

Software Alternatives for IRT Analyses

Ron D. Hays

September 27, 2017

HealthMeasures User Conference

Track D: Driving the Science

10:00-10:20 am

Prentice Women's Hospital Conference Center

250 E. Superior Street, Chicago, Illinois

8-item Acting with Awareness Scale

FFMQ_5. *When I do things, my mind wanders off and I'm easily distracted.*

FFMQ_8. *I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.*

FFMQ_13. *I am easily distracted.*

FFMQ_18. *I find it difficult to stay focused on what's happening in the present.*

FFMQ_23. *It seems I am "running on automatic" without much awareness of what I'm doing.*

FFMQ_28. *I rush through activities without being really attentive to them.*

FFMQ_34. *I do jobs or tasks automatically without being aware of what I'm doing.*

FFMQ_38. *I find myself doing things without paying attention.*

**1. Very often or always true/2. Often true/ 3. Sometimes true/
4. Rarely true/ 5. Never or very rarely true**

Amanda Shallcross

Sample (n = 240)

- 75% Female
- 56% White, 31% Black, 8% Hispanic
- Mean age = 36 (range: 19-71)
- 70% college education
- Acting with Awareness Scale
 - Possible range: 8-40
 - Observed range: 9-40
 - Mean = 24, SD = 6

<http://self-compassion.org/wp-content/uploads/publications/FFMQ.SCS.FactprStructure.pdf>

SAS Code (1)

```
PROC IRT DATA=TEMP PLOTS=ALL rorder=internal;  
VAR  
FFMQ_5 FFMQ_8 FFMQ_13 FFMQ_18 FFMQ_23  
FFMQ_28 FFMQ_34 FFMQ_38;  
TITLE "ACT5";  
RUN;
```

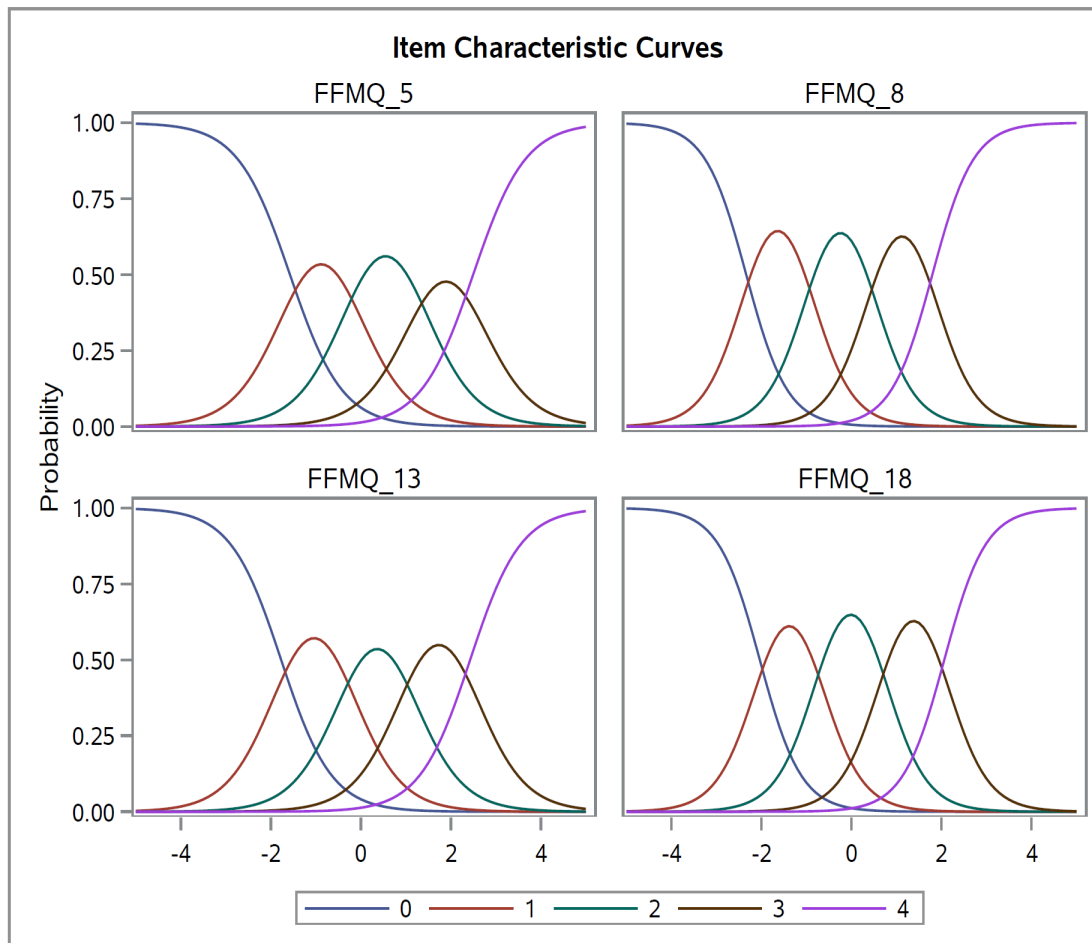
[http://support.sas.com/documentation/cdl/en/
statug/67523/HTML/default/
viewer.htm#statug_irt_syntax01.htm](http://support.sas.com/documentation/cdl/en/statug/67523/HTML/default/viewer.htm#statug_irt_syntax01.htm)

The IRT Procedure

Item Parameter Estimates					
Item	Label	Parameter	Estimate	Standard Error	Pr > t
FFMQ_5	When I do things, my mind wanders off and I'm easily distracted.	Threshold 1	-1.57523	0.19165	<.0001
		Threshold 2	-0.18825	0.11301	0.0479
		Threshold 3	1.28708	0.16381	<.0001
		Threshold 4	2.49580	0.30132	<.0001
		Slope	1.71906	0.22096	<.0001
FFMQ_8	I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.	Threshold 1	-2.33849	0.25031	<.0001
		Threshold 2	-0.93406	0.12750	<.0001
		Threshold 3	0.44868	0.10598	<.0001
		Threshold 4	1.79770	0.19153	<.0001
		Slope	2.17876	0.26789	<.0001
FFMQ_13	I am easily distracted.	Threshold 1	-1.77117	0.20606	<.0001
		Threshold 2	-0.30779	0.11305	0.0032
		Threshold 3	1.03945	0.14364	<.0001
		Threshold 4	2.42898	0.29056	<.0001

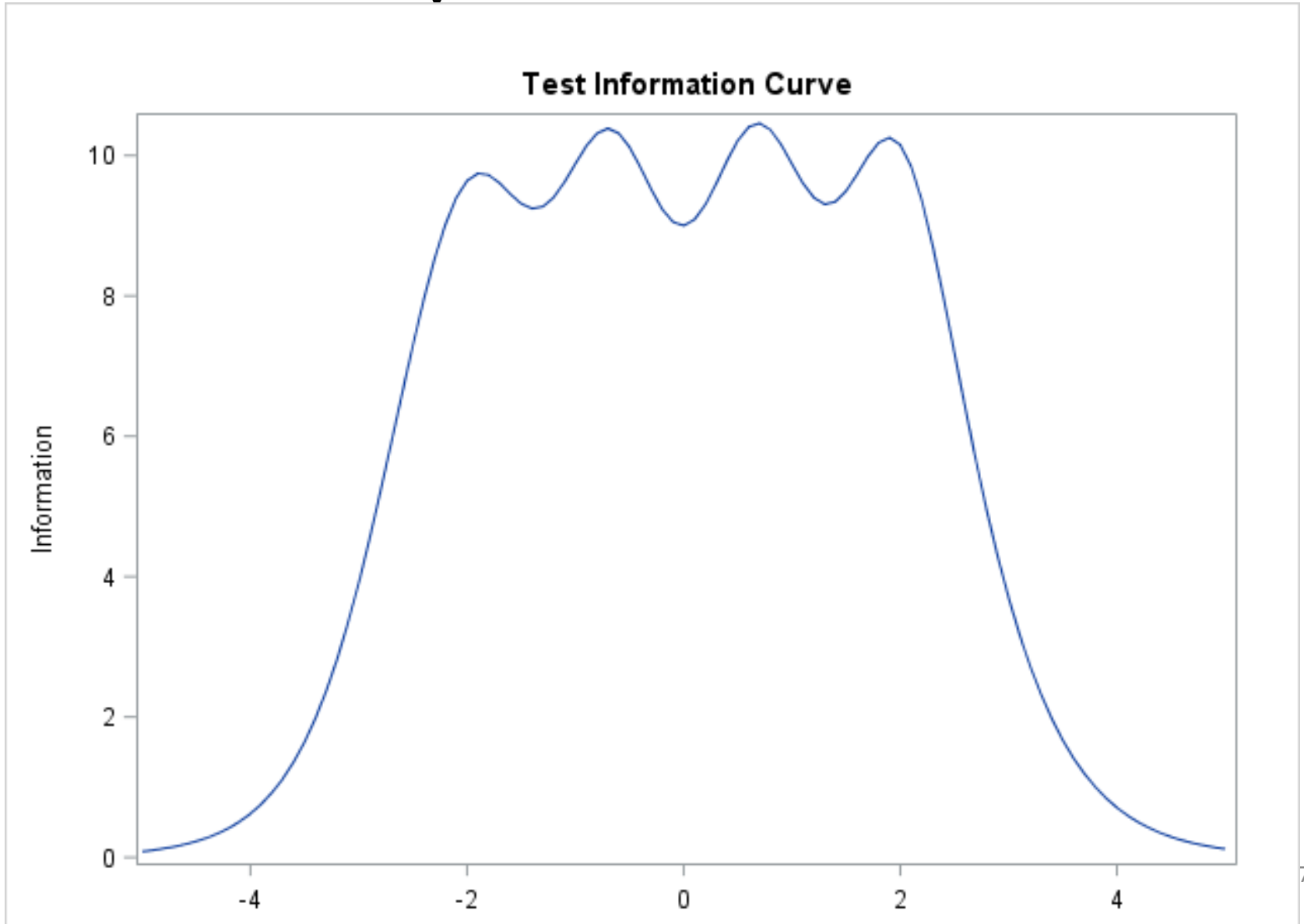
Very often or always true/Often true/Sometimes true/Rarely true/Never or very rarely true

The IRT Procedure



Very often or always true/Often true/Sometimes true/Rarely true/Never or very rarely true

$$\text{Reliability} = (\text{Info} - 1) / \text{Info}$$



SAS Code (2)

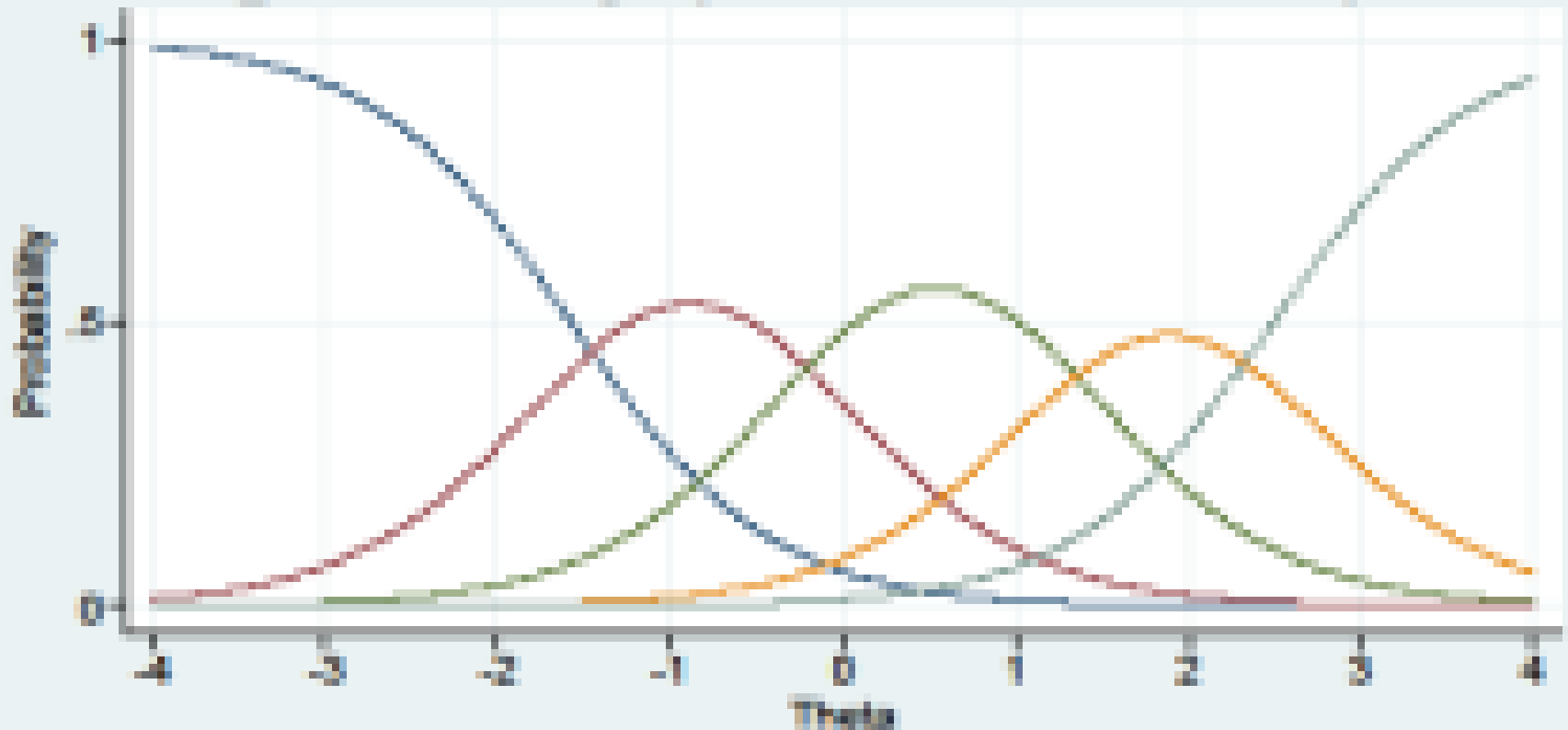
```
PROC IRT DATA=TEMP OUT=THETA8  
rorder=internal SCOREMETHOD=EAP PLOTS=ICC  
(XVIEWMAX=3 XVIEWMIN=-3);  
  
VAR  
  
FFMQ_5 FFMQ_8 FFMQ_13 FFMQ_18 FFMQ_23  
FFMQ_28 FFMQ_34 FFMQ_38;  
  
TITLE "ACT5";  
  
RUN;
```

STATA Code (*do file*)

- clear
- set more off
- cap log close
- log using c:\RCMAR\irt_grm,text replace
- use c:\RCMAR\temp
- irt grm ffmq_5 ffmq_8 ffmq_13 ffmq_18 ffmq_23 ffmq_28
ffmq_34 ffmq_38
- irtgraph icc ffmq_5, xlabel(-4 -3 -2 -1 0 1 2 3 4, grid)
subtitle("FFMQ_5: when I do things my mind wanders off and
I'm easily distracted") saving("ffmq_5.gph", replace)
- graph export ffmq_5.pdf, replace
- irtgraph tcc, thetalines(-3 -2 -1 0 1 2 3)
saving("tcc.gph",replace)

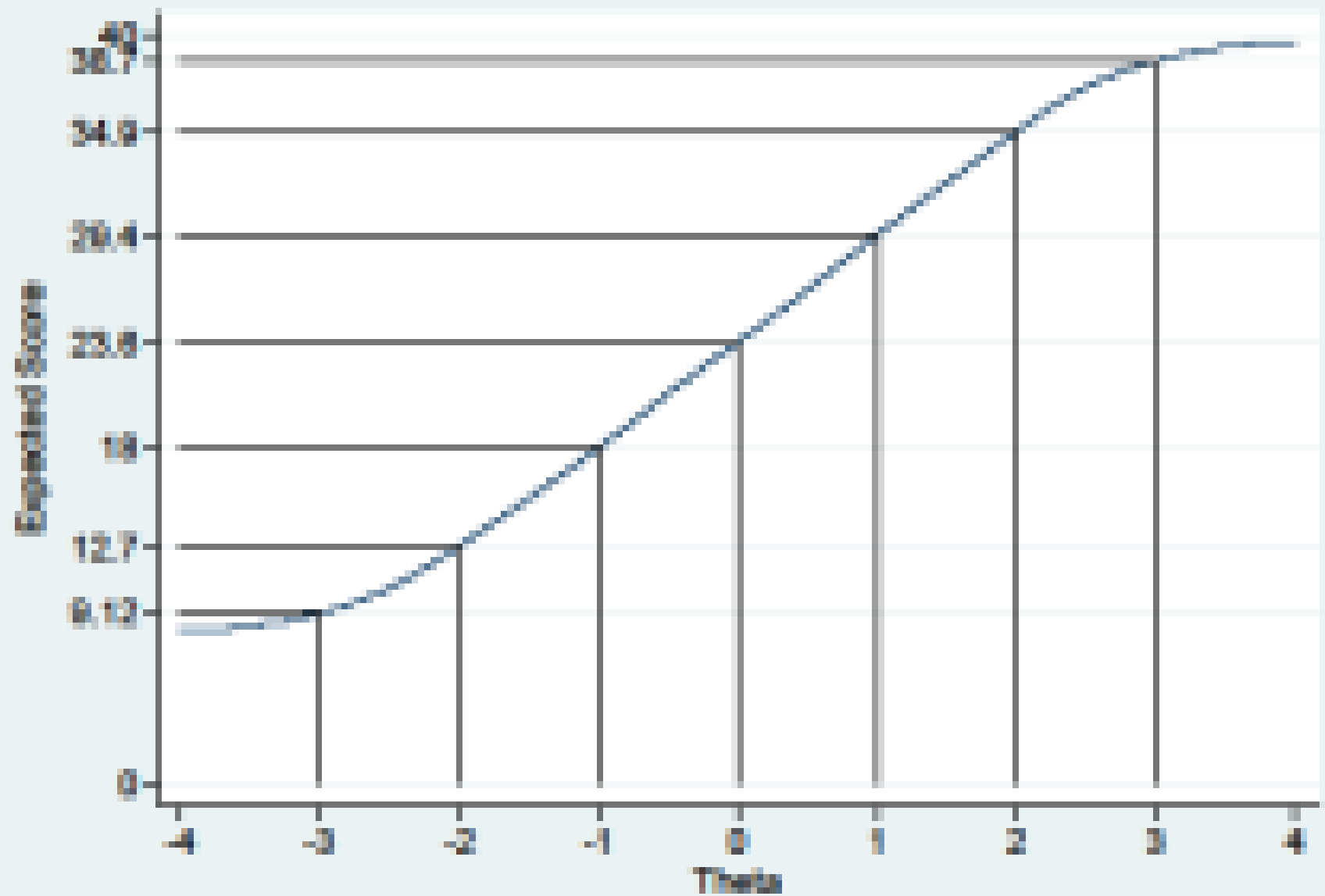
Category Characteristic Curves

FFMQ_5: when I do things my mind wanders off and I'm easily distracted



Very often or always true / Often true / Sometimes true / Rarely true / Never or very rarely true

Test Characteristic Curve



EQSIRT Code

```
/TITLE
Acting with Awareness
/SPECIFICATIONS
DATA = 'temp.dss';
VARIABLES = 8;
CASES = 240;
USE = 'ID'-'FFMQ_38';
/MODEL
GRM = 'FFMQ_5'-'FFMQ38';
PARAMETER = 2PL;
ESTIMATION = MML;
FACTOR = 1;
PLOTFILE = 'grm_8_irtplot.dss';
/TECHNICAL
ITERATIONS = 100;
OPTIMIZATION = opt1;
QUADRATURE = (4.0,15);
OUTPUT = TEXT;
/PRINT
/END
```

IRTPRO Code (1)

Project:

Name = act5;

Data:

File = .\temp.ssig;

Analysis:

Name = act5;

Mode = Calibration;

Title: act5

Comments:

Estimation:

Method = BAEM;

E-Step = 500, 1e-005;

SE = S-EM;

M-Step = 50, 1e-006;

Quadrature = 49, 6;

SEM = 0.001;

SS = 1e-005;

Saves:

PRM, IRT

Scoring:

Mean = 0;

SD = 1;

IRTPRO Code (2)

Miscellaneous:

Decimal = 2;

Processors = 8;

Print CTLD, P-Nums, Diagnostic;

Min Exp = 1;

Groups:

Group :

Dimension = 1;

Items = ffmq_5, ffmq_8, ffmq_13, ffmq_18, ffmq_23, ffmq_28, ffmq_34, ffmq_38;

Codes(ffmq_5) = 1(0), 2(1), 3(2), 4(3), 5(4);

Codes(ffmq_8) = 1(0), 2(1), 3(2), 4(3), 5(4);

Codes(ffmq_13) = 1(0), 2(1), 3(2), 4(3), 5(4);

Codes(ffmq_18) = 1(0), 2(1), 3(2), 4(3), 5(4);

Codes(ffmq_23) = 1(0), 2(1), 3(2), 4(3), 5(4);

Codes(ffmq_28) = 1(0), 2(1), 3(2), 4(3), 5(4);

Codes(ffmq_34) = 1(0), 2(1), 3(2), 4(3), 5(4);

Codes(ffmq_38) = 1(0), 2(1), 3(2), 4(3), 5(4);

Model(ffmq_5) = Graded;

Model(ffmq_8) = Graded;

Model(ffmq_13) = Graded;

Model(ffmq_18) = Graded;

Model(ffmq_23) = Graded;

Model(ffmq_28) = Graded;

Model(ffmq_34) = Graded;

Model(ffmq_38) = Graded;

Mean = 0.0;

Covariance = 1.0;

Constraints:

R code

- `library(mirt)`
- `library(latticeExtra)`

(8 items imported into “temp” and brought into RSE)

- `RSE<-temp[,1:8]`
- `nitems <- 8`
- `itemtype <- rep('graded',nitems)`
- `RSEGRM <- mirt(RSE, 1, itemtype=itemtype)`
- `param <- coef(RSEGRM, IRTpars=TRUE)`
- `RSEGRMpar <- do.call(rbind,param[1:nitems])`
- `print(RSEGRMpar,digits=4)`

- `plot(RSEGRM) # test response curve`
- `plot(RSEGRM, type="infoSE")`
- `plot(RSEGRM, type="infotrace")`

flexMIRT code

- See *Pattern_scoring_example.pdf*
 - <http://gim.med.ucla.edu/FacultyPages/Hays/IRT/>



Multidimensional IRT

- Parameter recovery with simulation found high level of estimation accuracy for
 - IRTPRO2.1, EQSIRT 1.0, flexMIRT 2.0, and Mplus 7.1
- Differences in user interface
 - e.g., IRTPRO and EQSIRT point-and-click
- EQSIRT 1.0
 - MCEM and MCMC estimation failed to finish
 - Program often stopped running without displaying any error messages
 - Took longest time to run
 - Error message in dialog boxed not helpful

Han, K. T., & Paek, I. (2014). A review of commercial software packages for multidimensional IRT modeling. *Applied Psychological Measurement*, 38 (6), 486-498.



Funding for HealthMeasures was provided by the National Institutes of Health grant U2C CA186878.

Powerpoint file available at:

<http://gim.med.ucla.edu/FacultyPages/Hays/present/>



HealthMeasures
TRANSFORMING HOW HEALTH IS MEASURED