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Further considerations on the GDI method for Q-matrix validation

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Abstract
In the context of cognitive diagnosis models, a Q-matrix reflects the correspondence between attributes and items. The construction of this Q-matrix is typically theoretically based, most of the time relying on domain experts. This approach is subjective and may lead to misspecifications in the Q-matrix that will negatively affect the attribute classification accuracy. In response, several methods of empirical Q-matrix validation have been developed with the aim of correcting misspecified entries in a Q-matrix. One of these methods is the general discrimination index (GDI) method proposed by de la Torre and Chiu (2016). All items with a proportion of variance accounted for (PVAF) lower than a predetermined cutoff for PVAF are modified. This talk will cover two studies from our research group that focus on improving the performance of the GDI method. First, a simulation study is conducted to test the GDI method under a wide range of conditions with the purpose of providing it with a higher generalization, and to empirically determine the most appropriate cutoff considering the specific data conditions. In a second study, an iterative application of the GDI method is evaluated under different conditions of misspecification rate. The overall results indicated that the performance of the GDI method improved when the application was iterative at the item level and was used in conjunction with an appropriate cutoff point. This was more noticeable when the original Q-matrix misspecification rate was high.

Keywords: cognitive diagnosis models, G-DINA, Q-matrix, validation, GDI.

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