Exercise 1   X = T + E

a and b.

Subject	T	E	X
1	9	0	9
2	8	1	9
3	7	-1	6
4	6	0	6
5	6	0	6
6	5	-1	4
7	4	1	5
8	3	0	3
	$\bar{T} = 6$	$\bar{E} = 0$	$\bar{X} = 6$

c. $S_T^2 = 4$ $S_E^2 = 0.571$ $S_X^2 = 4.571$

Descriptive Statistics

	N	Mean	Variance
T	8	6,00	4,000
E	8	,00	,571
X	8	6,00	4,571
Valid N (listwise)	8		

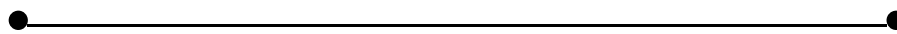d. $r_{XX'} = \dfrac{S^2_T}{S^2_X} = \dfrac{4}{4.571} = 0.875$

Exercise 2.

1. My own interest is mostly more important to me than the interests of others
2. I enjoy it if I can do other people a favor
3. If I do something for someone, I do want something back for it.
4. I do not really think about others' interests
5. I often take others' problems to heart

Altruism scale (continuous scale)

negative end   positive end

●────────────────────────●

Not altruistic   Altruistic

item1 score 5   item1 score 1

item2 score 1   item2 score 5

item3 score 5   item3 score 1

item4 score 5   item4 score 1

item5 score 1   item5 score 5

Items 1, 3 and 4 are formulated in a negative manner, i.e. higher scores on items indicate lower level of altruism.

Solution through the inversion of the items' scales (item 1, 3 and 4)

Thus: score 5 must become 1

score 4 must become 2

score 3 must become 3

score 2 must become 4

score 1 must become 5

Via SPSS function COMPUTE:

Item1new = 6 – item1

Item3new = 6 – item3

Item4new = 6 – item4

It is also possible to use function RECODE into different variable:

1 → 5

2 → 4

3 → 3

4 → 2

5 → 1

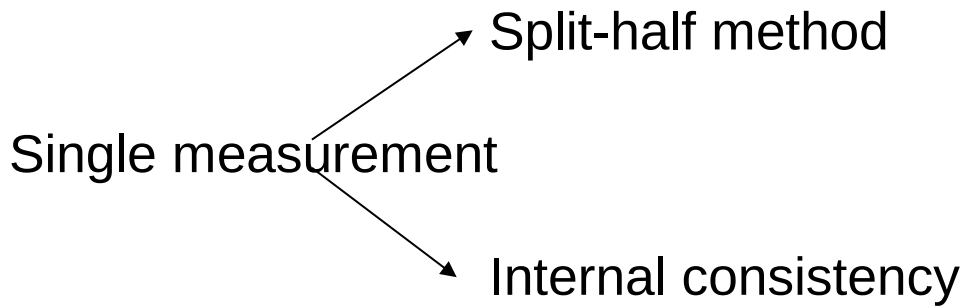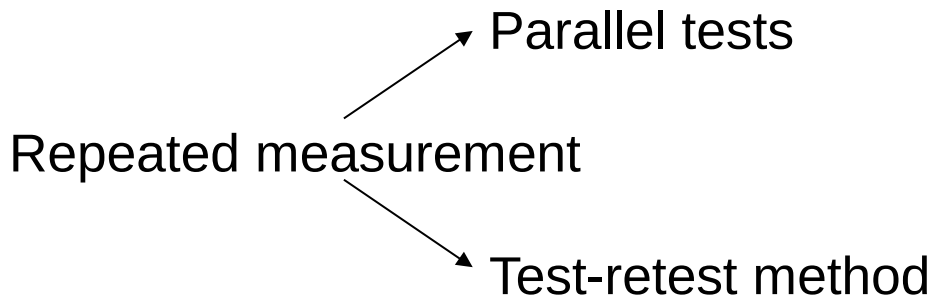# Exercise 3.

Repeated measurement → Parallel tests

Repeated measurement → Test-retest method

Single measurement → Split-half method

Single measurement → Internal consistency

Reliability:

Stability of an instrument:

> The degree to which test scores of the same person stay constant when testing in the same circumstances (p.6R).

1. test-retest reliability

Advantages:
- only 1 test is made
- similar to the definition of the reliability

Disadvantages:
- how long the period between the 2 test takes must be?
- Treats to internal validity

Treats to internal validity:

History: intermediate event occurs and affects the outcome. (T changes)

Maturation: 'natural' change over time. (T changes)

Testing: first measurement changes the subject (T changes, learning, memory)

Intrumentation: the instrument changes over time. (items change, other taker etc.)

Selection - dropouts: Failure of certain non-random group of subjects

2. Parallel form method

Advantages:
- Similar to the definition of the reliability.

Disadvantages:
- Also suffer from treats to internal validity, to a lesser extent than the test-retest, but in principle the same disadvantages as with test-retest. (less memory effect)
- 2 tests
- Difficult to construct 2nd test

3. Split half reliability

Advantages:
- Easy, because there is only 1 test at time 1.
- Less treats to internal validity

Disadvantages:
- Does not agree with the definition of the reliability.
- Construction of 2 parallel halves is difficult.

4. Cronbach's alpha

Advantages:

- Easy, because there is only 1 test at time 1.
- Do not bother with making 2 halves.
- Less treats to internal validity
- SPSS

Disadvantages:
- Does not agree with the definition of the reliability.
- Alpha is an underestimate of the reliability.

Exercise 4.

$X = X_1 + X_2 + X_3 + X_4$
X is sum score

Covariance matrix items:

	X_1	X_2	X_3	X_4
X_1	var(X_1)			
X_2	cov(X_2,X_1)	Var(X_2)		
X_3	cov(X_3,X_1)	Cov(X_3,X_2)	var(X_3)	
X_4	cov(X_4,X_1)	Cov(X_4,X_2)	cov(X_4,X_3)	var(X_4)

	X_1	X_2	X_3	X_4
X_1	2.4			
X_2	1.6	2.8		
X_3	1.4	1.5	2.1	
X_4	1.2	1.4	1.1	2.5

$$\alpha = \frac{J}{J-1}\left[1 - \frac{\sum \text{var}(X_j)}{\text{var}(X)}\right]$$

Var(X) using rule variance linear combinations

s_x^2 = 2.4+2.8+2.1+2.5+2(1.6+1.4+1.5+1.2+1.4+
1.1) = 9.8 +16.4 = 26.2

Insert in the formula:

$$\alpha = \frac{4}{3}\left[1 - \frac{9.8}{26.2}\right] = \frac{4}{3}\left[1 - 0.3740\right]$$
$$= \frac{4}{3} * 0.6260 = 0.8346$$

Exercise 5.

5a. Least tolerant:
- V227 (gem. 1.4215) joyriding
- V238 (gem. 1.5498) driving under infl. of alcohol

Most tolerant:
- V234 (gem. 5.5142) divorce
- V235 (gem. 4.8280) euthanasia
- V233 (gem. 4.6211) abortion
- V232 (gem. 4.4158) homosexuality

5b.
Requirements for parallel items are:
- Equal means
- Equal variances

- Mutual covariances equal

The (significant) differences in the averages and variances are such that the items <u>may not</u> be considered as parallel.
(N is so large that we don't need to check the significance)

5c.
What for are the data used?
In order to perform group comparisons, the criterion is a correlation higher than 0.7.
The reliability coeficient that we find (.8645) satisfies this condition.

What is the contribution of the items to the reliability?
All items contribute.
1. Look at 'alpha if item deleted'. These are all smaller than alpha.
2. Each item has a correlation with the rest of the scale greater than 0.3. Thus, the item-total correlation is good.

What to do when alpha if item deleted is greater than alpha? Then look at the wording of an item (content validity). If content of the item is not similar to that of the scale as a whole, than delete the item, otherwise leave the item in a scale.

Important comment:
Normally, one does not initiate a reliability analysis in order to assess whether or not one has developed a good scale. Techniques, which are more suitable to evaluate how many constructs lie at the bottom of responses to questions, are factor analytical techniques. These will just be discussed as from Lecture 7. We will apply factor analytical techniques on these data in Tutorial 5.

Exercise 6.

6a. The power is the probability that you reject H0 given that H0 is false. H0 in this situation is "no difference in tolerance between these six countries".
The power of a test increases as N increases. Here N is very high (N> 30000) so the power is great.
So if H0 is false (six populations from different countries differ with each other regarding tolerance), then we are rather sure that we will reject H0 when performing a test..

6b. From highest to lowest:
Sweden > Netherlands > UK > Russia = Italy > Hungary