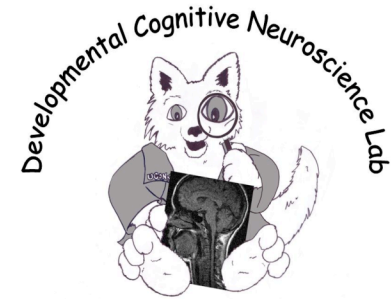


Autism as late language acquisition: Low-level learning processes



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July 20, 2009



Cognitive Science Society Annual Meeting
Amsterdam, The Netherlands

Acknowledgements

Developmental Cognitive Neuroscience Lab and affiliates:

- Jillian Schuh
- Ashley de Marchena
- Jessica Bean
- Jessica Mayo
- Molly Helt

Research Assistants:

- Jose Casares, Caitlin Dombrowski, Danielle Loughrey, Elizabeth Tsatkin, Lauren Long, Ashley Lepack, Justine Marsh, Terry Gustafson

Colleagues:

- Debbie Fein: optimal outcome
- J. Dixon: dynamical motor skills
- Rhea Paul: prosody
- Bob Schultz: prosody
- Loisa Bennetto
- Jesse Snedeker: mutual exclusivity

Funding:

- UConn Research Foundation, Eigsti (PI)
- NIMH P01, Rhea Paul (PI)
- NIMH R01, Deb Fein (PI)

And the children and families who participate in research!!

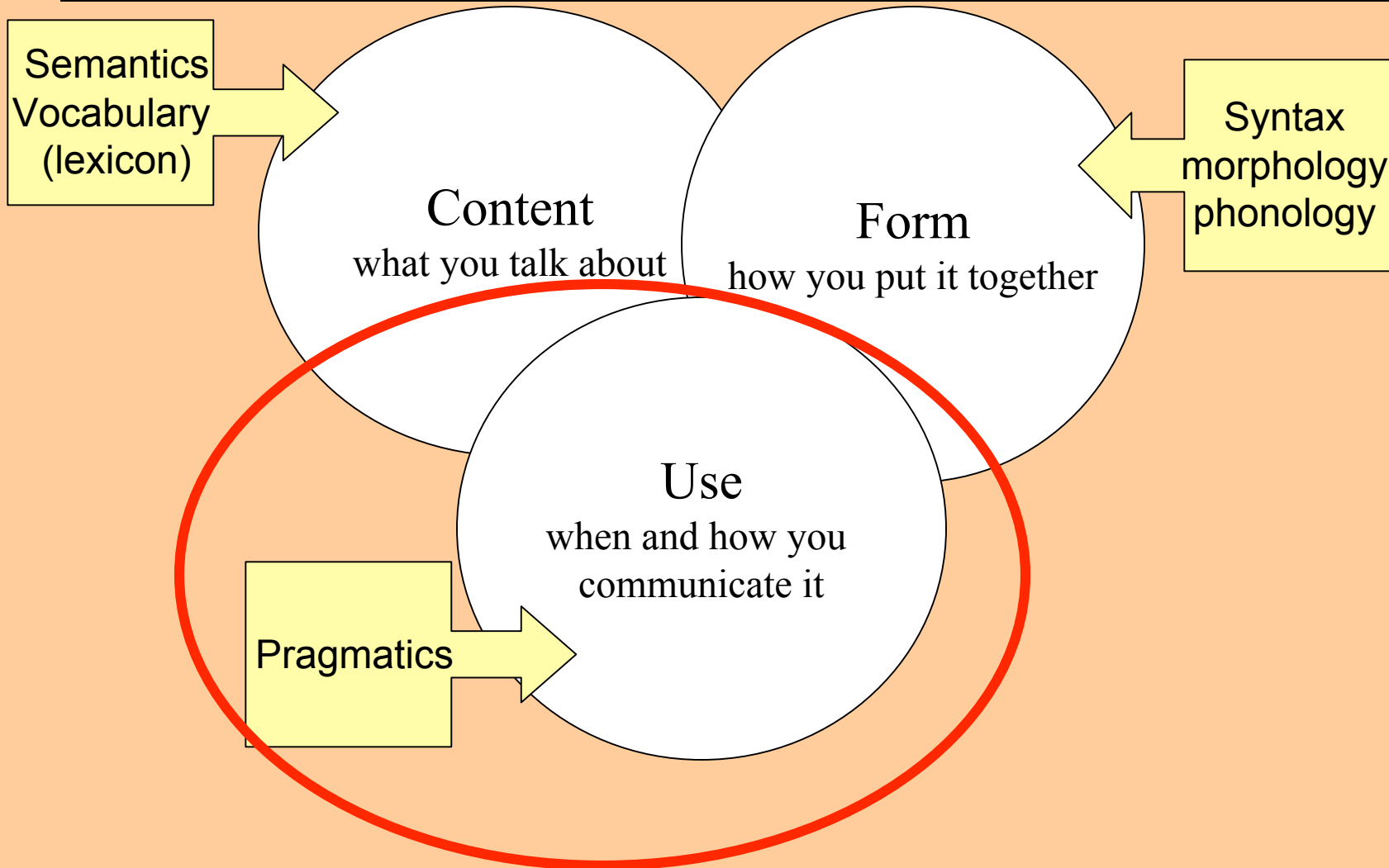
Autism diagnosis: Domain 2

Language and Communication

- 25-50% -- nonverbal
- Significant delays
 - First words: 24 months
 - First phrases 36-48 months
- Echolalia: Immediate or Delayed
- Poor conversational skills, less social “chat”
- Unusual speech: speed, volume, prosody (“melody”)

Less pretend play

Language form & use



Bloom and Lahey

Mechanism of disorder

- Is not necessarily identical to the phenotype of the disorder
 - Social deficits -> social symptoms
 - ✗ – Need to look at alternate levels of explanation

Some possibilities:

- Working memory
- Implicit learning
- Purely linguistic constraints

So what about syntax?

- Important findings documenting delays/deficits in acquisition of grammatical morphemes (Tager-Flusberg, Bartolucci, Rapin)
- However, most reviews indicate “no deficits in syntax”
 - Studies of similarities with SLI are exception to this generalization

Participants

	Autism <i>n=16</i>	Developmental Delays <i>n=16</i>	Typical Development <i>n=16</i>
Chronological Age (months)	57.7 (11.9)	56.9 (9.7)	42.6 (5.7)**
Receptive vocabulary (PPVT-III Age Equivalent, months)	43 (14)	48 (15)	51 (6)
Non-Verbal IQ (Stanford-Binet IV Scaled Score)	80 (15)	82 (13)	100 (9)**

** $p < .001$

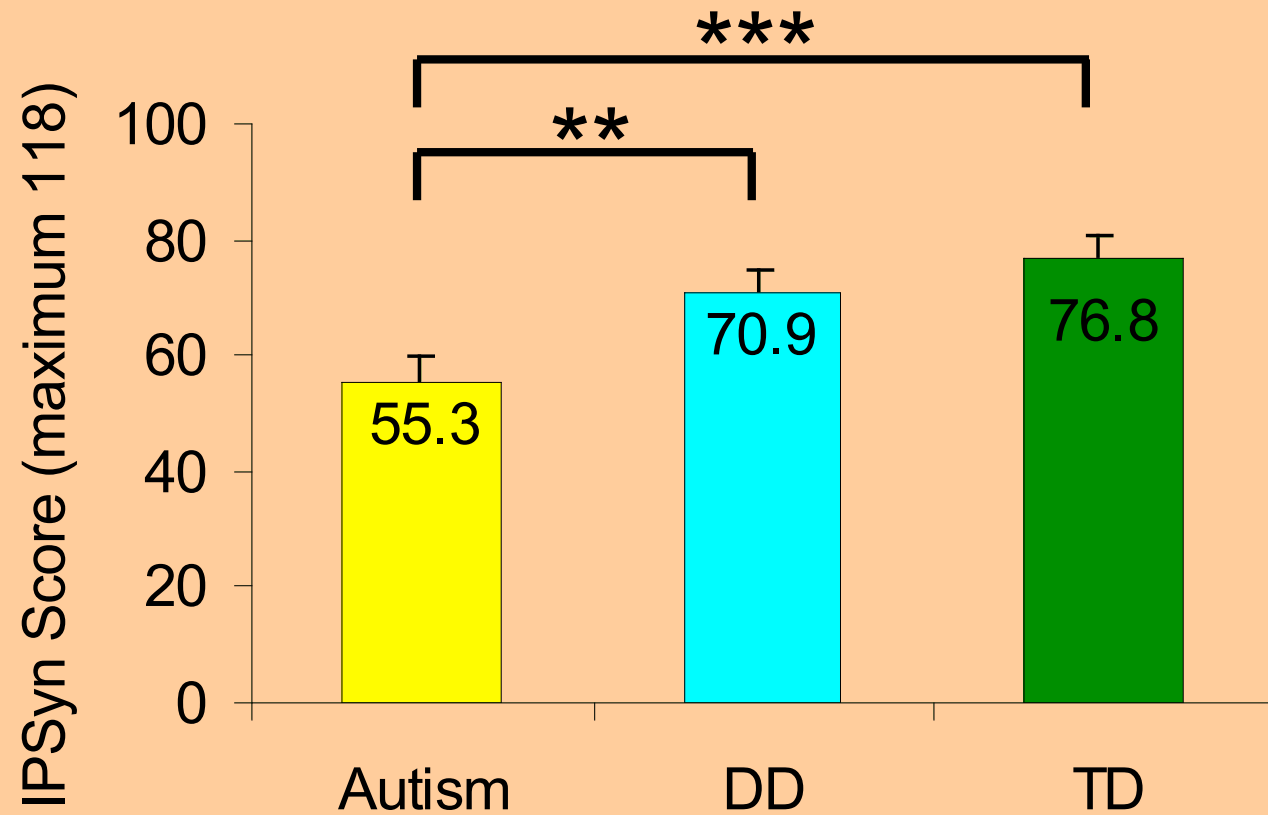
Syntactic complexity in spontaneous production

- 30-minute free play session, videotaped and transcribed.
- Assessed with the Index of Productive Syntax (IPSyn; Scarborough, 1990).



Eigsti et al., 2007, JADD

Findings: Syntactic complexity



Age Equivalent
(months)

28

35

41

** $p < .01$

*** $p < .001$

Syntax in relation to low-level cognitive processes

- Non-word repetition as a measure of phonological span
 - Span and IPSyn score, $r = .58^{***}$
 - Span and MLU, $r = .42^{**}$
- Mod. A-not-B as a measure of working memory
 - WM and IPSyn, $r = .542^{***}$
 - WM and MLU, $r = .426^{**}$

Effects of learning at a later age: Autism as late language acquisition?

Eigsti & Bennetto, in press, *J Child Lang*

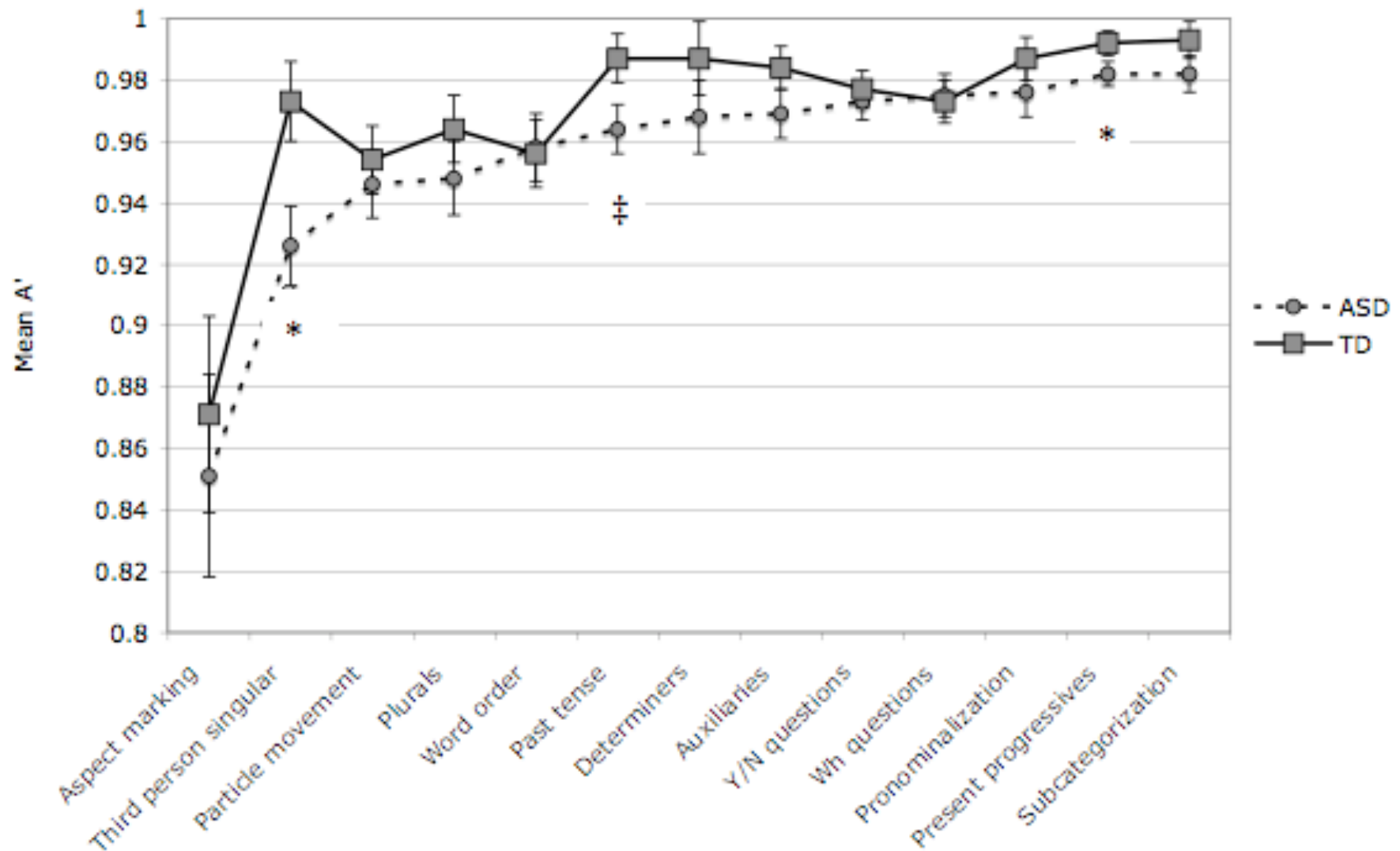
Participants

	Autism	Typical Development
	<i>n=21</i>	<i>n=22</i>
Chronological Age (years)	13.4 (2.2) 10-16	13.3 (2.0) 9-17
Receptive vocabulary (PPVT-III SS)	117 (11)	117 (13)
Full Scale IQ (Wechsler or WAIS)	119 (14)	117 (13)

Task

- Grammaticality judgment
 - Structures -> language deficits in late learners of English (Johnson & Newport, 1989)
 - 140 sentences (70 ungrammatical)
 - 14 kinds of structures
 - Sentence length manipulation

Findings: GJ



Findings

- ASD: overall less sensitive to grammaticality, $p = .02$
- Deficits: marking of 3rd person sing, present prog, past tense
 - Errors most marked for omissions/substitutions
 - No problems with word order
 - Analogous to late learners in Johnson & Newport
- Errors in longest sentences (10-11 words) but not in short (6-7) or medium (8-9) lengths. Interaction of working memory and grammaticality judgments

Similarity to SLI?

- No: Deficits on verb marking, but NOT on aspect marking
 - Impairments on verbs consistent with Extended Optional Infinitive hypothesis, but with additional structures affected
- Special subgroup? No: 8/10 of young participants scored 1 SD below control mean

Correlational analyses

- Gram judgements associated with vocab. Verbal IQ, and communication skills, but not PIQ
 - Tapping something salient in communicative skills
- GJ associated with 1st production of phrases, $r = -.42^*$ (even when control for IQ)
 - Tapping developmentally salient phenomenon
- Data consistent with a developmental account where general learnability rather than specific grammatical features impact learning

Explicit vs. implicit learning mechanisms

Explicit

- Deliberate
- Conscious
- Hippocampal/temporal

Intact in ASD

Implicit

- Incidental
- Unconscious
- Striatal/prefrontal

???Intact in ASD?????

Major goal: Understand difficulty of generalizations in ASD

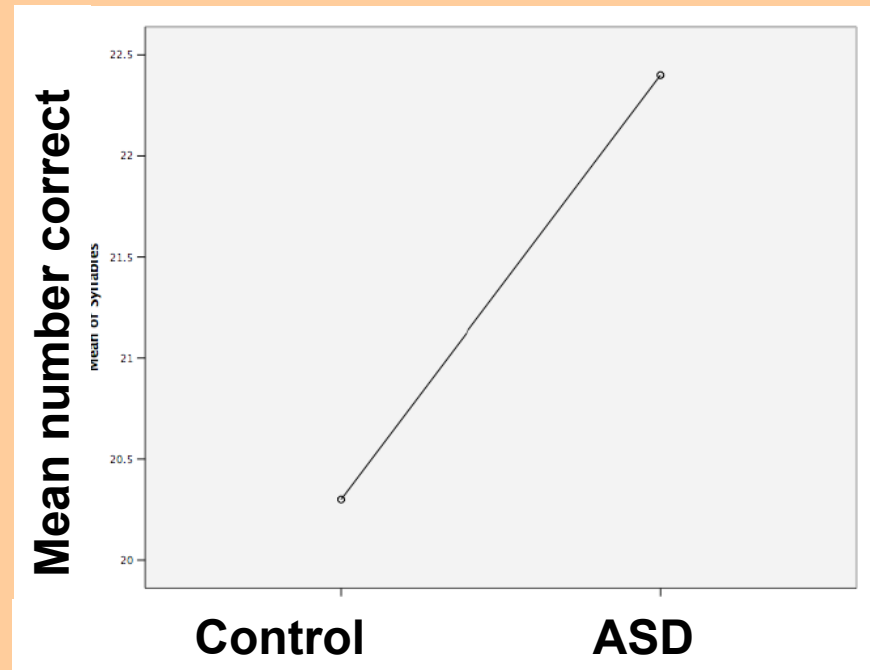
Simple implicit learning

Word Segmentation

- Exposure to 20 minutes of connected syllable stream
 - Some syllables cooccur at high frequencies (ie, they group)
 - Other syllables never cooccur
 - After exposure, Grammaticality Judgment (2AFC)
- Done by infants at 9 mos (Saffran, Aslin & Newport, 1999)
- Difficult for children with SLI (Evans, Saffran and Robe, 2009)

Word Segmentation Data

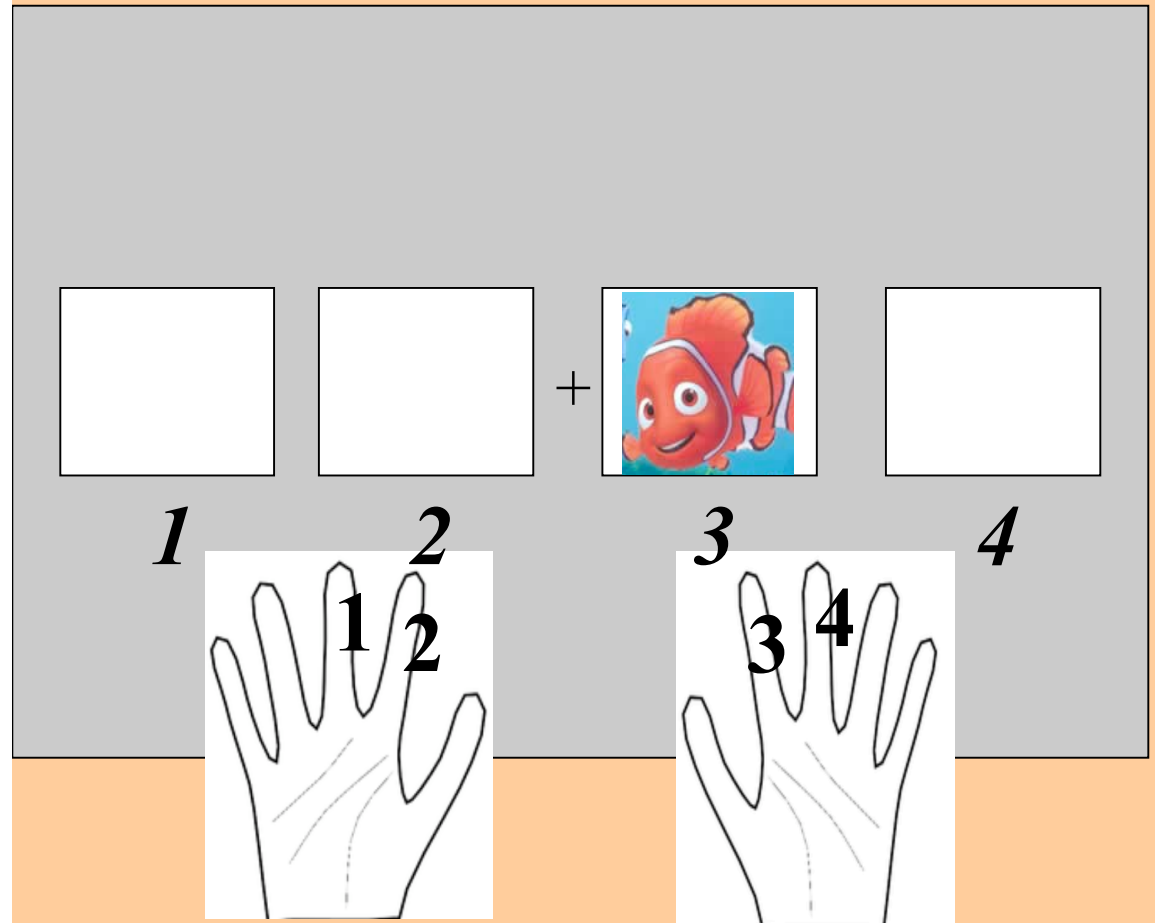
- ASD ($n = 5$) and TD ($n = 10$) (to date)
 - Ages 8-16 years ($M = 12$)
 - Matched on age, PPVT, FSIQ
- *To date*: Everyone above chance, no group differences
 - M 's = 20.3 (4.2) TD, 22.4 (5.3) ASD, out of 36
 - Range of 12-28 (TD) and 14-28 (ASD)



Complex Implicit Task

- 10-item sequence-> where Nemo appears next
- Alternate between 192 sequence and random trials

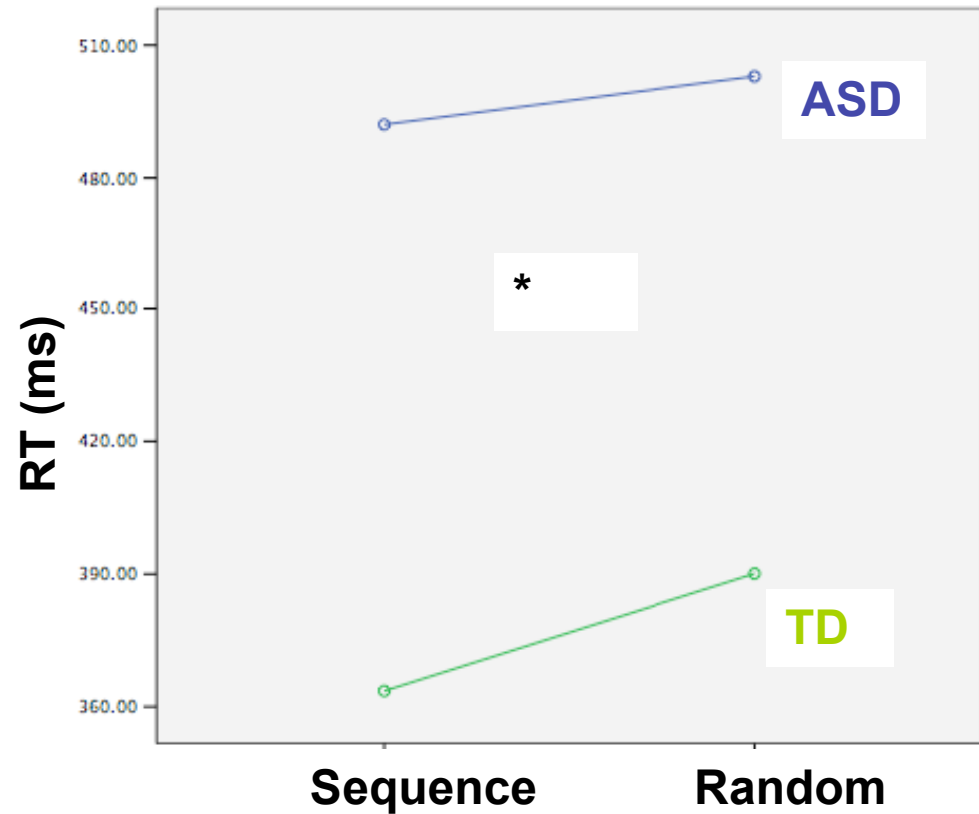
Typical adults ($n = 45$):
Change in RT for sequence trials correlated with **PPVT**, $r = .29^*$, and with verbal **SAT**, $r = .38^{**}$



Eigsti & Fang, 2006, *Cognitive Science Society*

Very Prelim Findings

- Main effect of Seq vs. Random**
- ASD slower than TD*, less change from Ran to Seq



Summary

- There are clear syntactic and morphological deficits in ASD
 - In younger (3-6 years) and older (9-17 years)
- Working memory and short-term memory span associated with those deficits
- Complex aspects of implicit learning may contribute to syntactic deficits

Why atypical pops?

- Study of atypical populations can inform understanding of typical acquisition -
 - Can see mechanisms at their extreme
 - Highlights relationships between processes that are causally linked, versus those that are simply correlated