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Systematic and Random Error in a Mixed Mode Online-Telephone Survey: An MTMM Approach

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Research Questions

- Comparison Web – Telephone interviewing

1. Do these two modes elicit answers that differ in reliability?
2. Do these two modes elicit answers that differ in validity?

- Research design: Multi-Trait Multi-Method (MTMM-design)

Data Collection

- Procedure:
  - Members Dutch LISS-panel (CentERdata)
    - Probability based panel, nationwide, established in 2007
      - Recruitment based on random sample of addresses (Statistics Netherlands)
      - Recruitment interviews face-to-face or telephone
      - Internet access no prerequisite
        - Free SimPC and web access offered to those with no access
  - Five questions on medical ethical issues were asked at two time points
    - Time 1: February 2009
    - Time 2: March 2009

Data Collection

- Data Collection Mode used:
  - Time 1: February 2009
    - Mixed-Mode CATI-Web, all panel members
      - Random assignment to CATI or Web
      - Response CATI 60.3%
      - Response Web 65.3%
  - Time 2: March 2009
    - Only web, all panel members
      - Special intro sometimes opinions change, sometimes not
      - Response 67.2%
      - Responded/invited
  - Total sample 5210 / 5444

Questions Used

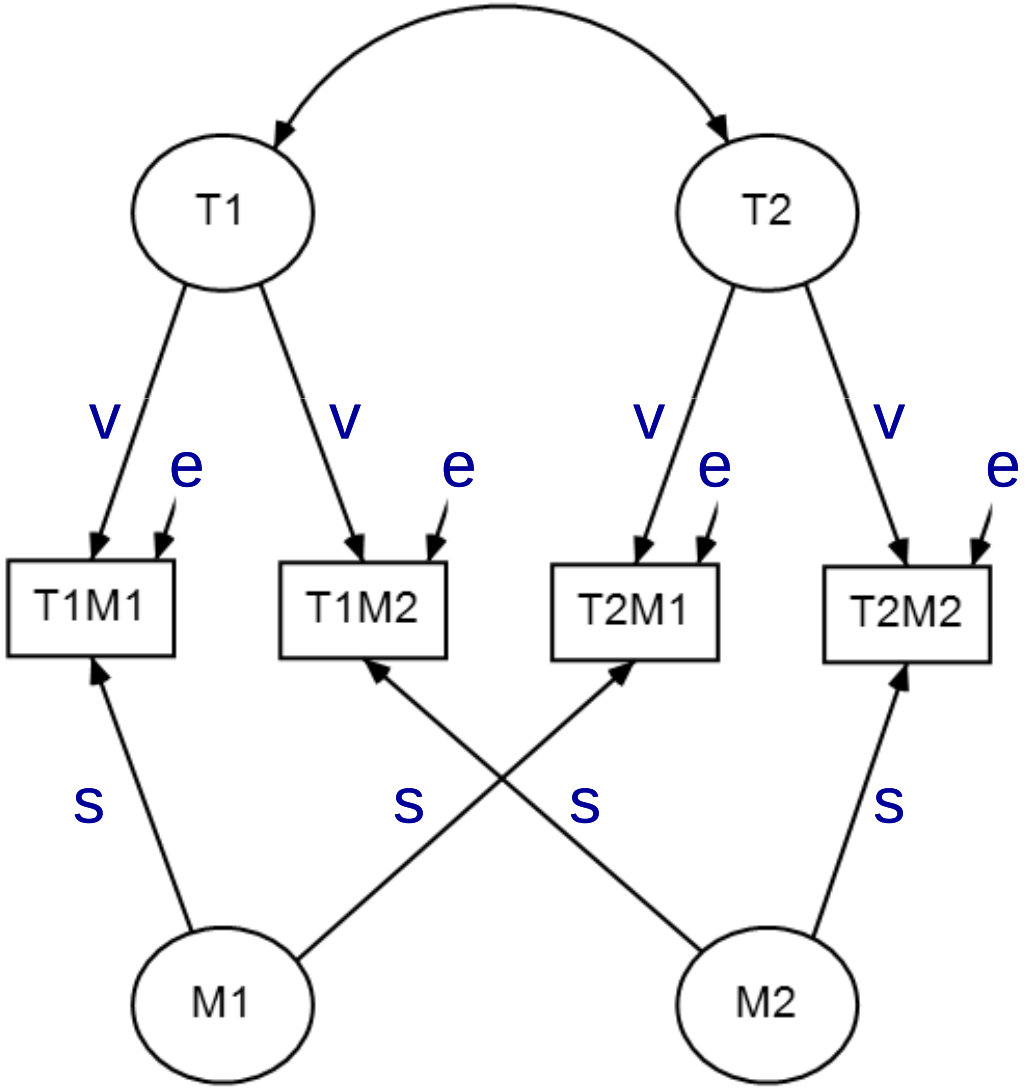
- Topic: Ethical issues in the public debate
  - Five questions on admissibility
    - Euthanasia, Experimentation on animals, Genetic manipulation of food crops, National register of DNA-profiles, Organ donation
    - Three point response scale
      - 1 = Absolutely not, 2 = Only under strict conditions, 3 = Always admissible
      - Do-not-know not offered, but possible

The MTMM Design

- Measure several constructs called *traits*
- Using several different measurement *methods*
  - Measure each trait using each method
- Calculate all correlations
- Use a confirmatory factor analysis to assess how much of the covariation is attributable to the *trait*, *method* or pure *error*
- In our case, question content is traits (→5 traits), and survey mode is methods (→2 methods)

First application to different types of survey questions as methods and content of survey questions as traits by Frank Andrews (Andrews & Withey, 1976)

The MTMM Model

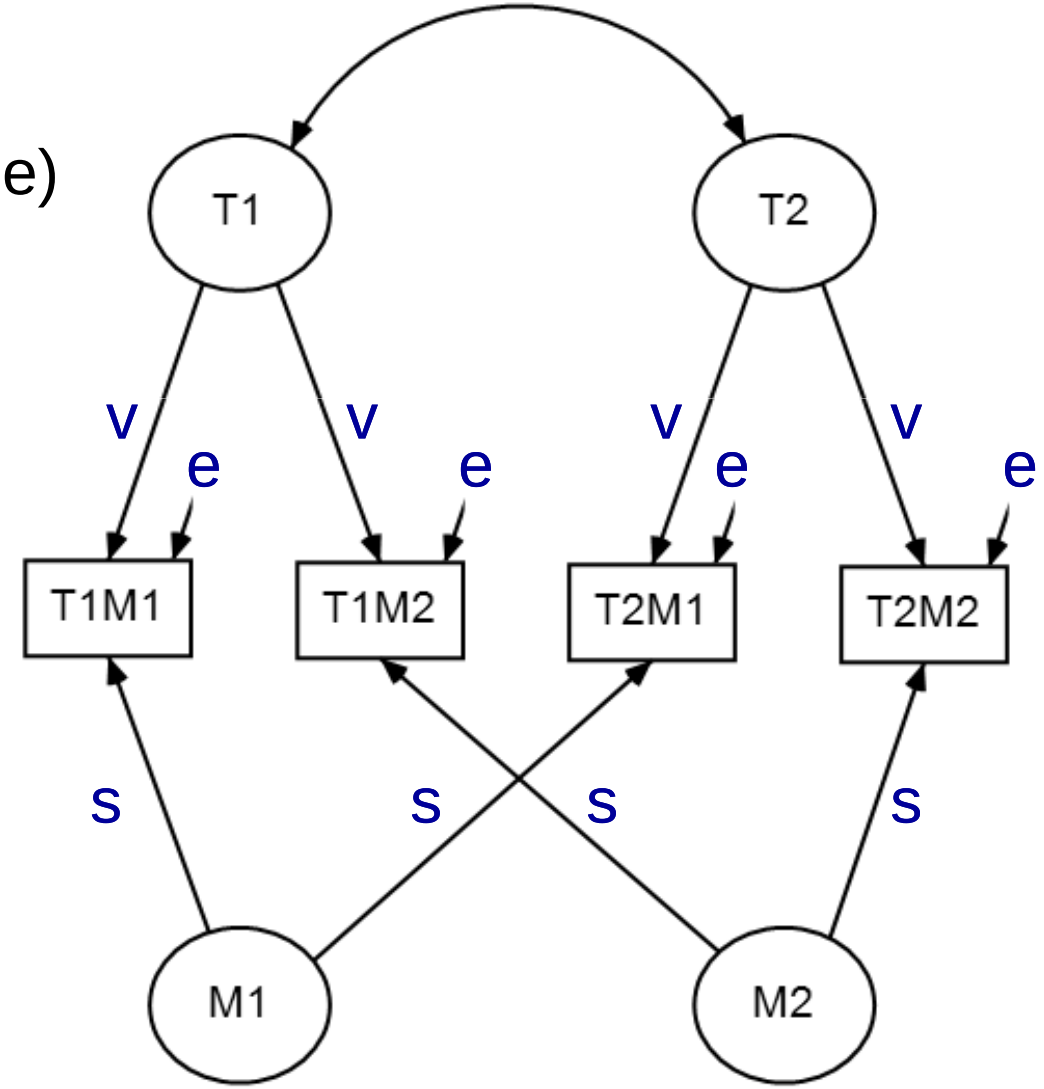


The MTMM Model

- Validity = v / (v+s+e)
- Reliability = (v+s) / (v+s+e)

$$v_{ii} = \frac{\left(\sigma^2_{trait}\right)}{\left(\sigma^2_{trait} + \sigma^2_{method} + \sigma^2_{error}\right)}$$

$$r_{ii} = \frac{\left(\sigma^2_{trait} + \sigma^2_{method}\right)}{\left(\sigma^2_{trait} + \sigma^2_{method} + \sigma^2_{error}\right)}$$

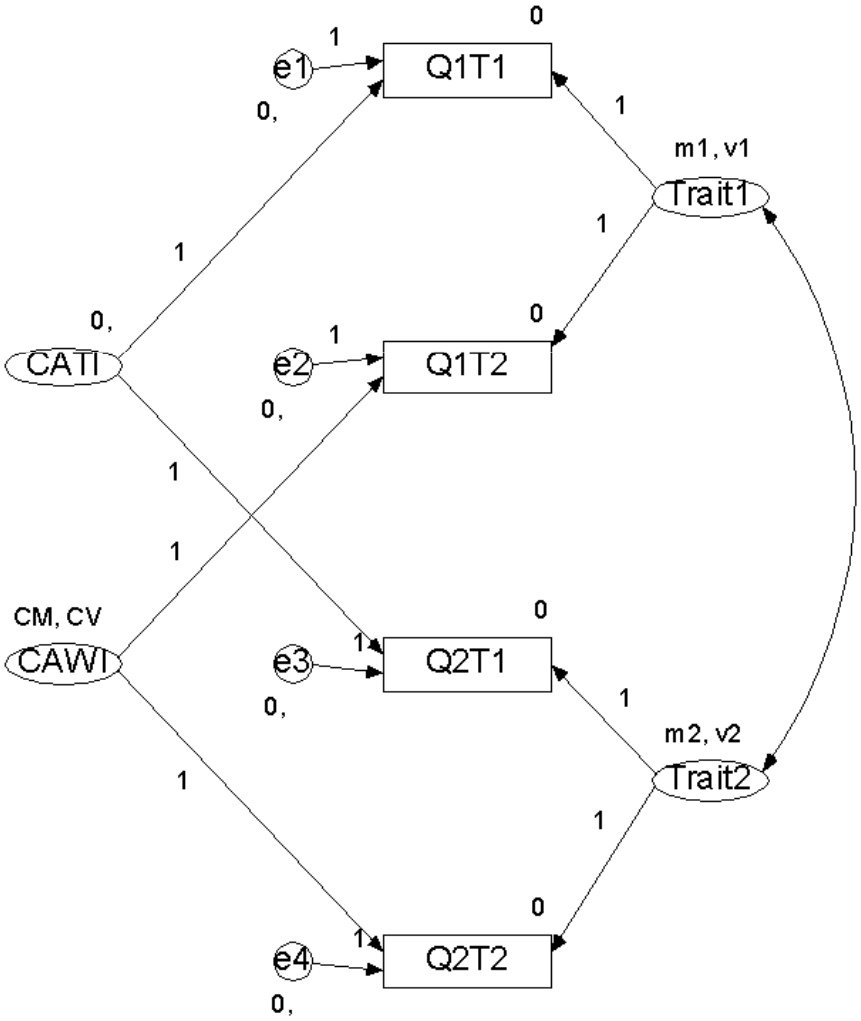


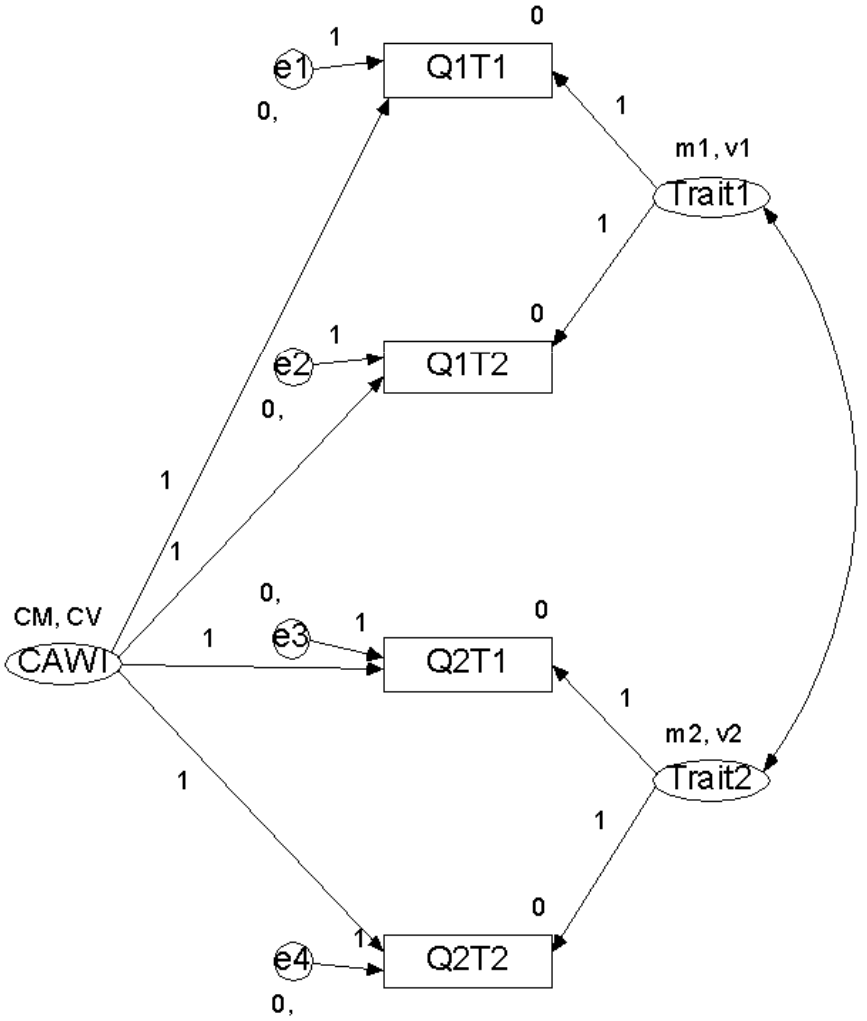
Some Analysis Issues

- Standard MTMM assumes we can calculate the correlations between all measures
- How do we get answers from the same respondents in two modes?
  - Call them after they finish the web questionnaire?
  - Ask them to go do a web survey after they finish the telephone interview?
- We used an adapted MTMM design

- We have responses on a 3-point scale
- Solved by using categorical variables in Mplus

The MTMM Model for Our Web – Telephone Study





Results 1: Model Fit

- The basic model with all constraints fits fine:
- χ^2 (df=82, N≈5444) = 461.3, p <.01
- CFI = 0.99, RMSEA = 0.04
- No large modification indices

- Estimating all loadings and thresholds gives a slightly better fit but also produces negative variances (not unusual in MTMM analyses)

Results 2: Loadings & Error Variances

	Trait	Method		Meas. error	
		CATI	CAWI	CATI	CAWI
Q1T1	5.05	0.26	0.22	1*	0.90
Q2T1	2.37	0.26	0.22	1*	0.61
Q3T1	1.86	0.26	0.22	1*	0.82
Q4T1	2.97	0.26	0.22	1*	0.79
Q5T1	5.86	0.26	0.22	1*	1.44
Q1T2	5.05	n.a.	0.22	n.a.	1*
Q2T2	2.37	n.a.	0.22	n.a.	1*
Q3T2	1.86	n.a.	0.22	n.a.	1*
Q4T2	2.97	n.a.	0.22	n.a.	1*
Q5T2	5.86	n.a.	0.22	n.a.	1*

* Constrained for identification. n.a. = not applicable.

Results 3: Reliability & Validity

	Reliability		Validity	
	CATI	CAWI	CATI	CAWI
Q1T1	0.84	0.85	0.80	0.82
Q2T1	0.73	0.81	0.65	0.74
Q3T1	0.68	0.72	0.60	0.64
Q4T1	0.76	0.80	0.70	0.75
Q5T1	0.86	0.81	0.82	0.78
Q1T2	n.a.	0.89	n.a.	0.81
Q2T2	n.a.	0.78	n.a.	0.66
Q3T2	n.a.	0.73	n.a.	0.60
Q4T2	n.a.	0.82	n.a.	0.71
Q5T2	n.a.	0.87	n.a.	0.83

n.a. = not applicable.

Results 4:
Factor Means and Variances

Table 2. Mean and variance of latent factors

	Mean[a]	Var.[a]	S.D.
Trait 1	4.19	5.05	2.25
Trait 2	1.73	2.37	1.54
Trait 3	1.57	1.86	1.36
Trait 4	2.02	2.97	1.72
Trait 5	2.08	5.86	2.42
CAWI	-.08	0.22	0.47
CATI	0.00[b]	0.26	0.47

[a] Constrained equal. [b] Constrained to zero

Conclusions

- Tendency for CAWI to produces more reliable and valid responses than CATI
  - Q5 is an exception (automatic organ donor)
- CAWI mean is lower than CATI mean
  - Difference is -0.08, Cohen *d* = -0.16
  - In CATI respondents agree more
  - Social desirability effect in CATI?
- Small mode effects, CAWI better quality than CATI

Thank You!

Appendix A: Original Text Questions

Er zijn in onze maatschappij allerlei kwesties waarbij ethische problemen rond normen en waarden een rol spelen. Mensen verschillen van mening over wat kan, wat niet kan, en wat soms onder strikte voorwaarden mag worden toegestaan. Wat is **uw** mening?

1. Vindt u dat euthanasie toelaatbaar is of niet?
2. Vindt u dat dierproeven toelaatbaar zijn of niet?
3. Vindt u dat genetische manipulatie van landbouwgewassen toelaatbaar is of niet?

Appendix A: Original Text Questions vv

4. Vindt u dat de Nederlandse overheid DNA-gegvens mag opslaan van de hele bevolking?
5. Vindt U dat alle Nederlanders automatisch orgaandonor zouden moeten zijn, tenzij ze daar zelf bezwaar tegen maken?

- Antwoordmogelijkheden
  1. Absoluut nooit
  2. Alleen onder strikte voorwaarden
  3. Zonder meer toelaatbaar
  4. (weet-niet niet op scherm, maar empty, dwz overslaan kan)

- N.B. Dit waren de laatste vragen, hierna volgden nog de standaard LISS evaluatievragen