

# Survey data quality in different countries

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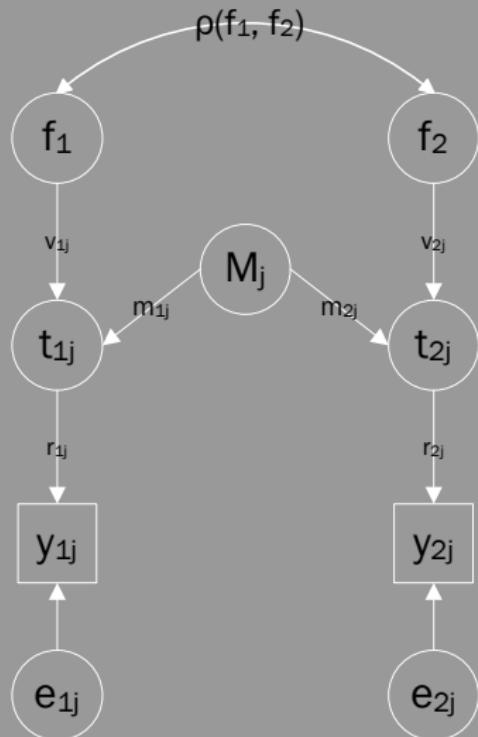
Survey Research Centre  
ESADE, Barcelona  
Universitat Ramon Llull



# Overview

- 1 Multitrait-multimethod experiments**
  - An example experiment
  - Models
- 2 What has been done before**
  - The international research project 1984–1996
  - Experiments in the European Social Survey
- 3 Why are there differences between countries?**
  - Categorisation errors in the efficacy experiment
  - Meta analysis of the 4 different experiments
- 4 Conclusion**

# The basic response model



$f_1, f_2$  = variables of interest

$v_{ij}$  = validity coefficient for variable i

$M_j$  = method factor for both variables

$m_{ij}$  = method effect on variable i

$t_{ij}$  = true score for  $y_{ij}$

$r_{ij}$  = reliability coefficient

$y_{ij}$  = the observed variable

$e_{ij}$  = the random error in variable  $y_{ij}$

# The basic response model

- The quality coefficient  $q$  is the product of the reliability and validity coefficients:
- $q = vr$
- The square  $q^2$  is called the 'total quality' of a measure.
- It is the percentage of variance in the observed variable that can be explained by the latent variable of interest.

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# First trait measured with three methods

**CARD 73** Using this card, please tell me how true each of the following statements is about your current job.

	Not at all true	A little true	Quite true	Very true	(Don't know)
<b>G64</b> There is a lot of variety in my work.	1	2	3	4	8

**iS19** The next 3 questions are about your current job. Please choose one of the following to describe how varied your work is.

**Please tick one box.**

- Not at all varied  1  
A little varied  2  
Quite varied  3  
Very varied  4

**iS32** Please indicate, on a scale of 0 to 10, how varied your work is, where 0 is not at all varied and 10 is very varied.

**Please tick the box that is closest to your opinion**

**Not at all varied**

0

1

2

3

4

5

6

7

8

9

10

**Very varied**

# Three traits measured with first method

**CARD 73** Using this card, please tell me how true each of the following statements is about your current job.

		Not at all true	A little true	Quite true	Very true	(Don't know)
<b>G64</b>	There is a lot of variety in my work.	1	2	3	4	8
...						
<b>G66</b>	My job is secure	1	2	3	4	8
...						
<b>G70</b>	My health or safety is at risk because of my work.	1	2	3	4	8

# Three traits measured with second method

**iS19** The next 3 questions are about your current job. Please choose one of the following to describe how varied your work is.

**Please tick one box.**

Not at all varied  1

A little varied  2

Quite varied  3

Very varied  4

**iS20** Please choose one of the following to describe how secure your job is.

**Please tick one box.**

Not at all secure  1

A little secure  2

Quite secure  3

Very secure  4

**iS21** Please choose one of the following to say how much, if at all, your work puts your health and safety at risk.

**Please tick one box.**

Not at all at risk  1

A little at risk  2

Quite a lot at risk  3

Very much at risk  4

# Three traits measured with third method

**IS32** Please indicate, on a scale of 0 to 10, how varied your work is, where 0 is not at all varied and 10 is very varied.

Please tick the box that is closest to your opinion

[Skip details of the model](#)

Not at  
all varied

Very  
varied



**IS33** Now please indicate, on a scale of 0 to 10, how secure your job is, where 0 is not at all secure and 10 is very secure.

Please tick the box that is closest to your opinion

Not at  
all secure

Very  
secure



**IS34** Please indicate, on a scale of 0 to 10, how much your health and safety is at risk from your work, where 0 is not at all at risk and 10 is very much at risk.

Please tick the box that is closest to your opinion

Not at  
all at risk

Very much  
at risk



# Different models for MTMM experiments

## ■ Classic MTMM model

- Correlated uniqueness (Kenny & Judd)
- Direct product (Browne)
- True score model
- MTM-1 (Eid 2000)

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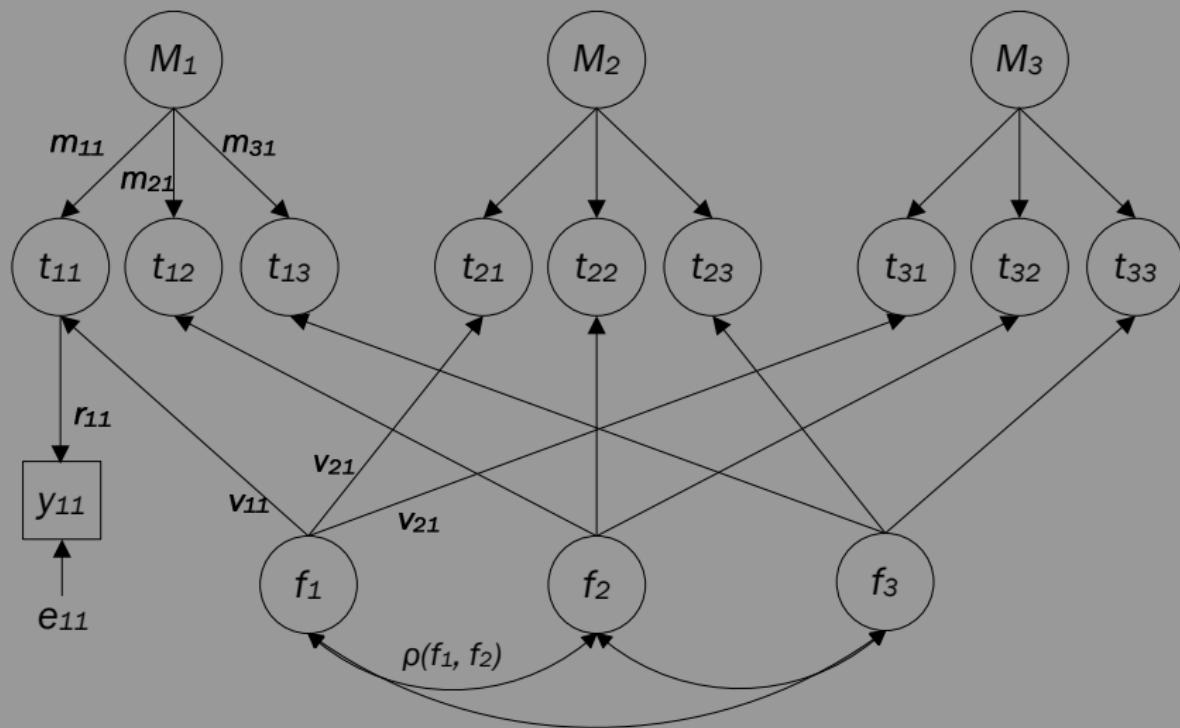
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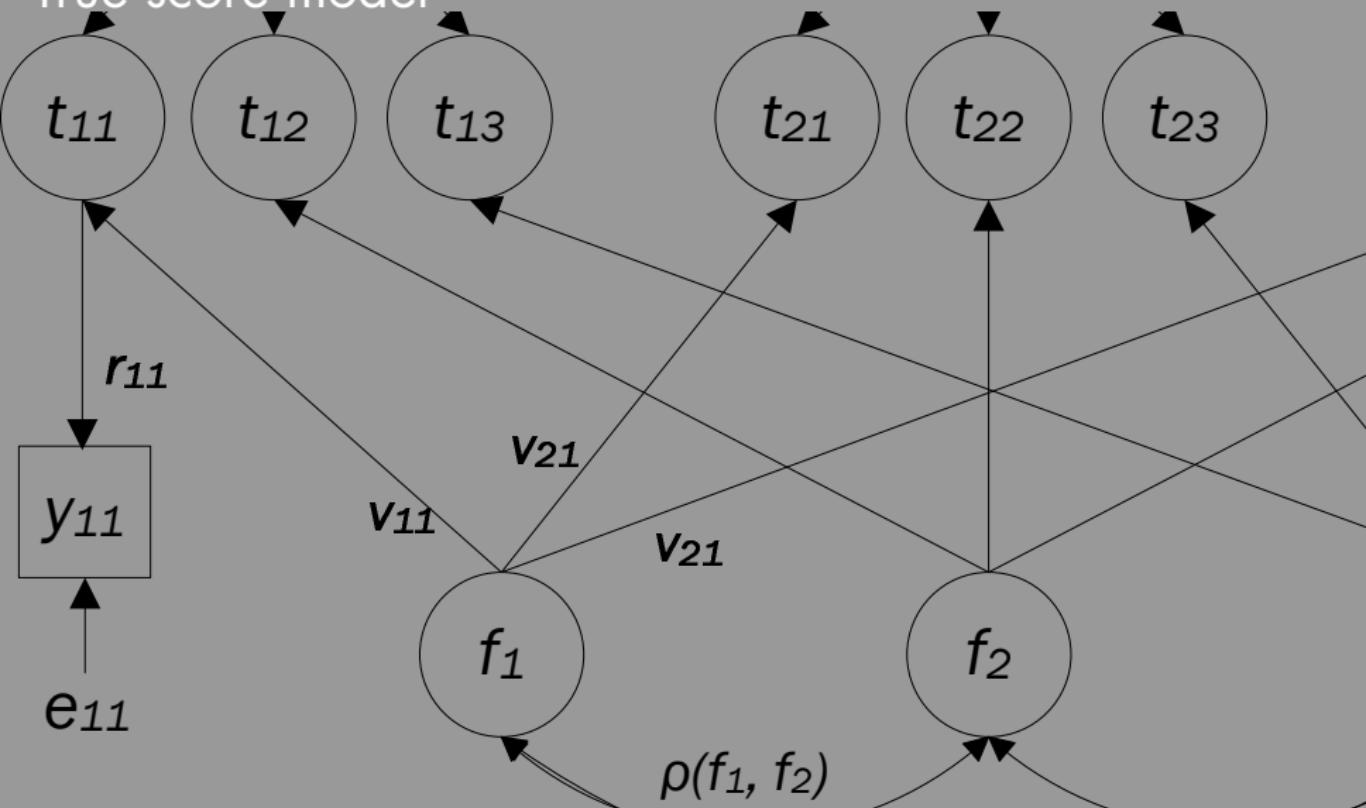
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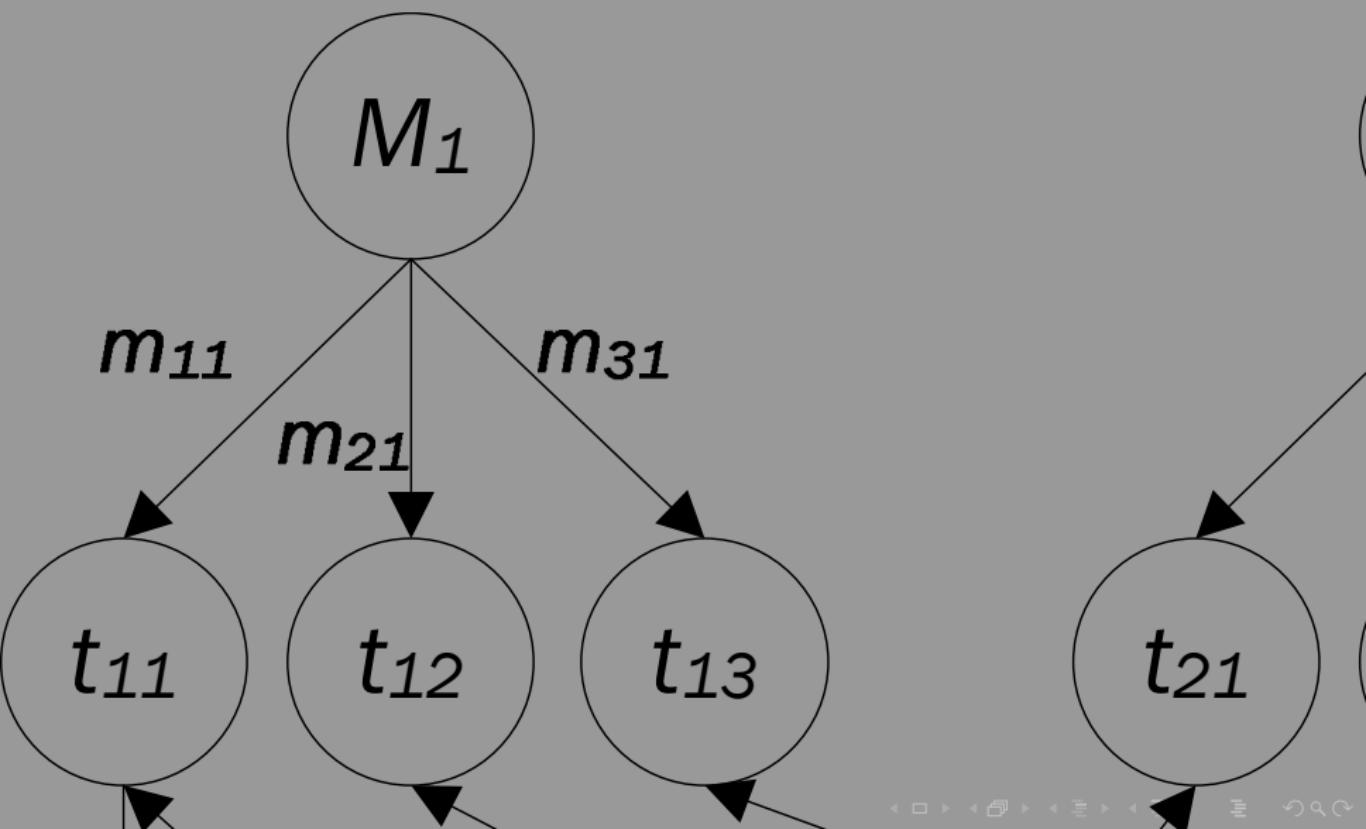
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## True score model assumptions

- No correlations among methods
- No correlations between traits and methods
- Equal method effects
- Linear and additive effects
- Normal errors, independent of all unobserved variables
- All variables are continuous

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# Countries in the international survey project 1984–1996 that have been included in SQP



# The European Social Survey (ESS)



- Three rounds, 4th coming up
- Six experiments in each round
- <http://www.europeansocialsurvey.org>

# Countries in round 1 of the ESS – 2002



- |    |                |                    |
|----|----------------|--------------------|
| 1  | Austria        |                    |
| 2  | Belgium        | 13. Luxembourg     |
| 3  | Czech Republic | 14. Netherlands    |
| 4  | Denmark        | 15. Norway         |
| 5  | Finland        | 16. Poland         |
| 6  | France         | 17. Portugal       |
| 7  | Germany        | 18. Slovenia       |
| 8  | Greece         | 19. Spain          |
| 9  | Hungary        | 20. Sweden         |
| 10 | Ireland        | 21. Switzerland    |
| 11 | Israel         | 22. United Kingdom |
| 12 | Italy          |                    |

# Countries in round 2 of the ESS – 2004



- |    |                |     |                |
|----|----------------|-----|----------------|
| 1  | Austria        | 14. | Luxembourg     |
| 2  | Belgium        | 15. | Netherlands    |
| 3  | Czech Republic | 16. | Norway         |
| 4  | Denmark        | 17. | Poland         |
| 5  | Estonia        | 18. | Portugal       |
| 6  | Finland        | 19. | Slovakia       |
| 7  | France         | 20. | Slovenia       |
| 8  | Germany        | 21. | Spain          |
| 9  | Greece         | 22. | Sweden         |
| 10 | Hungary        | 23. | Switzerland    |
| 11 | Iceland        | 24. | Turkey         |
| 12 | Ireland        | 25. | Ukraine        |
| 13 | Italy          | 26. | United Kingdom |

# Countries in round 3 of the ESS – 2006



- |    |          |     |                    |
|----|----------|-----|--------------------|
| 1  | Austria  | 13. | Netherlands        |
| 2  | Belgium  | 14. | Norway             |
| 3  | Bulgaria | 15. | Poland             |
| 4  | Cyprus   | 16. | Portugal           |
| 5  | Denmark  | 17. | Romania            |
| 6  | Estonia  | 18. | Russian Federation |
| 7  | Finland  | 19. | Slovakia           |
| 8  | France   | 20. | Slovenia           |
| 9  | Germany  | 21. | Spain              |
| 10 | Hungary  | 22. | Sweden             |
| 11 | Ireland  | 23. | Switzerland        |
| 12 | Latvia   | 24. | Ukraine            |
|    |          | 25. | United Kingdom     |

## Some results from rounds 1 and 2

Country	Mean	Median	Minimum	Maximum
Portugal	0.79	0.81	0.63	0.91
Switzerland	0.79	0.84	0.56	0.90
Greece	0.78	0.79	0.64	0.90
Estonia	0.78	0.85	0.58	0.90
Poland	0.73	0.85	0.51	0.90
Luxembourg	0.72	0.73	0.53	0.88
United Kingdom	0.70	0.71	0.56	0.82
Denmark	0.70	0.70	0.52	0.80
Belgium	0.70	0.73	0.46	0.90
Germany	0.69	0.70	0.53	0.83
Spain	0.69	0.64	0.54	0.90
Austria	0.68	0.68	0.51	0.85
Czech Republic	0.65	0.60	0.52	0.87
Slovenia	0.63	0.60	0.46	0.82
Norway	0.59	0.59	0.35	0.83
Sweden	0.58	0.58	0.43	0.68
Finland	0.57	0.54	0.42	0.78

## Differences between countries?

What we studied already:

- Differences in complexity of language?
- Artifacts due to sending in the questionnaire later?
- Artifacts due to mistakes in translation?

# Differences between countries?

What we studied already:

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  - Not found
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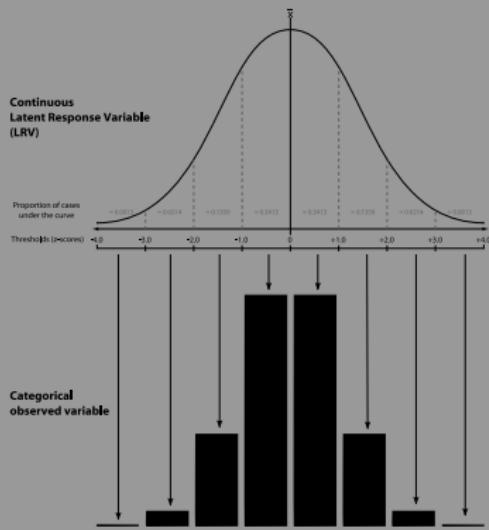
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- Differences in use of the scale?

## Categorisation of continuous variables

Our model assumes that there are *unobserved* continuous latent response variables (LRV) that have been categorised into the *observed* categorical variables.

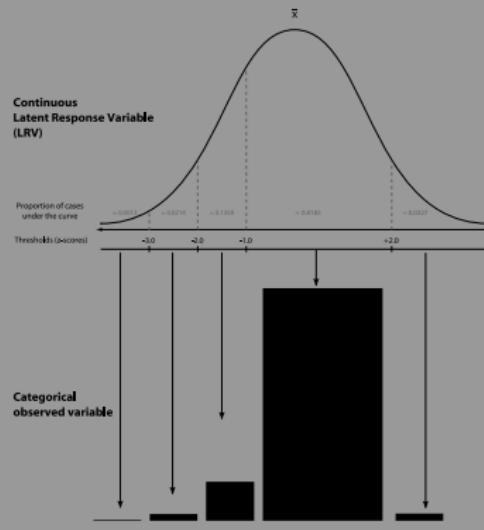
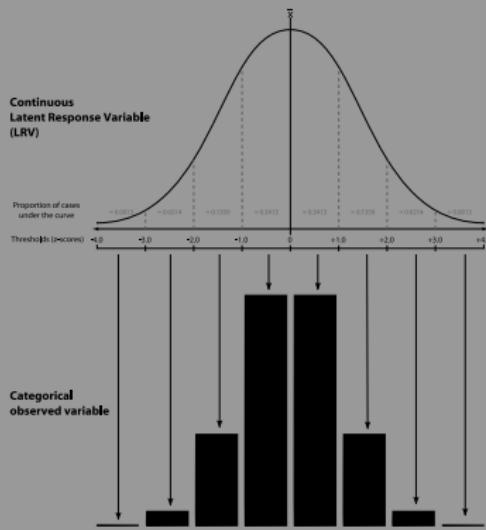
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Our model assumes that there are *unobserved* continuous latent response variables (LRV) that have been categorised into the *observed* categorical variables.



- These continuous latent response variables are related to each other according to the MTMM model.
- Method effects, quality coefficients, and thresholds can be estimated.
- Equivalent to a 2 parameter graded response model in IRT (Muthén & Asparouhov 2002).
- We call the ratio of the quality coefficient  $q = v.r$  from the categorical model to the same coefficient from the continuous model the 'categorisation factor'.

## Consequences of categorisation for the correlations between observed variables

- The fewer categories, the smaller the Pearson correlation;
- The more skew in observed variables, the smaller the Pearson correlation;
- The corrected ('polychoric') correlations are always higher than the Pearson correlations, but not necessarily equally so for all variables.

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Therefore,

- If the skewness of observed variables is higher for variables measured by one particular method, then the corrected correlations between those variables will go up more than the others, and the method effects in the categorical model will be higher;
- As method-induced correlation goes up, the estimates of the quality will go down;
- If this differs across countries, the process can explain differences in the quality.

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# Analysis of the experiments

- We analysed the 4 experiments from the ESS which involved variables with 5 categories or less
- The topics: role of women, GP's, political efficacy, job.



- Compare the country with the highest quality to the country with the lowest quality for that experiment

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# Quality ( $q^2$ ) and method effects ( $m$ ) in the efficacy experiment

Continuous MTMM model, main questionnaire (first method)

		'Efficacy'		
		Complex	Active	Mind
$q^2$	Denmark	0.77	0.83	0.79
	Switzerland	0.49	0.81	0.50
$m$	Denmark	0.00	0.00	0.00
	Switzerland	0.00	0.00	0.00

# Efficacy experiment: Denmark

Polychoric correlations

		Method 1		Method 2		
Method 1	Complex	1.00				
	Active	-0.44	1.00			
	Mind	-0.51	0.47	1.00		
Method 2	Complex	0.66	-0.45	-0.51	1.00	
	Active	-0.44	0.74	0.46	-0.51	1.00
	Mind	-0.52	0.51	0.67	-0.56	0.56
						1.00

Pearson correlations

		Method 1		Method 2		
Method 1	Complex	1.00				
	Active	-0.38	1.00			
	Mind	-0.46	0.41	1.00		
Method 2	Complex	0.60	-0.37	-0.44	1.00	
	Active	-0.39	0.67	0.40	-0.43	1.00
	Mind	-0.46	0.43	0.62	-0.49	0.48
						1.00

 $n \approx 916$

# Efficacy experiment: Switzerland

## Polychoric correlations

		Method 1		Method 2		
Method 1	Complex	1.00				
	Active	-0.37	1.00			
	Mind	-0.46	0.42	1.00		
Method 2	Complex	0.57	-0.36	-0.46	1.00	
	Active	-0.32	0.83	0.36	-0.39	1.00
	Mind	-0.36	0.44	0.69	-0.49	0.43
						1.00

## Pearson correlations

		Method 1		Method 2		
Method 1	Complex	1.00				
	Active	-0.33	1.00			
	Mind	-0.43	0.36	1.00		
Method 2	Complex	0.55	-0.35	-0.45	1.00	
	Active	-0.30	0.82	0.33	-0.34	1.00
	Mind	-0.35	0.41	0.62	-0.48	0.39
						1.00

$n \approx 779$

# % Increase in the correlations after correction for categorisation

## Efficacy experiment: Denmark

		Method 1		Method 2	
Method 1	Complex				
	Active	16%			
	Mind	11%	15%		
Method 2	Complex	10%	22%	16%	
	Active	13%	10%	15%	19%
	Mind	13%	19%	8%	14% 17%

Mean percentage increase of the polychoric correlations: 14.5%

# % Increase in the correlations after correction for categorisation

## Efficacy experiment: Switzerland

		Method 1		Method 2	
Method 1	Complex				
	Active	<b>12%</b>			
	Mind	8%	<b>17%</b>		
Method 2	Complex	4%	3%	3%	
	Active	6%	1%	1%	<b>16%</b>
	Mind	2%	7%	12%	<b>3%</b> <b>1%</b>

Mean percentage increase of the polychoric correlations: 7.6%

## Consequences of correction for categorisation

- In Denmark, the monomethod correlations for the second method increase more than those of the first method and more than the other correlations;
- The method effects for the second method are therefore higher, while...
- The quality coefficient estimates for the first method are lowered.
- In Switzerland, the opposite: the first methods' monomethod correlations increase more on average than the second's, leading to higher quality coefficients after correction.

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- In Switzerland, the opposite: the first methods' monomethod correlations increase more on average than the second's, leading to higher quality coefficients after correction.

# Quality ( $q^2$ ) and method effects ( $m$ ) according to the continuous and categorical models, with categorisation factors

		'Efficacy'		
		Complex	Active	Mind
Continuous analysis				
$q^2$	Denmark	0.77	0.83	0.79
	Switzerland	0.49	0.81	0.50
$m$	Denmark	0.00	0.00	0.00
	Switzerland	0.00	0.00	0.00
Categorical analysis				
$q^2$	Denmark	0.63	0.70	0.63
	Switzerland	0.62	0.94	0.62
$m$	Denmark	0.11	0.08	0.11
	Switzerland	0.00	0.00	0.00
Categorisation factor				
	Denmark	1.23	1.18	1.25
	Switzerland	0.79	0.86	0.81

## Correction for categorisation: conclusions

- The general 'push' of correcting for categorisation is that all coefficients go up, because the polychoric correlations are always higher than the Pearson correlations;
- But when method factors are taken into account, the coefficients can also go down;
- Particularly, if one method produces more categorisation errors than another, the quality coefficients can go down;
- If this happens more in some countries than others, we can find differences;
- Would then expect countries with high quality to have a lower quality after correction for categorisation and vice versa.

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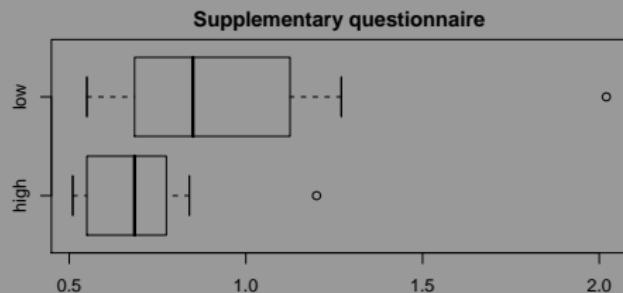
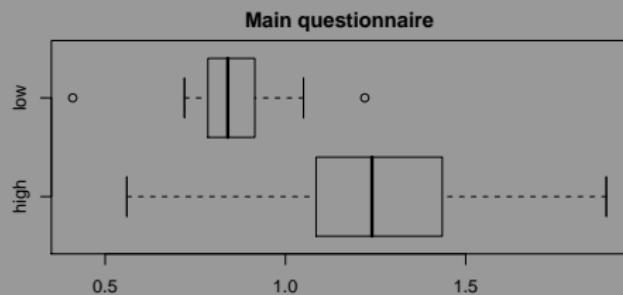
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# Does categorisation explain differences across countries

The categorisation factor,  $q_{cat}/q_{cont}$ :



# A meta-analysis of the categorisation error studies

			95% C.I		
		Estimate	S.E.	lower	upper
	(Intercept)	1.04	0.36	0.31	1.77
<i>Topic</i>					
Doctors	(reference category)				
Efficacy		0.06	0.10	-0.14	0.27
Job		0.04	0.40	-0.71	0.78
Women		0.38	0.26	-0.14	0.90
<i>Scale</i>					
Direct	(reference category)				
Agree-disagree		-0.11	0.35	-0.81	0.59
True-false		0.17	0.32	-0.48	0.81
Negative		-0.50	0.23	-0.96	-0.02
Main questionnaire		-0.30	0.29	-0.88	0.29
Highest quality		-0.19	0.09	-0.37	-0.01
Highest quality × main		0.66	0.15	0.35	0.96

Multiple R-Squared: 0.45; Adjusted R-squared: 0.35

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That's it for now. Moltes gràcies per a la seva atenció!

