Children with ASD Improve Categorical Induction Performance Over Time

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Background

- Categorical induction (CatInd): process of extending trait from a known category to new category members[1]
  - E.g., dogs *bark*, so a new dog we encounter also *barks*
- CatInd skills evident early in typically developing (TD) children
  - 4-year-old TD children performed above chance on an easy CatInd task[2] (see Fig. 1)
  - TD children aged 8-15 yrs performed above chance[3] on a challenging CatInd task[1] (see Fig. 2)
- Autism Spectrum Disorder (ASD) associated with weaker CatInd
  - Autistic children aged 8-15 yrs made correct inductions less consistently than age-matched TD peers[3] on the challenging CatInd task[1]
  - Autistic children aged 5-7 made correct inductions below chance and incorrect inductions at or below chance[4], even on the easy CatInd task[2]
- **No study has examined CatInd longitudinally:**

Might the CatInd abilities of autistic individuals improve over time?

Participants

- Subset of Longitudinal Study of Early Language (LSEL) participants[5]
  - At 1-2 yrs old, TD and ASD groups matched on language ability
- Visited again at approx. 6 years old (T1; Table 1)
- Visited again as teenagers/young adults, now more widely ranging in language ability (T2; Table 1)
- Analyzed as small longitudinal sample (T1 to T2) and larger cross-sectional sample (T2 only)

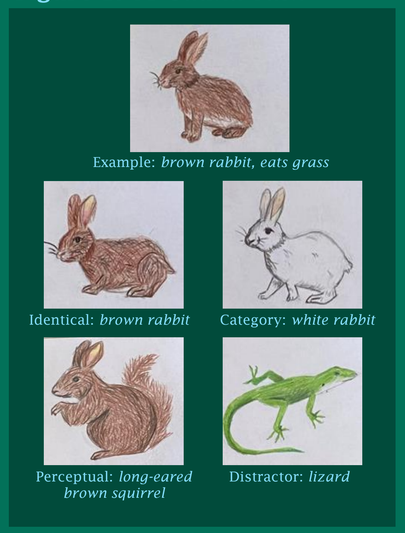
Table 1. *Participant Demographics and Language Scores*

		TD		ASD	Comparison
	N	*M (SD)*	*N*	*M (SD)*	*p* (Cohen's *d*)
Longitudinal (T1)	12		8		
Age		**5.63 (0.31)**		**6.24 (0.56)**	**.006 (1.43)**
Longitudinal (T2)	12		8		
Age		14.50 (2.15)		14.63 (2.62)	.908 (0.05)
Cross-sectional (T2)	20		17		
Age		15.80 (2.73)		16.35 (3.45)	.589 (0.18)
CELF-5[7] Expressive Language Index score		**104.35 (17.81)**		**78.82 (27.33)**	**.002 (1.13)**

Note. CELF-5[6]: Clinical Evaluation of Language Fundamentals-Fifth Edition. Expressive Language Index (ELI) scores calculated from summed scaled scores on three subtests (Formulated Sentences, Recalling Sentences, Sentence Assembly).

Procedure

Figure 1. *T1 CatInd Task[2]*



Q: "Does Identical/Category/Perceptual/Distractor share [trait] with Example?"

Figure 2. *T2 CatInd Task[1]*

Q: "Does the last animal share [trait] with the first or second animal/group?"

T1: TD and autistic children did easy CatInd task[2] (see Fig. 1)

T2: TD and autistic teenagers did challenging CatInd task[1] (see Fig. 2)

% CatInd

T1:

$$\frac{\text{\# of Category matches correctly inducted}}{\text{8 trials}} \times 100\%$$

T2:

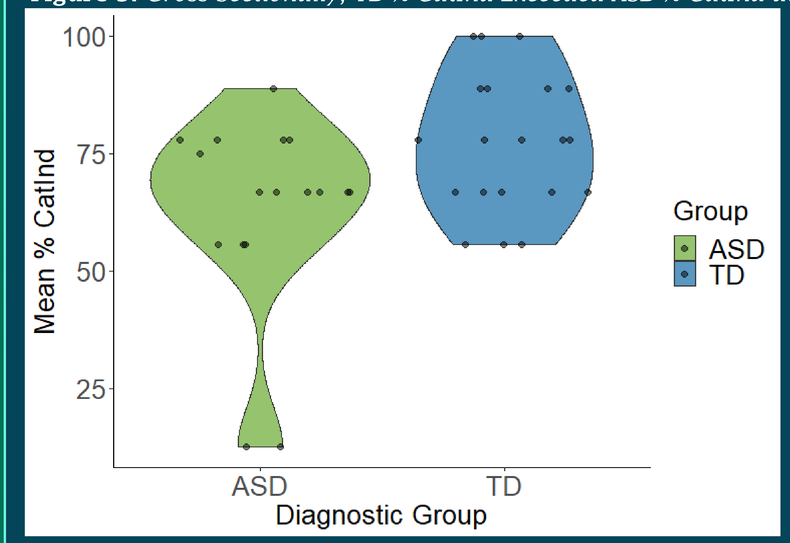
$$\frac{\text{\# of correct (bigger or more diverse group) choices}}{\text{9 trials}} \times 100\%$$

Results

- Cross-sectional sample: at T2, TD %CatInd > ASD %CatInd (Fig. 3)
- **T2 difference no longer significant** when controlling for **semantic** ability* (p = .827) and **syntactic** ability* (p = .495)
  *as measured by summed CELF raw scores on semantic and syntactic subtests
- Longitudinal sample: ASD %CatInd < TD %CatInd at **T1** (significantly; p = .031) and **T2** (marginally; p = .051)
- **Only** ASD % CatInd improved from T1 to T2 (Fig. 4)

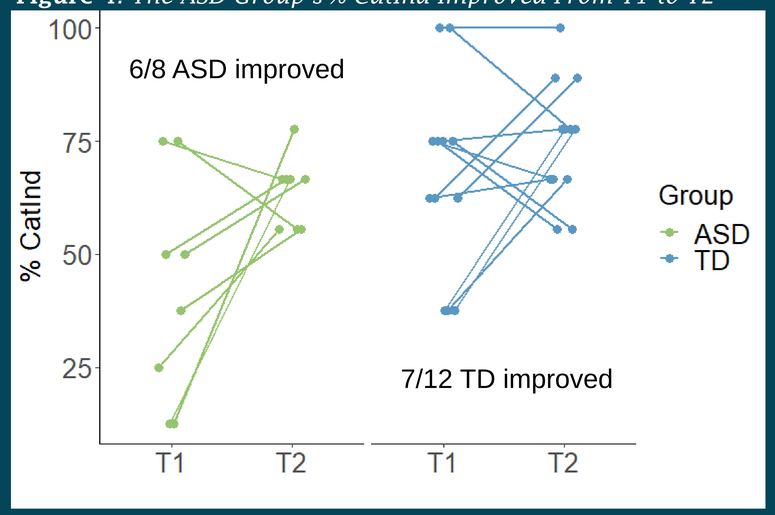
Results (Continued)

Figure 3. *Cross-Sectionally, TD % CatInd Exceeded ASD % CatInd at T2*



Note. TD > ASD, p = .019, Cohen's d = 0.81.

Figure 4. *The ASD Group's % CatInd Improved From T1 to T2*



Note. On average, the longitudinal ASD group's % CatInd improved significantly from T1 to T2 (p = .013, Cohen's d = 1.12), but the longitudinal TD group showed no change.

Conclusions

- Did CatInd ability change over time?
  For ASD: **yes; improved**
  For TD: **no; stayed high**
- Did group differences persist despite ASD improvement?
  Yes, but: group differences in T2 longitudinal sample **were qualified by language ability**

TAKEAWAY: Categorical induction is intrinsically linked to language

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