Nonparametric Tests for the Rasch-model in eRm: Analysis with small samples.

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Abstract

The dichotomous Rasch-model (Rasch, 1960) is an Item Response model where the validation is commonly related to the use of big sample sizes. But, in the phase of design of a psychological test the examination of items by means of a large sample of persons is not always efficient, e.g., reanalyzing the items by means of a new sample is associated with high costs. It would be preferable to test the items stepwise with small samples but based on few subjects estimation of the parameters is problematic and parametric model checks have little power. Ponocny (2001) introduced nonparametric (exact) test procedures based on Monte-Carlo simulations to sample random matrices with the same marginals as the observed data matrix. His simulation method and proposed test-statistics allow to check the model fit even in small samples. Verhelst (2008) improved the simulation algorithm using a Markov-Chain Monte-Carlo (MCMC) approach. Recently, some test statistics and the MCMC method have been implemented in the R packages RaschSampler (Verhelst, Hatzinger &, Mair, 2007) and eRm (Mair & Hatzinger, 1997) In this presentation we describe some test statistics and give an overview of first results of a power-analysis comparing the nonparametric tests with the likelihood ratio test (LRT) according to Andersen (1973). A practical application demonstrates the usefulness of the nonparametric methods.