Toddlers with ASD can use language to form expectations about the visual world

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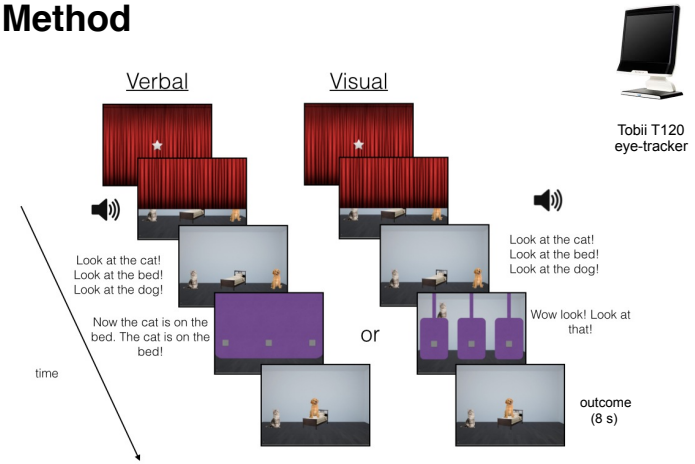
Background

- Typically developing 16-month-old toddlers are able to use language to update (retrieve, manipulate, & substitute) their mental representations of the object locations[1]
- Language delays and persistent deficits are common features of ASD, particularly in young children[2,3]. As it relates to updating:
  - **Retrieval:** Toddlers with ASD do not share the same appreciation for language being referential[4] and thus are likely to be delayed in using language to retrieve an absent referent
  - **Manipulation:** Toddlers with ASD are in some instances able to use language to make expectations about new or absent objects[5,6] but fail in others (e.g. categorical induction)[7].
  - **Substitution:** Should not differ from visual updating. To date, no visual updating studies in toddlers with ASD.

Question: Can toddlers with ASD use language to update their mental representations of an object's location?

	TD (n = 26)	ASD (n = 22)	*p*
# Females	13	1	
Age (days)	563.02 (41.86)	874.46 (155.93)	< .001
Mullen Scales:			
Visual Reception	21.96 (3.24)	21.61 (4.79)	*ns*
Fine Motor	26.96 (14.7)	21.04 (3.57)	*ns*
Receptive Language	19.73 (4.29)	12.81 (3.78)	<.001
Expressive Language	17.65 (1.98)	15.33 (4.92)	0.033
ELC	100.27 (14.75)	59.77 (8.62)	<.001
ADOS-2			
Social Affect	-	14.85 (4.15)	
Restricted Rep. Beh.	-	5.26 (1.53)	
Total	-	20.23 (3.8)	
Calibrated Severity Score	-	8.0 (1.74)	

Method



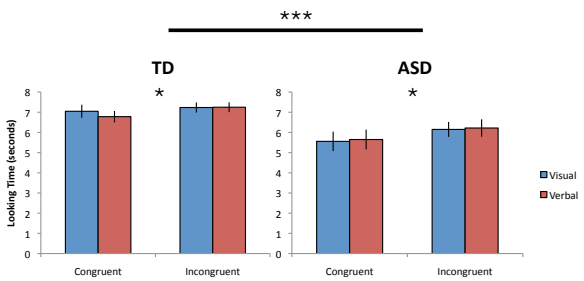
Toddlers were given information about an occluded event (one of the agents moving to the central location), via visual or verbal means (within-subjects). They were then presented with an outcome that either matched (congruent condition) or did not match (incongruent condition) the information given during occlusion (total: 4 trials, order counterbalanced).

Results

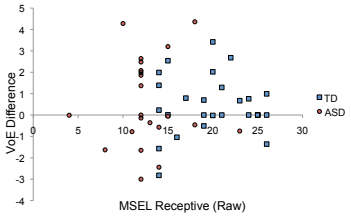
Both groups of toddlers looked longer to incongruent conditions relative to congruent ones, regardless of modality

Item	TD Comprehends (n = 26)	ASD Comprehends (n = 22)
Cat	22	10
Dog	23	10
Bed	16	9

- At the item level, children with ASD reportedly had significant poorer knowledge of both *cat* (p = .006) and *dog* (p = .002) than TD children.
- All children were less likely to know *bed*, but this is not critical for this type of update.



- Sig. main effect of group (p < .001).
- Sig. main effect of congruency (p = .029).
- No sig. main effect of modality.
- No sig. interaction.



- No correlation between MSEL-Receptive and VoE.
- Also no correlation between age, MSEL-expressive, or ADOS, and VoE.

Conclusions

Despite significantly lower verbal abilities, toddlers with ASD displayed the same VoE effect as TD toddlers when presented with an outcome that was incongruent with a prior testimony. **This suggests toddlers with ASD can use language to retrieve simple, absent referents, manipulate existing representations**, and substitute existing representations for old ones.

Toddlers with ASD spent less time looking at the outcome overall. This may reflect differences in chronological age, which leads to faster processing of visual stimuli.

Future work is warranted to determine if the same effect would hold in a more complex and/or social paradigm.

References: 1) Ganea et al., 2016, *JECP.* 2) Luyster et al., 2008, *JADD.* 3) Paul et al., 2008, *Aut Res.* 4) Curtin & Vouloumanos, 2013, *JADD.* 5) Preissler & Carey, 2005, *Cognition.* 6) Naigles et al., 2011, *Aut Res.* 7) Naigles et al., 2013

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Note: These data are reported in a manuscript currently under review.