

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?

- Automatisation (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

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

- Money skills
- Estimating quantities
- Interpretation of graphs and tables
- Spatial orientation
- Arithmetic terminology
- Mental representation
- Word problems
- 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)

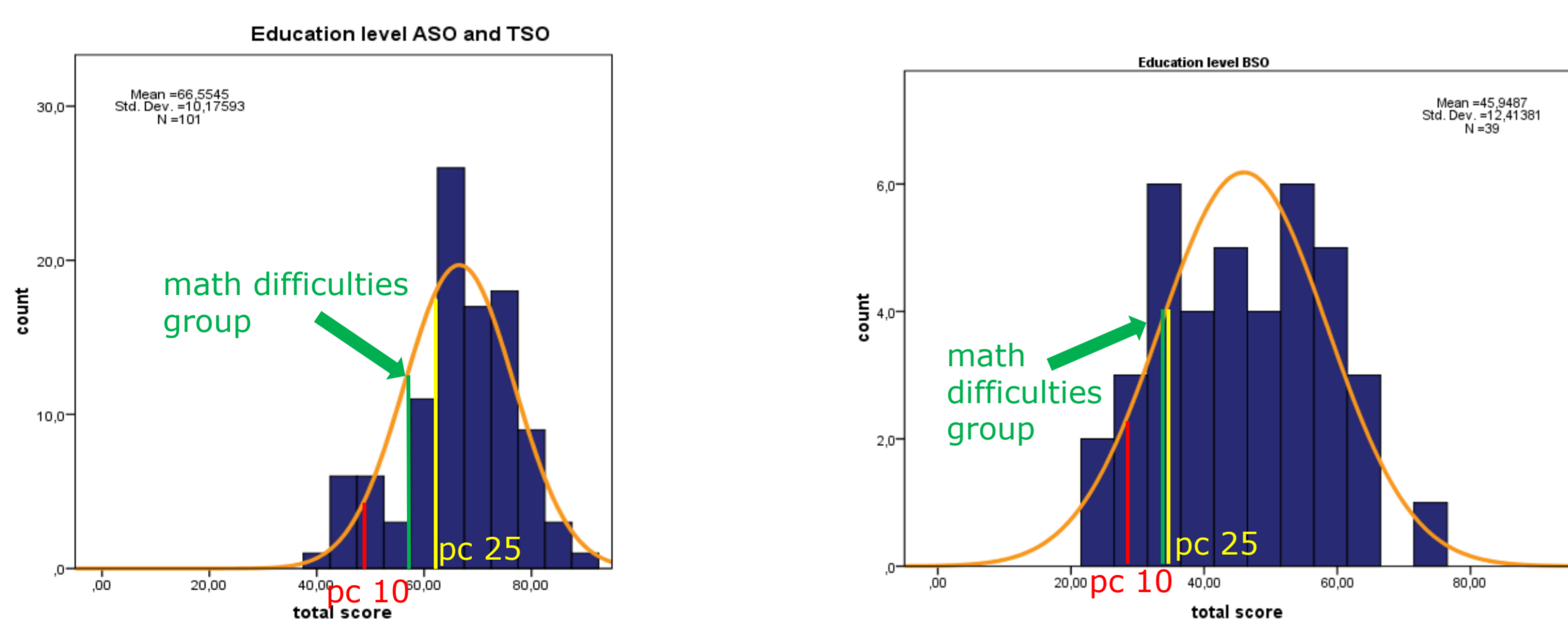
MATH DIFF. GROUP	Male	Female	Total
ASO	1	3	4
TSO	3	2	5
BSO	1	5	6
Total	5	10	15

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

- The instrument is **reliable** on item and cognitive subskill level
- It **discriminates** young adults with problems in arithmetic from controls
- 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
- 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