

Sample size for questionnaire validation studies

Dr Wan Nor Arifin

Unit of Biostatistics and Research Methodology, Universiti Sains Malaysia.

wnarifin@kk.usm.my

Outlines

Exploratory factor analysis

Confirmatory factor analysis

Cronbach's alpha

Intraclass correlation

Kappa agreement

Exploratory factor analysis (EFA)

- Two ways; rule-of-thumb and simulation study.

Sample size

- Using rule of thumbs: Minimum of 5 per item (Costello & Osborne, 2005).
- Simulation study:
 - Guadagnoli & Velicer 1988 (As summarized in Stevens, 2009)

Condition	Sample size
4 or more loadings > 0.6	Any sample size
10 or more loadings $= 0.4$	150
Only a few loadings $= 0.4$	300

Confirmatory factor analysis (CFA)

- Two ways; rule-of-thumb and simulation study.

Sample size

- Rule of thumbs: Minimum 10 per freely estimated parameters (Kline, 2011).
- Simulation study:
 - Hair Jr. et. al., 2009

Example:

Condition	Sample size
-----------	-------------

5 or less constructs + > 3 items per construct + item communality > 0.6	100
7 or less constructs + item communality > 0.5 + no under-identified constructs	150
7 or less constructs + items communality < 0.45 + 3 or less under-identified constructs	300
Large number of constructs + (some) with item communality < 0.45 + (some) constructs with < 3 items	500

Cronbach's alpha

- For internal consistency reliability in EFA. Also applicable to construct reliability for CFA.

Sample size

- Statstodo website [http://www.statstodo.com/SSiz1Alpha_Pgm.php].

Intraclass correlation

- For agreement (numerical) and test-retest reliability using ICC.
- Testing the agreement between total scores on two different occasions (test-retest).
- Testing the agreement of raters on the rating/score given to a number of subjects.

Sample size

- Formula – Excel file: [http://medic.usm.my/biostat/images/files/Sample_size_calculation_v1_3.xls] Also provided in folder.

Kappa agreement

- For agreement (categorical) using kappa analysis.
- Testing the agreement of raters on the rating/score given to a number of subjects.

Sample size

- Formula – Excel file provided in folder: Kappa sample size - 2 rater - with explanation.xls

References

Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four
Wan Nor Arifin, 2013 *Sample size for questionnaire validation studies – 2*

recommendations for getting the most from your analysis. *Practical Assessment Research & Evaluation*, **10(7)**.

Guadagnoli, E. & Velicer, W. F. (1988). Relation to sample size to the stability of component patterns. *Psychological bulletin*, **103(2)**, 265.

Hair Jr., J. F., Black, W. C., Babin, B. J. & Anderson, R. E. (2009). *Multivariate data analysis*. 7th ed. Upper Saddle River, NJ: Pearson Prentice-Hall.

Kline, R. B. (2011). *Principles and practice of structural equation modeling*. 3rd ed. New York: Guilford Publications.

Stevens, J. P. (2009). *Applied multivariate statistics for the social sciences (5th eds.)* New York: Taylor & Francis Group.