

# Pairwise Comparison Method

The screenshot displays a digital interface for pairwise comparison of two math problems. The interface is titled "Exit Fullscreen" and shows two side-by-side panels, each containing a math problem and a table for recording difficulty ratings.

**Problem 1: Hot Dogs**  
Read with care in problem of 12  
Read several times (15)  
What is the total cost of the number of problem of read with hot an bread?  
A hot dog costs of one sausage in one bread.

**Problem 2: EXCHANGE RATE**  
Read with care in problem of 12  
Read several times (15)  
What is the total cost of the number of problem of read with hot an bread?  
A hot dog costs of one sausage in one bread.

Both panels include a "Complexity ratings" table with columns for CF 1, CF 2, CF 3, CF 4, CF 5, and TOTAL, and a "Competency ratings (0-3)" table with columns for Item Code, Item Name, Communication, Problem Solving, Mathematical Proficiency, Mathematical Understanding, Mathematical Connections, Mathematical Reasoning, Mathematical Communication, and Mathematical Attitudes.

At the bottom of the interface, a question "Which is more difficult?" is posed, with "Select" buttons on either side.

## Presentation outline

- Method overview
- Empirical evaluation outcomes
- Operational deployment advice

Global Education Monitoring Centre



Australian Government  
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# Learning Progression Scale (LPS)

- ACER created LPSs for reading and mathematics using items from a range of assessments
- Items were located on the scale using a pairwise comparison approach, with judges rating which item within a pair of items is more difficult
- The International Standard Setting Exercise determined the location of the SDG4.1.1 Minimum Proficiency Levels on the scale using the Bookmark method

# Pairwise Comparison Method (PCM) Steps

**Step 1:** a self-assessment to determine whether the assessment instrument is of sufficient validity to be suitable for SDG 4.1.1 reporting.

**Step 2:** a pairwise comparisons exercise to place items from the assessment instrument onto a Learning Progression Scale (LPS).

**Step 3:** statistical, common items, linking to place MPL cut-scores on the assessment instrument reporting scale.

# PCM Advantages

**Cheaper and faster** than other statistical linking methods.

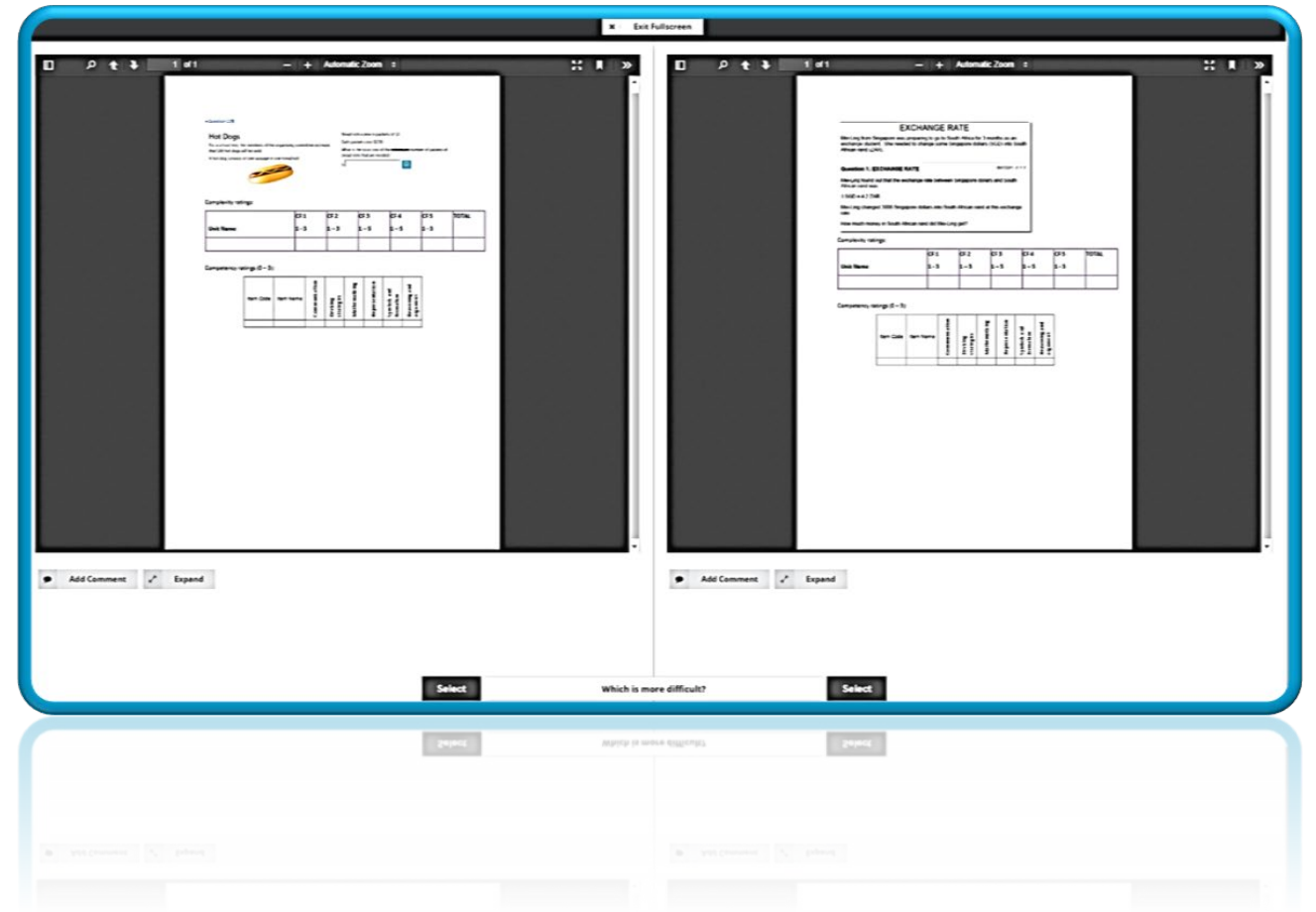
**Panellist training is simple** and does not require extensive preparation.

**Can be implemented consistently** using an online application.

**New assessment items can be added to LPS** to build an invaluable resource to support capacity development and strengthen the LPS and SDG 4.1.1 reporting.

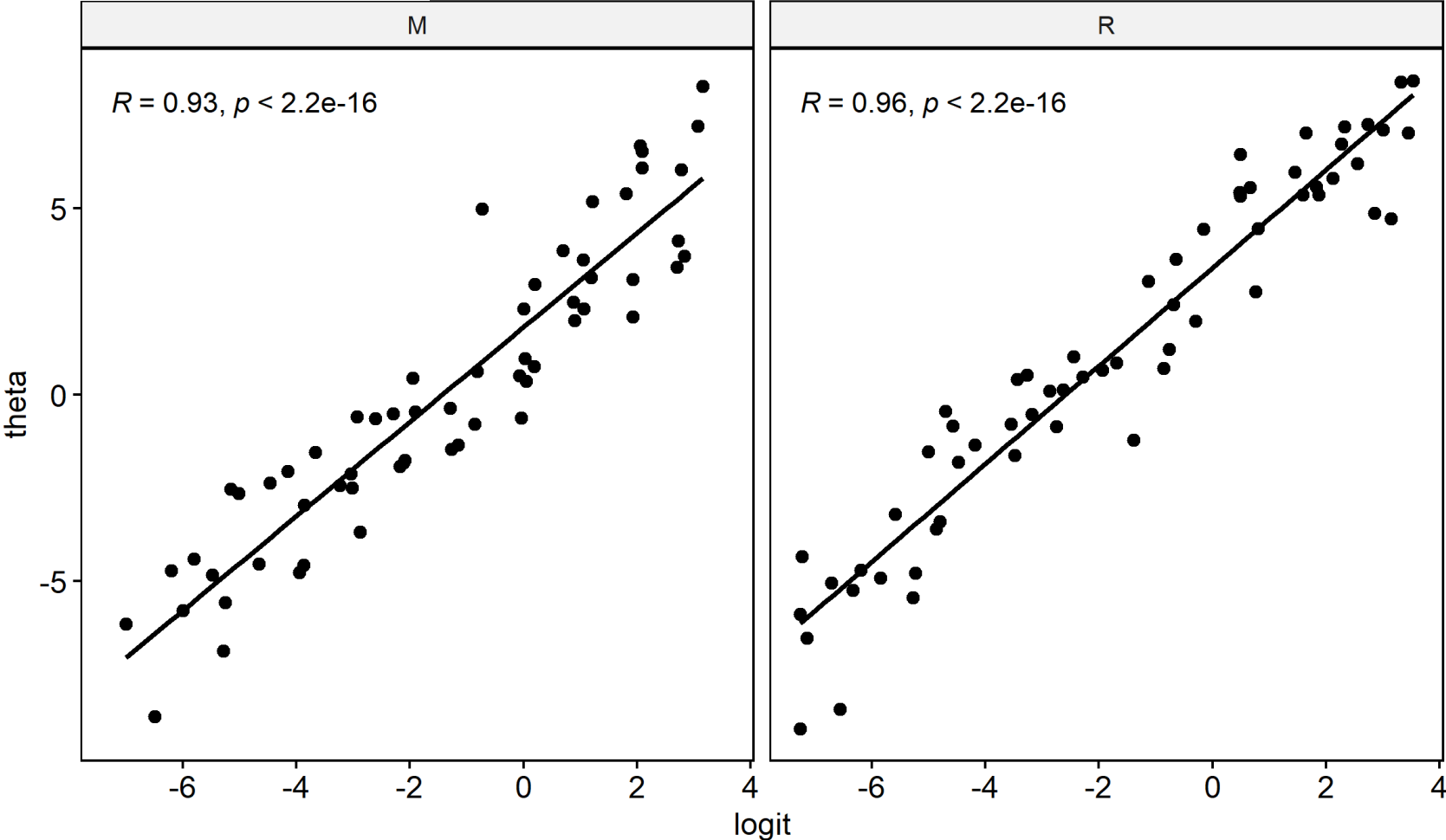
# Evaluating the PCM core postulate

- items from ACER's Progressive Achievement Tests (PAT) and items used in the initial learning progressions.
- reading 60 + 50 items and mathematics 61 + 60 items
- 2780 reading and 2994 mathematics item pairs
- mean item exposure = 42, max = 50, min = 30
- 21 reading judges and 20 mathematics did on average 133 and 157 comparisons respectively
- judges received extensive learning progressions training



# Correlation PAT and LPS locations

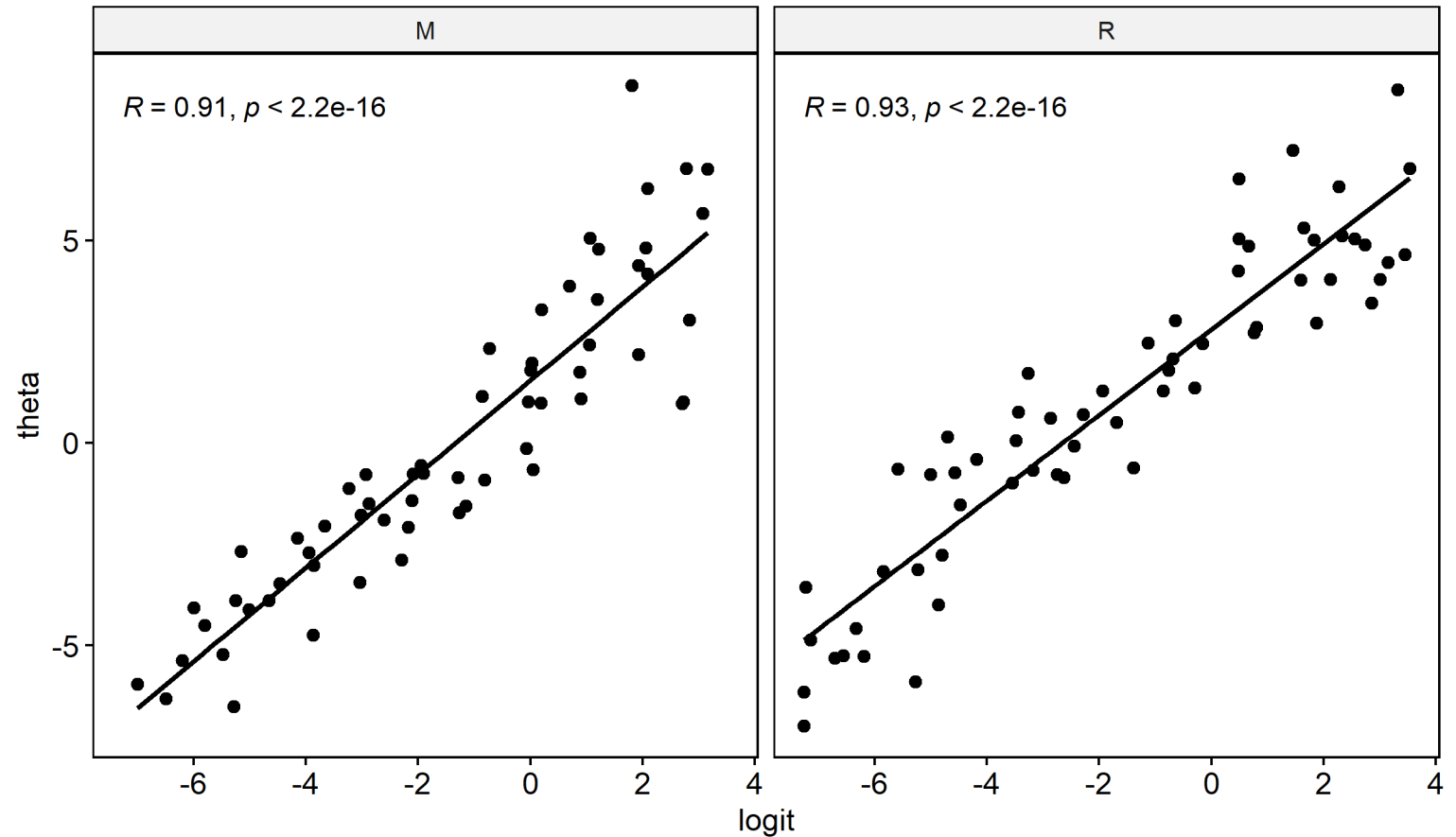
PAT vs. LPS location



# PCM replication and robustness

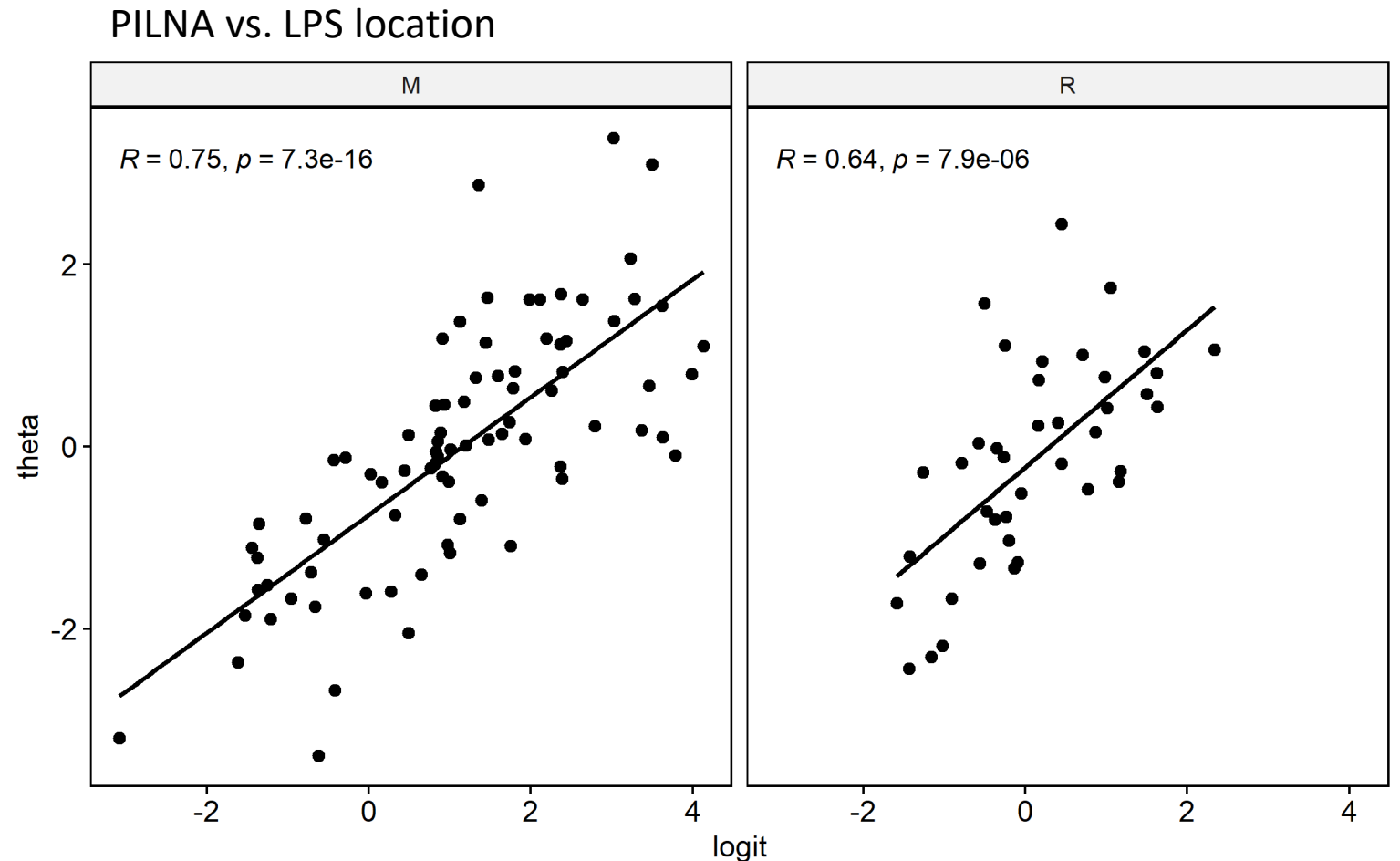
- same PAT items
- different judges (16 reading and 15 mathematics) did an average of 270 comparison
- judges had no experience with PAT items and received remote training
- in-person training on the comparative judgement task involved extensive learning progressions training

PAT vs. LPS location



# PCM operational deployment pilot

- 40 reading and 62 mathematics items from Pacific Islands Literacy and Numeracy Assessment (PILNA)
- 11 reading and 13 mathematics judges did an average of 290 comparisons
- all training online – EQAP staff provided logistical assistance on the ground

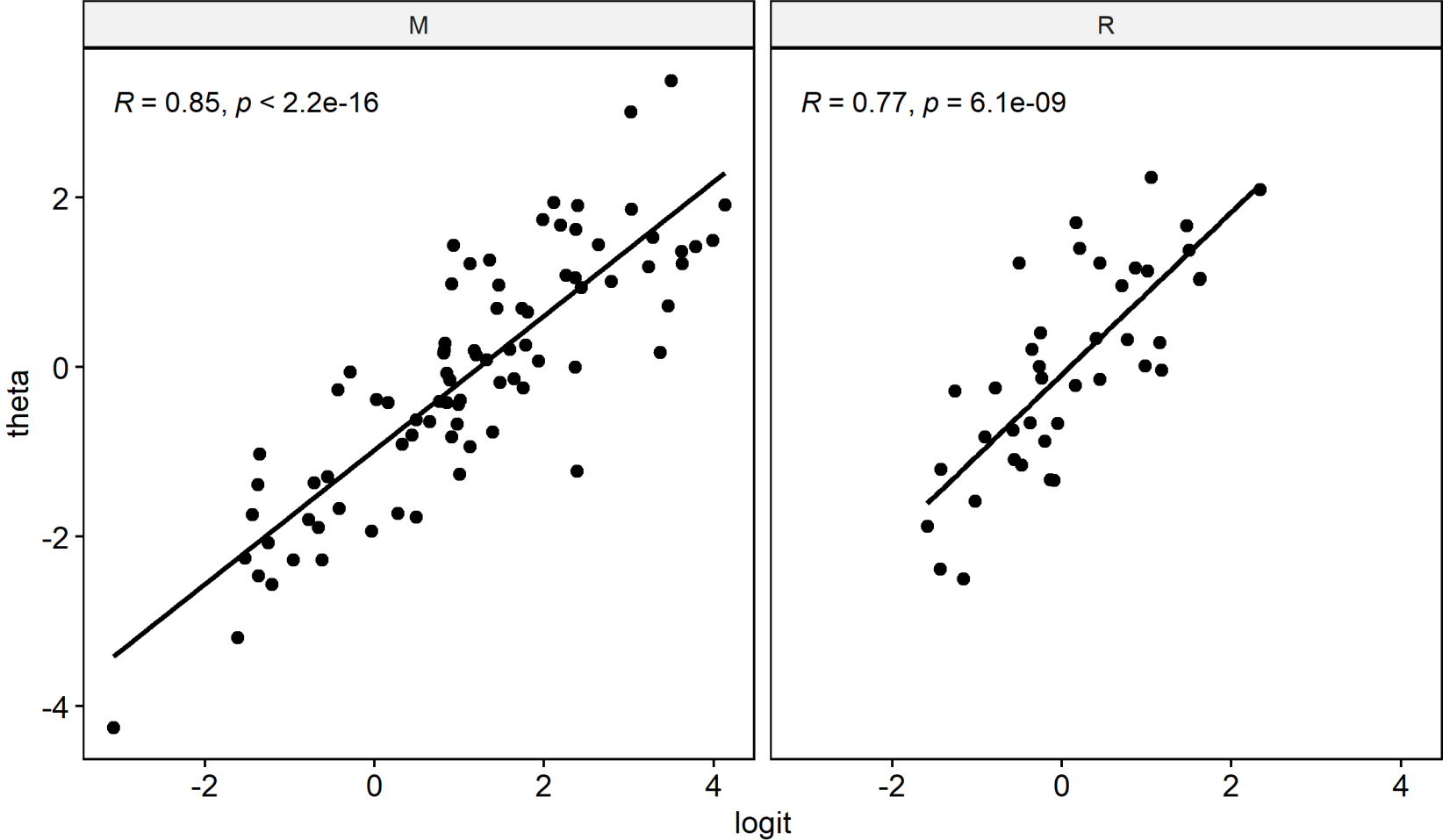


PAT items original and LPS location correlation:  $r = 0.86$  for reading and  $r = 0.85$  for mathematics.



# Correlation PILNA and LPS locations – across studies

PILNA vs. LPS location



# PCM operational deployment indication

- PCM provides reliable item location estimates enabling robust statistical linking of assessment instruments and MPLs cut-scores via LPSs
- item exposure rate should be set to at least 40
- at least 15 judges should participate in an exercise, more is desirable
- a number of comparisons each judge did seem to have had no impact on the reliability of item location estimates
- the exercise can be successfully done remotely

# Next steps

- ACER is developing a toolkit to enable the consistent implementation of the PCM
- ACER is looking for jurisdictions in which the approach can be implemented.
- At present, the LPS is only available for use with assessment items in English; however, ACER would be interested to implement the approach with a bilingual panel to determine if it is possible to link items in another language to the same LPS or whether separate LPSs are required for each language.

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Thank you

