Testing for measurement invariance of the PVQ5X questionnaire in ten countries

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Values – increasingly important role in the social sciences

What do we need to conduct fruitfull studies on values?
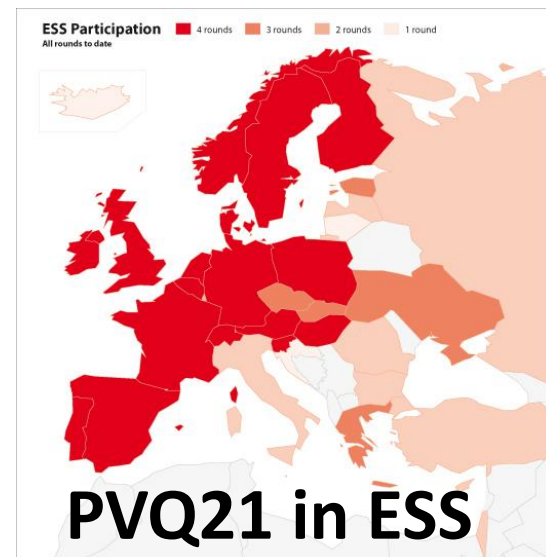
I
a good theory

We just have a good theory!
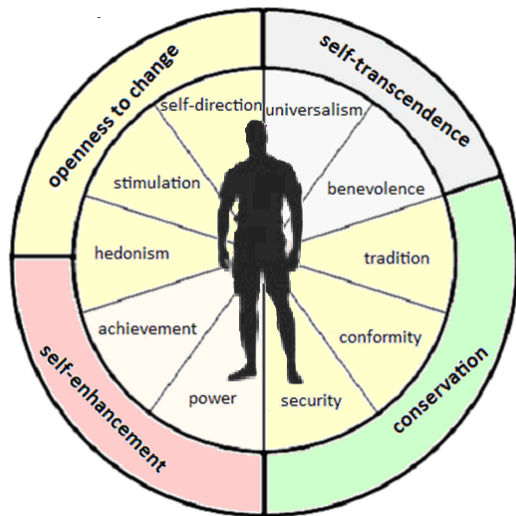
II
a good measurement

We just have a good measurement!

PVQ21 in ESS

Values – increasingly important role in the social sciences

What do we need to conduct fruitfull studies on values?

I

a good theory

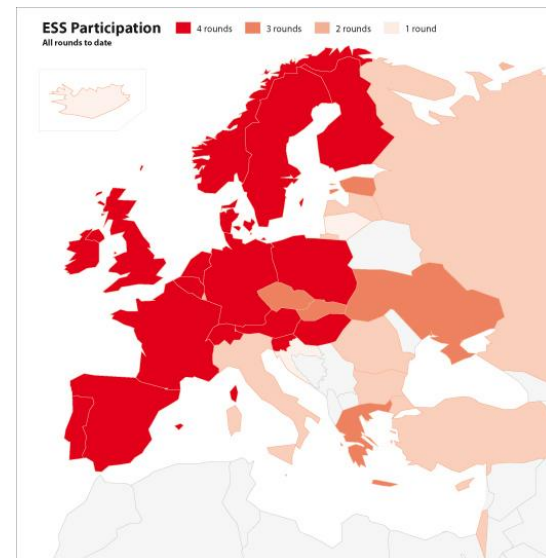**II**

a good measurement

Do we have a good theory???

Do we have a good measurement???

Good measurement = invariant measurement

Measurement invariance

Definition: Measurement invariance (MI) refers to

"whether or not, under different conditions of observing and studying a phenomenon, measurement operations yield measures of the same attribute" (Horn and McArdle, 1992: 117).
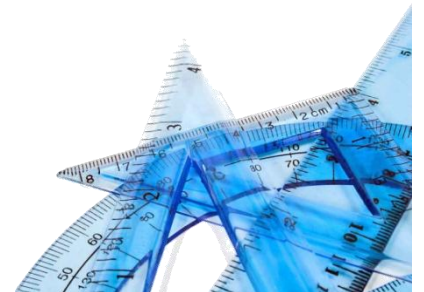
Multigroup Confirmatory Factor Analysis

1) configural invariance
2) metric invariance
3) scalar invariance

Group A (Culture, country, time point)
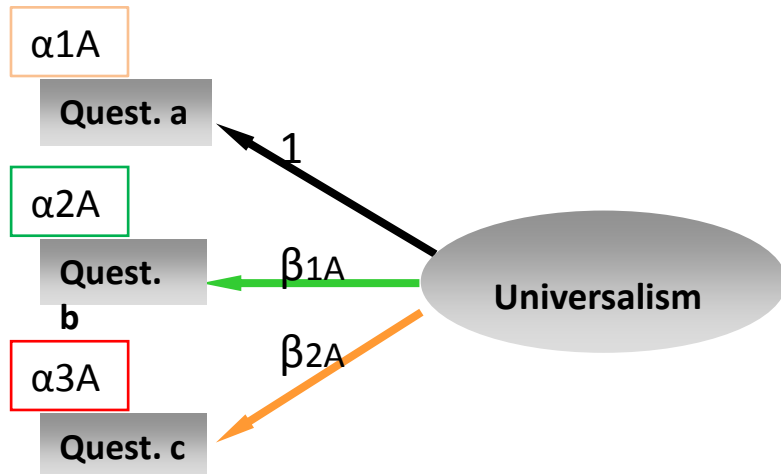
Group B (Culture, country, time point)
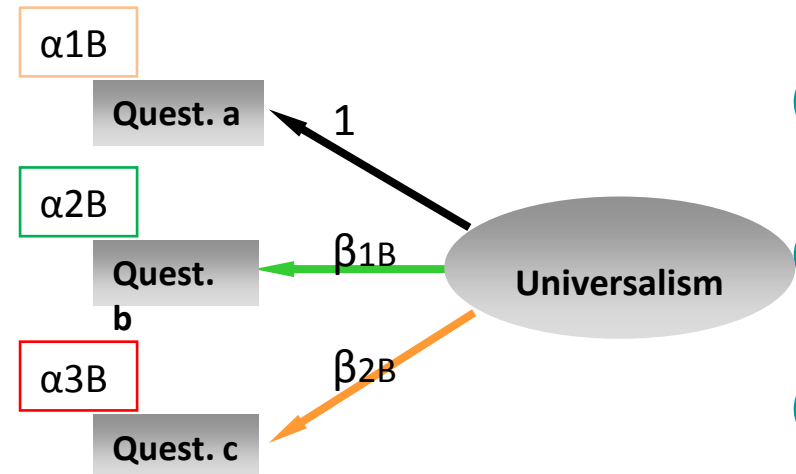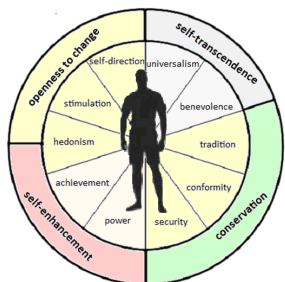
PVQ21
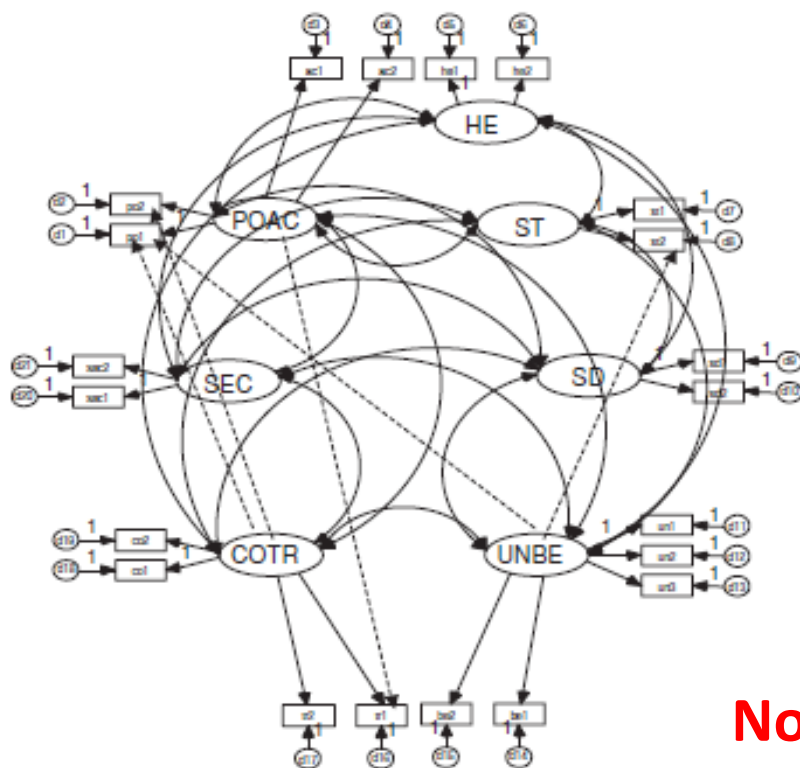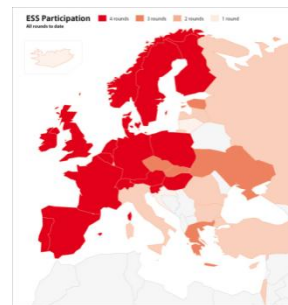
10 values → **7 values** *but*

No scalar measurement invariance!

Davidov, E., Schmidt, P., Schwartz, S. H. (2008) Bringing values back in. The adequacy of the European Social Survey to measure values in 20 countries. *Public Opinion Quarterly*, 72, 3, 420-445.

What to do?

First proposal

10 values = 7 values
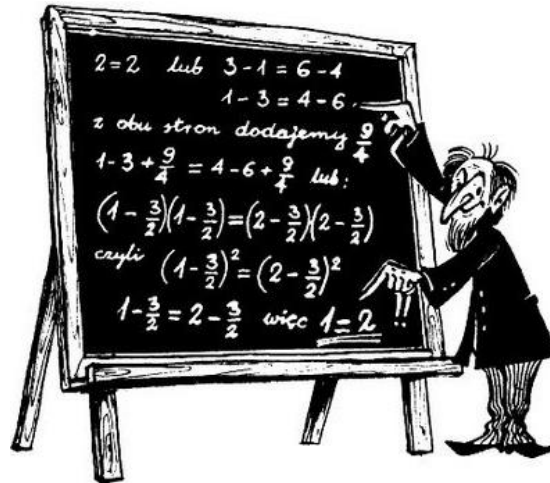
Second proposal

Schwartz:
refinment of the theory

Current study on measurement invariance

      1) new mesurement instrument: PVQ5x

      2) new method: accounting for ordinality

Summary of the new, refined theory

Summary of the new, refined theory
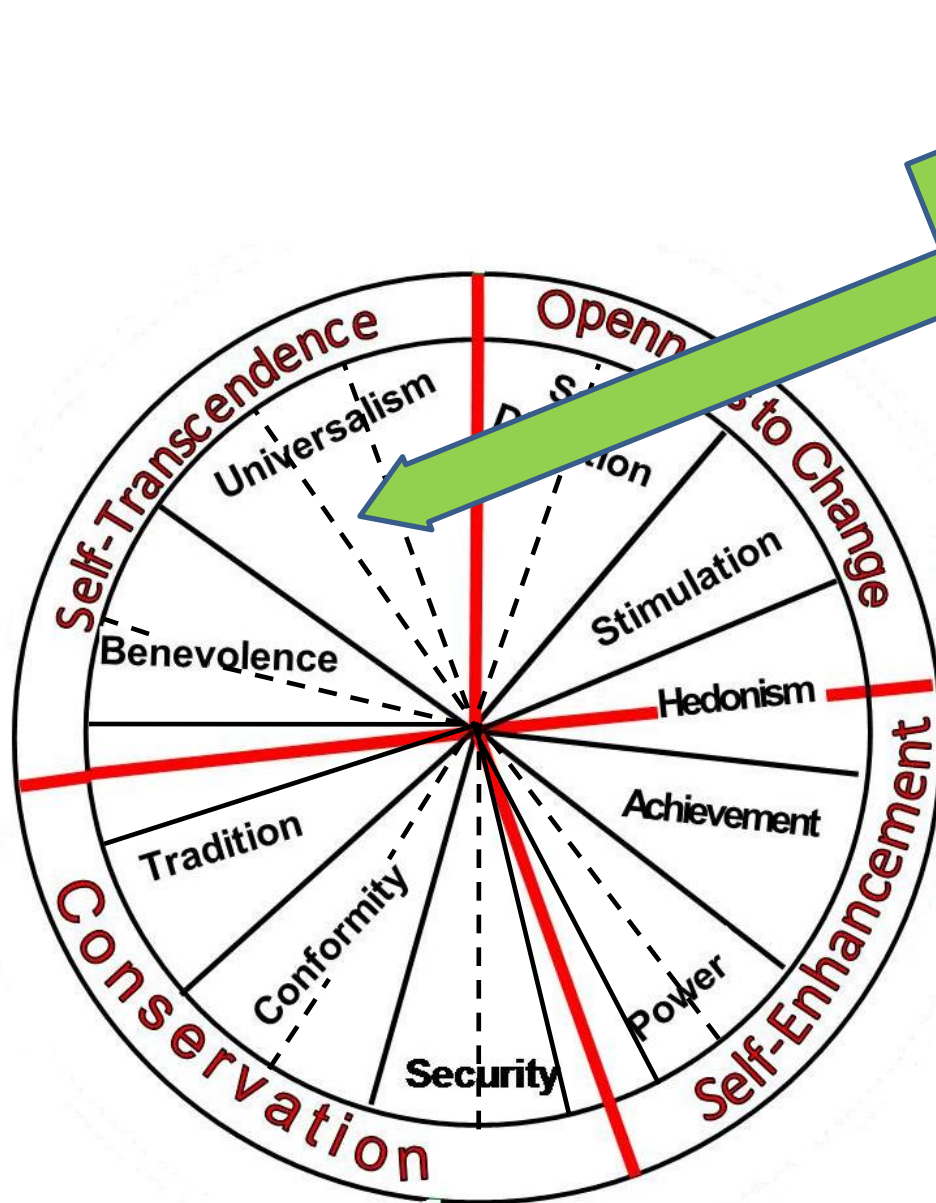
Universalism

➜ **Universalism - Concern**

Commitment to equality, justice and protection for all people

➜ **Universalism - Nature**

Preservation of the natural environment

➜ **Universalism - Tolerance**

Acceptance and understanding of those who are different from oneself
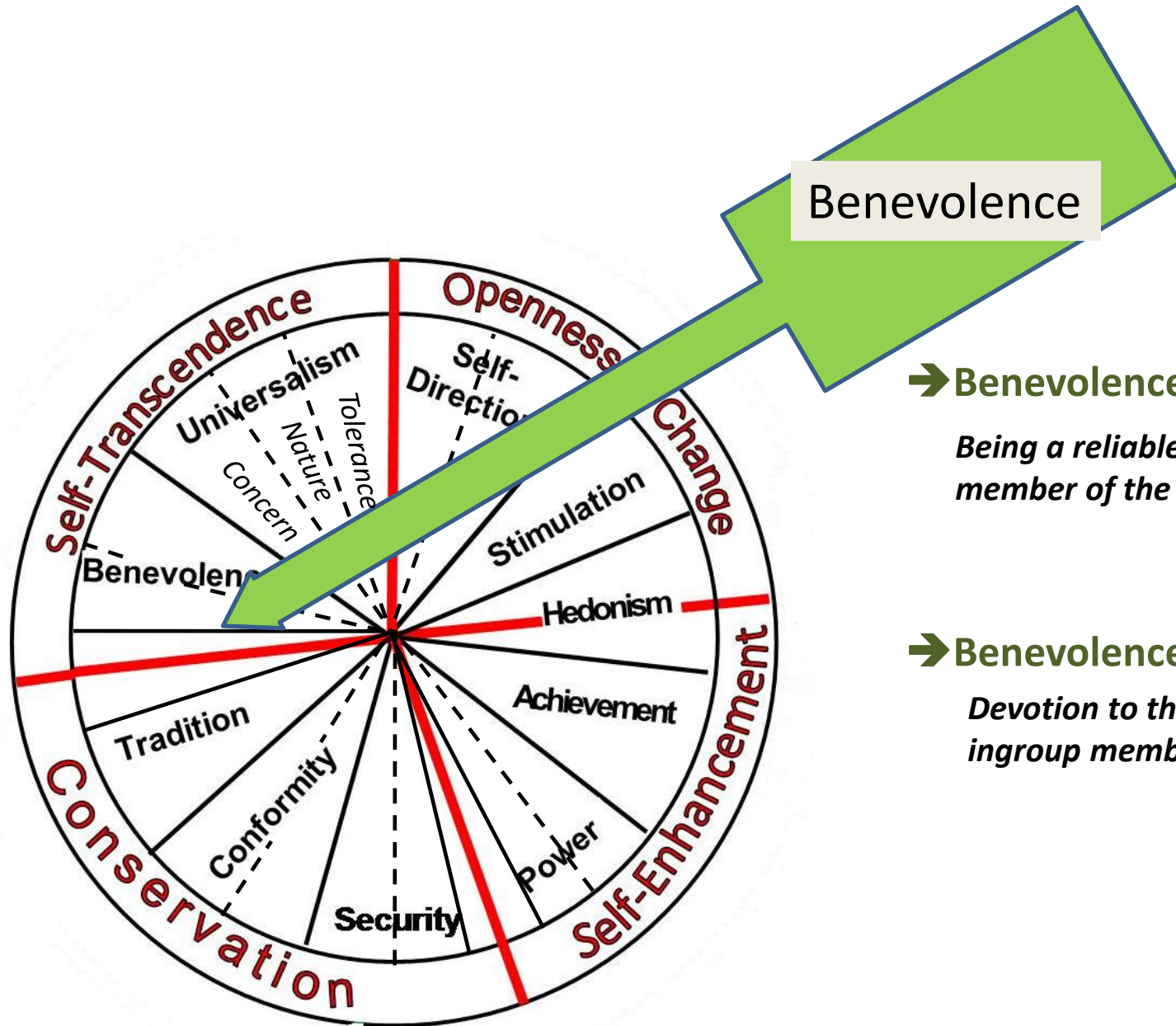
Benevolence

➔ **Benevolence -Dependability**

Being a reliable and trustworthy member of the ingroup

➔ **Benevolence-Caring**

Devotion to the welfare of ingroup members
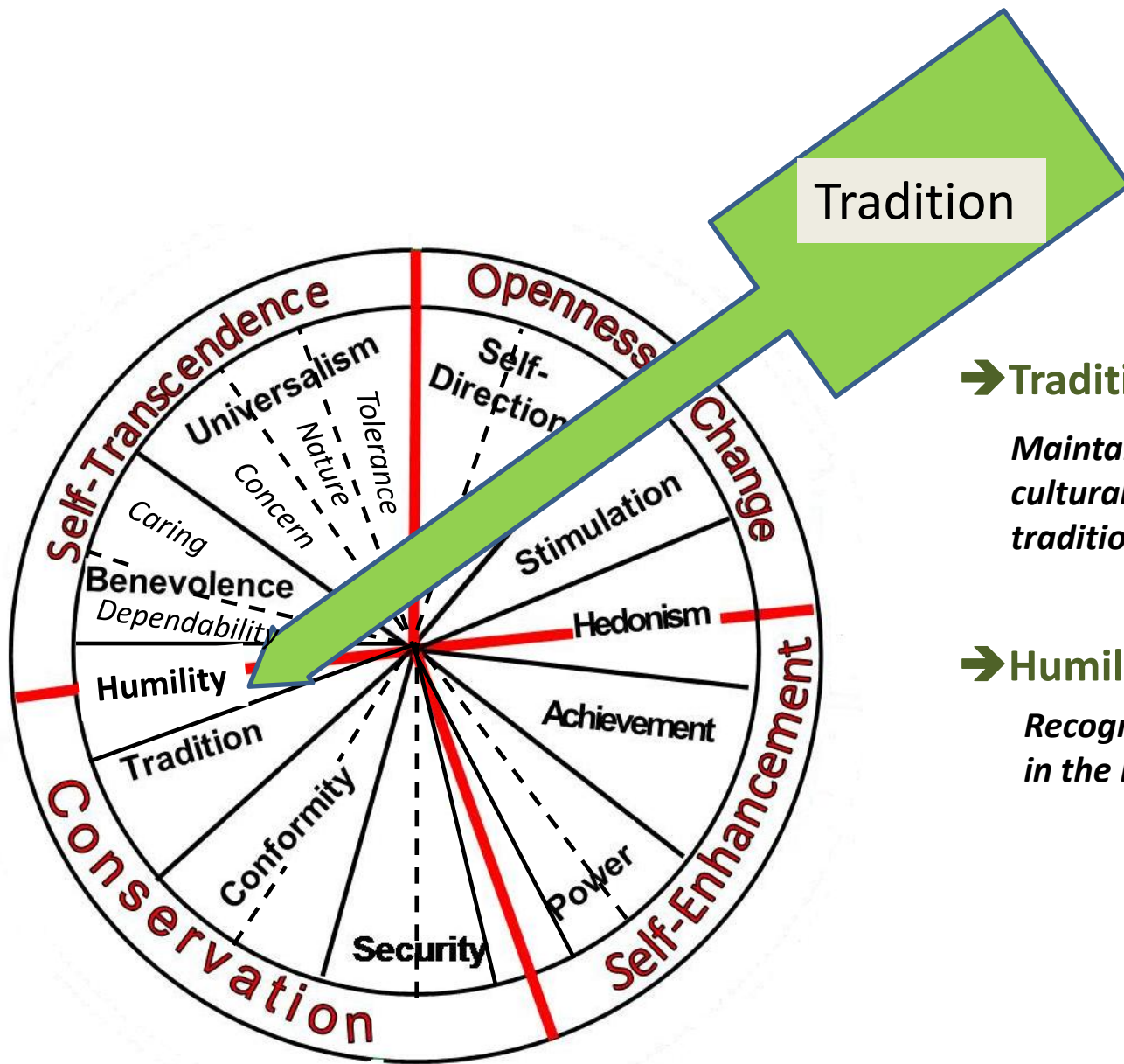
Tradition

Maintaining and preserving cultural, family or religious traditions

Humility

Recognizing one's insignificance in the larger scheme of things
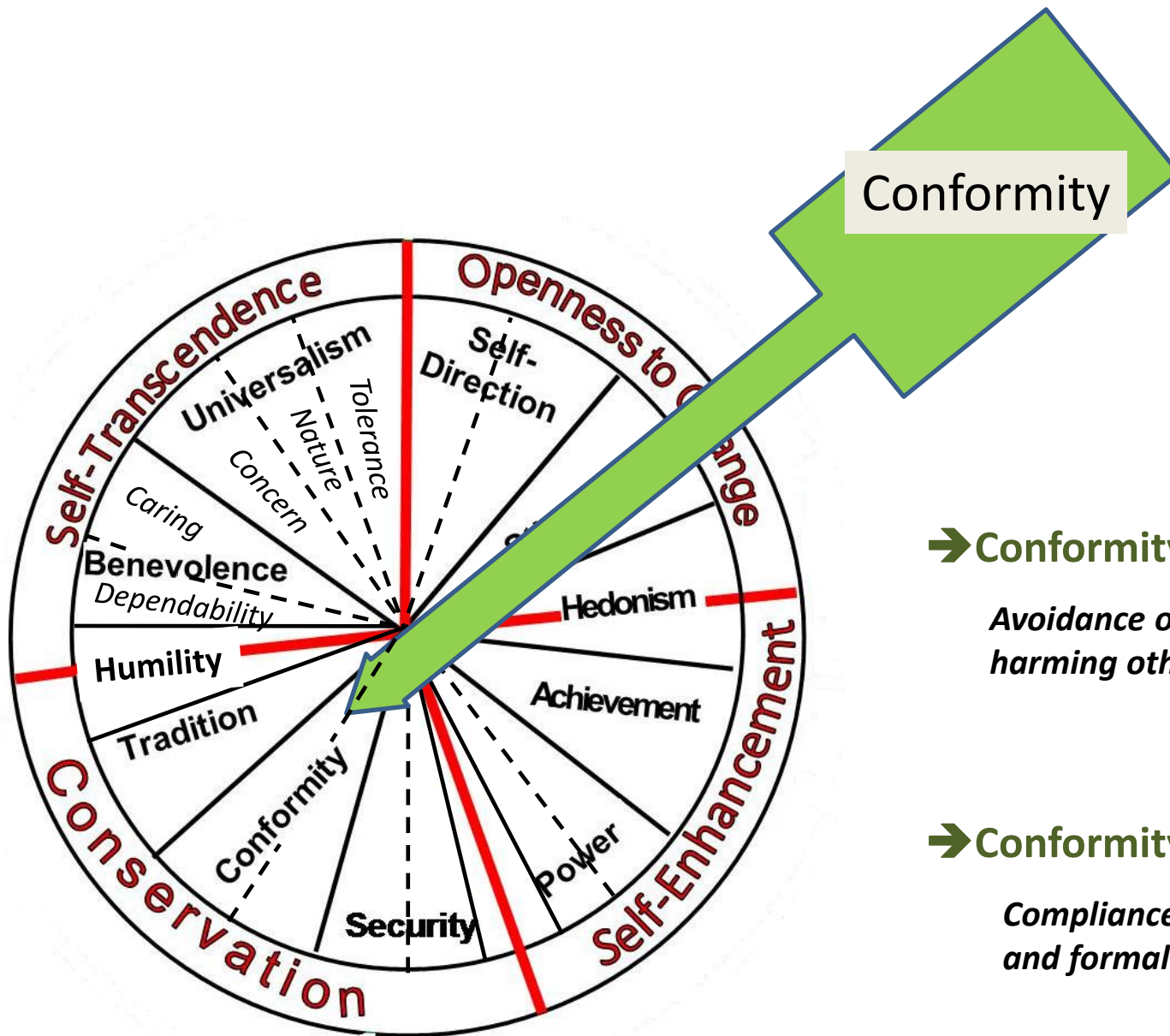
Conformity

→ **Conformity-Interpersonal**

Avoidance of upsetting or harming other people

→ **Conformity-Rules**

Compliance with rules, laws, and formal obligations

Security

➜ **Security-Societal**

Safety and stability in the wider society

➜ **Security-Personal**

Safety in one's immediate environment
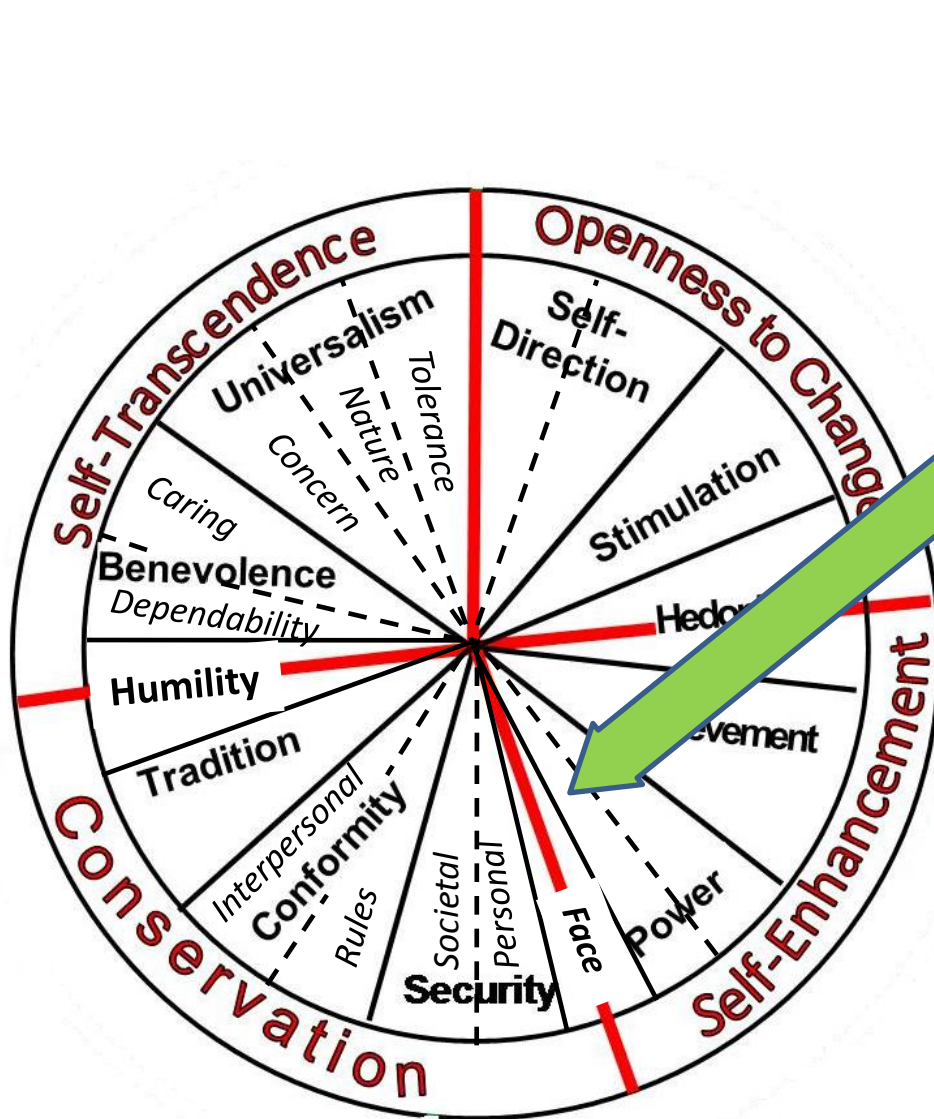
Power

→ **Face**

Security and power through maintaing one's public image and avoiding humiliation

→ **Power-Resources**

Power through control of material and social resources

→ **Power-Dominance**

Power through exercising control over people
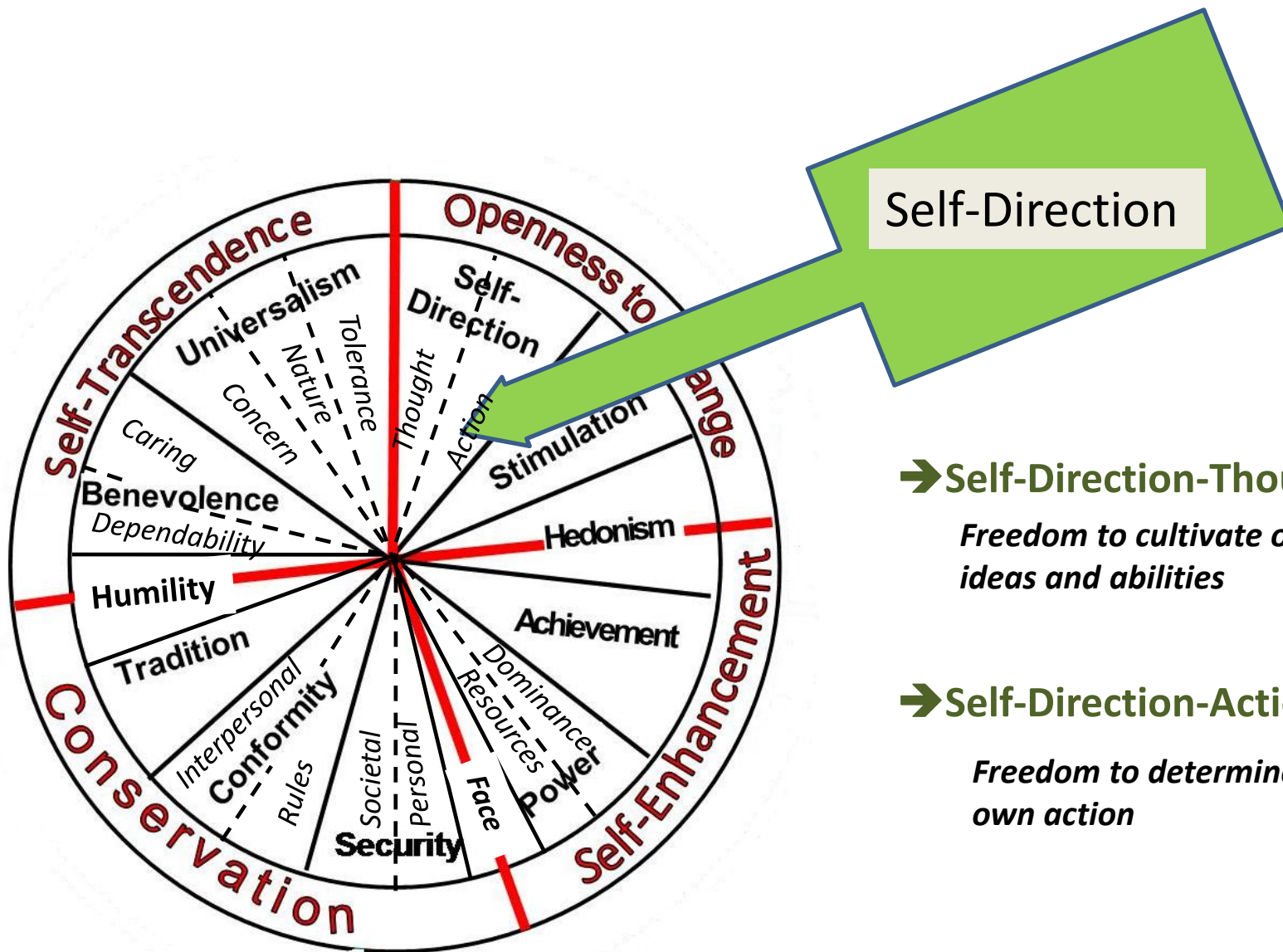
Self-Direction

➔ **Self-Direction-Thought**

Freedom to cultivate one's own ideas and abilities

➔ **Self-Direction-Action**

Freedom to determine one's own action
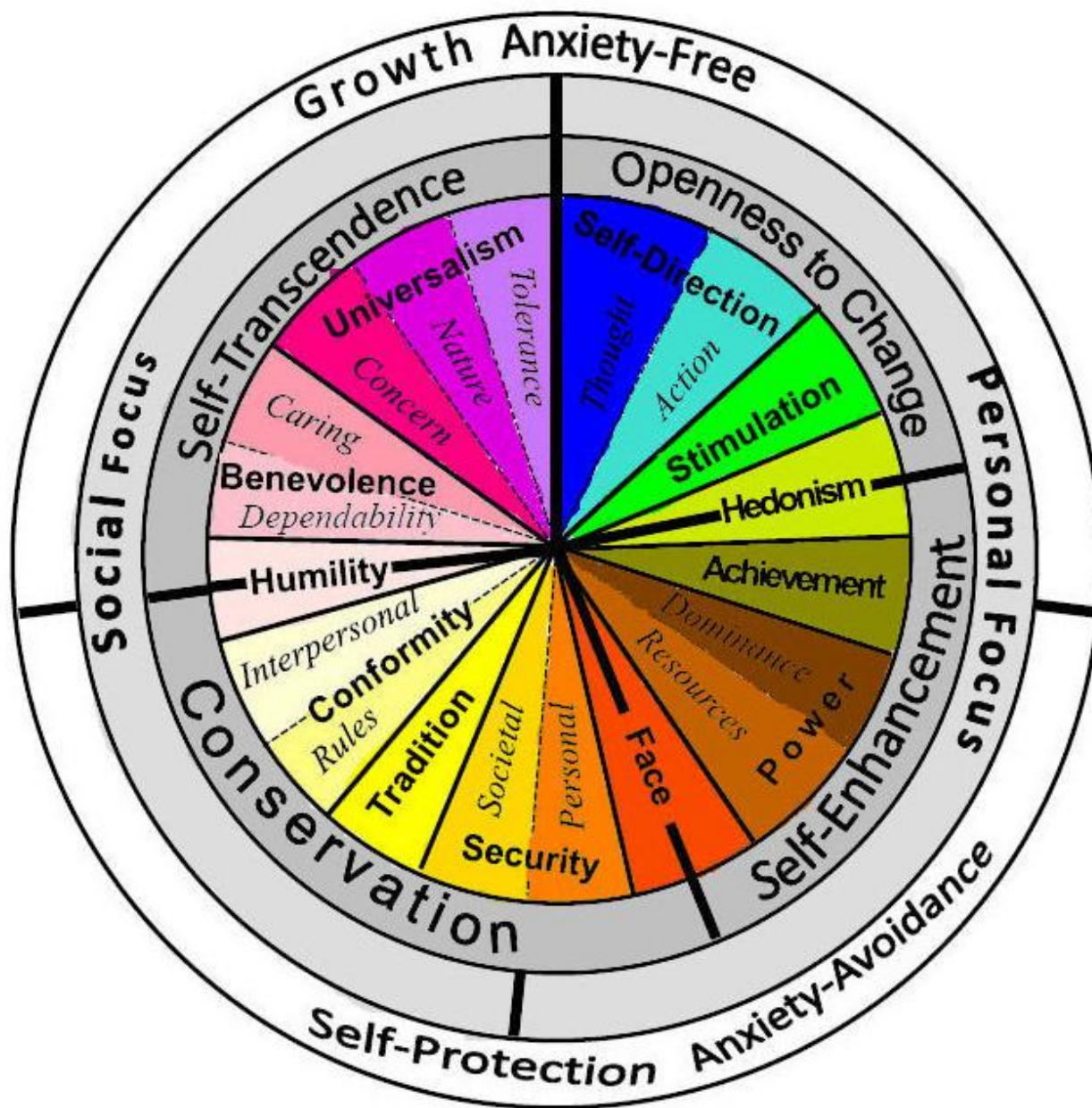
Data, measures and procedure

Country	Samples	N	Method	Researcher
Finland	Adult	334	P&P 6pt.	M. Verkasalo & K. Porkka
Germany	Student	325	P&P 6pt.	C. Beierlein
Israel	Student	394	Online 6pt	Y. Cohen & S. Schwartz
Italy	2: Adult & Student mix	388 382	P&P 11pt P&P 6pt	M. Vecchione
New Zealand	2: Student	141 527	Online 6pt Online 11pt	R. Fischer
Poland	2: Adult & Student mix	545 1295	P&P 6pt P&P 11pt	J. Cieciuch
Portugal	2: Adult & Student mix	295 297	P&P 6&11pt P&P 6&11pt	A. Ramos
Switzerland	Student	201	Online 6pt	E. Davidov
Turkey	2: Student	250 240	P&P 6pt P&P 11pt	K. Demirutku & O. Gumus
USA	Student	443	Online 11pt	M. Konty

The new method: accounting for ordinality

CFA with continuous indicators

Cont. observed variables
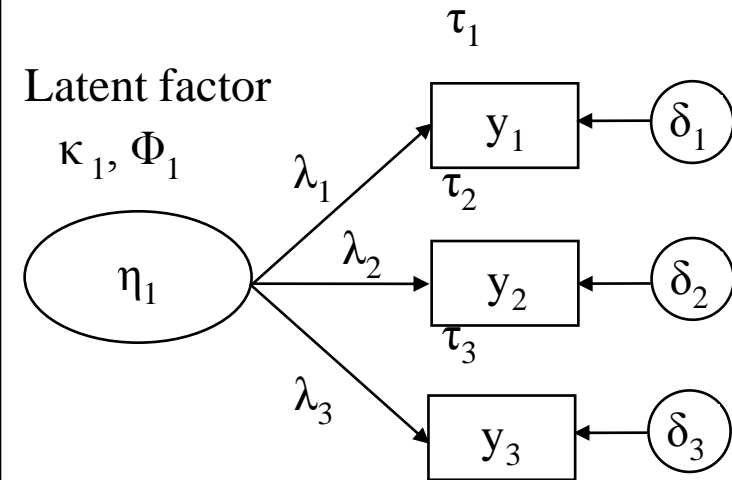
CFA with ordinal indicators

Latent response variables

Ordinal observed variables

η (Eta): Latent factor 　　　　λ (Lambda): Factor loading　　　y: observed variable

κ (Kappa): Latent mean 　　　τ (Tau): Intercept 　　　*y^*: Latent response variable*
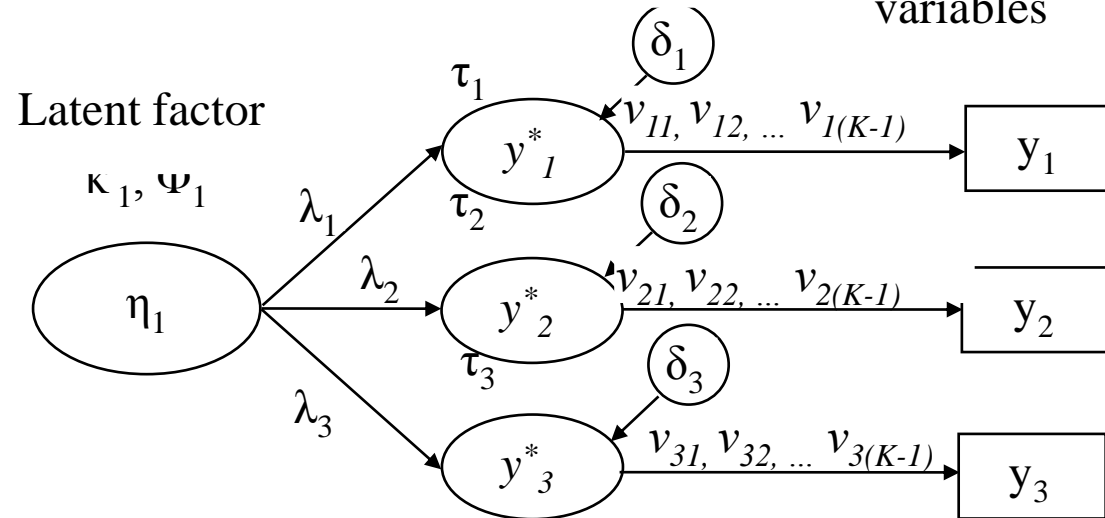
Φ (Phi): Factor variance 　　　δ (Delta): Error variance 　　　*v (Nu): Threshold*

K: number of categories of the ordinal item

Parameters and latent variables that are specific to the CFA with ordinal indicators in italics

Davidov, E., Datler, G., Schmidt, P. Schwartz, S. H. (2011). Testing the invariance of values in the Benelux countries with the European Social Survey: Accounting for ordinality. In: Davidov, E., P. Schmidt and J. Billiet (Eds.), Methods and applications in cross-cultural analysis. NJ: Routledge.

Plan of analysis

1) CFA for each higher order values in each country

(we deleted 9 trouble items)

2) MGCFA in AMOS 19 (the continuous case)

3) Looking for modification indexes and partial invariance

(if necessary)

4) Rerun the final models in Mplus while accounting for ordinality

Global fit measures for the single sample CFAs of self-transcendence with the PVQ5x

	Chi2	Df	CFI	RMSEA	PClose	SRMR
Switzerland	91.5	55	.961	.059	.233	.048
Germany	87.7	55	.977	.043	.748	.041
Finland	89.1	55	.978	.043	.738	.032
Israel	152.7	55	.953	.067	.013	.046
Italy	123.0	55	.956	.057	.200	.048
New Zealand	220.0	55	.937	.076	.000	.049
Poland	136.9	55	.964	.052	.341	.038
Portugal	82.9	55	.974	.042	.770	.038
Turkey	84.5	55	.972	.046	.599	.045

Global fit measures for the MGCFA of self-transcendance across nine countries

Level of invariance	Chi2	df	RMSEA	PCLOSE	SRMR	CFI
configural	983.9	440	.020	1.00	.048	.960
metric	1182.7	496	.022	1.00	.054	.949
scalar	2065.2	552	.030	1.00	.053	.888
partial scalar *released:* *UNn1, UNn3, UNc1,* *Bed3*	1371.4	524	.023	1.00	.054	.937

Conclusion:

scalar: BEc, UNt

partial scalar: UNc

lack of scalar: Bed, UNn

Noninvariance
= change in
CFI>.01
RMSEA>.015
SRMR>.03
(Chen, 2007)

Global fit measures for the single sample CFAs of conservation with the PVQ5x

	Chi2	Df	CFI	RMSEA	PClose	SRMR
Switzerland	119.9	75	.965	.056	.286	.049
Germany	132.2	75	.968	.049	.550	.040
Finland	125.6	75	.967	.045	.707	.041
Israel	210.2	75	.934	.068	.004	.060
Italy	139.0	75	.963	.047	.645	.036
New Zealand	198.4	75	.944	.056	.127	.047
Poland	190.8	75	.948	.053	.263	.049
Portugal	102.6	75	.977	.035	.932	.040
Turkey	**Matrix not positive definite**					

Global fit measures for the MGCFA of conservation across nine countries

Level of invariance	Chi2	df	RMSEA	PCLOSE	SRMR	CFI
configural	1218.9	600	.019	1.00	.049	.956
metric	1407.2	663	.019	1.00	.051	.947
scalar	3040.5	726	.033	1.00	.062	.835
partial scalar *released:* *COi1, COi2, COr2, HU3, TR1, TR2, SEs3*	1594.1	677	.021	1.00	.051	.935
Conclusion: scalar: SEp partial scalar: SEs						

Noninvariance = change in CFI>.01 RMSEA>.015 SRMR>.03 (Chen, 2007)

Global fit measures for the single sample CFAs of self-enhancement with the PVQ5x

	Chi2	Df	CFI	RMSEA	PClose	SRMR
Switzerland	59.0	22	.922	.094	.008	.064
Germany	75.5	22	.905	.087	.003	.064
Finland	53.1	21	.974	.068	.091	.035
Israel	72.0	21	.957	.079	.009	.044
Italy	58.5	21	.961	.068	.072	.036
New Zealand	59.0	21	.971	.059	.181	.037
Poland	76.0	21	.956	.070	.026	.042
Portugal	60.1	21	.949	.080	.020	.046
Turkey	32.3	21	.970	.047	.538	.039

Global fit measures for the MGCFA of self-enhancement across nine countries

Level of invariance	Chi2	df	RMSEA	PCLOSE	SRMR	CFI
configural	513.4	170	.026	1.00	.064	.956
metric	623.8	205	.026	1.00	.063	.946
scalar	1271.6	240	.038	1.00	.064	.867
partial scalar *the only not released item* *is Pod3*	746.63	212	.029	1.00	.063	.931
conclusion: scalar: POd						

Noninvariance = change in CFI>.01 RMSEA>.015 SRMR>.03 (Chen, 2007)

Global fit measures for the single sample CFAs of openness with the PVQ5x

	Chi2	Df	CFI	RMSEA	PClose	SRMR
Switzerland	44.8	29	.975	.053	.397	.043
Germany	35.8	29	.989	.027	.923	.035
Finland	94.4	29	.920	.083	.002	.052
Israel	107.0	29	.946	.083	.001	.042
Italy	98.3	29	.919	.079	.003	.052
New Zealand	93.0	29	.956	.065	.042	.037
Poland	172.7	29	.878	.096	.000	.059
Portugal	84.2	29	.906	.080	.007	.052
Turkey	Matrix not positive definite					

Global fit measures for the MGCFA of openness across nine countries

Level of invariance	Chi2	df	RMSEA	PCLOSE	SRMR	CFI
configural	750.2	232	.027	1.00	.043	.934
metric	849.3	274	.027	1.00	.049	.924
scalar	1830.9	316	.040	1.00	.062	.800
partial scalar *the only not released item is SDt2*	915.6	281	.028	1.00	.048	.916
Conclusion: partial scalar: SDt						

Noninvariance = change in CFI>.01 RMSEA>.015 SRMR>.03 (Chen, 2007)

Global fit measures in the different models of self-transcendence

	MGCFA Under Assumption of Normality – the Continuous Case (AMOS)	MGCFA Using Robust WLS – the Ordinal Case (Mplus)
Model 1 Full measurement invariance (scalar in the continuous case)		
Chi-square	2065.2	2346.5
Df	552	825
p-value	.000	.000
RMSEA	.030	.070
CFI	.888	.957
Model 2 Partial scalar invariance of three values (BET, UNT, UNC)		
Chi-square	1371.4	1660.0
Df	524	708
p-value	.000	.000
RMSEA	.023	.060
CFI	.937	.973

Global fit measures in the different models of conservation

	MGCFA Under Assumption of Normality – the Continuous Case (AMOS)	MGCFA Using Robust WLS – the Ordinal Case (Mplus)
Model 1 Full measurement invariance (scalar in the continuous case)		
Chi-square	3040.5	4400.8
Df	726	1041
p-value	.000	.000
RMSEA	.033	.093
CFI	.835	.892
Model 2 Partial scalar invariance of two values (SEP, SES)		
Chi-square	1594.1	2502.0
Df	677	747
p-value	.000	.000
RMSEA	.021	.079
CFI	.935	.944

Global fit measures in the different models of self-enhancement

	MGCFA Under Assumption of Normality – the Continuous Case (AMOS)	MGCFA Using Robust WLS – the Ordinal Case (mPlus)
Model 1 Full measurement invariance (scalar in the continuous case)		
Chi-square	1271.6	2072.4
Df	240	427
p-value	.000	.000
RMSEA	.038	.101
CFI	.867	.914
Model 2 Partial scalar measurement invariance of one value (POD)		
Chi-square	746.6	951.9
Df	212	226
p-value	.000	.000
RMSEA	.029	.092
CFI	.931	.962

Global fit measures in the different models of openness

	MGCFA Under Assumption of Normality – the Continuous Case (AMOS)	MGCFA Using Robust WLS – the Ordinal Case (mPlus)
Model 1 Full measurement invariance (scalar in the continuous case)		
Chi-square	1830.9	2137.4
Df	316	526
p-value	.000	.000
RMSEA	.040	.090
CFI	.800	.913
Model 2 Partial scalar measurement invariance of one value (SDT)		
Chi-square	915.6	1074.6
Df	281	323
p-value	.000	.000
RMSEA	.028	.079
CFI	.916	.959

Summary

AMOS – continous case

1) **Configural in all values**

2) **Metric in all values**

3) **Scalar (full or partial)**
   in 7 values

- **benevolence-caring**
- **universalism-concern**
- **universalism-tolerance**
- **self-direction thought**
- **power – dominance**
- **security-personal**
- **security-societal**

Mplus – ordinal case

Invariance in 15 values!!!

Full in all
- **self-transcendance**
- **self-enhancement**
- **openness**

Partial in
- **security-personal**
- **security societal**

Lack of invariance in
- **Tradition**
- **conformity**
       (interpersonal and rules
- **humility**

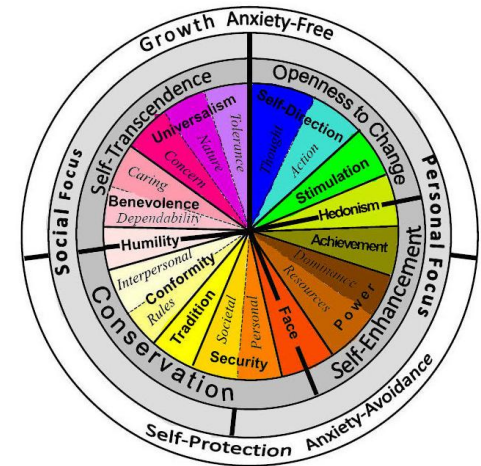# Summary

AMOS – continous case

3) Scalar (full or partial) in 7 values

$<$

Mplus – ordinal case

Invariance in 15 values!!!
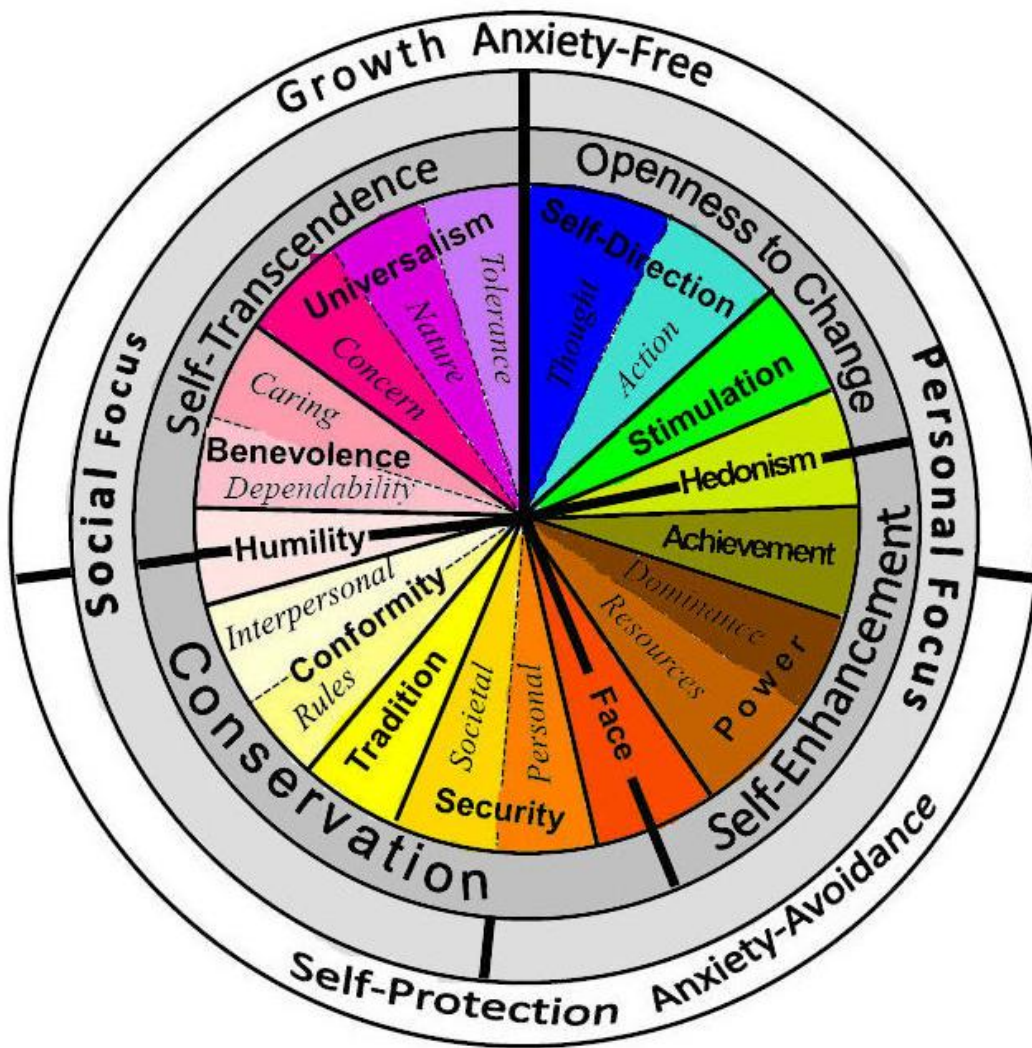
We have a good theory

We have a chance for a good measurement!

We need to improve 9 droped items

Furher plans:
we are going to use Jrule, but we are not sure about cutt off criteria

Thank you
for your attention!