 # Correlation table

```
> cor(cbind(VERBAL,SLEEP.C,ABSTRACT,SLEEP.CxABSTRACT,AGE,PHYSICAL,SOCIAL,HEADCIRCUMFERANCE))

                  VERBAL SLEEP.C   ABSTRACT SLEEP.CxABSTRACT   AGE PHYSICAL SOCIAL HEADCIRCUM
VERBAL             1.000  0.150   -0.835           0.138 -0.116  0.218 -0.055  0.023
SLEEP.C            0.150  1.000    0.073           0.649 -0.388 -0.032  0.011  0.095
ABSTRACT          -0.835  0.073    1.000           0.056 -0.112 -0.057  0.050  0.054
SLEEP.CxABSTRACT  0.138  0.649    0.056           1.000 -0.223 -0.074 -0.009  0.063
AGE              -0.116 -0.388   -0.112          -0.223  1.000 -0.019  0.085 -0.033
PHYSICAL          0.218 -0.032   -0.057          -0.074 -0.019  1.000 -0.064  0.047
SOCIAL           -0.055  0.011    0.050          -0.009  0.085 -0.064  1.000  0.064
HEADCIRCMFERANCE 0.023  0.095    0.054           0.063 -0.033  0.047  0.064  1.000
```

 # ====================================
 # Exercise 1: Model 1

```
Call:
lm(formula = VERBAL ~ SLEEP.C)

Residuals:
     Min       1Q   Median       3Q      Max
-24.2402  -7.2911   0.0269   7.5716  16.4986

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 67.81278    0.42459 159.715  < 2e-16 ***
SLEEP.C      0.09694    0.03205   3.025  0.00265 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 8.492 on 398 degrees of freedom
Multiple R-squared:  0.02247, Adjusted R-squared:  0.02001
F-statistic: 9.149 on 1 and 398 DF,  p-value: 0.00265
```

 # ====================================
 # Exercise 1: Model 2

```
Call:
lm(formula = VERBAL ~ SLEEP.C + ABSTRACT + SLEEP.CxABSTRACT)

Residuals:
    Min      1Q  Median      3Q     Max
-17.038  -2.948   0.006   2.985  16.399

Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)      75.06080    0.30804 243.673  < 2e-16 ***
SLEEP.C           0.10176    0.02158   4.715 3.36e-06 ***
ABSTRACT        -14.57721    0.43583 -33.447  < 2e-16 ***
SLEEP.CxABSTRACT  0.08406    0.03333   2.522   0.0121 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 4.346 on 396 degrees of freedom
Multiple R-squared:  0.7452,  Adjusted R-squared:  0.7433
F-statistic: 386.1 on 3 and 396 DF,  p-value: < 2.2e-16
```

```
# ====================================
# Exercise 1: Model 3

Call:
lm(formula = VERBAL ~ SLEEP.C + ABSTRACT + SLEEP.CxABSTRACT + AGE)

Residuals:
     Min       1Q   Median       3Q      Max
-18.7410  -2.5965   0.0891   2.8372  13.9980

Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)     107.63898    5.55012  19.394  < 2e-16 ***
SLEEP.C           0.05992    0.02191   2.734  0.00653 **
ABSTRACT        -14.80293    0.42022 -35.227  < 2e-16 ***
SLEEP.CxABSTRACT  0.09202    0.03203   2.873  0.00429 **
AGE              -0.46398    0.07893  -5.878 8.83e-09 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 4.173 on 395 degrees of freedom
Multiple R-squared:  0.7657,  Adjusted R-squared:  0.7633
F-statistic: 322.7 on 4 and 395 DF,  p-value: < 2.2e-16


# ====================================
# Exercise 1: Modell 4

Call:
lm(formula = VERBAL ~ SLEEP.C + ABSTRACT + SLEEP.CxABSTRACT + AGE +
    PHYSICAL + SOCIAL + HEADCIRCUMFERANCE)

Residuals:
     Min       1Q   Median       3Q      Max
-14.9701  -2.5632   0.0008   2.6500  11.7625

Coefficients:
                  Estimate Std. Error t value Pr(>|t|)
(Intercept)      98.013062   5.858633  16.730  < 2e-16 ***
SLEEP.C           0.055305   [redacted]  [redacted]  0.007157 **
ABSTRACT        -14.672794   [redacted] -37.375  [redacted]
SLEEP.CxABSTRACT  0.108071   0.029880  [redacted]  [redacted]
AGE              -0.447532   [redacted]  [redacted]  [redacted]
PHYSICAL          0.012860   [redacted]  [redacted]  [redacted]
SOCIAL            0.016303   [redacted]   0.416  [redacted]
HEADCIRCUMFERANCE 0.086030   [redacted]  [redacted]  [redacted]
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 3.882 on 392 degrees of freedom
Multiple R-squared:  0.7988,  Adjusted R-squared:  0.7952
F-statistic: 222.3 on 7 and 392 DF,  p-value: < 2.2e-16
```

[More output from model 4 on the next page]

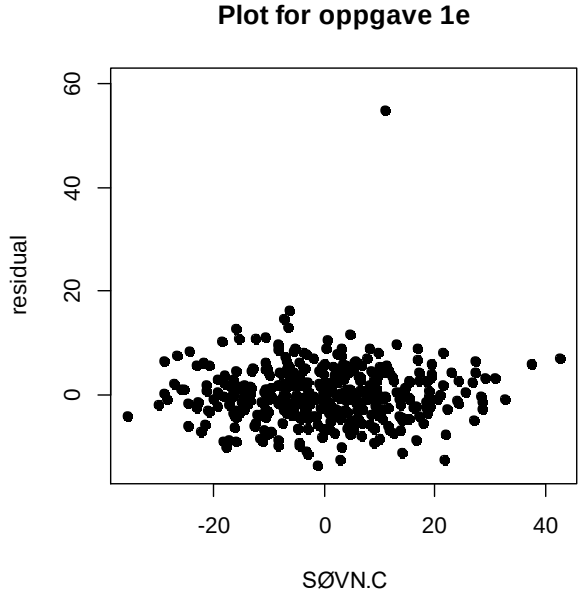
 # Standardized Coefficients Model 4:

```
> lm.beta(M4)

(Intercept)        0.000
SLEEP.C            0.086
ABSTRACT          -0.856
SLEEP.CxABSTRACT   0.108
AGE               -0.151
PHYSICAL           0.176
SOCIAL             0.010
HEADCIRCUMFERANCE 0.041
```

 # Confidence intervals model 4

```
> confint(M4)
                    2.5 %  97.5 %
(Intercept)       86.4948 109.531
SLEEP.C            0.0151   0.096
ABSTRACT
SLEEP.CxABSTRACT
AGE                       -0.302
PHYSICAL           0.0096
SOCIAL
HEADCIRCUMFERANCE -0.0084   0.180
```



Formulas for PSY2014

Gjennomsnitt: $\bar{X} = \frac{1}{n} \sum_{i=1}^{n} X_i$

Varians: $s_X^2 = \frac{\sum_{i=1}^{n}(X_i - \bar{X})^2}{n-1}$

Standardavvik: $s_X = \sqrt{s_X^2}$

Kovarians: $s_{XY} = \frac{\sum_{i=1}^{n}(X_i - \bar{X})(Y_i - \bar{Y})}{n-1}$

Pearson Korrelasjon: $r = \frac{s_{XY}}{s_X s_Y}$

Minste kvadraters estimater i bivariat regresjon.

$\hat{b}_0 = \bar{Y} - \hat{b}_1 \cdot \bar{X}$ $\quad$ $\hat{b}_1 = \frac{\sum_{i=1}^{n}(X_i - \bar{X}) \cdot (Y_i - \bar{Y})}{\sum_{i=1}^{n}(X_i - \bar{X})^2} = \frac{s_{XY}}{s_X^2}$

Standardfeilen til estimatet av b_1 i en bivariat regresjon. $SE(\hat{b}_1) = \frac{s}{\sqrt{\sum(X_i - \bar{X})^2}}$ $\quad$ $s = \sqrt{\frac{\sum(Y - \hat{Y})^2}{n-p-1}}$

Standardisert regresjonskoeffisient $\beta_i = b_i \frac{s_X}{s_Y}$

Sums of squares: $\sum(Y_i - \bar{Y})^2 = \sum(\hat{Y}_i - \bar{Y})^2 + \sum(Y_i - \hat{Y}_i)^2$

r^2: $r^2 = 1 - \frac{SSE}{TSS}$ $\quad$ $Justert\ r^2 = 1 - \frac{(n-1)(1-r^2)}{n-p-1}$

Z-skåre: $Z = \frac{X - \bar{X}}{s_X}$

F-ratio: $F = \frac{MSM}{MSE}$, er i en multippel regresjonsanalyse fordelt F(df_1=p, df_2=n-p-1) under H_0.

T-test: $t = \frac{\hat{b}_i}{SE(\hat{b}_i)}$, er i en multippel regresjonsanalyse fordelt t(df=n-p-1) under H_0.

Kji-kvadrat: $\chi^2 = \sum \frac{(O-E)^2}{E}$, fordelt $\chi^2(df = (Rader-1)(Kol-1)\ )\ under\ H_0$ $\quad$ $E_{kol\ i,radj} = \frac{R_j \times C_i}{n}$

Enveis Anova (mellom-gruppe design):

$SS_{between}$: $SS_b = \sum_{j=1}^{g}\sum_{i=1}^{n_j}(\bar{y}_j - \bar{y})^2 = \sum_{j=1}^{g} n_j(\bar{y}_j - \bar{y})^2$ $\quad$ $df_b = g - 1$

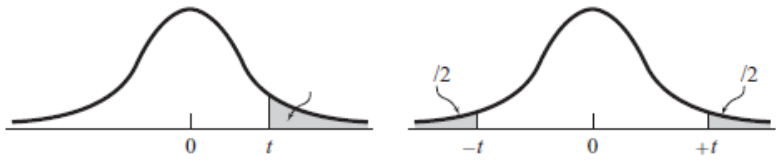
SS_{within} : $SS_w = \sum_{j=1}^{g}\sum_{i=1}^{n_j}(y_{ij} - \bar{y}_j)^2$ $\quad$ $df_w = n - g$

For "standardfeilen" (SE) til en differanse mellom to gjennomsnitt bruker vi:

$SE_{diff} = \sqrt{\frac{2\,MSS_w}{n}}$ (der *n* er antall personer innad i hver gruppe).

$t = \frac{x_1 - x_2}{SE_{diff}}$, med frihetsgrader (df) fra MSSw

Appendix *t*: Percentage Points of the *t* Distribution



One-tailed test Two-tailed test

	Level of Significance for One-Tailed Test								
	0.25	*0.20*	*0.15*	*0.10*	*0.05*	*0.025*	*0.01*	*0.005*	*0.0005*
	Level of Significance for Two-Tailed Test								
df	*0.50*	*0.40*	*0.30*	*0.20*	*0.10*	*0.05*	*0.02*	*0.01*	*0.001*
1	1.000	1.376	1.963	3.078	6.314	12.706	31.821	63.657	636.620
2	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	31.599
3	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	12.924
4	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	8.610
5	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	6.869
6	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.959
7	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	5.408
8	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	5.041
9	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.781
10	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.587
11	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.437
12	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	4.318
13	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	4.221
14	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	4.140
15	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	4.073
16	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	4.015
17	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.965
18	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.922
19	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.883
20	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.850
21	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.819
22	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.792
23	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.768
24	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.745
25	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.725
26	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.707
27	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.690
28	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.674
29	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.659
30	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.646
40	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.551
50	0.679	0.849	1.047	1.299	1.676	2.009	2.403	2.678	3.496
100	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	3.390
∞	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.291

Source: The entries in this table were computed by the author.