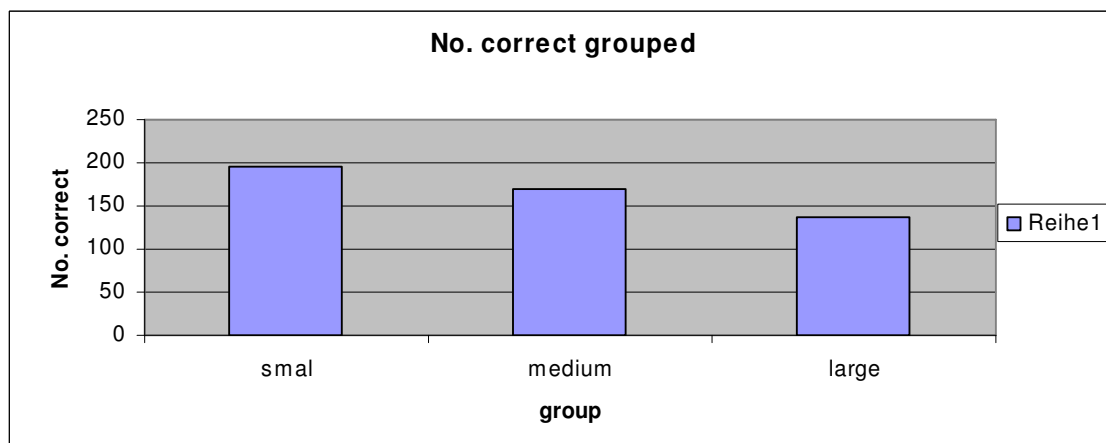
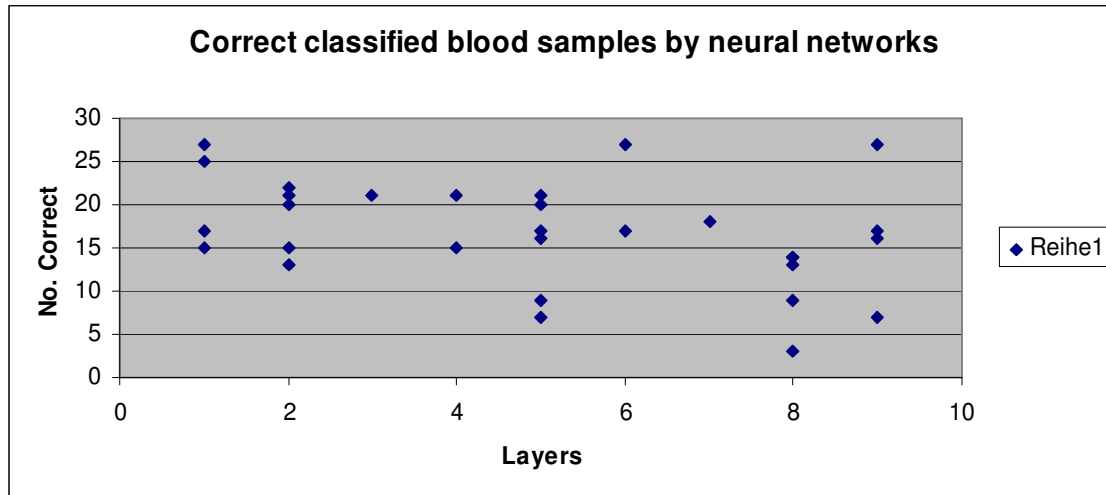


Exercise One:

The given data of Exercise 1 is interval scaled.



Descriptive statistical data:

Descriptive Statistics

groups:	N	Minimum	Maximum	Mean	Std. Deviation	correct classification rate
small	10	13,00	27,00	19,6000	4,55095	0,392
medium	10	7,00	27,00	17,0000	5,86894	0,34
large	10	3,00	27,00	13,8000	6,61312	0,276
altogether	30	3,00	27,00	16,8000	6,04238	0,336

Considering the descriptive statistical data as above my supposition goes to the direction, that the larger the number of layers of the neural network, the less the number of correct classified blood samples is. To prove this speculation, I use a one-factor-ANOVA with $\alpha=0.05$.

One of the required prerequisites to calculate an ANOVA is the homogeneity of variances. So I test if the variances of the 3 different groups are homogeneous:

Test of Homogeneity of Variances

H₀: All variances are equal.

H₁: At least one variance differs from the other.

I take $\alpha = 0.1$ to get a small β failure.

Test of Homogeneity of Variances

Correct

Levene Statistic	df1	df2	Sig.
,172	2	27	,843

The α -failure is 10%. The test showed a significance of 84,3%, which is much bigger than α . So H₀ is to be hold. The variances are homogeneous.

ANOVA

H₀: All mean values are equal – so there is no difference between the correct classification rate of the neural network and its number of layers.

H₁: At least one mean value differs from the other – so there is a difference.

As said above: $\alpha = 0,05$.

ANOVA

Correct

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	168,800	2	84,400	2,560	,096
Within Groups	890,000	27	32,963		
Total	1058,800	29			

H₀ is to be hold, because the significance value of 9,6% is bigger than $\alpha = 5\%$.

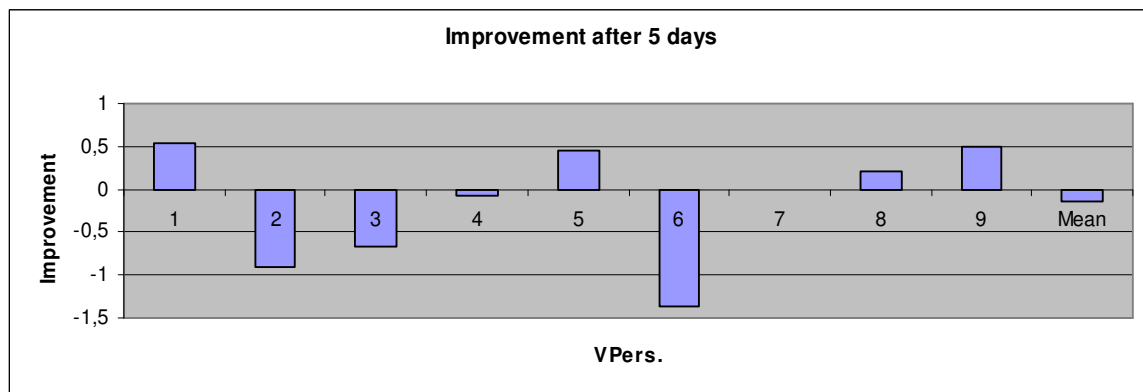
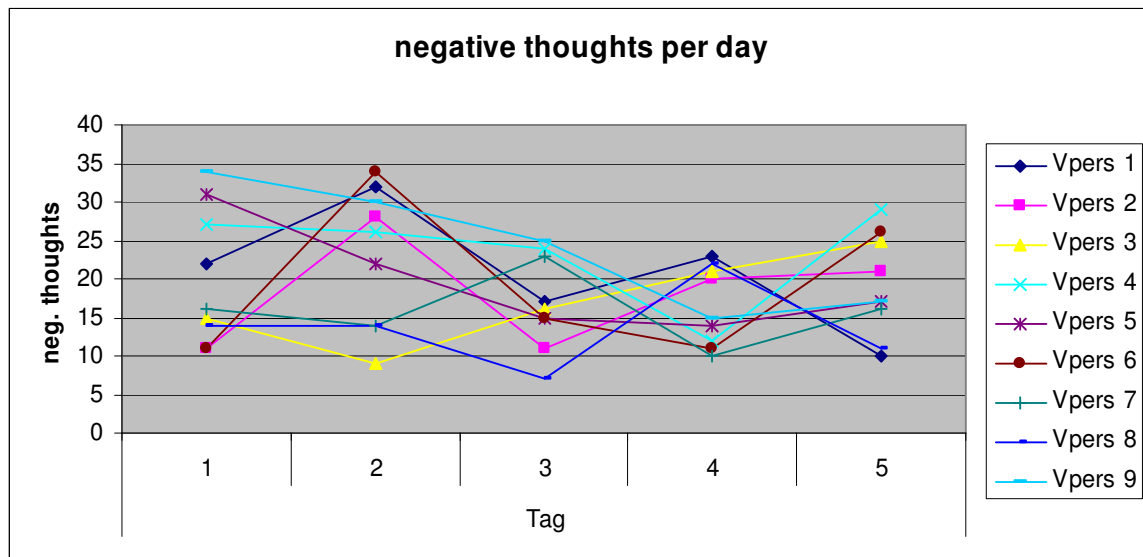
Results:

Although my first supposition was, that the increased number of layers of the neural network leads to less correct classified samples, this hypothesis could not be proven by the applied test.

There is no significant difference between the correct classification rates of different sized neural networks.

Exercise 2:

The given data is considered to be interval scaled.



Descriptive statistical data:

		day:					descriptives (VP):			
		1	2	3	4	5	mean	std. deviation	correlation	improvement
Vpers	1	22	32	17	23	10	20,80	8,11	-0,64	54,55%
	2	11	28	11	20	21	18,20	7,26	0,26	-90,91%
	3	15	9	16	21	25	17,20	6,10	0,83	-66,67%
	4	27	26	24	12	29	23,60	6,73	-0,23	-7,41%
	5	31	22	15	14	17	19,80	6,98	-0,82	45,16%
	6	11	34	15	11	26	19,40	10,21	0,11	-136,36%
	7	16	14	23	10	16	15,80	4,71	-0,13	0,00%
	8	14	14	7	22	11	13,60	5,50	0,06	21,43%
	9	34	30	25	15	17	24,20	8,17	-0,95	50,00%

Descriptives (days):		mean	std. deviation	20,11	8,72	23,22	8,97	17,00	6,06	16,44	5,08	19,11	6,62

Considering the descriptive data, I would suppose, that the cognitive therapy did not have effects – neither to improve nor to deteriorate the thoughts of the subject.

To get more detailed information I apply an ANOVA with repeated measurements (because each subject was examined 5 days).

H₀: All mean values are equal – so the therapy did not have effects on the patients – neither good nor bad.

H₁: At least one mean value differs from the other – so the therapy was effective.

$\alpha = 0,05$.

Tests of Within-Subjects Effects

Measure:

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
day	Sphericity Assumed	265,022	4	66,256	1,303	,290
	Greenhouse-Geisser	265,022	3,354	79,016	1,303	,294
	Huynh-Feldt	265,022	4,000	66,256	1,303	,290
	Lower-bound	265,022	1,000	265,022	1,303	,287
Error(day)	Sphericity Assumed	1627,378	32	50,856		
	Greenhouse-Geisser	1627,378	26,832	60,650		
	Huynh-Feldt	1627,378	32,000	50,856		
	Lower-bound	1627,378	8,000	203,422		

The value which is interesting for the hypothesizes is the Sphericity assumed (day), which has a significance of 29%. This is more than the 5% of the α -failure, so H₀ is to be hold.

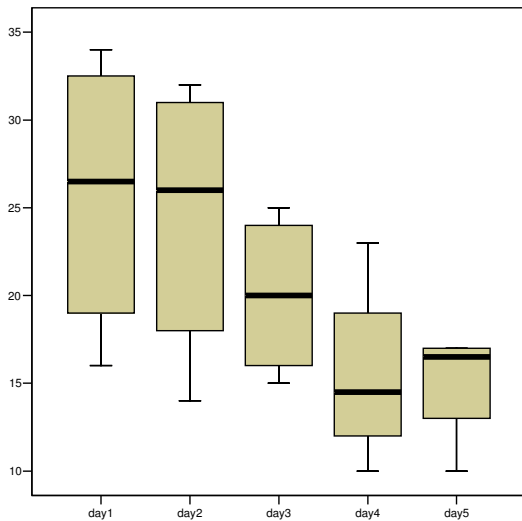
Results:

Although some subjects improved their number of negative thoughts, there are also some who deteriorated their thoughts. The applied test showed, that the cognitive therapy was not effective.

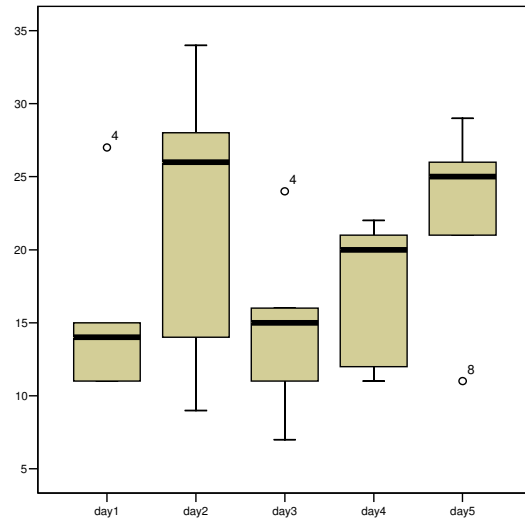
Exercise 3:

negative thoughts per day – grouped after sex

male:



female:



Descriptive Statistics

male:	N	Mini mum	Maxi mum	Mea n	Std. Deviation
day1	4	16	34	25,75	8,261
day2	4	14	32	24,50	8,226
day3	4	15	25	20,00	4,761
day4	4	10	23	15,50	5,447
day5	4	10	17	15,00	3,367
Valid N (listwise)	4				

female:	N	Mini mum	Maxi mum	Mea n	Std. Deviation
day1	5	11	27	15,60	6,618
day2	5	9	34	22,20	10,354
day3	5	7	24	14,60	6,348
day4	5	11	22	17,20	5,263
day5	5	11	29	22,40	6,986
Valid N (listwise)	5				

Considering the graphs and the descriptive statistical data I come to the close supposition, that the therapy has a slight effect on male subject, but none on female subjects.

To get more detailed information I apply another ANOVA, this time with the sex-factor included.

H₀: All mean values are equal – so the therapy effects did not differ between male and female subjects.

H₁: At least one mean value differs from the other – so the therapy effects did differ.

$\alpha = 0,05$.

Tests of Within-Subjects Effects

Measure:

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
day	Sphericity Assumed	278,689	4	69,672	1,589	,205
	Greenhouse-Geisser	278,689	2,931	95,069	1,589	,223
	Huynh-Feldt	278,689	4,000	69,672	1,589	,205
	Lower-bound	278,689	1,000	278,689	1,589	,248
day * sex	Sphericity Assumed	399,578	4	99,894	2,278	,086
	Greenhouse-Geisser	399,578	2,931	136,308	2,278	,111
	Huynh-Feldt	399,578	4,000	99,894	2,278	,086
	Lower-bound	399,578	1,000	399,578	2,278	,175
Error(day)	Sphericity Assumed	1227,800	28	43,850		
	Greenhouse-Geisser	1227,800	20,520	59,834		
	Huynh-Feldt	1227,800	28,000	43,850		
	Lower-bound	1227,800	7,000	175,400		

The significance value of 8,6% is higher than the α -failure of 5%, so H0 holds. The therapy effects do not differ between different sex.

But the difference between the two values is rather small, so I will apply separated ANOVAs, one for each sex, to say more about it.

female:

H₀: All mean values are equal – so the therapy did not have effects on the female patients – neither good nor bad.

H₁: At least one mean value differs from the other – so the therapy was effective.

$\alpha = 0,05$.

Tests of Within-Subjects Effects

Measure:

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
day	Sphericity Assumed	270,800	4	67,700	1,340	,298
	Greenhouse-Geisser	270,800	2,239	120,953	1,340	,314
	Huynh-Feldt	270,800	4,000	67,700	1,340	,298
	Lower-bound	270,800	1,000	270,800	1,340	,311
Error(day)	Sphericity Assumed	808,400	16	50,525		
	Greenhouse-Geisser	808,400	8,956	90,268		
	Huynh-Feldt	808,400	16,000	50,525		
	Lower-bound	808,400	4,000	202,100		

Looking at the female subjects only the ANOVA shows a significance of 29,8%, which is higher than $\alpha = 5\%$. So H0 holds, the therapy is not effective for female subjects.

male:

H0: All mean values are equal – so the therapy did not have effects on the male patients – neither good nor bad.

H1: At least one mean value differs from the other – so the therapy was effective.

$\alpha = 0,05$.

Tests of Within-Subjects Effects

Measure:

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
day	Sphericity Assumed	393,800	4	98,450	2,817	,073
	Greenhouse-Geisser	393,800	2,228	176,759	2,817	,127
	Huynh-Feldt	393,800	4,000	98,450	2,817	,073
	Lower-bound	393,800	1,000	393,800	2,817	,192
Error(day)	Sphericity Assumed	419,400	12	34,950		
	Greenhouse-Geisser	419,400	6,684	62,750		
	Huynh-Feldt	419,400	12,000	34,950		
	Lower-bound	419,400	3,000	139,800		

Like in the case of only female subjects, H0 holds, because the significance is 7,3% which is higher than the α -failure of 5%.

Results:

According to the applied tests the therapy effects do not differ between male and female patients.

But looking at the data there is shown, that the significance of the male subjects is very close to the α -failure (7,3%), while the significance for female subjects is rather not (29,8%). This could indicate that the therapy in fact is effective for male patients, although the test could not prove that.

F.ex. there could be more subjects examined during a longer period to show that the therapy is effective.