Applicant reactions to AIG: A CAT AIG feasibility study

Alan D. Mead[1], Sheng Zhang[2], Daniel Stopka[2]

[1]Talent Algorithms Inc.

[2]Illinois Institute of Technology

Agenda

- Background & Introduction
  - Current Use and Applications of CAT AIG
  - Weak vs. Strong AIG
  - The Impact of Flawed Items
- Methods
- Results
- Discussions & Next Steps

How to build a CAT that uses AIG?

- Automatic item generation (AIG)
  - Our method seems promising (see Mead, 2013)
- Strong AIG
  - Generate items with known difficulty
  - **We are working on this**
- Avoid flawed items
  - AIG CAT items will be shown to examinees without prior review
  - AIG algorithm must avoid (or detect) flawed items
  - **The current study**

Weak vs. Strong AIG

- Weak AIG
  - Emphasis on generating different items
  - Items generated from a template
  - Little known about item difficulty
- Strong AIG
  - Emphasis on understanding cognitive process underlying responding
  - Strong theoretical (or empirical) model of item difficulty
  - Generate items from “scratch” based on strong theory/model (Embretson, 1999)
- AIG CAT requires strong AIG

Our AIG Method: Sample Item

Hat:Head

a) Blowgun:Dart

b) Mitten:Hand

c) Candy:Sweet

d) Neck:Necklace

- Identify a “bridge”; you wear HAT on HEAD
- Find a matching answer; you wear MITTEN on HAND

Our AIG Method: Generation

Hat:Head

a) Blowgun:Dart

b) Mitten:Hand

c) Candy:Sweet

d) Neck:Necklace

- Assemble a database of “bridges” with multiple pairs of words matching the bridge
- Sample two word pairs for stem and key
- Generate distractors
  - *A work in progress*
  - May be pairs from unrelated bridges
  - May be be pairs from same bridge manipulated to be incorrect
  - May be related words not matching the bridge

Current Study

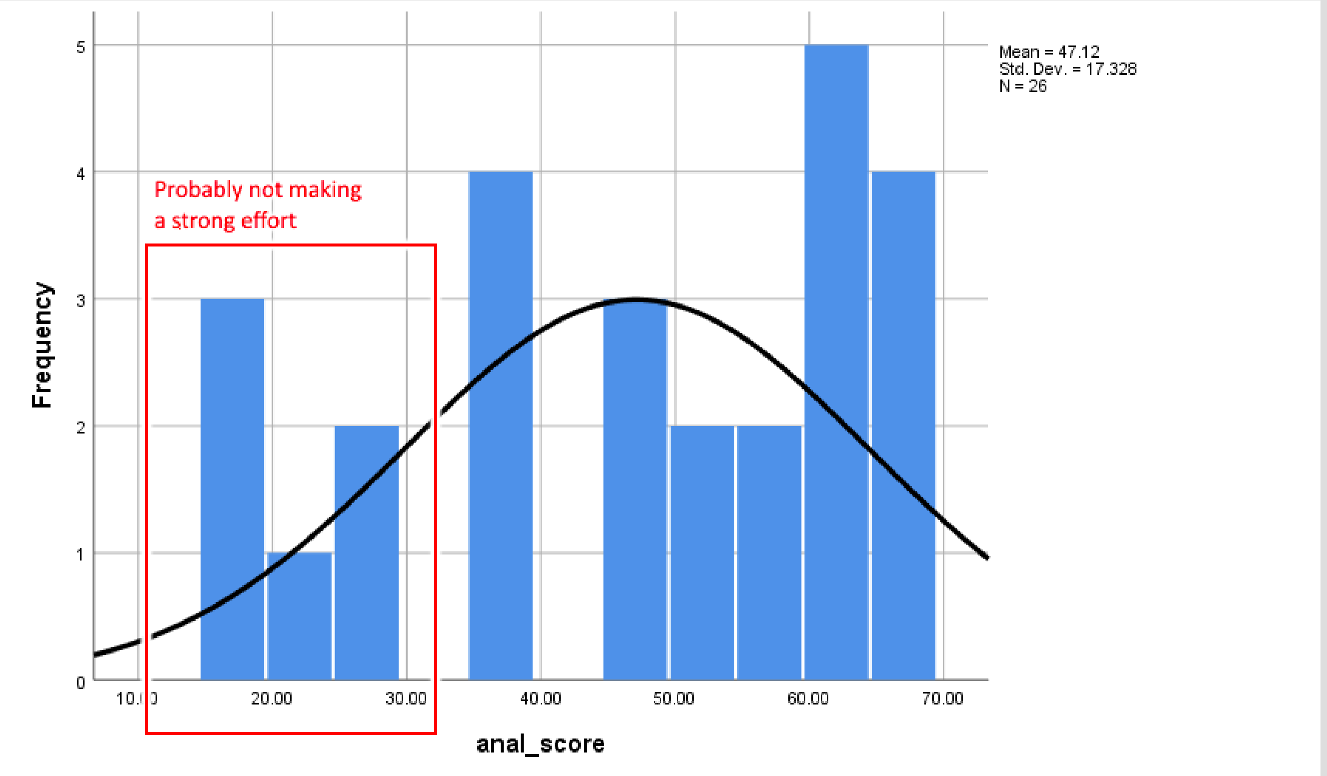
- Completely avoiding flawed items will be hard
- This study seeks to understand examinee perceptions of flaws in items
  - Asked examinees to flag flawed items
  - A next step will be to evaluate the psychological effects of flawed items (on examinee exam perceptions and performance)

Study Goals

- Goal 1: Understand examinees’ perceptions of flawed items
  - Verify that “normal” AIG items are **not** perceived as flawed by examinees
  - Verify that items we have manipulated to be flawed **are** perceived as flawed by examinees
- Goal 2: Estimate psychometrics of AIG items

Method

- Participants:
  - N=33 recruited from MTurk
  - Final sample N=23 after data cleaning



Probably not making a strong effort

Method

- 78 AIG items
  - 60 “normal” items generated from bridge item file
  - Types of distractor
  - 18 items manipulated to be flawed
- 21 “Applicant” reaction items

Type of Flaws

- We considered six possible flaws:
  1. Two Correct Keys
  2. No Correct Keys
  3. One Gibberish Distractor
  4. Extremely Difficult Word Sense
  5. Trivially Easy (Due to Flawed Generation)
  6. Stilted Analogy
- Wrote three items for each flaw

RESULTS

AIG Difficulty

- For all the items:
  - Mean = .668; SD = .179
- For items that were not being flagged:
  - Mean = .694; SD = .183

Which items were flagged?

- 18 items were manipulated to have flaws
  - 3 items for each of the six types of flaws
  - 14 (78%) were flagged by 1 or more examinees
    - Median proportion = 16% (i.e., 4 people)
  - 4 (12%) were not flagged (failed as flawed items)
- 60 AIG items (hopefully not flagged)
  - 36 (60%) were flagged by 1 or more examinees
    - Median proportion = 4% (i.e., one person)
  - 24 (40%) were not flagged (succeeded as “normal” items)

Flagging by type of flaw

Category	Number	Not Flagged	Prop. Flagging
Two correct keys	3	2	0.01
No correct keys	3	0	0.33
One gibberish distractor	3	0	0.15
Difficult word sense	3	1	0.09
Trivially easy	3	1	0.06
Stilted analogy	3	0	0.10

Discussions

- Overall, examinees flagged more proportions of intended flawed items than unflawed items.
- Some types of flawed items were more likely to be flagged than the others.
- 10 examinees (30%) were excluded from the study due to not paying enough attention or not putting enough effort into answering

Next Steps

- Sufficient flawed items do seem to be perceived by participants.
- Conditions with different percentages of flawed items will be tested and compared.
- Order of flawed items in the test. Flawed items will appear early in the test.
- Participants’ test-taking motivation.

Thank you!

amead@alanmead.org
szhang103@hawk.iit.edu
dstopka@hawk.iit.edu