Lab 2 - Validity

Tony Tan & Jarl Kristensen

University of Oslo

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Today

- Classical validity analysis using multitrait-multimethod matrix (MTMM)
- Examine convergent validity and discriminant validity
- MTMM's relevance depends on intended interpretations and uses of the test scores

MTMM: Background

- First proposed by Campbell and Fiske (1959)
- Origin in personality (or trait) psychology
- Involving examining convergent and discriminant validity
  - Convergent validity: Scores of *same trait* measured by *different methods* should correlate sufficiently strongly
  - Discriminant validity: *Different traits* measured by the *same methods* should not correlate more strongly than above
- A method for providing evidence pertaining to the relations to other variables category of the *Standards* (AERA et al., 2014)

MTMM: Structure

TABLE 1

A SYNTHETIC MULTITRAIT-MULTIMETHOD MATRIX

		Method 1			Method 2			Method 3		
	Traits	A_1	B_1	C_1	A_2	B_2	C_2	A_3	B_3	C_3
	A_1	(.89)								
Method 1	B_1	.51	(.89)							
	C_1	.38	.37	(.76)						
	A_2	.57	.22	.09	(.93)					
Method 2	B_2	.22	.57	.10	.68	(.94)				
	C_2	.11	.11	.46	.59	.58	(.84)			
	A_3	.56	.22	.11	.67	.42	.33	(.94)		
Method 3	B_3	.23	.58	.12	.43	.66	.34	.67	(.92)	
	C_3	.11	.11	.45	.34	.32	.58	.58	.60	(.85)

Convergent validation

- Reliability coefficient: The proportion of variance shared between true scores and observed scores produced when a trait is measured by way of one specific method.
- Validity coefficient: Correlation between trait scores produced by means of one method should correlate strongly with those produced using another method .

Discriminant validation

- Between-trait, within-method correlation: Correlation between scores on different traits measured using the same method
- Between-trait, between-method correlations: Correlation between scores on different traits measured sing different methods

MTMM validation criteria

1. Validity diagonal values should be
   - statistically significant, and
   - sufficiently large.
2. Validity diagonal values should be higher than heterotrait-heteromethod triangles.
3. Within each heteromethod block, correlation of the same trait should be higher than correlations between different traits.
4. The same pattern of trait interrelationship should be evident in all heterotrait triangles of both the monomethod and heteromethod blocks

Criterion 1 = Convergent validity
Criteria 2–4 = Discriminant validity

Task 1: MTMM analysis

- Download pomlab02.RData from Canvas and load it into 
- These are MTMM matrices presented in Campbell and Fiske's (1959) original paper
- Conduct convergent and discriminant validation organised in the MTMM matrix
  - Examine convergence and discriminant validities for the first method
  - Examine convergence and discriminant validities for the second method
  - Examine convergence and discriminant validities across methods

"Disattenuating" correlations

Correlations between scores are often impacted by imperfect reliability ("attenuation"). To get a "true correlation" between traits, we may correct for attenuation ("disattenuation").

- Let ρ_{xy} denote true correlation between traits x and y ("true"/perfect reliability).
- Let r_{xy} denote the observed correlation between traits x and y.
- Let r_{xx} and r_{yy} denote the reliabilities with which x and y are measured respectively.

An estimate of the "true" correlation between traits x and y can be obtained by:

$$\widehat{\rho}_{xy} = \frac{r_{xy}}{\sqrt{r_{xx} r_{yy}}}.$$

Task 2: MTMM disattenuation

- Select one trait from the mtmm matrix
  - Examine convergence and discriminant validities for the first method
  - Examine convergence and discriminant validities for the second method
  - Examine convergence and discriminant validities across methods

References

AERA, APA & NCME. (2014). *Standards for educational and psychological testing*. American Educational Research Association; American Psychological Association; National Council on Measurement in Education. https://www.testingstandards.net/uploads/7/6/6/4/76643089/standards_2014edition.pdf

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*, *56*(2), 81–105. https://doi.org/10.1037/h0046016