

## A diagnostic tool as the starting point for support

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### Introduction

- Sometimes math problems are not recognized early on
- Criticism on existing diagnostic tools: **no daily life skills** or **no time pressure**

Crucial skills to evaluate in (young) adults?

- Automatisisation (existing test: TTR/TTA)
- **Procedural skills in daily life situations**
- **Visuo-spatial skills in daily life situations**
- **Link symbols and their meaning**
- **Metacognitive abilities**



Goals for the screening/diagnostic tool for (young) adults:

- Global test with norms for individual skills
- Daily life skills incorporated
- Time pressure
- Qualitative problem analysis on cognitive subskills is possible

### Content of the diagnostic tool: 16 topics

1. Number transcoding: verbal to Arabic
2. Grasp of fractions
3. Knowledge of symbols and insight in number lines
4. Calculation with fractions and percentages
5. Procedural skills (addition, subtraction, multiplication, division and mixed)
6. Transpose word problems to a formula
7. (Transformation) of measurement units
8. Time telling (analog/digital)

9. Money skills
10. Estimating quantities
11. Interpretation of graphs and tables
12. Spatial orientation
13. Arithmetic terminology
14. Mental representation
15. Word problems
16. Number transcoding: Arabic to verbal

**And additionally:** Metacognitive abilities: self-judgment for each topic

Cronbach's  $\alpha = 0.86$

And **all topics** contribute to the **reliability** of the instrument (also on cognitive subskill level)

### Participants

- 140 **secondary school** students (year 5 and 6, mean age = 17 yrs)
- 3 education levels: general education (ASO; 3-4 h math), technical education (TSO; 0-4 h math) and professional education (BSO; 0-2 h math)

CONTROL GROUP	Male	Female	Total
ASO	8	26	34
TSO	29	29	58
BSO	2	31	33
Total	39	86	125

**Math difficulties group:**  
dyscalculia (n = 9)  
or history of  
intervention for  
math (n = 6)

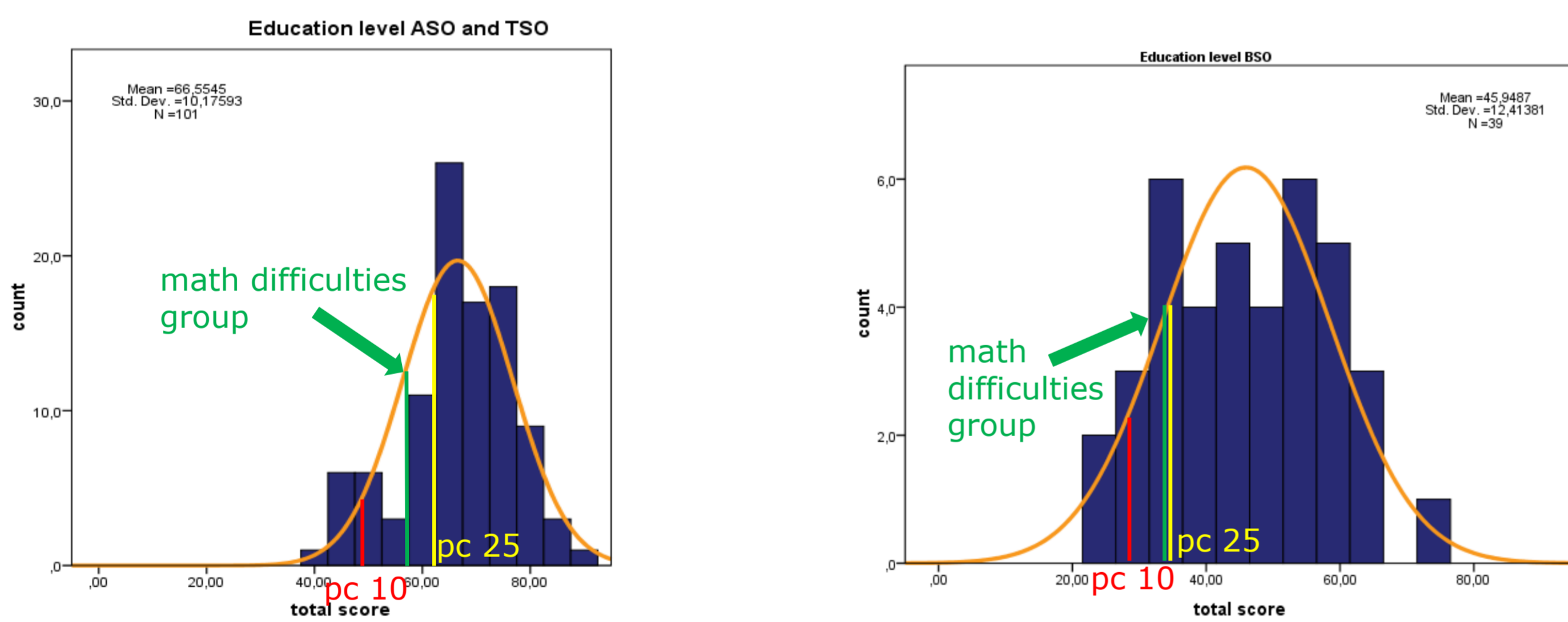
MATH DIFF. GROUP	Male	Female	Total
ASO	1	3	4
TSO	3	2	5
BSO	1	5	6
Total	5	10	15

### Procedure

- Paper and pencil test
- In the classroom
- **Time limit** for each topic (based on pilot testing)
- Total duration: about 1,5 hour
- 2 trained students did the testing

### Total score

- Significant effect of group: **math difficulties group < control group**
- Significant effect of sex: **female < male**
- Significant effect of education level: **ASO = TSO > BSO**
- No significant interactions



### Subscores on the different topics

**Math difficulties group** scores significantly **lower** on:

- Number transcoding: verbal to Arabic
- Procedural skills
- Interpretation of graphs and tables
- Calculation with fractions and percentages

### Results

#### Cognitive subskills

When scoring on underlying cognitive skills, the **math difficulties group** scores significantly **lower** on:

- Number transcoding
- Number knowledge
- Math language
- Word problems
- Procedures
- Estimation
- Graphs

#### Metacognitive skills

Is there a correlation between self-judgment and actual score on the different topics?

	Nr of significant correlations	Underestimation?
Math difficulties	0 / 16	8 / 16
ASO and TSO	3 / 16	14 / 16
BSO	8 / 16	10 / 16

➔ in line with metacognitive difficulties in dyscalculia

### Conclusions

1. The instrument is **reliable** on item and cognitive subskill level
2. It **discriminates** young adults with problems in arithmetic from controls
3. The **most discriminative topics** are:
  - **Transcoding (verbal to Arabic)** ➔ verbal tests put weak students at a disadvantage
  - **Procedural knowledge**
  - Interpretation of **graphs** ➔ interpretation of symbolic information
4. Against our expectations **daily life skills** do not always discriminate: small group?; items too easy?; individual variation?

### Further steps

- More dyscalculic students
- Standardization with a better distribution of subject variables
- Investigate validity of the instrument
- Item analysis
- Evaluation of item distribution across topics
- Qualitative analysis of results is also necessary and preferable