The Effectiveness of Matrix Sampling with Non-Cognitive Measures

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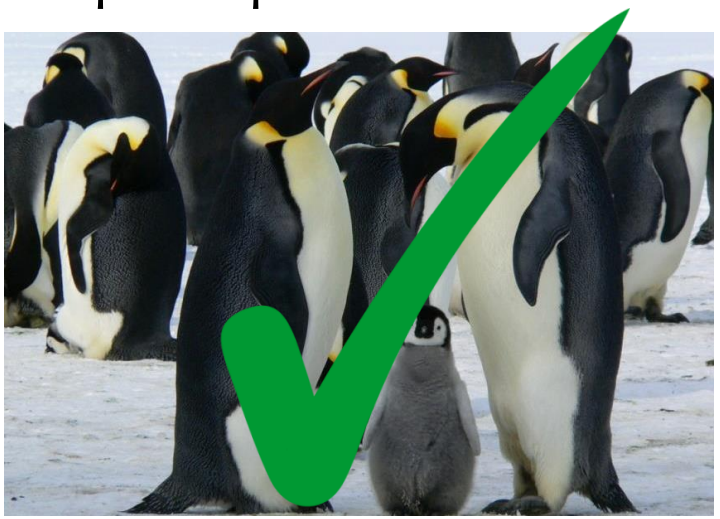
Matrix sampling

* Useful when we are not interested in individual scores, but instead we are interested in group-level information.
  * AKA item-examinee sampling, type 12 sampling, incidence sampling
  * A technique where samples of items are administered to samples of subjects
  * Reduced testing demand on individual participants



What motivates our work

* The technique has powerful utility for assessing group level information
* Surprisingly few studies use the technique in non-cognitive assessment, even when group level information is desired.
* Some authors have recommended more conceptually and practically simpler solutions to reduce testing burden, such as shortening scales (e.g., Fraser, 1982).

Our Intent

* To demonstrate the utility of matrix sampling specifically for group level non-cognitive assessment
  * And hopefully raise awareness of the technique
* To test the effectiveness of matrix sampling as compared to the shortening of scales (i.e., a 'simpler' method with the same goal)

Methods

We used an existing dataset from a measure of non-cognitive traits.

The measure

* Three primary areas, with 4 subfactors each
  * Motivation, Perseverance, and Optimism
  * Primary factors were 24 items long
    * Secondary factors were 6 items long

Participants

* 281 students in grades 6 through 12.

Our Design

1. Fixed reduction of the measure's length
   * I.e., shortening of the scale
2. Matrix sampling
   * I.e., sampling items and participants

* We proceeded via iterations, having an iteratively smaller test and sampling iteratively fewer items to each participant

Analysis

* Each iteration was compared to the original group mean via T-test
* The T-tests produced 129 trials with a measure of success or failure
  * These 129 trials were then analyzed via χ^2

Results

* Method A failed 44% of the 129 trials of mean equivalence, whereas Method B never failed to reproduce the initial group mean, *even when only a single item was sampled randomly to varying participants*.

* χ^2 was significant (p<.001)

Contingency Table

Obtained

	Pass	Fail	Total
Short	72	57	129
Matrix	129	0	129
Total	201	57	258

Expected

	Pass	Fail	Total
Short	100.5	28.5	129
Matrix	100.5	28.5	129
Total	201	57	258

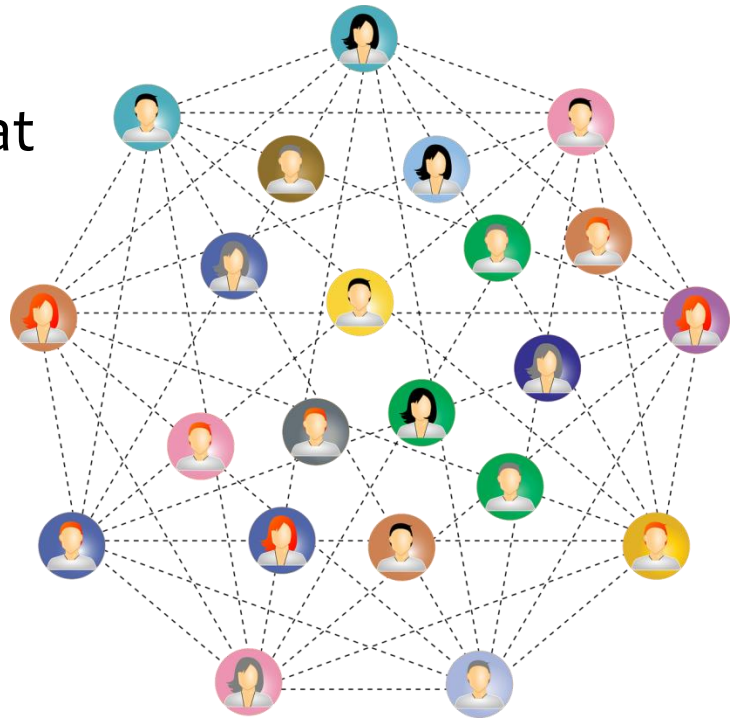
χ^2	73.19
df	1

Conclusions

* The result demonstrates both that
  * 1) Matrix sampling is an effective method for estimating group means on non-cognitive measures
  * 2) The matrix sampling technique leads to better estimates with fewer items than does simply reducing scale length.

Implications

* More efficient group-level sampling for non-cognitive assessment
* Matrix sampling could have great uses in technology enhanced or fully online programs



On-going research

* We are now running simulation studies with a colleague
  * One question of interest is how many participants are necessary to get good estimates, relative to scale size. I.e., what are the minimum numbers.
* We will be working with a researcher who will be utilizing the technique in the collection of an extensive dataset; they will be administering a non-cognitive measure.

Questions or Comments?

* Questions may also be addressed to Jesse.Pace@ku.edu

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