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A Bayesian Saturated Model Approach to Posterior Predictive Model Checks in Confirmatory Factor Analysis

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Data with different sample sizes ($N = 50$, 500, 2000) were simulated based on two correct CFA models and estimated with four types of mis-specified models (overspecified, underspecified, a model with the correct number of dimensions but one item loading onto the wrong factor, and a model with

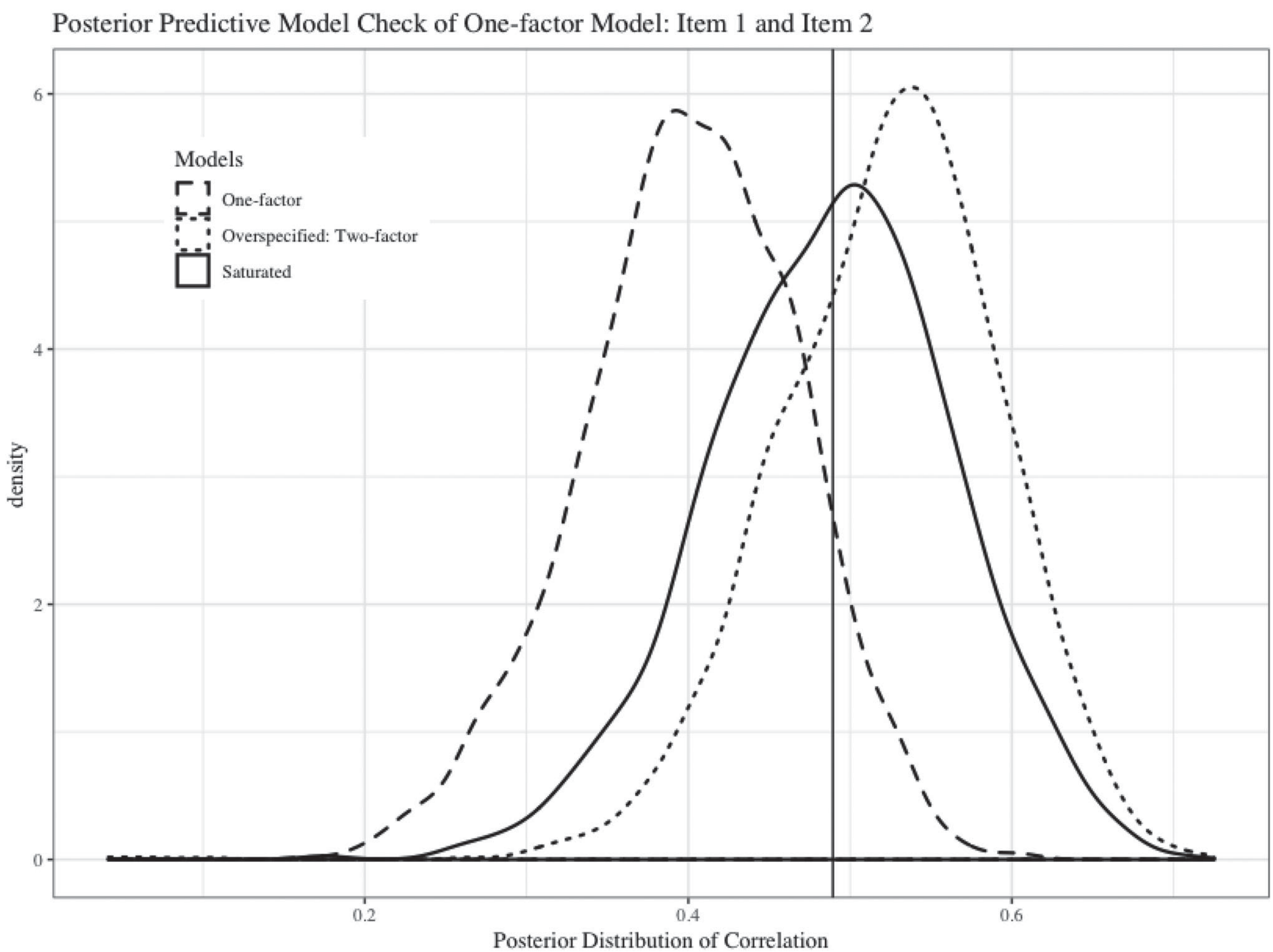

Figure 1. Posterior predictive model check of correlation between Item 1 and Item 2 in one-factor model. The solid vertical line represents the location of the MLE of the correlation. The density with solid line represents the posterior predictive distribution of the correlation generated by the saturated model, dashed line represents the posterior predictive distribution of the correlation generated by the one-factor model, and dotted line represents the posterior predictive distribution of the correlation generated by the two-factor model (overspecified). When the solid vertical line (MLE) is far away from the center of the posterior predictive distribution of the correct model and the mis-specified model, the model fit is poor. Greater overlapping of the posterior predictive distribution between the saturated and the alternative models indicates better model fit.

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the correct number of dimensions but having one item with an additional, unnecessary, factor loading). The factor loadings and factor correlations were randomly sampled in each replication from a uniform distribution ranging from 0.1 to .8 and from .3 to .8, respectively. All models were estimated using *JAGS* with an uninformative prior. For each estimated model, 1,000 sets of parameters were sampled from the posterior distribution; these parameters were used to generate data sets from which the corresponding posterior predictive distribution of item-pair correlations were calculated. To examine local misfit between the tested model-based and saturated model's posterior predictive distributions, we used the Kolmogorov-Smirnov (KS) test to measure the distance of posterior predictive distribution between the estimated model and the saturated model.

Results showed that the saturated model PPMC approach and KS provide an accurate method of determining local model misfit. Compared to the traditional point-estimate MLE-based PPMC, the conclusions drawn from this approach provide more information about the measurement and sampling error of the observed data. The overlapping area between the distributions of model with that of the saturated model are expected to provide more accurate results than previous PPMC methods.

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