Assignment 3

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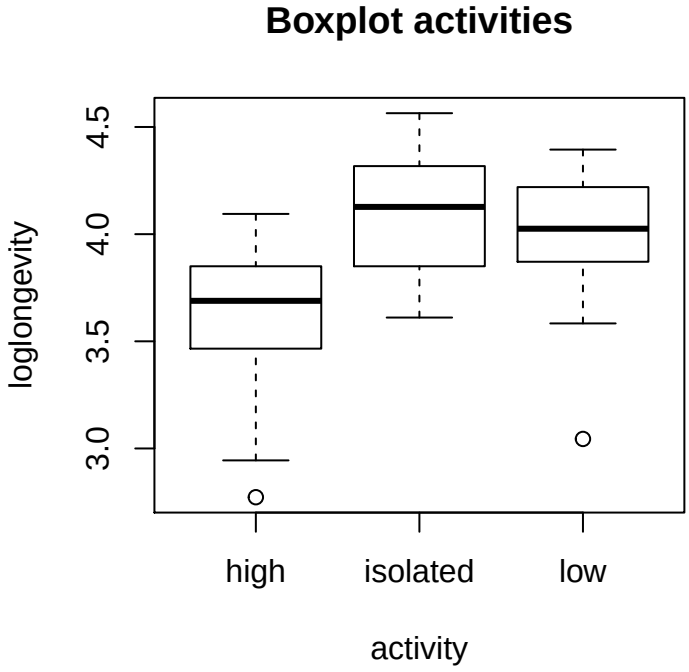
March 11, 2020

Exercise 1

a)
The activity has a significant effect F(2, 72)=19.42, p < .000. on the longevity. The fruitflies in the high-condition lives the shortest (3.60212), fruitflies that are isolated live longer (4.11935), and in the low-condition they are a duration in between (3.81437).



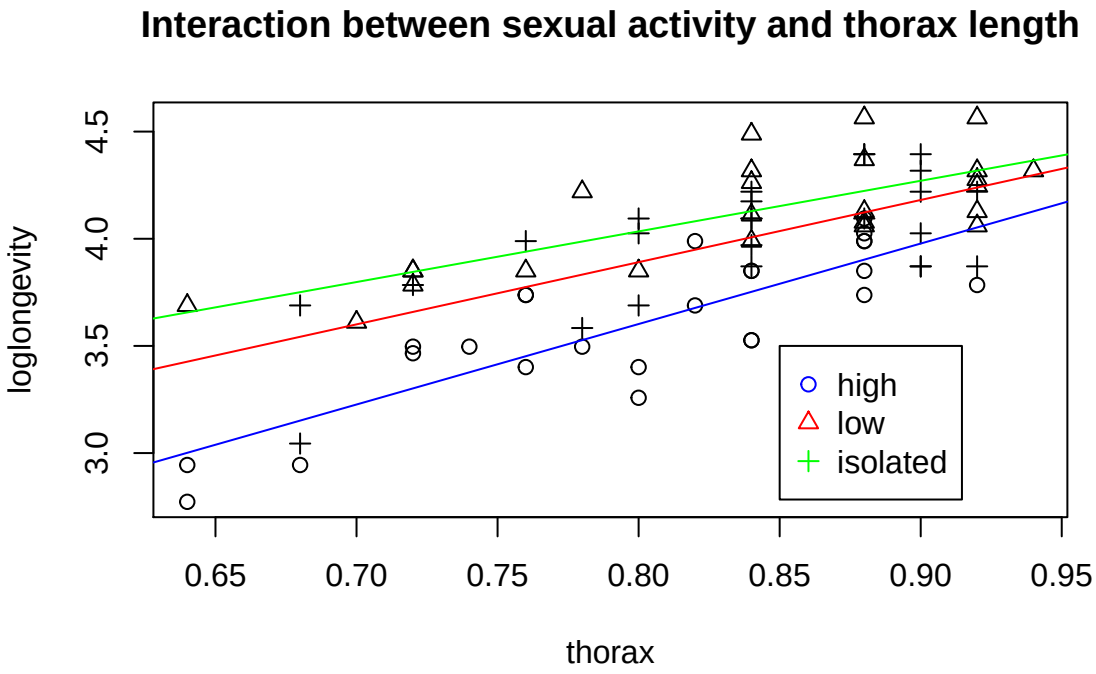

```
## Analysis of Variance Table
##
## Response: loglongevity
##           Df Sum Sq Mean Sq F value    Pr(>F)
## activity   2 3.6665  1.8333  19.421 1.798e-07 ***
## Residuals 72 6.7966  0.0944
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

b)
The effect of activity is significant $F(2, 71)=25.71$, $p < .000$. The fruitflies in high-condition live shorter, isolated-condition longer and low-condition somewhere in between. The estimates are: high = 3.675217 isolated = 4.085197 low = 3.960907

```
## Analysis of Variance Table
##
## Response: loglongevity
##           Df Sum Sq Mean Sq F value Pr(>F)
## thorax     1 5.4322  5.4322 132.175 <2e-16 ***
## activity   2 2.1129  1.0565  25.705  4e-09 ***
## Residuals 71 2.9180  0.0411
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

c)
First the ANCOVA is carried out with the interaction of activity and thorax. This resulted in a non-significant interaction effect ($p = 0.154$). To continue, a ANCOVA without interaction is carried out. The ANCOVA without interaction resulted in a significant effect of thorax $F(1, 71) = 94.37$, $p < .000$, where a longer thorax results in a longer longevity.

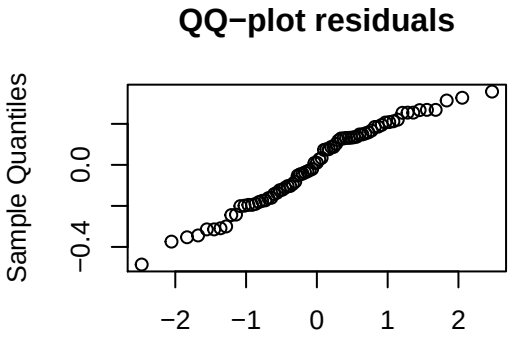
```
## Analysis of Variance Table
##
## Response: loglongevity
##                 Df Sum Sq Mean Sq F value    Pr(>F)
## activity         2 3.6665  1.8332 45.7687 2.228e-13 ***
## thorax           1 3.8786  3.8786 96.8327 9.020e-15 ***
## activity:thorax  2 0.1542  0.0771  1.9251    0.1536
## Residuals       69 2.7638  0.0401
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

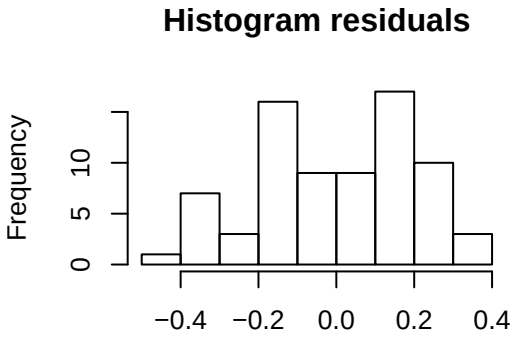


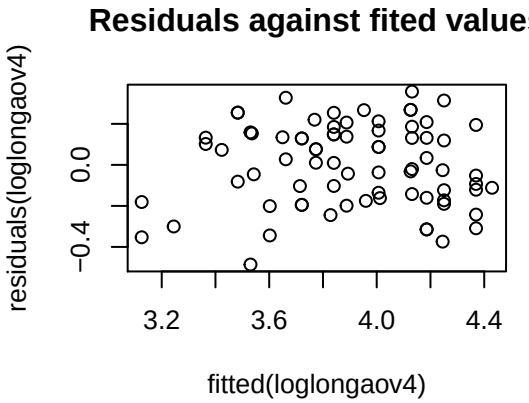

```
## Analysis of Variance Table
##
## Response: loglongevity
##           Df Sum Sq Mean Sq F value    Pr(>F)
## activity   2 3.6665  1.8332  44.606 2.838e-13 ***
## thorax     1 3.8786  3.8786  94.374 1.139e-14 ***
## Residuals 71 2.9180  0.0411
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

d)
The ANCOVA with thorax included in the model, has a explained variance of 70.9%, compared with the model without thorax, with an explained variance of 33.2%. The analyses without thorax is not wrong, if beforehand is not known if the thorax has an influence and the only goal is to know if sexual acitivity is of influence on longevity. However, if it is known that there is or coule be an effect of thorax length, it should be taken into account to do a right analyses.

e)
Investigating the QQ-plot and the plot of the residuals against the fitted values, it can be seen that the data is normally distributed and it does not show heteroscedasticity, because no pattern can be seen in the plot.

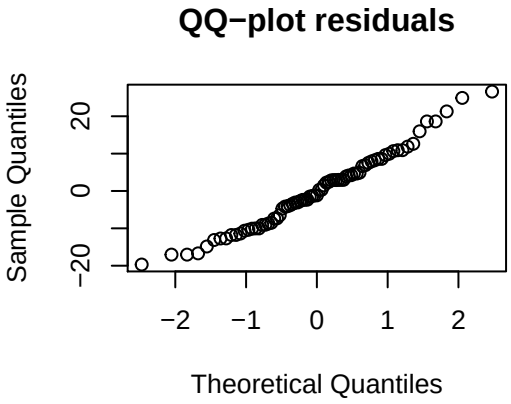


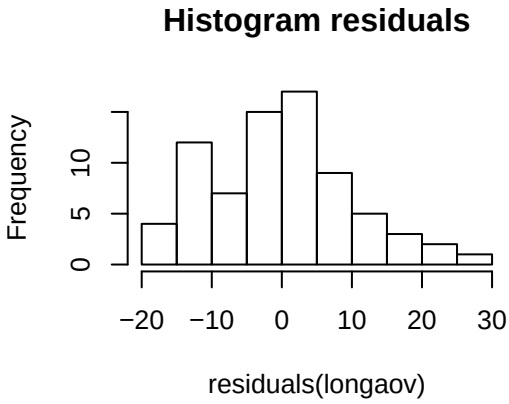


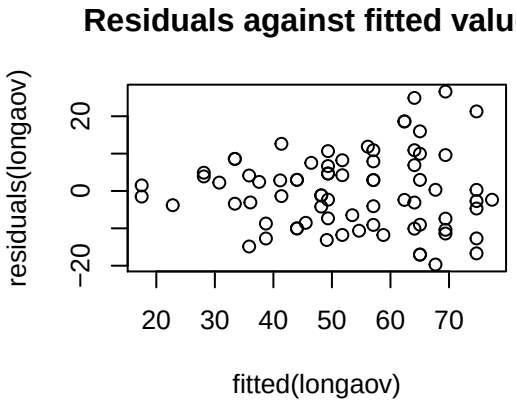


f)
The same QQ-plot and residuals plot is carried out, with the original longevity data. This resulted in a normally distributed data. However, the plot of the residuals against the fitted values showed some pattern of heteroscedasticity.

```
## Analysis of Variance Table
##
## Response: longevity
##           Df Sum Sq Mean Sq F value    Pr(>F)
## activity   2 8239.2  4119.6  38.120 5.686e-12 ***
## thorax     1 7686.8  7686.8  71.127 2.624e-12 ***
## Residuals 71 7673.0   108.1
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```


QQ−plot residuals
Sample Quantiles
Theoretical Quantiles
−20
0
20
−2
−1
0
1
2


Histogram residuals
Frequency
residuals(longaov)
0
5
10
−20
−10
0
10
20
30


Residuals against fitted values
residuals(longaov)
fitted(longaov)
−20
0
20
20
30
40
50
60
70