

# Multilevel factor models for ordinal variables <sup>1</sup>

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## Abstract

Factor models for multilevel continuous data have been proposed, among others, by Goldstein and McDonald (1988) and Longford and Muthén (1992). Only recently such models have been extended to the non-normal case (Ansari and Jedidi 2000; Goldstein and Browne, 2002; Rabe-Hesketh *et al.* 2002). In this work, we focus on the multilevel factor model for ordinal variables, which is an useful tool especially in the social sciences, where quite often the statistical units are nested in multilevel structures and the response variables are measurements on ordinal scales, e.g. Likert scales. Moreover, the multilevel factor model for ordinal variables is quite general, since it includes binary responses as a special case and can be easily extended to mixed continuous-ordinal-binary responses (Rabe-Hesketh *et al.* 2002).

In this work we tackle several issues involved in specifying, fitting and interpreting the results of multilevel factor models for ordinal variables. First, we address the problem of model specification and identification, outlining the parameters' interpretation. Then, given the computational effort required to fit such a complex model, we suggest a step-by-step strategy for model selection based on a series of simple preliminary analyses. An application to Italian graduates' job satisfaction illustrates the model selection procedure and the parameters' interpretation, using maximum likelihood with adaptive numerical quadrature. Finally, we review the available software, stressing computational problems and giving some indication for future research.

## References

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