

**A Supplement to “The number of Guttman errors as a simple and powerful person-fit statistic”
(Volume 18, Number 4, pp. 311–314)**

Rob R. Meijer, University of Twente

Meijer (1994) used a statistic to determine person-fit that was defined as follows:

$$G = \sum_{g=1}^{k-1} \sum_{h=g+1}^k f_{gh}, \tag{1}$$

where

g and h are item indexes,

k is the number of items in the test,

$f_{gh} = 1$ if a person has a 1 (correct, keyed response) on the easier item and a 0 (incorrect, not keyed response) on the more difficult item, and

$f_{gh} = 0$ otherwise.

G is based on the number of errors from the deterministic Guttman (1950) model. This may have given the impression that this statistic was Guttman’s own error definition for his deterministic model. This is not the case. G is the number of errors from the deterministic Guttman model as defined by Loevinger (1947, 1948).

Guttman (1950) defined the number of errors by counting the “... number of responses which would have been predicted wrongly for each person on the basis of his scale score ...” (Guttman, 1950, p. 77), whereas Loevinger (1947, 1948) defined the number of errors by counting all error pairs. A small illustration may clarify the difference.

Assume a test consisting of five items ordered according to increasing item difficulty. Thus, the item score pattern for someone with three 1s according to the perfect Guttman (1950) model is [11100]. A person with the pattern [01011] has four errors according to Guttman’s error definition and five errors according to Loevinger’s definition. Because Loevinger’s definition and scaling approach appeared to be more useful for defining a probabilistic version of the deterministic Guttman model than Guttman’s own definition (e.g., Mokken & Lewis, 1982), Loevinger’s error definition was used as a simple person-fit statistic.

References

Guttman, L. (1950). The basis for scalogram analysis. In S. A. Stouffer, L. Guttman, E. A. Suchman, P. F. Lazarsfeld, S. A. Star, & J. A. Clausen (Eds.), *Measurement and prediction* (pp. 60–90). Princeton NJ: Princeton University Press.

Loevinger, J. (1947). A systematic approach to the construction and evaluation of tests of ability. *Psychological Monograph*, 61, No 4.

Loevinger, J. (1948). The technique of homogeneous tests compared with some aspects of scale analysis and factor analysis. *Psychological Bulletin*, 45, 507–530.

Meijer, R. R. (1994). The number of Guttman errors as a simple and powerful person-fit statistic. *Applied Psychological Measurement*, 18, 311–314.


Mokken, R. J., & Lewis, C. (1982). A nonparametric approach to the analysis of dichotomous item responses. *Applied Psychological Measurement*, 6, 417–430.

Acknowledgment

Thanks are due to Bert Green for pointing out this historical inaccuracy.

Author’s Address

Send requests for reprints or further information to Rob R. Meijer, TO/OMD, University of Twente, P.O. Box 217, 7500 AE, Enschede, The Netherlands. Internet: Meijer@edte.utwente.nl.

Handwritten notes:

 $n^2 = n^2$