Rasch Users' Day Introduction

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Outline

- Logistics
- Our tenth meeting
- The growing interest in Rasch measurement
- A reminder by way of two measures of:
  - What "equal" means on the equal interval scale
  - Unidimensionality
  - Differential Item Functioning
  - The polytomous model
  - Local response dependency
  - The map
- And how to estimate your quiz success (In logits)
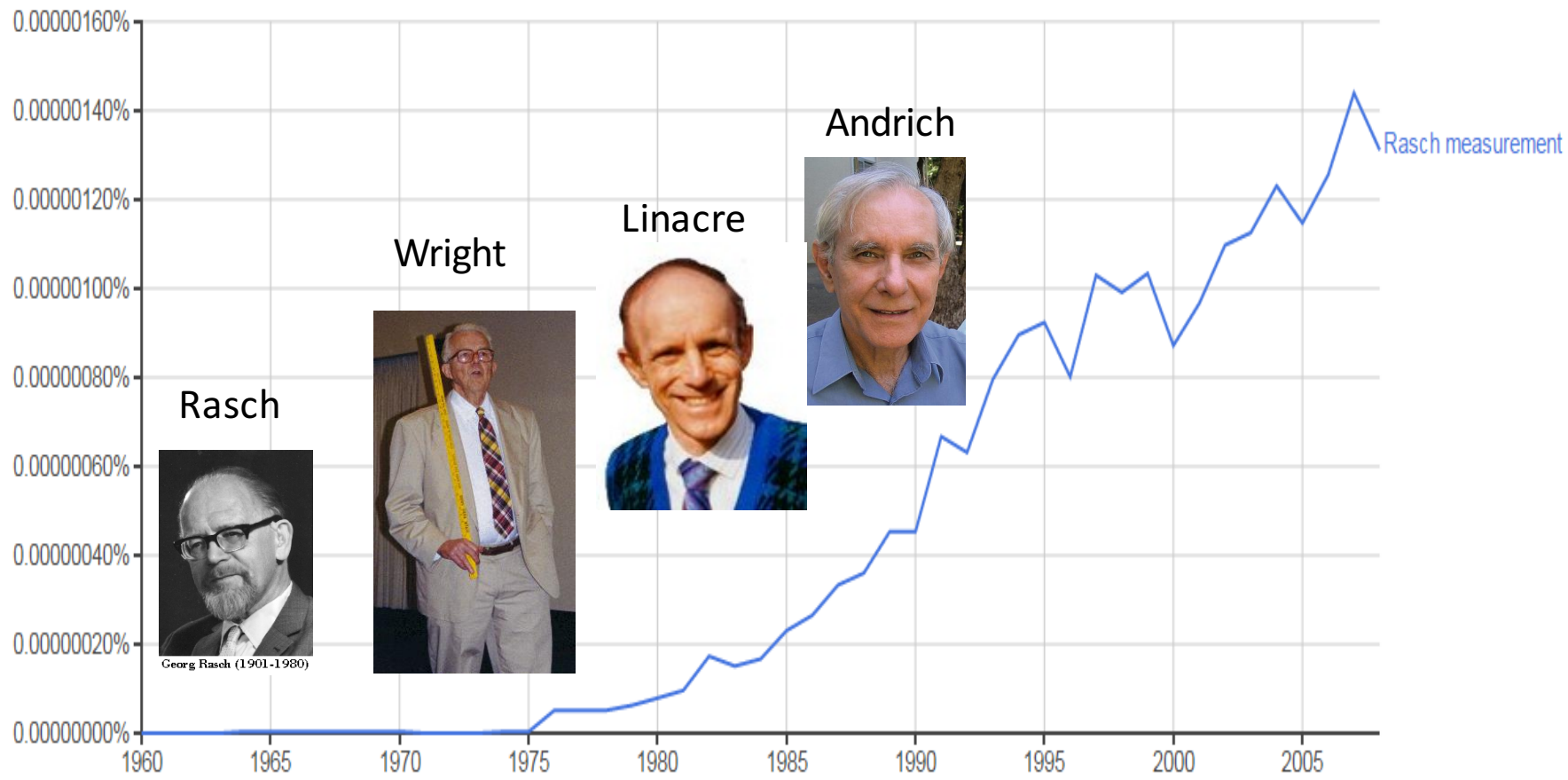
The tenth meeting

- The venue
- We have met in:
  - Durham, Cambridge, Manchester, Leeds York and London
- Who has remained invariant

- Today
  - A varied, exciting and full program

The equal interval scale

- The ability of children to identify numbers such as

    3

    14

    45

  265

  75,453,221

```
MEASURE     PERSON - MAP - ITEM
                  <more>|<rare>
    12            #  +
                  .  |
    11               +
                     |  3 digits b
    10               +  3 digits c   3 digits d   3 digits e
                     |  3 digits a
     9               +
                  . T|
     8               +
               .#####  |
     7               +
                     |S
     6               +
                .#   |
     5               +  2 digits a
                .##  |  2 digits b  2 digits c
     4          .##  +
                   S|
     3       .######  +
                     |  15
     2          ###  +  19
                .#   |  12            13
     1       .####   +  17
                .##  |  14            16
     0            .  +M
               .####  |
    -1          ####  +
         .######## M|
    -2               +  11
                .####  |
    -3               +
             .########  |
    -4               +  9
             .########  |  8
    -5               +  6
              .###   |  0
    -6             S+
                     |S 7
    -7       .###    +
                  .  |
    -8               +
                 ##  |
    -9               +  2             5
                 .#  |
   -10       .###    +  3             4
                     |
   -11          T+  1
                 .#  |
   -12       .######  +
                  <less>|<freq>
```

7% chance

7% chance

7% chance

Unidimensionality

- 75% of the Raw variance in observations explained by measures
- First contrast 2.1% of unexplained variance

DIF

- Girls and boys: does the same ruler apply?

- Is there invariance?

- Watch out for
  - Size of difference
  - Significance of difference

  A challenge

    Compare China (age 6) and Scotland (age 5)

```
  MEASURE    PERSON - MAP - ITEM
                <more>|<rare>
    23           .##  +T TENMILL
    22                +
    21            .   +
    20                +    MILLION
    19            .   +
    18                +    HUNTHOU
    17                +
    16         .### T+
    15                +
    14         .###   +
    13                +    TEHTHOU_C   TENTHOU_A   TENTHOU_B
    12           .#  +S
    11           ##   +
    10           .#   +    THOU_A      THOU_B      THOU_C
     9           .#   +
     8                +
     7    .######## S+   HUND_D
     6            .   +   HUND_E
     5         .###   +   HUND_A      HUND_C
     4          .##   +   HUND_B
     3                +
     2       .######  +
     1                +
     0                +M
    -1          .##   +   Two_A       Two_B
    -2         .### M+   Two_C
    -3       .######  +
    -4                +
    -5       .######  +   Teen_A      Teen_B      Teen_C
    -6      .#######  +
    -7                +
    -8  .###########  +
    -9                +
   -10         .###   +   8
   -11       .###### S+   0           6           9
   -12          .#   +S 7
   -13         .###   +
   -14          .#    +
   -15          .#    +   2           4           5
   -16           #    +   3
   -17          .#    +   1
   -18          .#    +
```

What about Quizes

- Keep your tally compared to another.

- But ignore items where are in line with the contestant

- Count what you get right that (s)he gets wrong: $N_{\checkmark\times}$

- Count what you get wrong that (s)he gets right: $N_{\times\checkmark}$

- Your Logit advantage = ln ($N_{\checkmark\times}$/ $N_{\times\checkmark}$)

Looking at the REF

- Education in Durham prepared for the REF with:
  - 42 academics who had
  - Authored 225 papers
  - Assessed by 23 raters
  - Number of ratings: 710

The polytomous model

- ## The rating were on a 0-4 scale.
  - ### With halves or without halves?
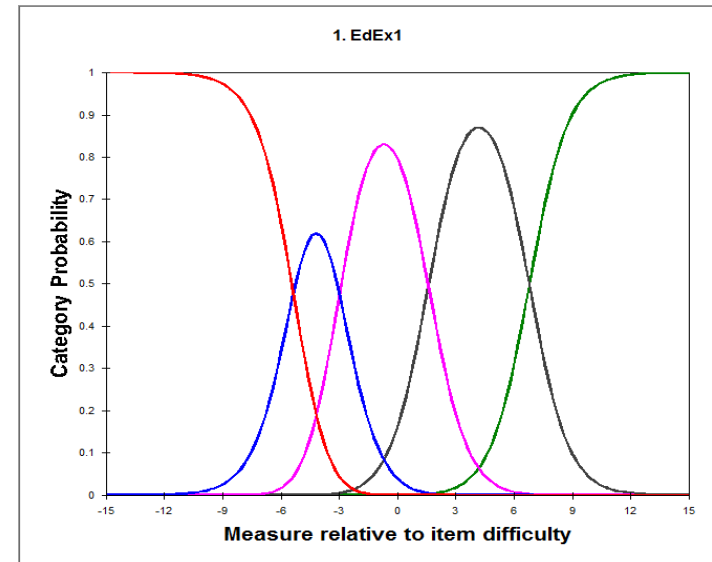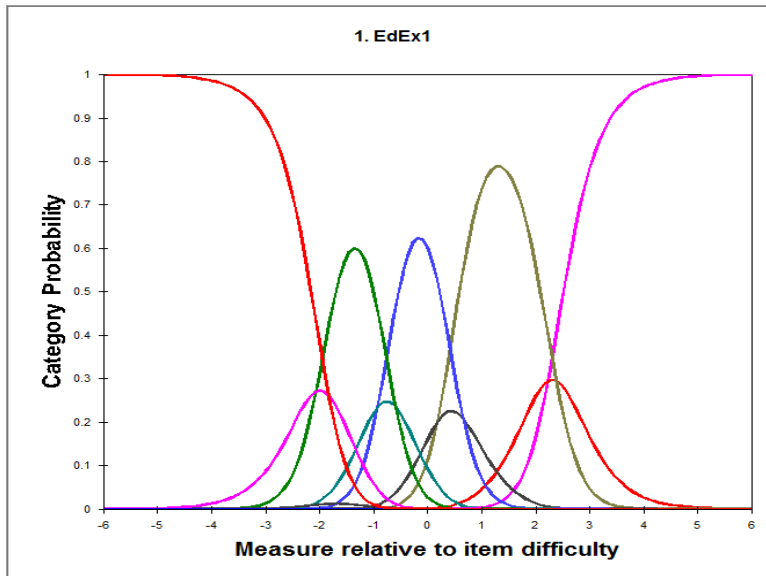
Local response dependency

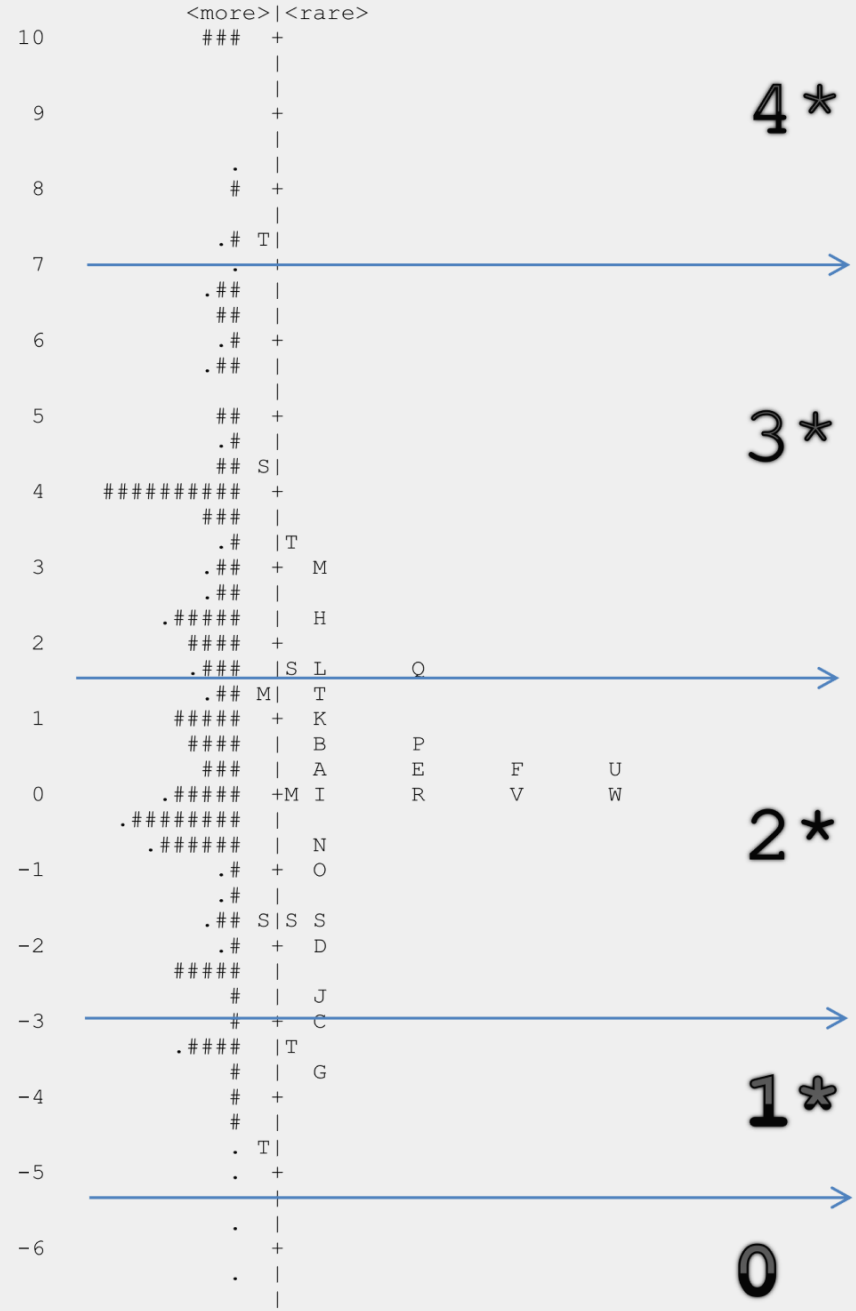- Are some responses dependent on other responses?

- Are some people dependent on other people

- Does it matter

Do the data fit?

- 2 out of 23 raters did not fit
- 25 out of 223 papers did not fit
- One construct dominated the measures
- Local dependency existed by was not troublesome.

```
MEASURE    Papers - MAP - raters
                    <more>|<rare>
   10          ###  +
                     |
                     |
    9               +
                     |
               .     |
    8          #  +
                     |
               .#  T|
    7     .          +          ──────────────────────────→
               .##  |
               ##  |
    6          .#  +
               .##  |
                     |
    5          ##  +
               .#  |
               ## S|
    4     ##########  +
               ###  |
               .#  |T
    3          .##  +  M
               .##  |
          .#####  |  H
    2          ####  +
          .###  |S L        Q     ──────────────────────────→
               .## M|    T
    1     #####  + K
               ####  |  B        P
               ###  |  A      E        F        U
    0     .#####  +M I        R        V        W
          .########  |
          .######  |  N
   -1          .#  +  O
               .#  |
               .## S|S S
   -2          .#  +  D
          #####  |
               #  |  J
   -3          #  +  C     ──────────────────────────→
          .####  |T
               #  |  G
   -4          #  +
               #  |
               . T|
   -5          .  +     ──────────────────────────→
               .  |
   -6               +
               .  |
                     |
                 <less>|<freq>
EACH "#" IS 2: EACH "." IS 1
```

Finally

Enjoy the day