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Comparing children starting school and their progress during the first school year in Russia and Scotland

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Need of international comparative baseline assessment

Importance of the first year of school

No national large scale baseline assessment in Russia

No international comparative baseline studies (until recently)

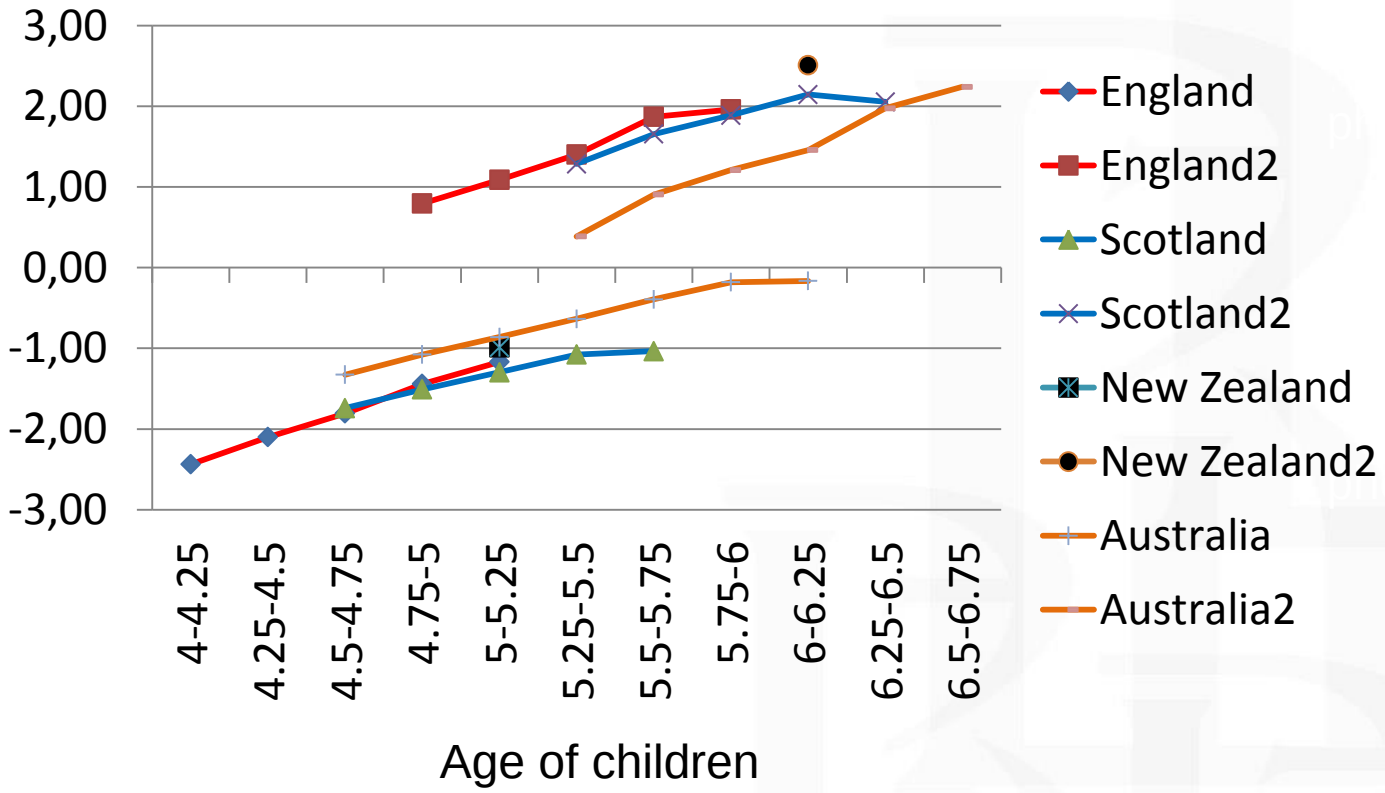
EDI, ECERS, iPIPS

Why iPIPS?

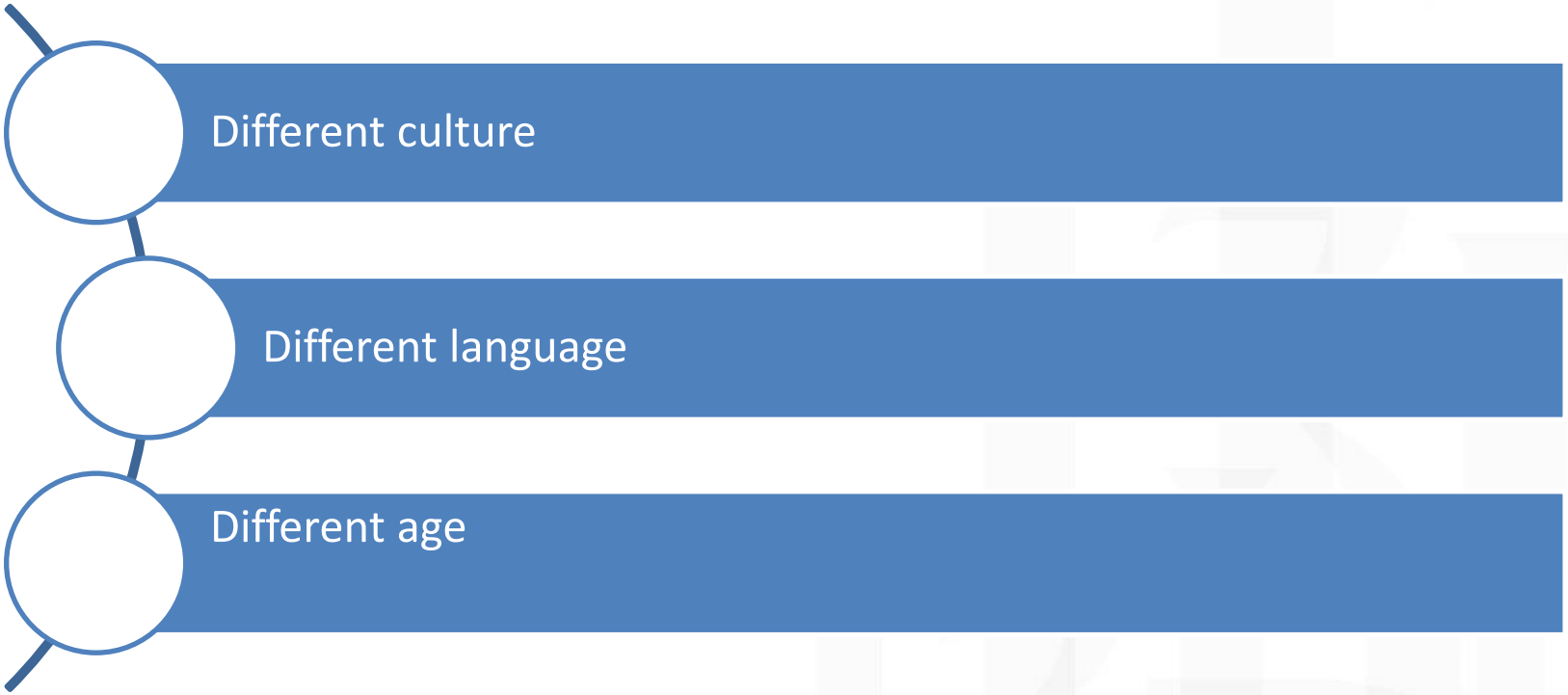
iPIPS is a international project looking at children starting school and the progress they make in their first school year

- ✓ A baseline and follow-up assessment
- ✓ Developed in Durham University
- ✓ The object of the study: the range of children's skills and abilities, both cognitive and non-cognitive
- ✓ Adaptive algorithm, child friendly
- ✓ Standardized assessment with established psychometric properties and validity
  - High reliability (0.98 test-retest; 0.92 Cronbach's alpha)
  - Good predictive validity (0.6-0.7 correlations to performance at age 7 and 11)
- ✓ Provides diagnostic feedback to schools, as well as data for policy makers

iPIPS international comparative study



iPIPS in Russia



The research question: Can we compare children starting school and their progress during the first school year in Russia and Scotland?

Early years education in Russia and Scotland

The two educational systems – Russian and Scottish – have a number of features in common:

- ✓ Both countries place great importance on early childhood education and development.
- ✓ Preschool education is not compulsory in any of the countries, but the majority of children do attend.
- ✓ In both countries there is an understanding of the importance of baseline assessment.

The two educational systems also differ significantly:

- ✓ They differ in the age of children starting school.
- ✓ There are different country-specific traditions and cultures of assessment.
- ✓ The countries have different curricula at the start of school (although both include literacy and mathematics albeit in differing contexts with differing traditions and different foci)

Adaptation process

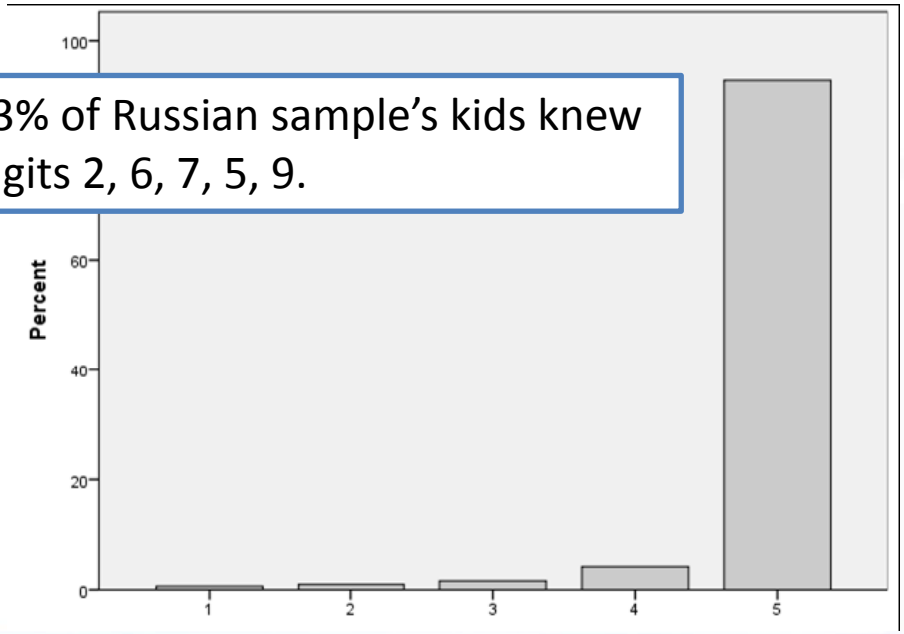
Test adaptation includes many activities from deciding whether or not a test could measure the same construct in a different language and culture, to checking equivalence of the initial and adapted test versions (Hambleton, 2005).

- Successive test adaptation process

- The equivalence of different language versions of tests (backward translation)
- The equivalence of test conditions (similar procedure of testing as in UK)
- Equivalence of measurement (psychometric analysis)
  - IRT analysis of test items and tests
  - DIF analysis

iPIPS adaptation in Russia

1. Translation of baseline and follow-up booklets into Russian by two independent translators
2. Edition and discussion
3. Expertise (experts in literacy and numeracy)
4. Back-translation of the Russian booklet



93% of Russian sample's kids knew digits 2, 6, 7, 5, 9.

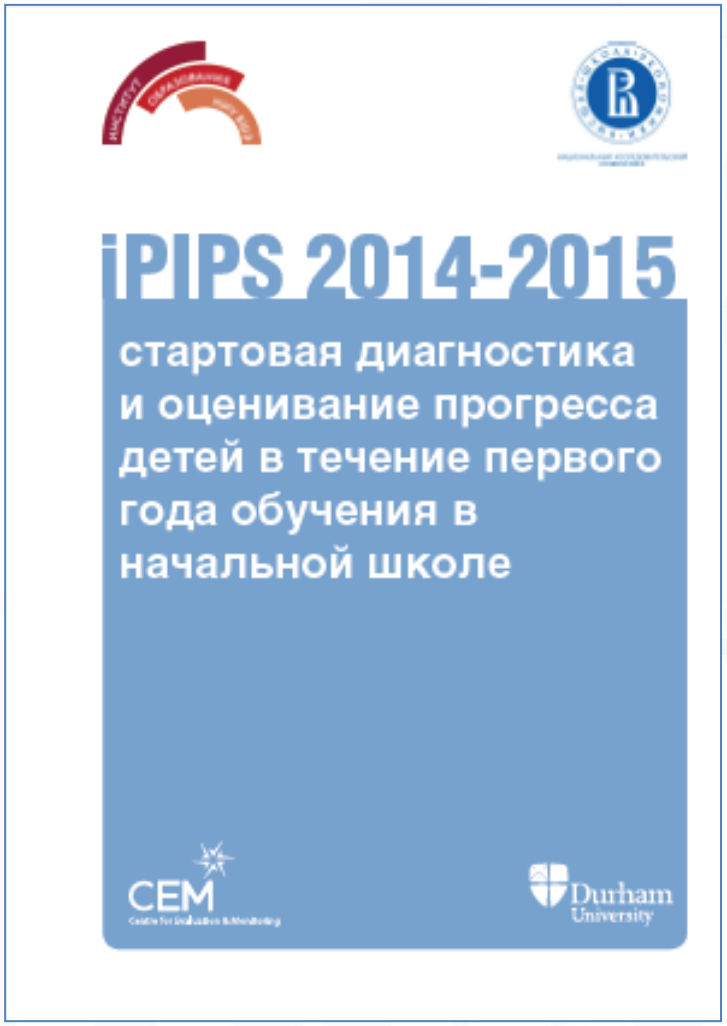
5. Piloting
   - ✓ Ceiling effect

6. Significant revision of Russian booklet

The English and Russian versions of the booklet have enough common items for equating and constructing the common scale.

The final version of Russian iPIPS

Writing
Vocabulary
Repeating words
Rhyming words
Ideas about Reading
Letters
Words
Reading short story
Reading passages
Counting
Simple sums
Numbers
Math problems



The purpose of this study

- to equate attainment in mathematics at different ages in different countries at the start of school and at the end of the first year

- to compare children from Russia and Scotland taking into account the age of starting school.

Samples in Russia and Scotland

Country	Number of participants in the baseline assessment	Number of participants in the follow up assessment
Scotland	6627	6627
Russia	1438	1393

Country	5% Trimmed Mean, age in years
Scotland	5.09
Russia	7.31

Methodology.
Ensuring psychometric quality and a common scale between cycles of assessment and countries

- We used Item Response Theory (IRT) modelling to conduct item analyses as well as tests of dimensionality and reliability.
- The one-parameter dichotomous Rasch model was used for the IRT analysis
- We also paid particular attention to differential item functioning (DIF) to provide evidence concerning the cross-national comparability of the test results and to ascertain the possibility of creating a common scale between the two assessment cycles and across the two countries.

Analysis

Objective

- Choose “good” items
- Confirm, that we measure “ability” as a unidimensional construct
- Make sure items are fair across countries
- Look at the test as a whole: understand if the test is an appropriate measurement tool for the sample

Methodology

- IRT
- Test of dimensionality
- DIF analysis
- Reliability study, variable map

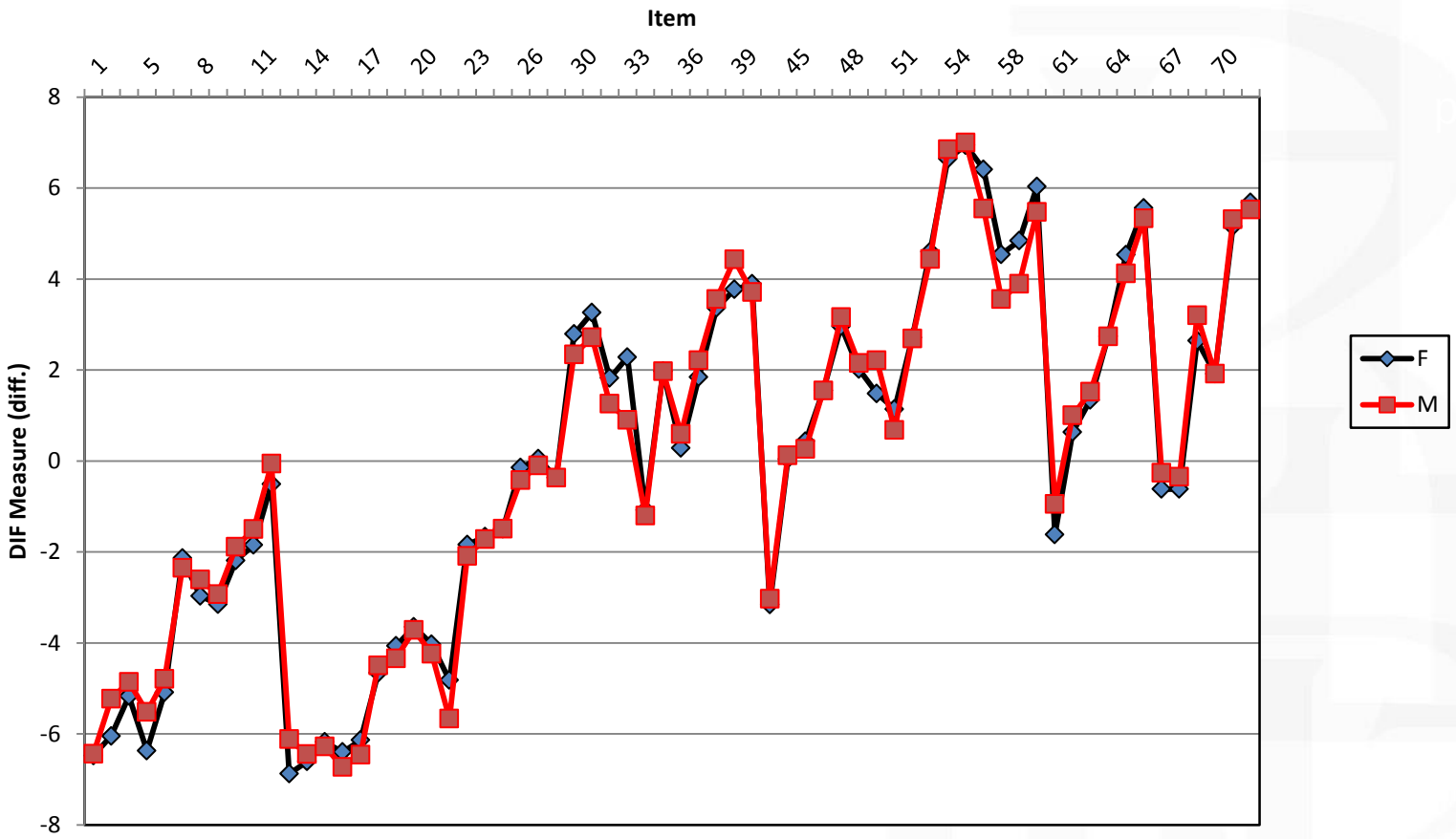
Make sure items are fair across countries. Approach: DIF analysis

DIF (Differential Item Functioning):
when test participants with the same ability level who belong to different groups (e.g. gender, country) have varying chances to complete the item correctly.

So check at each item for any difference in performance by group, while controlling for ability.

- Mantel-Haenszel method
- ETS approach for DIF classification

Math: Scotland and Russia, DIF across gender

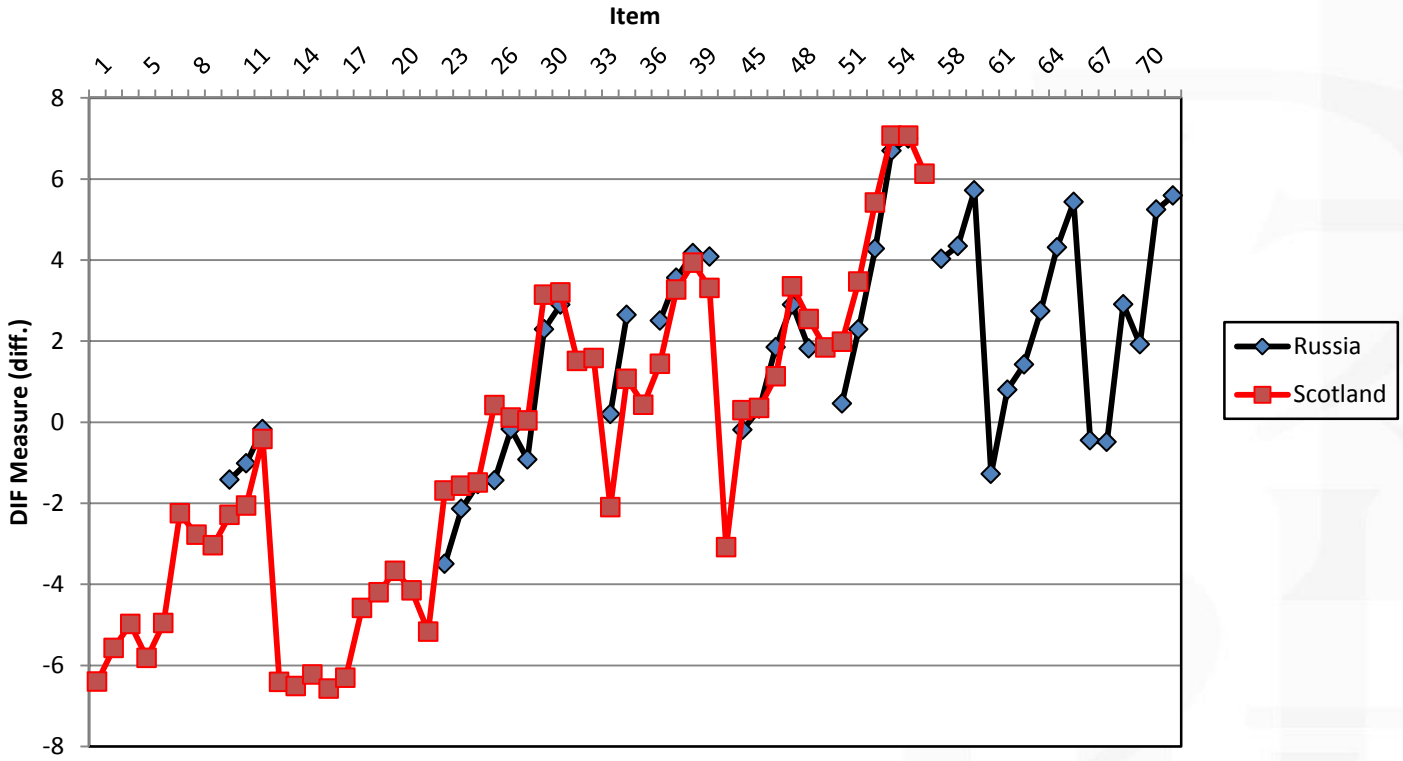


There is no difference in item difficulty for boys and girls

NO DIF

No gender bias

Math: Scotland and Russia, DIF across country



We start with 69 items:

- 27 common items
- 42 country specific items

16 items are DIF free (no statistically significant DIF)

11 items with DIF (with statistically significant DIF): 4 items in favour of Scotland, 7 items in favour of Russia

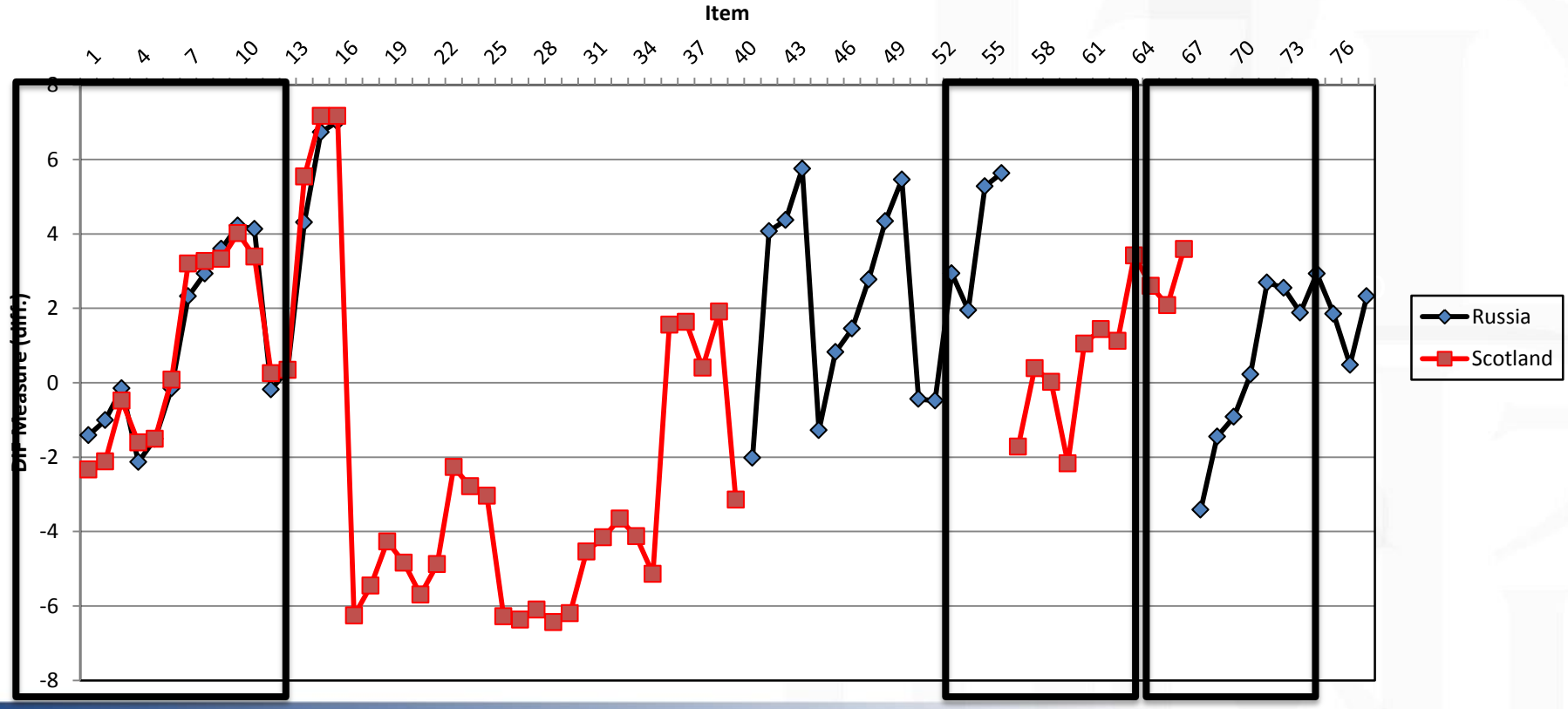
This suggests the test is not entirely fair for different countries

DIF items

#	List of items	Direction of DIF
1	Number teen	Ru>SC
2	Number 2dig	Ru>SC
3	Number 3dig	Ru>SC
4	What is 1 more than 5?	Sc>Ru
5	What is 3 less than 7?	Sc>Ru
6	What is 3 more than 8?	Sc>Ru
7	Sasha would like to buy an orange, which costs 12 rubles. Which coin should he use?	Ru>SC
8	Can you do this sum? 15-4=	Ru>SC
9	Can you do this sum? 4+11=	Ru>SC
10	What is half of 6?	Ru>SC
11	Look at this set of numbers. What should be there instead of the asterisk? 2 4 6 8 * 12	Sc>Ru

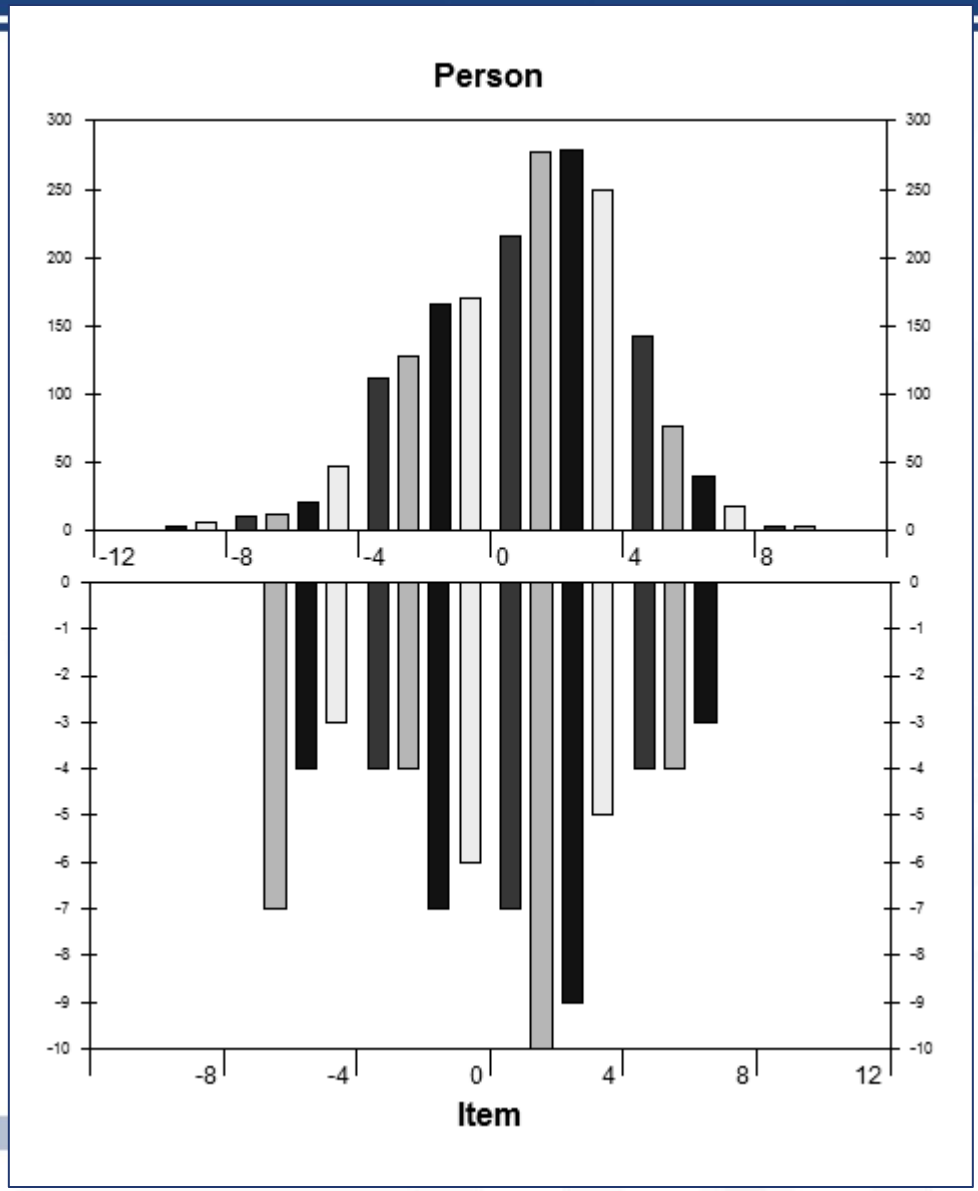
Our solution

- ✓ 16 DIF-free items: linking between the two countries
- ✓ Original Scotland's items and original Russia's items
- ✓ The 11 items with DIF are considered as unique items for Russia and unique items for Scotland

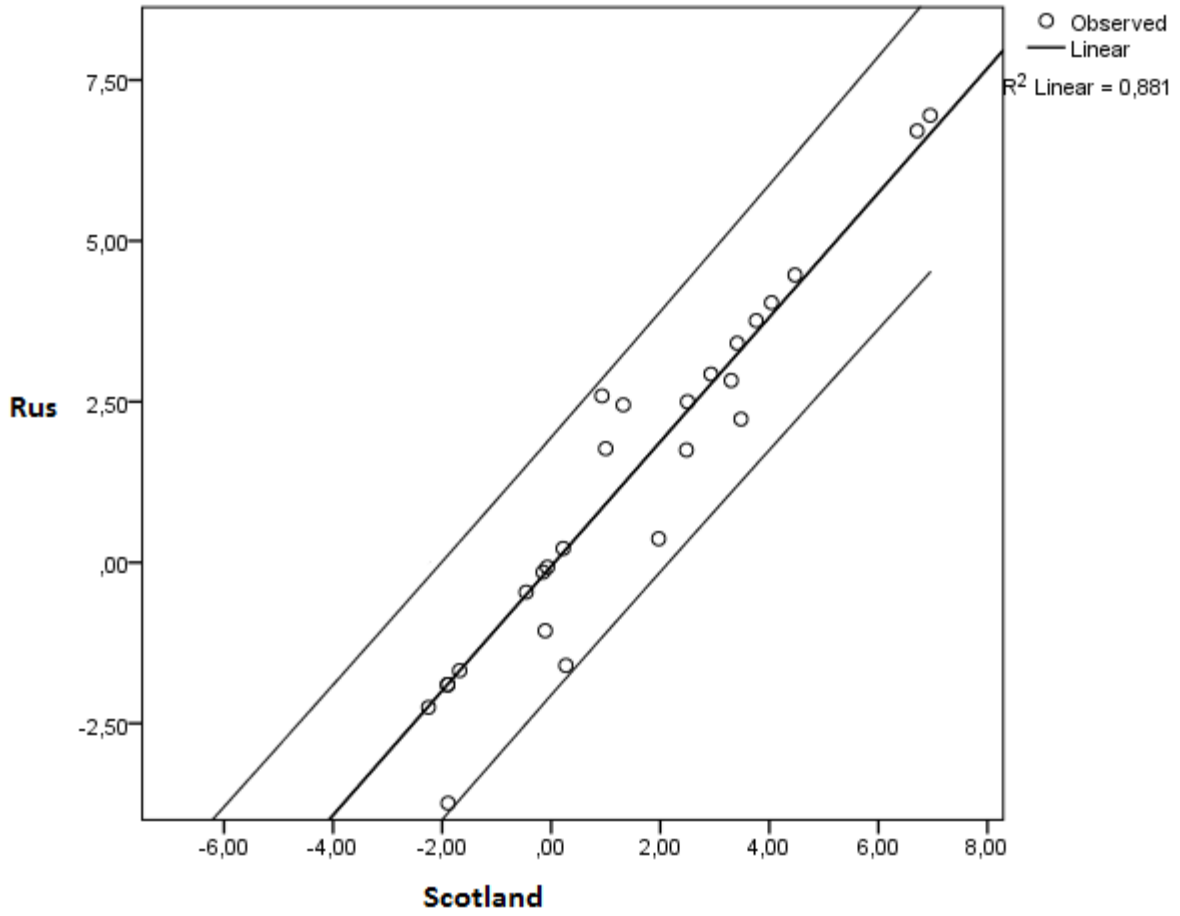


Reliability study and Variable map

- ✓ The person reliability is 0.95
- ✓ Classical reliability α = 0.83
- ✓ The person separation index is 4.52
- ✓ The test is essentialy unidimensional



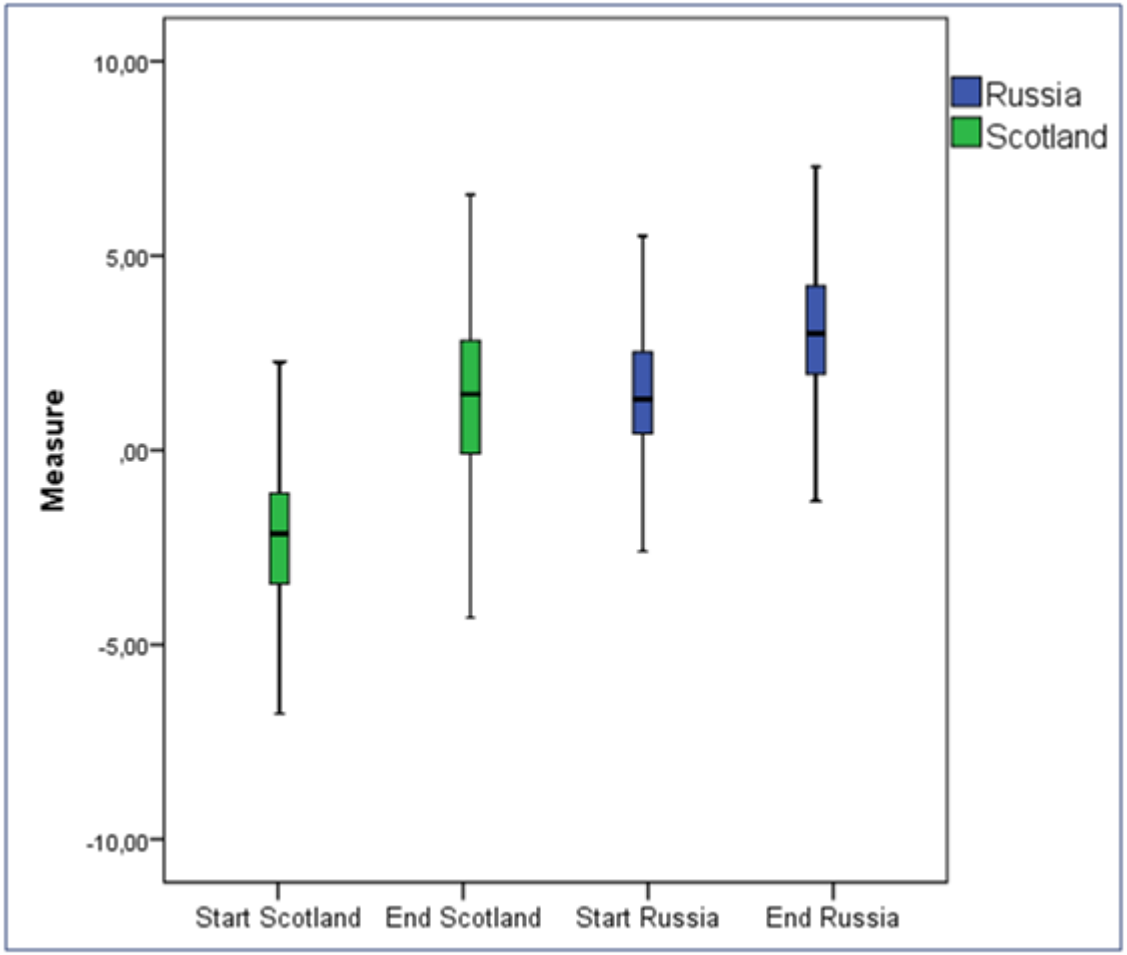
Comparing the item difficulty



Conclusion of data analysis

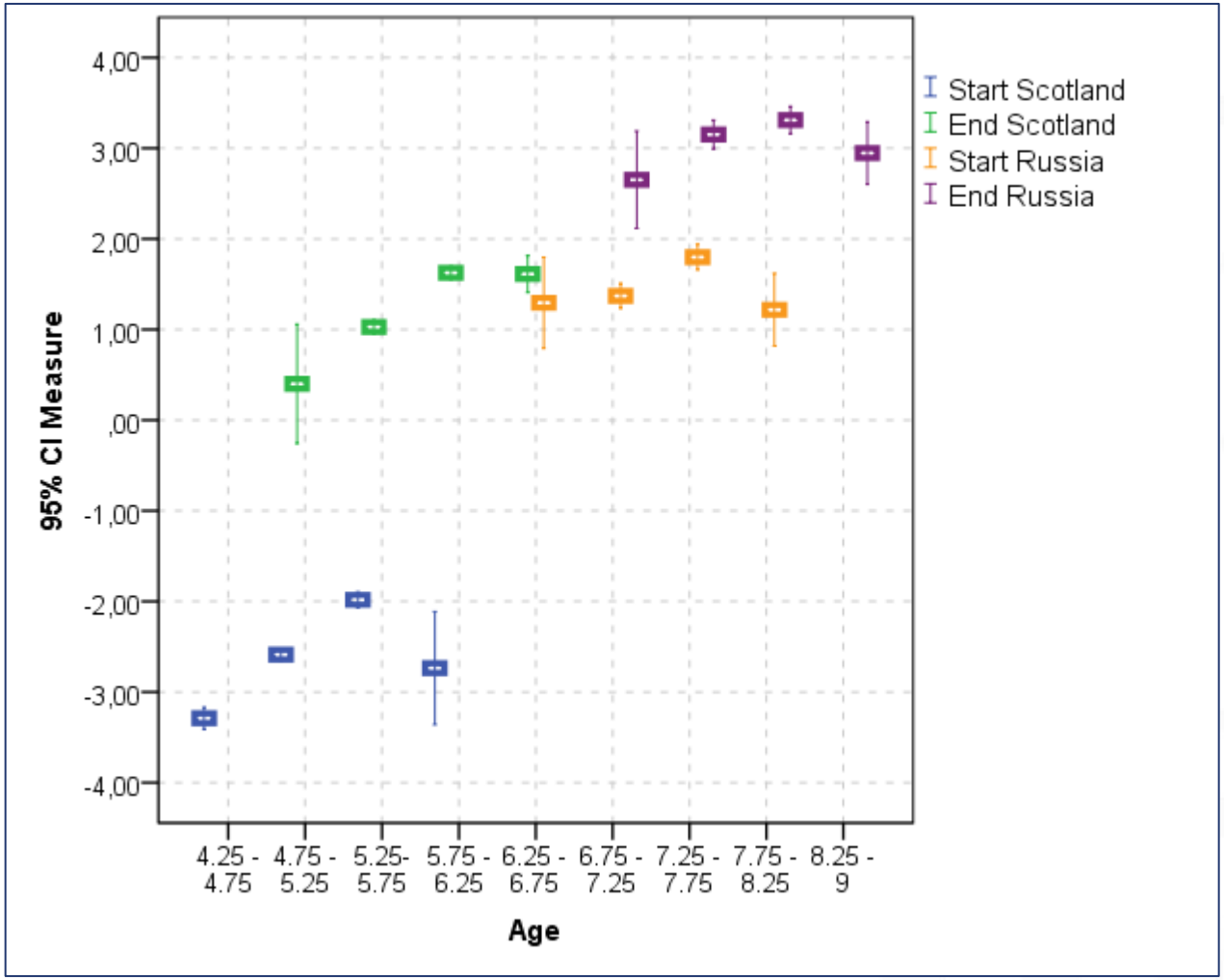
- iPIPS test have good psychometric quality, are essentially unidimensional, reliable and valid instrument for measuring and comparing the mathematics skills of children in the beginning and in the end of the first school year within and across the two countries.
- Although some test items demonstrated DIF across countries, a sufficient number of DIF-free items allowed us to construct a common scale for both countries.
- It is indeed possible to equate attainment in mathematics at different ages (5 to 7) in different countries (Scotland and Russia), at the start of school and at the end of the first year.

Comparison across countries and assessment cycles



- Considerable range of math performance from the weakest children to the strongest
- Progress from starting school to the end of the first year is strong for both countries, although less so for in Russia

Comparison across countries and age



Math scores of Russian children starting school are similar to those of Scottish children in the end of the first year of schooling, despite the fact that at this point in time they are considerably older.

Age and ability differences in Scotland

Scotland, baseline

	4.25 - 4.75	4.75 - 5.25	5.25- 5.75
4.75 - 5.25	-,70*		
5.25- 5.75	-1,31*	-,61*	
5.75 - 6.25	-,55	,15	,75

*$p<0.05$

Scotland, follow up

	4.75 - 5.25	5.25- 5.75	5.75 - 6.25
5.25- 5.75	-,63		
5.75 - 6.25	-1,23*	-,60*	
6.25 - 6.75	-1,21*	-,58*	,01

Age and ability differences in Russia

Russia, baseline

	6.25 - 6.75	6.75 - 7.25	7.25 - 7.75
6.75 - 7.25	-,08		
7.25 - 7.75	-,50*	-,43*	
7.75 - 8.25	,08	,15	,58*

*$p<0.05$

Russia, follow up

	6.75 - 7.25	7.25 - 7.75	7.75 - 8.25
7.25 - 7.75	-,50		
7.75 - 8.25	-,66*	-,16	
8.25 - 9	-,29	,21	,37*

Conclusions

1. It is possible to equate iPIPS scores in mathematics from the start and the end of the first school year across Scotland and Russia
   - despite of the age differences

2. The findings are limited
   - by the smaller Russian sample
   - by slightly different time between the two assessments in Russia and Scotland

Future research

1. It would be interesting to compare the relative progress of 2nd year's Scottish pupils and Russian first graders to see

    - how changes the dynamics of the progress with age?
    - will the progress of Scottish children remain bigger comparing to Russian children, or not
    - could it be that younger children demonstrate bigger relative progress during a year of schooling

2. What are the conditions of educational system, that define the progress of children in elementary school in both countries

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Thank you for your attention!

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