

# Constant Latent Odds-Ratios models and the Mantel-Haenszel null hypothesis

Dave J. Hessen

Department of Psychology, University of Amsterdam, Roetersstraat 15, 1018WB Amsterdam, The Netherlands. E-mail: [ml\\_hessen@macmail.psy.uva.nl](mailto:ml_hessen@macmail.psy.uva.nl)

**Keywords:** Item Response Theory and Test Development

## **Abstract:**

Under a more general model for dichotomous item scores than the one-parameter logistic Rasch model, it is shown that methods based on an observed conditional invariance model in general and the Mantel-Haenszel procedure in particular can be diagnostic of measurement invariance or differential item functioning. The assumptions of nondecreasing item response functions, local independence of the item scores conditional on a unidimensional latent trait, and the additional assumption of constant latent odds-ratios between all pairs of items define this general model. Three parametric special cases of this general model are shown to be generalizations of the Rasch model. For the general model and each of its parametric special cases, the total score is shown to be a sufficient statistic for the latent trait. Under the general model, the manifest odds-ratios used in the Mantel-Haenszel procedure are derived. The derivations of the manifest Mantel-Haenszel odds-ratios are used in discussing specific hypothetical situations that can arise in a practical DIF investigation by means of the Mantel-Haenszel procedure. Special attention is given to a so-called worst-case scenario in which the Mantel-Haenszel null hypothesis is satisfied while all items are DIF items systematically in favor of one of two groups under study.