Work in electronic format in the ProQuest Dissertations & Theses database, where it may be made available for free download. A subset of the ProQuest Dissertations & Theses database may be accessed by the academic community as well as through major search engines and open access harvesters. ProQuest may also provide an electronic copy of the Work to Author’s degree-granting institution where it may also be posted for free open access. Learn more:

- **Copy Sales.** ProQuest and its agents and distributors may offer copies of the Work for sale in tangible media, including but not limited to microform, print and CD-ROM, as well as electronic format individually or as part of its electronic database and reference products and services. No royalties shall be due to Author.

- **Publishing Fees.** Author’s payment of the additional Open Access fee is a one-time, up-front fee in addition to the ProQuest dissertation or thesis publishing fee. Author’s institution may assess additional fees to be collected along with the Open Access and publishing fees.

**Section III. Publishing Options & Signature**

Select the publishing options below that best fit your interests and scholarly publishing obligations.

**Traditional Publishing**

- X I want to make my work widely available and I want to be eligible to receive royalties on the sale of my work.
- I understand that I must maintain a current mailing address with ProQuest in order to be eligible to receive royalties.
- I understand that the ProQuest fee for Traditional Publishing is $55 for Masters Theses and $65 for Dissertations, and that my graduate institution may pay all or a portion of the total fee as well as may require additional fees in association with my submission to ProQuest.

**Open Access Publishing Plus**

- ☐ I want the broadest possible dissemination of my work, and I want to provide free global access to the electronic copy of my work via the internet.
  - I understand that I will not be eligible to receive royalties.
  - I understand that the ProQuest fee for Open Access Publishing Plus is $150 for Masters Theses and $160 for Dissertations, and that my graduate institution may pay all or a portion of the total fee as well as may require additional fees in association with my submission to ProQuest.

**Select Publishing Options**

- I want my work to be available as soon as it is published.
  - X Yes
  - ☐ No – I would like access to the full text of my Work to be delayed for the following period of time:
    - ☐ 6 month embargo
    - ☐ 1 year embargo
    - ☐ 2 year embargo

Note: Most institutions have delayed release (embargo) policies; please consult with your Graduate School/Program if you need to delay the release of your Work. Access to the full-text of your work will be delayed for the time period specified above, beginning from the date that we receive your manuscript at ProQuest. During this time, only your citation and abstract will appear in the ProQuest Dissertations & Theses database (PQDT).

- I want major search engines (e.g. Google, Yahoo) to discover my work.
  - ☐ Yes
  - ☐ No

Learn more: [http://www.proquest.com/go/dissertations-google](http://www.proquest.com/go/dissertations-google)

**Acknowledgment:** I have read, understand and agree to this ProQuest Publishing Agreement, including all rights and restrictions included within the publishing option chosen by me as indicated above.

**REQUIRED Author’s signature** ____________________________ Date March 24, 2020

(Print Name) Kirsten Hochstedt

Institution conferring degree The Pennsylvania State University

*This page must accompany your manuscript and the rest of the submission materials.*
Dissertation/Master’s Thesis Submission Form

Please print clearly in block letters

Personal Information

Last Name
Hochstedt

Middle Name or Initial
S.

First Name
Kirsten

Country(ies) of Citizenship
U.S.A.

Degree & Dissertation Information

Title of Dissertation/Thesis
Performance of popular item response theory dimensionality assessment methods under several nonstandard and suboptimal conditions

The Pennsylvania State University

The College of Education

Educational Psychology

Dr. Pui-Wa Lei

Dr. Jonna Kulikowich

Dr. Sarah E. Zappe

Dr. Mosuk Chow

Language of manuscript
English

Primary Subject Category: Enter the 4-digit code and category name from Guide 2 that most closely describes the disciplinary area of your research.

0525 Educational psychology

You may suggest two additional subject categories that may aid in the discovery of your work in our digital database.

0288 Educational tests & measurements

0632 Quantitative psychology

Provide up to 6 keywords or short phrases for citation indices, library cataloging, and database searching.

item response theory

dimensionality

DIMTEST

latent trait nonnormality

unidimensionality

NOHARM

Current Contact Information

Current Email
ksh148@psu.edu

Street Address (line 1)
728 Willowbank Street

City
Bellefonte

State/Province
PA

Postal Code
16823

Daytime Phone
717-891-1082

Evening Phone
717-891-1082

Permanent Contact Information

Permanent Email Address
ksh148psu@gmail.com

Street Address (line 1)
728 Willowbank Street

City
Bellefonte

State/Province
PA

Postal Code
16823

Phone
717-891-1082

Alternate Phone

THIS PAGE MUST ACCOMPANY YOUR MANUSCRIPT AND THE REST OF YOUR SUBMISSION MATERIALS

Attach additional, separate copies of your Title Page and Abstract to this form
ABSTRACT

Assessing test dimensionality is a fundamental part of the evaluation of a test and a prerequisite for using item response theory models. The purpose of this study was to investigate how popular dimensionality assessment methods perform under some nonstandard and commonly encountered suboptimal conditions when the items are dichotomously scored. To this end, a range of sample sizes (250, 500, 1,000, and 2,000 examinees), test lengths (20, 40, and 60 items), latent trait distributions (normal, symmetric/leptokurtic, uniform/platykurtic, and asymmetric/leptokurtic), guessing specifications (correct/no guessing, correct/guessing, and incorrect/guessing), and inter-trait correlation (.3, .5, and .7) were manipulated in a simulation study. The dimensionality assessment methods examined include two nonparametric item pair conditional covariance-based essential dimensionality assessments as implemented in DIMTEST and four goodness-of-fit indices based on a parametric nonlinear factor analytic method as performed in NOHARM.

The performance of each method was evaluated based on their incorrect rejection rates of unidimensionality (Type I error rate). The methods that performed well based on the Type I error rate were then examined by their correct rejection rates of unidimensionality (power). The results indicate that the nonparametric method DIMTEST performed the best overall. DIMTEST is recommended particularly when the sample size is large, the test length is medium or long, and there is no guessing behavior, even when the inter-trait correlation is high. Based on the power analysis, the NOHARM-based approximate chi-square statistic (ACHI) might be preferred over DIMTEST when the test length is short, particularly if guessing behavior is present. There was a tendency for DIMTEST and ACHI to maintain high power when the latent trait distribution was uniform (skewness = 0; kurtosis = 1.7).