Untitled

2024-03-27

```
library("FrF2")
```

```
## Loading required package: DoE.base
```

```
## Loading required package: grid
```

```
## Loading required package: conf.design
```

```
## Registered S3 method overwritten by 'DoE.base':
##   method           from
##   factorize.factor conf.design
```

```
##
## Attaching package: 'DoE.base'
```

```
## The following objects are masked from 'package:stats':
##
##     aov, lm
```

```
## The following object is masked from 'package:graphics':
##
##     plot.design
```

```
## The following object is masked from 'package:base':
##
##     lengths
```

```
#load the data
data<-read.csv('sta305_project_data.csv')
hours<-data$hours
physical_activity<-as.factor(data$physical_activity)
Alcohol<-as.factor(data$Alcohol)
Meal<-as.factor(data$Meal)
```

```
#Fit the model
sleep<-lm(hours~physical_activity*Alcohol*Meal, data=data)
summary(sleep)
```

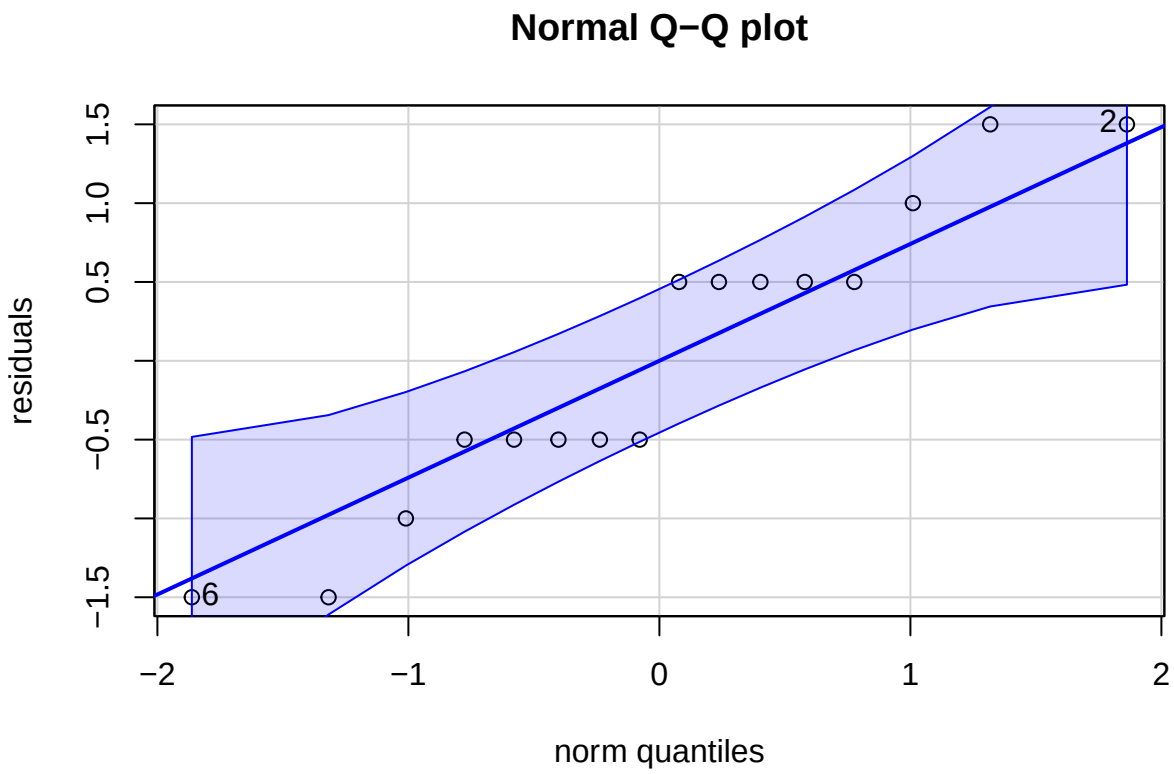
```
##
## Call:
## lm.default(formula = hours ~ physical_activity * Alcohol * Meal,
```

```
##     data = data)
##
## Residuals:
##    Min     1Q Median     3Q    Max
##   -1.5   -0.5    0.0    0.5    1.5
##
## Coefficients:
##                                Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      7.8125     0.3248  24.056  9.5e-09 ***
## physical_activity                1.3125     0.3248   4.041  0.00373 **
## Alcohol                          1.3125     0.3248   4.041  0.00373 **
## Meal                             0.6875     0.3248   2.117  0.06714 .
## physical_activity:Alcohol       -0.1875     0.3248  -0.577  0.57958
## physical_activity:Meal           0.1875     0.3248   0.577  0.57958
## Alcohol:Meal                    -0.3125     0.3248  -0.962  0.36410
## physical_activity:Alcohol:Meal  -0.3125     0.3248  -0.962  0.36410
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.299 on 8 degrees of freedom
## Multiple R-squared:  0.8322, Adjusted R-squared:  0.6853
## F-statistic: 5.667 on 7 and 8 DF,  p-value: 0.01301
```

```
#Assumption checking
library(car)
```

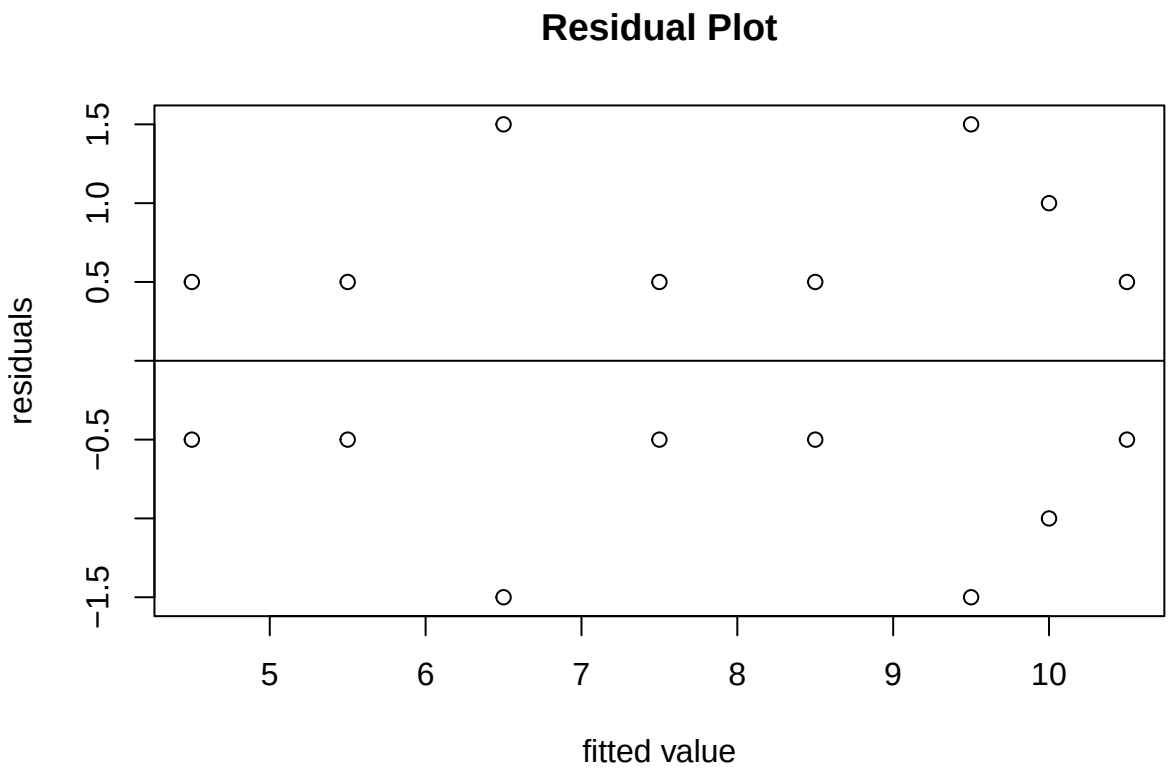
```
## Loading required package: carData
```

```
qqPlot(sleep$residuals, ylab='residuals', main='Normal Q-Q plot')
```




```
## [1] 2 6
```

```
plot(sleep$fitted.values, sleep$residuals, xlab='fitted value', ylab='residuals', main='Residual Plot')
abline(h=0)
```




```
#Calculate the effect of each factor and interaction term
data.frame(effect=2*sleep$coefficients)
```

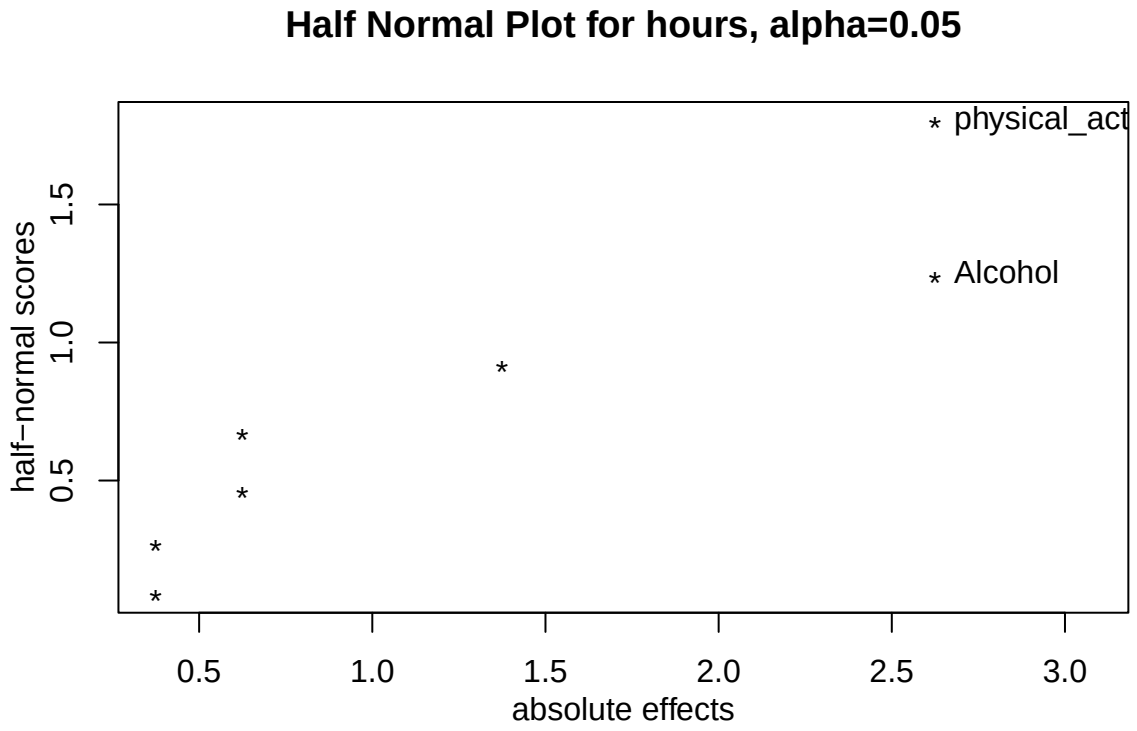
```
##                                effect
## (Intercept)                    15.625
## physical_activity               2.625
## Alcohol                         2.625
## Meal                            1.375
## physical_activity:Alcohol      -0.375
## physical_activity:Meal          0.375
## Alcohol:Meal                   -0.625
## physical_activity:Alcohol:Meal -0.625
```

```
#Calculate the confidence interval for factors and interaction terms.
#confidence interval
2*confint.lm(sleep)
```

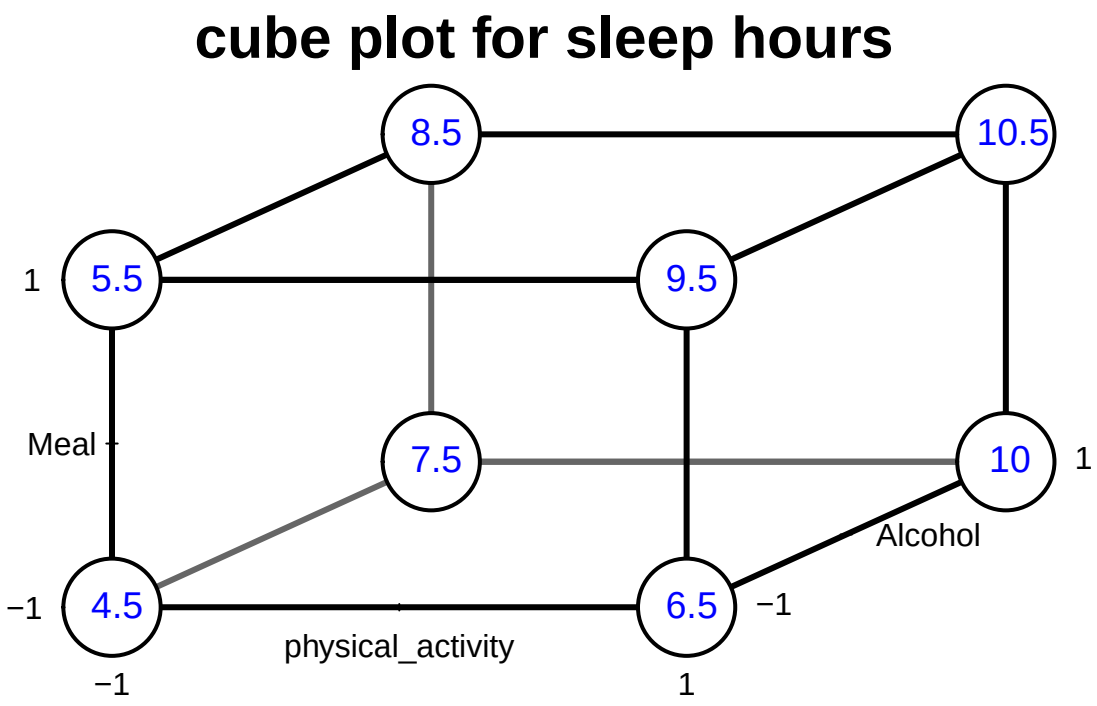
```
##                                    2.5 %     97.5 %
## (Intercept)                   14.1272064 17.1227936
## physical_activity              1.1272064  4.1227936
## Alcohol                        1.1272064  4.1227936
## Meal                          -0.1227936  2.8727936
## physical_activity:Alcohol     -1.8727936  1.1227936
## physical_activity:Meal        -1.1227936  1.8727936
## Alcohol:Meal                  -2.1227936  0.8727936
```

```
## physical_activity:Alcohol:Meal -2.1227936  0.8727936
```

```
#Generate half normal plot
DanielPlot(sleep, half= TRUE,autolab = T)
```




```
#Generate the Cube Plot
cubePlot(sleep,'physical_activity', 'Alcohol', 'Meal', main='cube plot for sleep hours')
```



modeled = TRUE

```
#Calculate the variance of effect

#first method
s1=((4-5)^2)/2
s2=((8-5)^2)/2
s3=((8-7)^2)/2
s4=((6-5)^2)/2
s5=((11-9)^2)/2
s6=((8-11)^2)/2
s7=((8-9)^2)/2
s8=((11-10)^2)/2
#pooled variance of hours
s=(s1+s2+s3+s4+s5+s6+s7+s8)/8
var_effect = s/4
print(var_effect)
```

```
## [1] 0.421875
```

```
#Second method
var_effect_2 <- (0.3248*2)**2
print(var_effect_2)
```

```
## [1] 0.4219802
```