Assessing pain severity and interference – the EPCRC Project

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On behalf of EPCRC collaborators

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Introduction

- **Most of the currently recommended pain instruments were developed many years ago.**

- **Questionnaires such as BPI and McGill continue to be widely used – reflecting the care, the expertise and the thought that went into their initial construction.**

- **Modern instrument development emphasises the (documented) application of:**
  - **Qualitative methods**
  - **Traditional psychometric methods**
  - **Item response theory**

- **The development of most existing pain instruments was not to the modern standards.**

Pain items

- **Five domains were judged as the as most relevant for assessment of pain in cancer patients**

    - *Pain intensity*
    - *Pain interference*
    - *Temporal pattern (incl. breakthrough pain, BTP)*
    - *Treatment and exacerbating/relieving factors*
    - *Pain location*

- **Items were selected based on:**

    - **review of existing instruments,**
    - **experts opinions,**
    - **qualitative assessment,**
    - **pilot study**

Pain items

- ## 23 pain questions.
  - Of these, 12 thought to address intensity, 12 interference (3 thought to cover both)

- ## Response format –
  - EORTC-format (Not at all, A little, Quite a bit, Very much)

  - BPI-format NRS 0-10

0	1	2	3	4	5	6	7	8	9	10

  No pain   Pain as bad as you can imagine

- ## Data has been collected on 732 palliative care patients

Objectives

1. **To confirm the dimensionality**

   - How many scales are represented by the items? (2 ?)

   - Are these 2 scales unidimensional?

2. **To check the performance of the items**

   - Item Response Theory (IRT) characteristics

   - Item information

   - Identify items that perform poorly

3. **To calibrate the items**

   - Estimate parameters for use in
     Computer Adaptive Testing (CAT)

   - Identify gaps that are not addressed by items in our pool, or
     floor/ceiling effects

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Factor analysis

Variable	Factor1	Factor2
bpi_3	0.9087	0.0583
pa_max	0.8914	0.0549
esas1	0.8559	-0.0001
bpi_4	0.8539	0.0988
esas2	0.8353	0.0416
pa1	0.7645	0.1583
pa_4w	0.7098	0.0074
pa15	0.6465	-0.0505
pa10	0.6068	0.1972
pa4	0.4323	0.4537
pa12	0.4083	0.4396
pa11	0.3609	0.4799
bpi_b	0.1892	0.7107
pa6	0.1744	0.6723
bpi_g	0.1353	0.7422
pa13	0.1216	0.5319
bpi_e	0.0814	0.7280
pa5	0.0448	0.6958
pa9	-0.0106	0.7620
pa14	-0.0231	0.6628
pa8	-0.0592	0.7445

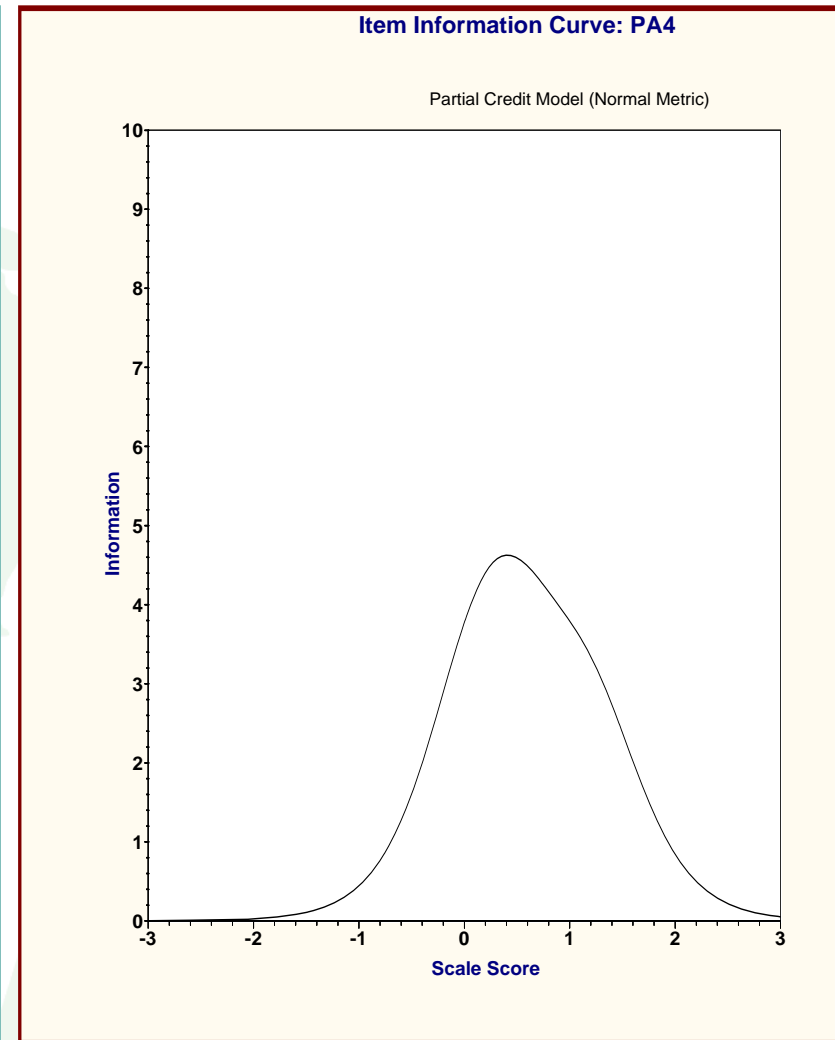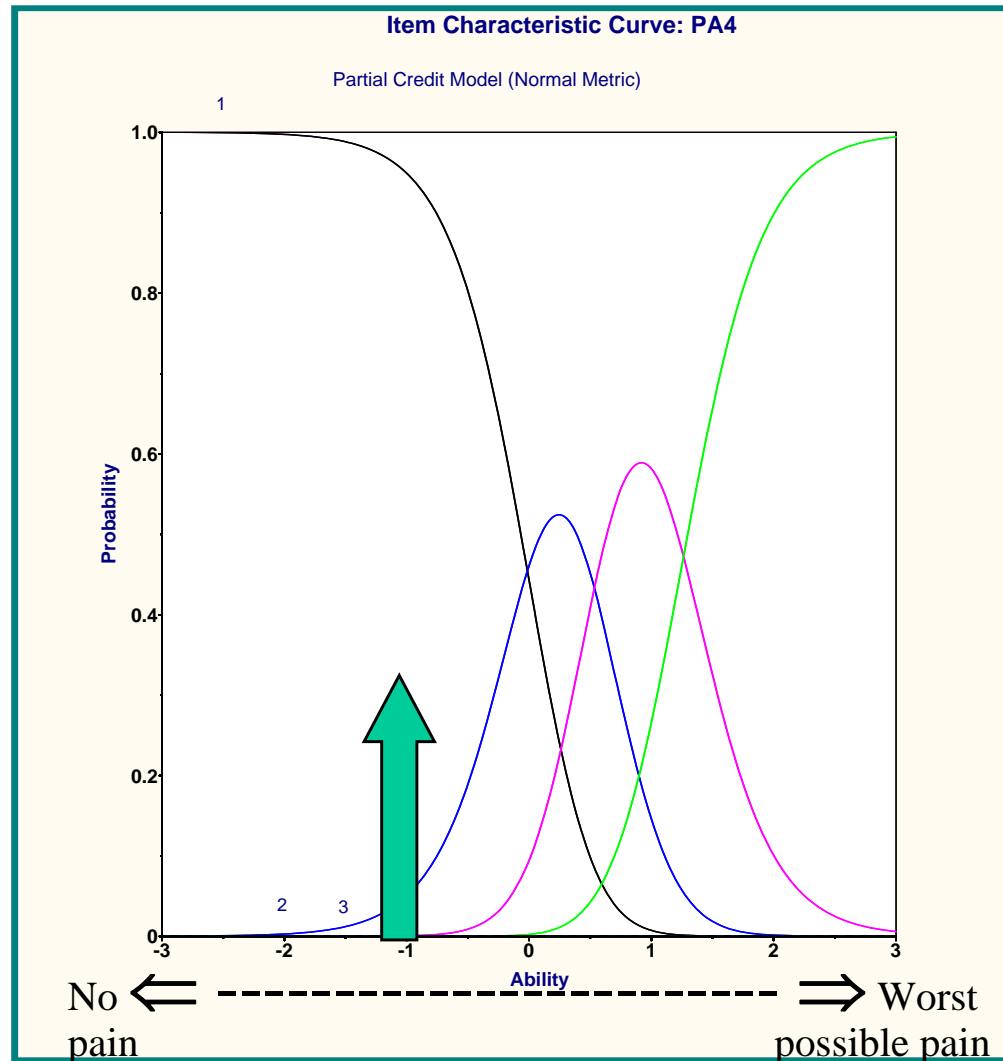Scree plot of eigenvalues after factor

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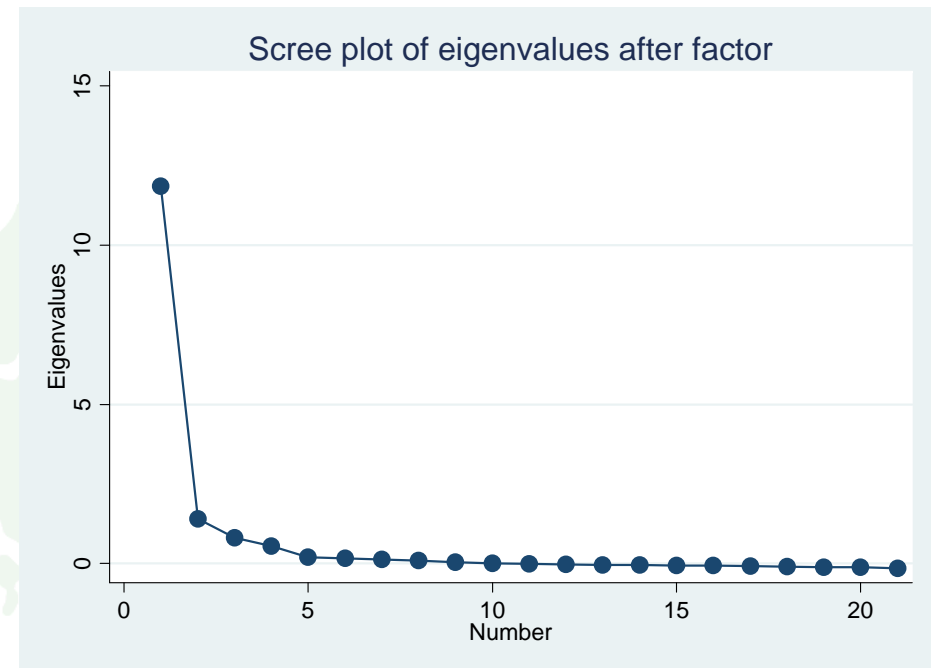
Factor analysis

- **Consistent with 1-factor *OR* 2-factor solution.**

- **The 1-factor solution reflects a high correlation (0.8) between the hypothesized item-groupings for intensity and interference.**

- **It seems reasonable to accept our hypothesised 2 factors, despite the strong correlation.**

- **But, arguably a one-factor solution is sufficient – "essentially unidimensional".**
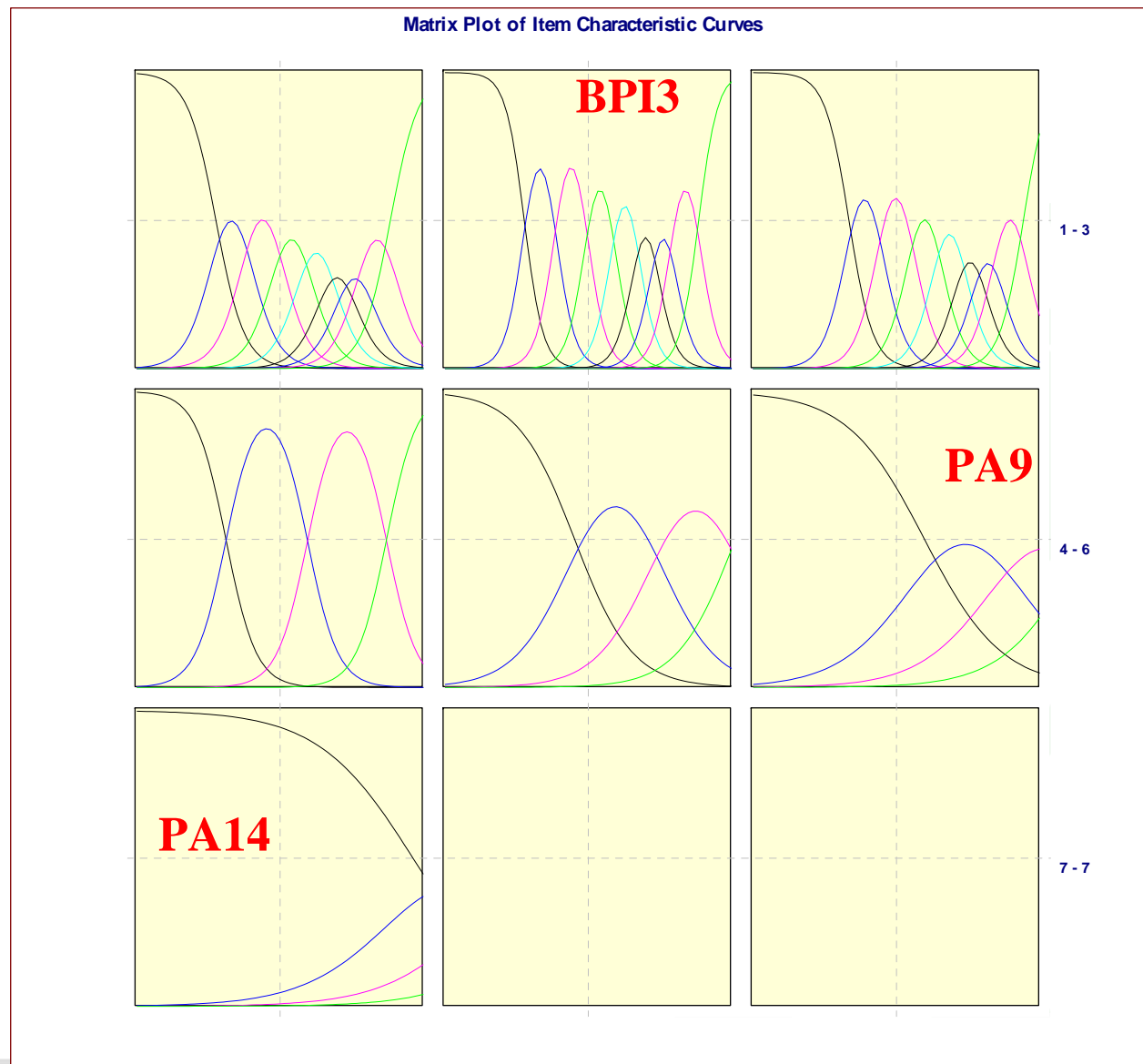
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PA4:
How much does your pain interfere with your *daily activities*?
1=Not at all,   2=A little,   3=Quite a bit,   4=Very much

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ICC curves – Intensity

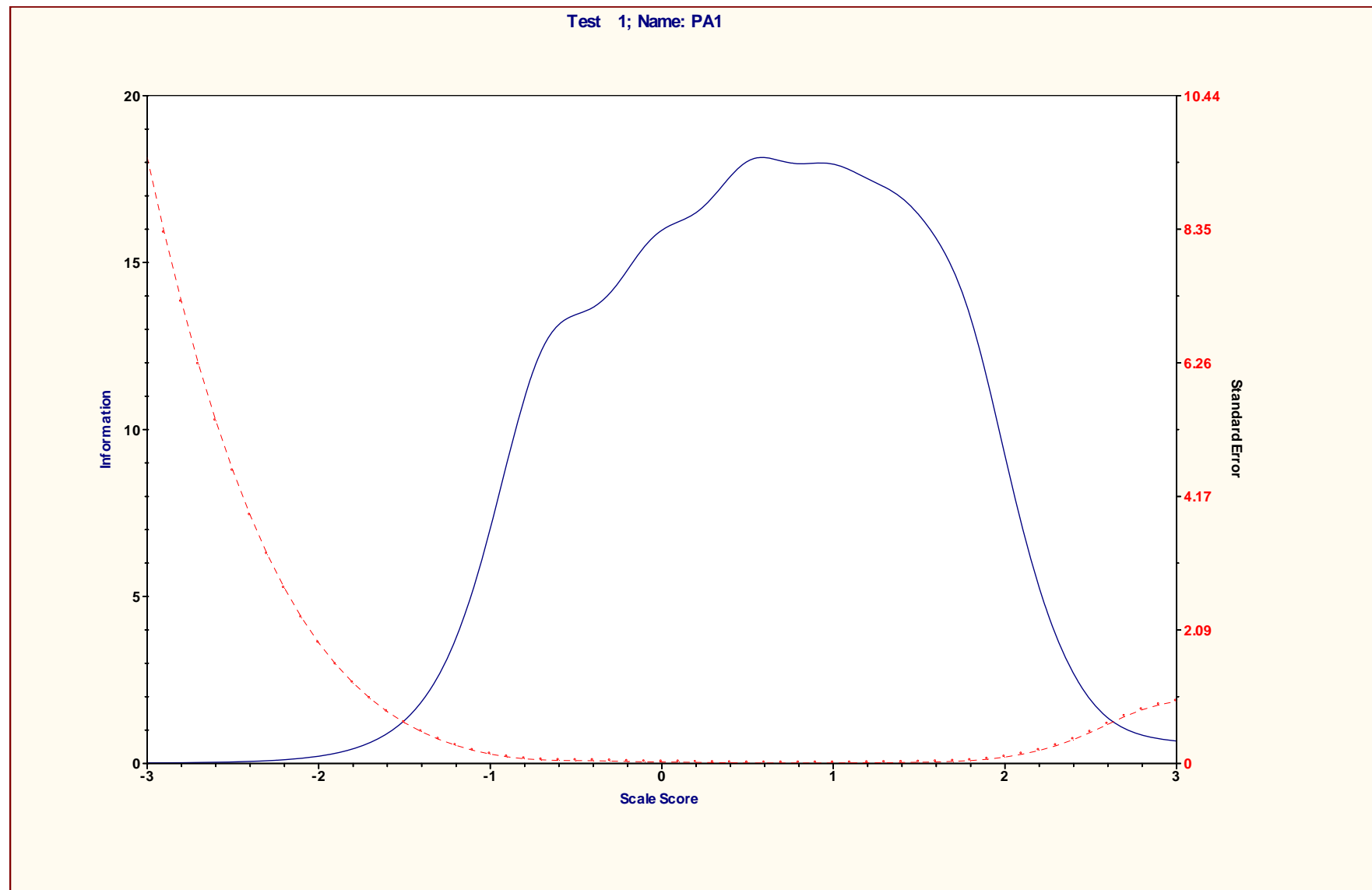Matrix Plot of Item Characteristic Curves

BPI1, BPI3, BPI4,

PA1 Have you had pain today?

PA10 Did you have pain last night?

PA9 Did pain make you feel depressed?
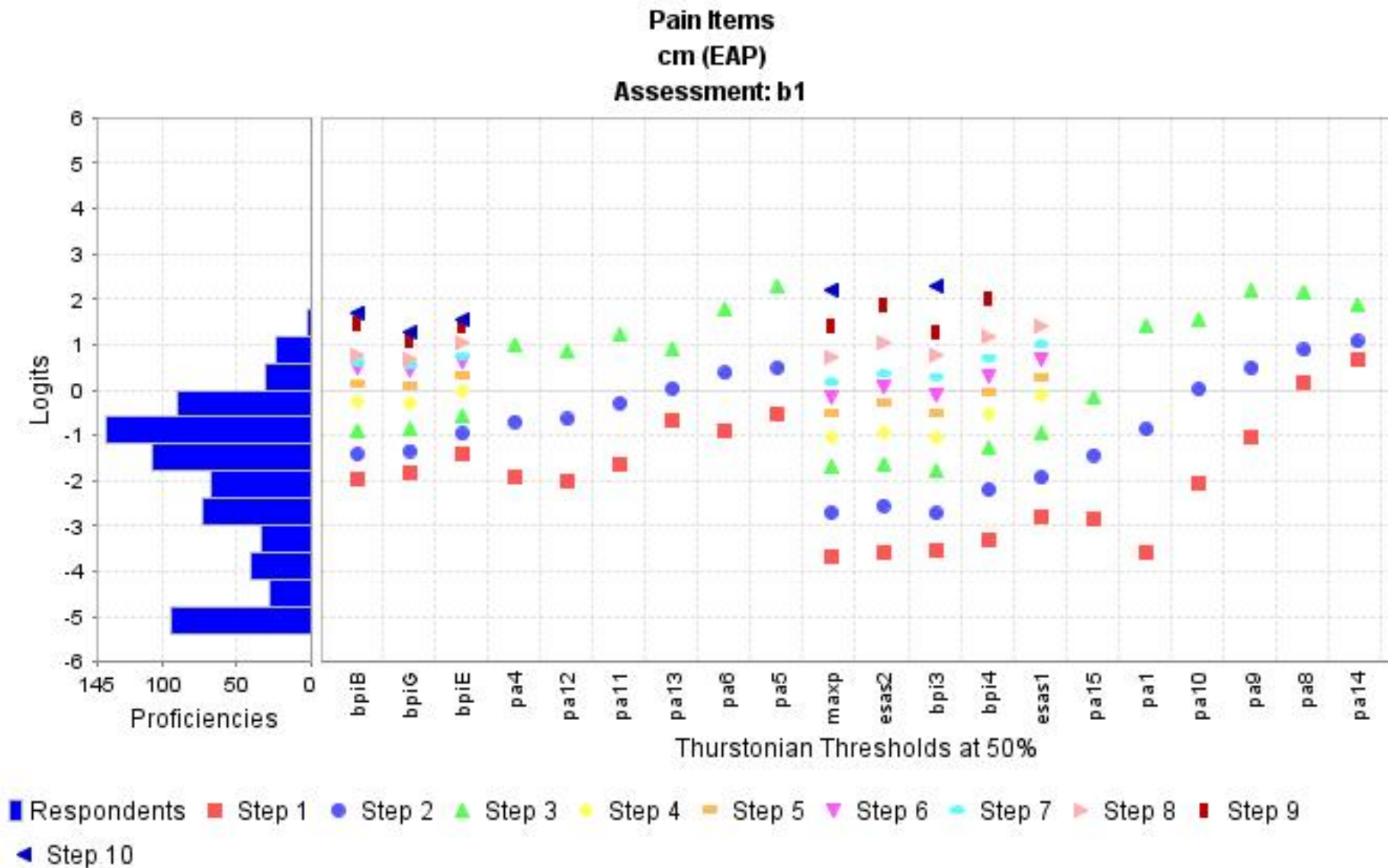
PA14 Pain is so bad I feel I am going insane

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Information – Intensity

Test 1; Name: PA1

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BPI3 – How intense has your worst pain been during the past 24 hours?

Item Information Curve: BPI3

Graded Response Model (Normal Metric)

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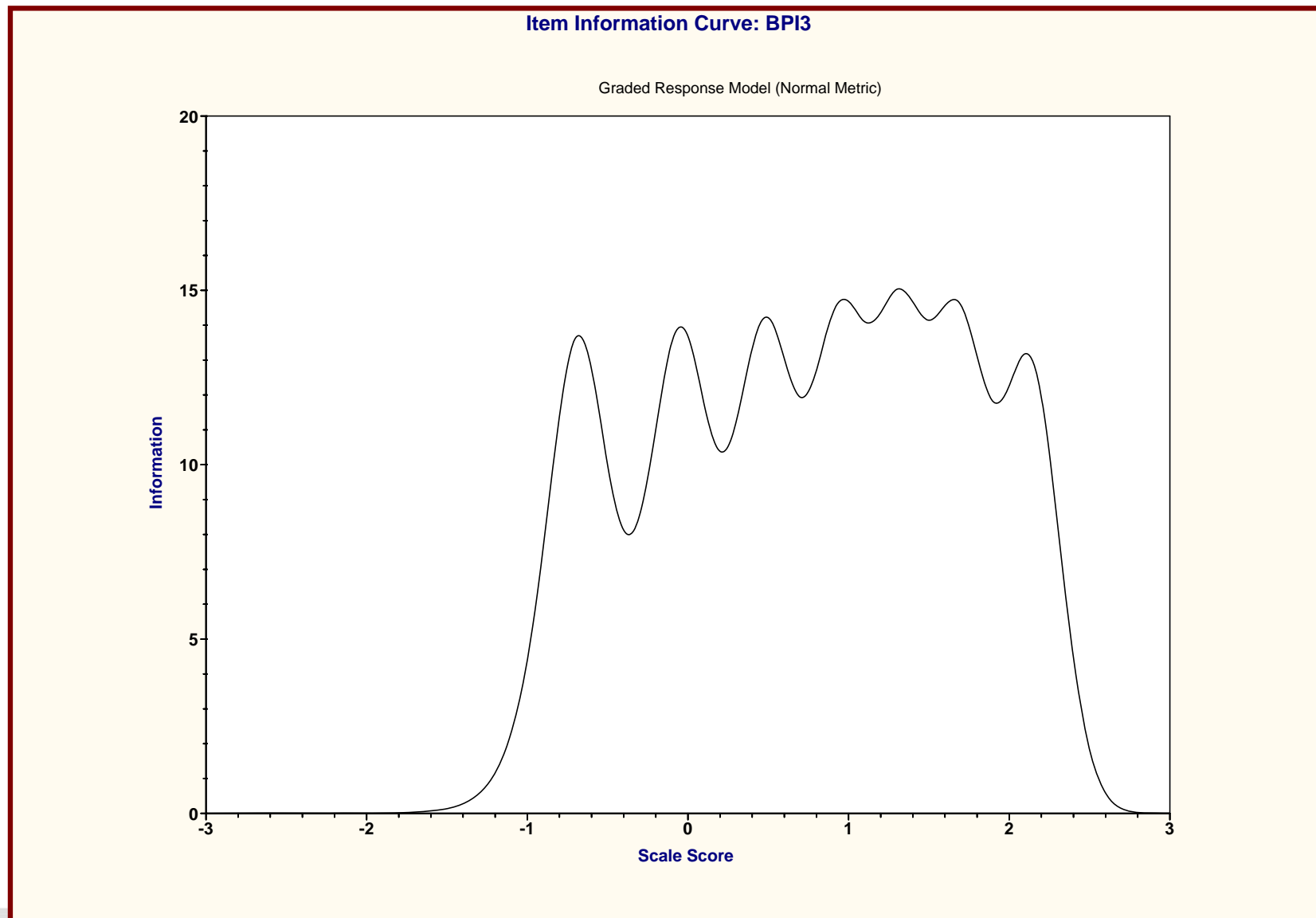
Intensity and Interference (all items)

DIF analyses

DIF = Differential Item Functioning

- **Example – Gender difference:**

  – **BPIe – pain interfered with relations with other people;**

  – **BPIg – pain interfered with enjoyment of life.**

- **These two items function differently in males and females**

- **However, the effects appear quite small, and more of academic interest than practical importance.**

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Summary

1. The three 0–10 items (pa_max, bpi_3, bpi_4) and the 4-category items (pa1 pa10, pa9 and pa14) form a reasonable intensity measure.

2. BPI3 (How intense has your worst pain been during the past 24 hours?) works well on its own.

3. As anticipated, the pain interference items relate to upper end of the pain spectrum.

4. For calibration, we lack data from patients with extreme severe pain.
   (Says the dispassionate statistician)

5. We have few items that cover mild pain.
   Maybe that is OK?

Conclusions

- These analyses will be updated as more data accrues, especially data from patients with very severe pain and patients with mild pain.

- We have now calibrated the items, producing provisional estimates of the pain severity that corresponds to each item responses.

- These estimates can be used to drive item selection for a computer-adaptive test.

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