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# Effectiveness of factor enumeration rules on personality data

S. Mason Garrison<sup>1</sup>

Vanderbilt University<sup>1</sup>

s.mason.garrison@gmail.com

## Introduction

The study of individual differences is inexorably linked with factor analysis. Many generally accepted theories, such as the Big Five (Goldberg, 1990) or the General factor of intelligence (Spearman, 1904) were developed using factor analysis. Measures, based on those theories were developed and refined, using factor analysis. In turn, those measures are used to validate other measures and develop new theories.

This cycle leaves differential psychology vulnerable because factor analysis is

- often misused in construct validation (Distefano & Hess, 2005);
- conventional methods for determining number of factors are subjective (Zwick & Velicer, 1986); and
- standard cut points for determining good fit aren't designed for personality-like data (Kang, McNeish, & Hancock, 2016).

## Present Study

Do the commonly used methods *actually* recover the correct number of factors?

How well do the following perform in recovering the correct number of factors?:

- Minimum Average Partial procedure, and
- various goodness-of-fit indices
  - (BIC,  $\chi^2$ , RMSEA, SABIC, SRMR, TLI),
  - using classic thresholds (Hu & Bentler, 1998) .

## Design

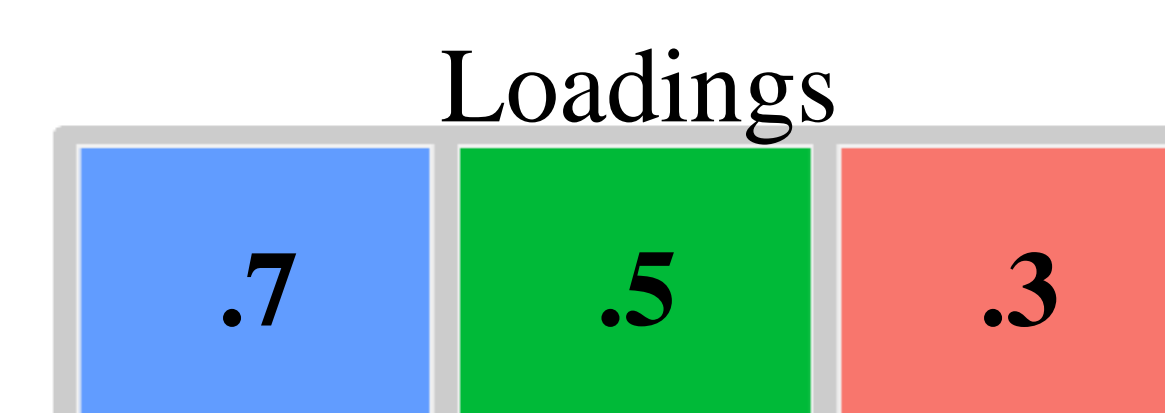
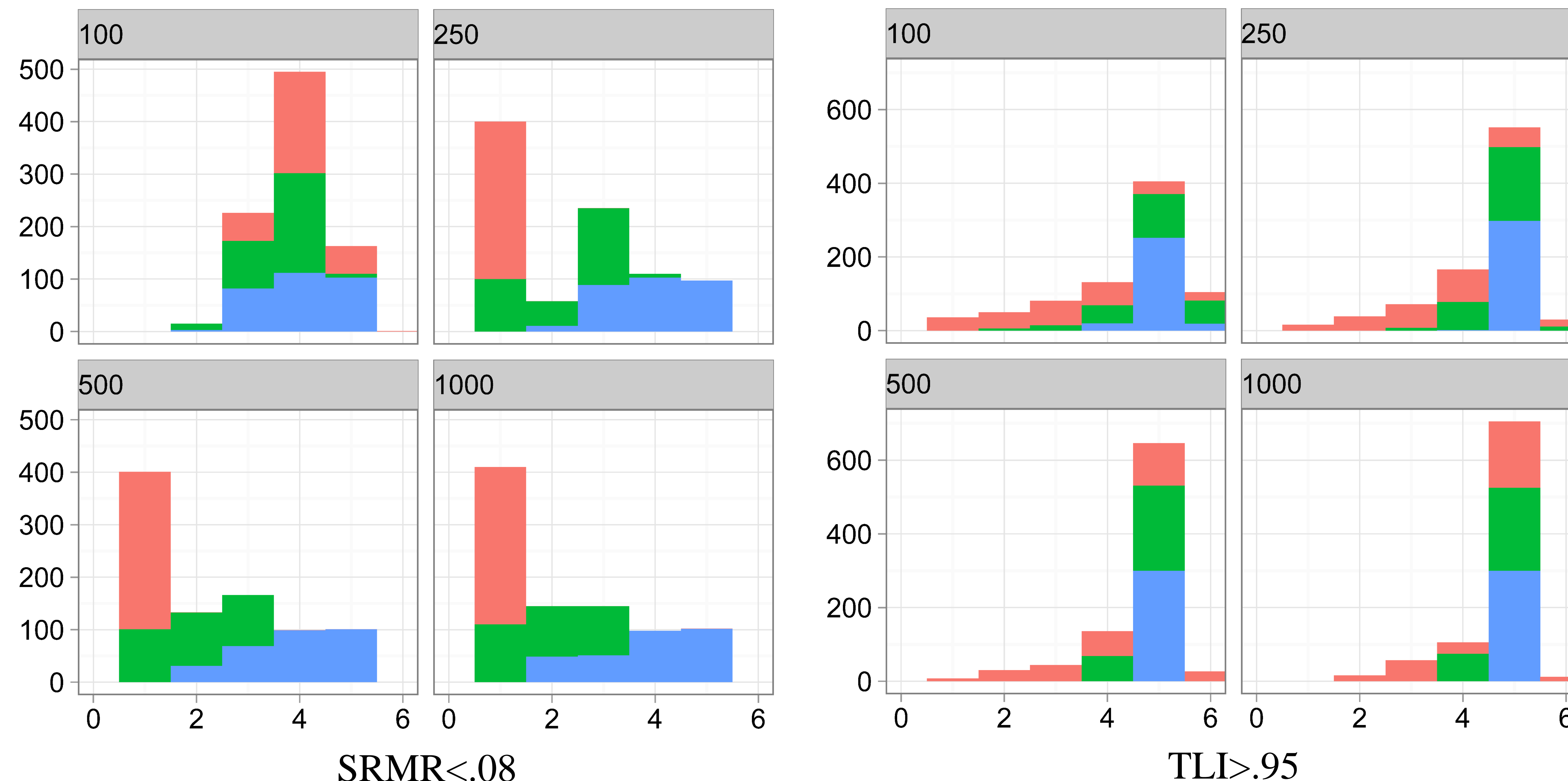
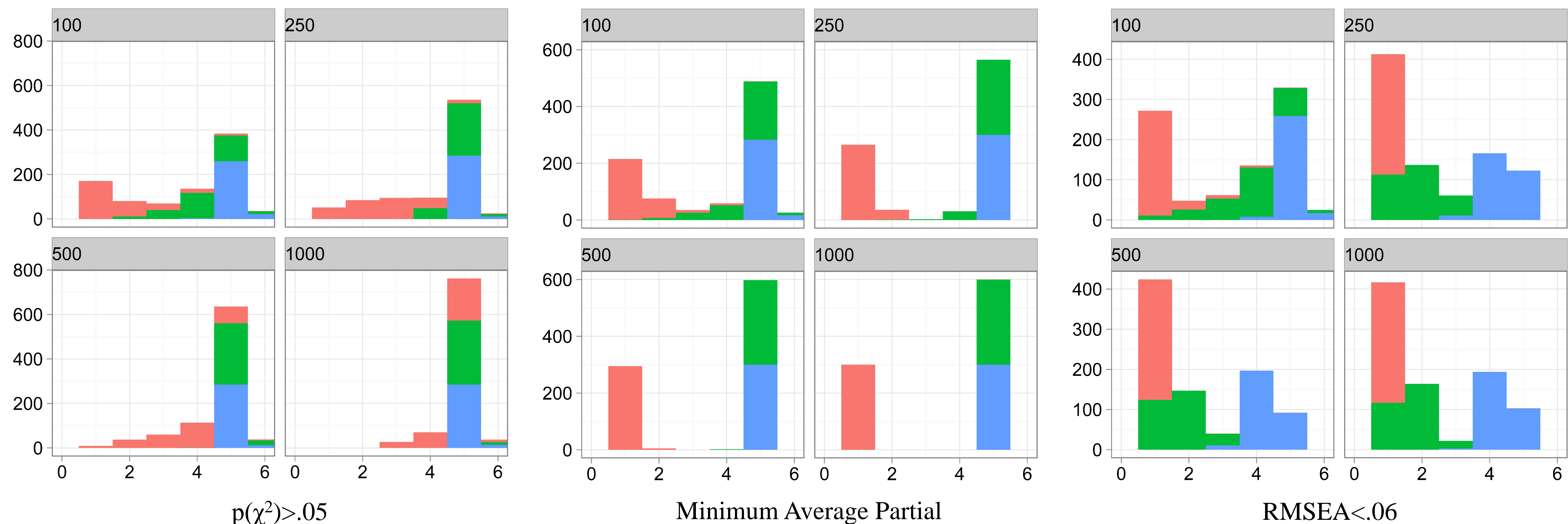
Data Generation and Analyses

- R 3.3.3
- Adapted vss function from Psych package
- Estimated using MLE with Oblimin Rotation
- Extracted maximum of 9 factors
- 100 Data Sets per condition

Conditions

- Tests (BFI, IPIP50, IPIP100)
- Average Item Loadings (.3, .5, .7)
- Correlation between Factors (0, .1, .3)
- Sample Size (100, 250, 500, 1000)

## Number of Factors Selected (IPIP50)



## Major Findings

Number of factors selected: Mean 3.45 (Median 4)

TLI	5.00 (5)
SABIC	4.09 (5)
$\chi^2$	4.00 (5)
MAP	3.57 (5)
BIC	3.01 (4)
SRMR	2.36 (2)
RMSEA	2.19 (1)

Sources of incorrect number of factors

- Low Factor Loadings (all n)
- High Factor Correlations  $\geq .3$  (small n)

## Recommendations

Samples Size

- 5 people per item (250 minimum)

Factor Selection Rules

- Use Minimum Average Partial procedure
- RMSEA  $\leq .02$ ; SRMR  $\leq .04$ ; TLI  $\geq .95$

High Quality Items

- Average Factor Loading  $\geq .5$