASSUP_FinSuccess, data = data_update_anxiety)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.39659 -0.13608 -0.03301  0.15730  0.44846
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.23954     0.10678   2.243  0.0353 *
## LifetimeSubstanceDisorder1 0.19212     0.09206   2.087  0.0487 *
## WASSUP_FinSuccess      0.01610     0.01059   1.521  0.1425
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2138 on 22 degrees of freedom
## Multiple R-squared:  0.2499, Adjusted R-squared:  0.1817
## F-statistic: 3.665 on 2 and 22 DF,  p-value: 0.04229

vif(reg.model4)

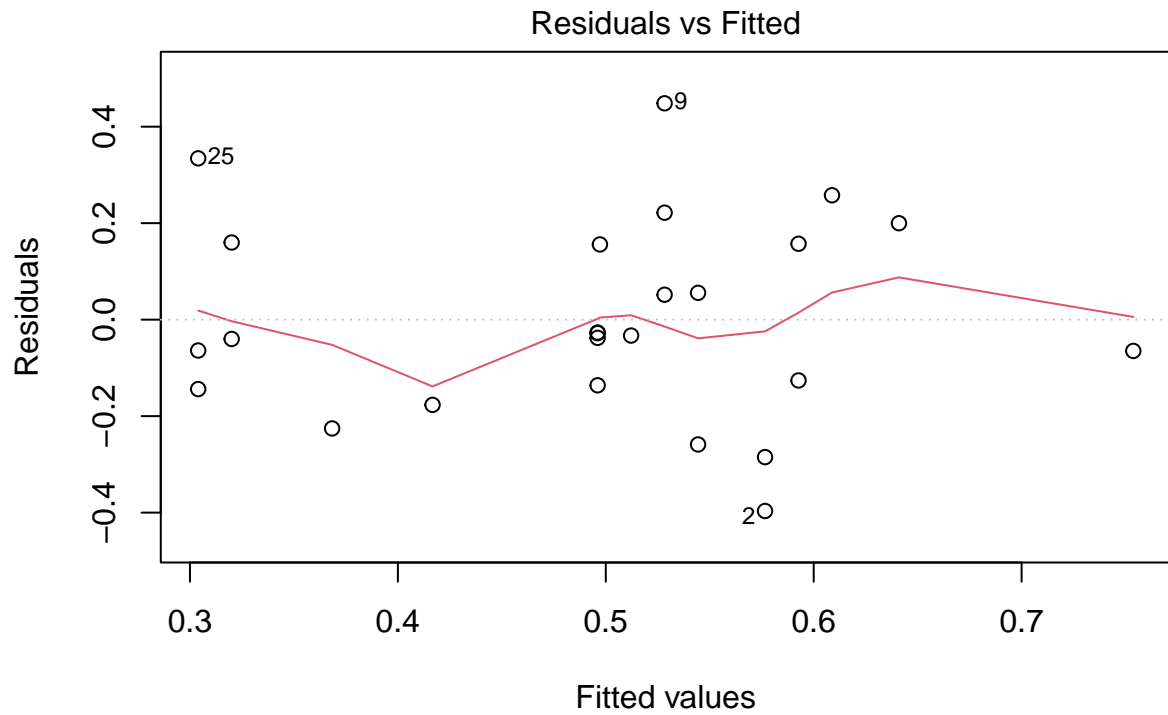
## LifetimeSubstanceDisorder      WASSUP_FinSuccess
##              1.008886              1.008886

ncvTest(reg.model4)

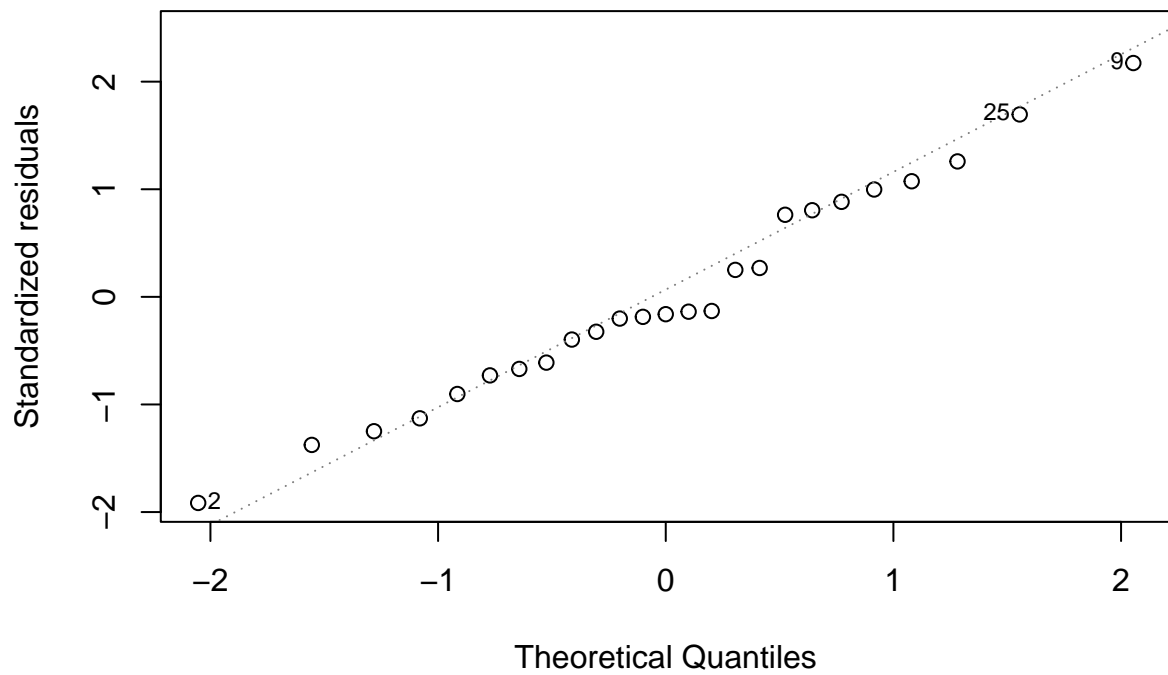
## Non-constant Variance Score Test
## Variance formula: ~ fitted.values
## Chisquare = 0.1178277, Df = 1, p = 0.7314

plot(reg.model4)

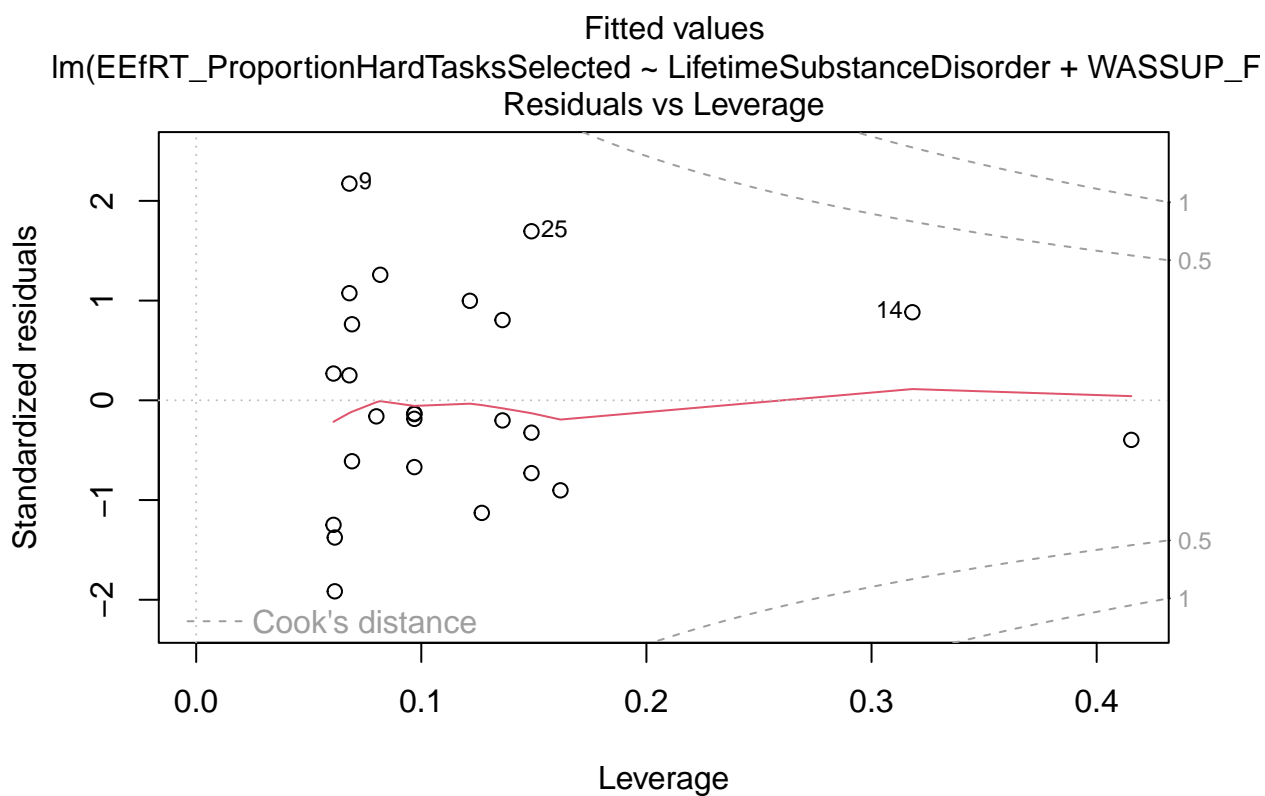
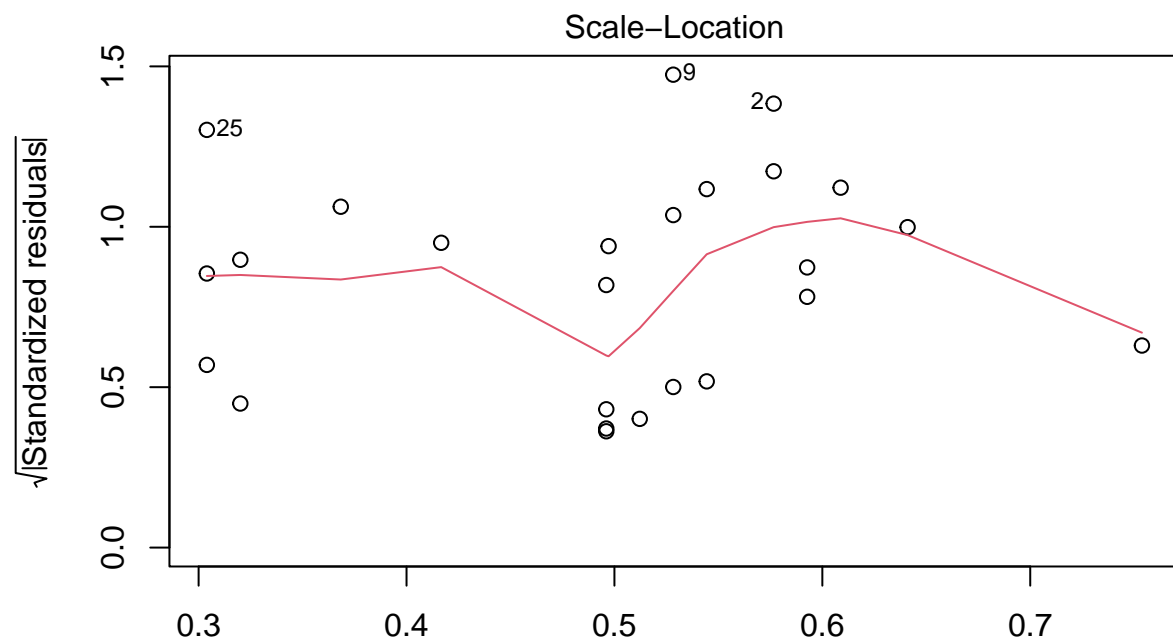
```



Fitted values
lm(EEfRT_ProportionHardTasksSelected ~ LifetimeSubstanceDisorder + WASSUP_F
Normal Q-Q



Theoretical Quantiles
lm(EEfRT_ProportionHardTasksSelected ~ LifetimeSubstanceDisorder + WASSUP_F



lm(EEfRT_ProportionHardTasksSelected ~ LifetimeSubstanceDisorder + WASSUP_F

```
AIC(reg.model14)
```

```
## [1] -1.390689
```

```
reg.model15 <- lm(
  EEfRT_ProportionHardTasksSelected ~ LifetimeSubstanceDisorder +
  WASSUP_FinSuccess,
```

```

    data = data_update
)

summary(reg.model15)

##
## Call:
## lm(formula = EEfRT_ProportionHardTasksSelected ~ LifetimeSubstanceDisorder +
##     WASSUP_FinSuccess, data = data_update)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.38907 -0.20142 -0.00308  0.15364  0.53974
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.406569   0.101005   4.025 0.000271 ***
## LifetimeSubstanceDisorder1 -0.008988   0.080991  -0.111 0.912238
## WASSUP_FinSuccess      0.015670   0.010213   1.534 0.133457
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2442 on 37 degrees of freedom
## Multiple R-squared:  0.05993,    Adjusted R-squared:  0.009116
## F-statistic: 1.179 on 2 and 37 DF,  p-value: 0.3188

vif(reg.model15)

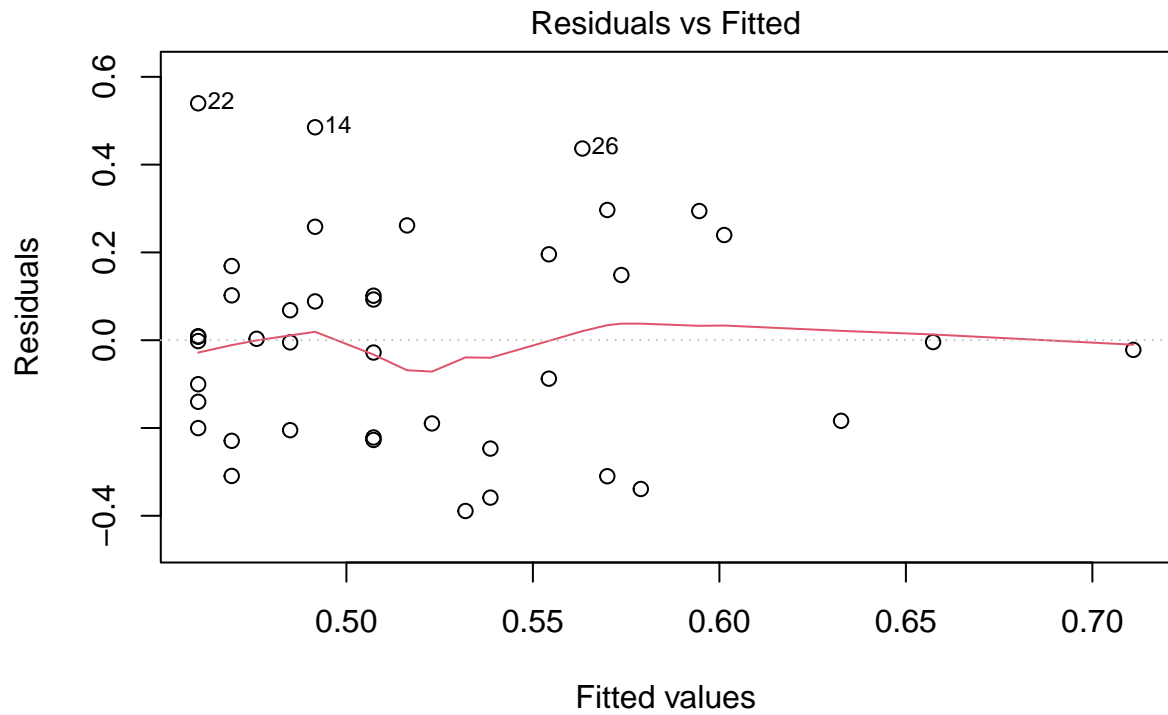
## LifetimeSubstanceDisorder      WASSUP_FinSuccess
##              1.000782              1.000782

ncvTest(reg.model15)

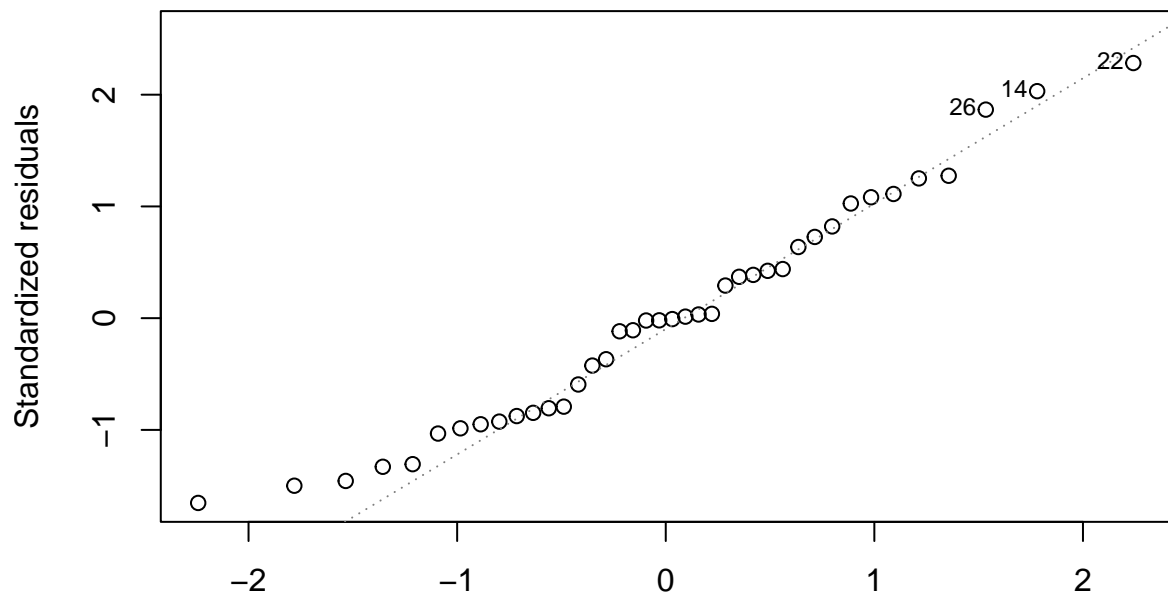
## Non-constant Variance Score Test
## Variance formula: ~ fitted.values
## Chisquare = 0.002162215, Df = 1, p = 0.96291

plot(reg.model15)

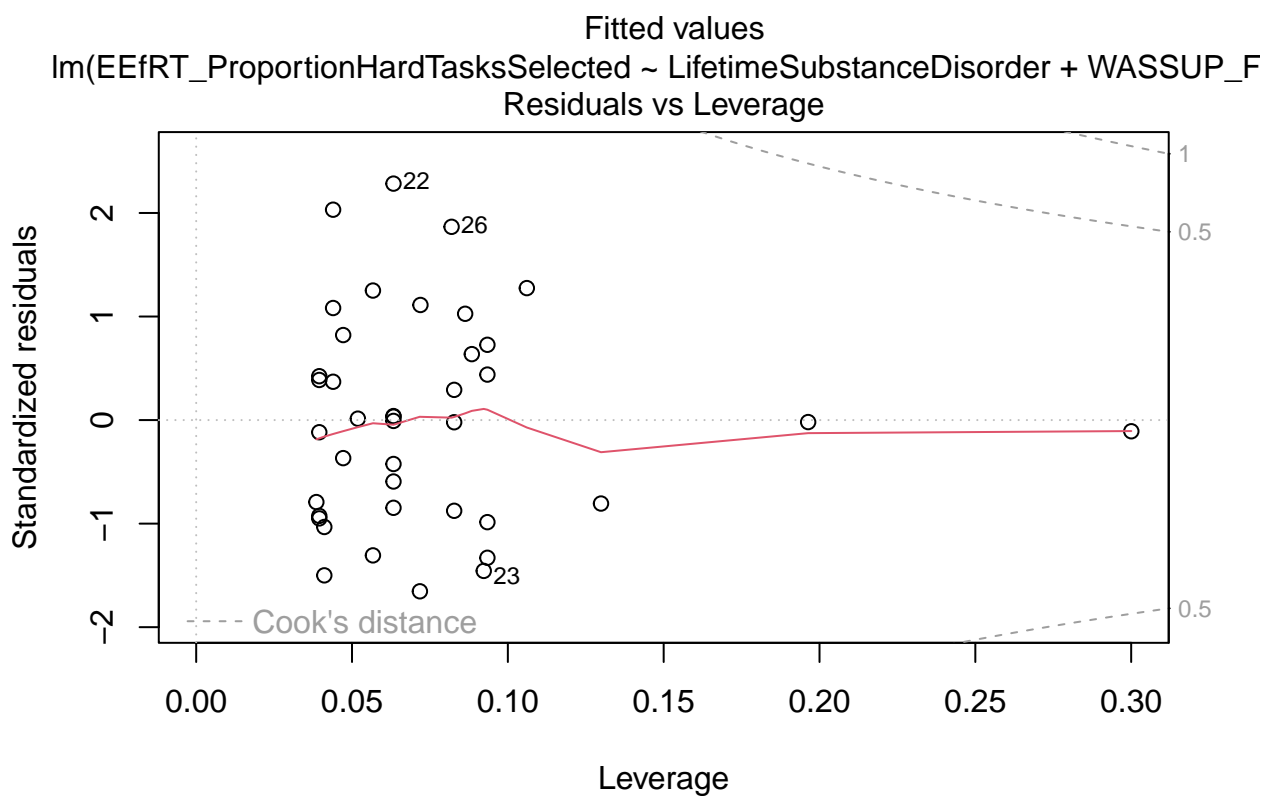
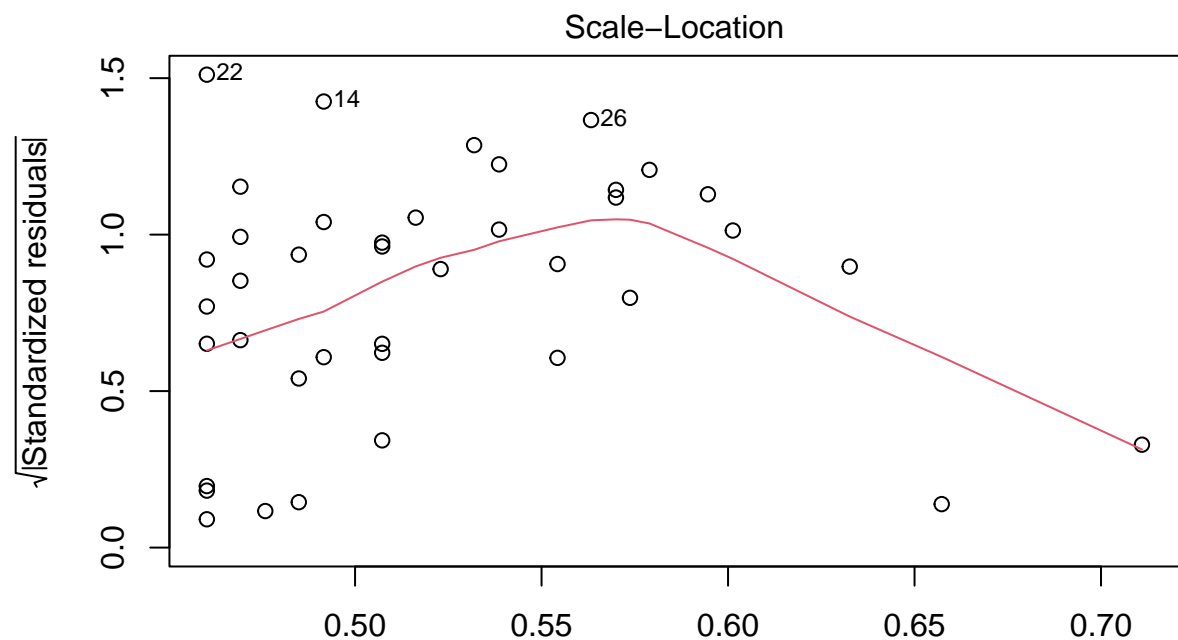
```



Fitted values
lm(EEfRT_ProportionHardTasksSelected ~ LifetimeSubstanceDisorder + WASSUP_F
Normal Q-Q



Theoretical Quantiles
lm(EEfRT_ProportionHardTasksSelected ~ LifetimeSubstanceDisorder + WASSUP_F



lm(EEfRT_ProportionHardTasksSelected ~ LifetimeSubstanceDisorder + WASSUP_F)

```
AIC(reg.model15)
```

```
## [1] 5.623112
```

```
reg.model8 <- lm(
  EEfRT_ProportionHardTasksSelected ~ LifetimeSubstanceDisorder + LithiumDosage +
  WASSUP_FinSuccess,
```

```

    data = data_update
)

summary(reg.model8)

##
## Call:
## lm(formula = EEfRT_ProportionHardTasksSelected ~ LifetimeSubstanceDisorder +
##     LithiumDosage + WASSUP_FinSuccess, data = data_update)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.3822 -0.1987 -0.0189  0.1404  0.5231
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      4.299e-01  1.057e-01   4.067 0.000248 ***
## LifetimeSubstanceDisorder1 -1.497e-02  8.175e-02  -0.183 0.855758
## LithiumDosage      -6.375e-05  8.052e-05  -0.792 0.433693
## WASSUP_FinSuccess      1.549e-02  1.027e-02   1.508 0.140175
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2455 on 36 degrees of freedom
## Multiple R-squared:  0.07602,    Adjusted R-squared:  -0.0009785
## F-statistic: 0.9873 on 3 and 36 DF,  p-value: 0.4097

vif(reg.model8)

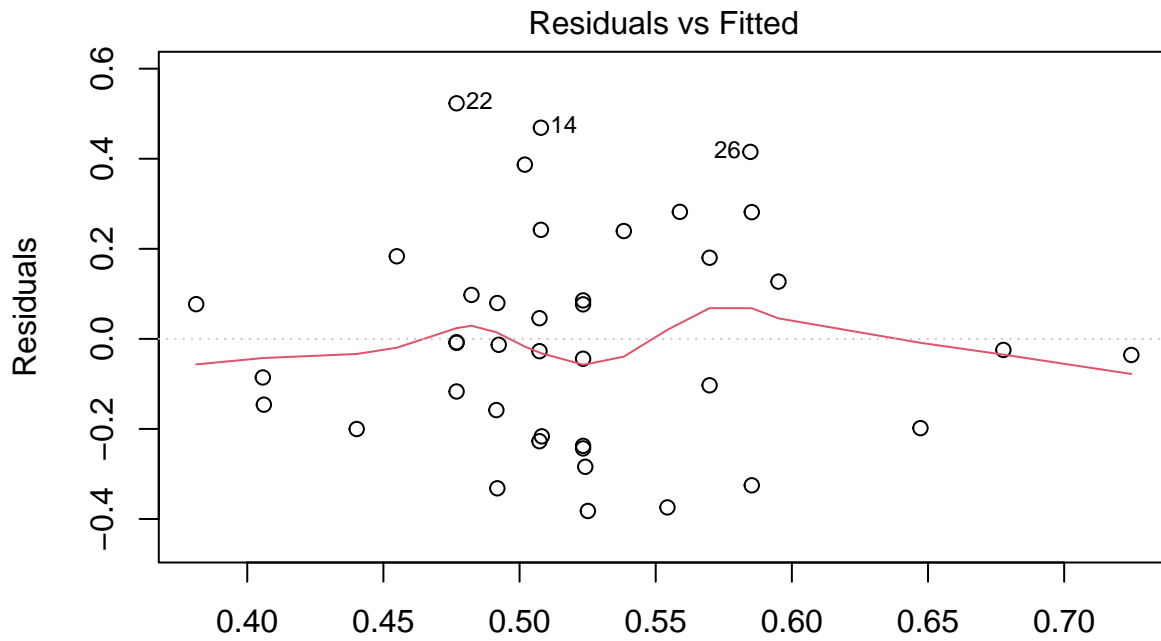
## LifetimeSubstanceDisorder      LithiumDosage      WASSUP_FinSuccess
##              1.009397              1.009236              1.001286

ncvTest(reg.model8)

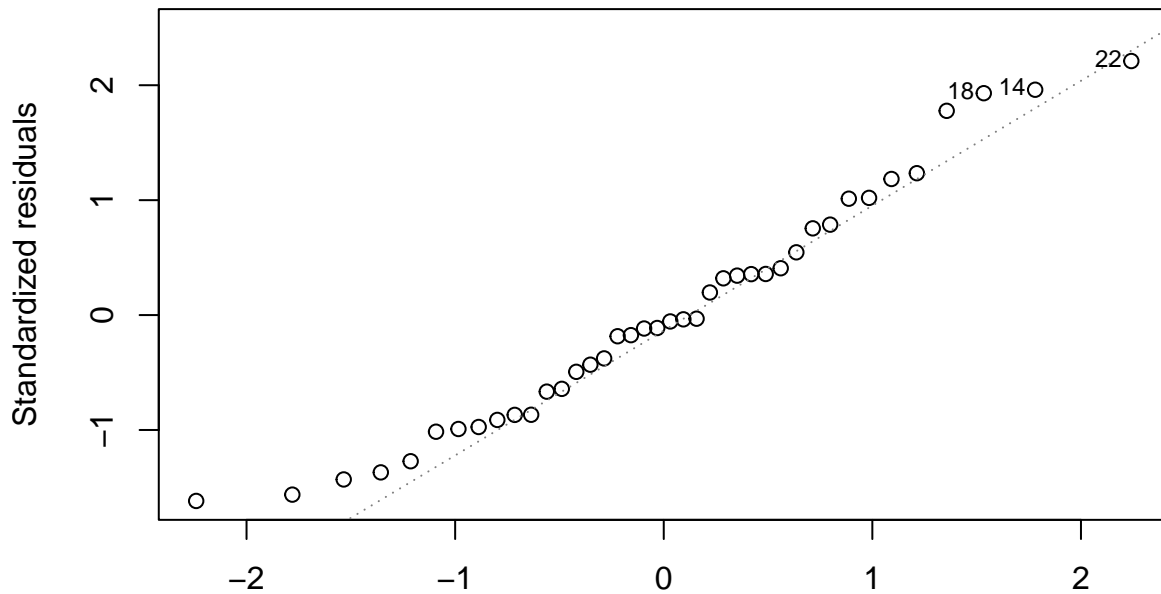
## Non-constant Variance Score Test
## Variance formula: ~ fitted.values
## Chisquare = 0.03574935, Df = 1, p = 0.85003

plot(reg.model8)

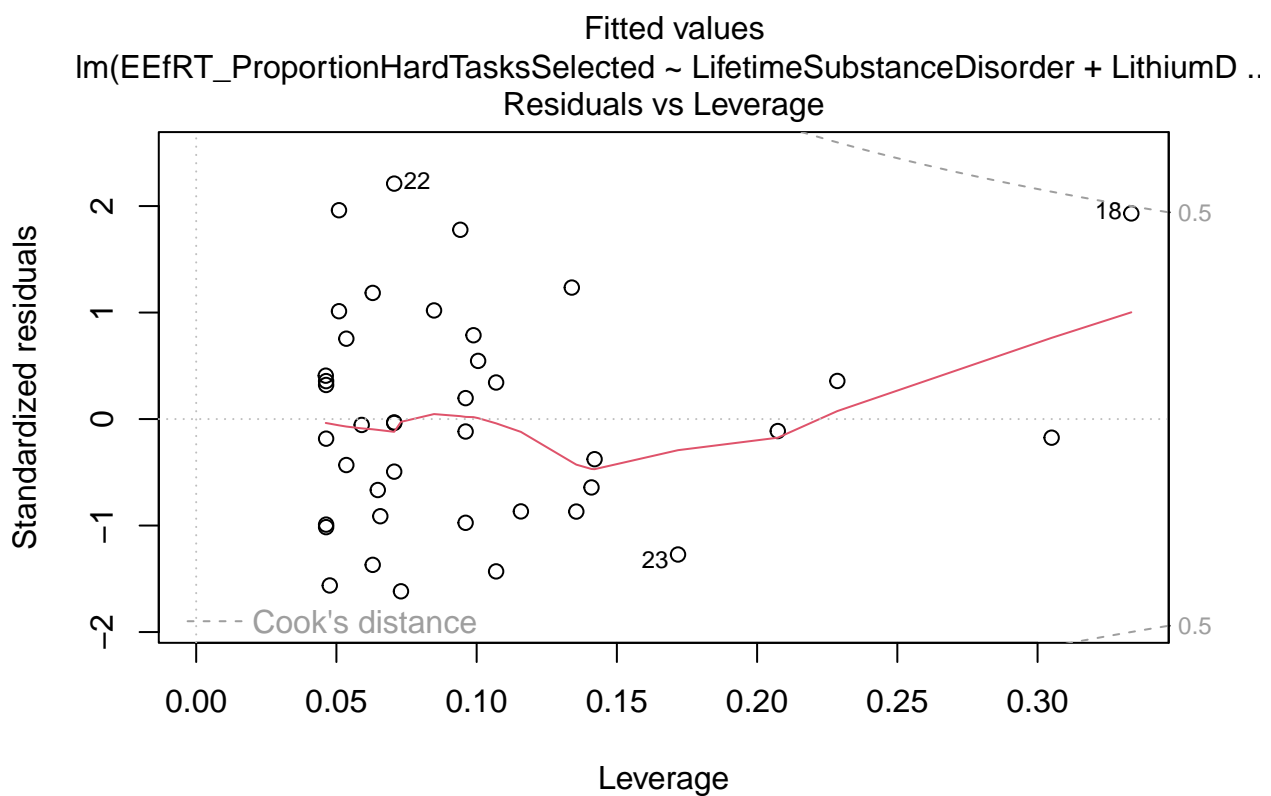
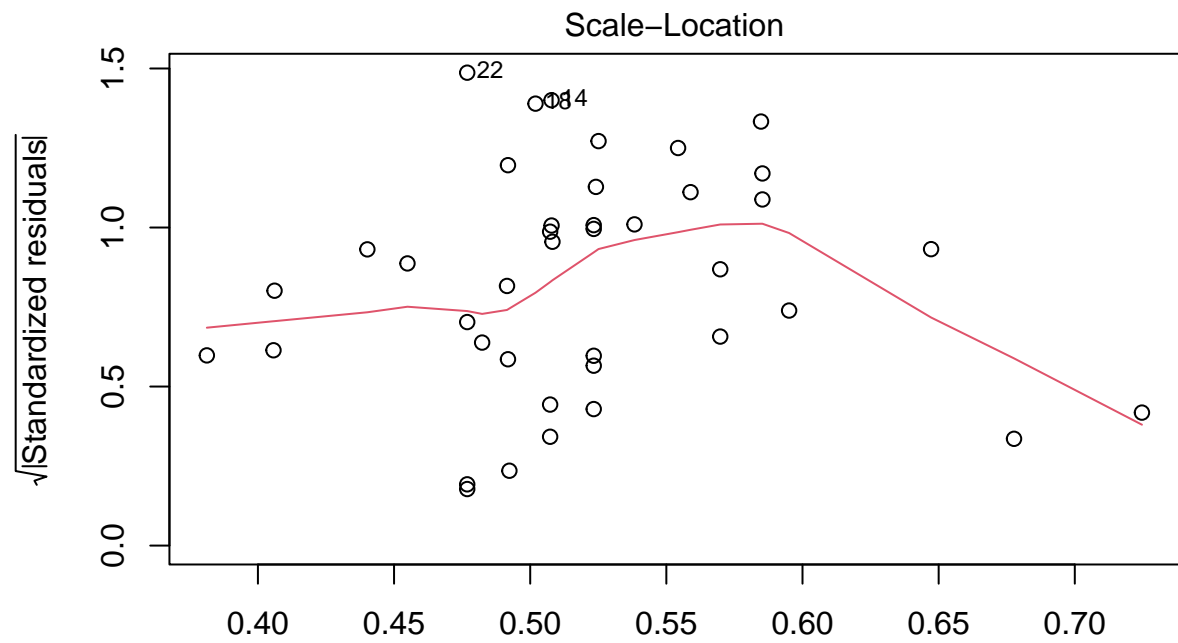
```

lm(EEfRT_ProportionHardTasksSelected ~ LifetimeSubstanceDisorder + LithiumD ..
Normal Q-Q



lm(EEfRT_ProportionHardTasksSelected ~ LifetimeSubstanceDisorder + LithiumD ..

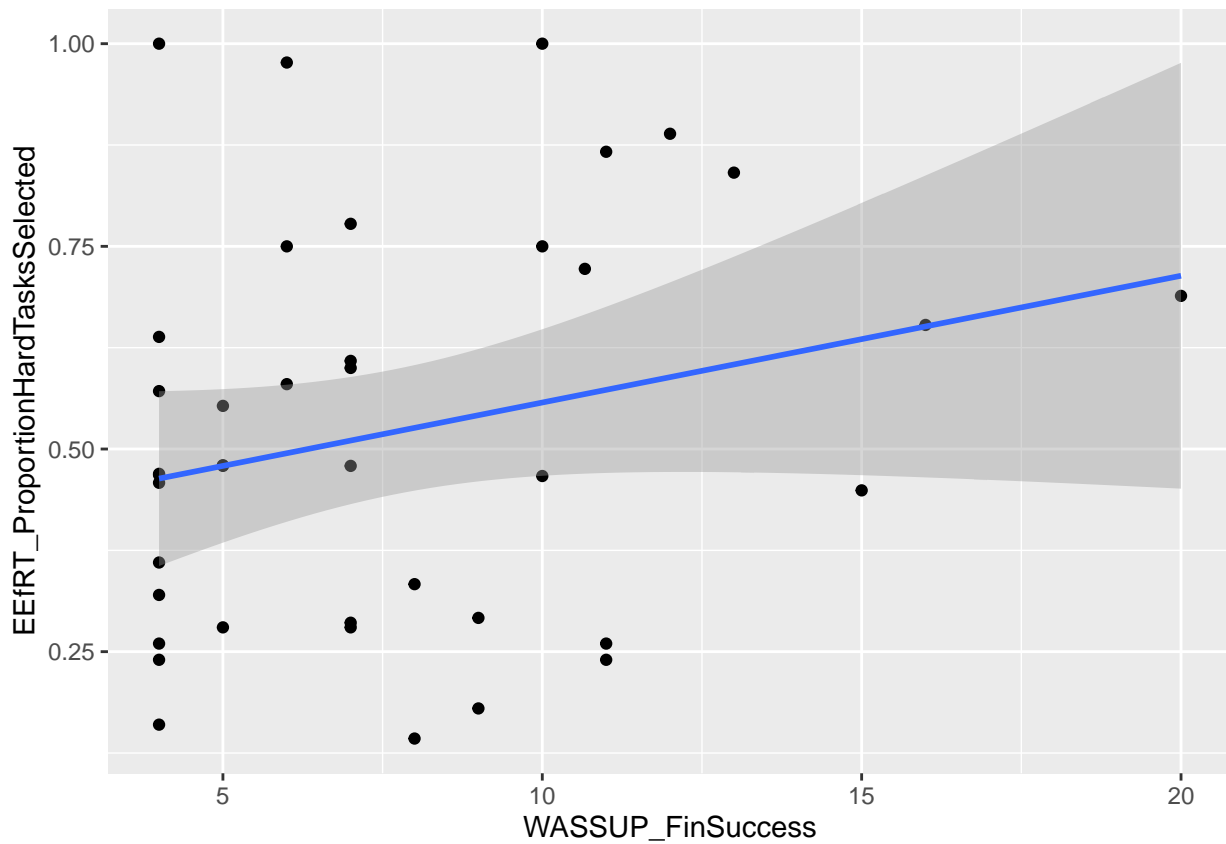


```
AIC(reg.model18)
```

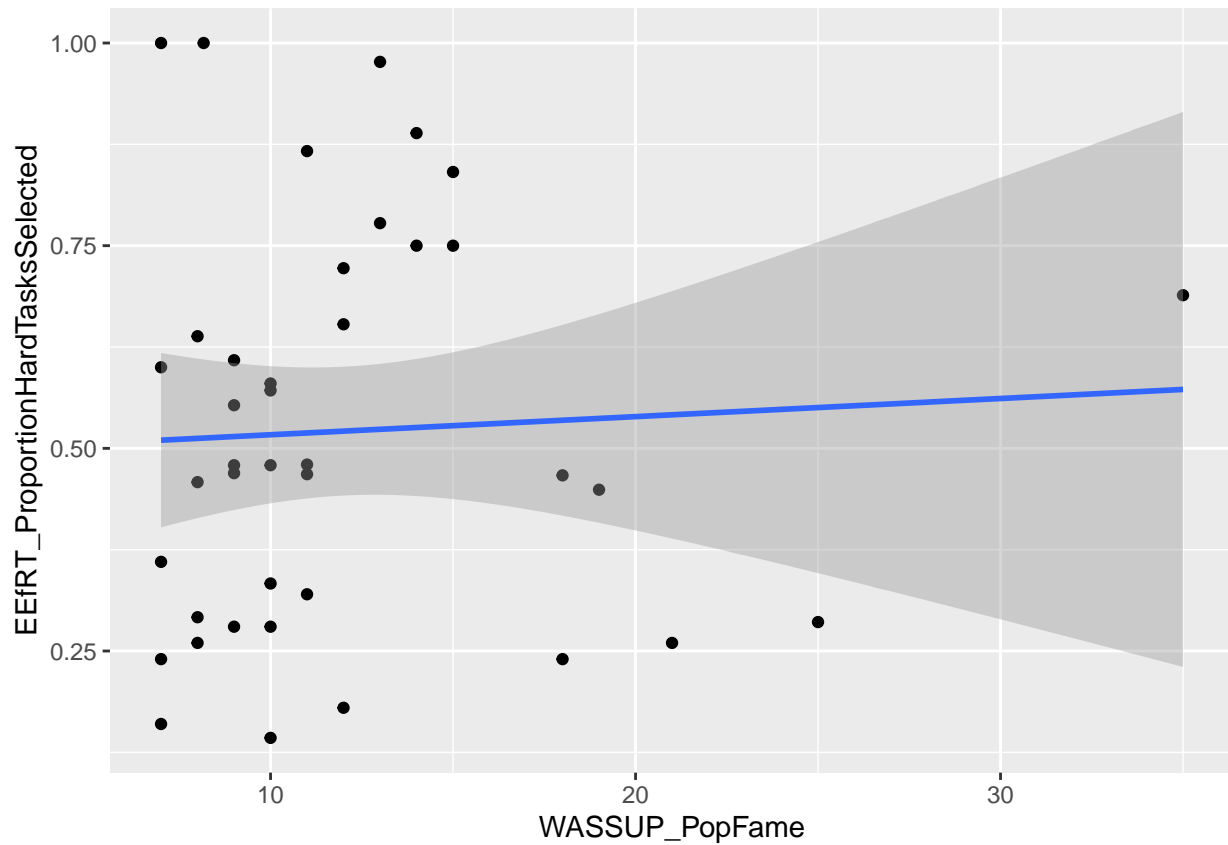
```
## [1] 6.932589
```

Best Fit Line (Replication of Paper)

```
# plot the regression line between EEfRT and WASSUP_FinSuccess with the data points  
ggplot(data_update, aes(x = WASSUP_FinSuccess, y = EEfRT_ProportionHardTasksSelected)) +  
  geom_point() +  
  geom_smooth(method = "lm")
```



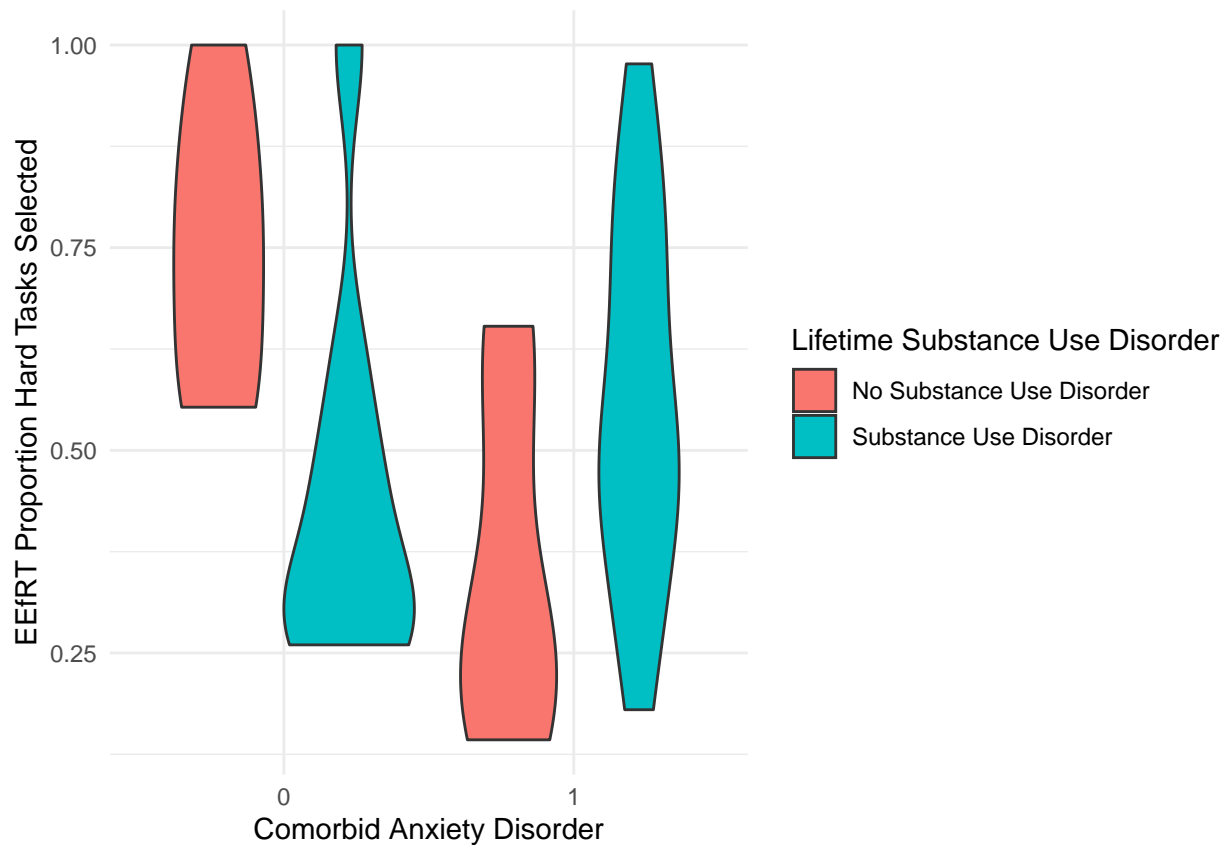
```
# plot the regression line between EEfRT and WASSUP_PopFame with the data points  
ggplot(data_update, aes(x = WASSUP_PopFame, y = EEfRT_ProportionHardTasksSelected)) +  
  geom_point() +  
  geom_smooth(method = "lm")
```



Plots

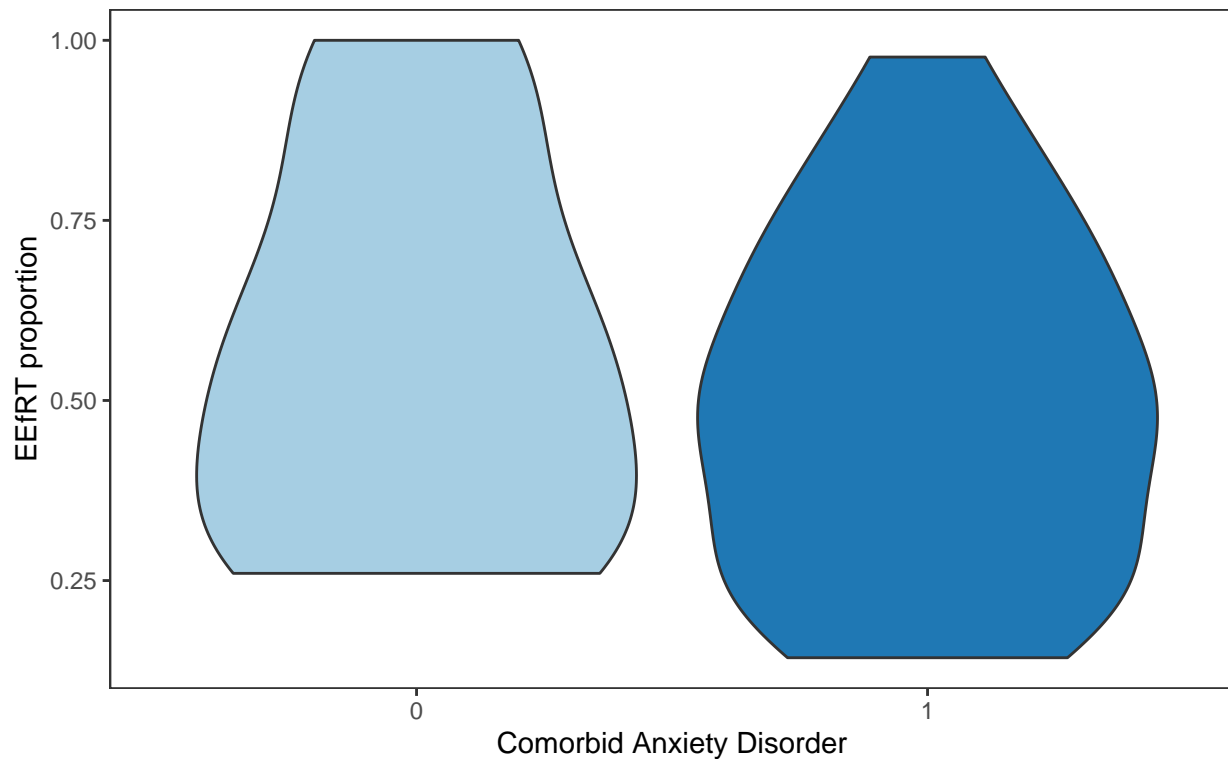
Violin Plots

```
# Boxplot
# in the fill, replace 0 with No and yes with 1
ggplot(
  data_update,
  aes(
    x = ComorbidAnxietyDisorder,
    y = EEfRT_ProportionHardTasksSelected,
    fill = factor(LifetimeSubstanceDisorder)
  )
) +
  geom_violin() +
  theme_minimal() +
  labs(
    x = "Comorbid Anxiety Disorder",
    y = "EEfRT Proportion Hard Tasks Selected",
    fill = "Lifetime Substance Use Disorder"
  ) +
  scale_fill_discrete(
    name = "Lifetime Substance Use Disorder",
    labels = c("No Substance Use Disorder", "Substance Use Disorder")
  )
```



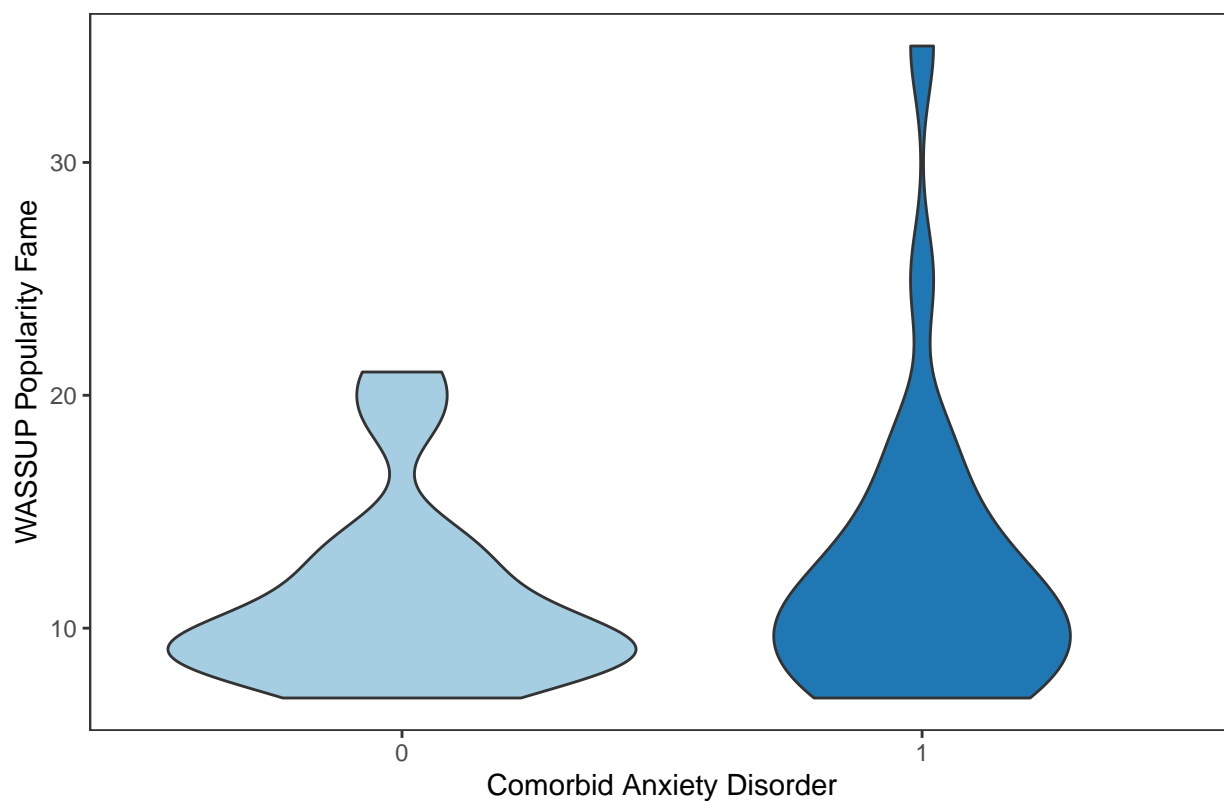
```
ggplot(
  data_update,
  aes(
    x = ComorbidAnxietyDisorder,
    y = EEfRT_ProportionHardTasksSelected,
    fill = ComorbidAnxietyDisorder
  )
) +
  geom_violin() +
  theme_bw() +
  theme(
    panel.grid.major = element_blank(),
    panel.grid.minor = element_blank(),
    legend.position = "none"
  ) +
  scale_fill_brewer(palette = "Paired") +
  labs(title = "Comorbid Anxiety Disorder Proportion of
Hard Tasks Selected on EEfRT",
    x = "Comorbid Anxiety Disorder",
    y = "EEfRT proportion"
  )
```

Comorbid Anxiety Disorder Proportion of Hard Tasks Selected on EEfRT

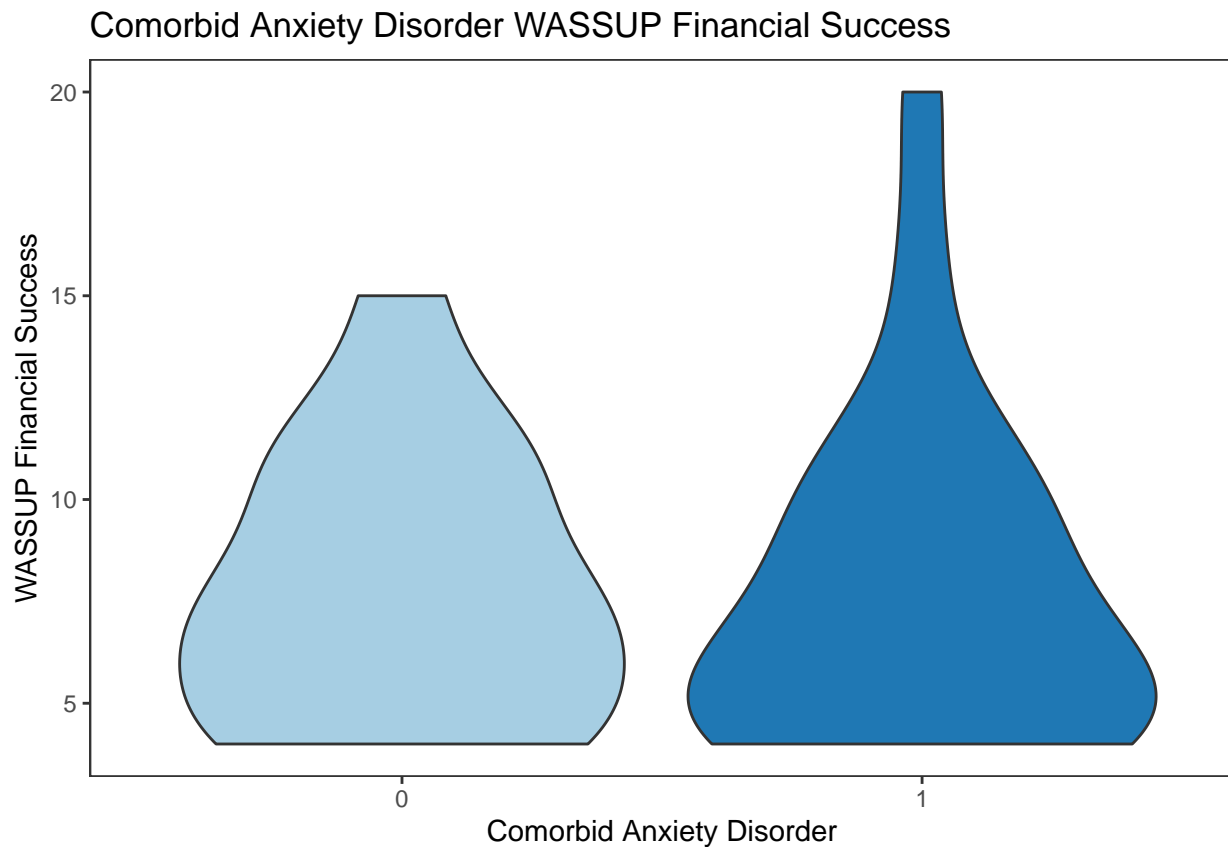


```
ggplot(
  data_update,
  aes(
    x = ComorbidAnxietyDisorder,
    y = WASSUP_PopFame,
    fill = ComorbidAnxietyDisorder
  )
) +
  geom_violin() +
  theme_bw() +
  theme(
    panel.grid.major = element_blank(),
    panel.grid.minor = element_blank(),
    legend.position = "none"
  ) +
  scale_fill_brewer(palette = "Paired") +
  labs(
    title = "Comorbid Anxiety Disorder WASSUP Popularity Fame",
    x = "Comorbid Anxiety Disorder",
    y = "WASSUP Popularity Fame"
  )
)
```

Comorbid Anxiety Disorder WASSUP Popularity Fame



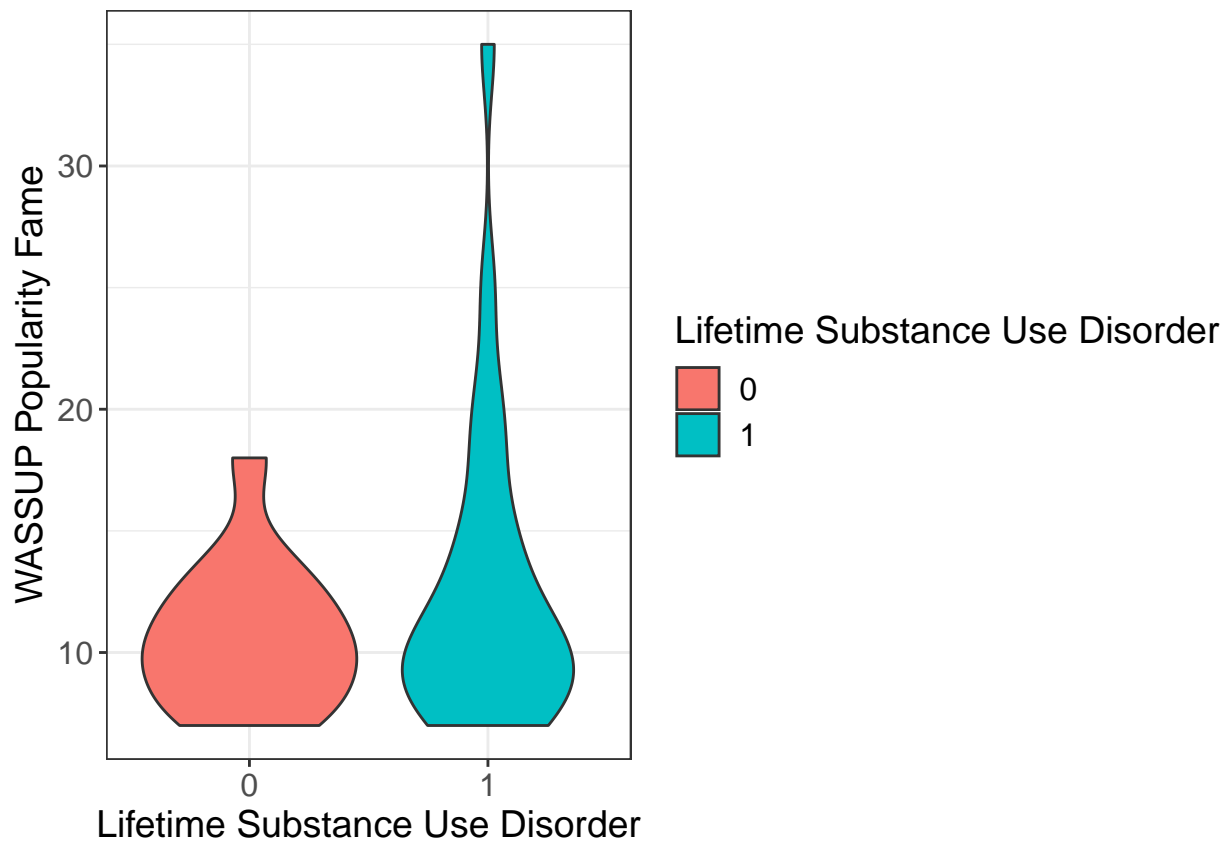
```
ggplot(  
  data_update,  
  aes(  
    x = ComorbidAnxietyDisorder,  
    y = WASSUP_FinSuccess,  
    fill = ComorbidAnxietyDisorder  
  )  
)+  
geom_violin()+  
theme_bw()+  
theme(  
  panel.grid.major = element_blank(),  
  panel.grid.minor = element_blank(),  
  legend.position = "none"  
)+  
scale_fill_brewer(palette = "Paired")+  
labs(  
  title = "Comorbid Anxiety Disorder WASSUP Financial Success",  
  x = "Comorbid Anxiety Disorder",  
  y = "WASSUP Financial Success"  
)
```



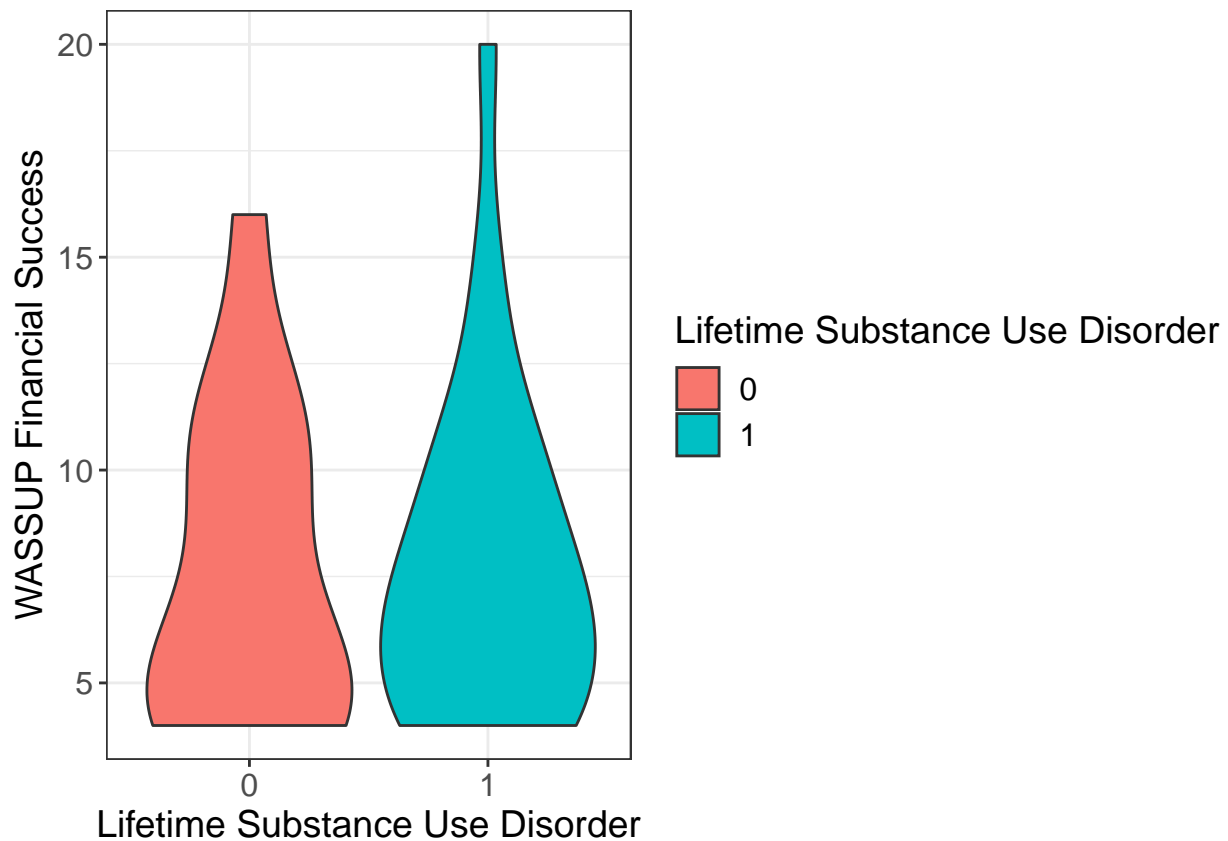
```
ggplot(
  data_update,
  aes(
    x = LifetimeSubstanceDisorder,
    y = EEfRT_ProportionHardTasksSelected,
    fill = LifetimeSubstanceDisorder
  )
) +
  geom_violin() +
  theme_bw() +
  theme(
    axis.text.x = element_text(size = 12),
    axis.text.y = element_text(size = 12),
    axis.title.x = element_text(size = 14),
    axis.title.y = element_text(size = 14),
    legend.text = element_text(size = 12),
    legend.title = element_text(size = 14)
  ) +
  labs(
    x = "Lifetime Substance Use Disorder",
    y = "EEfRT Proportion Hard Tasks Selected",
    fill = "Lifetime Substance Use Disorder"
  )
)
```




```
# plot between lifetime substance and fame
ggplot(
  data_update,
  aes(
    x = LifetimeSubstanceDisorder,
    y = WASSUP_PopFame,
    fill = LifetimeSubstanceDisorder
  )
) +
  geom_violin() +
  theme_bw() +
  theme(
    axis.text.x = element_text(size = 12),
    axis.text.y = element_text(size = 12),
    axis.title.x = element_text(size = 14),
    axis.title.y = element_text(size = 14),
    legend.text = element_text(size = 12),
    legend.title = element_text(size = 14)
  ) +
  labs(
    x = "Lifetime Substance Use Disorder",
    y = "WASSUP Popularity Fame",
    fill = "Lifetime Substance Use Disorder"
  )
)
```



```
# plot between life substance and financial success
ggplot(
  data_update,
  aes(
    x = LifetimeSubstanceDisorder,
    y = WASSUP_FinSuccess,
    fill = LifetimeSubstanceDisorder
  )
) +
  geom_violin() +
  theme_bw() +
  theme(
    axis.text.x = element_text(size = 12),
    axis.text.y = element_text(size = 12),
    axis.title.x = element_text(size = 14),
    axis.title.y = element_text(size = 14),
    legend.text = element_text(size = 12),
    legend.title = element_text(size = 14)
  ) +
  labs(
    x = "Lifetime Substance Use Disorder",
    y = "WASSUP Financial Success",
    fill = "Lifetime Substance Use Disorder"
  )
)
```



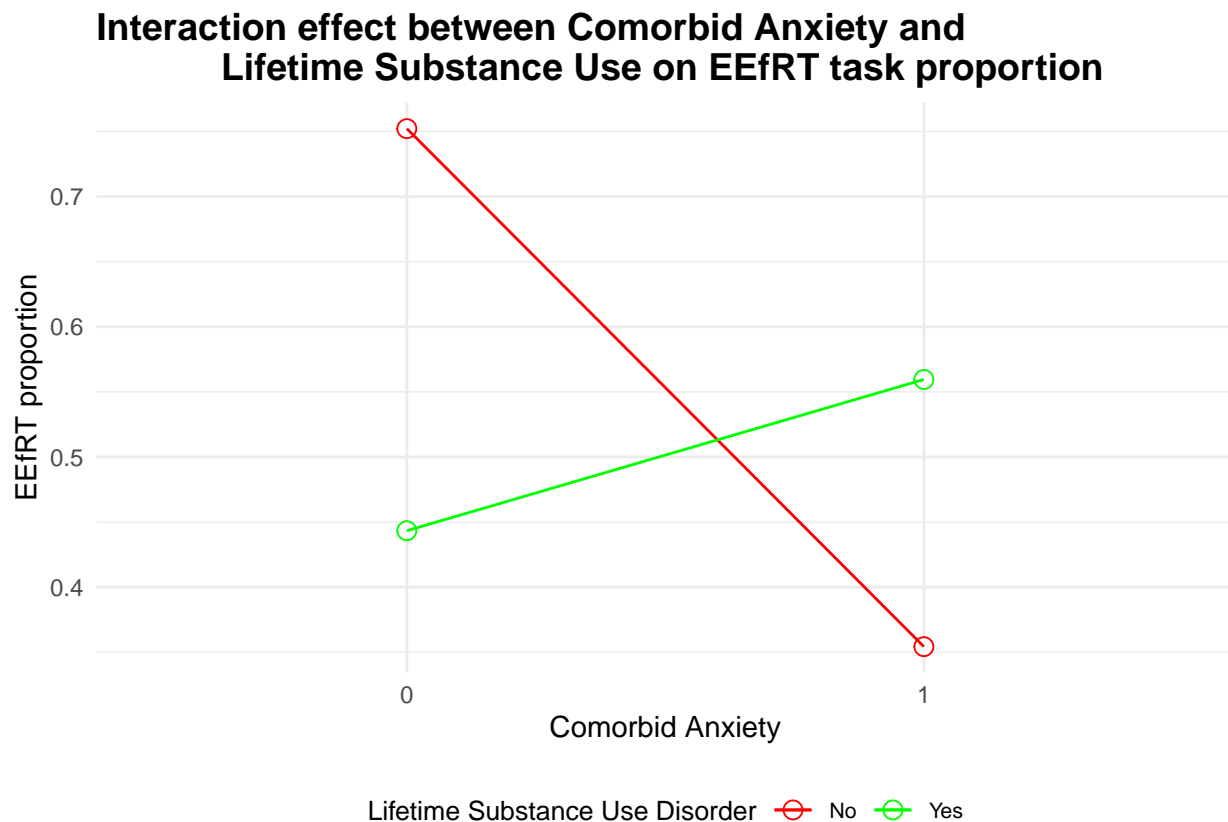
Interaction Plots

```
ggplot(
  data_update,
  aes(
    x = ComorbidAnxietyDisorder,
    y = EEfRT_ProportionHardTasksSelected,
    color = factor(LifetimeSubstanceDisorder)
  )
) +
  stat_summary(
    fun = mean,
    geom = "point", size = 3, shape = 21, fill = "white"
  ) +
  stat_summary(
    fun = mean,
    geom = "line",
    size = 0.5,
    aes(group = factor(LifetimeSubstanceDisorder))
  ) +
  stat_summary(
    fun.data = mean_cl_normal,
    geom = "errorbar", width = 0.2
  ) +
  labs(
    x = "Comorbid Anxiety",
    y = "EEfRT proportion",
  )
```

```

    color = "Lifetime Substance Use Disorder"
  ) +
  scale_color_manual(
    values = c("red", "green"),
    name = "Lifetime Substance Use Disorder",
    labels = c("No", "Yes")
  ) +
  ggtitle("Interaction effect between Comorbid Anxiety and
    Lifetime Substance Use on EEFRT task proportion") +
  theme_minimal() +
  theme(plot.title = element_text(size=14, face="bold")) +
  theme(
    legend.position = "bottom",
    legend.title = element_text(size = 10),
    legend.text = element_text(size = 8)
  )
)

```



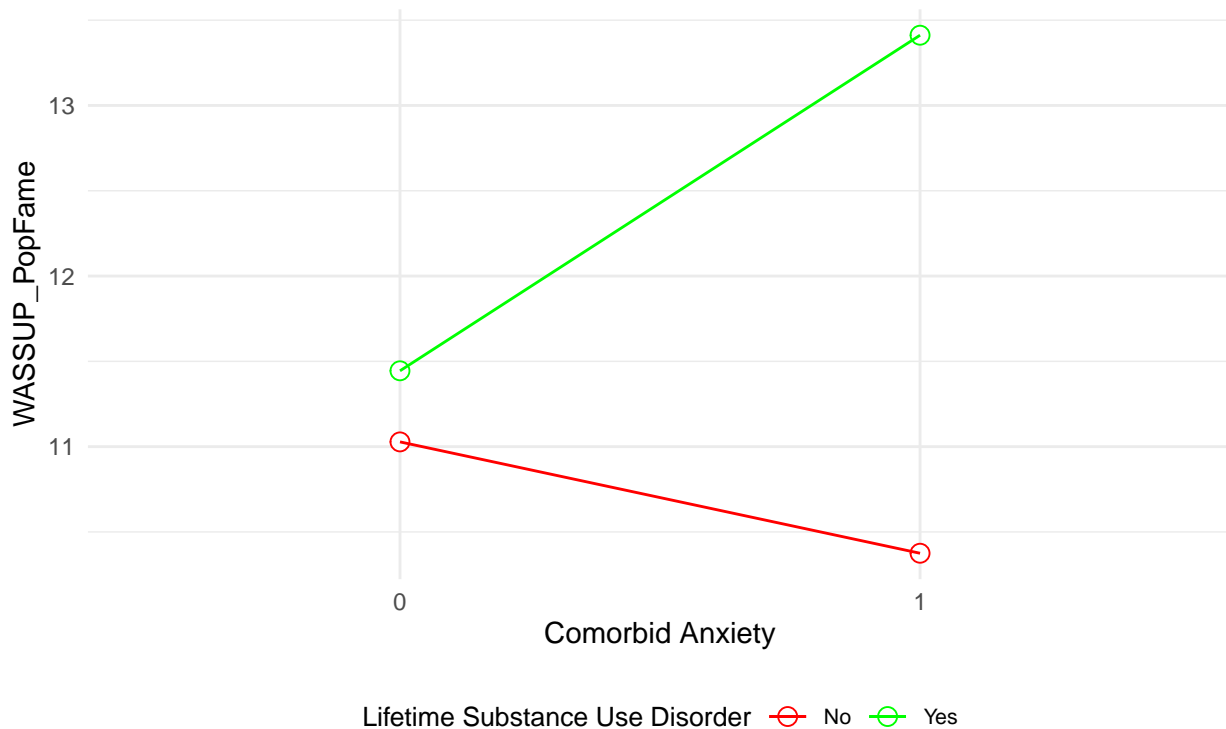
```

# Plot interaction effect of between
# Comorbid Anxiety and Lifetime Substance Use on WASSUP Popular Fame Scale
ggplot(
  data_update,
  aes(x = ComorbidAnxietyDisorder, y = WASSUP_PopFame,
    color = factor(LifetimeSubstanceDisorder))) +
  stat_summary(fun = mean, geom = "point", size = 3,
    shape = 21, fill = "white") +
  stat_summary(fun = mean, geom="line", size = 0.5,
    aes(group = factor(LifetimeSubstanceDisorder))) +
  stat_summary(fun.data = mean_cl_normal, geom = "errorbar",

```

```
width = 0.2) +
labs(x = "Comorbid Anxiety", y = "WASSUP_PopFame",
color = "Lifetime Substance Use Disorder") +
ggtitle("Interaction effect between Comorbid Anxiety
and Lifetime Substance Use on WASSUP PopFame Scale") +
scale_color_manual(values = c("red", "green"),
name = "Lifetime Substance Use Disorder", labels = c("No", "Yes")) +
theme_minimal() +
theme(plot.title = element_text(size = 14,
face = "bold")) +
theme(legend.position = "bottom",
legend.title = element_text(size = 10),
legend.text = element_text(size = 8))
```

Interaction effect between Comorbid Anxiety and Lifetime Substance Use on WASSUP PopFame Scale



```
ggplot(data_update, aes(x = ComorbidAnxietyDisorder,
y = WASSUP_FinSuccess, color = factor(LifetimeSubstanceDisorder))) +
stat_summary(fun = mean, geom = "point", size = 3,
shape = 21, fill = "white") +
stat_summary(fun=mean, geom="line", size=0.5,
aes(group = factor(LifetimeSubstanceDisorder))) +
stat_summary(fun.data = mean_cl_normal,
geom = "errorbar", width = 0.2) +
labs(x = "Comorbid Anxiety", y = "WASSUP_FinSuccess",
color = "Lifetime Substance Use Disorder") +
scale_color_manual(values = c("red", "green"),
name = "Lifetime Substance Use Disorder", labels = c("No", "Yes")) +
ggtitle("Interaction effect between Comorbid Anxiety
and Lifetime Substance Use on WASSUP FinSuccess Scale") +
```

```
theme_minimal() +  
theme(plot.title = element_text(size=14, face="bold")) +  
theme(legend.position = "bottom",  
legend.title = element_text(size = 10), legend.text = element_text(size = 8))
```

