Gaining a Better Understanding of General Mattering Scale

An Application of CTT and IRT

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Introduction

How one analyzes and makes inferences about test items plays a vital role in measurement.

This study showed how inferences and interpretations made from the items intended to measure students' feelings about mattering would differ across different measurement theories.

Introduction

Classical test theory (CTT) or "true score theory"

$$X_{observed} = X_{true} + error \tag{1}$$

Item response theory (IRT) or "modern test theory"[1]

$$P\left(Y_{zi} = x\right) = \frac{\exp \sum_{h=0}^{x} \left(\alpha_i \left(\theta_z - \delta_{ih}\right)\right)}{1 + \sum_{j=1}^{M_i} \exp \sum_{h=1}^{j} \left(\alpha_i \left(\theta_z - \delta_{ih}\right)\right)} \tag{2}$$

[1] Specifically for this study the Generalized Partial Credit Model

Mattering: Am I Significant?

- Rosenberg and McCullough (1981) stated three elements of mattering: attention, importance, and dependence. This has continued to constitute the theoretical base of measurements and explain external validation of a person by others.
- This external validation comes true at the interpersonal and societal levels
  - The interpersonal dimension indicates individuals' level of mattering to people in their lives.
  - The societal dimension includes individuals' perception of mattering toward outer world, such as, schools, governmental institutions, religious institutions.

Participants and Measure

- Volunteer students attending university in Turkey
  - $n = 1623$
  - 5 different universities
  - 59.5
  - Ages: 17 to 39, $\bar{x} = 21.4$
- General Mattering Scale - Turkish (GMS-TS; Haktanir et al., 2016)
  - GMS (original; Marcus, 1991) developed to assess the degree individuals believe how they are important to others
  - 5-point Likert
  - 4 items
  - Previous studies: $\alpha = .76$

CTT vs IRT

- CTT Calculations
  - SPSS v22.0 (IBM, 2013)
  - Mean of response categories
  - Observed Score distribution
  - Item mean
  - Item discrimination
  - Reliability (Cronbach's α)
- IRT Calculations
  - R package 'ltm' (R Core Team, 2016; Rizopoulos, 2017)
  - Item parameters (step difficulty, discrimination)
  - Item information
  - Test information

CTT Findings - Item Descriptives

Item	Response Options			
	Not At All	A Little	Somewhat	Very Much
Important	14.6	21.4	46.8	17.2
Attention	8.7	27.0	44.0	20.3
Miss	10.3	22.1	36.7	30.9
Say	7.5	21.2	43.9	27.4
Depend	6.3	12.8	36.8	44.1

Note: Values are percentages

CTT Findings - Item Statistics

	Mean	Standard Deviation	Item-Total Correlation	Alpha if deleted
Important	2.66	0.92	0.59	0.70
Attention	2.75	0.87	0.52	0.72
Miss	2.88	0.96	0.57	0.71
Say	2.91	0.87	0.53	0.72
Depend	3.18	0.87	0.45	0.75

CTT Findings - Scale Statistics

	Mean	Standard Deviation	Variance	Alpha
Scale Level	2.88	0.64	0.41	0.76

IRT Findings - Item Parameters

Item	Step Parameters			Discrimination
	b1	b2	b3	a
Important	-1.06	-0.64	1.24	1.64
Attention	-1.81	-0.60	1.17	1.16
Miss	-1.46	-0.65	0.53	1.37
Say	-1.86	-0.94	0.81	1.10
Depend	-1.79	-1.66	-0.05	0.83

IRT Findings - Item Characteristic Curves

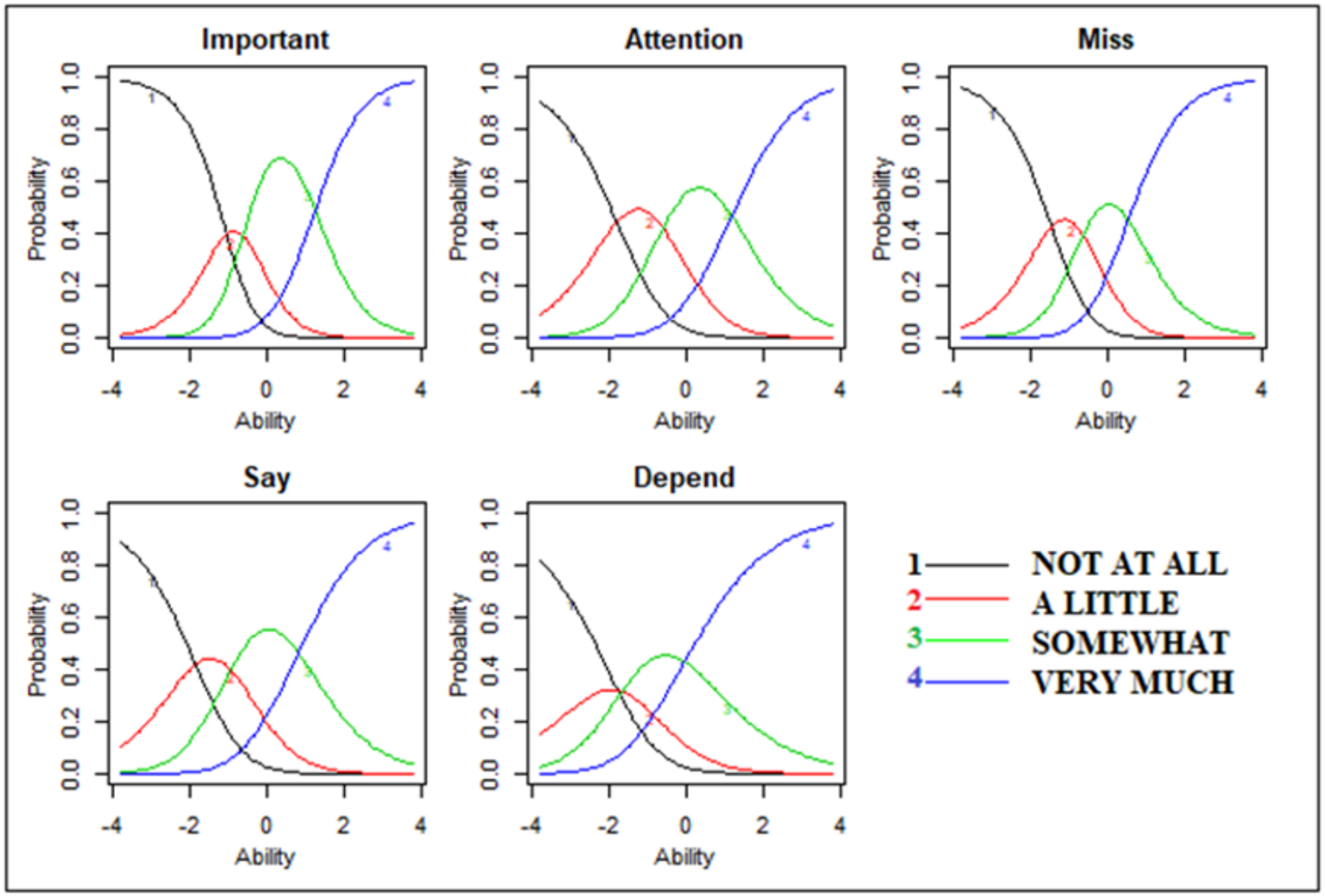

Figure 1: Item response category characteristic curves for all items.

IRT Findings - Information Curves

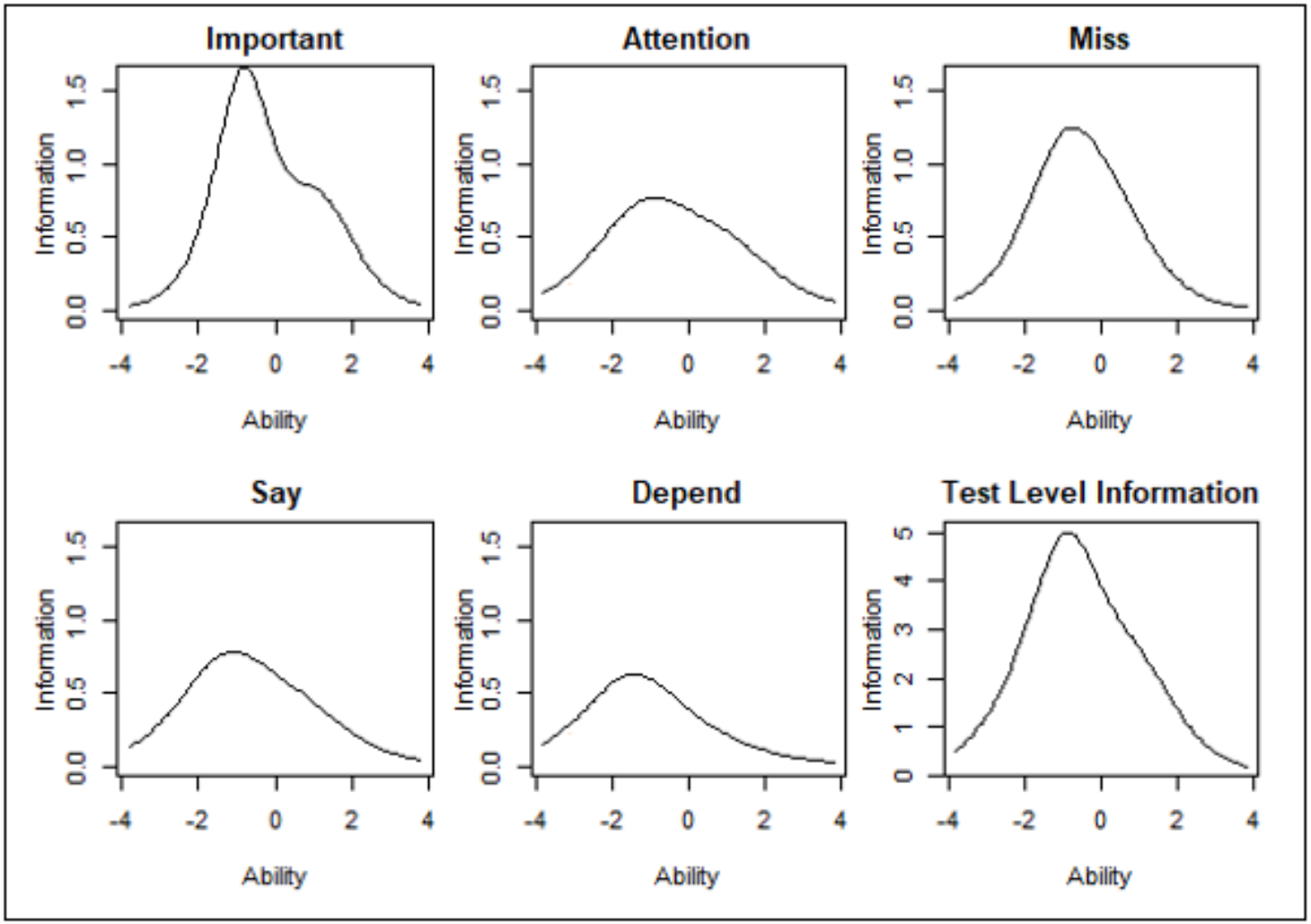

Figure 2: Information curves for the five items and the total scale.

CTT Findings

- Students generally selected the third response option ("somewhat") the most
- Students generally selected the first response option ("Not At All") the least
- The "Depend" item had the lowest item discrimination
  - Perhaps due to distribution of response options
  - Probably least effective item

IRT Findings

- The "Depend" item had the lowest item discrimination
  - Little information
  - Easiest item
- Greatest information found just below ability mean
  - All items peaked below $\theta = 0$
- The "Important" item was most informative
  - Highest discrimination
  - Highest information peak
  - Second peak higher than other items' peak!

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