Title

Multiple maximum exposure rates in computerized adaptive testing

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Title

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Abstract

Computerized adaptive testing is subject to security problems, as the item bank content remains operative over long periods and administration time is flexible for examinees (Chang, 2004). Spreading the content of a part of the item bank could lead to an overestimation of the examinees' trait level. The most common way of reducing this risk is to impose a maximum exposure rate (r^{max}) that no item should exceed. Several methods have been proposed with this aim (Revuelta & Ponsoda, 1998; Sympson & Hetter, 1985; van der Linden & Veldkamp, 2004). All of these methods establish a single value of r^{max} throughout the test. We present a new method, the multiple-r^{max} method, which defines as many values of r^{max} as the number of items presented in the test. In this way, it is possible to impose a high degree of randomness in item selection at the beginning of the test, leaving the administration of items with the best psychometric properties to the moment when the trait level estimation is most accurate. We describe the implementation of the multiple-r^{max} method, and test it in simulated item banks and in an operative bank. Compared with a single maximum exposure method, the new method has a more balanced usage of the item bank and delays the possible distortion of trait estimation due to security problems, with either no or only slight decrements of measurement accuracy.

Keywords

computerized adaptive testing; item exposure control; test security; item selection