```
> # Aufgabe 1
> #a)
> shapiro.test(mussel$Magadan)

        Shapiro-Wilk normality test

data:  mussel$Magadan
W = 0.80901, p-value = 0.03571

> #Voraussetzungen nicht erfüllt, da Magadan nicht normalverteilt
> #b)
> mst <- stack(log(mussel))
> mst.aov <- aov(values~ind, data=mst)
> summary(mst.aov)
            Df Sum Sq Mean Sq F value   Pr(>F)
ind          4 0.6436 0.16089    8.55 6.91e-05 ***
Residuals   34 0.6398 0.01882
---
11 Beobachtungen als fehlend gelöscht
> #c)
> library(agricolae)
> HSD.test(mst.aov, "ind", group=T, console=T)

Study: mst.aov ~ "ind"
HSD Test for values
Mean Square Error:  0.01881827
ind,  means

Alpha: 0.05 ; DF Error: 34
Critical Value of Studentized Range: 4.072295

Groups according to probability of means differences and alpha level( 0.05 )

Treatments with the same letter are not significantly different.

              values groups
Petersburg -2.278685      a
Tvarminne  -2.313661      a
Tillamook  -2.534093      b
Magadan    -2.561915      b
Newport    -2.598676      b
> > #Aufgabe 2
> #a)
> startup <- stack(startup)
> #testen Sie zunächst, in welcher Reihenfolge die Faktor-level gelistet sind:
> levels(startup$ind)
[1] "pizza"  "bakery" "shoes"  "gifts"  "pets"
> contrasts(startup$ind) <- c(1.5,1.5,-1,-1,-1)
> contrasts(startup$ind)
       [,1]       [,2]       [,3]       [,4]
pizza   1.5 -0.4082483 -0.4082483 -0.4082483
bakery  1.5  0.4082483  0.4082483  0.4082483
shoes  -1.0  0.6666667 -0.3333333 -0.3333333
gifts  -1.0 -0.3333333  0.6666667 -0.3333333
pets   -1.0 -0.3333333 -0.3333333  0.6666667
> startup.aov <- aov(values~ind, data=startup)
> summary.aov(startup.aov,split=list(ind=list("food vs. non-food"=1)))
                         Df Sum Sq Mean Sq F value Pr(>F)
ind                       4  14298    3575   3.246 0.0184 *
  ind: food vs. non-food  1   5744    5744   5.217 0.0263 *
Residuals                55  60561    1101
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
20 Beobachtungen als fehlend gelöscht
> #b)
> contrasts(startup$ind) <- c(1,1,1,1,-4)
> startup.aov <- aov(values~ind, data=startup)
> summary.aov(startup.aov,split=list(ind=list("pets vs. other"=1)))
                      Df Sum Sq Mean Sq F value  Pr(>F)
ind                    4  14298    3575   3.246 0.01839 *
  ind: pets vs. other  1  12109   12109  10.997 0.00162 **
```

```
Residuals             55  60561    1101
---
20 Beobachtungen als fehlend gelöscht
> #c)
> summary(aov(values~ind, data=subset(startup, ind!="pets")))
            Df Sum Sq Mean Sq F value Pr(>F)
ind          3   2189   729.7   0.589  0.626
Residuals   40  49565  1239.1
20 Beobachtungen als fehlend gelöscht
Warnmeldung:
contrasts dropped from factor ind due to missing levels

> #Aufgabe 3
> #a)
> summary(aov(Subjective_Valence~Item_Category+Error(Participant_ID/Item_Category),
data=emotion))

Error: Participant_ID
          Df Sum Sq Mean Sq F value Pr(>F)
Residuals 18 115444    6414

Error: Participant_ID:Item_Category
              Df Sum Sq Mean Sq F value Pr(>F)
Item_Category  1   1685    1685   1.526  0.233
Residuals     18  19877    1104

Error: Within
           Df  Sum Sq Mean Sq F value Pr(>F)
Residuals 874 2285663    2615
> #b)
> # In der Aufgabe (b) wird nach einer two-way ANOVA gefragt. Hier hatten wir diskutiert,
ob im Error-Term auch die Interaktion von
> # Item_Category und Emotion_Condition zu berücksichtigen ist. Während ich dies verneint
habe, schlug Herr Beykoz vor, die Inter-
> # aktion zu berücksichtigen. DIE LITERATUR GIBT HERRN BEYKOZ RECHT:
> summary(aov(Subjective_Valence~Item_Category*Emotion_Condition+Error(Participant_ID/
(Item_Category*Emotion_Condition)), data=emotion))

Error: Participant_ID
          Df Sum Sq Mean Sq F value Pr(>F)
Residuals 18 115444    6414

Error: Participant_ID:Item_Category
              Df Sum Sq Mean Sq F value Pr(>F)
Item_Category  1   1685    1685   1.526  0.233
Residuals     18  19877    1104

Error: Participant_ID:Emotion_Condition
                  Df  Sum Sq Mean Sq F value   Pr(>F)
Emotion_Condition  1 1279858 1279858   246.4 6.01e-12 ***
Residuals         18   93493    5194
---

Error: Participant_ID:Item_Category:Emotion_Condition
                               Df Sum Sq Mean Sq F value Pr(>F)
Item_Category:Emotion_Condition  1   4706    4706   5.834 0.0266 *
Residuals                       18  14518     807
---

Error: Within
           Df Sum Sq Mean Sq F value Pr(>F)
Residuals 836 893088    1068

> #c)
> summary(aov(Subjective_Valence~Item_Category+Error(Participant_ID/Item_Category),
data=subset(emotion, Emotion_Condition=="Negative" & Participant_Sex=="Female")))

Error: Participant_ID
           Df Sum Sq Mean Sq F value Pr(>F)
Residuals 14  48394    3457
```

```
Error: Participant_ID:Item_Category
              Df Sum Sq Mean Sq F value Pr(>F)
Item_Category  1   4787    4787   3.667 0.0762 .
Residuals     14  18275    1305
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Error: Within
           Df Sum Sq Mean Sq F value Pr(>F)
Residuals 330 400957    1215


> #Aufgabe 4
> #a)
> # während Item_Category ein "within subject" Faktor ist (also innerhalb der Subjekte
variiert wird), ist Geschlecht eine "between subjekt" Variable
> # diese ist nicht in Participant_ID verschachtelt, DIE BERÜCKSICHTIGUNG IM ERROR-TERM
HAT KEINEN EFFEKT:
> summary(aov(Subjective_Valence~(Participant_Sex*Item_Category)+Error((Participant_ID/
Item_Category)+Participant_Sex), data=emotion))

Error: Participant_ID
                Df Sum Sq Mean Sq F value Pr(>F)
Participant_Sex  1   3073    3073   0.465  0.505
Residuals       17 112370    6610

Error: Participant_ID:Item_Category
                             Df Sum Sq Mean Sq F value Pr(>F)
Item_Category                 1   1685  1685.1   1.446  0.246
Participant_Sex:Item_Category  1     66    66.5   0.057  0.814
Residuals                     17  19810  1165.3

Error: Within
           Df  Sum Sq Mean Sq F value Pr(>F)
Residuals 874 2285663    2615
Warnmeldung:
In aov(Subjective_Valence ~ (Participant_Sex * Item_Category) +  :
  Error() Modell ist singulär
> # ENTSPRICHT:
> summary(aov(Subjective_Valence~(Participant_Sex*Item_Category)+Error(Participant_ID/
Item_Category), data=emotion))

Error: Participant_ID
                Df Sum Sq Mean Sq F value Pr(>F)
Participant_Sex  1   3073    3073   0.465  0.505
Residuals       17 112370    6610

Error: Participant_ID:Item_Category
                             Df Sum Sq Mean Sq F value Pr(>F)
Item_Category                 1   1685  1685.1   1.446  0.246
Participant_Sex:Item_Category  1     66    66.5   0.057  0.814
Residuals                     17  19810  1165.3

Error: Within
           Df  Sum Sq Mean Sq F value Pr(>F)
Residuals 874 2285663    2615
> #b)
> summary(aov(Subjective_Valence~(Participant_Sex*Emotion_Condition)
+Error(Participant_ID/Emotion_Condition), data=emotion))

Error: Participant_ID
                Df Sum Sq Mean Sq F value Pr(>F)
Participant_Sex  1   3073    3073   0.465  0.505
Residuals       17 112370    6610

Error: Participant_ID:Emotion_Condition
                                Df  Sum Sq Mean Sq F value   Pr(>F)
Emotion_Condition                1 1279858 1279858 298.445 3.23e-12 ***
Participant_Sex:Emotion_Condition  1   20590   20590   4.801   0.0427 *
```

```
Residuals                        17   72903    4288
---


Error: Within
           Df Sum Sq Mean Sq F value Pr(>F)
Residuals 874 933874    1068

> #c)
> summary(aov(Subjective_Valence~(Participant_Sex*Emotion_Condition*Item_Category)
+Error(Participant_ID/(Emotion_Condition*Item_Category)), data=emotion))

Error: Participant_ID
               Df Sum Sq Mean Sq F value Pr(>F)
Participant_Sex  1   3073    3073   0.465  0.505
Residuals       17 112370    6610

Error: Participant_ID:Emotion_Condition
                                 Df  Sum Sq Mean Sq F value   Pr(>F)
Emotion_Condition                 1 1279858 1279858 298.445 3.23e-12 ***
Participant_Sex:Emotion_Condition  1   20590   20590   4.801   0.0427 *
Residuals                         17   72903    4288
---

Error: Participant_ID:Item_Category
                           Df Sum Sq Mean Sq F value Pr(>F)
Item_Category               1   1685  1685.1   1.446  0.246
Participant_Sex:Item_Category  1     66    66.5   0.057  0.814
Residuals                  17  19810  1165.3

Error: Participant_ID:Emotion_Condition:Item_Category
                                            Df Sum Sq Mean Sq F value Pr(>F)
Emotion_Condition:Item_Category              1   4706    4706   5.530  0.031 *
Participant_Sex:Emotion_Condition:Item_Category  1     52      52   0.062  0.807
Residuals                                   17  14466     851
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Error: Within
           Df Sum Sq Mean Sq F value Pr(>F)
Residuals 836 893088    1068

> #Aufgabe 5
> #a)
> basket.lm = lm(points~height+weightclass+ratio, data=basketball)
> library(car)
Lade nötiges Paket: carData
> Anova(basket.lm)
Anova Table (Type II tests)

Response: points
             Sum Sq Df F value   Pr(>F)
height       135.69  1  4.7391 0.034331 *
weightclass   92.74  2  1.6196 0.208400
ratio        317.86  1 11.1016 0.001647 **
Residuals   1402.99 49
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
> #c)
> Anova(lm(ratio~height+weightclass, data=basketball))
Anova Table (Type II tests)

Response: ratio
              Sum Sq Df F value Pr(>F)
height      0.005420  1  2.2295 0.1417
weightclass 0.006313  2  1.2983 0.2820
Residuals   0.121562 50
```