Exercise 1

Rotated Component Matrix

	Component	
	1	2
Working Fast?	.729	.187
Too much work to do?	.583	.337
Work extra hard to finish something?	.759	.227
Work under time pressure?	.773	.299
Do you have to hurry?	.827	.171
Can you do your job in your own time?	-.661	-.019
Are you behind in your work?	.520	.222
Too little work?	.556	.093
Problems with work pace?	.169	.793
Problems with work pressure?	.145	.839
Do you want to be calmer in your work?	.229	.716

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

a. Component loading on the second component of item 'Too little work?' is: 0.093

b. Correlation between item 'Working fast?' and the first component is: 0.729. Therefore, correlation between items and components represent component loadings.

c. Percentage of explained variance of item 'Working fast?' by the first component is: 0.729 * 0.729 = 0.531 = 53,1%

d. Communality of the item 'Working fast?' is: 0.729 * 0.729 + 0.187 * 0.187 = 0.566

e. Unicity of the item 'Working fast?' is: 1 – 0.566 = 0.434 (actually not unicity but unexplained variance)

f. Amount of variance of all items explained by the first component (i.e. eigenvalue of first component) is actually sum of proportions of explained variances for each item:

$$0.729^2 + 0.583^2 + 0.759^2 + 0.773^2 +$$
$$0.827^2 + -0.661^2 + 0.520^2 + 0.556^2 +$$
$$0.169^2 + 0.145^2 + 0.229^2 = 3.847 = \lambda_1$$

g. Amount of variance of all items explained by the two components together:

$$0.187^2 + 0.337^2 + 0.227^2 + 0.299^2 +$$
$$0.171^2 + -0.019^2 + 0.222^2 + 0.093^2 +$$
$$0.793^2 + 0.839^2 + 0.716^2 = 2.22$$
$$2.222 + 3.847 = 6.069 = \lambda_1 + \lambda_2$$

This can also be calculated as a sum of item's communalities.

h. Total proportion of variance that is explained by both components:

$$\frac{\lambda_1 + \lambda_2}{number\ of\ items} = \frac{6.069}{11} = 0.552$$

i. Reproduced correlation between the item 'Working fast?' and the item 'Too

little work?' is equal to the sum of products of the factor loadings of these two variables on the components F1 and F2:

$$r_{sw,tww} = 0.729 * 0.556 + 0.187 * 0.093 = 0.423$$

j. residual correlation between items 'Working fast?' and 'Too little work?' is de observed correlation minus the reproduced correlation:

0.309 – 0.423 = -0.114

k. $r_{sw,tww} = .4346 - .00049 - .0144 + .00273 = 0.422$

→ is equal to i.

l. Rule of thumb for choosing right solution. Choose oblimin when:
   1) Simple structure is clearly better approximated by oblimin then by varimax.
   OR
   2) correlation between a pair (or pairs) of components is > 0.3.

Here we choose OBLIMIN:
Because the two components are correlated (0.428> 0.3) and the simple structure with oblimin is better approximated than by varimax. (E.g., item 2 loads on both factors after varimax but not after oblimin).

m. Factor 1: work pressure.
     Factor 2: problems with work pressure

Excercise 2.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5,655	31,416	31,416	5,655	31,416	31,416
2	2,142	11,898	43,315	2,142	11,898	43,315
3	1,188	6,599	49,914	1,188	6,599	49,914
4	,949	5,271	55,184			
5	,818	4,542	59,726			
6	,795	4,417	64,143			
7	,740	4,111	68,254			
8	,668	3,709	71,962			
9	,649	3,605	75,567			
10	,627	3,481	79,048			
11	,552	3,064	82,112			
12	,548	3,042	85,154			
13	,523	2,907	88,061			
14	,511	2,840	90,901			
15	,460	2,553	93,454			
16	,435	2,417	95,872			
17	,426	2,366	98,238			
18	,317	1,762	100,000			

Extraction Method: Principal Component Analysis.

a. Why 3 components?
When you look at the scree-plot you can distinguish these 3 components. When you apply Kaiser criterion (eigenvalues > 1) there are 3 components with eigenvalues >1.

Communalities

	Initial	Extraction
claim state benefits	1,000	,426
cheating on tax	1,000	,686
joyriding	1,000	,433
taking soft drugs	1,000	,424
lying	1,000	,510
adultery	1,000	,402
accepting a bribe	1,000	,465
homosexuality	1,000	,574
abortion	1,000	,646
divorce	1,000	,680
euthanasia	1,000	,485
suicide	1,000	,434
throwing away litter	1,000	,505
driving under influence of alcohol	1,000	,537
paying cash	1,000	,530
having casual sex	1,000	,499
smoking in public places	1,000	,310
speeding over limit	1,000	,437

Extraction Method: Principal Component Analysis.

b. Percentage of explained variance of 'Joyriding': 43,3 %

c. Unicity is 1 – communality. Unicity of item 'Joyriding' is:

1 – 0.433 = 0.567

d. Eigenvalue can be seen in a table 'Total variance explained'.

Eigenvalue of the first component is: 5.655

e. Total variance explained by the three components is sum of the eigenvalues for each of the components:

5.655 + 2.142 + 1.188 = 8.985 = 0.499*18

f. No. Items 'having casual sex', 'adultery (2x)', 'taking soft drugs', 'smoking in public places' and 'accepting a bribe' loads on more than 1 component. Thus they don't satisfy the simple structure.

g. Look in the structure matrix. Correlation between 'joyriding' and the first component is 0.655.

h. No. Items 'taking soft drugs' and 'accepting a bribe' loads on 2 out of 3 components. However, this solution is

much closer to the simple structure than the Varimax rotation.

i. Choose the Oblimin solution. It approximates better simple structure and its components correlate with each other (-0.432 between component 1 and component 3).

j. From *Hagenaars, Halman & Moors* (2003):

1. tolerance for criminal behavior

2. tolerance for personal sexual behavior (behavior towards people)

3. tolerance for selfish behavior

k. look in the last table: 0.454

l. look in the last table: -0.033