READING & ACADEMIC DEVELOPMENT CENTER

Reading Development and Instructional Practices for School-Aged Children and Adolescents with Autism

CAPTAIN South Summit

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UCD Reading and Academic Development Center

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- Overview of Reading Development & Reading Disability
- Reading Development in Individuals with Autism: Data from the field and the UCD longitudinal data study
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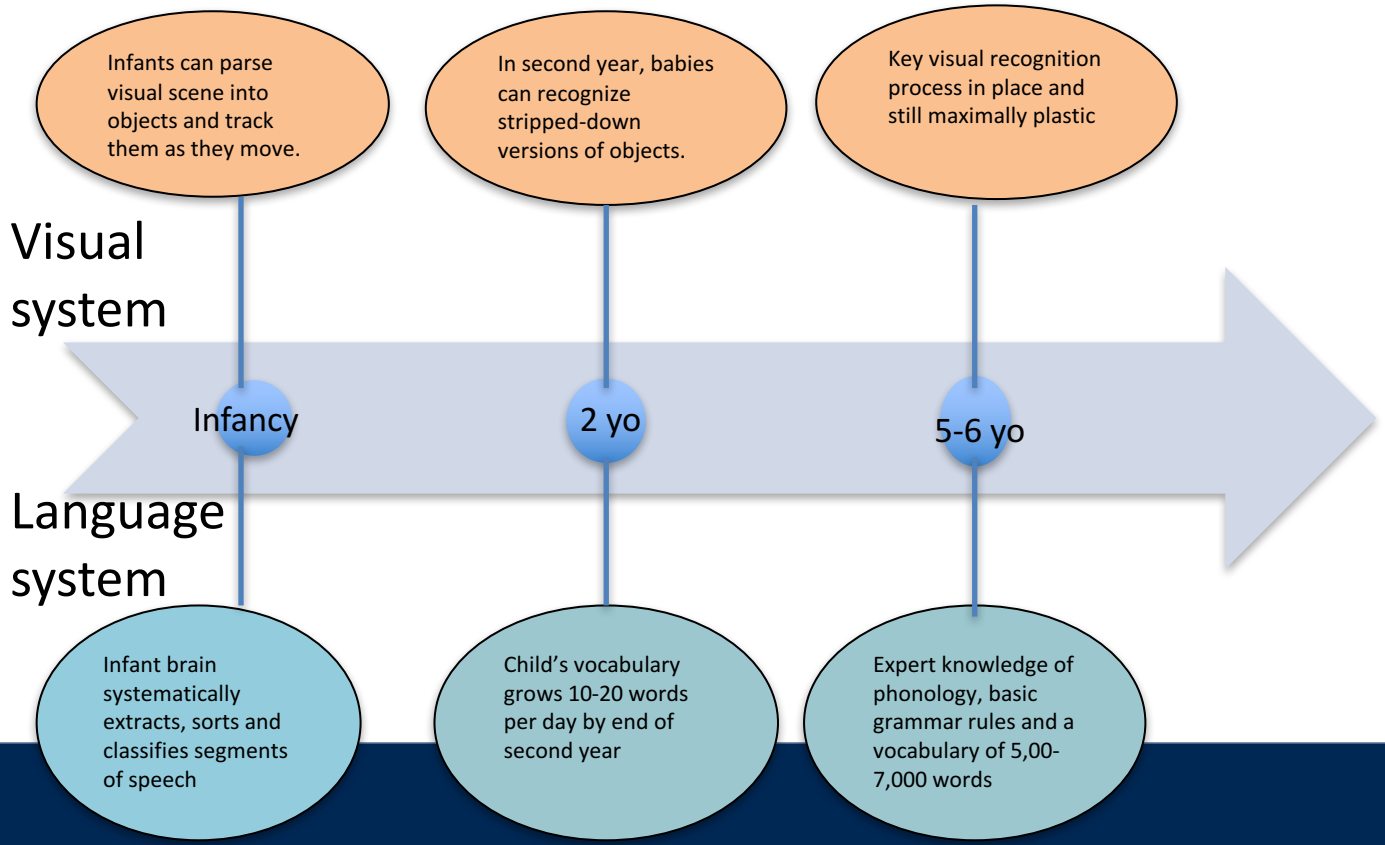
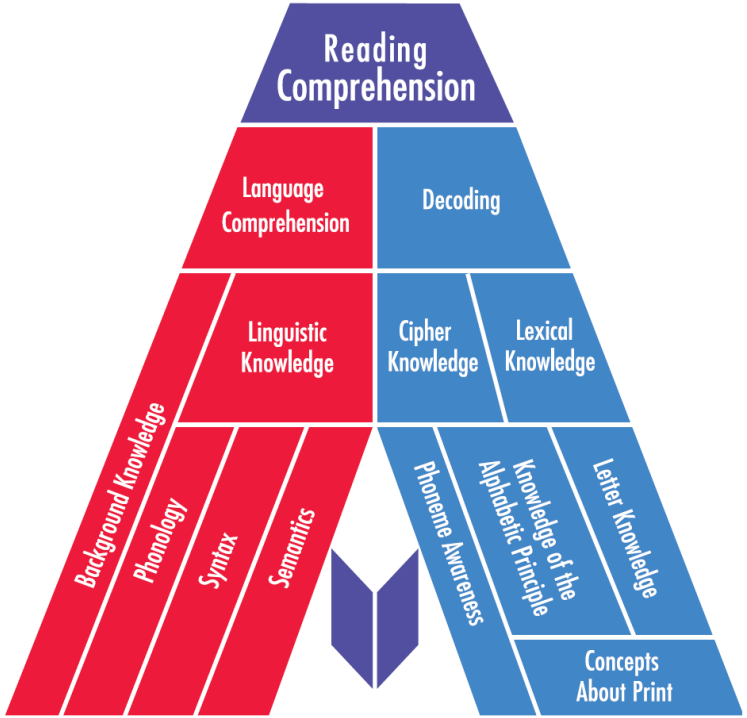
Preparing to Read, *S. Dehaene (2009)*



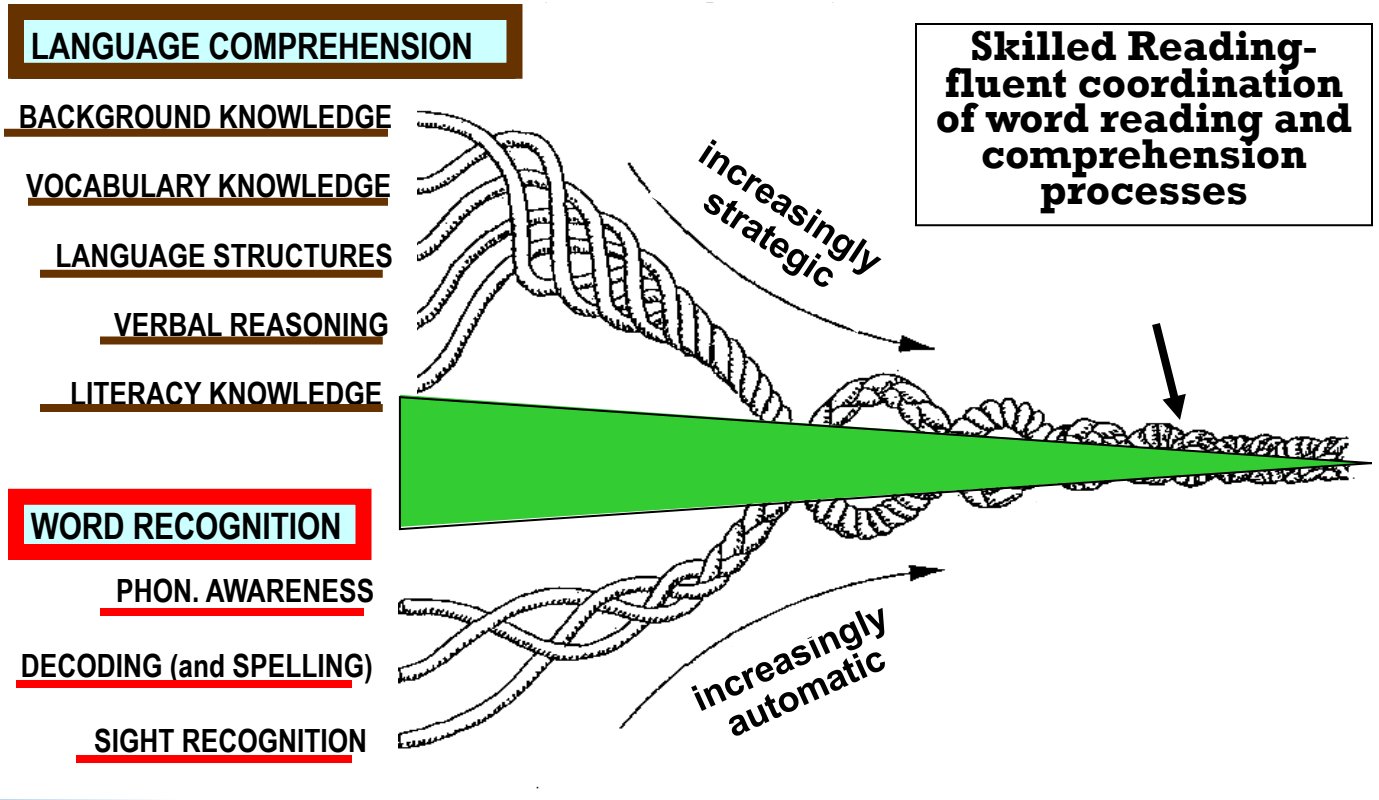
Simple View of Reading

(Hoover & Gough)



The Many Strands that are Woven into Skilled Reading

(Scarborough, 2001)



Reading is a multifaceted skill, gradually acquired over years of instruction and practice.

Other factors that influence reading comprehension:

- Motivation/purpose/goals/engagement: *requires understanding that reading is a form of communication between an author and reader*
- Nature of text itself (difficulty & interest)
- Type and genre of the text (fiction, nonfiction, poetry)
- The amount of reading done
- **Social understanding and social cognition (theory of mind)**

Subgroups of Reading Disability

Developmental Dyslexia

"difficulty with words"

- Phonological processing difficulties (Catts, Fey, Zhang, & Tomblin, 1999)
- Causes difficulties with alphabetic principle, decoding and fluency
- Often dx by 3rd grade

Poor Comprehenders

- Poor comprehension despite fluent decoding ability
- 7-10% of school aged population (Clarke, Snowling, Truelove, & Hulme, 2010; Stothard & Hulme, 1992)
- Often not dx until after 4th grade

Reading in students with autism spectrum disorder

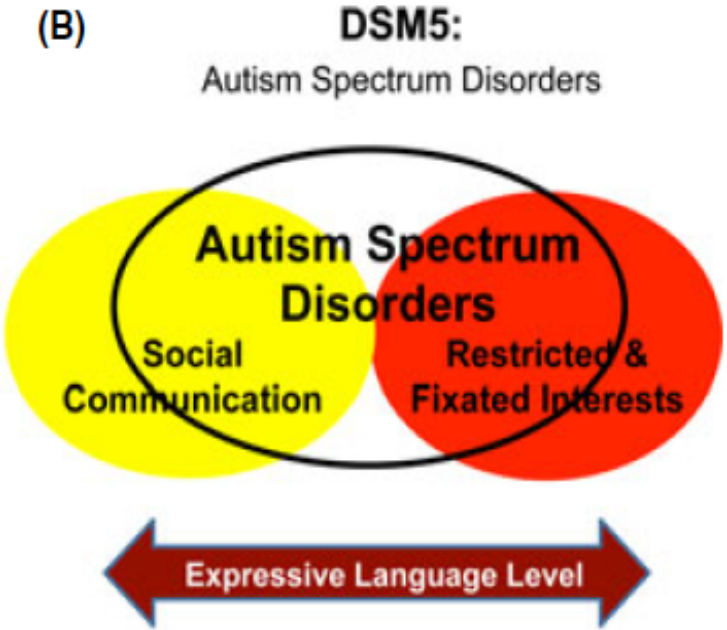
Autism: A Human Diversity Perspective

(Mundy, Mastergeorge & McIntyre, 2011)

- Autism is a part of human nature and the characteristics associated with it can be observed in many people in the general population.

- They are children first: children affected by autism are more similar than different from their peers.

Autism Spectrum Disorder



- General term used to describe a spectrum of biologically based neuro-developmental disorders.
- DSM-5 (2012) delineates two core features:
  - **Social Communication/Interaction deficits**
  - **Restricted, Repetitive Behaviors & Interests**
- **Expressive Language is no longer considered a defining core feature, but is still a crucial dimension for clinicians, educators, and researchers to evaluate.**
- Prevalence estimates:
  - 1 in 68 (CDC, 2014)
  - 69% have IQ in average range

(Lord & Jones, 2012)

Reading comprehension is a particular challenge for students with autism

- Poor reading comprehension found in multiple studies in 33-65% of their samples. (Estes et al., 2011; Jones et al., 2009; McIntyre et al., 2017; Nation et al., 2006; Norbury & Nation, 2011; Randi, Newman, & Grigorenko, 2010).
- Impairments ranged from profound to within the normal range.
- Developmental impact:
  - A common thread that emerged in several studies is that the development of reading comprehension in these students presents a particular, but not universal, challenge, especially after the shift from learning to read to reading to learn in 4th grade. (Whitby & Mancil, 2009).

Reading Comprehension and ASD

➢**Contributing factors:**

1) **Oral Language:** Children affected by ASD are at risk for oral language difficulties, which have been shown to play a significant role in reading comprehension (e.g., Eigsti, Marchena, Schuh, & Kelley, 2011; Rapin et al., 2009; Tager-Flusberg, 2006):
   a) In reading studies with children affected by ASD, reading comprehension and higher order language abilities aligned with structural language skills and were often dissociated from word reading abilities (Lindgren et al., 2009; Lucas & Norbury, 2014; Norbury & Nation, 2011).

2) **Social Communication & Functioning:** Several studies have reported significant associations between individual differences in reading comprehension and differences in autistic symptom intensity (Asberg, Berg-Kelly, & Gillberg, 2010; Estes et al., 2011; Jones et al., 2009; McIntyre et al., 2017; Norbury & Nation, 2011; Ricketts et al., 2013).

Social Cognition

- Social cognition refers to how people process, store, and apply information about other people and social situations. It focuses on the role cognitive processes play in social interactions.

- Development: as children grow, they become aware not only of their own thoughts, feelings and motives, but also of the emotions and mental states of others.
  - *Perspective taking*: taking someone else's point of view
  - *Empathy:* generation of an emotional response to another's mental state
  - *Theory of Mind (ToM):* understanding of others' beliefs, intentions, and desires

- Social cognition, as operationalized by Theory of Mind (ToM) tasks, has been shown to be a unique predictor of reading comprehension even after controlling for oral language and word reading for adolescents with ASD (Ricketts et al., 2013).

- Performance on ToM tasks has been shown to be related to language skills (Happe, 1995) and communicative competence (Hale & Tager-Flusberg, 2005).

Goals of the UCD Longitudinal Study of Reading Development in Students with ASD

1) Better understanding of the role of decoding and linguistic comprehension (Simple View) in reading comprehension- with a larger sample size and more comprehensive reading battery.

2) Better understanding of the role of autism symptom severity and social cognition in predicting reading comprehension.

3) Comparison of reading skills development between student with ASD and those who are typically developing in order to inform instructional practices.

UCD Longitudinal Study Design

- Students between the ages of 7 and 16 were recruited at the beginning of the study.
- ASD, ADHD, and typically developing individuals were recruited.
- Assessed at 3 time points at 15 month intervals on a comprehensive battery.

Longitudinal Study Sample

N =164: 7 - 16 years old, FSIQ ≥ 75, English-proficient speakers.

Three diagnostic groups were matched on age, grade, & mothers' level of education:

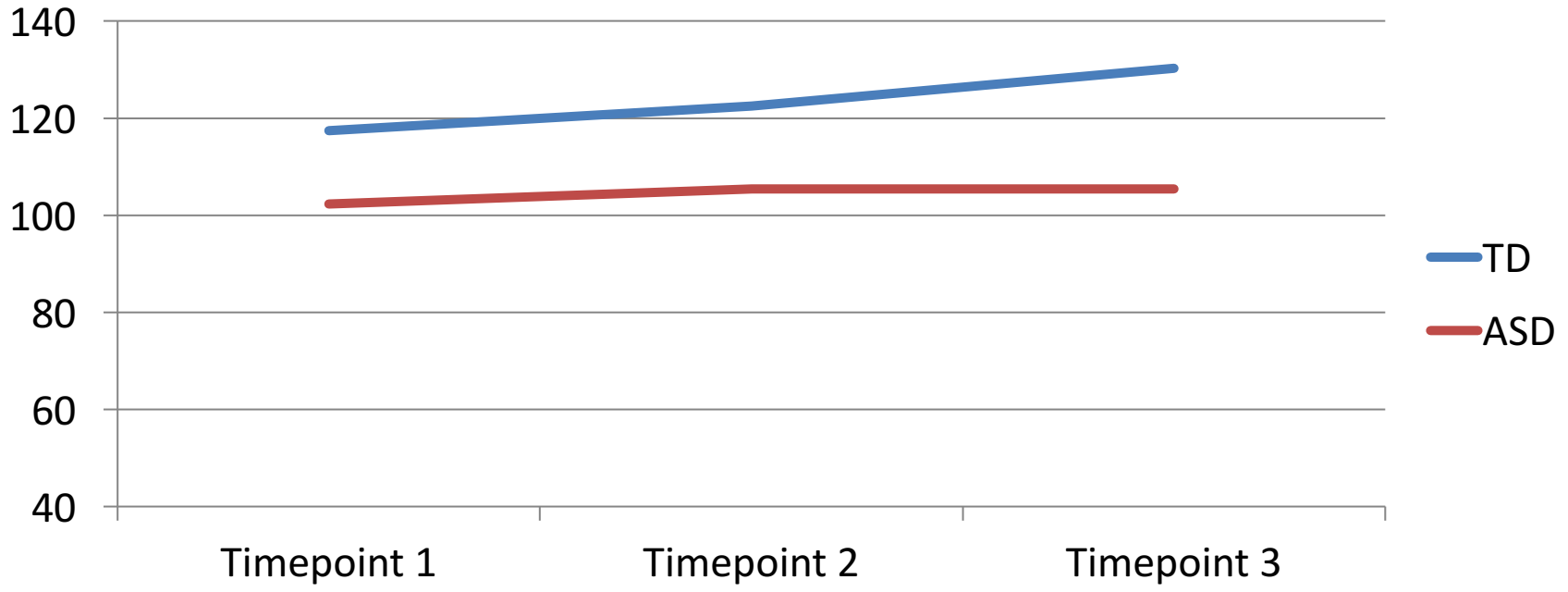
- *n*= 81 (66 male) children with High-Functioning ASD (HFASD)
  - Community diagnosis confirmed with ADOS-2
  - 93% had IEP or 504 Plan
  - 80% spent majority or all of their school day in inclusive general education classes.
  - 11% attended special day classes.
- *n* = 39 (32 male) children with ADHD
  - Community diagnosis, current symptoms assessed with Conners-3
  - 57% had IEP or 504 Plan
- *n*= 44 (28 male) children with Typical Development (TD)

Measures

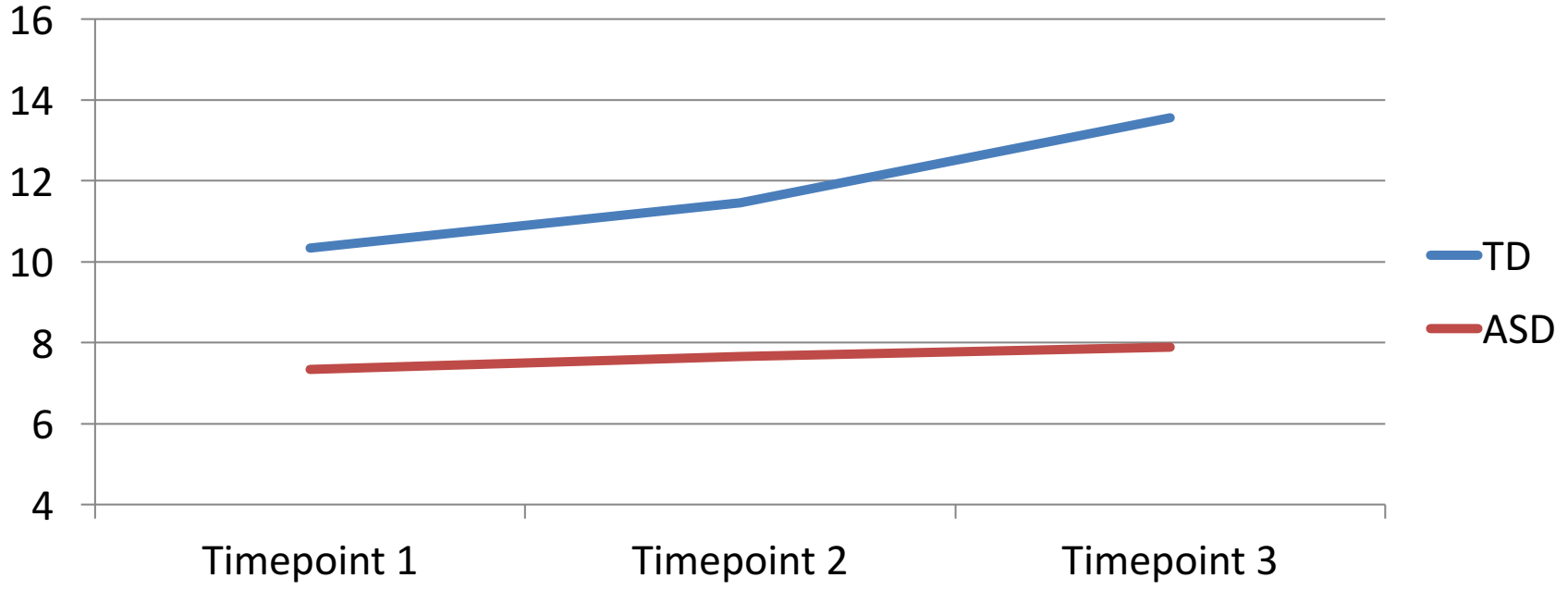
- We assessed:
  - **Language & Reading:**
    - *Phonological processing, oral language, vocabulary, word reading & decoding, oral text reading, reading comprehension, narrative retelling, inference*
  - **Social Communication & Social Cognition:**
    - *Autism Diagnostic Observation Schedule-2* (ASD sample only) – Semi-structured assessment of communication, social interaction, and play (imaginative use of materials)- used to diagnosis ASD and also as a proxy for social communication skills.
    - *Theory of Mind- Strange Stories Task & Silent Films Task*

READING SKILLS TRENDS OVER TIME

Vocabulary Trends in HFASD & TD Samples



Reading Comprehension Trends in HFASD & TD Samples



Narrative Retelling Trends in HFASD Sample

- Children with ASD improved in their narrative retelling skills over time.
- Lower ASD symptomatology and higher verbal skills, but not age, were associated with better narrative retelling.
- Provides evidence that early oral language and social communication intervention may improve higher order abilities, such as narrative skills, which in turn impact reading comprehension.

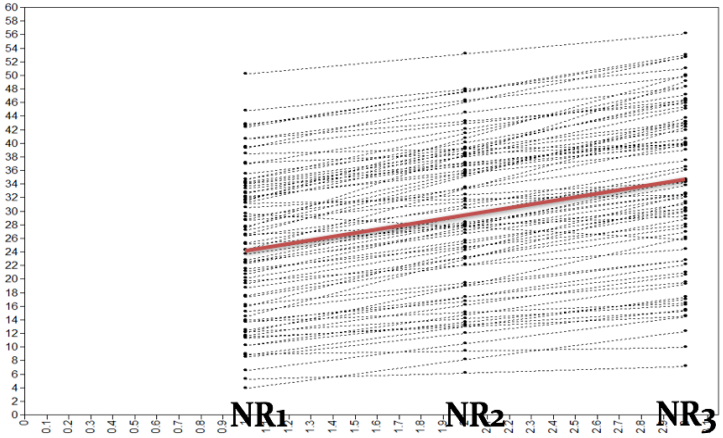


Figure 1. Estimated values in HFASD sample (n=78) for narrative retelling raw scores at time points 1, 2, & 3.

Inferencing Trends in HFASD Sample

- Much variability in growth in inference skills among participants, but on average, growth was attenuated.
- Inference ability in the ASD group was significantly lower than in TD sample.
- Higher verbal abilities, but not age or ASD symptomatology, was associated with better inference ability.
- These data support early oral language intervention for school-aged children as a means to improve later higher-order skills such as inference and reading comprehension.

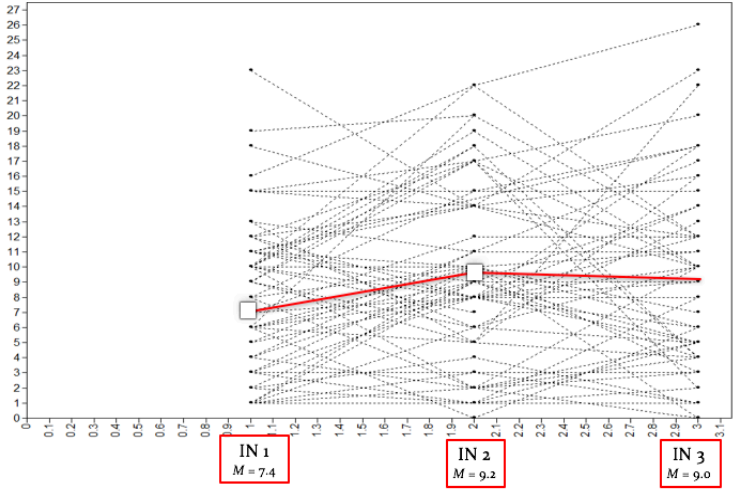
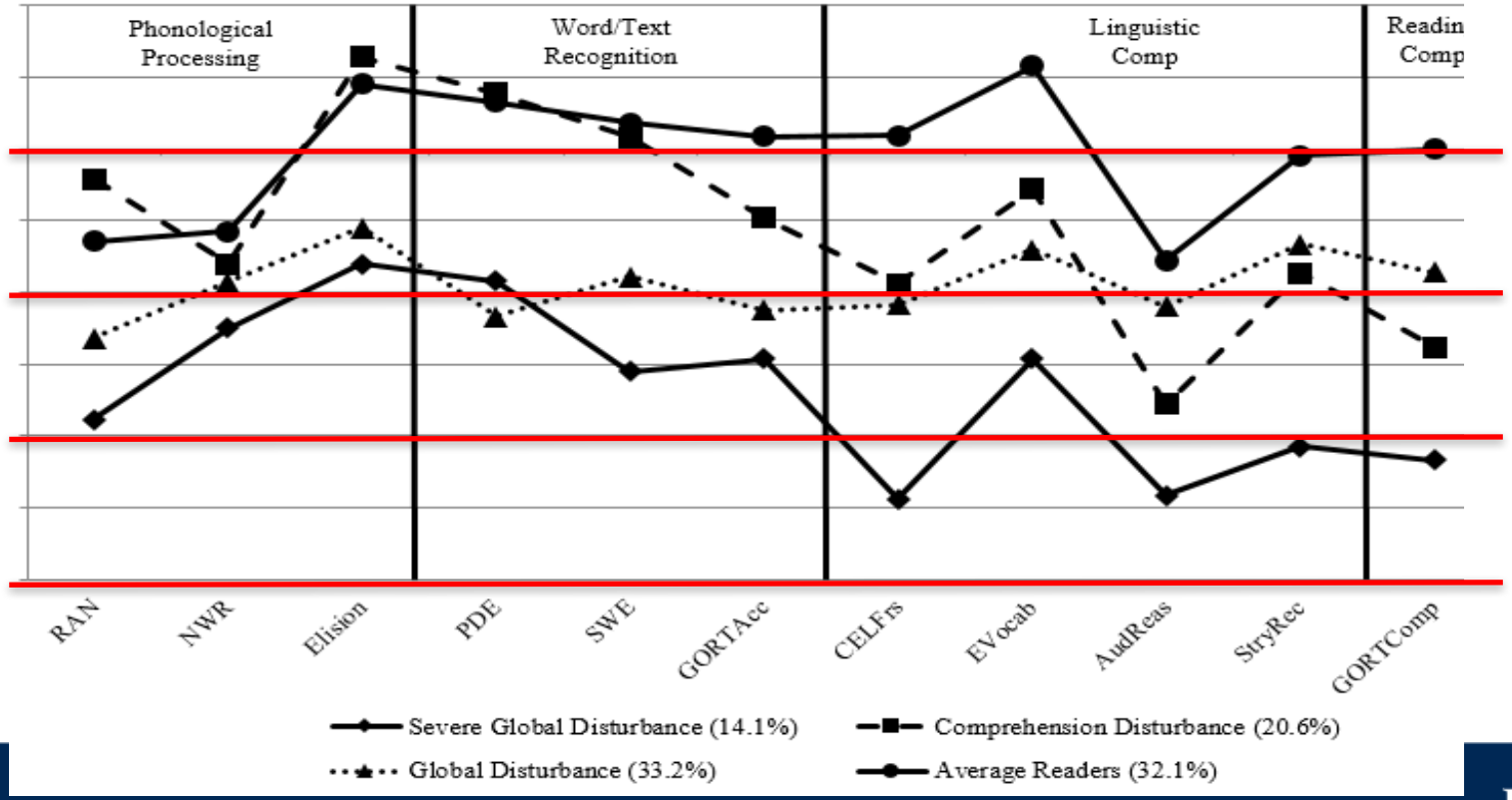


Figure 1. Actual and mean values in HFASD sample (n=76) for raw inference scores at time points 1, 2, & 3.

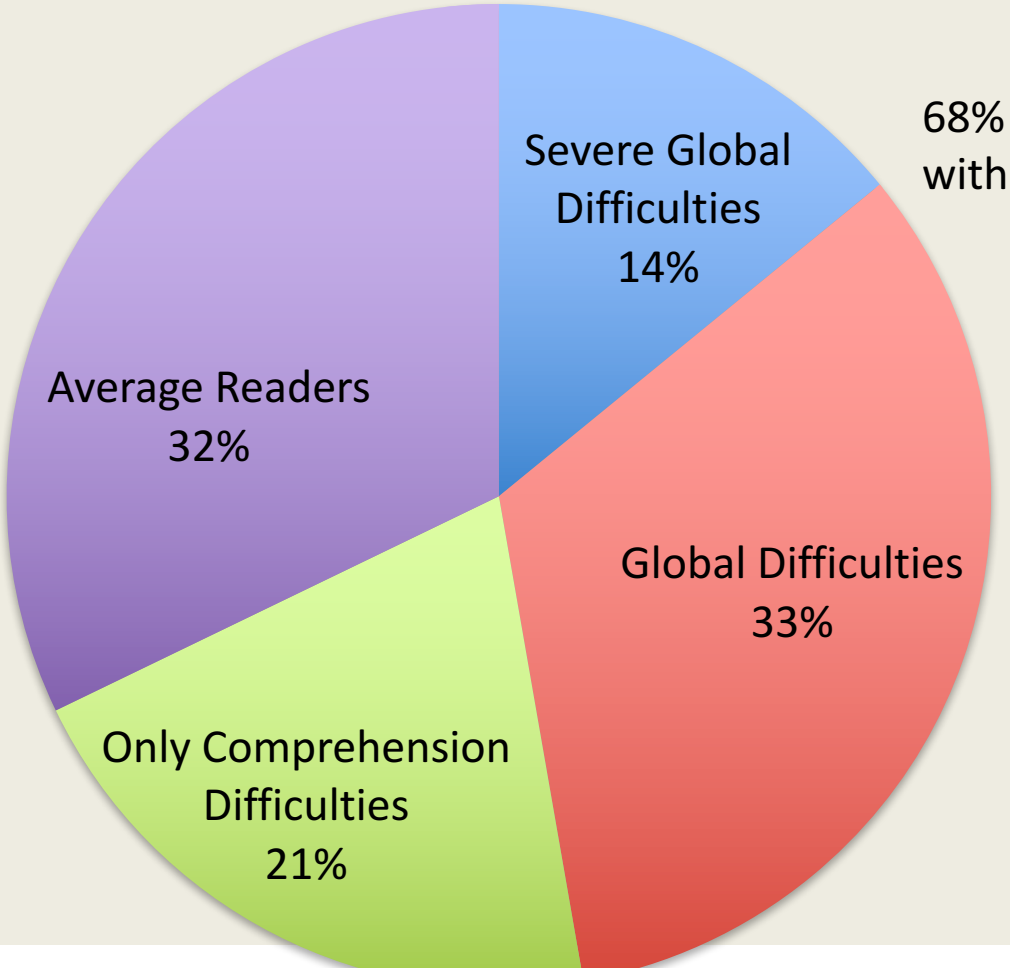
LATENT PROFILE ANALYSIS TO DETERMINE READING SUBGROUPS: HFASD SAMPLE

Reader Subgroups

(McIntyre, N., Solari, E., Grimm, R., Lerro, L., Gonzales, J., & Mundy, P., 2017)



Reader Subgroups Analysis

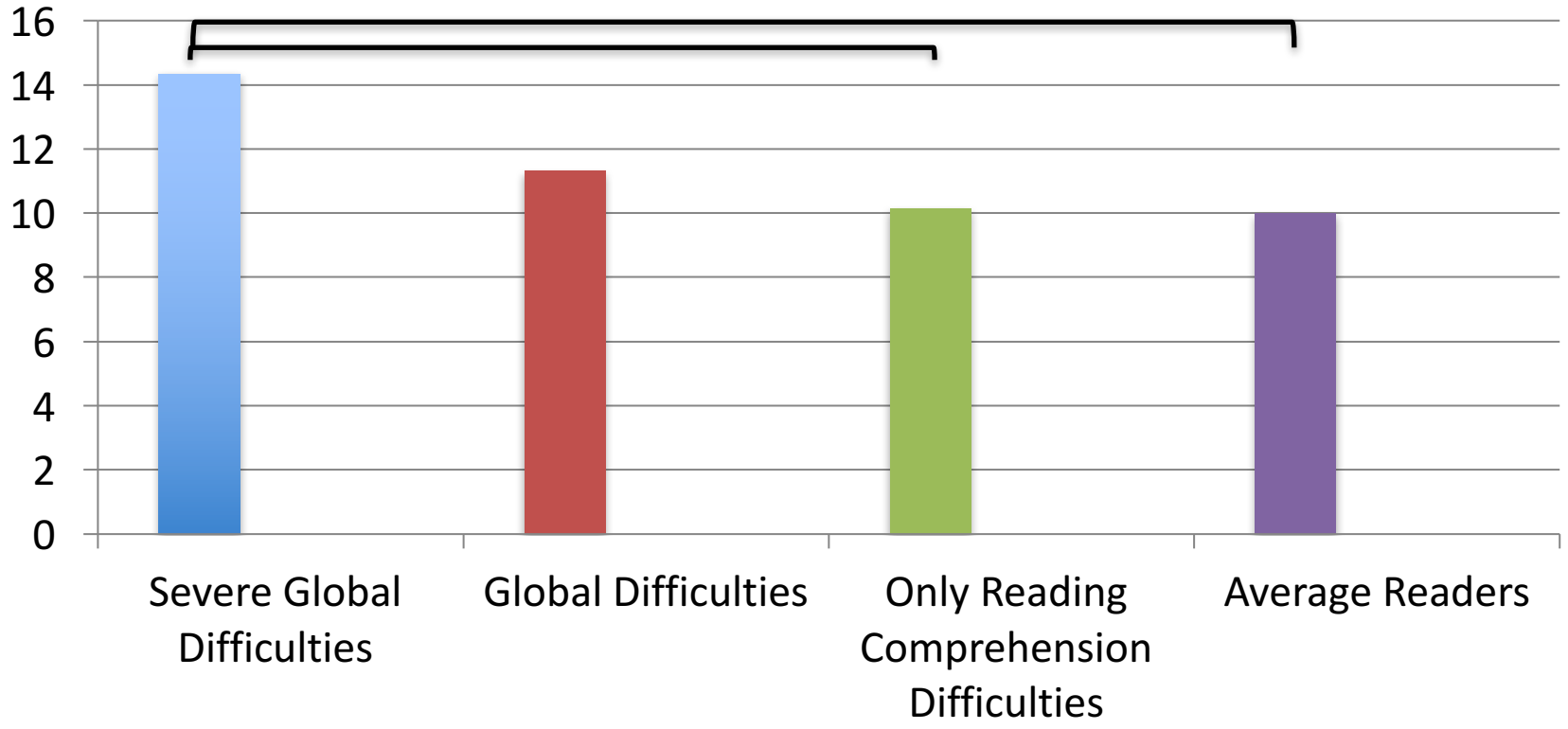


68% show some level of difficulty with reading comprehension

21% demonstrate only comprehension difficulties with intact word reading skills

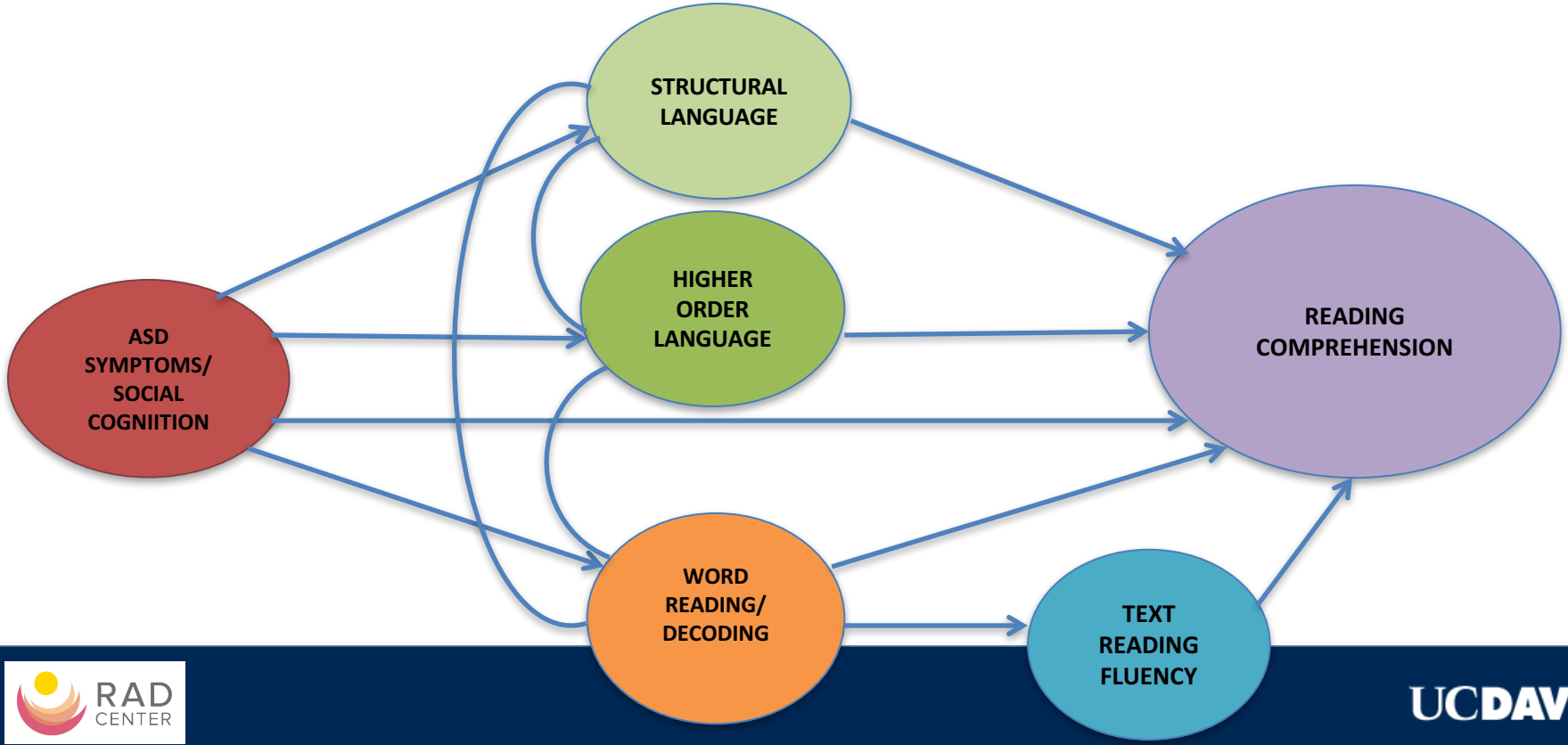
32% are average readers

Autism symptom severity was related to reader subgroups



STRUCTURAL EQUATION MODELS FOR READING COMPREHENSION: HFASD SAMPLE

Tested Model of Factors in Reading Comprehension for ASD Subsample



Social cognition was a significant predictor of reading comprehension for children and teens with ASD

- Even after nonverbal cognition, sight word reading and nonword decoding fluency, vocabulary, syntax, and narrative recall skills were taken into account, the two **social cognition measures were still significantly related to reading comprehension in the ASD group** but not the typically developing group.

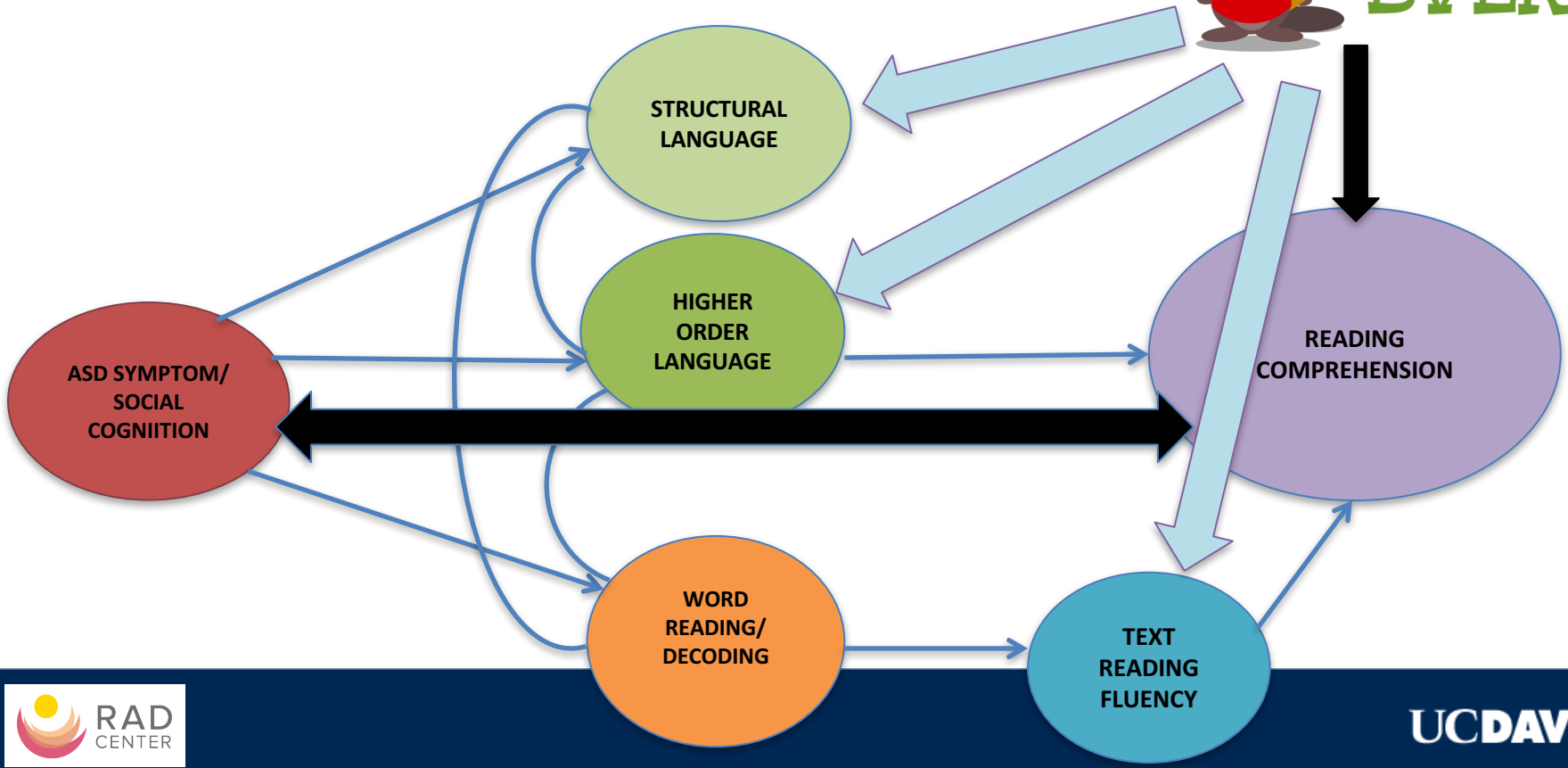
- The most important predictors were:
  - ASD group: Oral language, narrative recall, and social cognition
  - TD group: Sight word reading fluency and expressive vocabulary

Summary of Findings

- Approximately 68% of the sample had difficulties with reading comprehension, however, the reading profiles of children with ASD are not homogenous (McIntyre, Solari, Grimm, et al., 2017)
- ASD symptom severity and oral language are related to reading comprehension performance (McIntyre, Solari, Gonzales, et al., 2017)
- After controlling for word decoding, oral language and ASD symptom severity, reading fluency predicts reading comprehension (Solari, McIntyre, Grimm, Mundy, 2017)
- Over time, discrepancies do not resolve (children with ASD do not catch up to peers)

HOW CAN WE IMPROVE READING COMPREHENSION FOR THESE STUDENTS?

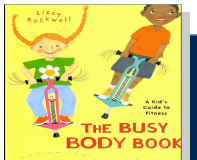
Tested Model of Factors in Reading Comprehension for ASD Subsample



Intervention Pieces (Solari & Ciancio)

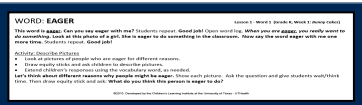
Listening Comprehension – Book or Anchor Lesson

- Before/During/After prompts
- Guiding Questions
- Targeted questions during reading to help with comprehension



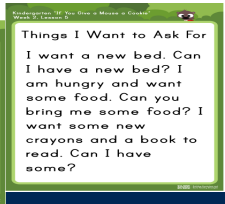
Vocabulary Instruction with Targeted Words

- Target Vocabulary Words
- Provided with child-Friendly definition
- Vocabulary Activities

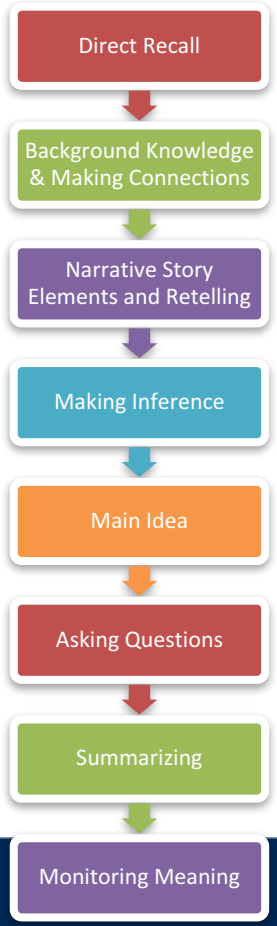


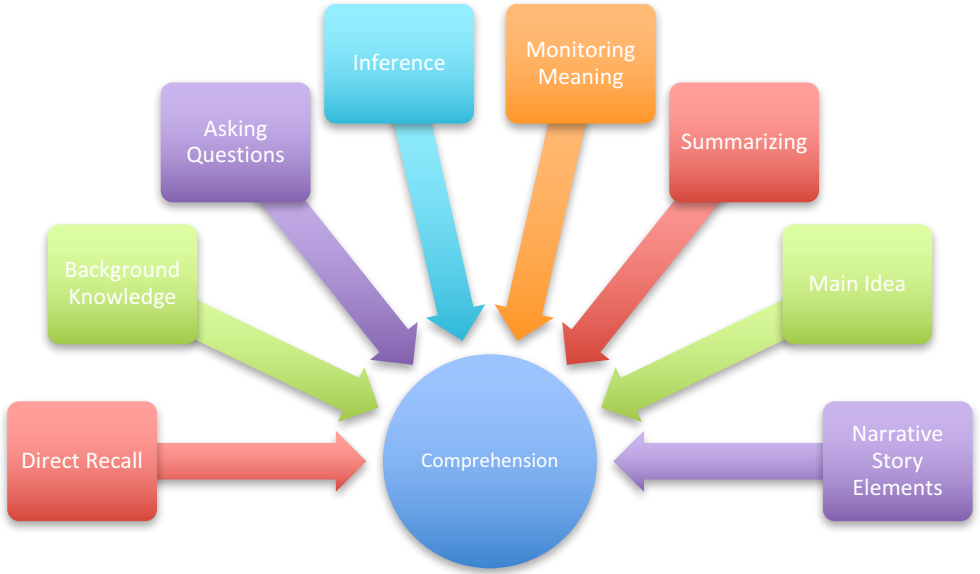
Writing

- Model and independent practice
- Moves from planning stages to production of writing



Comprehension Sequence

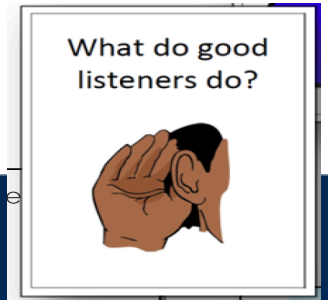




EAGER BVERS

Other components of the intervention:

- Hand signals (gestures) to reinforce comprehension skill being taught
- Vocabulary log to enhance retention of new words
- Turn and talk with partner facilitates social interactions
- Group creates own rules which are reinforced each session
  - Taking turns, working together, and having fun are emphasized
- Daily agendas help children monitor progress & provide structure



Pilot Study:
Intervention Implementation

- Students received 8 weeks of intervention, three times per week for 45 minutes
- Each session, students receive targeted instruction in listening comprehension, vocabulary, and writing
- Instruction is direct and explicit and follows the comprehension scope and sequence.
- Behavior support to address concerns pertaining to managing attention and anxiety during the sessions.
- Also explicitly scaffold social interactions and social understanding.
- Scaling up the intervention by training undergraduate RA's as teachers and behavior facilitators.
- 3 pilot study cohorts to date: Summer 2015, Fall 2016, Winter 2016.

Pilot Intervention Studies: Descriptive Statistics (n = 15)

Measure	Mean	SD	Range
Age	9.3	1.8	7.1 – 12.4
Grade	3	1.5	1 – 6
PIQ (Block Design T-Score)	37.46	5.80	27 – 46
VIQ (Similarities T-Score)	33.38	10.39	21 – 47
SRS (ASD Parent Quest.)	77.71	17.10	49 – 113
Pre-test EVT (expressive vocab)	75.93	19.46	38 – 114

Video Examples

Hand Signal Use

Making Connections

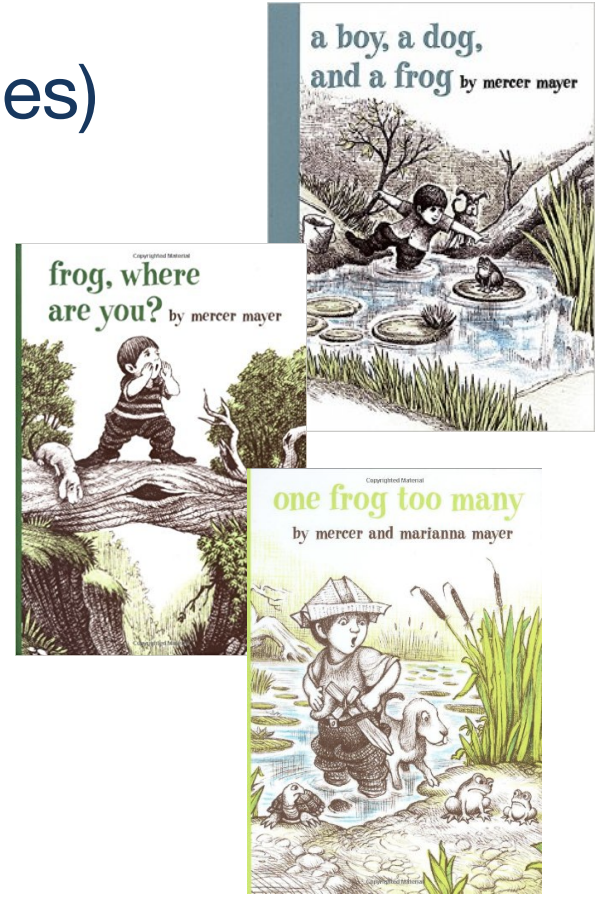
Video Examples

Scaffolding Social Interaction

Scaffolding Writing

Narrative Generation Task (Frog Stories)

- Given pre- and post-intervention
- One of three wordless picture books
  (*Frog, Where Are You?*, Mayer, 1969; *A Boy, a Dog, and a Frog,* Mayer, 1971; *One Frog Too Many*; Mayer, 1970)
- Participants asked to look through pictures one time to become familiar with story
- “Tell me a story based on the pictures.”



Narrative Evaluation Characteristics

Emotional & Cognitive States

- The frog was upset
- The boy wondered where the frog went

Hedges

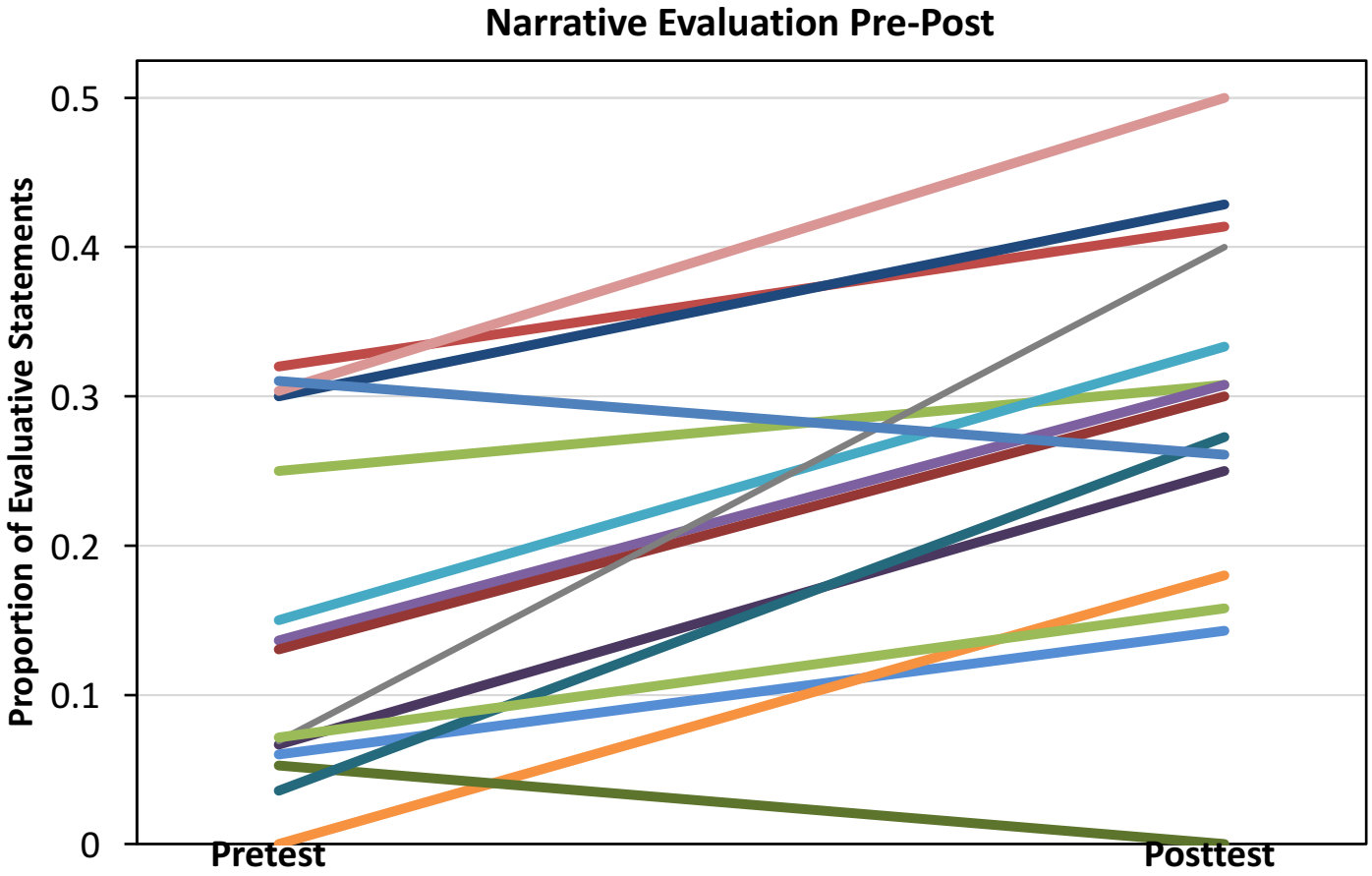
- I *think* that the frog is hiding
- It *looks* like he's all wet

Character Speech & Sound Effects

- *Splash!* The frog went in the water
- (Use of a character voice)

Intensifiers & Attention-Getters

- Look at that!
- The frog jumped *really really* high


Narrative Evaluation Pre-Post
Proportion of Evaluative Statements
0.5
0.4
0.3
0.2
0.1
0
Pretest
Posttest

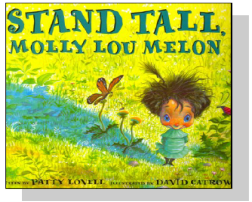
Beyond the Pilot Studies: School-Based Implementation

- We moved the work to an authentic school setting. Completed a November-April implementation in a SDC classroom 4 days per week:
  - 6 children receiving treatment in reading group pairs during station time. Also tracked 6 randomly assigned, matched, control children.
  - 2 undergraduate RA's worked with each pair of children (1 teacher, 1 behavior support).
  - Developed and tested more proximal, sensitive measures of listening comprehension and vocabulary.
  - Taught 4 skills: Direct Recall, Making Connections to Background Knowledge, Narrative Retelling, Making Inferences.

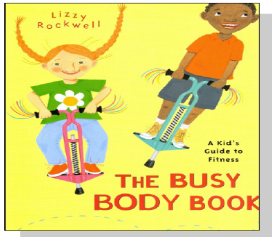
Beyond the Pilot Studies: School-Based Implementation

Narrative evaluation: We saw significantly more growth in the proportion of evaluative statements in the treatment children's narratives than in those who did not receive the intervention.

Takeaway: it appears that direct instruction in narrative retelling and modeling of good storytelling is effective even for students with lower cognitive and verbal abilities, and that this narrative measure is sensitive to change.



Other Findings



Positive outcomes:

- Growth in curriculum based measures of listening comprehension and vocabulary for many students
- Children looked forward to sessions
- Engaged with curriculum
- Learned hand signals
- Liked the structure: agendas, rules
- Interacted with teachers and one another
- Story recall

Challenges (impediments to accessing curriculum):

- Attention regulation
- Anxiety
- Language level for some children

What next?

- Behavior monitoring needed (as data and for success of intervention)
- More explicit scaffolding of vocabulary and comprehension skills beyond direct recall may be needed

Future Directions

- **We currently have grants under review to expand the curriculum:**
  - Develop routines in the group setting for social scaffolding to develop social communication abilities with peers and teachers.
  - Develop explicit instruction in social cognitive skills.
  - Develop assessments that are more sensitive to change.
  - Facilitate transfer of learning from listening comprehension and oral language intervention to reading comprehension.

Thank You!

Also, please feel free to drop us an email if you have other comments or questions!

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