VR5-KET Image Data ANOVA

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```
library(ggplot2)
library(ggpubr)
library(car) # For levene.test() function
```

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

```
library(emmeans)
```

Stats in Python were weird

Yesterday I did all the ANOVAs and post hoc tests for the standard stain types (normalized intensity, mean cell counts). I spot checked a few in prism and found that all the main effect F values were slightly different. The interaction effects all agree. Looking into this issue a little deeper, it seems that R agrees with SPSS which agrees with Prism and so I will just have to repeat these in R.

EDA and ANOVA function

This function performs the same type of ANOVA as performed in graphpad prism. In addition, performs some exploratory data analysis to assess normality and homogeneity of variances (both quantitatively and qualitatively)

```
Sidak <- function(pvals)
  # takes a vector of p-values and corrects p-values according to
  # Sidaks method for multiple comparisons (1967)
  #
  # Jonathan Ramos 3/12/2024
  {
  adjusted <- c()
  j <- length(pvals)

  for (i in 1:j){
    adj_p <- 1-(1-pvals[i])^j
    adjusted <- c(adjusted, adj_p)
  }
  return(adjusted)

}

eda_anova <- function(fname)
  # takes a filname, loads data from csv; data 4 columns:
  # react_treat, react, treat, and norm_int (response var)
  # react_treat is just react and treat in one string separated by "_"
```

```
# builds factor cols for categorical cols (norm_int is numeric, all others are categorical)
# then performs the following tasks:
# checks assumptions of normality with qqplot and shapiro wilk tests
# checks assumptions of equal variances with box plot and levene test
# performs 2way ANOVA (2 by 2, react by treat)
# performs post hoc pairwise comparisons (emmeans of levels of react by treat
# and emmeans of levels of treat by react)
# prints out all statistical test results and returns plot objects
# for the two plots: the qqplots and the box plots
#
# Jonathan Ramos 3/12/2024

{
df <- read.csv(fname, header=TRUE, sep=",")
df$react_treat_factor <- as.factor(df$react_treat)
df$react_factor <- as.factor(df$react)
df$treat_factor <- as.factor(df$treat)

### check assumption of normality
# quantitative assessment
print(tapply(df$norm_int, df$react_treat_factor, shapiro.test))

# qualitative assessment
g <- ggqqplot(df, x="norm_int", facet.by=c("treat_factor", "react_factor"))

### check assumption of equal variances
# quantitative assessment
print(leveneTest(y = df$norm_int, group=df$react_treat_factor, center='mean'))

# qualitative assessment
f <- ggplot(df, aes(x=treat_factor, y=norm_int)) + geom_boxplot(aes(fill=treat_factor), alpha=0.5) +
  #geom_dotplot(binaxis = "y", stackdir = "center", dotsize=0.5) +
  facet_wrap(~react_factor) +
  theme(axis.text.x = element_text(angle = 45, vjust = 1, hjust=1))

# run the ANOVA, display summary
df.lm <- lm(norm_int ~ treat_factor + react_factor + treat_factor*react_factor, contrasts=list(treat_
df.III.aov <- car::Anova(df.lm, type = 3)
print(df.III.aov)

# post hoc pairwise comparisons
emm <- emmeans(df.lm, ~ treat_factor * react_factor)
p1 <- pairs(emm, simple="treat_factor", adjust="tukey")
p2 <- pairs(emm, simple="react_factor", adjust="tukey")

# add col to summary dataframe containing sidak adjusted p-values
adjusted_p.value1 <- Sidak(summary(p1, adjust="tukey")$p.value)
s1 <- summary(p1)
s1['adjusted_p.value'] <- adjusted_p.value1

adjusted_p.value2 <- Sidak(summary(p2, adjust="tukey")$p.value)
s2 <- summary(p2)
s2['adjusted_p.value'] <- adjusted_p.value2
```

```
  # display results
  print(s1)
  print(s2)

  return(list(g, f))
}
```

pulling out filenames

```
singles = list.files(pattern="KET-VR5_single")
quads = list.files(pattern="KET-VR5_quad")
pv = list.files(pattern="PV_coloc")
cfos = list.files(pattern="cFos_coloc")
npas4 = list.files(pattern="Npas4_coloc")
wfa = list.files(pattern="WFA_coloc")
```

Single cFos

```
fname = singles[1]

print(fname)
```

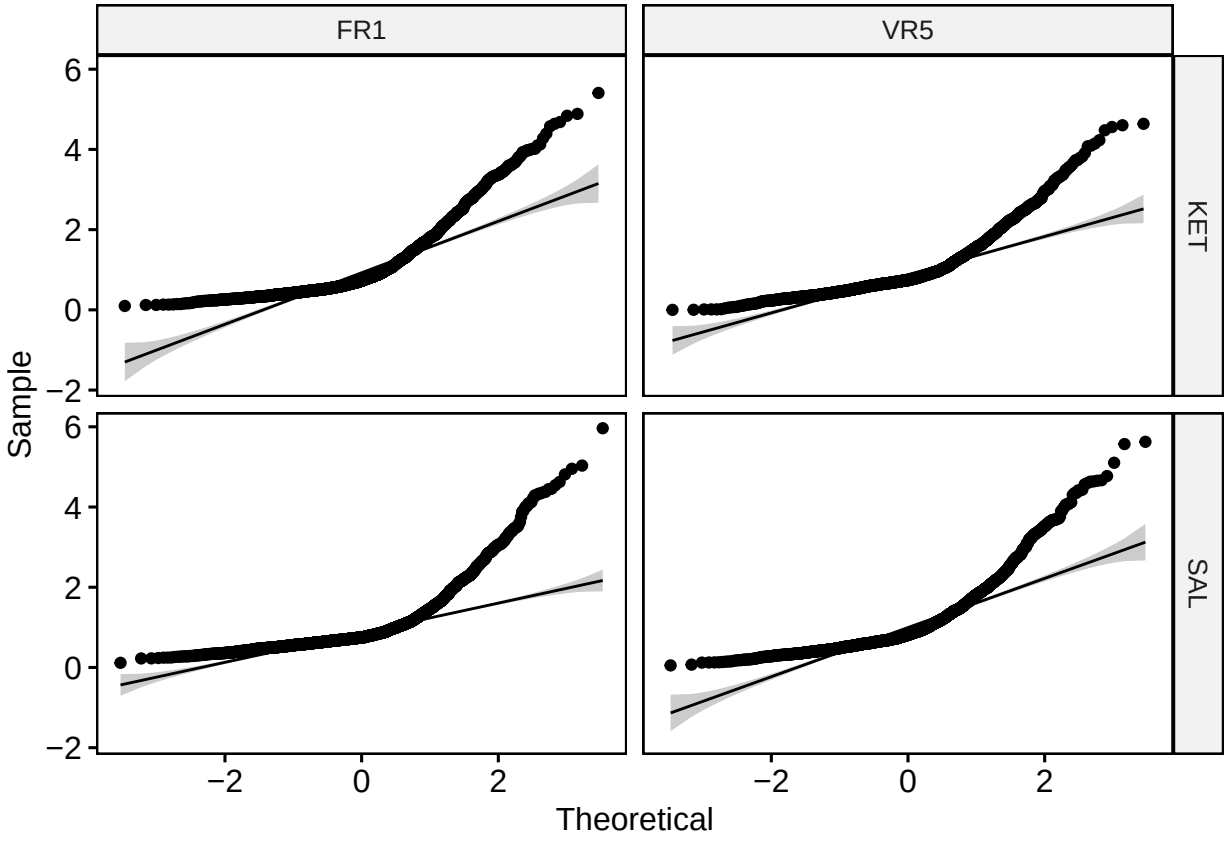
```
## [1] "KET-VR5_single_cFos_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

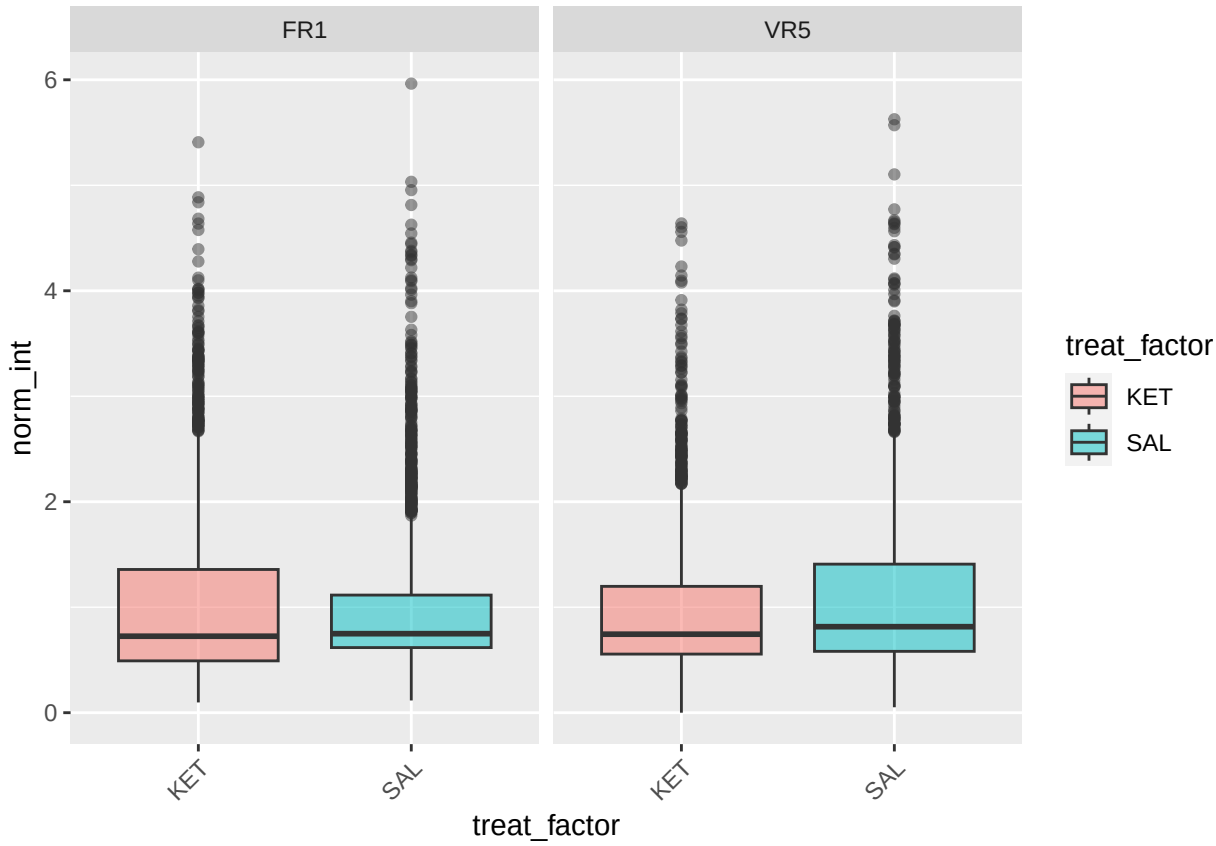
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.81022, p-value < 2.2e-16
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.73405, p-value < 2.2e-16
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.81916, p-value < 2.2e-16
##
##
## $VR5_SAL
##
```

```
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.81114, p-value < 2.2e-16
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##         Df F value    Pr(>F)
## group    3  46.678 < 2.2e-16 ***
##       7995
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq   Df    F value    Pr(>F)
## (Intercept)              8420.2    1 15088.1755 < 2.2e-16 ***
## treat_factor                3.2    1     5.7738   0.01629 *
## react_factor                0.6    1     1.0990   0.29451
## treat_factor:react_factor  15.3    1    27.3998 1.697e-07 ***
## Residuals                4461.7 7995
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  KET - SAL   0.0476 0.0230 7995   2.071  0.0384         7.52e-02
##
## react_factor = VR5:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.1284 0.0245 7995  -5.231  <.0001         3.40e-07
##
## treat_factor = KET:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  FR1 - VR5   0.0704 0.0247 7995   2.846  0.0044         8.86e-03
##
## treat_factor = SAL:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  FR1 - VR5  -0.1056 0.0228 7995  -4.637  <.0001         7.20e-06
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_single_cFos_NORM_Rsubset.csv"
```

Single Npas4

```
fname = singles[2]

print(fname)
```

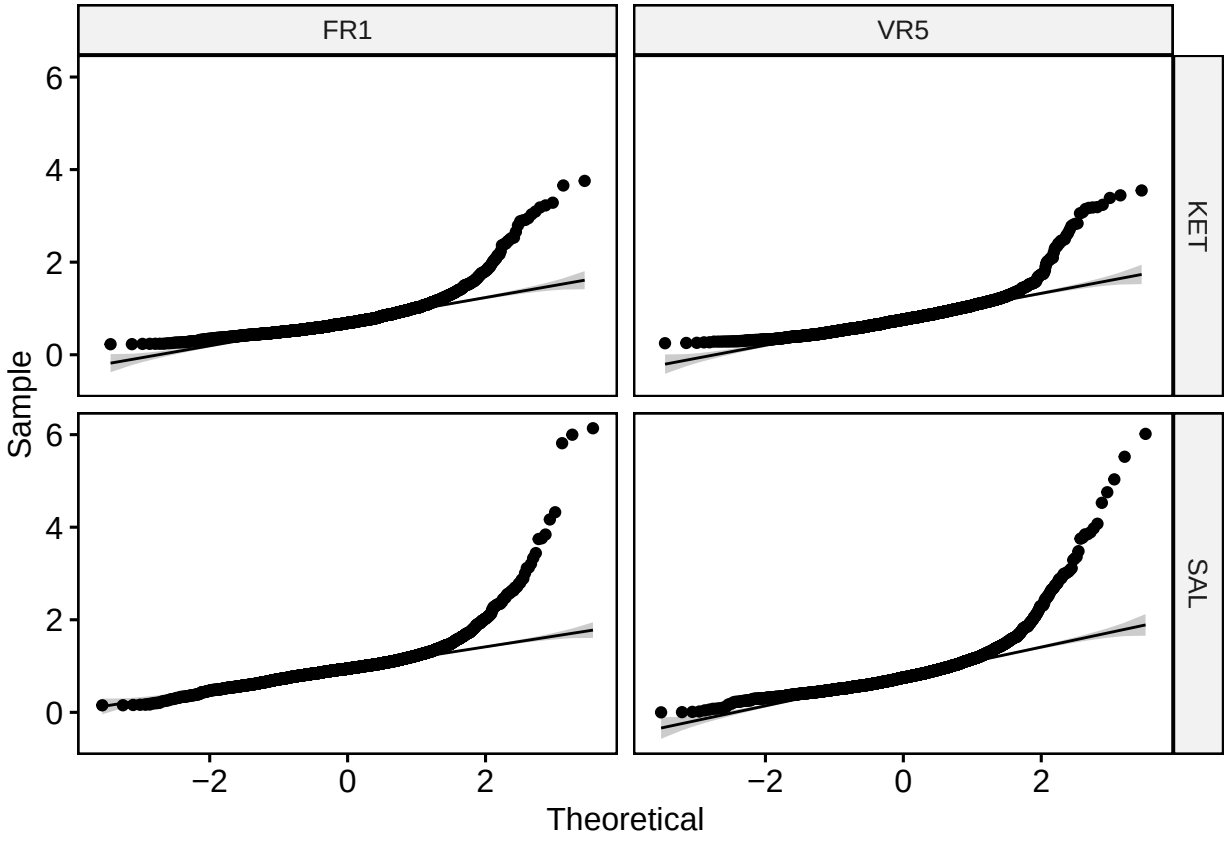
```
## [1] "KET-VR5_single_Npas4_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

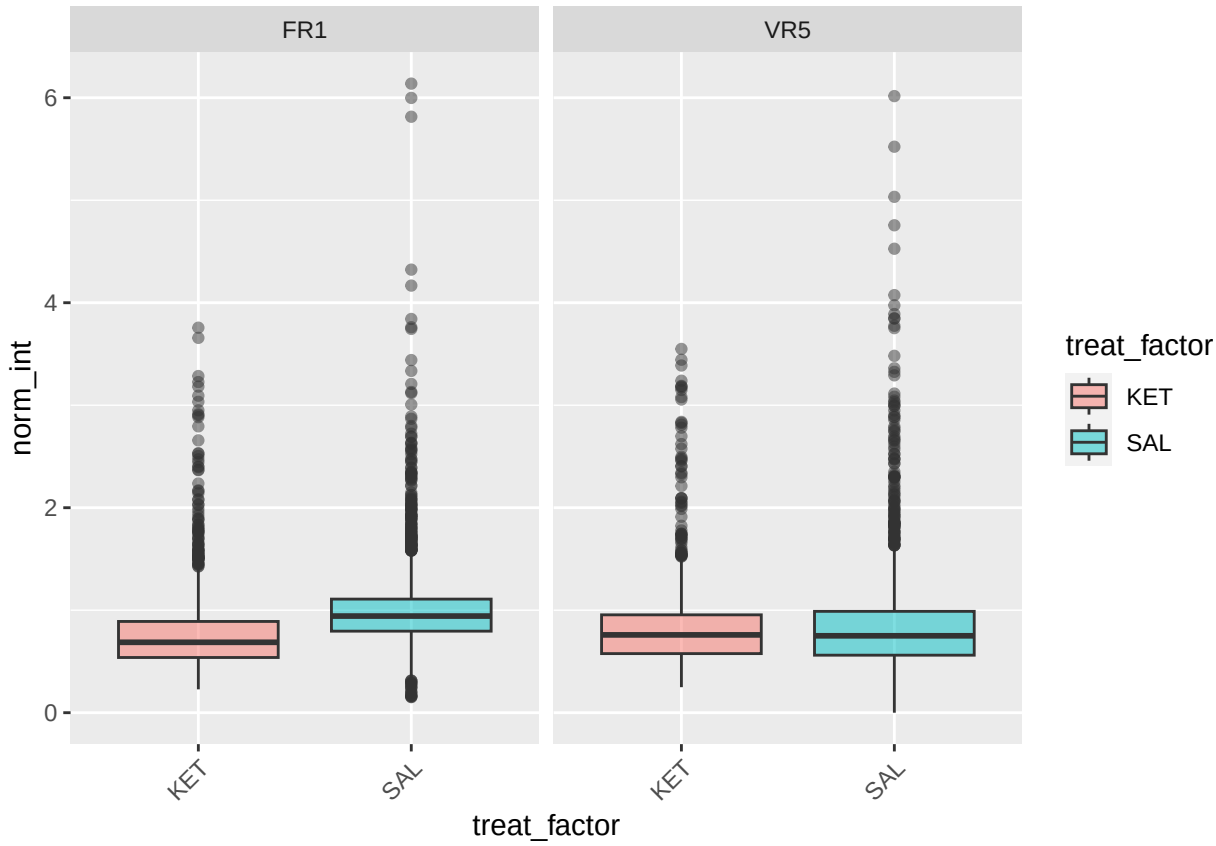
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.77214, p-value < 2.2e-16
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.74665, p-value < 2.2e-16
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.80268, p-value < 2.2e-16
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.74038, p-value < 2.2e-16
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##         Df F value    Pr(>F)
## group    3  25.664 < 2.2e-16 ***
##       8460
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq   Df   F value    Pr(>F)
## (Intercept)               6049.4    1 33334.848 < 2.2e-16 ***
## treat_factor                37.3    1   205.787 < 2.2e-16 ***
## react_factor                 6.0    1    33.249 8.392e-09 ***
## treat_factor:react_factor   17.7    1    97.598 < 2.2e-16 ***
## Residuals                 1535.3 8460
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.228 0.0132 8460 -17.269  <.0001          0.00000
##
## react_factor = VR5:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.042 0.0134 8460  -3.133  0.0017          0.00347
##
## treat_factor = KET:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  FR1 - VR5  -0.0387 0.0144 8460  -2.697  0.0070            0.014
##
## treat_factor = SAL:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  FR1 - VR5   0.1472 0.0122 8460  12.093  <.0001            0.000
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_single_Npas4_NORM_Rsubset.csv"
```

Single PV

```
fname = singles[3]

print(fname)
```

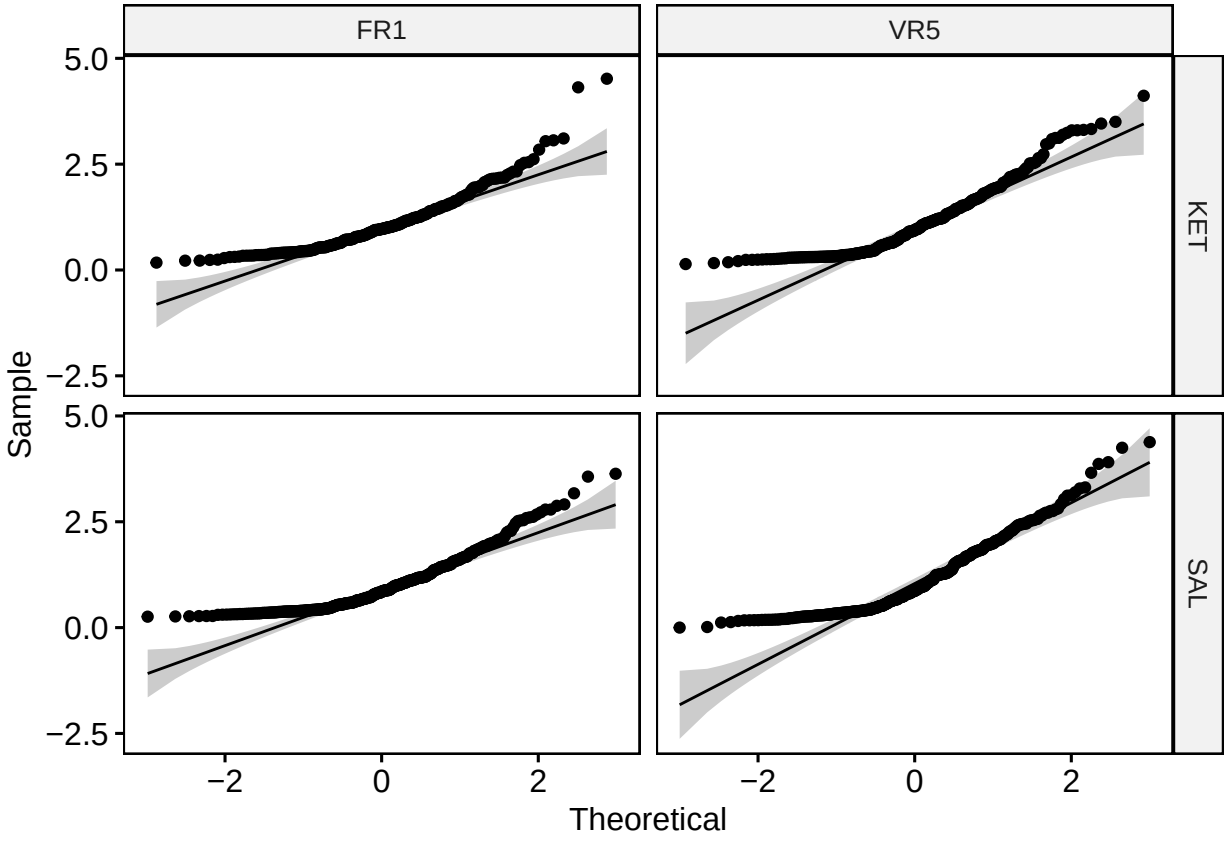
```
## [1] "KET-VR5_single_PV_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

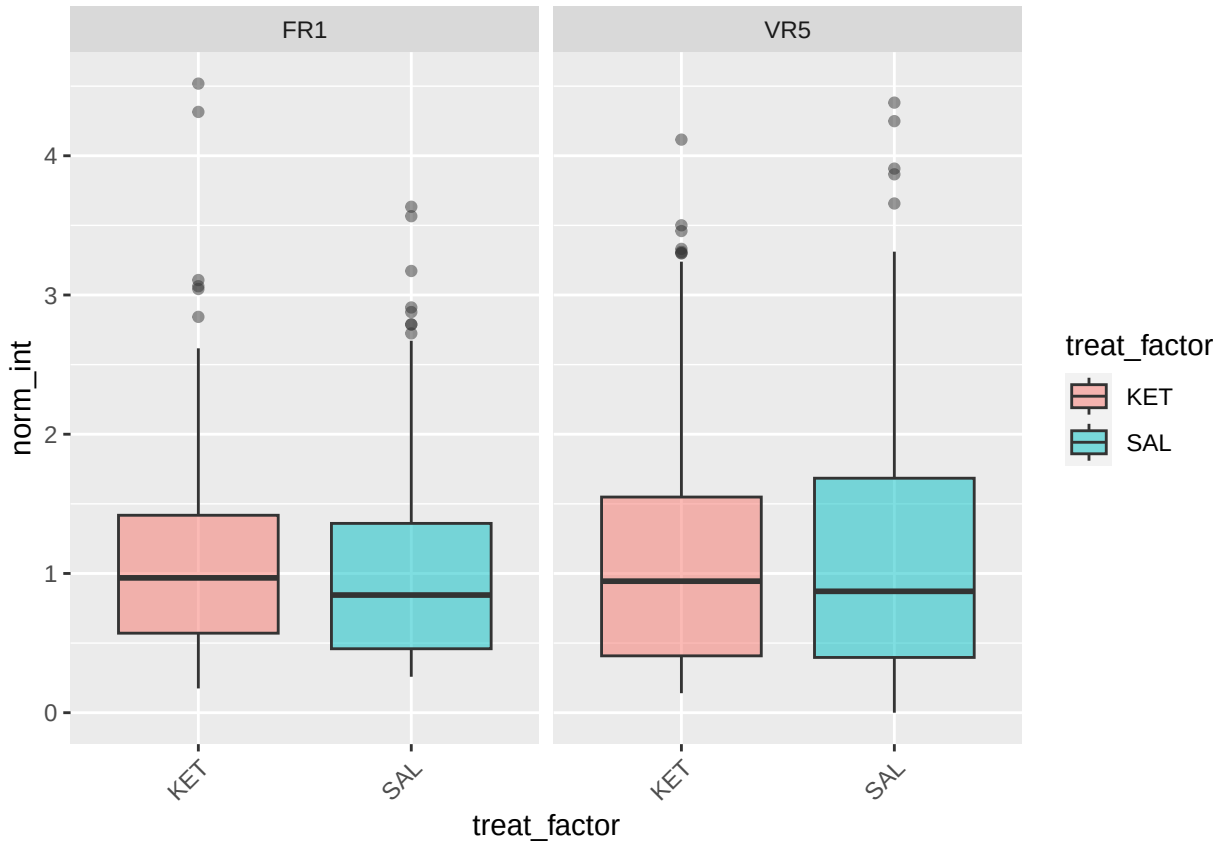
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.88479, p-value = 8.784e-13
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.88329, p-value = 8.269e-16
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.89227, p-value = 1.761e-13
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.89805, p-value = 4.459e-15
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##         Df F value    Pr(>F)
## group    3  14.281 3.731e-09 ***
##       1262
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                             Sum Sq   Df   F value Pr(>F)
## (Intercept)               1439.86    1 2560.0767 <2e-16 ***
## treat_factor                 0.61    1    1.0888 0.2969
## react_factor                 1.50    1    2.6751 0.1022
## treat_factor:react_factor    0.68    1    1.2069 0.2722
## Residuals                  709.79 1262
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  KET - SAL  0.09150 0.0620 1262   1.475  0.1404            0.261
##
## react_factor = VR5:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  KET - SAL -0.00235 0.0587 1262  -0.040  0.9680            0.999
##
## treat_factor = KET:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  FR1 - VR5  -0.0229 0.0649 1262  -0.354  0.7237           0.9236
##
## treat_factor = SAL:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  FR1 - VR5  -0.1168 0.0556 1262  -2.101  0.0359           0.0705
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_single_PV_NORM_Rsubset.csv"
```

Single WFA

```
fname = singles[4]

print(fname)
```

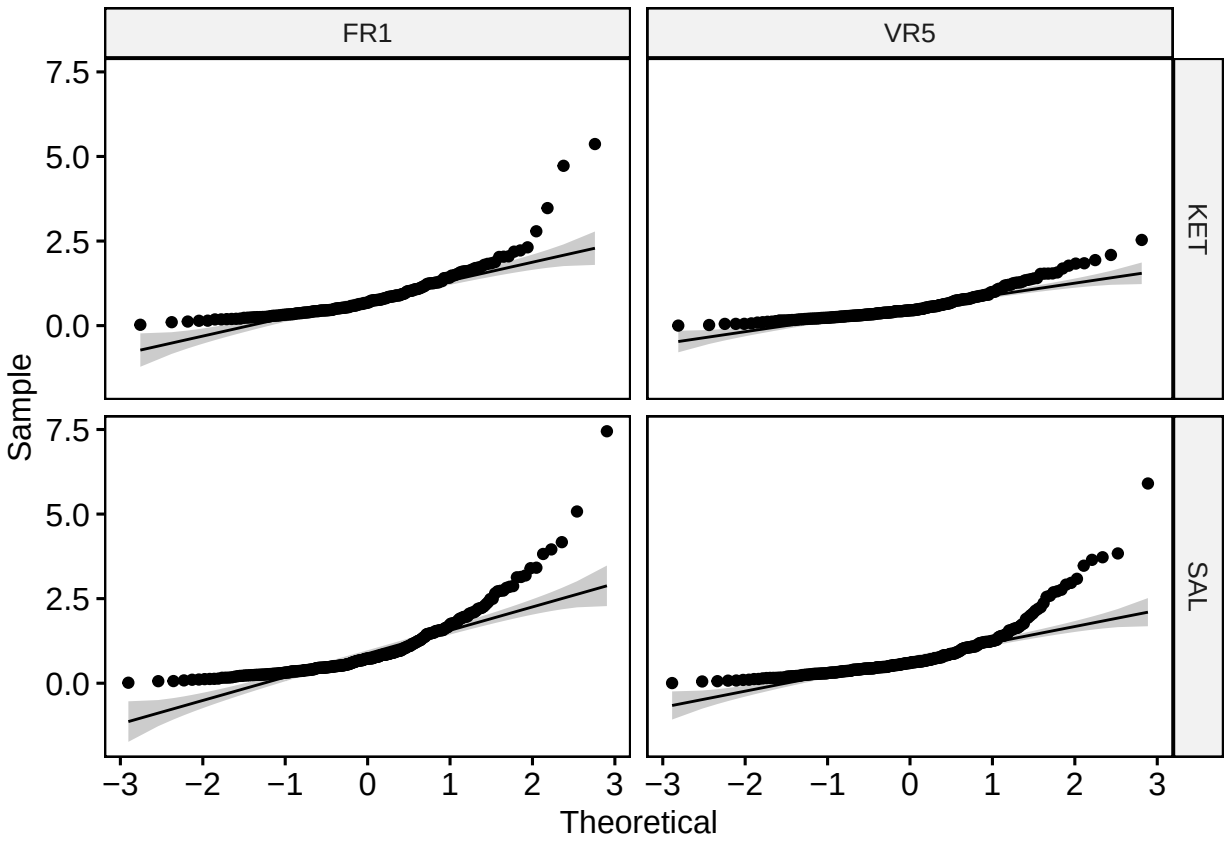
```
## [1] "KET-VR5_single_WFA_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

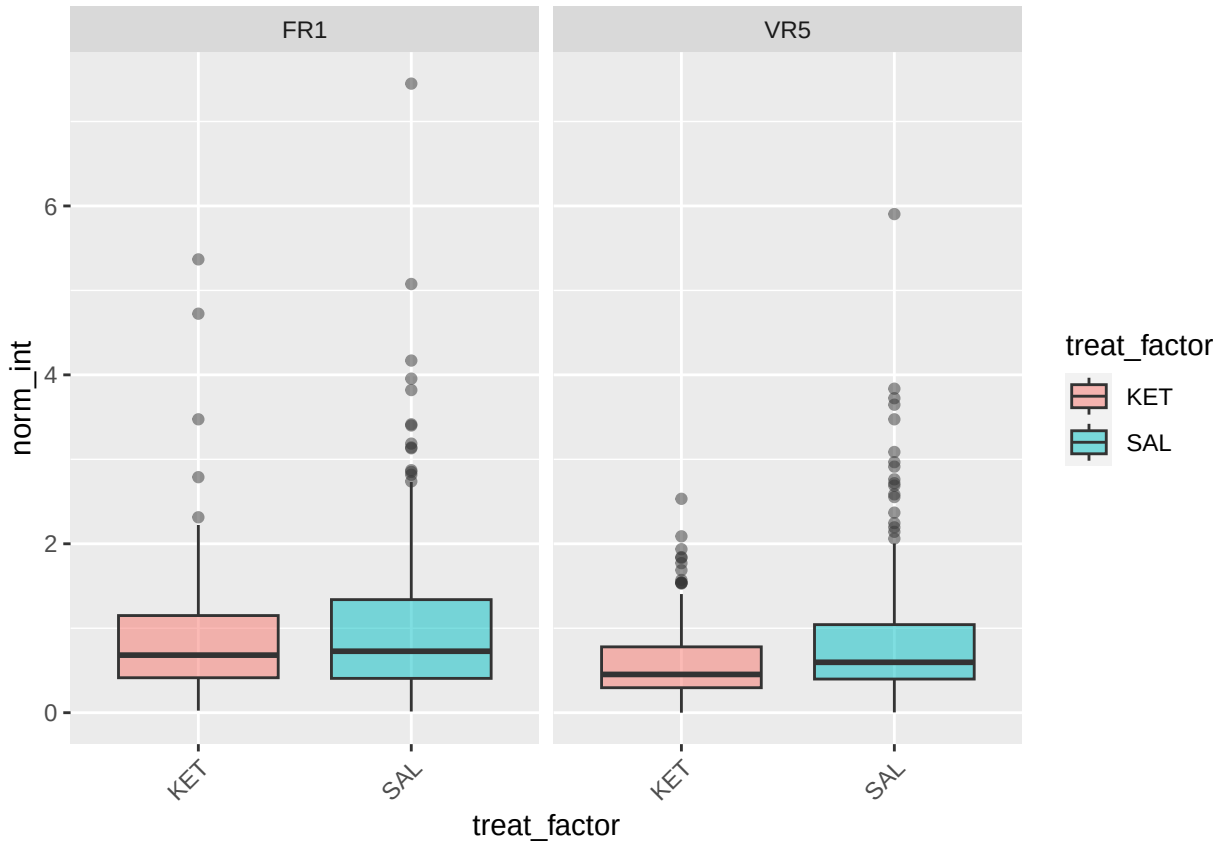
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.7653, p-value = 2.643e-15
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.77493, p-value < 2.2e-16
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.8671, p-value = 2.463e-12
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.73971, p-value < 2.2e-16
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value    Pr(>F)
## group   3  13.077 2.302e-08 ***
##       899
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq  Df   F value    Pr(>F)
## (Intercept)                594.90   1 1075.7751 < 2.2e-16 ***
## treat_factor                 6.84   1   12.3617 0.0004601 ***
## react_factor                11.21   1   20.2770 7.582e-06 ***
## treat_factor:react_factor    0.64   1    1.1627 0.2811975
## Residuals                  497.14 899
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.123 0.0725 899  -1.692  0.0909          0.17362
##
## react_factor = VR5:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.231 0.0698 899  -3.311  0.0010          0.00193
##
## treat_factor = KET:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.281 0.0771 899   3.645  0.0003         0.000566
##
## treat_factor = SAL:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.172 0.0647 899   2.662  0.0079         0.015751
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_single_WFA_NORM_Rsubset.csv"
```

PV coloc w cFos

```
fname = pv[1]

print(fname)
```

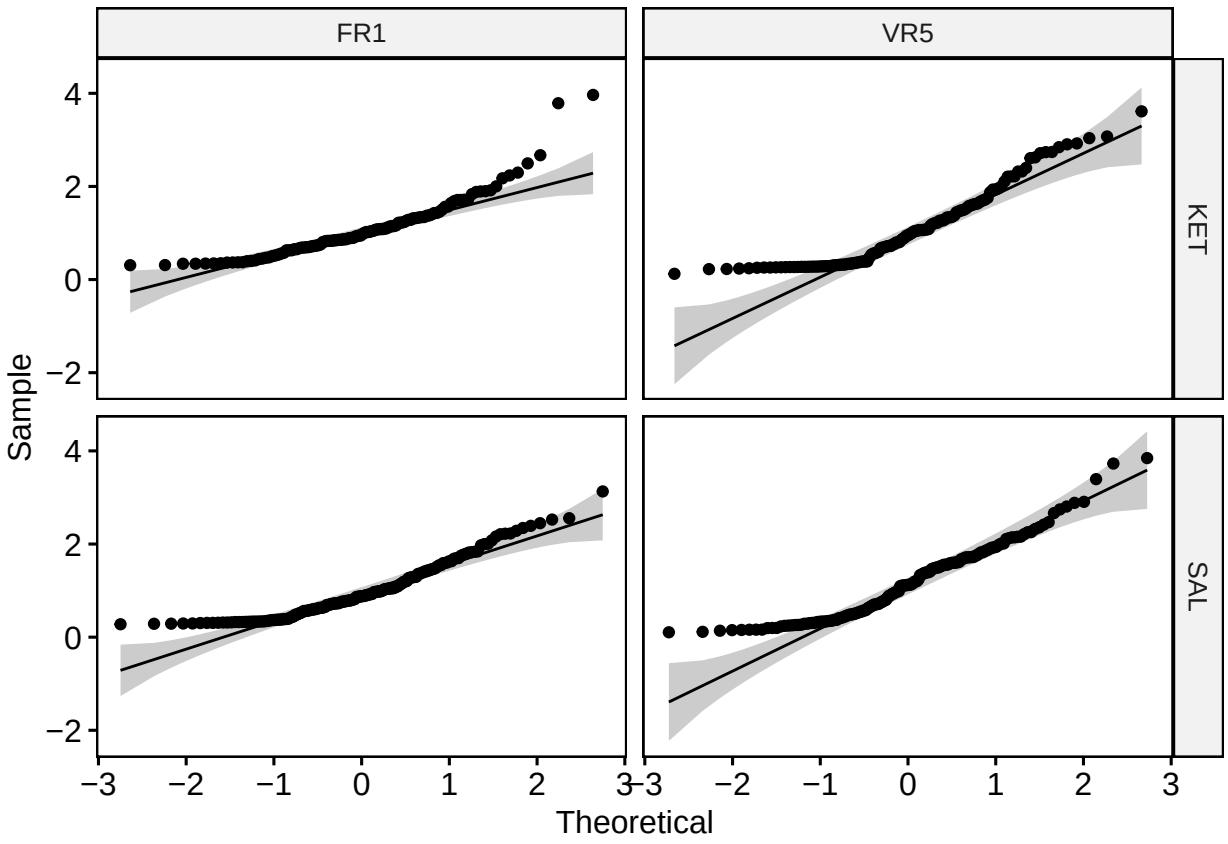
```
## [1] "KET-VR5_PV_coloc_w_cFos_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

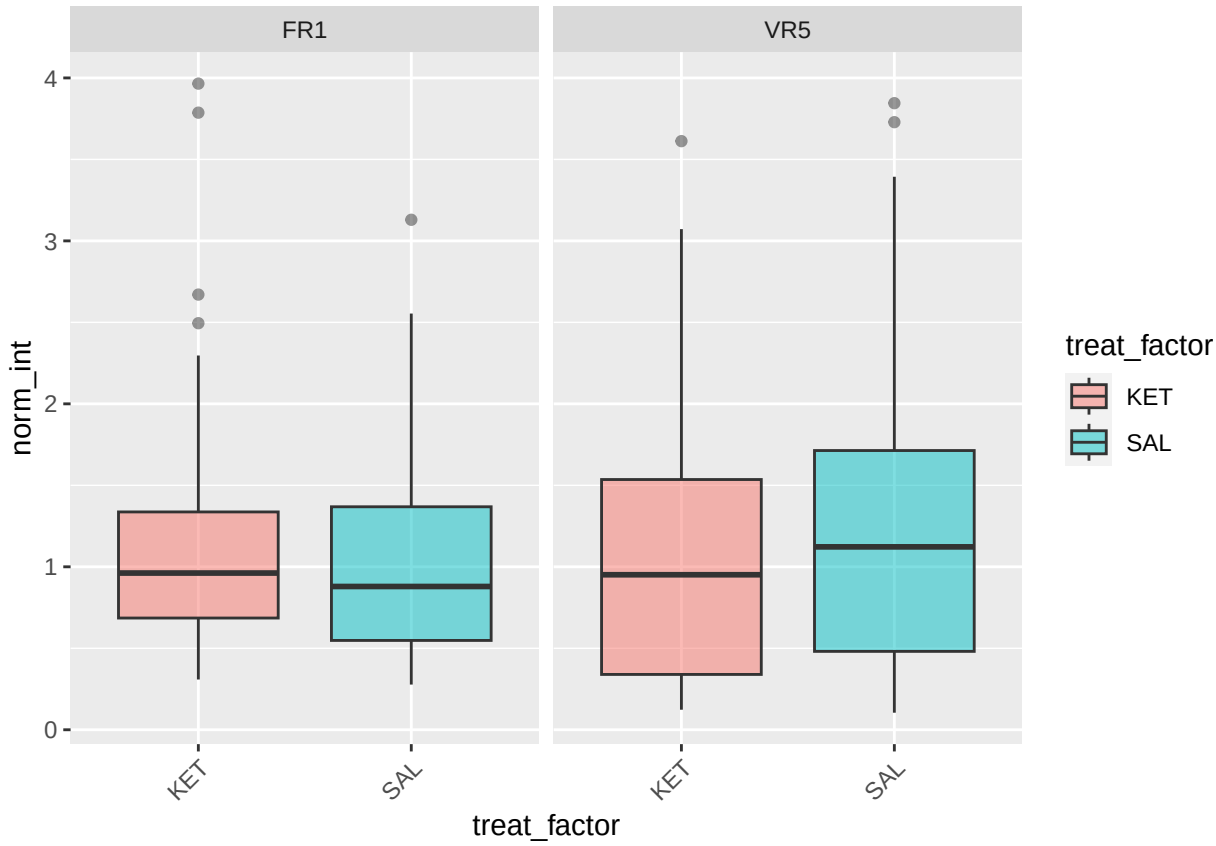
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.86312, p-value = 3.827e-09
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.91676, p-value = 3.586e-08
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.89255, p-value = 3.49e-08
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.93813, p-value = 2.549e-06
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value    Pr(>F)
## group   3  9.9851 2.016e-06 ***
##       568
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq  Df   F value Pr(>F)
## (Intercept)                667.64   1 1315.7840 <2e-16 ***
## treat_factor                 0.00   1    0.0096 0.9219
## react_factor                 1.27   1    2.5028 0.1142
## treat_factor:react_factor    1.17   1    2.3023 0.1297
## Residuals                  288.21 568
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   0.0853 0.0852 568   1.001  0.3173            0.534
##
## react_factor = VR5:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.0971 0.0848 568  -1.145  0.2525            0.441
##
## treat_factor = KET:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5 -0.00389 0.0903 568  -0.043  0.9657            0.999
##
## treat_factor = SAL:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5 -0.18630 0.0793 568  -2.349  0.0192            0.038
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_PV_coloc_w_cFos_NORM_Rsubset.csv"
```

PV coloc w cFos, Npas4

```
fname = pv[2]

print(fname)
```

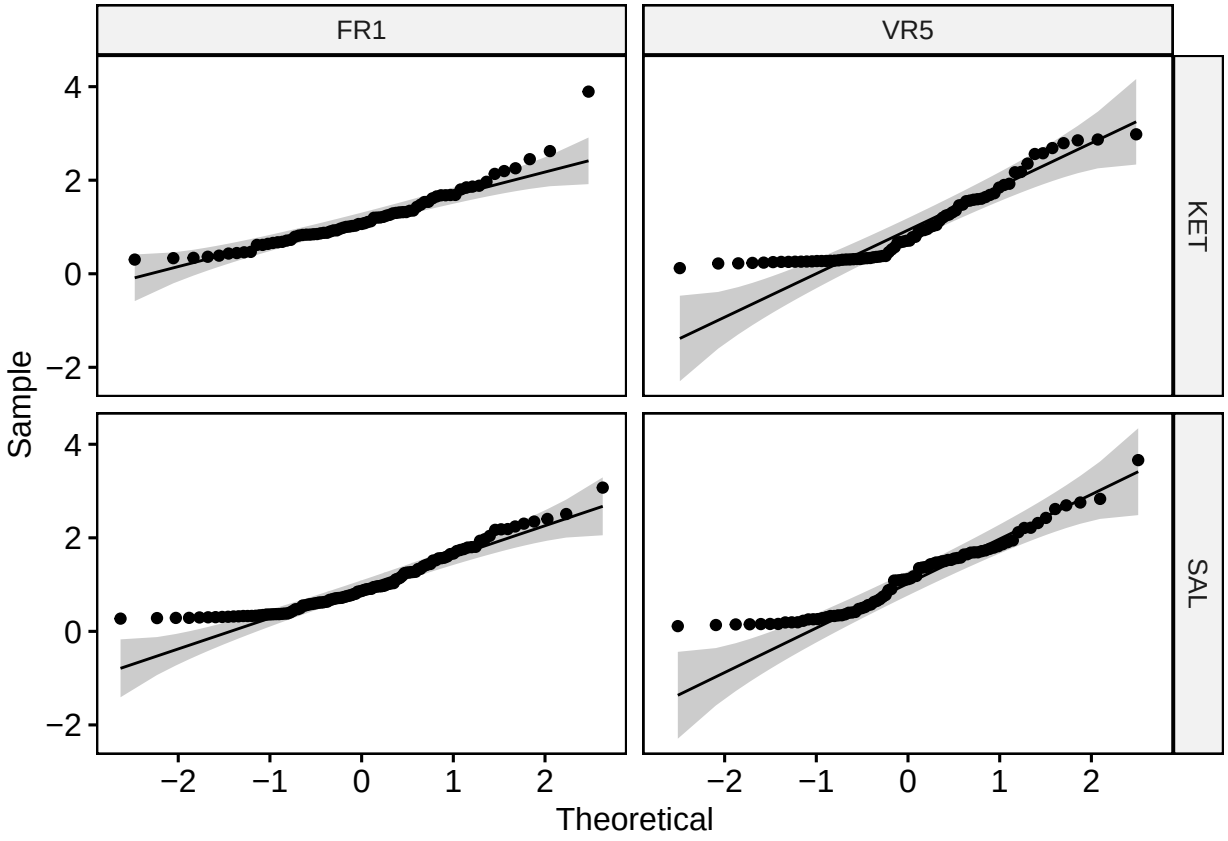
```
## [1] "KET-VR5_PV_coloc_w_cFos,Npas4_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

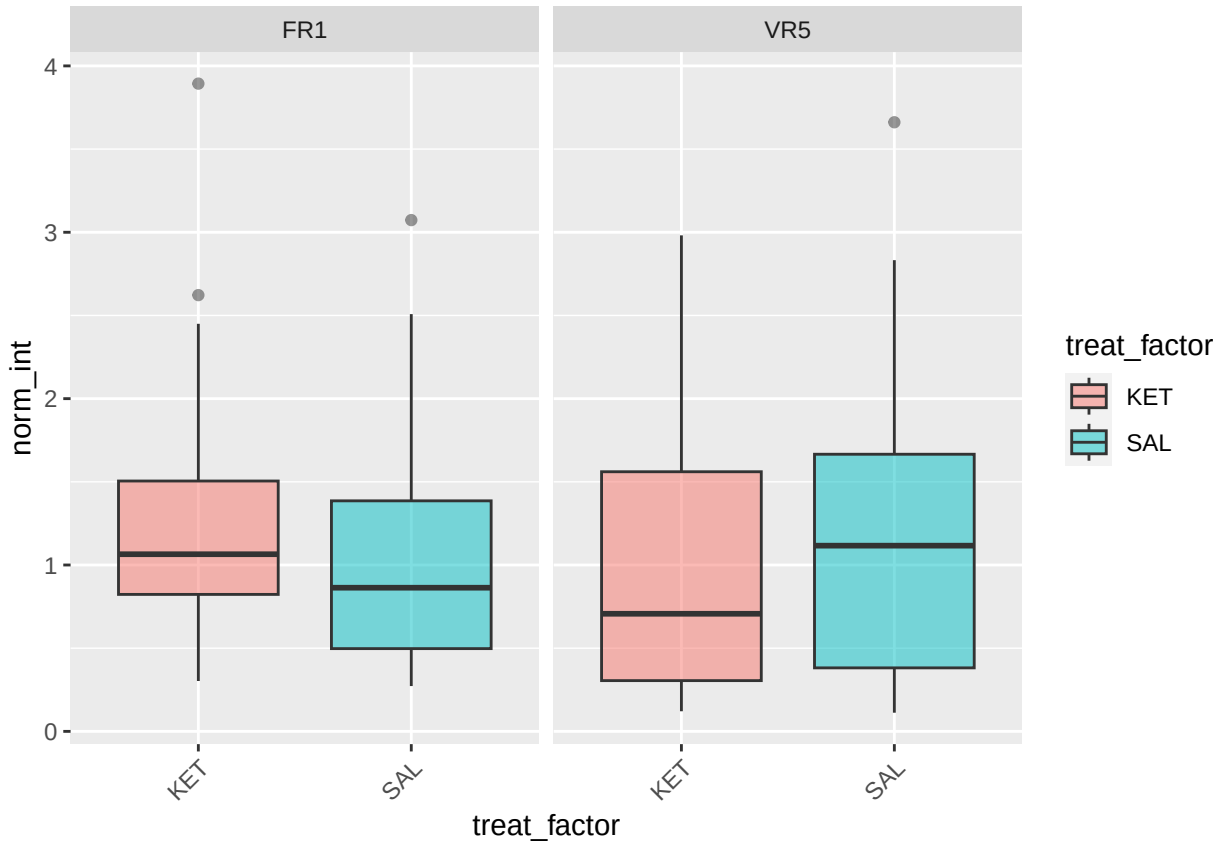
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.90836, p-value = 4.821e-05
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.9117, p-value = 1.072e-06
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.85526, p-value = 3.206e-07
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.93343, p-value = 0.000334
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value    Pr(>F)
## group   3  6.2406 0.0003882 ***
##       349
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq  Df  F value  Pr(>F)
## (Intercept)                399.86   1 801.8523 < 2e-16 ***
## treat_factor                 0.03   1   0.0591 0.80806
## react_factor                 0.05   1   0.0958 0.75709
## treat_factor:react_factor    2.38   1   4.7762 0.02952 *
## Residuals                  174.04 349
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL    0.185 0.104 349   1.775  0.0768            0.148
##
## react_factor = VR5:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.148 0.111 349  -1.332  0.1839            0.334
##
## treat_factor = KET:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.190 0.114 349   1.668  0.0962            0.183
##
## treat_factor = SAL:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   -0.143 0.101 349  -1.413  0.1585            0.292
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_PV_coloc_w_cFos,Npas4_NORM_Rsubset.csv"
```

PV coloc w cFos, WFA

```
fname = pv[3]

print(fname)
```

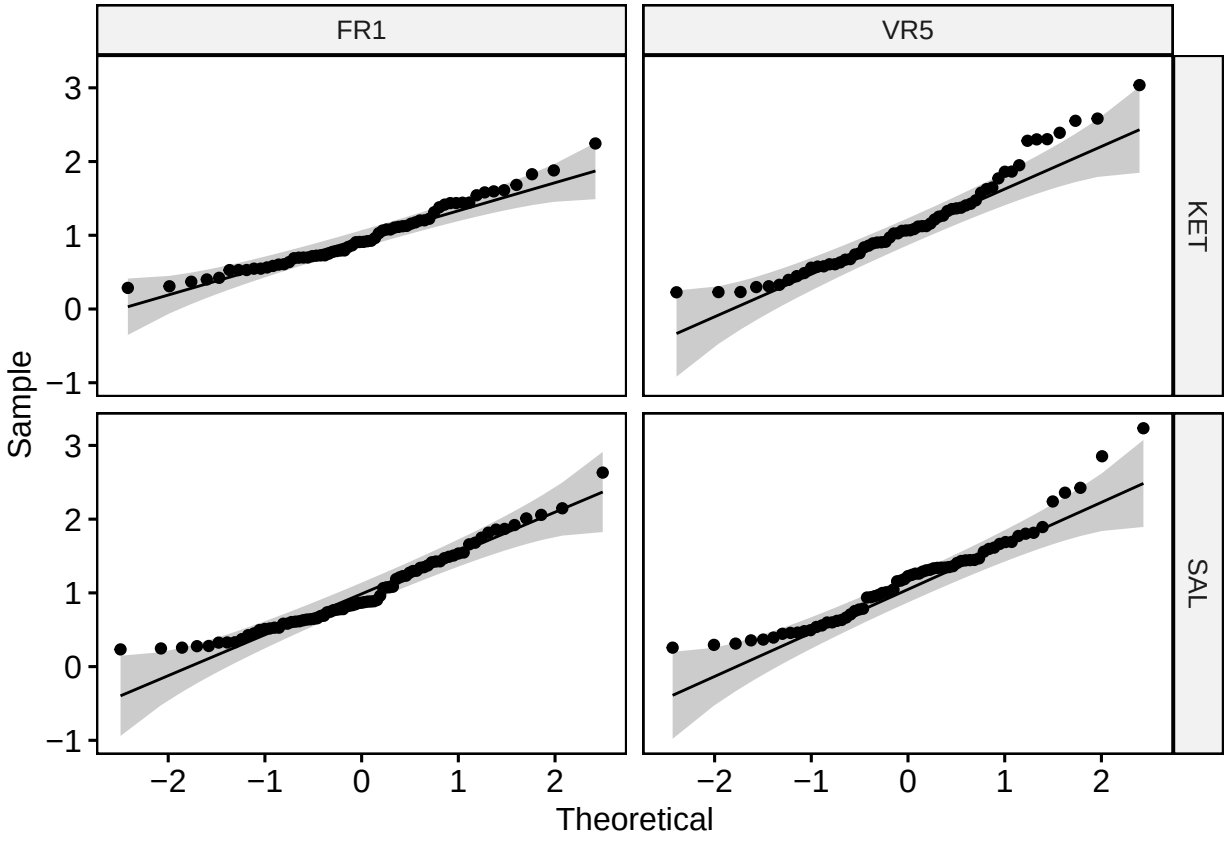
```
## [1] "KET-VR5_PV_coloc_w_cFos,WFA_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

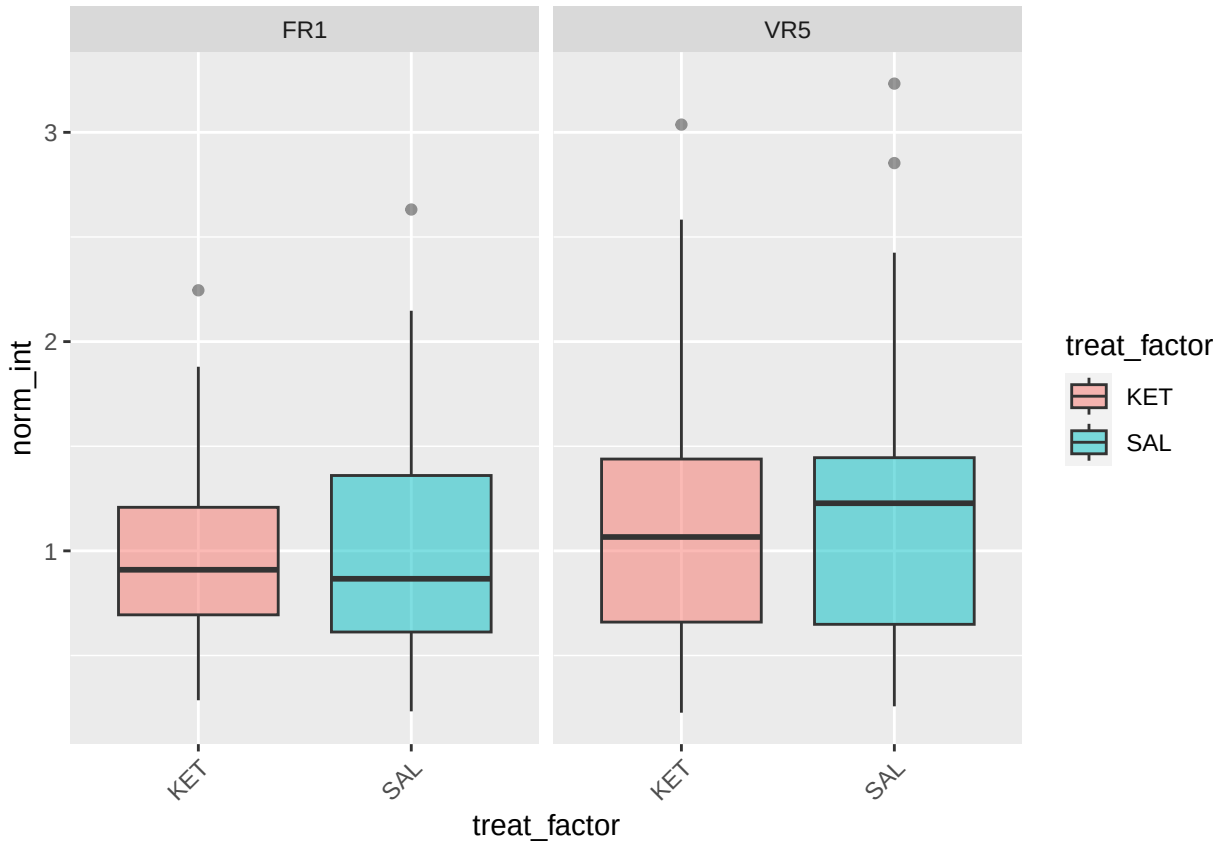
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.96142, p-value = 0.04323
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.94841, p-value = 0.003017
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.94218, p-value = 0.006789
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.93946, p-value = 0.002747
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value Pr(>F)
## group   3   2.828  0.039 *
##       266
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                             Sum Sq  Df  F value    Pr(>F)
## (Intercept)               311.346   1 993.0975 < 2.2e-16 ***
## treat_factor                0.018   1   0.0579  0.810089
## react_factor                2.113   1   6.7392  0.009956 **
## treat_factor:react_factor   0.000   1   0.0014  0.970414
## Residuals                  83.394 266
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.0190 0.0942 266  -0.202  0.8401            0.974
##
## react_factor = VR5:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.0139 0.0995 266  -0.140  0.8887            0.988
##
## treat_factor = KET:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   -0.180 0.101 266  -1.793  0.0741            0.143
##
## treat_factor = SAL:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   -0.175 0.093 266  -1.885  0.0605            0.117
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_PV_coloc_w_cFos,WFA_NORM_Rsubset.csv"
```

PV coloc w Npas4

```
fname = pv[4]

print(fname)
```

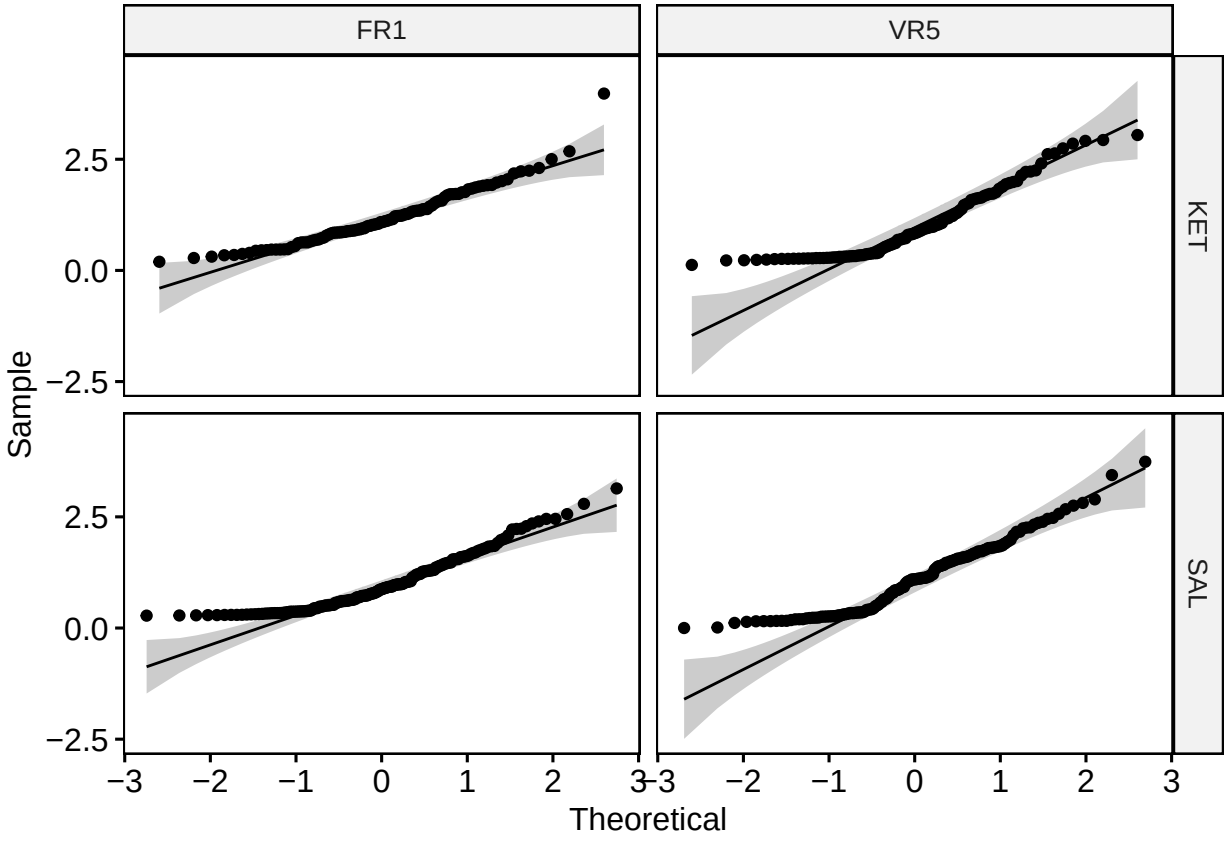
```
## [1] "KET-VR5_PV_coloc_w_Npas4_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

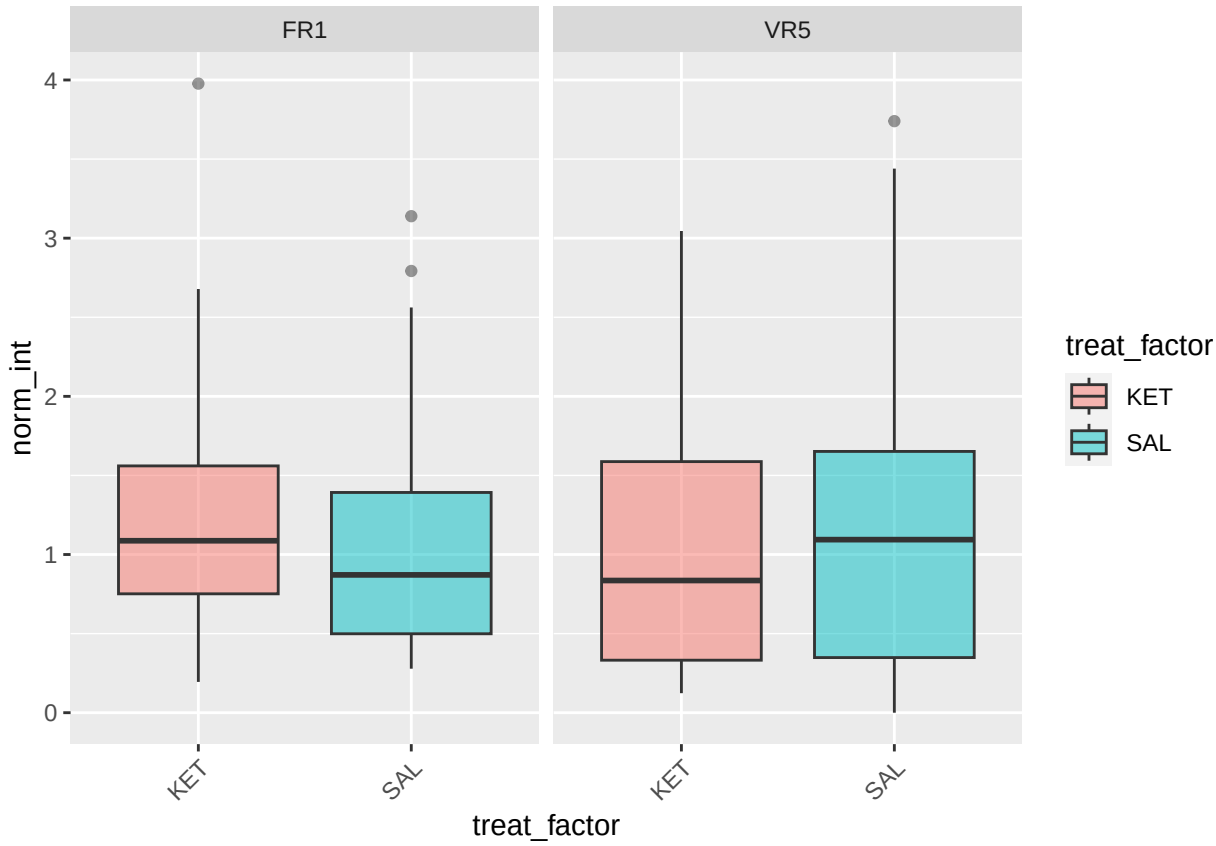
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.93322, p-value = 4.659e-05
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.91155, p-value = 1.919e-08
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.88445, p-value = 1.183e-07
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.93553, p-value = 4.628e-06
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value    Pr(>F)
## group   3  6.6024 0.0002201 ***
##       516
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq  Df   F value  Pr(>F)
## (Intercept)                587.59   1 1191.6395 < 2e-16 ***
## treat_factor                 0.23   1    0.4717 0.49252
## react_factor                 0.05   1    0.0942 0.75908
## treat_factor:react_factor    2.43   1    4.9271 0.02687 *
## Residuals                  254.43 516
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL    0.182 0.0874 516   2.083  0.0377            0.074
##
## react_factor = VR5:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.096 0.0898 516  -1.070  0.2853            0.489
##
## treat_factor = KET:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.158 0.0960 516   1.649  0.0998            0.190
##
## treat_factor = SAL:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   -0.120 0.0805 516  -1.488  0.1373            0.256
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_PV_coloc_w_Npas4_NORM_Rsubset.csv"
```

PV coloc w Npas4, WFA

```
fname = pv[5]

print(fname)
```

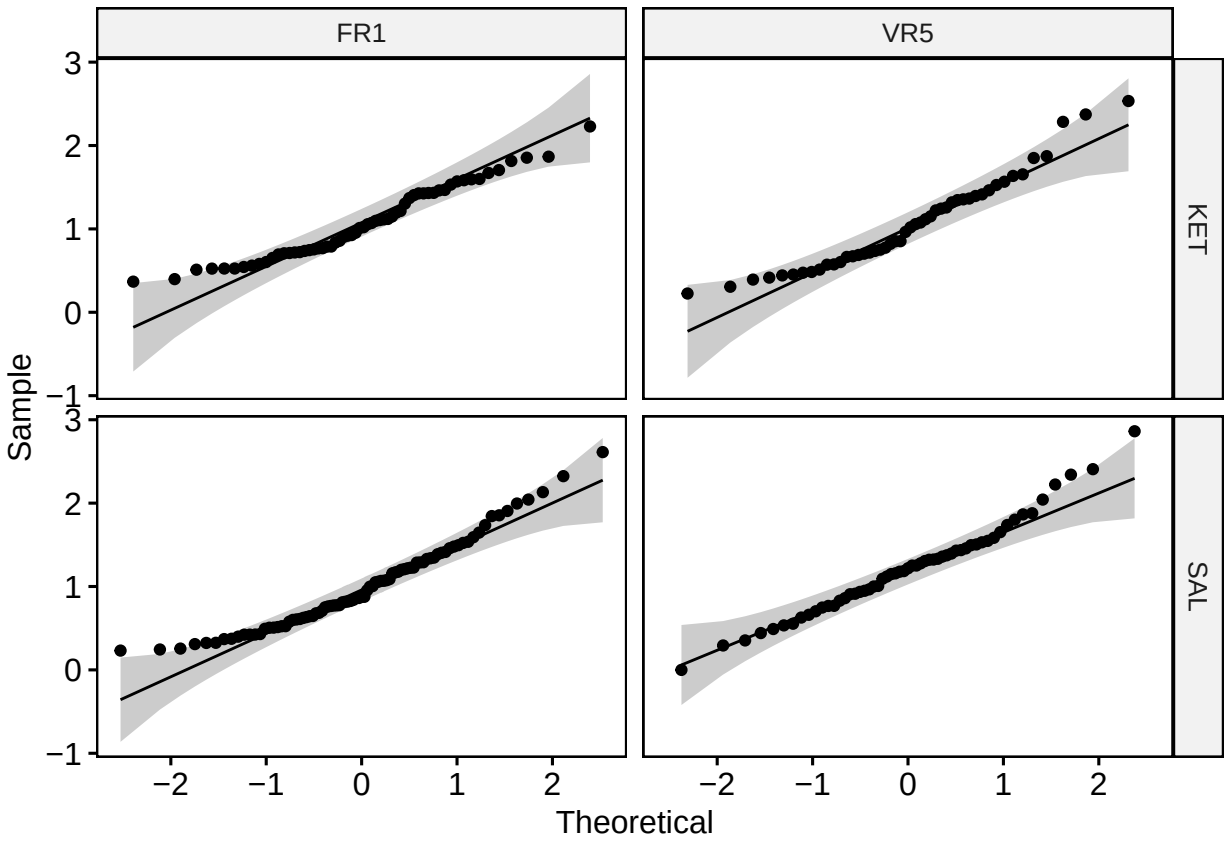
```
## [1] "KET-VR5_PV_coloc_w_Npas4,WFA_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

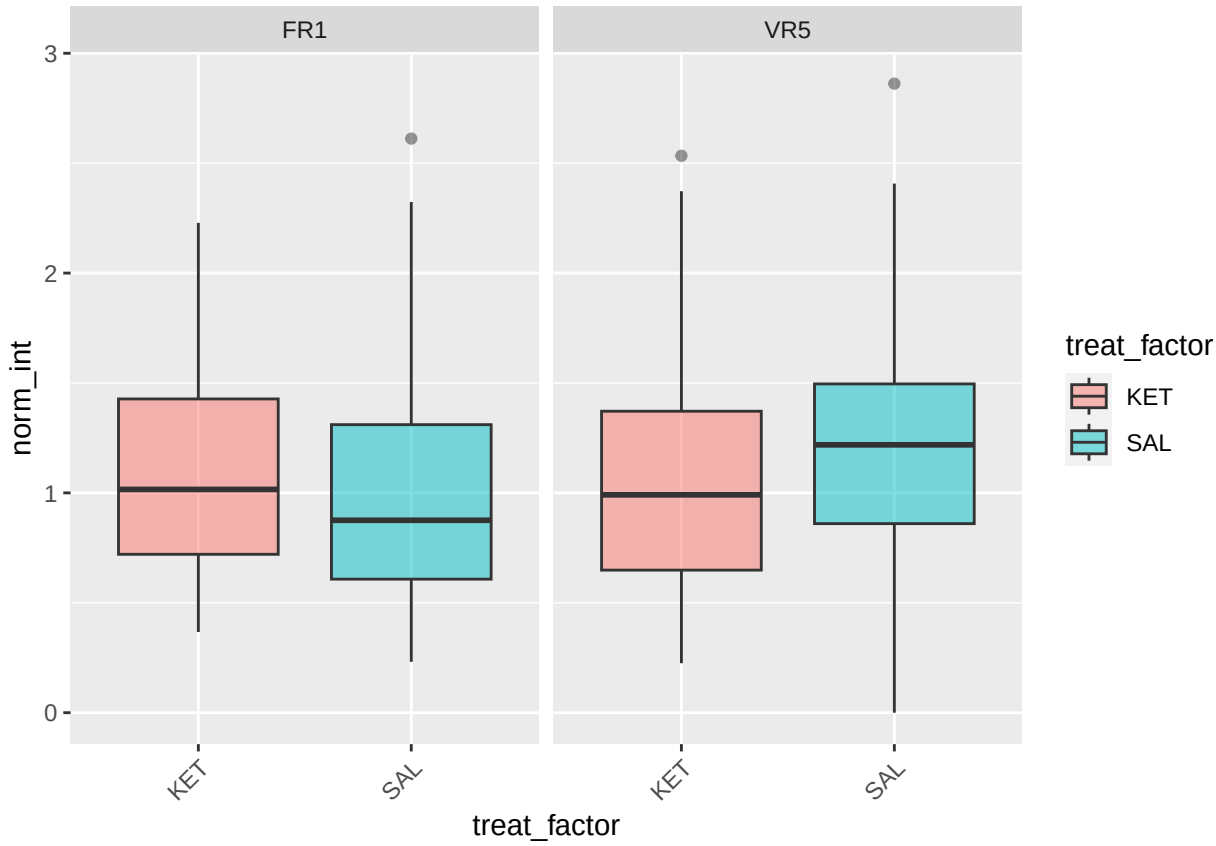
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.95643, p-value = 0.03157
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.95168, p-value = 0.002623
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.94089, p-value = 0.01756
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.98056, p-value = 0.4881
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value Pr(>F)
## group   3  0.7417 0.5281
##       248
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq  Df   F value  Pr(>F)
## (Intercept)               283.152   1 1072.9078 < 2e-16 ***
## treat_factor                0.133   1    0.5057 0.47767
## react_factor                0.651   1    2.4667 0.11756
## treat_factor:react_factor   0.772   1    2.9257 0.08843 .
## Residuals                  65.450 248
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   0.0662 0.0862 248   0.768  0.4432            0.690
##
## react_factor = VR5:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.1604 0.1006 248  -1.594  0.1121            0.212
##
## treat_factor = KET:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5  0.00927 0.0995 248   0.093  0.9258           0.9945
##
## treat_factor = SAL:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5 -0.21739 0.0875 248  -2.483  0.0137           0.0272
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_PV_coloc_w_Npas4,WFA_NORM_Rsubset.csv"
```

PV coloc w WFA

```
fname = pv[6]

print(fname)
```

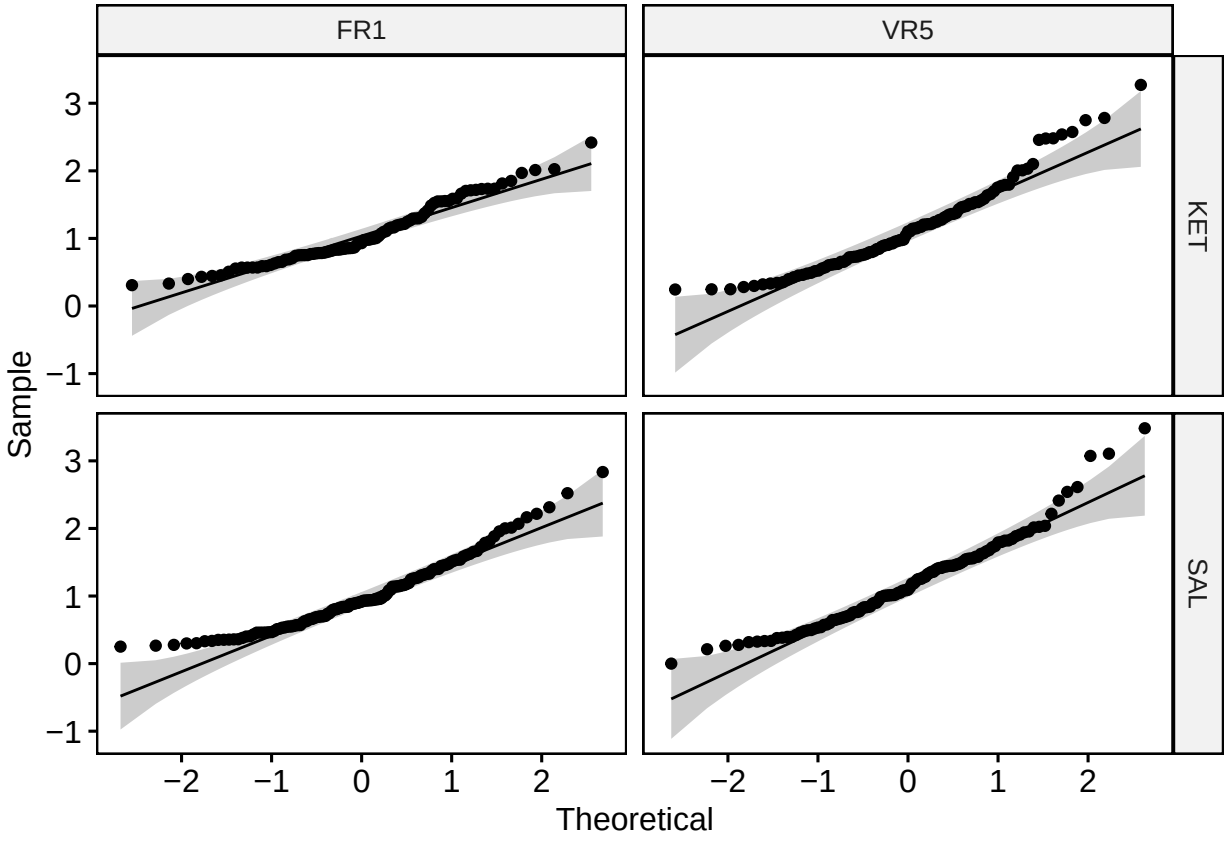
```
## [1] "KET-VR5_PV_coloc_w_WFA_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

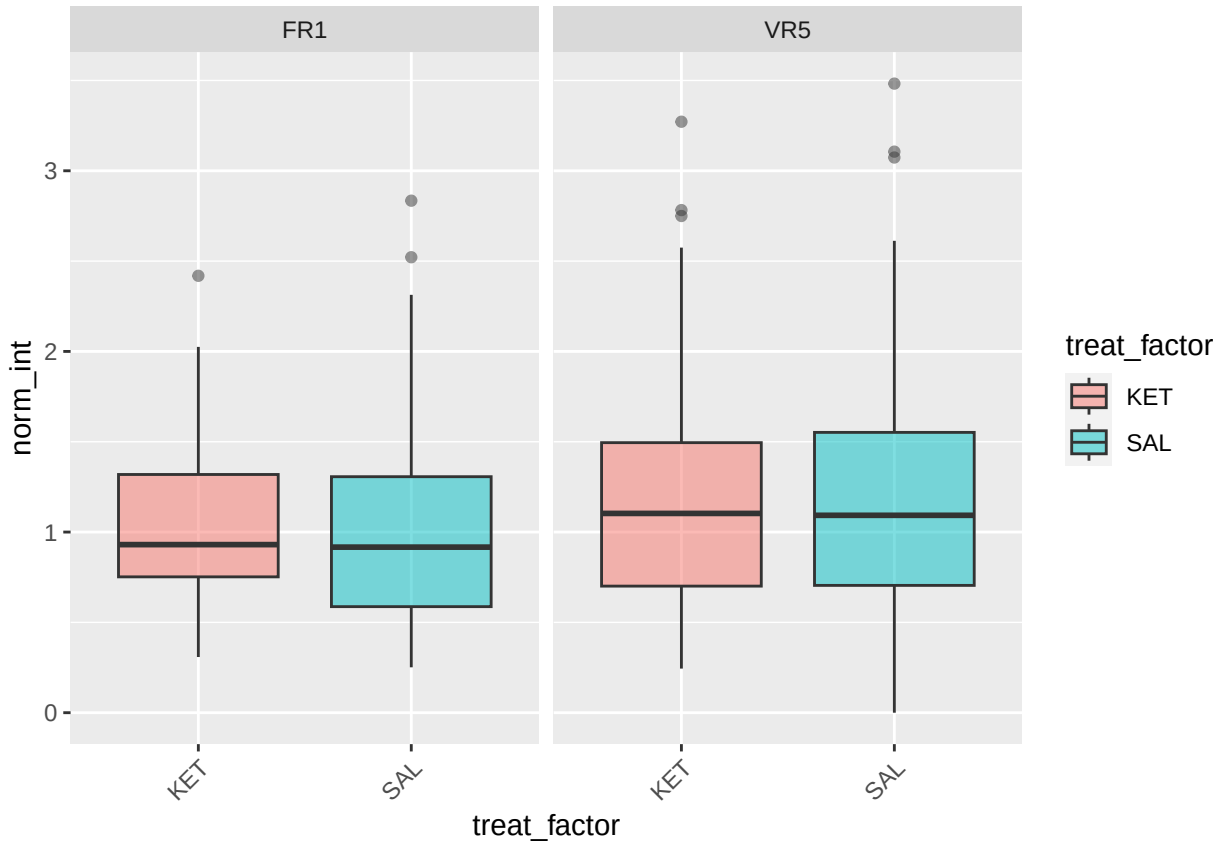
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.94993, p-value = 0.001339
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.94052, p-value = 1.602e-05
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.93763, p-value = 0.0001093
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.95334, p-value = 0.0004624
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value  Pr(>F)
## group   3  3.7435 0.01118 *
##       444
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq  Df   F value    Pr(>F)
## (Intercept)                532.65   1 1645.8078 < 2.2e-16 ***
## treat_factor                 0.01   1    0.0379  0.845679
## react_factor                 2.33   1    7.1933  0.007591 **
## treat_factor:react_factor    0.23   1    0.7166  0.397733
## Residuals                  143.70 444
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   0.0565 0.0767 444   0.737  0.4614            0.710
##
## react_factor = VR5:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.0354 0.0769 444  -0.460  0.6456            0.874
##
## treat_factor = KET:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5  -0.0996 0.0814 444  -1.224  0.2215           0.3939
##
## treat_factor = SAL:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5  -0.1915 0.0719 444  -2.665  0.0080           0.0159
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_PV_coloc_w_WFA_NORM_Rsubset.csv"
```

cFos coloc w Npas4

```
fname = cfos[1]

print(fname)
```

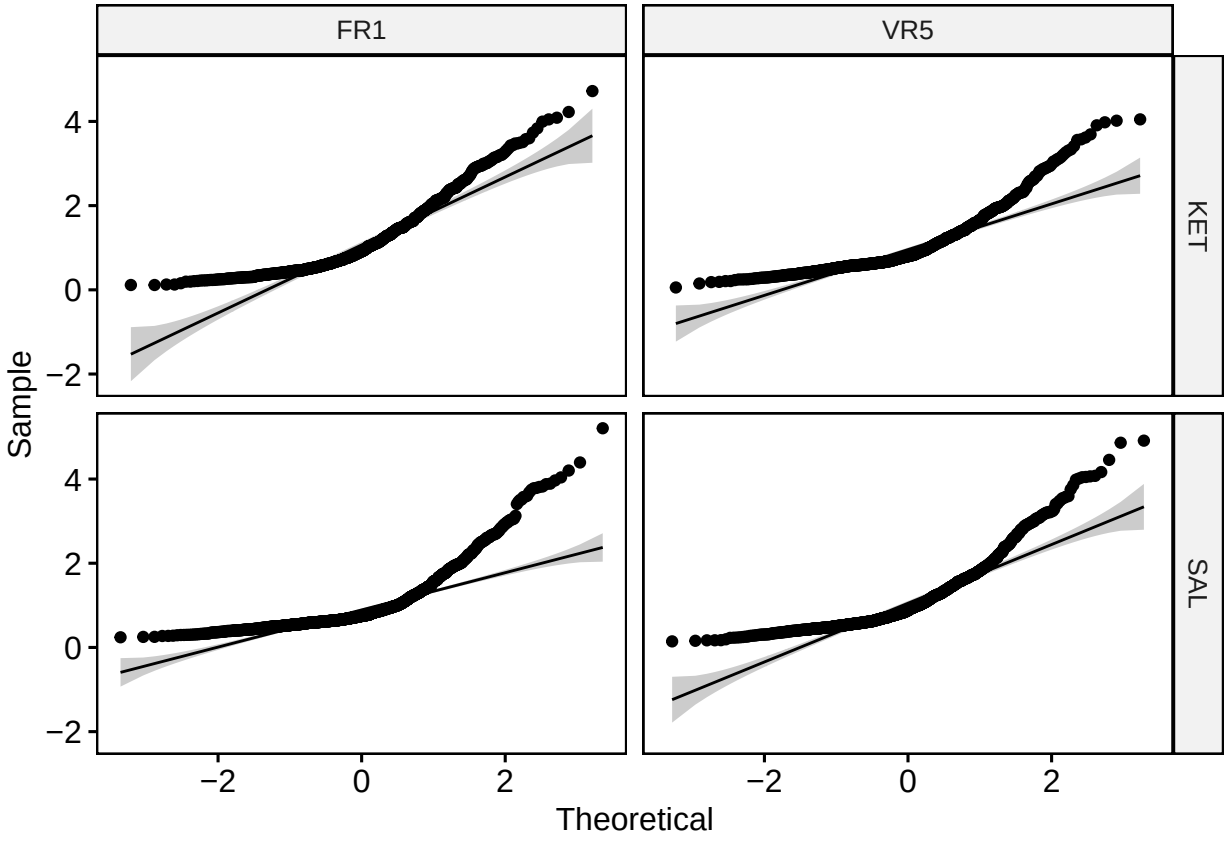
```
## [1] "KET-VR5_cFos_coloc_w_Npas4_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

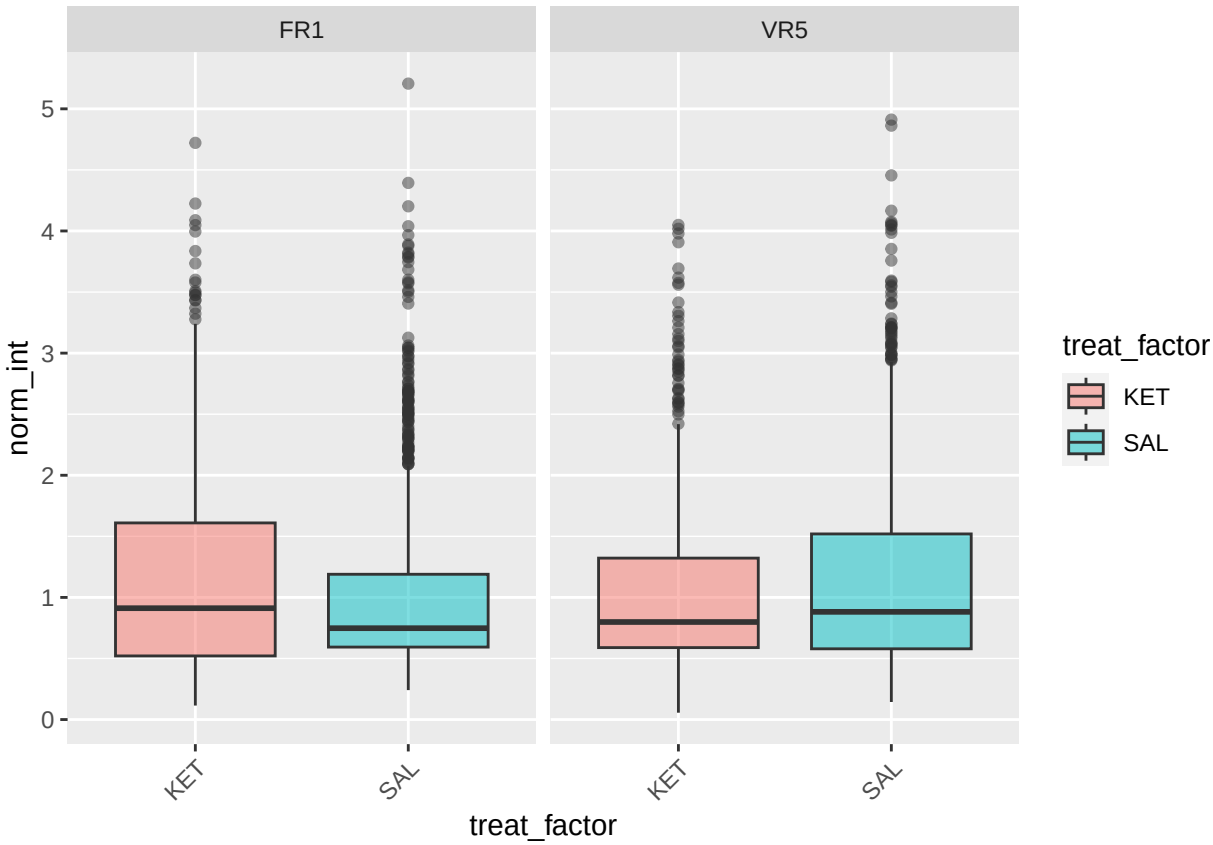
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.88605, p-value < 2.2e-16
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.77075, p-value < 2.2e-16
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.84412, p-value < 2.2e-16
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.84974, p-value < 2.2e-16
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##         Df F value    Pr(>F)
## group    3  29.619 < 2.2e-16 ***
##       3838
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq   Df   F value    Pr(>F)
## (Intercept)                4420.2    1 8145.4834 < 2.2e-16 ***
## treat_factor                  1.2    1    2.2220    0.1361
## react_factor                  0.1    1    0.1328    0.7156
## treat_factor:react_factor    18.8    1   34.6292  4.33e-09 ***
## Residuals                 2082.7 3838
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  KET - SAL    0.179 0.0337 3838   5.307  <.0001         2.35e-07
##
## react_factor = VR5:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.107 0.0349 3838  -3.055  0.0023         4.53e-03
##
## treat_factor = KET:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.134 0.0371 3838   3.611  0.0003         6.17e-04
##
## treat_factor = SAL:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  FR1 - VR5   -0.151 0.0313 3838  -4.845  <.0001         2.63e-06
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_cFos_coloc_w_Npas4_NORM_Rsubset.csv"
```

cFos coloc w Npas4, WFA

```
fname = cfos[2]

print(fname)
```

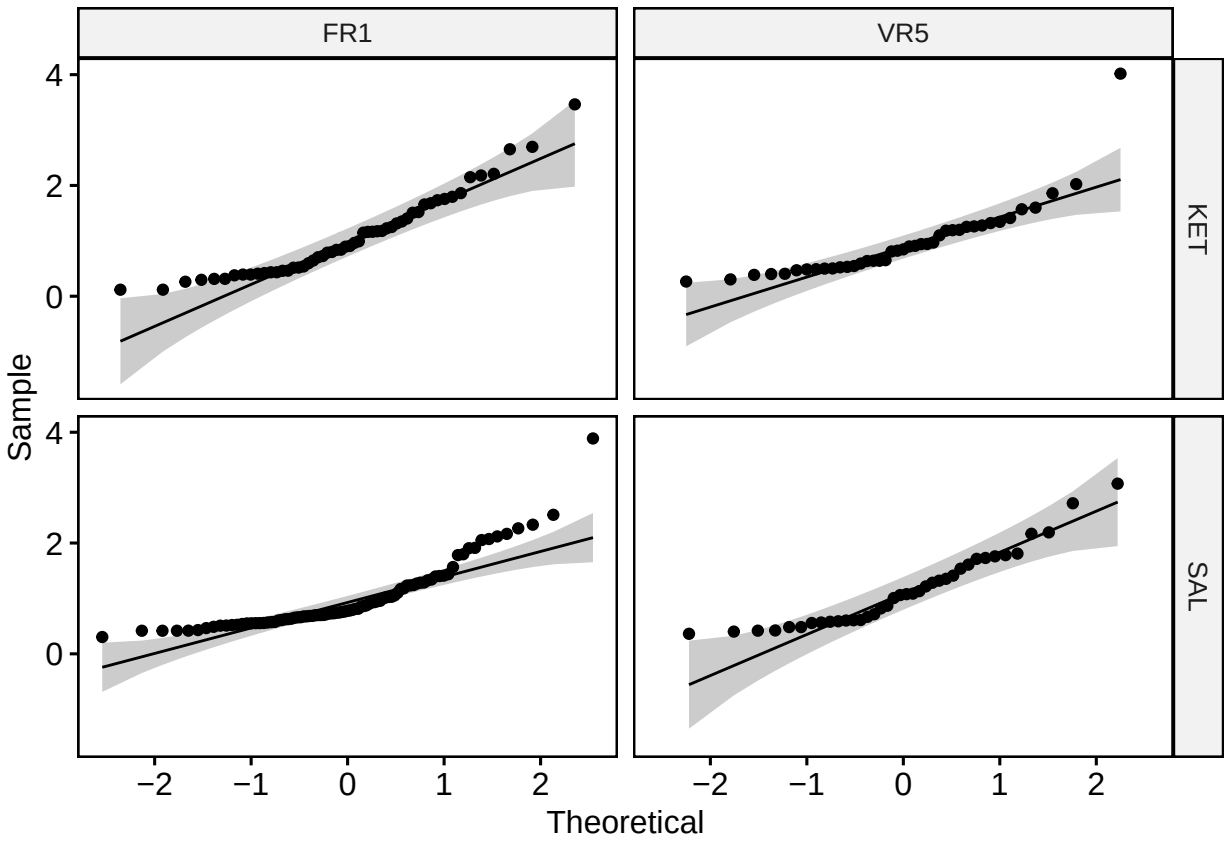
```
## [1] "KET-VR5_cFos_coloc_w_Npas4,WFA_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

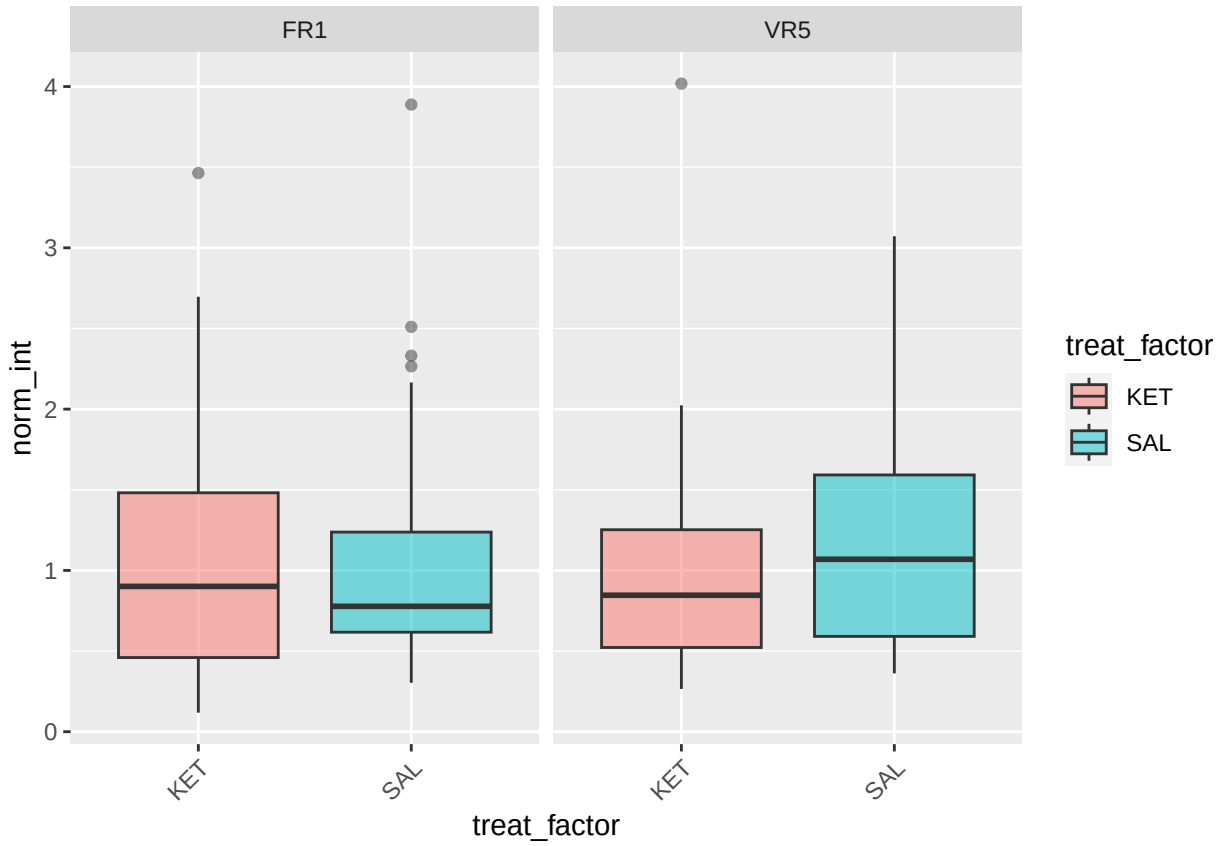
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.91291, p-value = 0.0008143
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.8076, p-value = 1.516e-09
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.76229, p-value = 9.599e-07
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.90499, p-value = 0.003535
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value Pr(>F)
## group   3   1.623 0.1849
##       220
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq  Df  F value Pr(>F)
## (Intercept)               218.715   1 515.1406 <2e-16 ***
## treat_factor                0.168   1   0.3958 0.5299
## react_factor                0.034   1   0.0812 0.7760
## treat_factor:react_factor   0.792   1   1.8658 0.1734
## Residuals                  93.406 220
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL    0.068 0.112 220   0.607  0.5442            0.792
##
## react_factor = VR5:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.184 0.147 220  -1.255  0.2109            0.377
##
## treat_factor = KET:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   0.0997 0.135 220   0.739  0.4607            0.709
##
## treat_factor = SAL:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5  -0.1523 0.126 220  -1.210  0.2274            0.403
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_cFos_coloc_w_Npas4,WFA_NORM_Rsubset.csv"
```

cFos coloc w PV

```
fname = cfos[3]

print(fname)
```

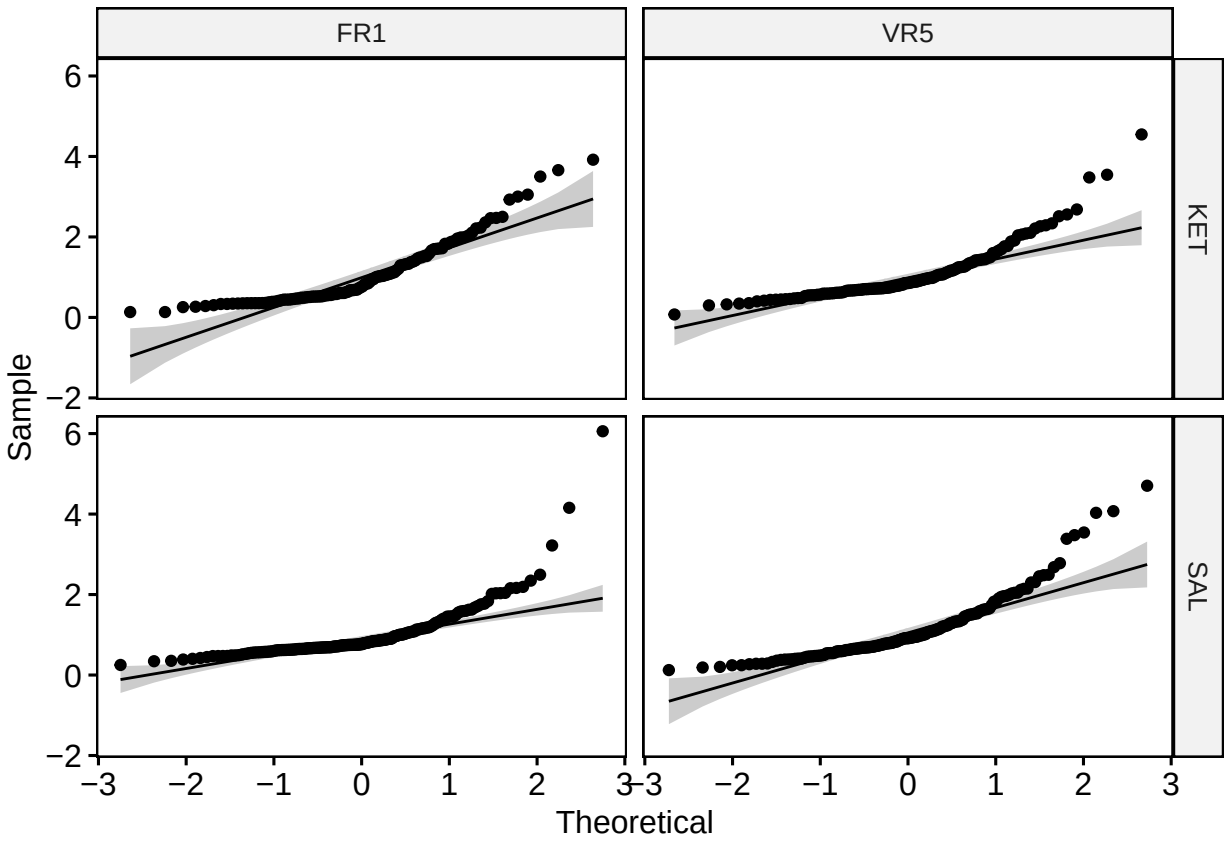
```
## [1] "KET-VR5_cFos_coloc_w_PV_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

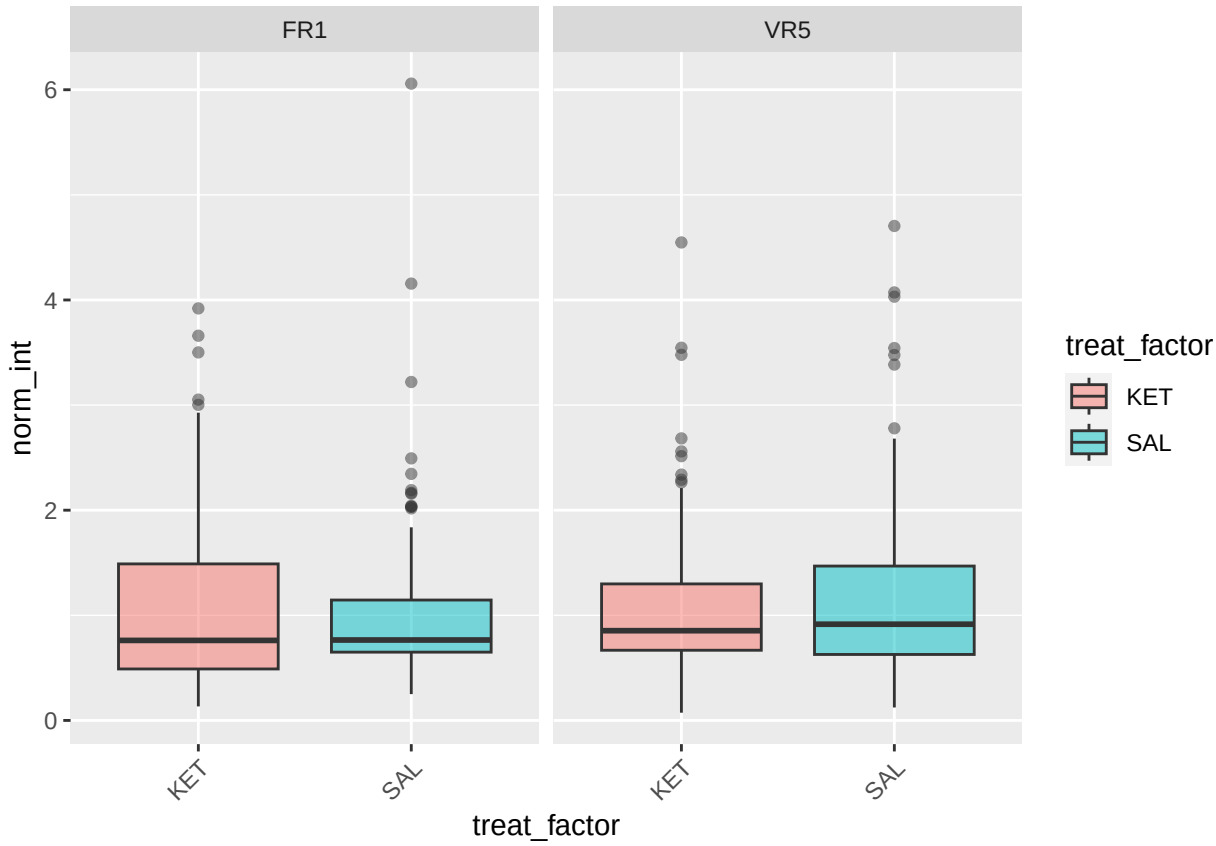
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.85523, p-value = 1.801e-09
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.66634, p-value < 2.2e-16
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.81071, p-value = 1.322e-11
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.83865, p-value = 8.019e-12
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value   Pr(>F)
## group   3  4.7857 0.002656 **
##       568
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq  Df   F value Pr(>F)
## (Intercept)                645.92   1 1188.8512 <2e-16 ***
## treat_factor                 0.00   1    0.0038 0.9509
## react_factor                 0.72   1    1.3329 0.2488
## treat_factor:react_factor    0.67   1    1.2309 0.2677
## Residuals                  308.60 568
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   0.0728 0.0882 568   0.826  0.4093            0.651
##
## react_factor = VR5:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.0652 0.0877 568  -0.743  0.4578            0.706
##
## treat_factor = KET:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5  -0.0028 0.0935 568  -0.030  0.9761            0.999
##
## treat_factor = SAL:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5  -0.1408 0.0821 568  -1.716  0.0867            0.166
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_cFos_coloc_w_PV_NORM_Rsubset.csv"
```

cFos coloc w PV, Npas4

```
fname = cfos[4]

print(fname)
```

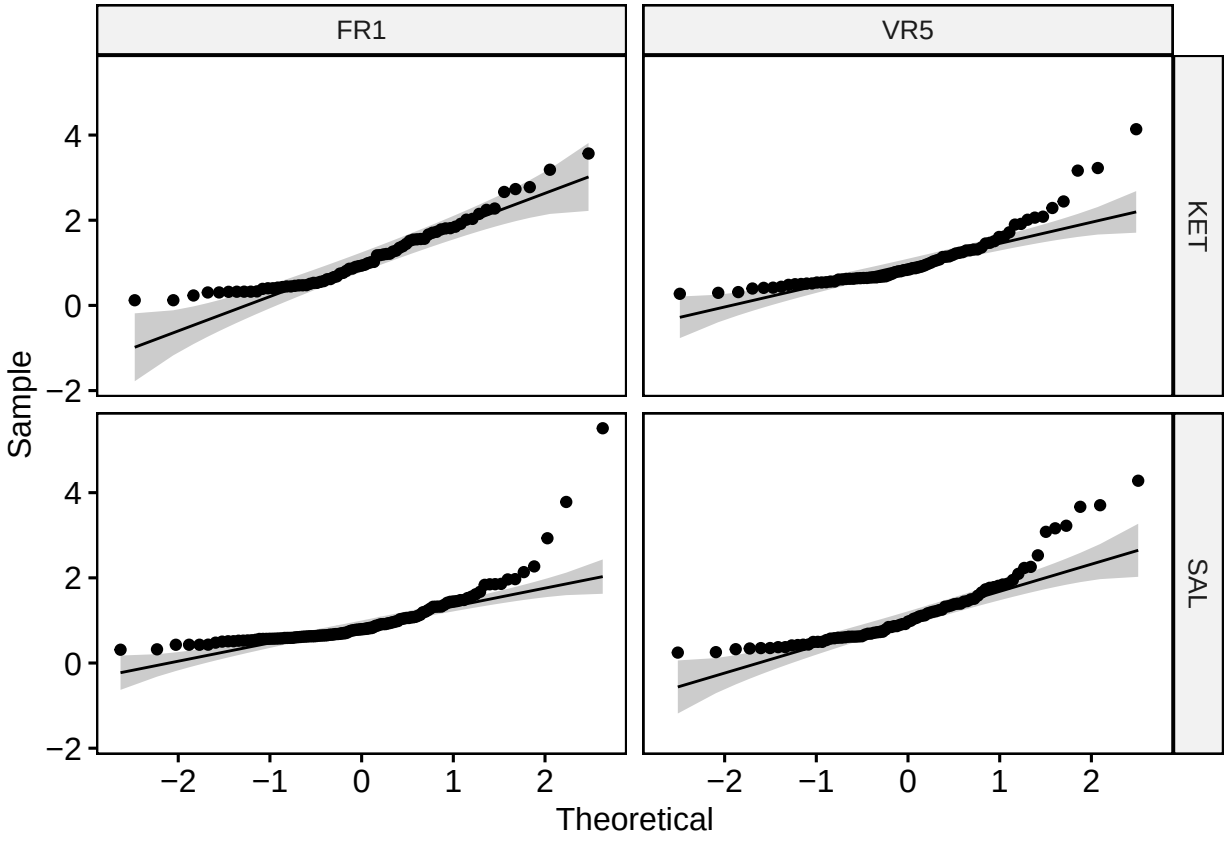
```
## [1] "KET-VR5_cFos_coloc_w_PV,Npas4_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

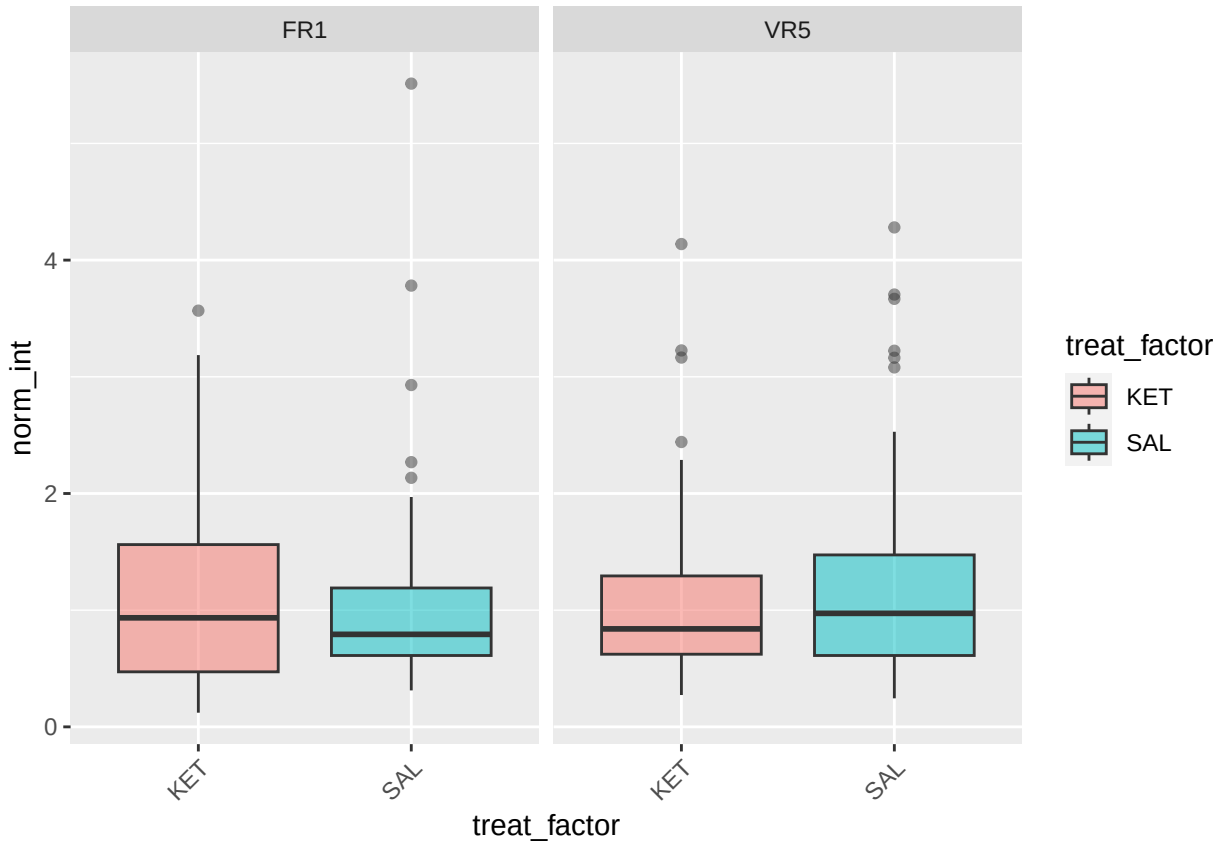
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.91123, p-value = 6.408e-05
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.67969, p-value = 1.245e-14
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.80842, p-value = 1.124e-08
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.84098, p-value = 5.354e-08
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value  Pr(>F)
## group   3  3.2335 0.02248 *
##       349
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq  Df  F value Pr(>F)
## (Intercept)                409.80   1 739.7976 <2e-16 ***
## treat_factor                 0.00   1   0.0072 0.9326
## react_factor                 0.41   1   0.7462 0.3883
## treat_factor:react_factor    1.35   1   2.4443 0.1189
## Residuals                  193.33 349
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL    0.119 0.110 349   1.081  0.2805            0.482
##
## react_factor = VR5:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.133 0.117 349  -1.130  0.2593            0.451
##
## treat_factor = KET:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   0.0563 0.120 349   0.468  0.6403            0.871
##
## treat_factor = SAL:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5  -0.1953 0.107 349  -1.828  0.0683            0.132
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_cFos_coloc_w_PV,Npas4_NORM_Rsubset.csv"
```

cFos coloc w PV, WFA

```
fname = cfos[5]

print(fname)
```

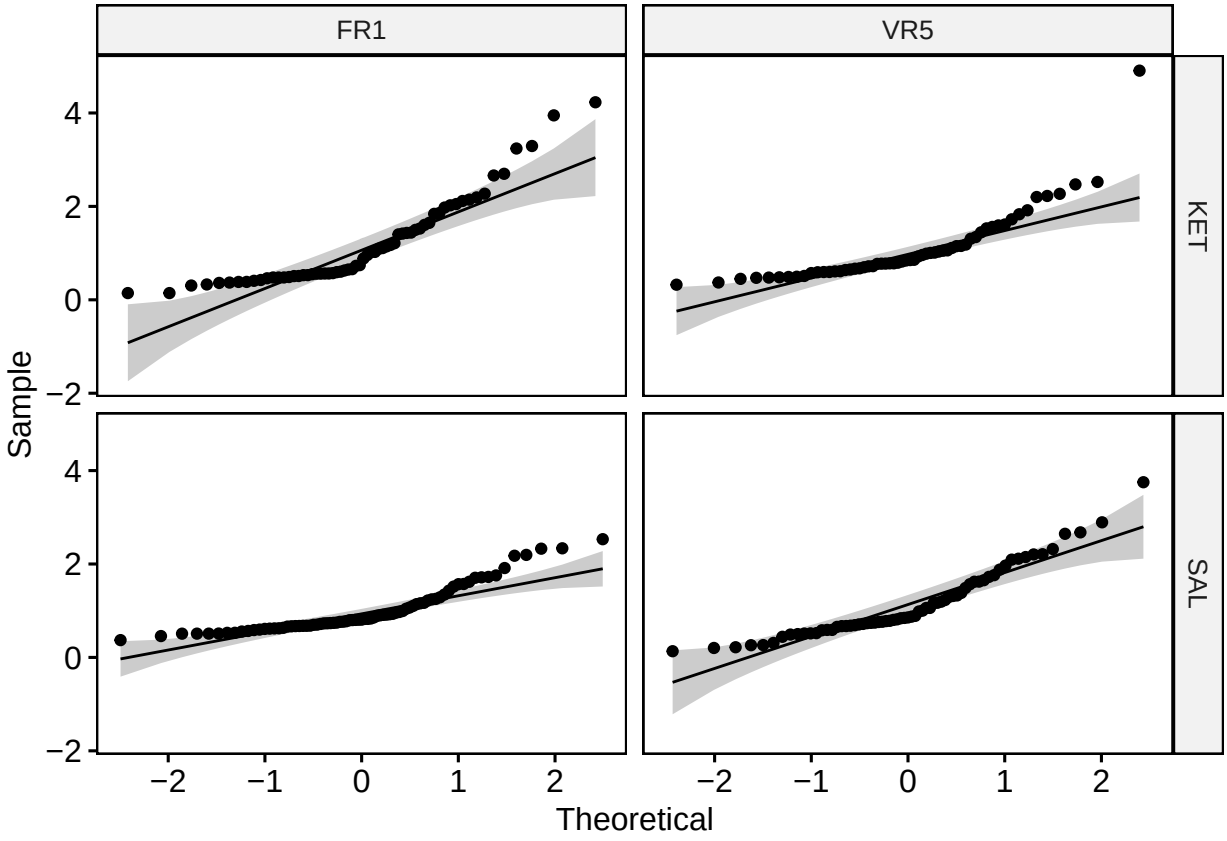
```
## [1] "KET-VR5_cFos_coloc_w_PV,WFA_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

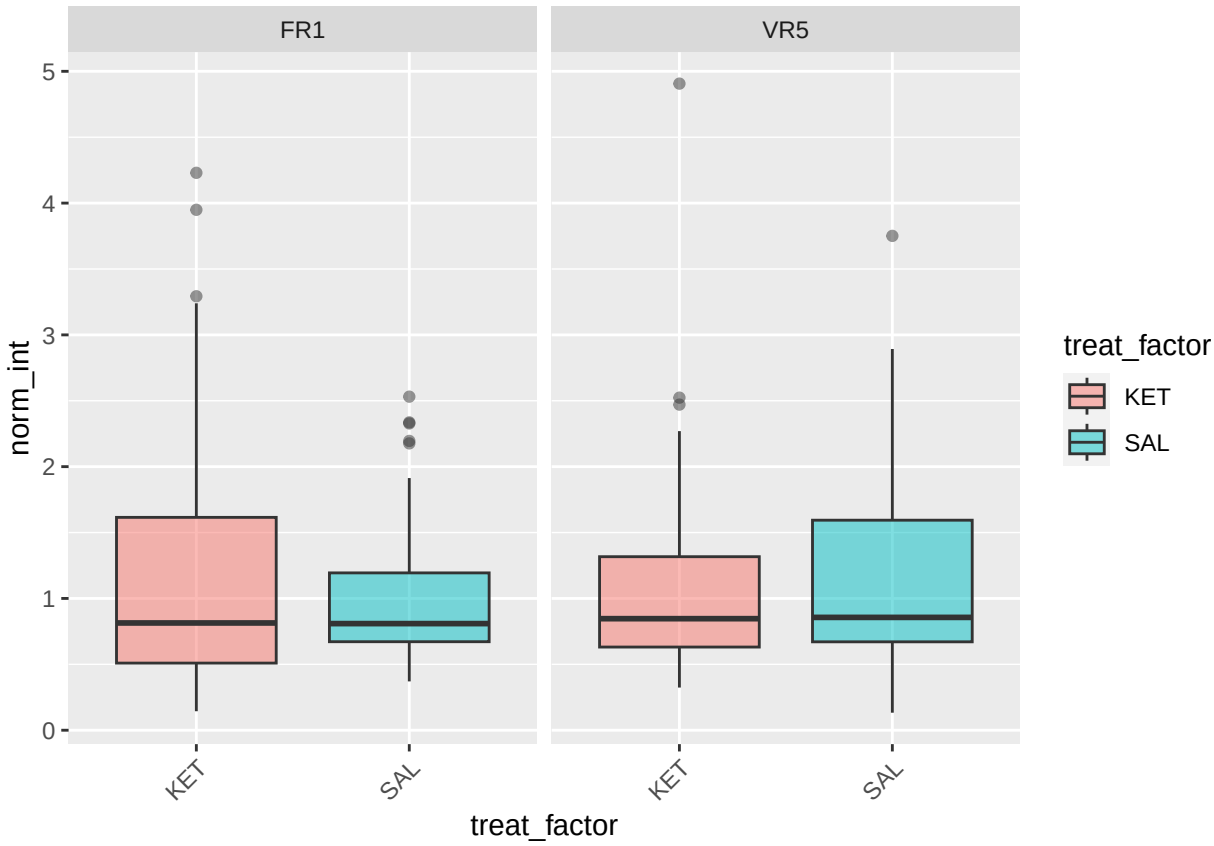
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.84568, p-value = 1.217e-06
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.84673, p-value = 1.447e-07
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.75034, p-value = 9.479e-09
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.90061, p-value = 5.863e-05
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value    Pr(>F)
## group   3  6.7651 0.0002059 ***
##       266
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq  Df  F value Pr(>F)
## (Intercept)                326.41   1 614.1396 <2e-16 ***
## treat_factor                 0.29   1   0.5521 0.4581
## react_factor                 0.05   1   0.0849 0.7710
## treat_factor:react_factor    0.93   1   1.7546 0.1864
## Residuals                  141.37 266
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   0.1844 0.123 266   1.504  0.1337            0.250
##
## react_factor = VR5:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.0519 0.130 266  -0.400  0.6892            0.903
##
## treat_factor = KET:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   0.0922 0.131 266   0.704  0.4823            0.732
##
## treat_factor = SAL:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5  -0.1441 0.121 266  -1.190  0.2350            0.415
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_cFos_coloc_w_PV,WFA_NORM_Rsubset.csv"
```

cFos coloc w WFA

```
fname = cfos[6]

print(fname)
```

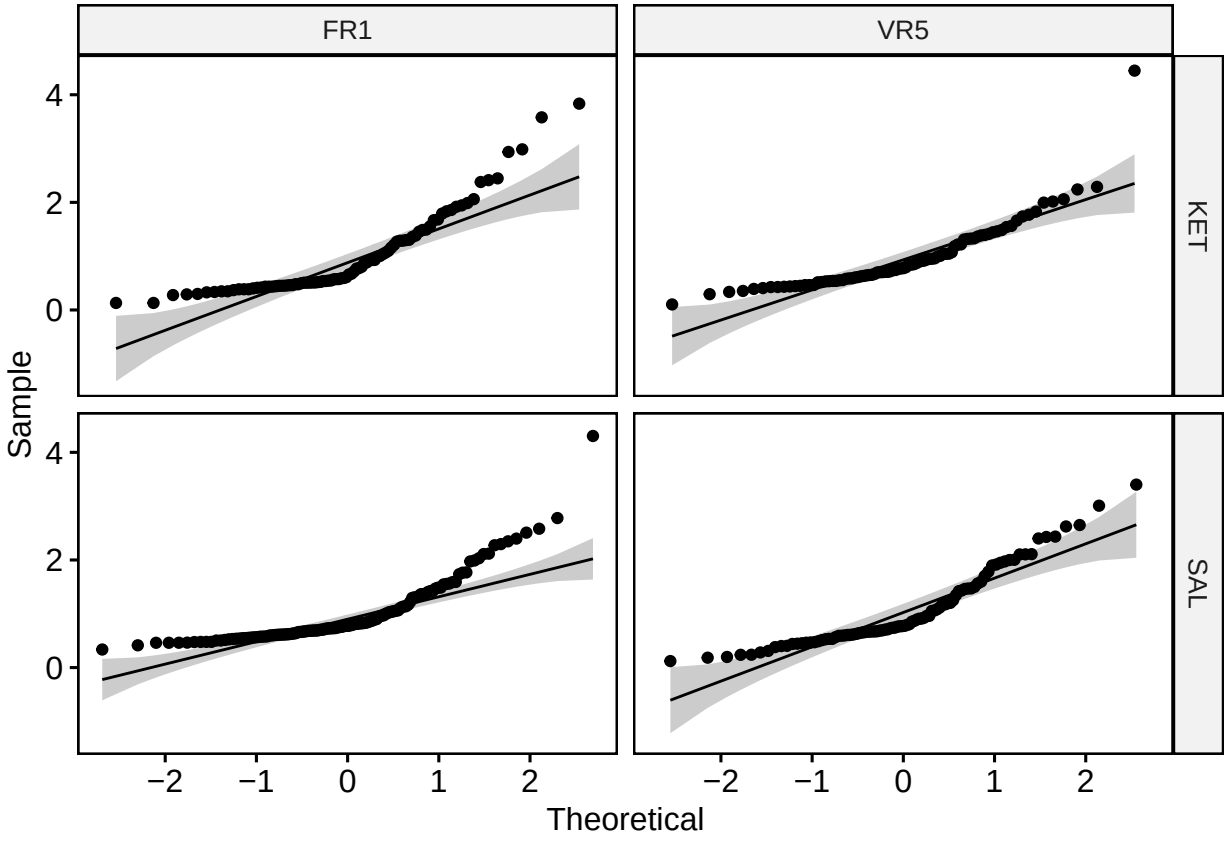
```
## [1] "KET-VR5_cFos_coloc_w_WFA_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

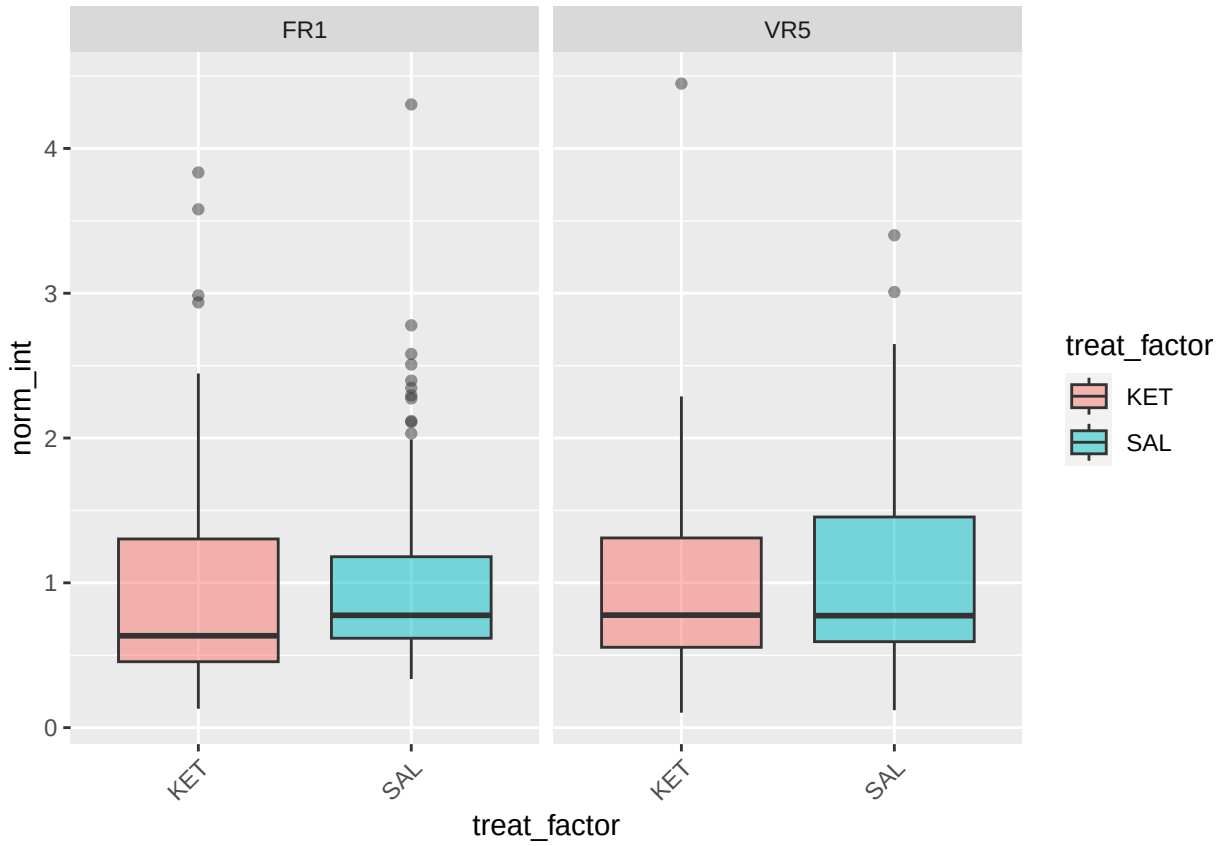
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.82089, p-value = 4.513e-09
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.77913, p-value = 3.011e-13
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.80179, p-value = 1.362e-09
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.88404, p-value = 5.288e-07
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value Pr(>F)
## group   3  3.7006 0.0119 *
##       409
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq  Df  F value Pr(>F)
## (Intercept)                400.64   1 921.0911 <2e-16 ***
## treat_factor                 0.25   1   0.5814 0.4462
## react_factor                 0.03   1   0.0610 0.8051
## treat_factor:react_factor    0.15   1   0.3459 0.5568
## Residuals                  177.90 409
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.0115 0.0891 409  -0.129  0.8972            0.989
##
## react_factor = VR5:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.0892 0.0975 409  -0.915  0.3609            0.592
##
## treat_factor = KET:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   0.0225 0.0986 409   0.229  0.8193            0.967
##
## treat_factor = SAL:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5  -0.0552 0.0879 409  -0.627  0.5309            0.780
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_cFos_coloc_w_WFA_NORM_Rsubset.csv"
```

Npas4 coloc w cFos

```
fname = npas4[1]

print(fname)
```

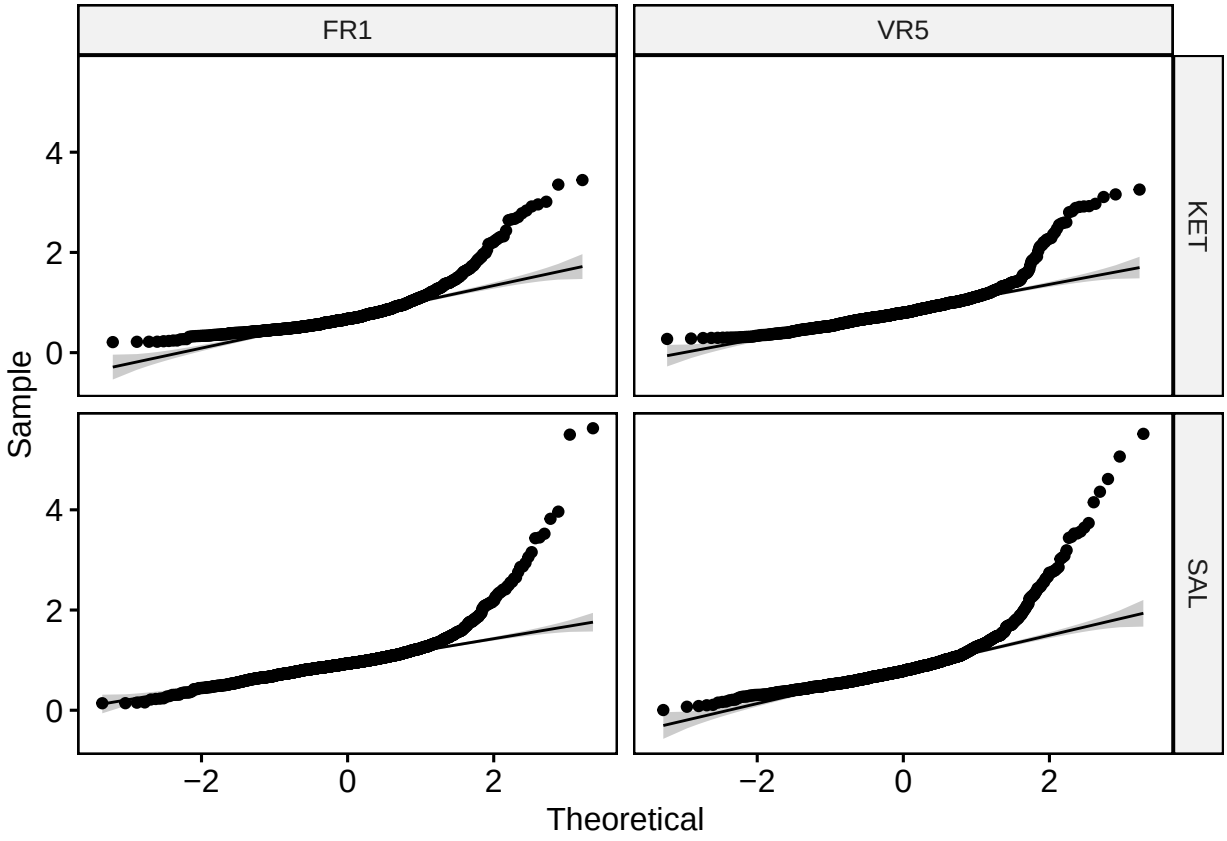
```
## [1] "KET-VR5_Npas4_coloc_w_cFos_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

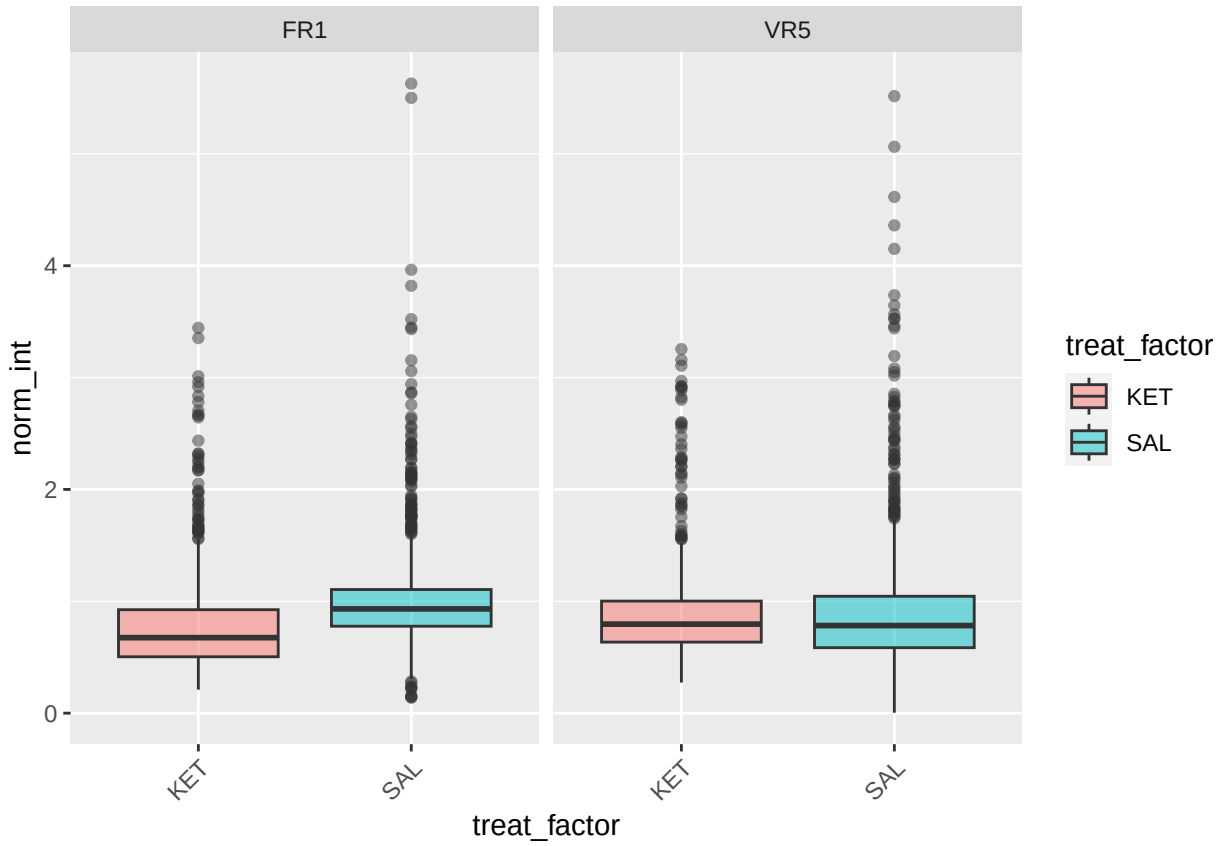
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.78371, p-value < 2.2e-16
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.74751, p-value < 2.2e-16
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.79382, p-value < 2.2e-16
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.74382, p-value < 2.2e-16
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##         Df F value    Pr(>F)
## group    3  16.497 1.194e-10 ***
##       3838
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                             Sum Sq   Df    F value    Pr(>F)
## (Intercept)               2972.88    1 12856.5226 < 2.2e-16 ***
## treat_factor                15.05    1    65.1041 9.413e-16 ***
## react_factor                 0.00    1     0.0001    0.9913
## treat_factor:react_factor    5.63    1    24.3642 8.313e-07 ***
## Residuals                  887.48 3838
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.2058 0.0220 3838  -9.358  <.0001           0.0000
##
## react_factor = VR5:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.0496 0.0228 3838  -2.178  0.0295           0.0581
##
## treat_factor = KET:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  FR1 - VR5  -0.0779 0.0242 3838  -3.222  0.0013         0.002565
##
## treat_factor = SAL:
##  contrast  estimate     SE   df t.ratio p.value adjusted_p.value
##  FR1 - VR5   0.0783 0.0204 3838   3.836  0.0001         0.000255
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_Npas4_coloc_w_cFos_NORM_Rsubset.csv"
```

Npas4 coloc w cFos, WFA

```
fname = npas4[2]

print(fname)
```

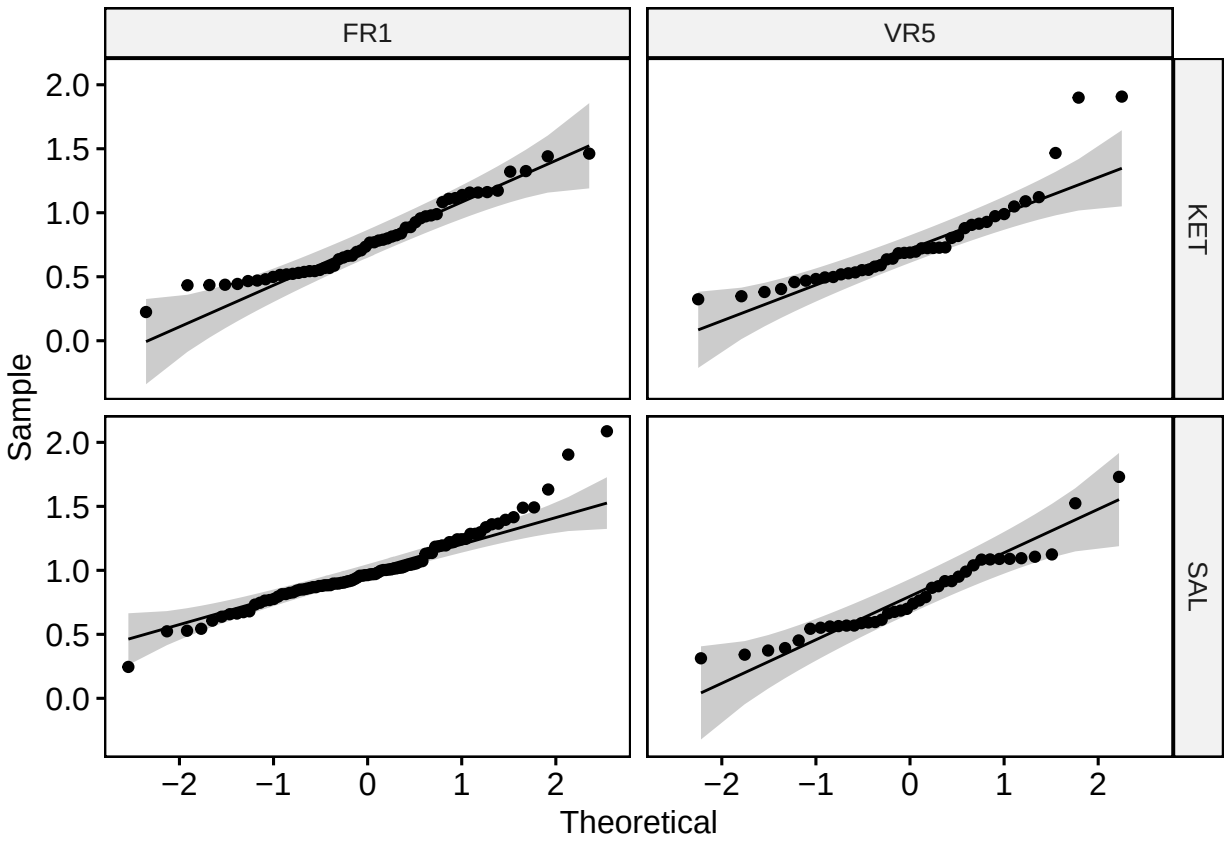
```
## [1] "KET-VR5_Npas4_coloc_w_cFos,WFA_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

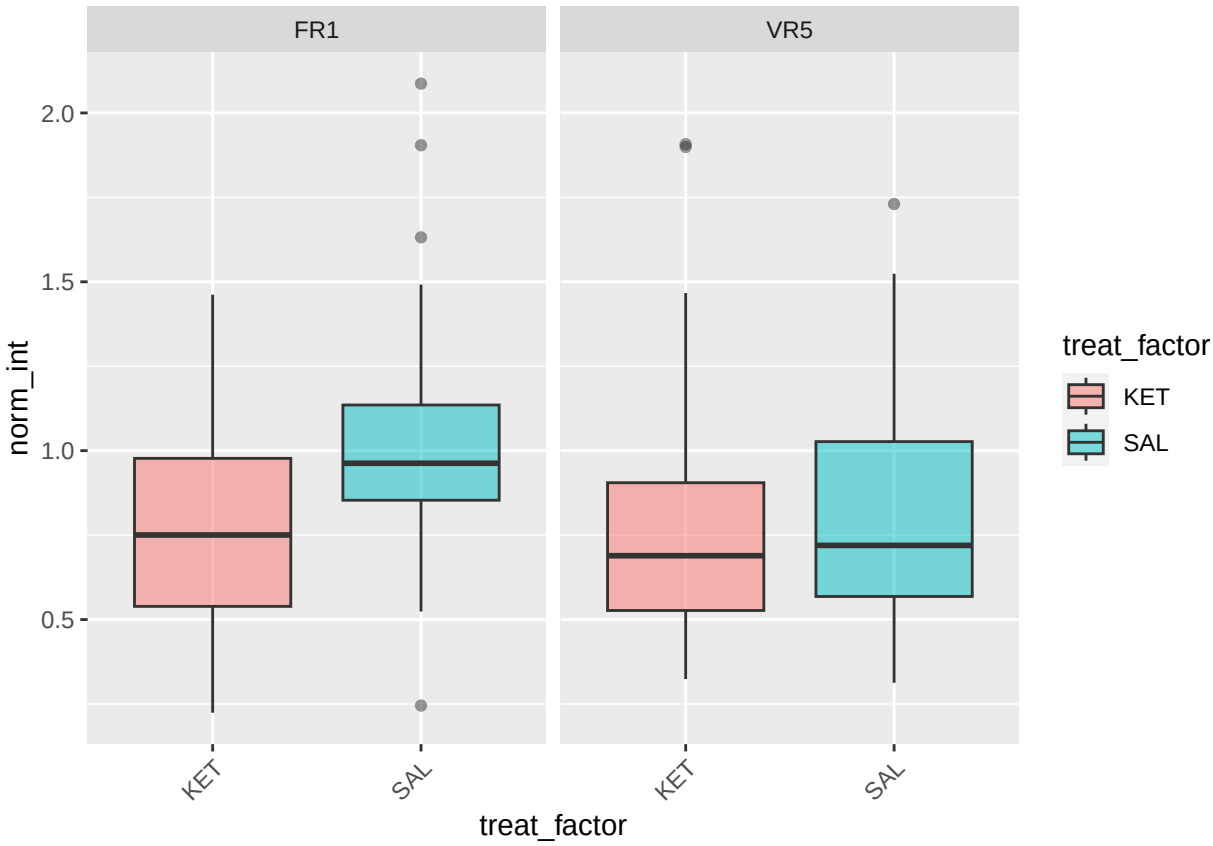
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.94825, p-value = 0.02089
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.94086, p-value = 0.0004401
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.82901, p-value = 2.378e-05
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.93205, p-value = 0.02329
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value Pr(>F)
## group   3  1.0442 0.3738
##       220
## Anova Table (Type III tests)
##
## Response: norm_int
##                             Sum Sq  Df   F value    Pr(>F)
## (Intercept)               138.558   1 1503.1874 < 2.2e-16 ***
## treat_factor                0.787   1    8.5427  0.003831 **
## react_factor                0.665   1    7.2098  0.007803 **
## treat_factor:react_factor   0.422   1    4.5784  0.033479 *
## Residuals                  20.279 220
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.2177 0.0522 220  -4.173  <.0001         8.64e-05
##
## react_factor = VR5:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.0337 0.0684 220  -0.492  0.6229         8.58e-01
##
## treat_factor = KET:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   0.0234 0.0629 220   0.373  0.7096         0.915679
##
## treat_factor = SAL:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   0.2074 0.0586 220   3.537  0.0005         0.000985
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_Npas4_coloc_w_cFos,WFA_NORM_Rsubset.csv"
```

Npas4 coloc w PV

```
fname = npas4[3]

print(fname)
```

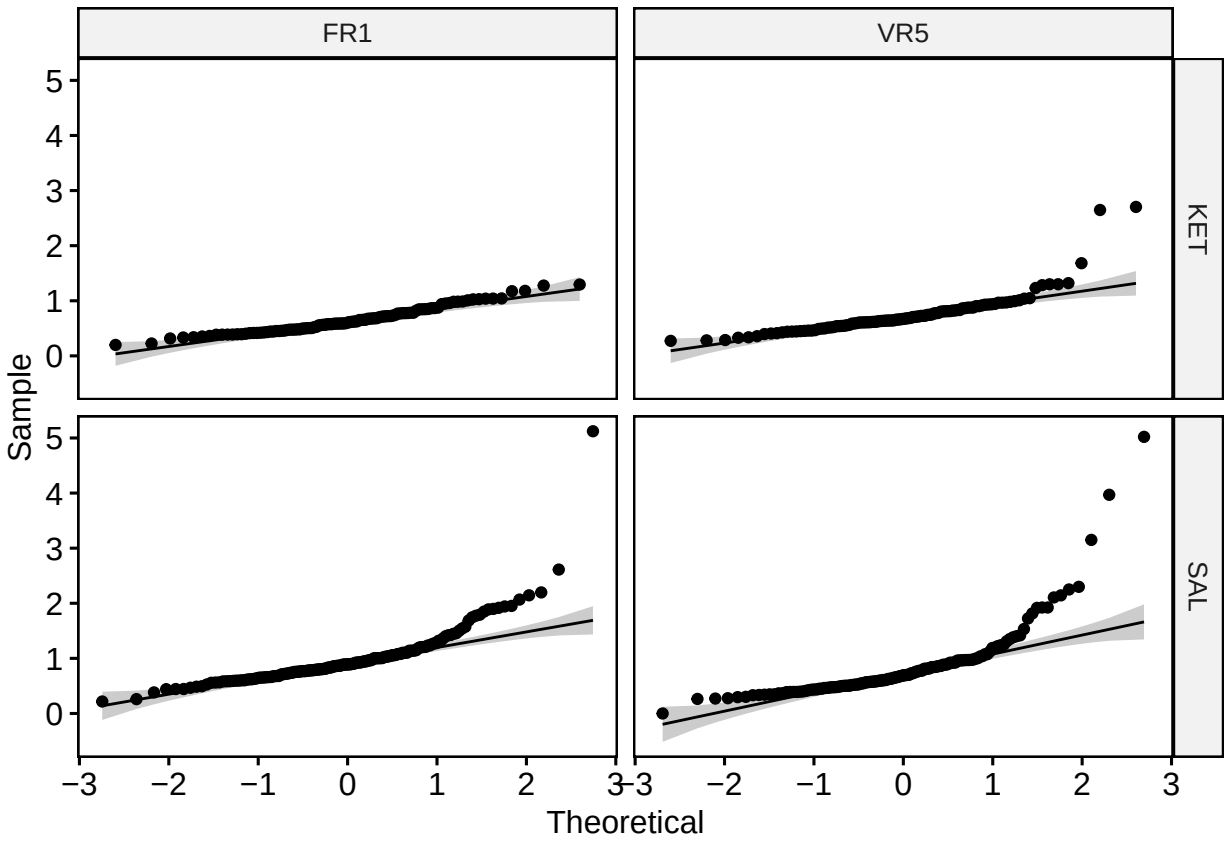
```
## [1] "KET-VR5_Npas4_coloc_w_PV_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

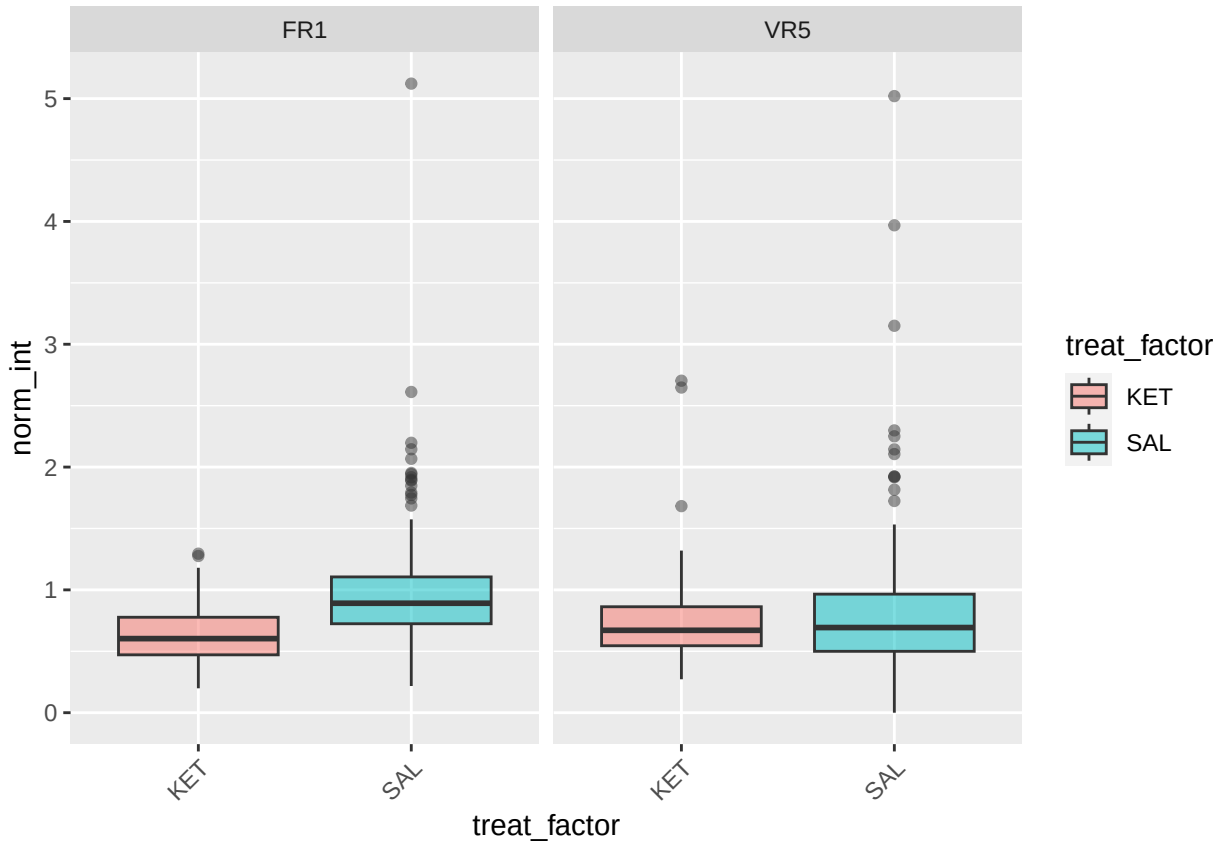
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.96062, p-value = 0.003142
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.72619, p-value = 3.439e-16
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.73588, p-value = 1.194e-12
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.68467, p-value = 5.245e-16
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value    Pr(>F)
## group   3   7.747 4.542e-05 ***
##       516
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq  Df   F value    Pr(>F)
## (Intercept)                331.04   1 1412.5563 < 2.2e-16 ***
## treat_factor                 6.78   1   28.9210 1.145e-07 ***
## react_factor                 0.07   1    0.2972  0.585909
## treat_factor:react_factor    1.83   1    7.8101  0.005389 **
## Residuals                  120.93 516
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.353 0.0603 516  -5.858  <.0001         2.00e-08
##
## react_factor = VR5:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.112 0.0619 516  -1.802  0.0721         1.39e-01
##
## treat_factor = KET:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5  -0.0972 0.0662 516  -1.468  0.1427           0.2650
##
## treat_factor = SAL:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   0.1443 0.0555 516   2.598  0.0096           0.0192
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_Npas4_coloc_w_PV_NORM_Rsubset.csv"
```

Npas4 coloc w PV, cFos

```
fname = npas4[4]

print(fname)
```

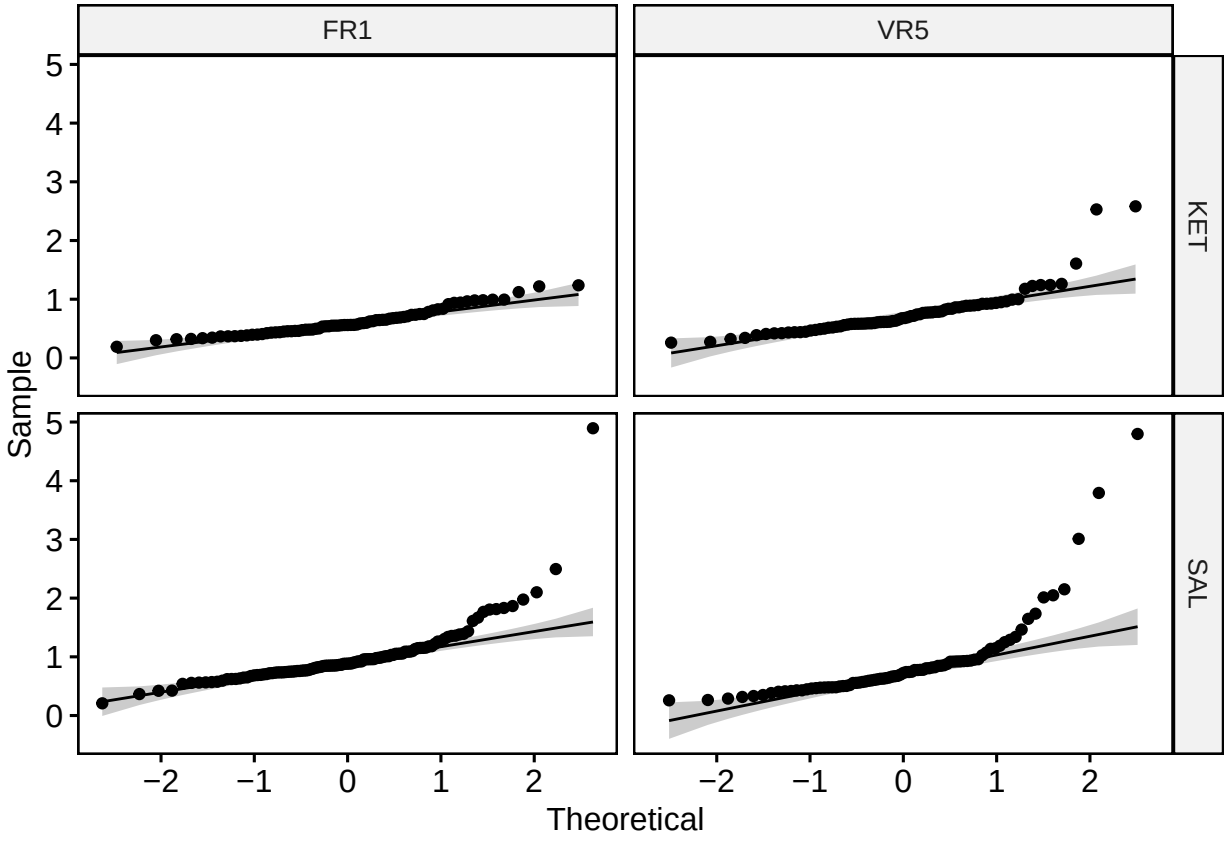
```
## [1] "KET-VR5_Npas4_coloc_w_PV,cFos_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

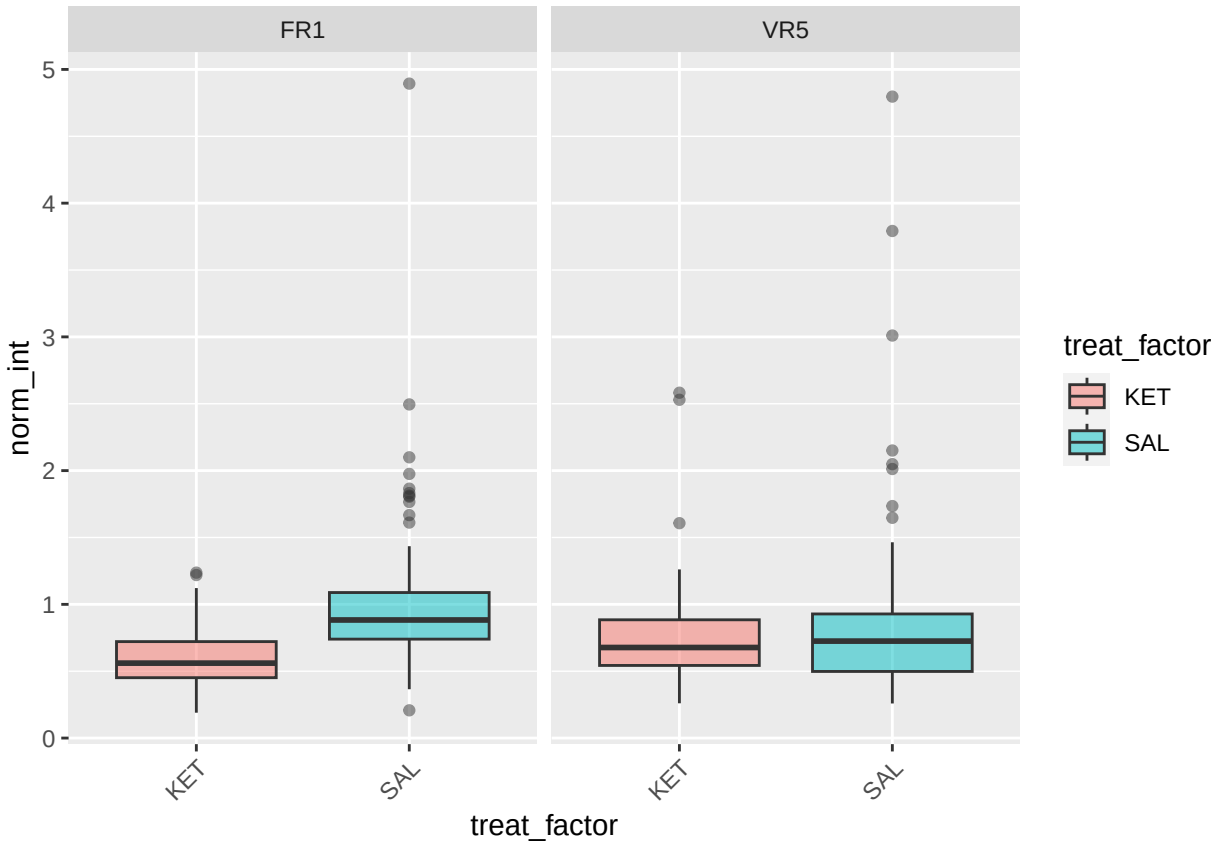
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.94238, p-value = 0.001948
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.67681, p-value = 1.066e-14
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.74935, p-value = 3.209e-10
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.64414, p-value = 7.061e-13
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value   Pr(>F)
## group   3  5.2986 0.001391 **
##       349
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                             Sum Sq  Df  F value    Pr(>F)
## (Intercept)               226.485   1 898.4550 < 2.2e-16 ***
## treat_factor                5.871   1  23.2890 2.087e-06 ***
## react_factor                0.027   1   0.1090   0.74146
## treat_factor:react_factor   1.424   1   5.6504   0.01799 *
## Residuals                  87.977 349
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.391 0.0743 349  -5.264  <.0001         4.90e-07
##
## react_factor = VR5:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.133 0.0792 349  -1.679  0.0941         1.79e-01
##
## treat_factor = KET:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   -0.147 0.0812 349  -1.810  0.0712            0.137
##
## treat_factor = SAL:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.111 0.0721 349   1.542  0.1240            0.233
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_Npas4_coloc_w_PV,cFos_NORM_Rsubset.csv"
```

Npas4 coloc w PV, WFA

```
fname = npas4[5]

print(fname)
```

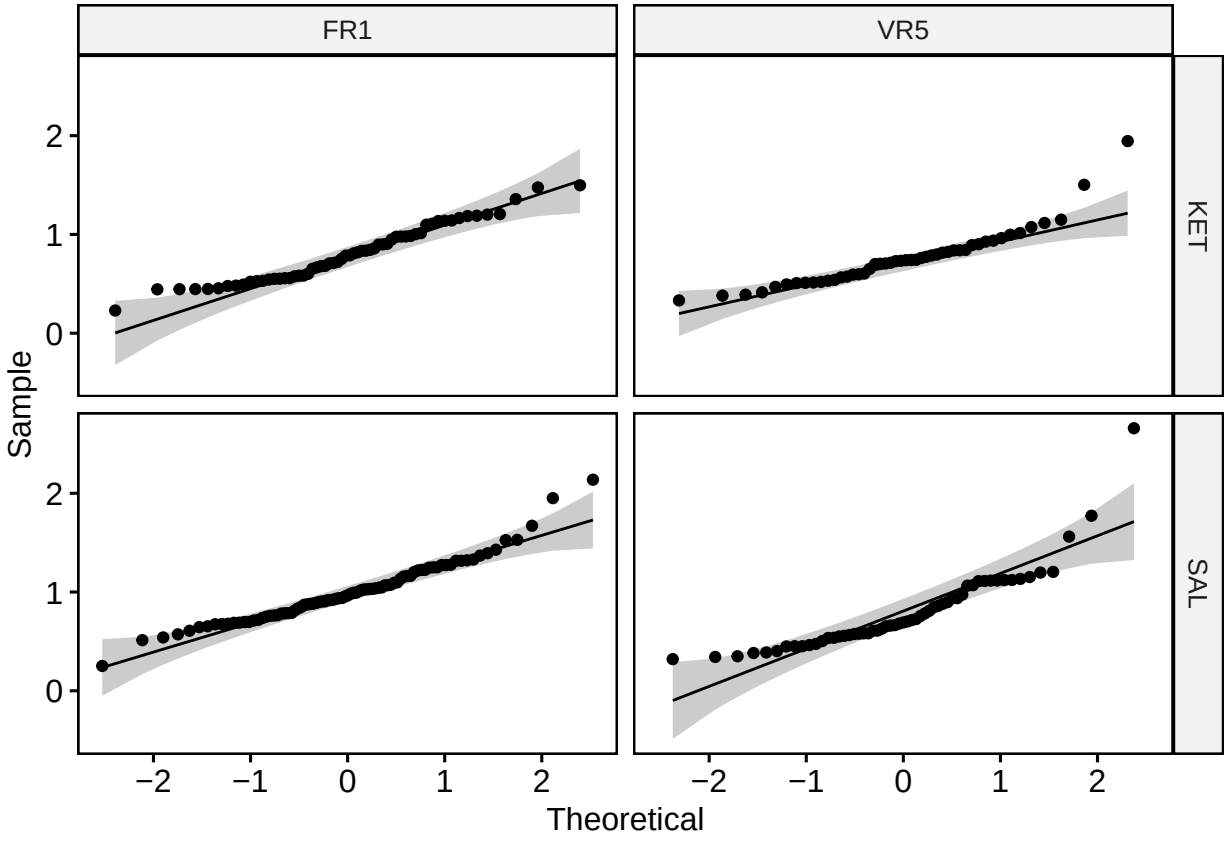
```
## [1] "KET-VR5_Npas4_coloc_w_PV,WFA_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

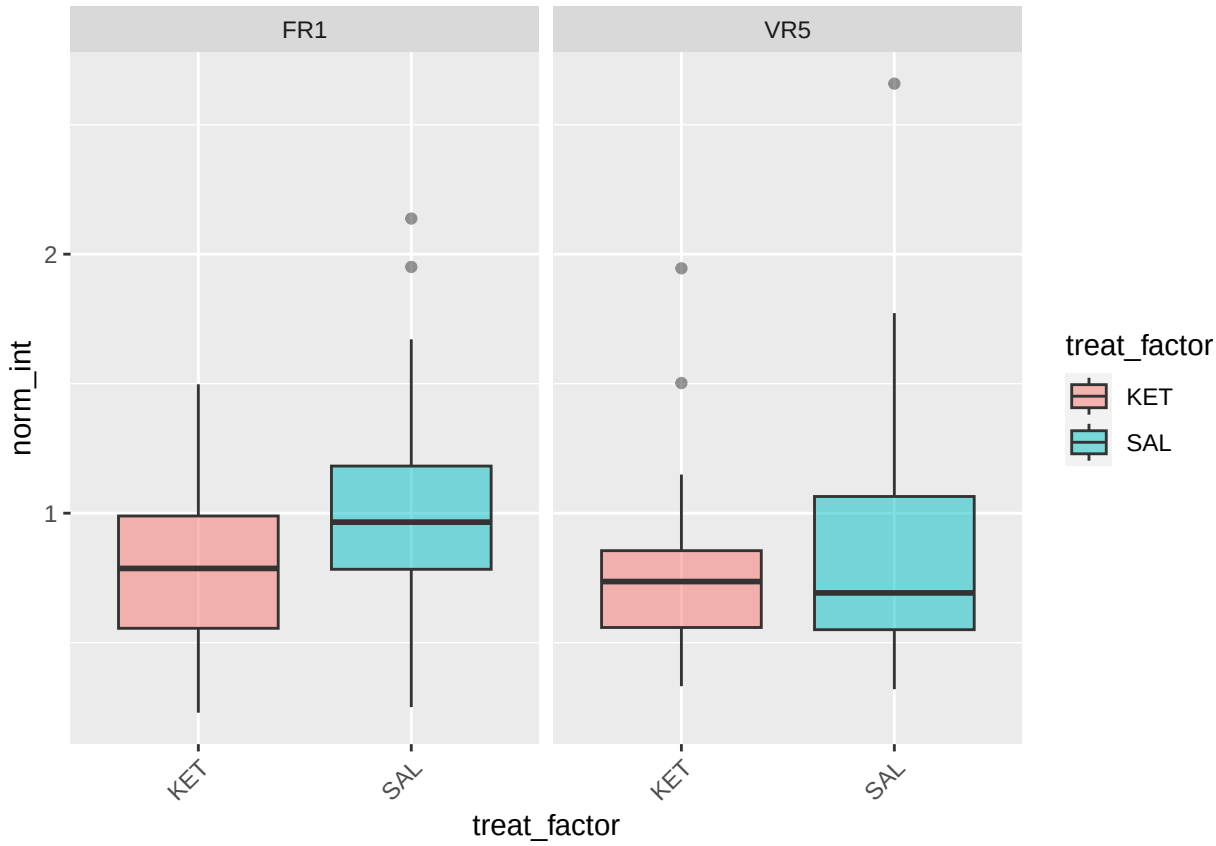
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.96036, p-value = 0.04897
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.95328, p-value = 0.00329
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.87162, p-value = 8.601e-05
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.82432, p-value = 9.621e-07
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value Pr(>F)
## group   3   1.748 0.1577
##       248
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq  Df   F value    Pr(>F)
## (Intercept)               169.802   1 1641.5781 < 2.2e-16 ***
## treat_factor                0.850   1    8.2155  0.004510 **
## react_factor                0.912   1    8.8148  0.003281 **
## treat_factor:react_factor   0.359   1    3.4728  0.063566 .
## Residuals                  25.653 248
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.1962 0.054 248  -3.635  0.0003         0.000675
##
## react_factor = VR5:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.0416 0.063 248  -0.660  0.5098         0.759672
##
## treat_factor = KET:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   0.0459 0.0623 248   0.736  0.4623         0.710857
##
## treat_factor = SAL:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   0.2005 0.0548 248   3.658  0.0003         0.000622
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_Npas4_coloc_w_PV,WFA_NORM_Rsubset.csv"
```

Npas4 coloc w WFA

```
fname = npas4[6]

print(fname)
```

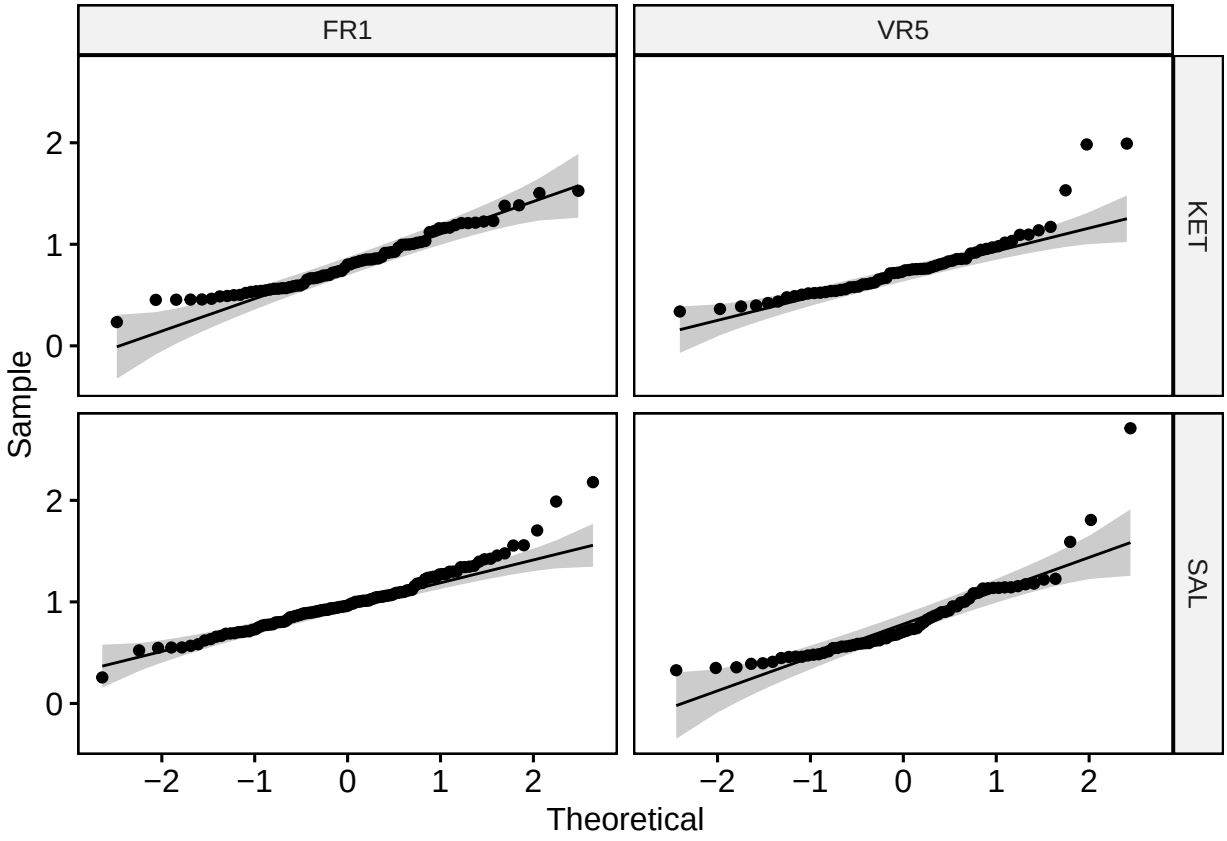
```
## [1] "KET-VR5_Npas4_coloc_w_WFA_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

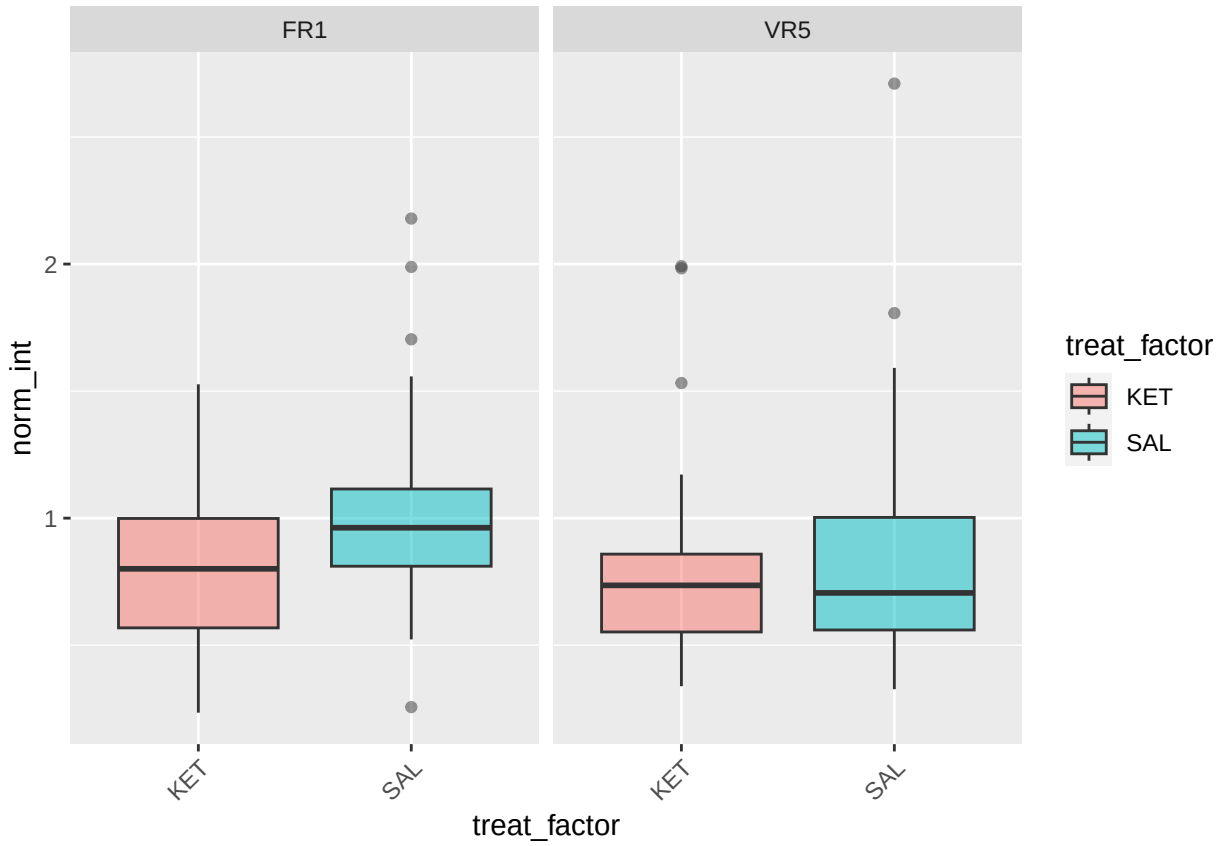
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.95889, p-value = 0.01391
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.95091, p-value = 0.0002363
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.83109, p-value = 6.332e-07
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.82696, p-value = 1.57e-07
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value Pr(>F)
## group   3  1.7703 0.1527
##       325
## Anova Table (Type III tests)
##
## Response: norm_int
##                             Sum Sq  Df   F value    Pr(>F)
## (Intercept)               220.716   1 2244.1567 < 2.2e-16 ***
## treat_factor                0.951   1    9.6676 0.0020413 **
## react_factor                1.140   1   11.5925 0.0007452 ***
## treat_factor:react_factor   0.440   1    4.4721 0.0352131 *
## Residuals                  31.964 325
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.1866 0.0457 325  -4.081  0.0001         0.000113
##
## react_factor = VR5:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.0355 0.0549 325  -0.647  0.5179         0.767627
##
## treat_factor = KET:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   0.0461 0.0535 325   0.861  0.3899         6.28e-01
##
## treat_factor = SAL:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   0.1971 0.0473 325   4.167  <.0001         7.93e-05
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_Npas4_coloc_w_WFA_NORM_Rsubset.csv"
```

WFA coloc w cFos

```
fname = wfa[1]

print(fname)
```

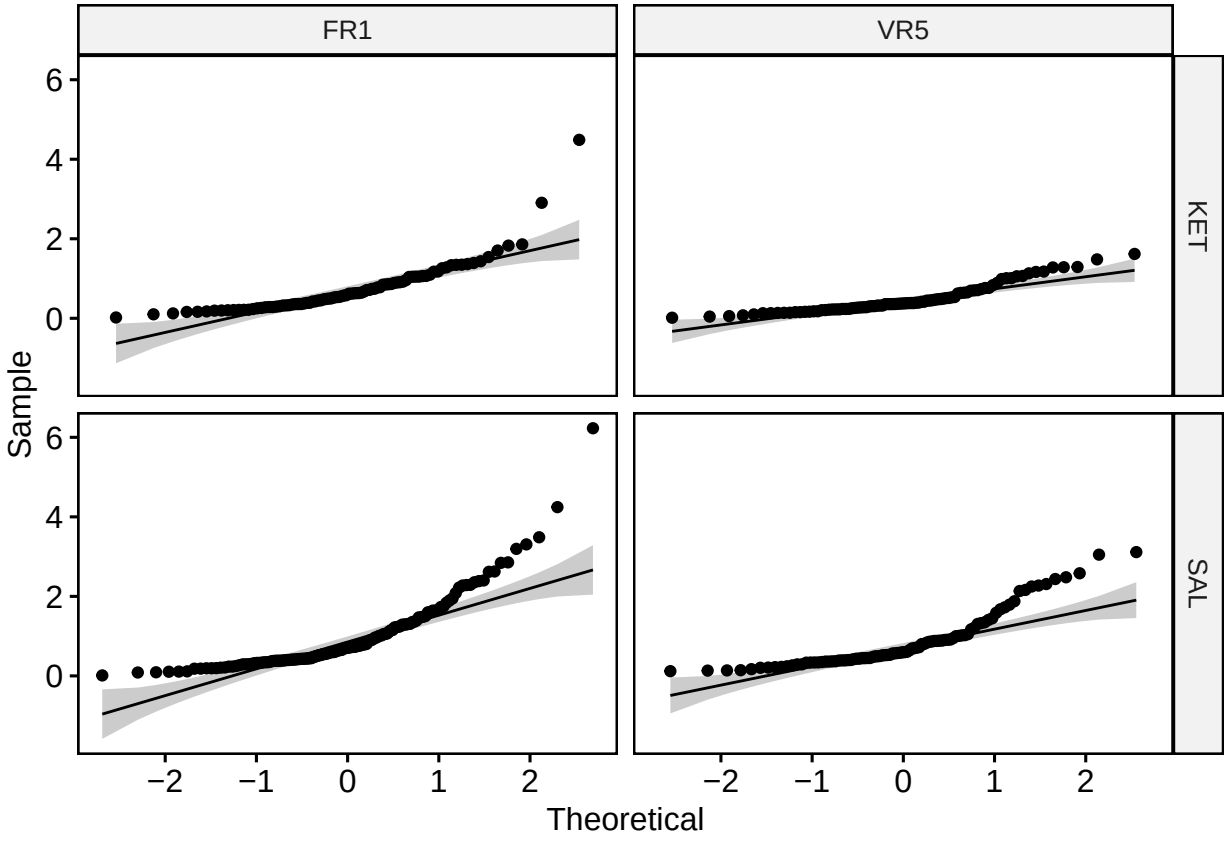
```
## [1] "KET-VR5_WFA_coloc_w_cFos_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

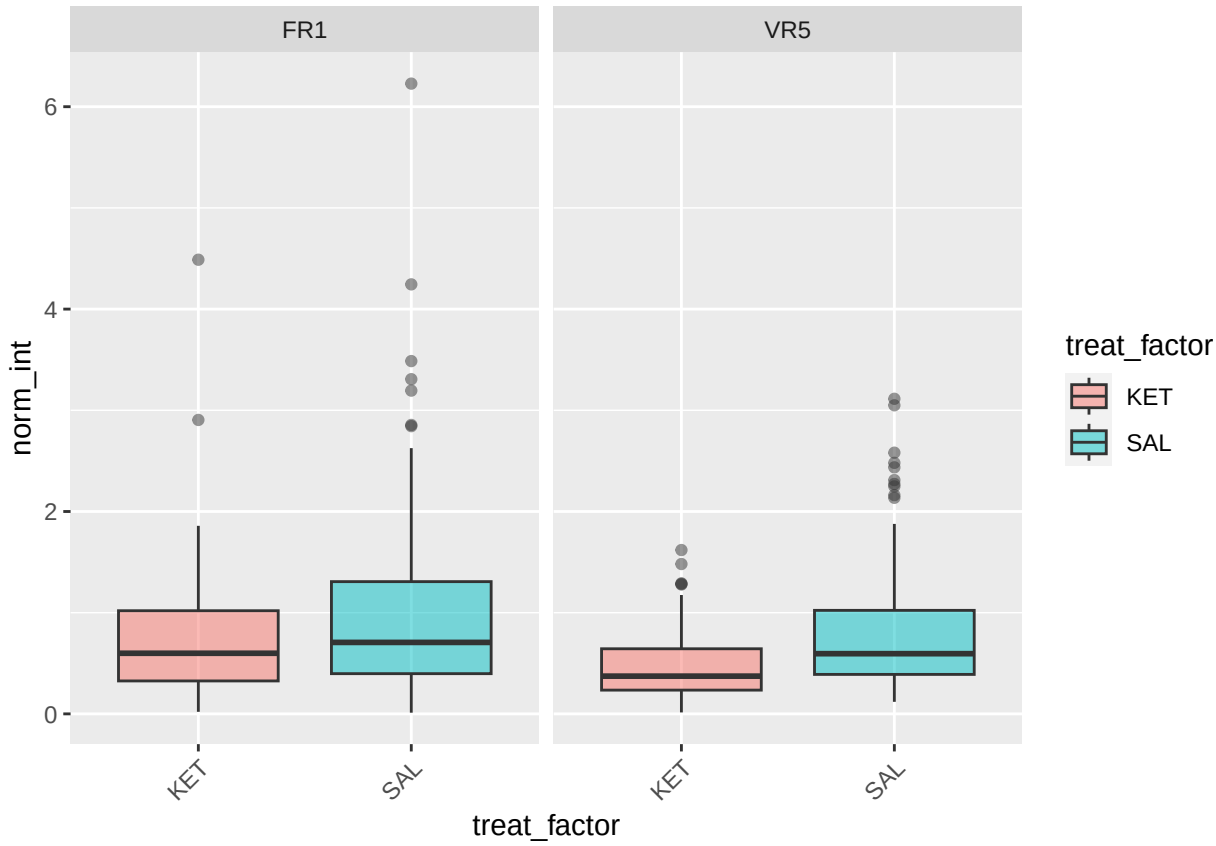
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.75486, p-value = 5.962e-11
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.79048, p-value = 7.162e-13
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.87421, p-value = 3.802e-07
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.83041, p-value = 5.296e-09
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value    Pr(>F)
## group   3   11.88 1.785e-07 ***
##       409
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                             Sum Sq  Df  F value    Pr(>F)
## (Intercept)               238.082   1 469.7587 < 2.2e-16 ***
## treat_factor               10.343   1  20.4085 8.197e-06 ***
## react_factor                3.784   1   7.4658  0.006561 **
## treat_factor:react_factor   0.388   1   0.7663  0.381888
## Residuals                 207.288 409
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.260 0.0962 409  -2.700  0.0072         0.014387
##
## react_factor = VR5:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.385 0.1053 409  -3.652  0.0003         0.000587
##
## treat_factor = KET:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.257 0.1064 409   2.417  0.0161           0.0319
##
## treat_factor = SAL:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.132 0.0949 409   1.395  0.1638           0.3008
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_WFA_coloc_w_cFos_NORM_Rsubset.csv"
```

WFA coloc w cFos, Npas4

```
fname = wfa[2]

print(fname)
```

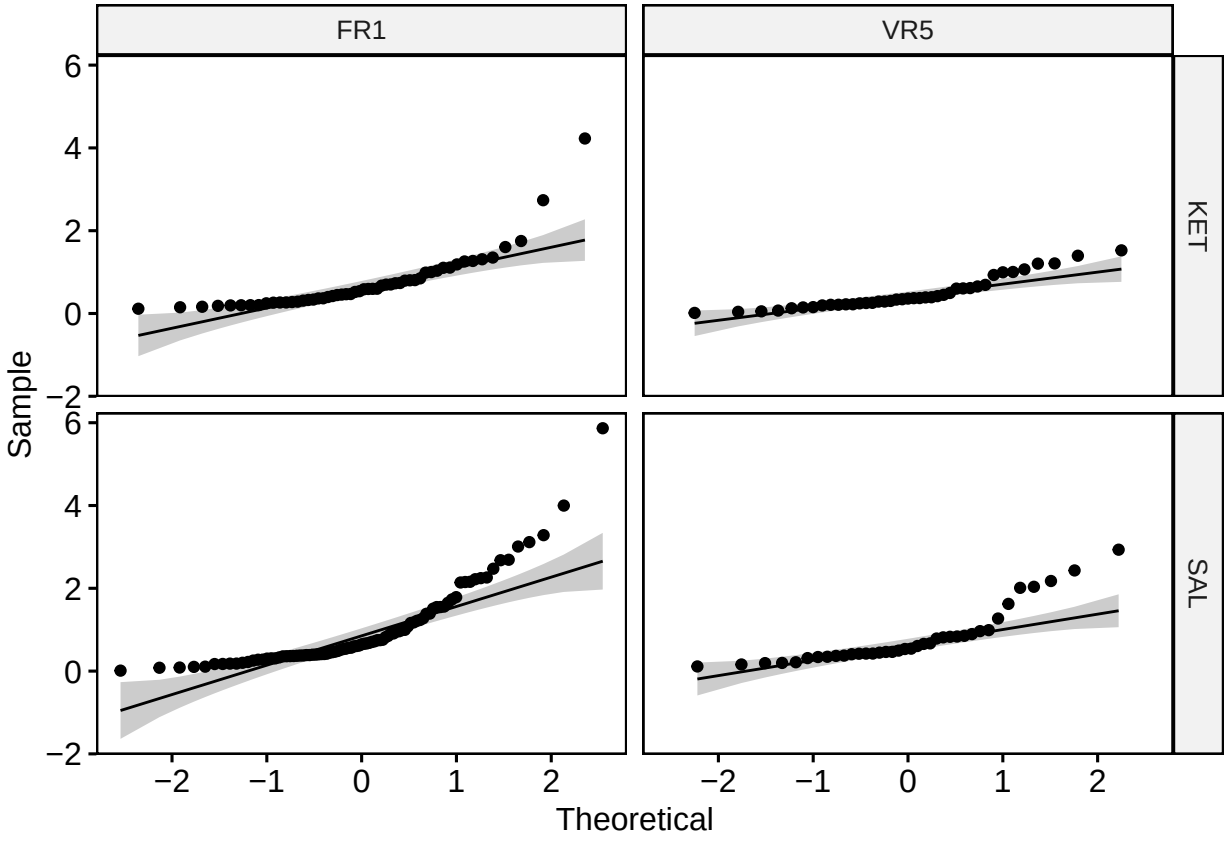
```
## [1] "KET-VR5_WFA_coloc_w_cFos,Npas4_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

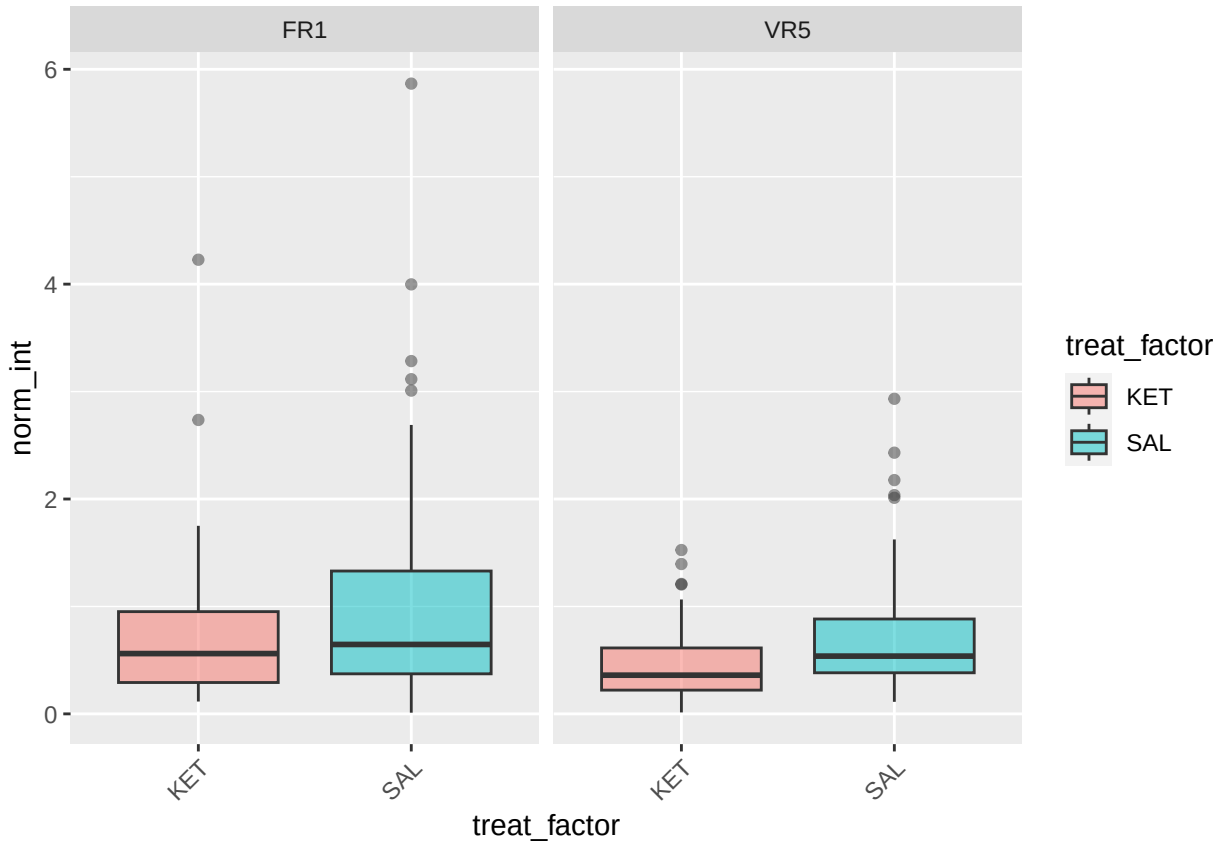
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.70671, p-value = 4.408e-09
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.77992, p-value = 2.387e-10
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.86707, p-value = 0.0002025
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.79202, p-value = 7.221e-06
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value    Pr(>F)
## group   3  6.3018 0.0004042 ***
##       220
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                             Sum Sq  Df  F value    Pr(>F)
## (Intercept)               113.549   1 184.1764 < 2.2e-16 ***
## treat_factor                4.385   1   7.1118  0.008227 **
## react_factor                2.472   1   4.0100  0.046459 *
## treat_factor:react_factor   0.040   1   0.0642  0.800221
## Residuals                 135.635 220
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.268 0.135 220  -1.990  0.0479           0.0935
##
## react_factor = VR5:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.325 0.177 220  -1.836  0.0676           0.1307
##
## treat_factor = KET:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.251 0.163 220   1.542  0.1245            0.233
##
## treat_factor = SAL:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.194 0.152 220   1.282  0.2010            0.362
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_WFA_coloc_w_cFos,Npas4_NORM_Rsubset.csv"
```

WFA coloc w Npas4

```
fname = wfa[3]

print(fname)
```

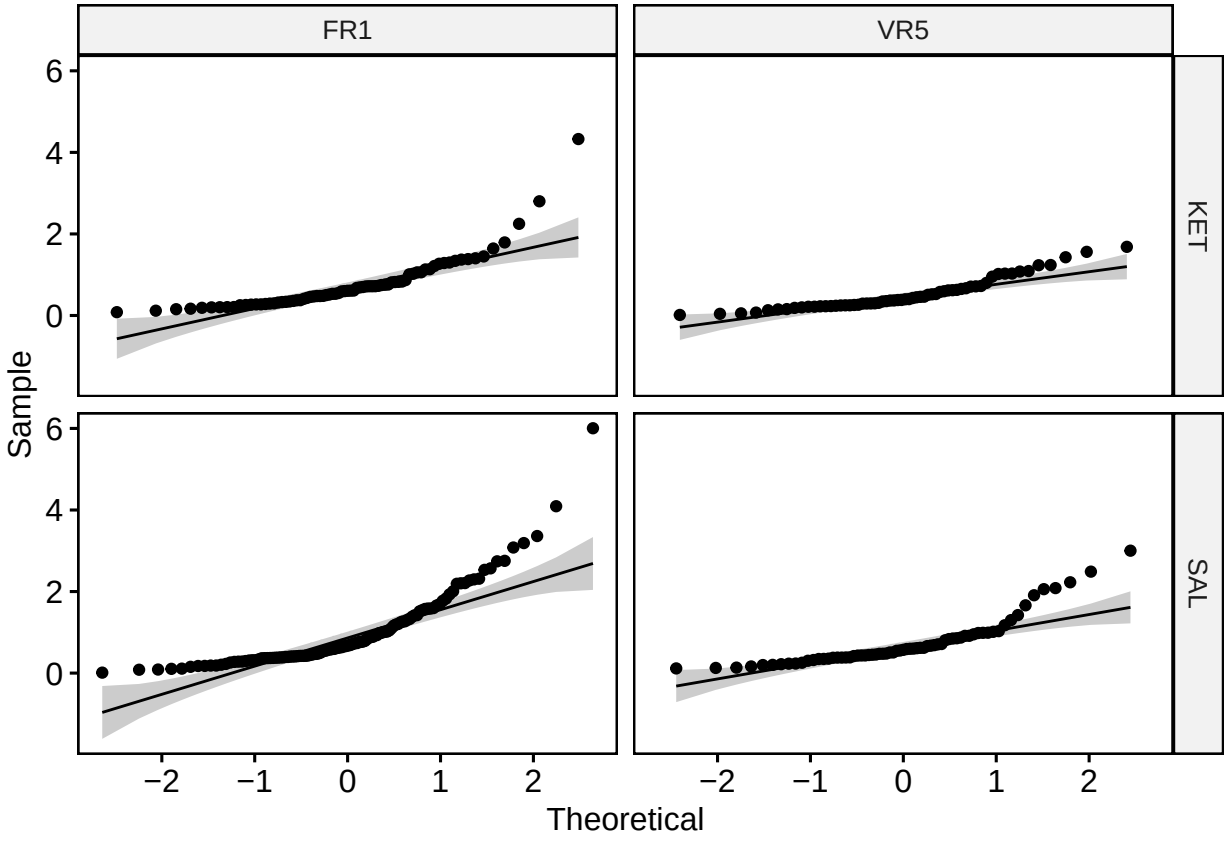
```
## [1] "KET-VR5_WFA_coloc_w_Npas4_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

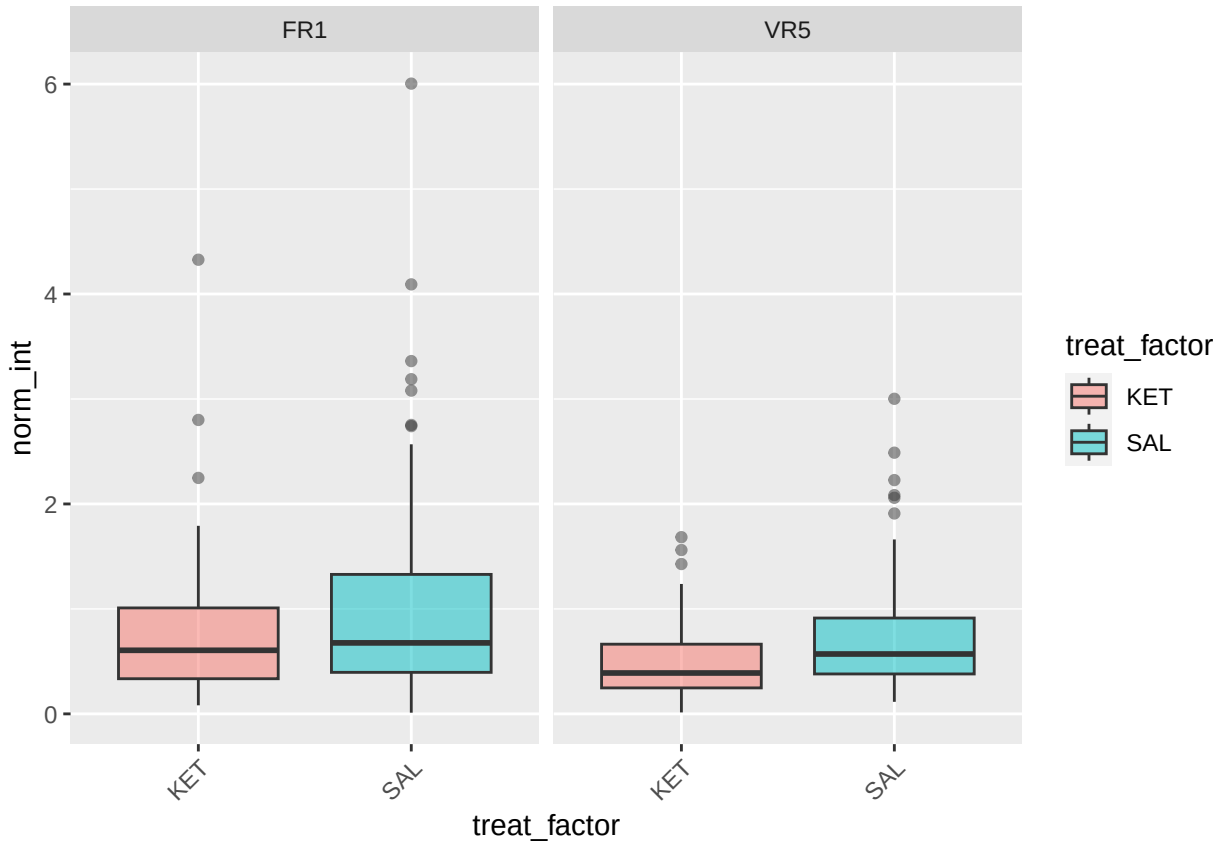
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.74815, p-value = 3.577e-10
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.79167, p-value = 8.162e-12
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.88267, p-value = 2.474e-05
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.79587, p-value = 2.202e-08
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value    Pr(>F)
## group   3  9.1816 7.566e-06 ***
##       325
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                             Sum Sq  Df  F value    Pr(>F)
## (Intercept)               175.155   1 342.8635 < 2.2e-16 ***
## treat_factor                4.164   1   8.1504  0.004582 **
## react_factor                4.822   1   9.4386  0.002304 **
## treat_factor:react_factor   0.008   1   0.0164  0.898133
## Residuals                 166.030 325
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.243 0.104 325  -2.330  0.0204           0.0404
##
## react_factor = VR5:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.222 0.125 325  -1.774  0.0769           0.1479
##
## treat_factor = KET:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5     0.24 0.122 325   1.965  0.0503           0.0980
##
## treat_factor = SAL:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5     0.26 0.108 325   2.416  0.0162           0.0322
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_WFA_coloc_w_Npas4_NORM_Rsubset.csv"
```

WFA coloc w PV

```
fname = wfa[4]

print(fname)
```

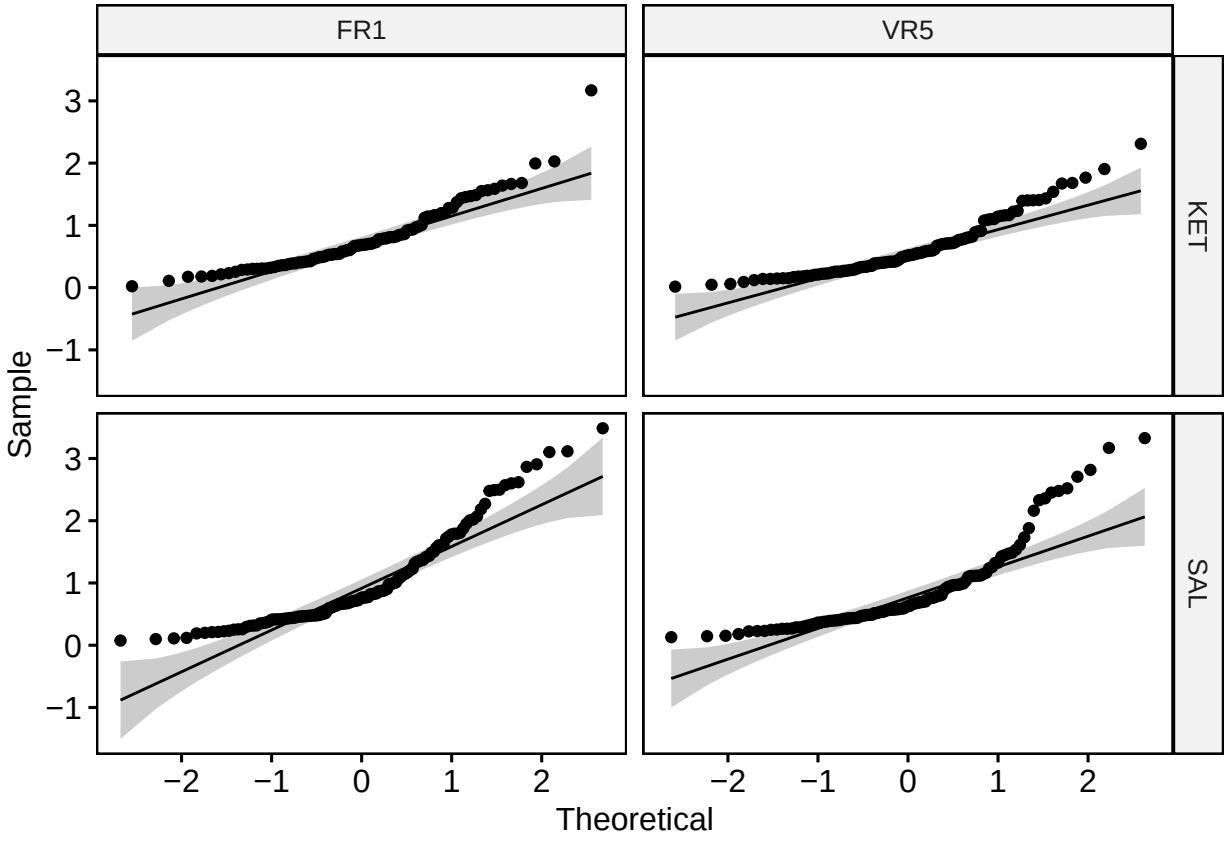
```
## [1] "KET-VR5_WFA_coloc_w_PV_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

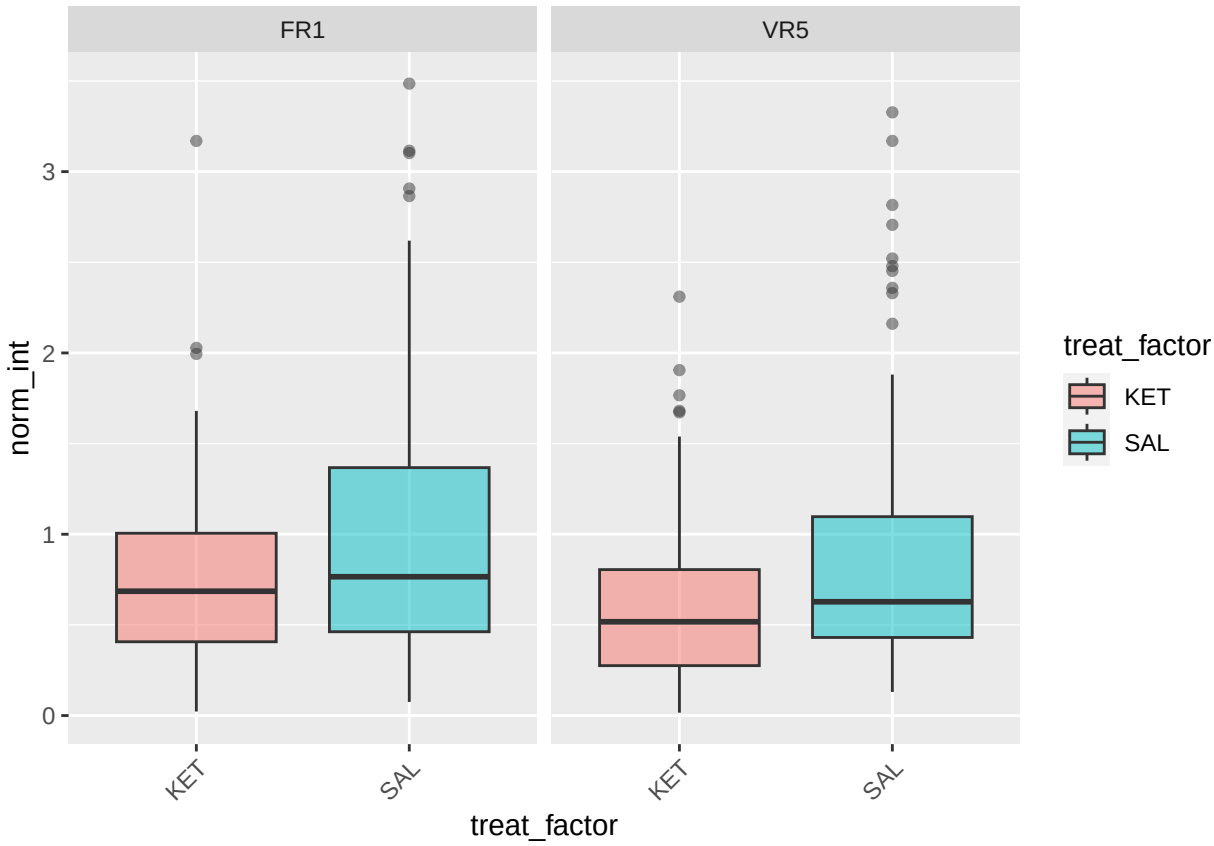
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.88878, p-value = 9.403e-07
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.87351, p-value = 2.319e-09
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.89269, p-value = 4.738e-07
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.80383, p-value = 3.392e-11
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value    Pr(>F)
## group   3  7.5999 5.763e-05 ***
##       444
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                             Sum Sq  Df  F value    Pr(>F)
## (Intercept)               294.116   1 760.6333 < 2.2e-16 ***
## treat_factor                5.393   1  13.9466 0.0002126 ***
## react_factor                2.483   1   6.4207 0.0116226 *
## treat_factor:react_factor   0.007   1   0.0194 0.8893554
## Residuals                 171.682 444
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.213 0.0838 444  -2.546  0.0112           0.0224
##
## react_factor = VR5:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.230 0.0840 444  -2.736  0.0065           0.0129
##
## treat_factor = KET:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.159 0.0889 444   1.783  0.0753            0.145
##
## treat_factor = SAL:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.142 0.0785 444   1.809  0.0711            0.137
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_WFA_coloc_w_PV_NORM_Rsubset.csv"
```

WFA coloc w PV, cFos

```
fname = wfa[5]

print(fname)
```

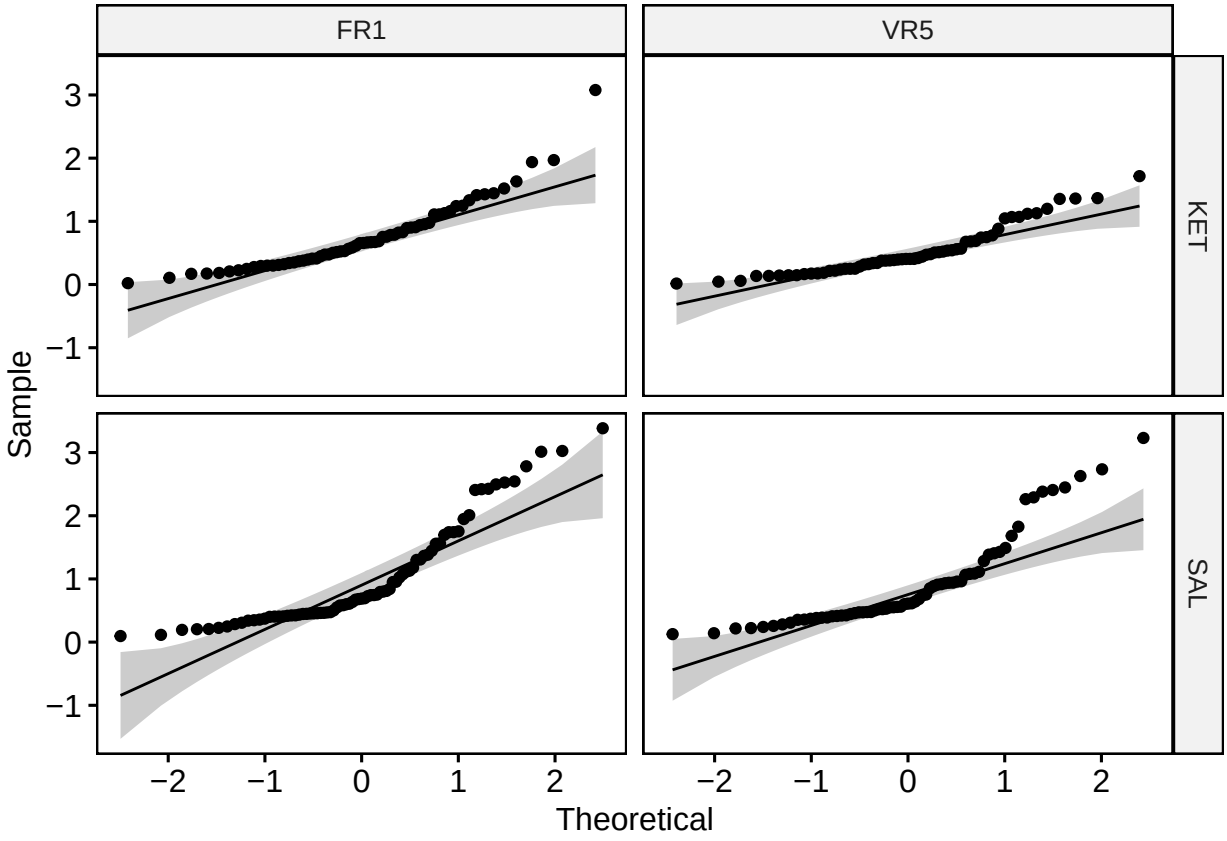
```
## [1] "KET-VR5_WFA_coloc_w_PV,cFos_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

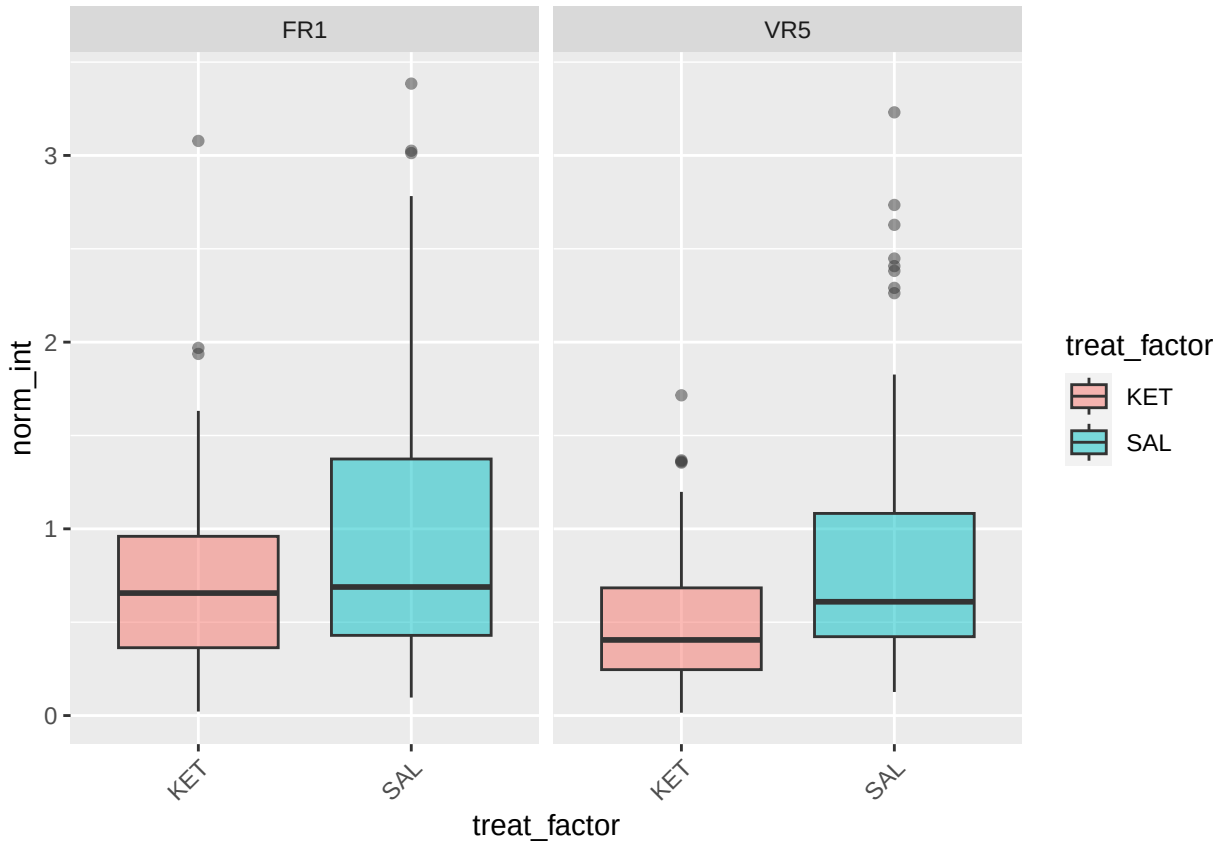
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.87272, p-value = 8.66e-06
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.84148, p-value = 9.762e-08
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.88603, p-value = 4.229e-05
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.81716, p-value = 1.145e-07
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value    Pr(>F)
## group   3  9.6557 4.521e-06 ***
##       266
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                             Sum Sq  Df  F value    Pr(>F)
## (Intercept)               169.097   1 403.8585 < 2.2e-16 ***
## treat_factor                6.783   1  16.2002 7.436e-05 ***
## react_factor                1.716   1   4.0982   0.04393 *
## treat_factor:react_factor   0.326   1   0.7791   0.37820
## Residuals                 111.375 266
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.249 0.109 266  -2.286  0.0230          0.04555
##
## react_factor = VR5:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.389 0.115 266  -3.378  0.0008          0.00168
##
## treat_factor = KET:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   0.2301 0.116 266   1.979  0.0488           0.0952
##
## treat_factor = SAL:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   0.0904 0.107 266   0.841  0.4011           0.6413
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_WFA_coloc_w_PV,cFos_NORM_Rsubset.csv"
```

WFA coloc w PV, Npas4

```
fname = wfa[6]

print(fname)
```

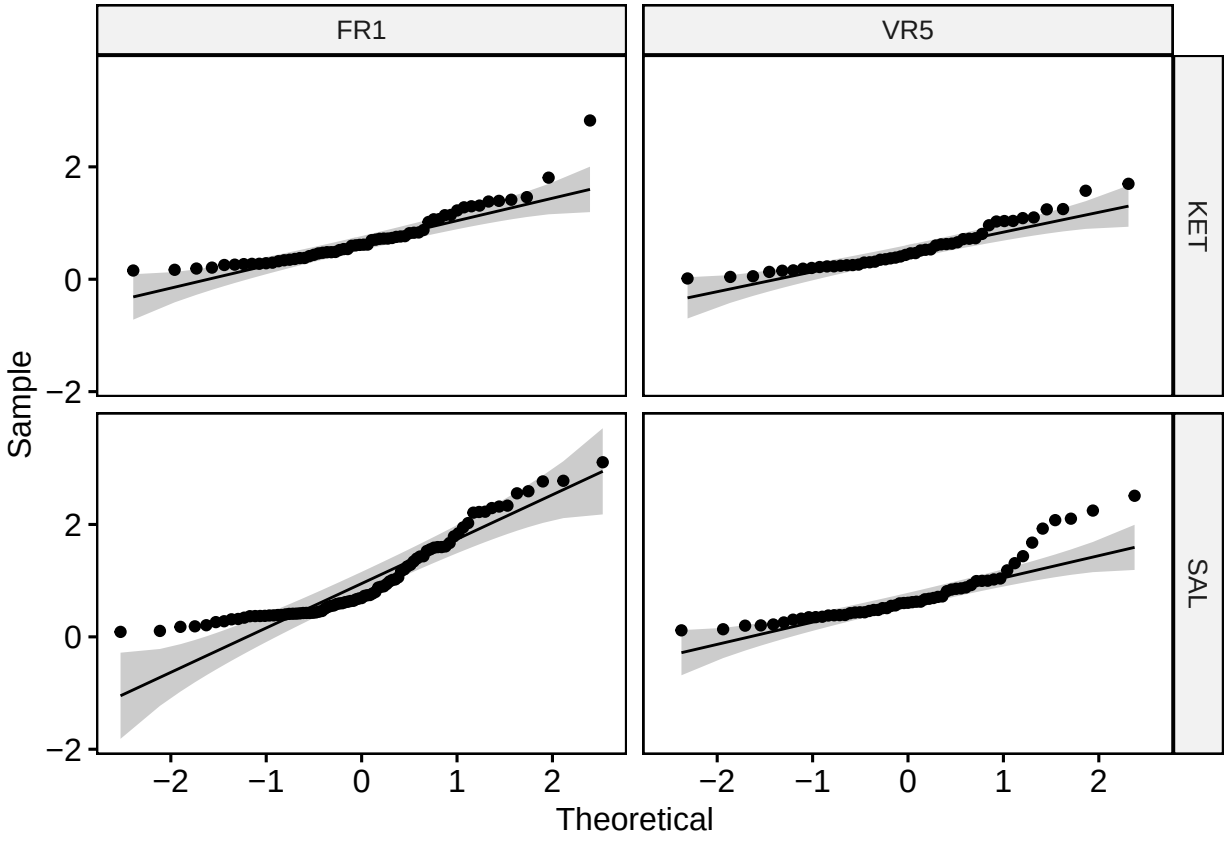
```
## [1] "KET-VR5_WFA_coloc_w_PV,Npas4_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

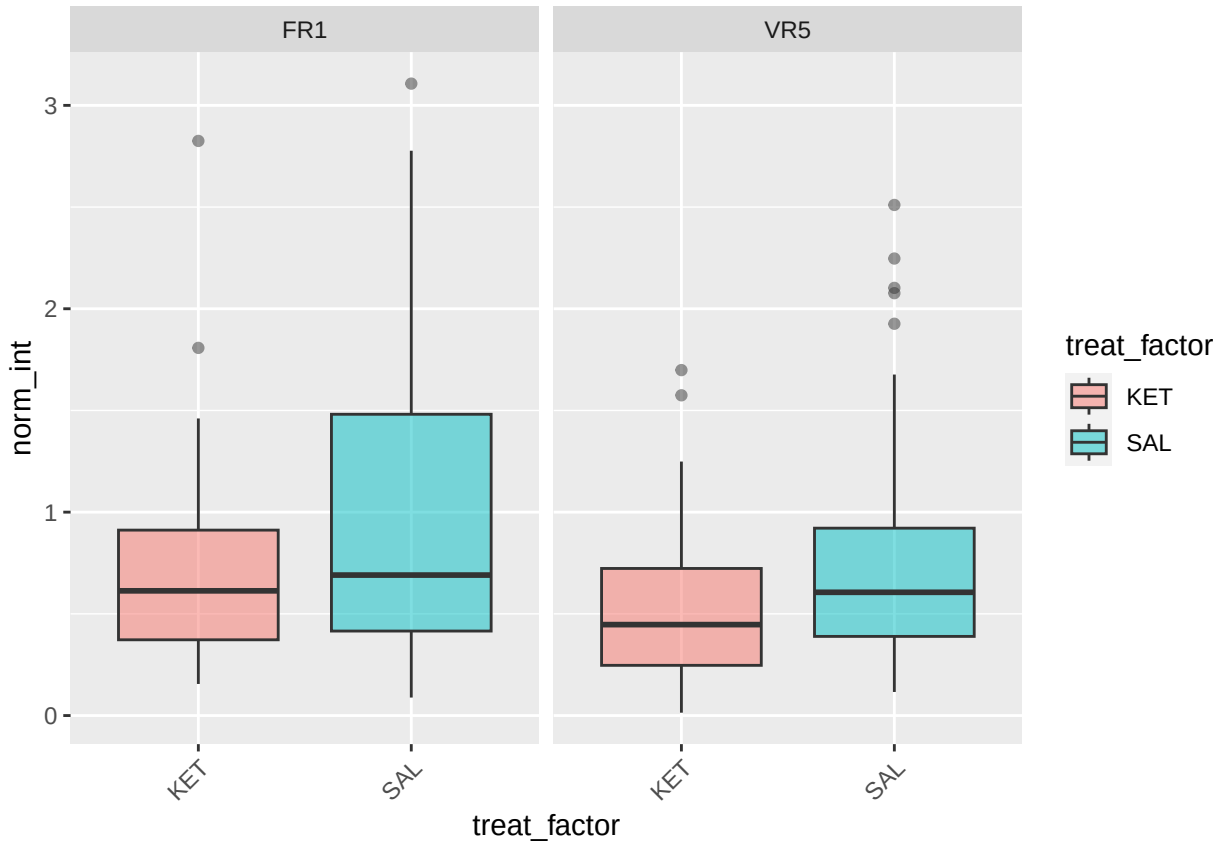
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.85781, p-value = 5.22e-06
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.87485, p-value = 5.136e-07
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.9094, p-value = 0.001283
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.82913, p-value = 1.291e-06
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value    Pr(>F)
## group   3  10.338 1.954e-06 ***
##       248
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                             Sum Sq  Df  F value    Pr(>F)
## (Intercept)                138.565   1 401.7973 < 2.2e-16 ***
## treat_factor                 3.586   1  10.3986  0.001431 **
## react_factor                 2.524   1   7.3203  0.007291 **
## treat_factor:react_factor    0.064   1   0.1856  0.666997
## Residuals                   85.526 248
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.277 0.0985 248  -2.809  0.0054           0.0107
##
## react_factor = VR5:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.212 0.1150 248  -1.839  0.0671           0.1296
##
## treat_factor = KET:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.172 0.114 248   1.515  0.1310           0.2449
##
## treat_factor = SAL:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.238 0.100 248   2.374  0.0184           0.0364
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_WFA_coloc_w_PV,Npas4_NORM_Rsubset.csv"
```

quad cFos

```
fname = quads[1]

print(fname)
```

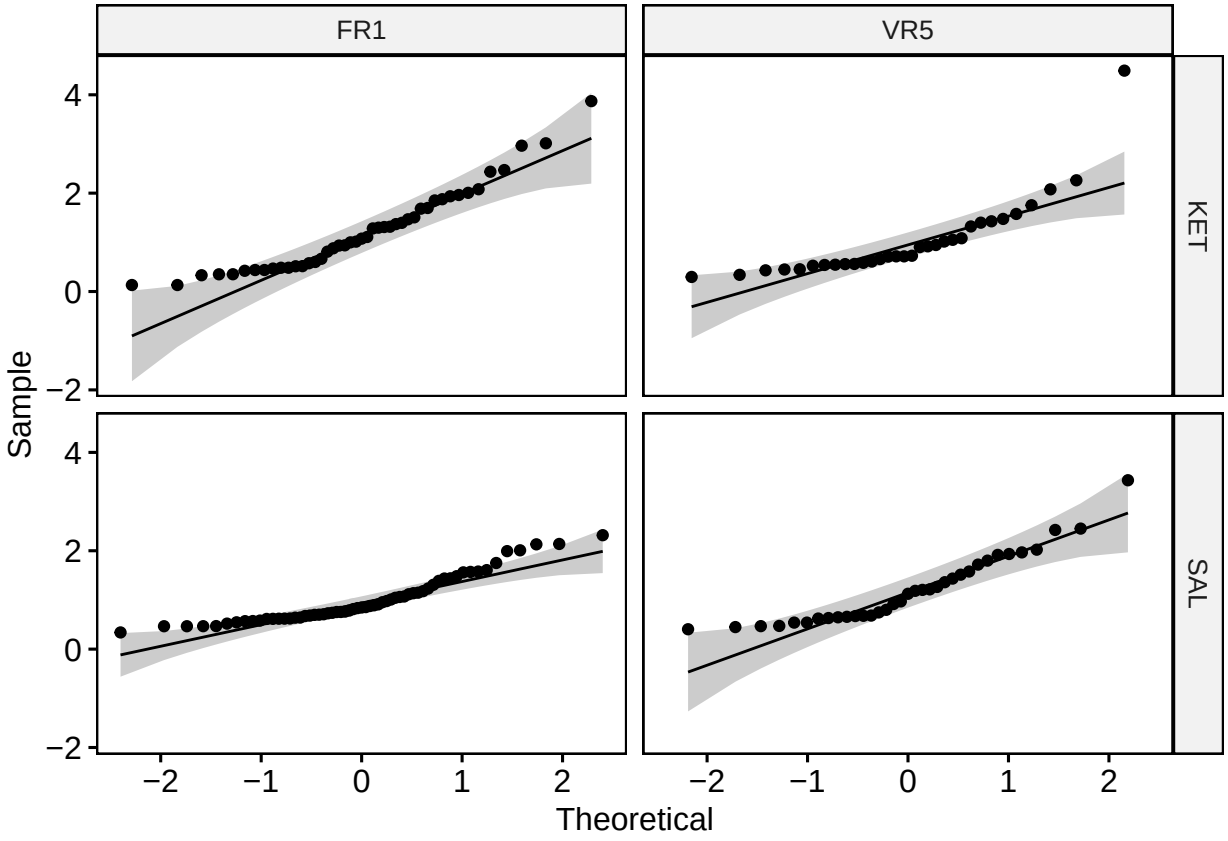
```
## [1] "KET-VR5_quad_cFos_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

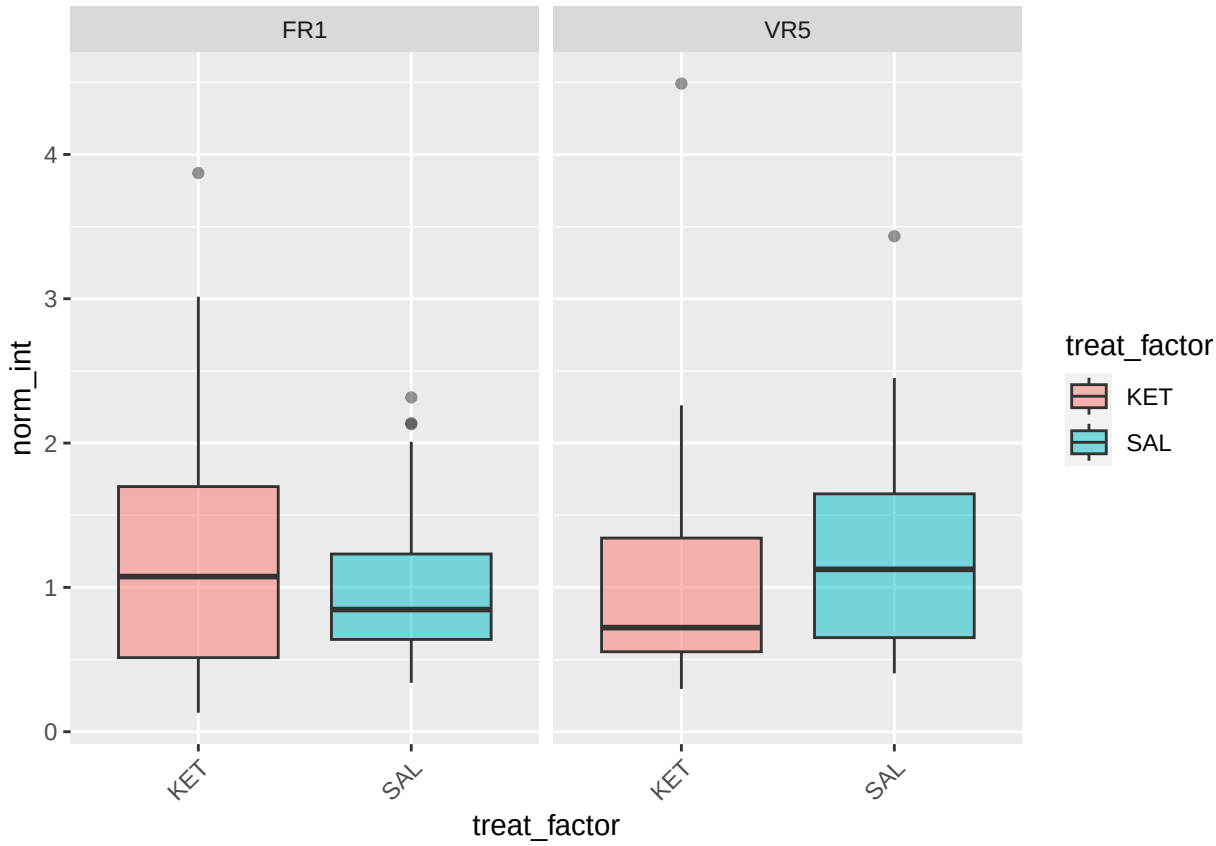
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.91743, p-value = 0.003465
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.89225, p-value = 6.093e-05
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.71869, p-value = 1.675e-06
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.8931, p-value = 0.002593
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value  Pr(>F)
## group   3  3.6218 0.01435 *
##       169
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                             Sum Sq  Df  F value  Pr(>F)
## (Intercept)               203.883   1 419.9202 < 2e-16 ***
## treat_factor                0.031   1   0.0634 0.80156
## react_factor                0.002   1   0.0047 0.94539
## treat_factor:react_factor   1.707   1   3.5153 0.06253 .
## Residuals                  82.054 169
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL    0.232 0.137 169   1.698  0.0914            0.174
##
## react_factor = VR5:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.177 0.170 169  -1.041  0.2993            0.509
##
## treat_factor = KET:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.197 0.161 169   1.225  0.2221            0.395
##
## treat_factor = SAL:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5   -0.212 0.148 169  -1.438  0.1523            0.281
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_quad_cFos_NORM_Rsubset.csv"
```

quad Npas4

```
fname = quads[2]

print(fname)
```

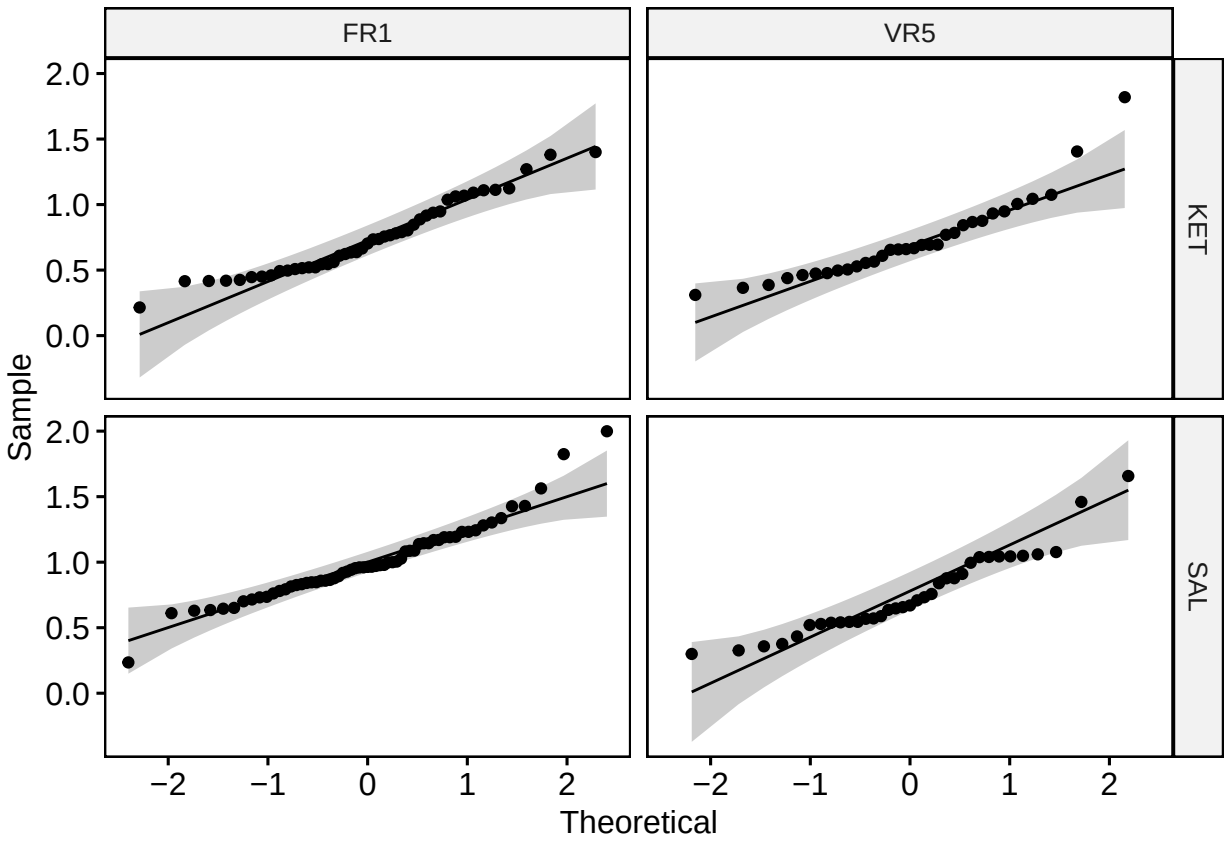
```
## [1] "KET-VR5_quad_Npas4_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

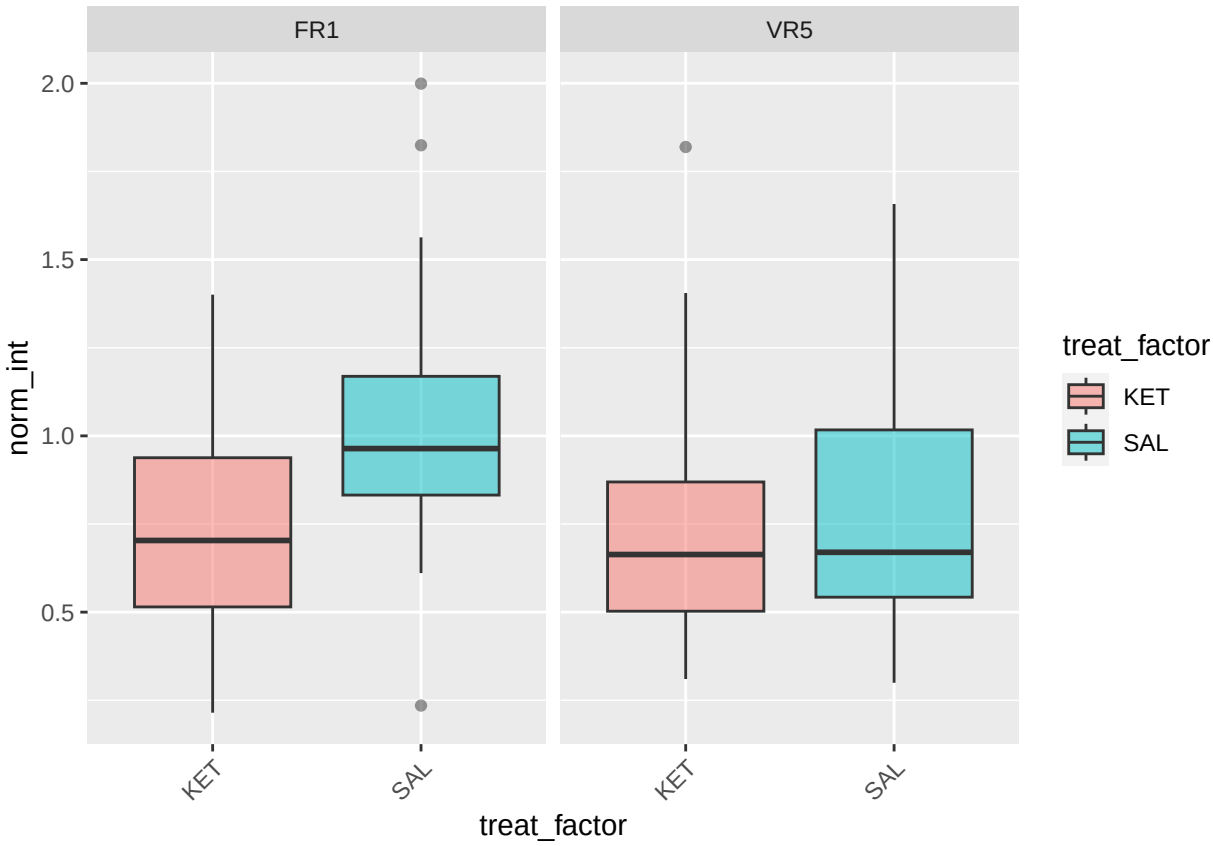
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.9482, p-value = 0.04342
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.94411, p-value = 0.007632
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.87518, p-value = 0.001532
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.9277, p-value = 0.02392
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value Pr(>F)
## group   3  0.2967 0.8278
##       169
## Anova Table (Type III tests)
##
## Response: norm_int
##                             Sum Sq  Df   F value    Pr(>F)
## (Intercept)               105.731   1 1198.6533 < 2.2e-16 ***
## treat_factor                0.848   1    9.6178  0.002259 **
## react_factor                0.673   1    7.6339  0.006363 **
## treat_factor:react_factor   0.526   1    5.9578  0.015684 *
## Residuals                  14.907 169
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.2582 0.0584 169  -4.424  <.0001         3.46e-05
##
## react_factor = VR5:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.0308 0.0726 169  -0.424  0.6724         8.93e-01
##
## treat_factor = KET:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.015 0.0687 169   0.218  0.8273         0.970177
##
## treat_factor = SAL:
##  contrast  estimate     SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.242 0.0630 169   3.850  0.0002         0.000335
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_quad_Npas4_NORM_Rsubset.csv"
```

quad PV

```
fname = quads[3]

print(fname)
```

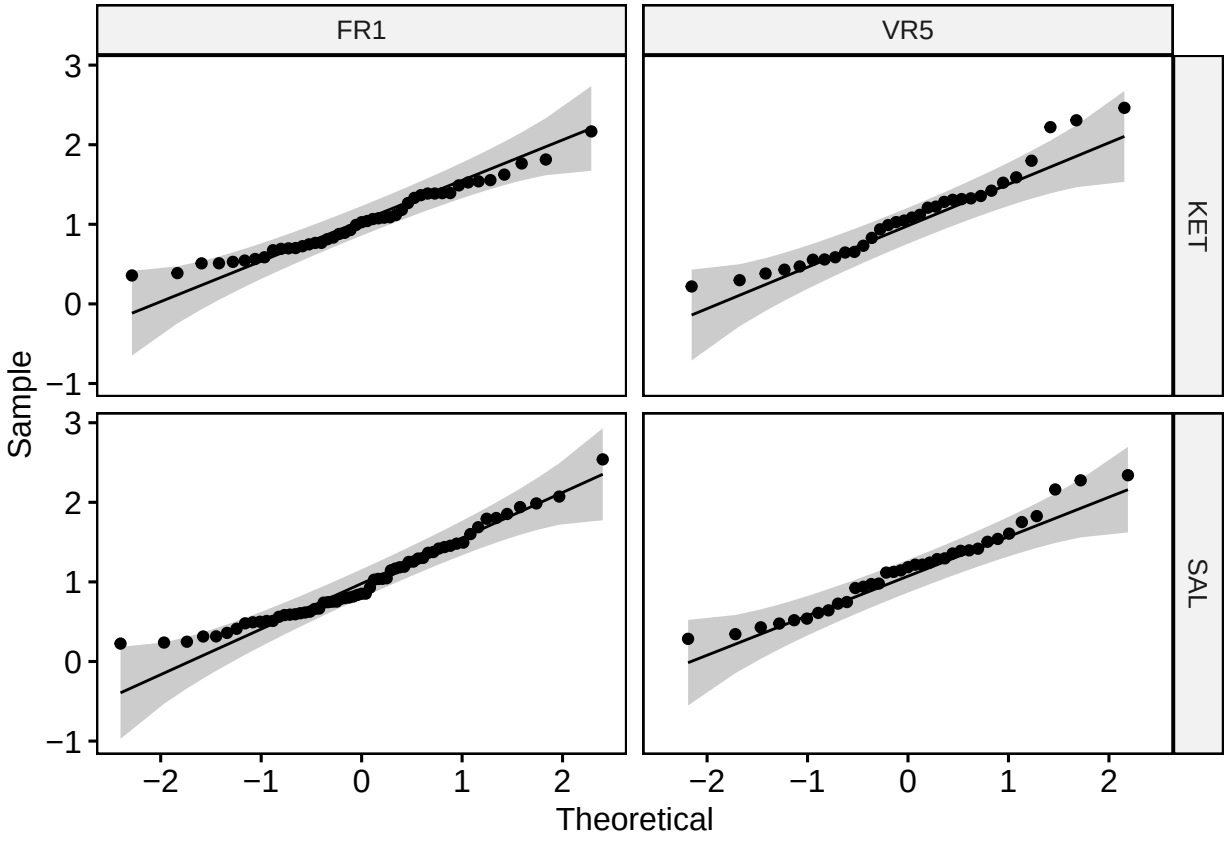
```
## [1] "KET-VR5_quad_PV_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

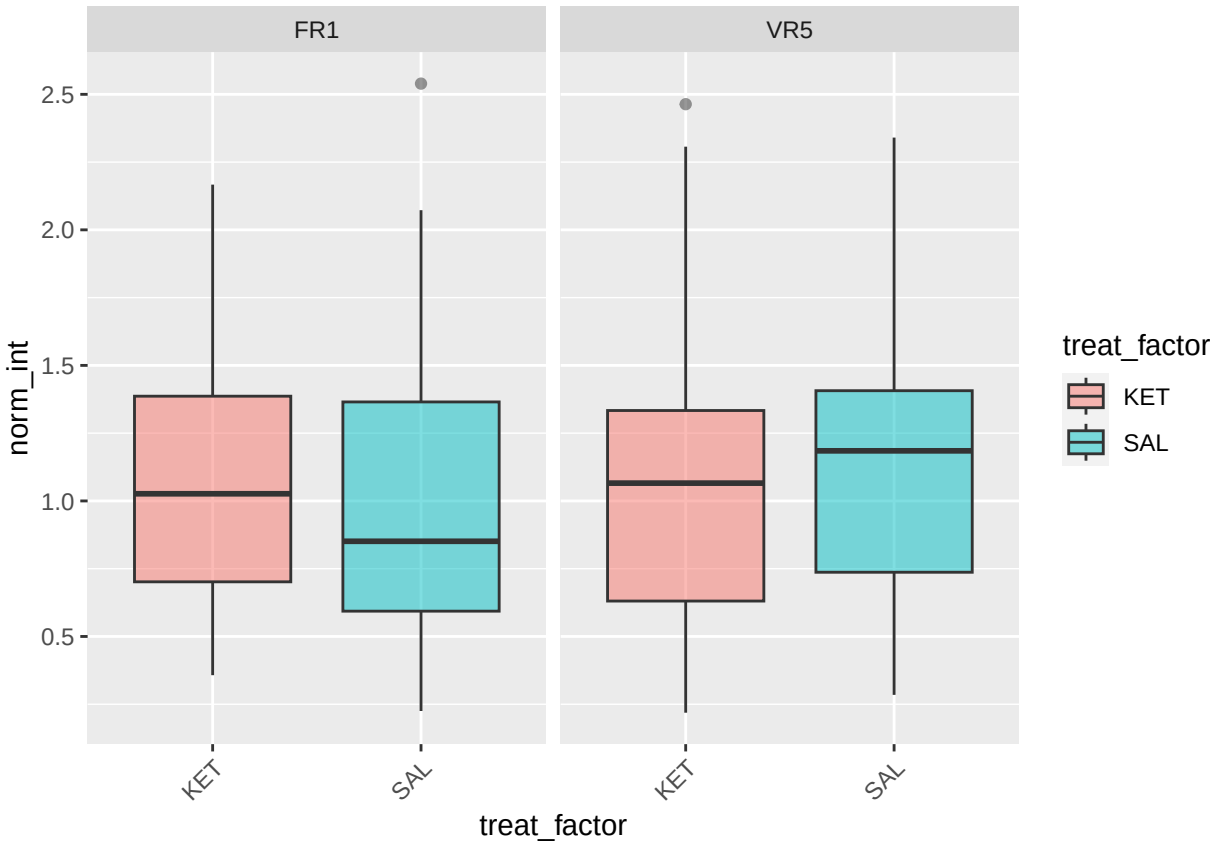
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.96581, p-value = 0.2029
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.95153, p-value = 0.01706
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.94674, p-value = 0.1164
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.96504, p-value = 0.322
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value Pr(>F)
## group   3  0.9614 0.4124
##       169
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq  Df  F value Pr(>F)
## (Intercept)               186.804   1 717.5646 <2e-16 ***
## treat_factor                0.008   1   0.0301 0.8625
## react_factor                0.445   1   1.7098 0.1928
## treat_factor:react_factor   0.116   1   0.4437 0.5063
## Residuals                  43.996 169
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   0.0394 0.100 169   0.393  0.6947            0.907
##
## react_factor = VR5:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL  -0.0672 0.125 169  -0.539  0.5909            0.833
##
## treat_factor = KET:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5  -0.0513 0.118 169  -0.435  0.6640            0.887
##
## treat_factor = SAL:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5  -0.1580 0.108 169  -1.460  0.1461            0.271
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_quad_PV_NORM_Rsubset.csv"
```

quad WFA

```
fname = quads[4]

print(fname)
```

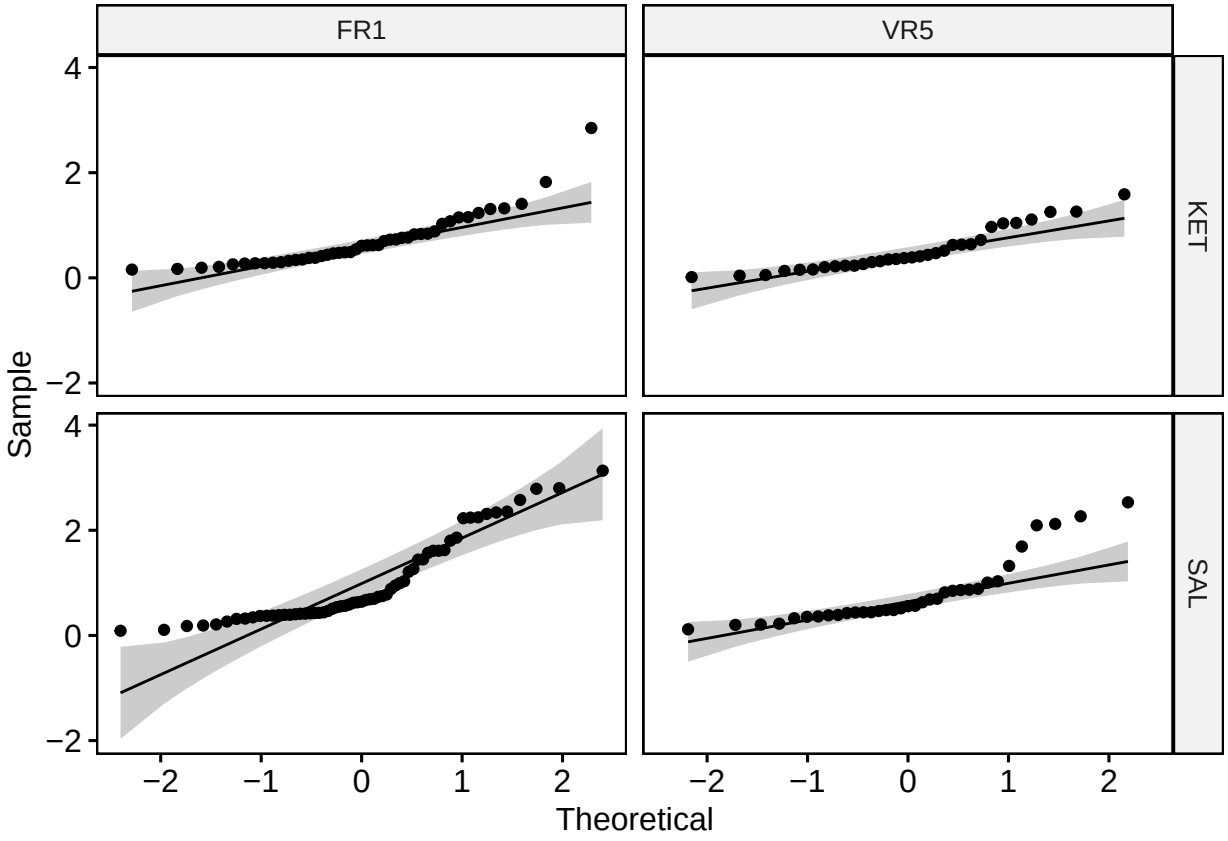
```
## [1] "KET-VR5_quad_WFA_NORM_Rsubset.csv"
```

```
figs = eda_anova(fname)
```

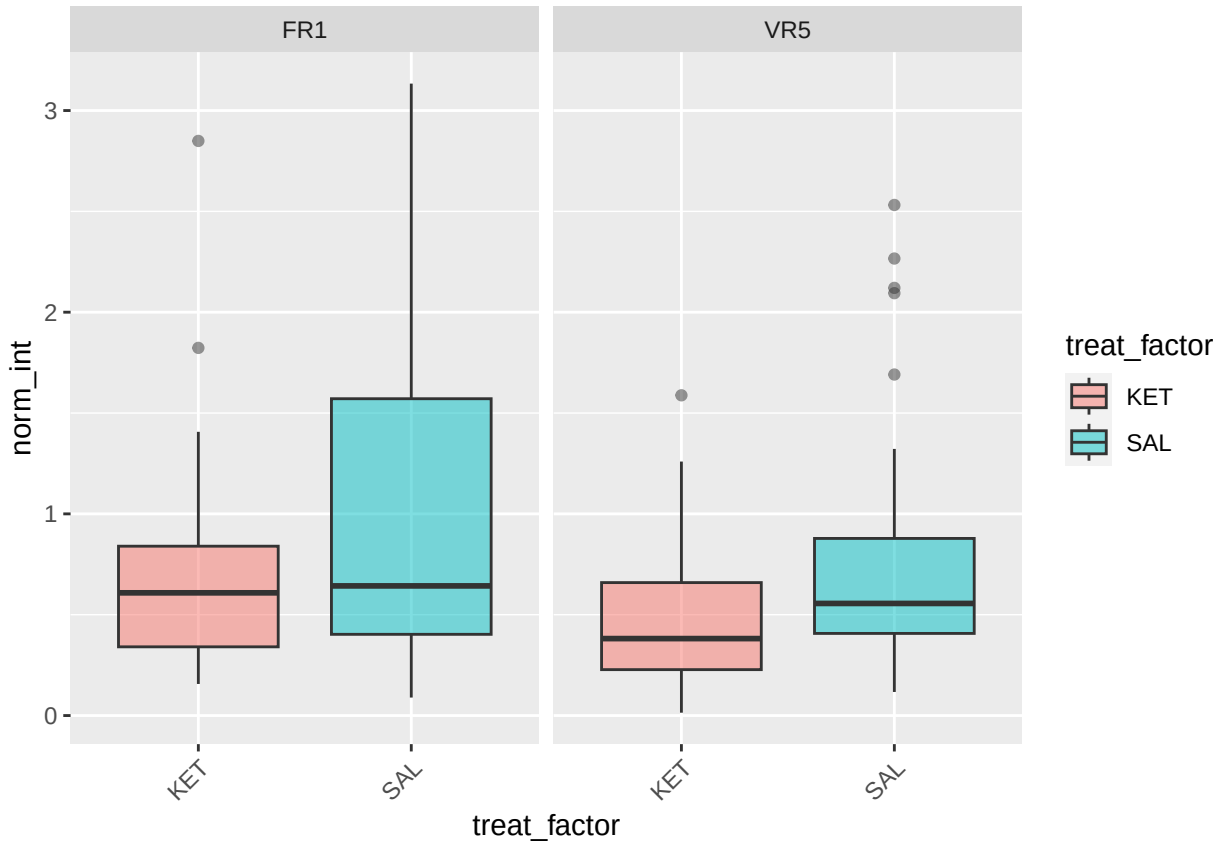
```
## $FR1_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.82035, p-value = 6.874e-06
##
##
## $FR1_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
```

```
## W = 0.84795, p-value = 2.266e-06
##
##
## $VR5_KET
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.89203, p-value = 0.003904
##
##
## $VR5_SAL
##
##  Shapiro-Wilk normality test
##
## data:  X[[i]]
## W = 0.79734, p-value = 1.811e-05
##
##
## Levene's Test for Homogeneity of Variance (center = "mean")
##        Df F value    Pr(>F)
## group   3  8.3057 3.479e-05 ***
##       169
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova Table (Type III tests)
##
## Response: norm_int
##                            Sum Sq  Df  F value    Pr(>F)
## (Intercept)                91.702   1 224.9661 < 2.2e-16 ***
## treat_factor                3.415   1   8.3767  0.004302 **
## react_factor                1.541   1   3.7806  0.053512 .
## treat_factor:react_factor   0.007   1   0.0172  0.895798
## Residuals                  68.889 169
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## react_factor = FR1:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.303 0.125 169  -2.415  0.0168           0.0333
##
## react_factor = VR5:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  KET - SAL   -0.277 0.156 169  -1.772  0.0782           0.1502
##
## treat_factor = KET:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.182 0.148 169   1.230  0.2204            0.392
##
## treat_factor = SAL:
##  contrast  estimate    SE  df t.ratio p.value adjusted_p.value
##  FR1 - VR5    0.208 0.135 169   1.535  0.1265            0.237
```

```
# display qq plot to assess normality
figs[[1]]
```




```
# display box plot to assess homogeneity of variances
figs[[2]]
```




```
print(fname)
```

```
## [1] "KET-VR5_quad_WFA_NORM_Rsubset.csv"
```