Issues surrounding conversion of paper-and-pencil to computerized testing

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July 24, 2012

Presented at the 2012 conference of the International Personnel Assessment Council

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Intended audience & purpose

- HR and/or public safety professionals who have their own paper-and-pencil tests
- Highlight general approach and issues for practitioners
- Not intended as a presentation of advanced psychometric techniques and latest advances in computerized testing

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Introduction

- Attention has been growing over the last 20 years regarding computerized testing
- Many major professional school admissions and professional certification exams have converted from paper-and-pencil testing to computerized testing
  - Admissions: e.g., GRE, LSAT, MCAT
  - Certification: e.g., NCLEX, (Nursing) MCSE (IT)
- Many personnel selection tests have followed suit
- Cheaper, faster, more advanced and readily available computers
- Increased availability of testing networks
- Increased "do-it-yourself" resources
- IRT and computerized adaptive testing

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Questions to be addressed

- Why/when should a test be converted?
- What kind of computerized testing is available?
- Is a test a candidate for conversion?
- What are the requirements for conversion?
- How do computerized tests work in practice?
- What are the steps for conversion?
- Who will convert the test?
- How is a computerized test maintained?
- What other factors should be considered?

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Test development (regardless of mode)

- Testing program should be defined
- Job analysis must be conducted
- Test content must be related to the job
- SME review must be conducted
- Items should be pretested
- Reliability and validity must be assessed
- Standard setting should be conducted
- There should be periodic monitoring and reporting

Types of computerized testing

- Fixed-length testing
  - Linear (all items presented to candidates in the same order)
  - Randomized (all items presented to candidates in scrambled order)
- Adaptive testing
  - A large pool of calibrated items is built (i.e., an "item bank")
  - A candidate receives some "starter" items
  - The candidate's ability is estimated in real time based on previous responses
  - An item selection algorithm picks the next item for a candidate based on the candidate's ability estimate and various other criteria ("test targeting")
  - The adaptive test concludes when one or more conditions have been met (i.e., the "stopping rule")
- Both have advantages and limitations
- Hybrids are possible

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When/why a test should be converted

Fixed-length and adaptive testing:

- Use of complex/multimedia item types
- Concerns with test security/item exposure with written test and/or procedures
- Need or desire for continuous testing/retesting
- Need for instant/on-screen score reporting or independent score verification (e.g., Texas "Chapter 143" Rule)

Adaptive testing:

- Potential for reduced test length, time, and cost
- Potential for greater precision (increased reliability)
- Possible real-time item exposure control

Deciding if a test should be converted

- Critical need (e.g., test security)
- Critical opportunity (e.g., building momentum)
- Available technology
- Culture (organization/profession)
- Legal barriers or challenges
  - Civil service rules, (e.g., Texas "Chapter 143" Rule)

Requirements for conversion

Fixed-length or adaptive testing:

- Technology (hardware/software/testing platform or network)
- Availability of test sites
  - Proctored/secure: lab (closed network or internet delivery)
  - Unproctored/non-secure ("screeners): internet delivery only
- Data handling/transfer capability

Adaptive testing only:

- Previous paper-and-pencil testing data
- Calibrated item bank
- Pretesting
- Adaptive algorithm
- More extensive data analysis

Steps for conversion

Fixed-length testing:

- Data analysis (optional)
- Additional item writing
- Pretesting (optional)
- Creation of one or more forms
- Creation of scoring program
- Creation of eligibility/registration system
- Creation of score reporting system
- Implementation of platform/network testing
- Assessment of measurement equivalence(optional)

Adaptive testing only:

- Data analysis, pretesting assessment of measurement equivalence required
- Creation of item selection algorithm

Who converts the test

- Internal: staff
  - Additional staff
  - Necessary expertise (data analysis, ability to handle technical support issues, etc.)
- External: vendor/consultant
  - Tailored solution
  - Responsiveness/availability

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How computerized tests work in practice

- A candidate is determined to be eligible and is registered to take a test
- The exam is administered to the candidate
- A score reported is viewed/printed or sent
- The score is verified if necessary
- Ongoing monitoring and reporting are conducted
- The test is periodically revised as necessary

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Maintaining a computerized test

- Not much different than paper-and-pencil testing, but sometimes can lead to more active item/test management
- Possible to randomly seed in experimental items
- Some or all of a test can be rotated in/out
- With adaptive testing, emphasis is on the state of the item bank; possible to rotate entire item pools in/out (e.g., GRE)

Other factors to consider

- On-screen item presentation
  - One item vs. several
  - Scrolling can affect performance
- Item/answer review
  - Not allowing candidates to go back
- Practice test with real-time feedback and post-test survey
  - Reduced test anxiety
  - Increased perceptions of fairness

Conclusions

- These issues weren't new 10 years ago and certainly aren't today, yet there continues to be a resurgence of interest
- 20 years ago there were predictions that CBT was superior to paper-and-pencil testing and that paper-and-pencil testing would disappear – that hasn't happened yet and it won't
- There are good reasons both for and against conversion – decisions to the key issues presented herein and elsewhere will determine what's best in any given situation

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Thank you/For further information

To obtain further information please contact us at:

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