

A study of early mathematical competence in students with ASD



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Introduction

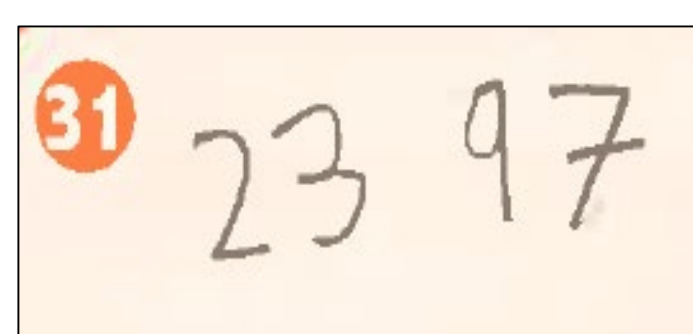
On the assumption that early detection helps to prevent subsequent difficulties, different studies have been carried out to assess mathematical competence:

- Informal knowledge is considered to be a strong predictor of subsequent academic mathematical performance (see e.g., Kilday & Kinzie, 2009).
- According to Titeca et al. (2014), early numeracy skills of children diagnosed with high-functioning ASD are similar to those found in their typically developing peers.
- On the contrary, Chen et al. (2019) identified two different profiles within autistic students showing discrepancies in mathematical achievement.

Information-gathering tool

The *Test of Early Mathematical Ability* (3rd edition; TEMA-3, Ginsburg et al, 2007) is used to assess the mathematical skills of the students.

- It is a valuable tool for children, aged from 3 to 8 years and 11 months old, with typical mathematical development, and for older students with special needs.
- Since the test assesses different aspects of mathematical competence including both informal and formal tasks, it allows the specialist to determine specific strengths or weakness in the student's proficiency.



Example of a task of numeral literacy in which children are asked to write twenty-three and ninety-seven.

Example of a task of number comparison (informal knowledge): the student is asked to identify the set with larger number of elements.



Participants

The present study was carried out with a sample of 17 students enrolled in the first four levels of primary school. The following selection criteria were also considered to be met by participants: (1) being between 6 and 12 years old; (2) being diagnosed with ASD and showing no evidence of another psychiatric comorbidity; and (3) an IQ score equal to or greater than 70, as measured by the Wechsler Intelligence Scale for Children (WISC-V; Wechsler et al., 2014). The mean age of the students within the subsample is 8,16 years old, with a standard deviation of 1,42 years. Only two of the selected students are girls (11.8%).

Student	Sex	Academic year	Age (years)	CI (WISC-V)	Direct Score (TEMA-3)	Mathematical age (years)
S1	M	1º	6.25	105	50	7.08
S2	M	1º	6.25	87	44	6.67
S3	F	1º	6.33	101	43	6.58
S4	M	1º	6.50	72	26	5.50
S5	M	1º	6.67	96	50	5.50
S6	M	2º	6.75	94	49	7.00
S7	M	3º	8.33	82	50	7.08
S8	F	3º	8.42	83	48	6.92
S9	M	3º	8.50	70	50	7.08
S10	M	4º	8.75	79	60	8.17
S11	M	4º	8.75	95	58	7.92
S12	M	4º	8.83	77	45	6.75
S13	M	4º	9.25	88	39	6.33
S14	M	4º	9.25	99	46	6.83
S15	M	4º	9.50	89	71	9.00
S16	M	4º	9.58	84	49	7.00
S17	M	4º	10.83	75	57	7.75

Table 1: Characteristics of the ADS group of participants.

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Participants (cont.)

A comparison group (non-ADS) of typically developing children was also considered by selecting one-to-one students of the same sex, academic year and educational centre as the students of the ADS group. Table 2 shows the characteristics of the students within the non-ADS group. In this case, they are listed correspondingly, according to the order defined in Table 1. The mean age of the students within the non-ADS group is 8.27 years old, with a standard deviation of 1.32 years.

Student	Sex	Academic year	Age (years)	CI (WISC-V)	Direct Score (TEMA-3)	Mathematical age (years)
C1	M	1º	6.67	105	60	8.17
C2	M	1º	6.25	109	47	6.83
C3	F	1º	6.33	130	42	6.50
C4	M	1º	6.42	109	41	6.50
C5	M	1º	6.58	117	49	7.00
C6	M	2º	7.67	82	44	6.67
C7	M	3º	8.33	98	60	8.17
C8	F	3º	8.58	95	54	7.42
C9	M	3º	8.67	93	70	9.00
C10	M	4º	9.58	105	70	9.00
C11	M	4º	9.58	94	59	8.00
C12	M	4º	9.50	95	70	9.00
C13	M	4º	9.00	99	70	9.00
C14	M	4º	9.33	102	67	9.00
C15	M	4º	9.25	111	70	9.00
C16	M	4º	9.00	92	71	9.00
C17	M	4º	9.83	94	68	9.00

Table 2: Characteristics of the non-ADS group of participants.

Preliminary results and conclusions

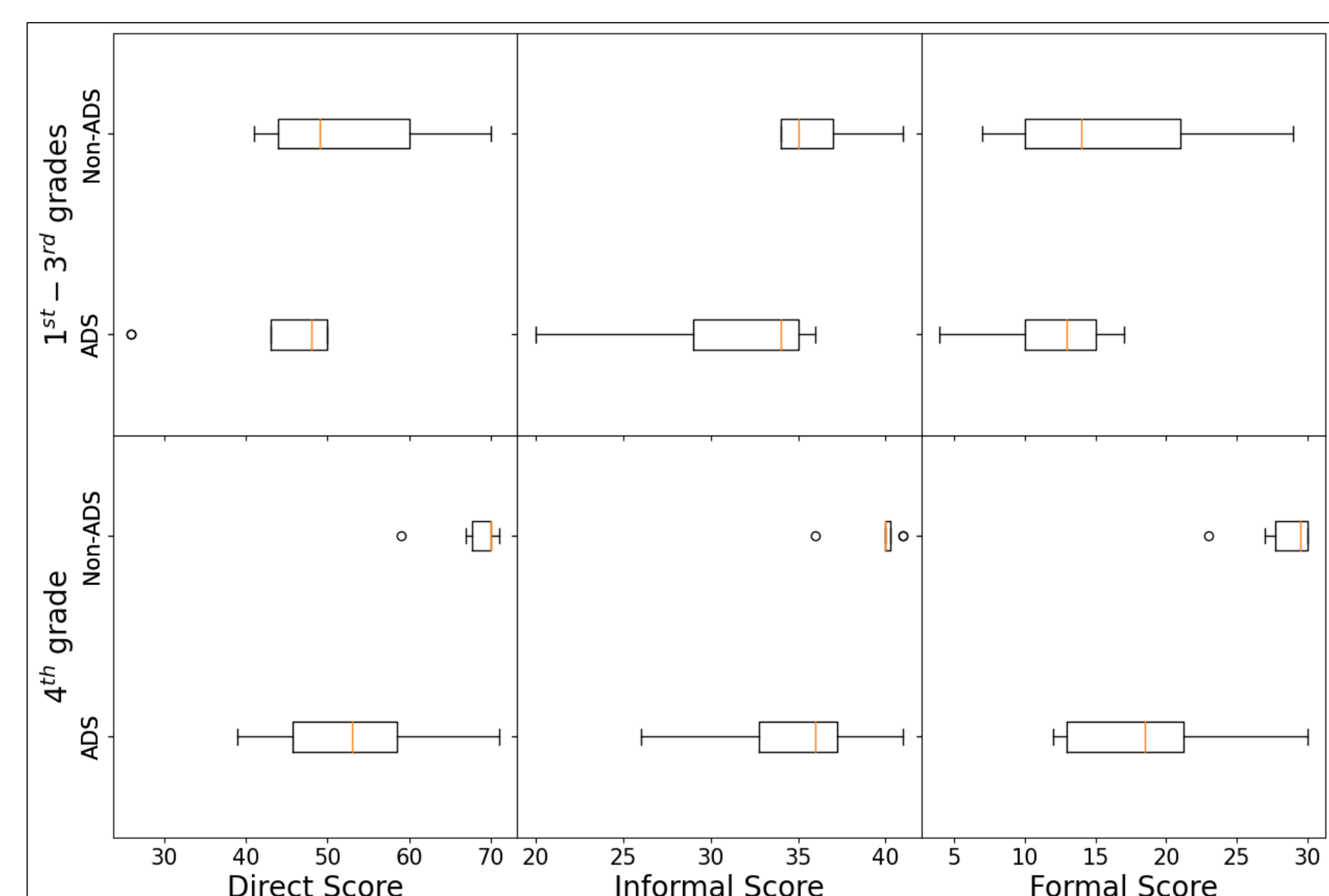
Two age groups (1st – 3rd grade and 4th-grade students) are analysed separately. Typically, we found greater scores for the non-ADS group for both informal and formal categories. For each intersection of groups, the figure on the right shows the median value of the scores and the different percentiles.

1st–3rd grade students:

differences between ADS and non-ADS group are observed, but not statistically significant.

4th-grade students:

- The scores obtained by the non-ADS group are saturated because the test is valid for typical developing children up to 9 years.
- The scores obtained by the ADS group are likely to be lower than by the non-ADS group.



Conclusions: Future instruction should be focused on improving formal and informal skills in students with ASD in the early years so that they don't fall behind in mathematical knowledge in higher grades. .



Project web: <https://matematicasyautismo.unican.es/>