IN ACCORDANCE WITH ACCME DISCLOSURE GUIDELINES

• I RECEIVE ROYALTIES FOR A BOOK DISCUSSED IN THIS PRESENTATION.
  • AUTISM AND JOINT ATTENTION: DEVELOPMENTAL, NEUROSCIENCE AND CLINICAL
    FUNDAMENTALS, GUILFORD PUBLICATIONS, 2016

• I DO NOT HAVE FINANCIAL RELATIONSHIPS WITH ANY OF THE OTHERS ASSESSMENTS,
  INTERVENTIONS OR PRODUCTS THAT MAY BE MENTIONED IN THIS PRESENTATION

• MUCH OF THE RESEARCH AND/OR THE PREPARATION FOR THIS PRESENTATION HAS BEEN
  SUPPORTED BY:
  • IES GRANT R324A120168
  • NIH GRANT R21MH085904
  • THE LISA CAPPS ENDOWMENT FOR RESEARCH ON NEURODEVELOPMENTAL
    DISORDERS & EDUCATION
AUTISM SPECTRUM Conditions (ASC) INVOLVE SOCIAL & LEARNING IMPAIRMENTS

What Features or Symptom Relate to both Learning & Social Differences?

- Disturbance of Learning with and from Others
  - Joint Attention Problems observed by 8- to 18-months of Age

- Disturbance of Social Relatedness

- Undifferentiated Development 0 – 4 months

- Restricted & Repetitive Behaviors
  - Atypical Sensory Responses

Autism is still difficult to detect in the 1st six-months of Life
JOINT ATTENTION IS OUR MENTAL CAPACITY TO ADOPT A COMMON POINT OF REFERENCE AND ENGAGE IN COORDINATED INFORMATION PROCESSING.
OUTLINE

- IT'S BEEN DIFFICULT TO UNDERSTAND THE DEFINING SOCIAL BEHAVIOR (PHENOTYPE) OF AUTISM.

- JOINT ATTENTION, OR ADOPTING A COMMON POINT OF VIEW WITH OTHERS, IS CENTRAL TO THE SOCIAL AND LEARNING NATURE OF ASD ACROSS THE LIFESPAN.

  - JOINT ATTENTION DOES NOT ENTIRELY EXPLAIN AUTISM, BUT IT'S HARD TO UNDERSTAND, ASSESS OR TREAT AUTISM WITHOUT UNDERSTANDING JOINT ATTENTION.

THE INCREASE IN ASD DIAGNOSIS AND SCIENTIFIC RESEARCH REPORTS

Increase in Prevalence of ASD Over Four Decades

![Graph showing the increase in prevalence of ASD over four decades from 1975 to 2016. The prevalence increases from 1 in 5000 in 1975 to 1 in 68 in 2016.]

Increase in Peer-Reviewed Science Journal Articles per Decade

Data from Proquest-PsychINFO April 2016

Total = 56970

![Bar graph showing the increase in peer-reviewed science journal articles per decade from 1970-79 to 2010-2016. The total number of articles from 1970-79 to 2010-2016 is 56970.]
Key Findings from the ADDM Network: A Snapshot of Autism Spectrum Disorder 2016

Data from the Autism and Developmental Disabilities Monitoring (ADDM) Network help us understand more about the number of children with autism spectrum disorder (ASD), the characteristics of those children, and the age at which they are first evaluated and diagnosed. Read on to learn more about ASD across the ADDM Network.

How many children were identified with ASD?
About 1 in 68 or 1.5% of 8-year-olds were identified with ASD by the ADDM Network.

1 in 68

How did the percentage of children identified with ASD range across geographic areas?
The percentage of children identified with ASD ranged widely across geographic areas.

For example, in the areas where the ADDM Network reviewed both health and special education records, the percentage of children who were identified with ASD ranged from a low of 1 in 81 or 1.2% in areas of South Carolina to a high of 1 in 41 or 2.5% in areas of New Jersey.

6th ADDM Report.
ADDM started in 2000.
346,978 8-year-olds.
What was the intellectual ability of the children identified with ASD?
Among children identified with ASD who had IQ scores available, about a third also had intellectual disability.

- **Average or above average intellectual ability**: 84%
- **Borderline range**: 32%
- **Intellectual disability**: 14%
- **2%**

*Based on information from the 9 ADDM Network sites that had intelligence quotient (IQ) scores available for at least 70% of children identified with ASD. Intellectual disability defined as IQ score ≤70.*

When were children evaluated and diagnosed?
- About 43% of children identified with ASD were evaluated for developmental concerns by age 3 years. This percentage is lower than the goal set by Healthy People 2020 that 47% of children with ASD have a first evaluation by age 3 years.
- Black and Hispanic children were less likely to be evaluated for developmental concerns by age 3 years than white children.
- Even though ASD can be diagnosed as early as age 2 years, most children were not diagnosed with ASD by a community provider until after age 4 years.

<table>
<thead>
<tr>
<th>ASD Subtype</th>
<th>Median* Age of Diagnosis</th>
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<tbody>
<tr>
<td>Autistic disorder</td>
<td>3 years, 10 months</td>
</tr>
<tr>
<td>Pervasive developmental disorder-not otherwise specified (PDD-NOS)</td>
<td>4 years, 1 month</td>
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<tr>
<td>Asperger disorder</td>
<td>6 years, 2 months</td>
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</table>

*Median is the number in the "middle" within a sorted list of numbers from highest to lowest.*
RESPONDING TO JOINT ATTENTION (RJA) AND A COMMON POINT OF VIEW

RJA in 9 months olds
Likely initial development 2-6 months

Picture from the *Early Social Communication Scales* (ESCS, Seibert, Hogan & Mundy 1982; Mundy et al. 2003)
INITIATING JOINT ATTENTION (IJA) AND A COMMON POINT OF VIEW

Spontaneously Sharing Experience at 9 months of Age
Likely initial development 5-8 months of age
JOINT ATTENTION DEVELOPMENT IN AUTISM

N = 18/group 4-year-olds

96% discrimination

Curcio, 1978
Wetherby & Prutting, 1984
Loveland & Landry, 1986
Mundy, Sigman, Ungerer, & Sherman, 1986
SOCIAL DIAGNOSTIC CRITERIA FOR AUTISM (1994 FROM THE DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS OR DSM-IV)

- A LACK OF SPONTANEOUS SEEKING TO SHARE ENJOYMENT, INTERESTS, OR ACHIEVEMENTS (LACK OF SHOWING, POINTING, …)
- FAILURE TO DEVELOP PEER RELATIONS
- MARKED IMPAIRMENT UN NONVERBAL BEHAVIORS (EYE-CONTACT, FACIAL EXPRESSION, …)
- LACK OF SOCIAL EMOTIONAL RECIPROCITY

JOINT ATTENTION (videos from UCLA, 1982-1986; University of Miami, 2003)
THE AUTISM DIAGNOSTIC OBSERVATION SCHEDULE (ADOS) SOCIAL-AFFECT DIMENSION (GOTHAM ET AL. 2007, 2008)

• MODULE 1: NO WORDS
  • GAZE* & OTHER BEHAVIORS
  • FACIAL EXPRESSION
  • FREQUENCY OF VOCALIZATION
  • QUALITY OF SOCIAL OVERTURES
  • SHARED ENJOYMENT*
  • UNUSUAL EYE CONTACT
  • RESPONDS TO JOINT ATTENTION
  • GESTURES
  • SHOWING
  • INITIATES JOINT ATTENTION

• MODEL 1 W/WORDS & MODULE 2
  • GAZE* & OTHER BEHAVIORS
  • FACIAL EXPRESSION
  • FREQUENCY OF VOCALIZATION
  • QUALITY OF SOCIAL OVERTURES
  • SHARED ENJOYMENT*
  • UNUSUAL EYE CONTACT
  • POINTING
  • GESTURES
  • SHOWING
  • INITIATES JOINT ATTENTION
IJA at 8 months correctly predicted 6/9 High Risk infants who received a DX of ASD at 36 months and 25/26 who did not.
WHY DO CHILDREN WITH ASD HAVE PROBLEMS WITH EARLY JOINT ATTENTION DEVELOPMENT?

• CONNECTIVITY HYPOTHESIS
  • EARLY DEVELOPMENT OF JOINT ATTENTION REQUIRES MANY BRAIN SYSTEMS WORKING TOGETHER.
    • SOCIAL-COGNITION SOCIAL BRAIN HYPOTHESIS

• SOCIAL MOTIVATION & THE EYE CONTACT EFFECT
  • BRAIN SYSTEMS THAT MAKE OTHER PEOPLE’S ATTENTION-TO-SELF AROUSING OR REWARDING ARE ATYPICAL
JOINT ATTENTION INVOLVES COMPLEX INFORMATION PROCESSING

- JOINT ATTENTION INVOLVES REPRESENTING SELF, OTHER AND A REFERENT IN SPACE.
- THE EARLY DEVELOPMENT OF THIS COMPLEX TYPE OF COGNITION PLACES DEMANDS ON CONNECTIVITY ACROSS MANY AREAS OF THE BRAIN.
JOINT ATTENTION BEGINS TO DEVELOP NO LATER THAN 5- TO 6-MONTHS OF AGE

Selective prefrontal cortex responses to joint attention in early infancy

Tobias Grossmann* and Mark H. Johnson
Centre for Brain and Cognitive Development, Birkbeck, University of London, London, UK

*Author for correspondence (t.grossmann@bbk.ac.uk).

Figure 1  Three-dimensional reconstructions of the white matter fiber tracts examined in the current study: red = uncinate fasciculi (UF), blue = inferior longitudinal fasciculi (ILF), grey = optic tract.
JOINT ATTENTION IS A FORM OF PARALLEL PROCESSING OF:

- SELF-REFERENCED ATTENTION INFORMATION
- OTHER-REFERENCED ATTENTION INFORMATION

ACROSS A DISTRIBUTED NEURAL NETWORK:
- ANTERIOR/POSTERIOR ATTENTION SYSTEMS
- DEFAULT/DORSAL ATTENTION SYSTEMS

WITH PRACTICE WITH JA BECOME INTERNALIZED, SOCIAL SHARING OF MENTAL ATTENTION TO COVERT MENTAL REPRESENTATIONS (SYMBOLS, SOCIAL-COGNITION)

ENGAGEMENT OF DISTRIBUTED SYSTEM ENHANCES DEPTH OF PROCESSING OF MEMORY AND LEARNING IN JOINT ATTENTION.
A frontotemporoparietal network common to initiating and responding to joint attention bids

Nathan Caruana, Jon Brock, Alexandra Woolgar
Department of Cognitive Science, Macquarie University, Sydney, Australia
ARC Centre of Excellence in Cognition and its Disorders, Australia

Neuroimage 108 (2015) 34-46

Look into my eyes: Investigating joint attention using interactive eye-tracking and fMRI in a developmental sample


Neuroimage 2016
Regions of significant activation Differences for IJA across samples of 16 adolescents with ASD or Typical Development (14.2 years, IQ = 111, 13.2 years, IQ = 118 respectively).
JOINT ATTENTION AND SOCIAL COGNITION
Figure 7. In the first year the development of joint attention involves the “learning to” integration of executive, motivation and imitation processes to support the routine, rapid and efficient (error free) execution of patterns of behavior that enable infants to coordination processing of overt aspects of visual self attention with processing of the social attention of other people. In the latter part of the first year and the second year infants can better monitor their own experiences and integrate it with information about the social partners during joint attention events. This provides a critical multi-modality source of information to the infants about the convergence and divergence of self and others experience and behavior during sharing information in social interactions. Theoretically, this provides the stage for the “learning from” phase of joint attention development. In this stage infants can control their attention to self organize and optimize information processing in social-learning opportunities. The integration of anterior and posterior self-other-attention processing (Fig. 5) provides a neural network that enriches encoding in social learning. The internalization of the overt joint processing of attention to the covert joint processing of attention to representations is part of an executive system that facilitates symbolic development and the social cognition. Indeed both symbolic thought and social cognition may be characterized by a transition from learning to socially coordinate overt attention to the capacity to socially coordinate covert mental representations of the attention of self and others.
LEARNING TO ENGAGE IN JOINT ATTENTION REQUIRES MENTAL EFFORT, BUT BECOMES EASIER WITH AGE

**Joint attention becomes faster and easier from infancy through adolescence.**

Gredebeck et al. 2010

How fast do infants follow gaze?

LEARNING TO ENGAGE IN JOINT ATTENTION REQUIRES MENTAL EFFORT, BUT BECOMES EASIER WITH AGE

**Joint attention becomes faster and easier from infancy through adolescence.**

Gredebeck et al. 2010

How fast do infants follow gaze?
LEARNING FROM PHASE OF DEVELOPMENT

Self-Experience as a Mechanism for Learning About Others: A Training Study in Social Cognition

Andrew N. Meltzoff and Rechele Brooks

Abstract:

12-month-olds learn not to follow gaze of blind-folded tester after experience with blindfold.

18-month-olds learn to follow gaze of blind-folded tester after experience with transparent blindfold.

Figure 1.

Training with opacity. Infants were randomly assigned three different types of training experiences prior to a gaze-following test (n = 32 per group). Infants who experienced an opaque blindfold subsequently gazed followed the blindfolded adult significantly less than controls. Error bars represent standard error of the means.

Figure 2.

Training with transparency using trick blindfolds. The specially constructed trick blindfold looked opaque from the outside but could be seen through. Infants were randomly assigned three different types of training experiences prior to a gaze-following test (n = 24 per group). Infants who experienced a see-through, trick blindfold subsequently gazed followed the blindfolded adult significantly more than controls. Error bars represent standard error of the means.
<table>
<thead>
<tr>
<th>Study</th>
<th>12 month IJA (pointing)</th>
<th>20 month IJA (alternating gaze)</th>
<th>15 month IJA (pointing)</th>
<th>9 month RJA</th>
<th>10 month RJA</th>
<th>9 month RJA</th>
<th>18-20 month joint engagement</th>
<th>2-3 year olds use direction of gaze of others to infer Intent</th>
<th>3 year olds with ASD RJA related to intention understanding</th>
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<tr>
<td>Sodian &amp; Kristen-Antonow (2015)</td>
<td>False Belief 50 month</td>
<td>44 month ToM</td>
<td>mental state terms in toy play</td>
<td>mental state language at 36 months</td>
<td>54 month ToM</td>
<td>48 month ToM</td>
<td>43 and 54 month ToM</td>
<td>2-3 year olds use direction of gaze of others to infer Intent</td>
<td>3 year olds with ASD RJA related to intention understanding</td>
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<td>Schiettecatte et al. (2012)</td>
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The Development of Core Cognitive Skills in Autism: A 3-Year Prospective Study

Elizabeth Pellicano
Institute of Education, London, and University of Western Australia

Continuity of Atypical Social Cognition in ASD

Younger Children
5 year olds with ASD N = 37

Older Children
ASD sample retested at age 8

ToM = Number of children with atypical Social Cognitive scores
EF = Number of children with Atypical executive function scores
CC = Number of children with atypical central coherence scores
The overlap between social cognitive neural Network activation and the neural network correlates of following attention or experiencing one’s own attention tracked by another person.
JOINT ATTENTION & LEARNING FROM INSTRUCTION

- Paying attention to what other people attend to (refer to) is fundamental to learning.
  - Bruner (1975)

- Success with teaching, scaffolding, instruction in any contexts requires joint attention.

- Practice with sharing a common point of visual reference necessary to sharing a common point of mental reference (symbols and language)
  - Werner & Kaplan (1963)

- Vulnerability to disturbed joint attention contributes to learning problems in ASD.
Joint attention increases infant’s likelihood of correctly associating new words with objects/events (referential mapping).

**Figure 1.4** Illustration of the Role of Joint Attention in Social Learning

In this image an eighteen-month-old has the opportunity to learn a new word, Rooster. However, the possibility of a referential mapping error exists (that is, incorrectly associating the new word, rooster, with the wrong entity, the lizard). To decrease the likelihood of this error and increase correct word learning, the infant may be an active partner in the social learning process. She may look in the direction of her parent’s gaze and turn in the correct direction toward the rooster. This is a simple illustration of a larger and vital element of social learning: children must actively coordinate their attention with that of others to adopt a common frame of reference in order to avoid referential mapping errors in most direct instruction situations. If children, such as those affected by autism, struggle with adopting a common frame of reference with others, their learning can suffer. Recognizing this issue goes more than halfway to providing improved educational opportunities for children with autism.
29 children with ASD

Mean age 46.5 months

Assessed twice over 12.4 months

0.45 to 40 hrs per week of language intervention

Only children with higher RJA displayed “dose related” language growth in response to intervention. RJA also related to initial language level.
JOINT ATTENTION AND LEARNING IN PRESCHOOL AND MINIMALLY VERBAL CHILDREN WITH AUTISM
APPROACHES TO INTERVENTION

- **Discrete Trial**
  - A Type of Applied Behavior Analysis (ABA)
  - Adult Directed
  - Modeling of Behavior
    - Verbal & Physical Prompts
  - Primary Contingent Reinforcement of Successive Approximations (Shaping)
    - LovAas (1987)
- **Developmental**
  - Child Directed
  - Imitation & Shared Experience
  - Social Reinforcement of Developmentally Advanced Behaviors
    - (Voice Tone, Affect & Gesture)
    - Greenspan & Wiedner (2000)
  - Building Motivation and Ability for Social Learning
• 42 CHILDREN
  • 24 -36 MONTH OLDS
  • IQS 50-80, MEAN = 60
• 21 EARLY INTENSIVE BEHAVIORAL TREATMENT
  • 35 -40M HOURS OF BEHAVIORAL TREATMENT
• 21 COMMUNITY PUBLIC SCHOOLS
• TWO YEARS

• APPLIED BEHAVIORAL ANALYSIS (ABA)
  • ADULT DIRECTED
  • 3 TO 8 LEARNING TRIALS ADMINISTERED
  • 1 – 2 MINUTE BREAK
  • 50 MINUTES PER HOUR
  • SUCCESSIVE APPROXIMATIONS

• EXTERNAL REWARDS FOR LEARNING
  • ATTENDING TO TASK
  • USING GESTURES
  • FOLLOWING REQUESTS
  • USING SYMBOLS & WORDS
HIGH QUALITY ABA IMPROVES INTELLIGENCE SCORES FOR MANY PRESCHOOL CHILDREN

Merrill-Palmer

IQ

Reynell (Expressive)

Reynell (Receptive)
• 30 HOURS OF TARGETED JOINT ATTENTION INTERVENTION BOO_STS LANGUAGE LEARNING IN 2- TO 4-YEAR-OLDS WITH AUTISM WHO RECEIVED 1800 HOURS OF APPLIED BEHAVIOR ANALYSIS (ABA) TREATMENT.
Review

Joint attention interventions for children with autism spectrum disorder: a systematic review and meta-analysis

Kimberly A. Murza†, Jamie B. Schwartz‡, Debbie L. Hahs-Vaughn§ and Chad Nye¶

†Audiology & Speech Language Sciences, University of Northern Colorado, Greeley, CO, USA
‡Communication Sciences and Disorders, University of Central Florida, Orlando, FL, USA
§Methodology, Measurement, and Analysis, University of Central Florida. Orlando, FL, USA
¶University of Central Florida Center for Autism and Related Disabilities. Orlando. FL, USA

(Received March 2015; accepted September 2015)

What this paper adds?

What is already known on the subject?

A core social-communication deficit in children with ASD is limited joint attention behaviours—important in the diagnosis of ASD and shown to be a powerful predictor of later language ability. Various interventions have been used to train joint attention skills in children with ASD. However, it is unclear which participant, intervention and interventionist factors yield more positive results.

What this paper adds?

The results of this meta-analysis provide strong support for explicit joint attention interventions for young children with ASD with most comparisons showing a statistically significant 2/3 standard deviation treatment effect increase for the experimental group compared with the control/comparison group.
Isolating active ingredients in a parent-mediated social communication intervention for toddlers with autism spectrum disorder

Amanda C. Gulsrud,¹ Gerhard Hellemann,¹ Stephanie Shire,¹ and Connie Kasari¹,²
¹UCLA Semel Institute for Neuroscience & Human Behavior; ²UCLA Graduate School of Education and Information Studies, Los Angeles, CA, USA

Key points

- Intervention can be isolated and measured.
- All parents increased in their use of intervention techniques, but the active treatment group increased to a significantly greater degree.
- Parent strategies were related to the primary outcome of joint engagement.
- One of the parent strategies, Mirrored Pacing, mediated the relationship between treatment and the primary outcome suggesting its role as an active ingredient of treatment.
MIRRORED PACING

• PARENTS IMITATION OF APPROPRIATE AND FUNCTIONAL PLAY ACTS

• TIMING OF MIRRORED ACTS IS IMPORTANT.
  • CONTINGENCY AND RAPIDITY OF THE IMITATIVE ACT

• POSITIONING OF THE IMITATIVE ACT
  • PARENT DISPLAYS THAT ACT IN VIEW OF THE CHILD

• IF THE CHILD PUT A TOY DOWN THE SLIDE, PARENT’S SHOULD WAIT TO IMITATE UNTIL THE CHILD IS ABOUT TO REPEAT AND THE PARENT CAN SLIDE AN OBJECT JUST AS THE CHILD SLIDES AN OBJECT
EXAMINED THE EFFECTS OF RECIPROCAL IMITATION TRAINING (RIT) ON JOINT ATTENTION MEASURED WITH THE ESCS

14 CHILDREN WITH ASD (27 TO 47 MONTHS) RECEIVED RIT 3 HOURS/WEEK FOR 10 WEEKS. COMPARED TO A CONTROL GROUP OF 13 CHILDREN WITH ASD. RANDOM ASSIGNMENT TO GROUPS

RIT TARGETS - IMITATION PRODUCTION AND IMITATION RECOGNITION

TREATMENT SIGNIFICANTLY INCREASE INITIATING JOINT ATTENTION

INCREASED IMITATION NOT RELATED TO INCREASED (IJA)

AUTHOR “THE BENEFICIAL EFFECT OF RIT ON SOCIAL BEHAVIOR MAY BE DUE TO INTERVENTION EFFECTS ON IMITATION RECOGNITION” (P. 1772)
Imitating the autistic child: Facilitating communicative gaze behavior

Journal of Autism and Developmental Disorders
March 1984, Volume 14, Issue 1, pp 27–38

Authors Authors and affiliations
Ellenmorris Tiegerman, Louis H. Primavera

Imitation and social responsiveness in autistic children

Journal of Abnormal Child Psychology
June 1984, Volume 12, Issue 2, pp 209–226

Authors Authors and affiliations
Geraldine Dawson, Alexandra Adams
• 61 SIX-YEAR-OLD MINIMALLY VERBAL CHILDREN WITH ASD
  • FEWER THAN 20 SPONTANEOUS WORDS IN 20 MINUTE SAMPLE.
  • ONE GROUP RECEIVED 12 WEEKS/24 SESSIONS OF JOINT ATTENTION SYMBOLIC PLAY ENGAGEMENT REGULATION (JASPER) + ENHANCED MILIEAU TEACHING (JASP+EMT) INTERVENTION.
  • THE OTHER GROUP RECEIVED 12 WEEKS/24 SESSIONS OF JASP+EMT, PLUS SPEECH GENERATING DEVICE (SPD)
INTERVENTION COMPONENTS

- **JASPER** is a naturalistic behavioral intervention focused on the development of prelinguistic gestures (pointing, showing, alternating gaze, pointing to request) and symbolic play skills (play with objects “as if” they were something else to increase the child’s experience and enjoyment of joint engagement with an adult.

- **EMT** is a naturalistic behavioral intervention that uses systematic responsiveness and modeling to promote the spontaneous use of spoken language.

- **SGD** involved use of iPad or Dynavox to enable children to touch a symbol to produce a word.
JASP + EMT + SGD IMPROVED COMMUNICATIVE WORD USE

Number of Words Used In the 24-week Intervention and 12 Weeks After the Intervention Ended

- JASP + EMT
- JASP + EMT + SGD

Start  12 weeks  24 weeks  36 weeks
JOINT ATTENTION AND LEARNING IN VERBALLY FLUENT SCHOOL-AGED CHILDREN WITH ASD
Teaching Children with Autism to Read for Meaning: Challenges and Possibilities

Judi Randi · Tina Newman · Elena L. Grigorenko

Core Deficits of ASD

- Difficulty mentally representing unseen events or abstract ideas.
- Difficulty with planning or organizing actions or thoughts.
- Difficulty going beyond the details of information to infer larger meaning or gestalt.
- Difficulty following acts of reference or adopting a common frame of reference with others.

Poor Reading Comprehension

- Difficulty visualizing causes and consequences of actions and events in text.
- Difficulty with planning a strategic approach to reading, self-monitoring comprehension, keeping text information organize in memory.
- Difficulty integrating words, sentences and passages into a meaningful whole.
- Difficulty following reference (e.g. pronouns) and the social convention of what's important in text.

Poor Social-Communication Development in Preschool Children with ASD

Poor Reading Comprehension in Middle School Students with ASD

FIGURE 2. Illustration of the theoretical relations between the neurodevelopmental disturbance of cognition and social communication in ASD and reading comprehension impairment.
ONE BIG HYPOTHESIS

• THE SOCIAL COMMUNICATION IMPAIRMENTS THAT CHARACTERIZE ASD OVERLAP WITH THE COGNITIVE DEMANDS OF LEARNING READING COMPREHENSION, WRITING AND MATH.

• IF SO, VULNERABILITY TO ACADEMIC LEARNING DISABILITY MAY PART OF THE PHENOTYPE FOR MANY SCHOOL AGED CHILDREN WITH ASD.
GORT-5 COMPREHENSION: DIAGNOSTIC GROUPS AND GRADE EQUIVALENCE SCORE
(CONTROLLING FSIQ; MCINTYRE ET AL. IN PRESS)

DX Group
p < .008 (.11)

DX Group X
Age Interaction
p < .05, (.08)
Social Cognition and Reading in ASD

- **ASD**
  - PIQ
  - TOWRE
  - REC. VOCAB
  - CELF
  - Story Memory
  - Social Cognition
  - Adjusted R-square = .61, N = 58, p < .001

- **TYPICAL**
  - TOWRE
  - REC. VOCAB
  - PIQ
  - CELF
  - Story Mem
  - SocCog
  - Adj. R-Square = .57, N = 38, p < .001
QRI-5 READING COMPREHENSION
(CONTROL FSIQ)

Exp: The boys were walking home with shopping bags full of food.

Explicit Questions: No group differences in initial recall condition
LB: HFA < ADHD = TD, * p ≤ .004

Implicit Questions: HFA = HFA+ADHD < TD * p ≤ .003
Reading and Academic Development (RAD) Center

http://education.ucdavis.edu/reading-and-academic-development-center

1st Row: Emily Solari, Director; Peter Mundy, Faculty; Nicole Sparapani, Faculty; Nancy McIntyre, Post-Doc; Ryan Grim, Post-Doc; Matt Zajic, Ph.D. Candidate; Alyssa Henry, Ph.D. Student.

2nd Row: Janay Brown-Wood, Ph.D. Student; Deanne Castaneda, Project Coordinator; Elise Spang, Project Coordinator; Katherine Lacy, Research Analyst; Akemi Joe, Administrative Assistant

NOT SHOWN 12 Undergraduate Research/Intervention Assistants

FUNDING: IES RCT Reading Intervention (Solari), IES ASD Longitudinal Academic Development (Mundy), Chancellors Fellowship (Solari); Lisa Capps Endowment (Mundy), Brett Cornett Fund (Sara Cornett-Hagen Gift); UC Davis Committee on Research Seed Grant (Solari); Fee for service contributions.
RECIPROCAL TEACHING & READING IS AN ACADEMIC PLATFORM FOR SOCIAL COMMUNICATION & SOCIAL-COGNITIVE DEVELOPMENT
The Socially Interactive Context of Reciprocal Teaching is Important
Meta cognitive process are a good intervention target for ASD.

Improved reading contributes to social knowledge and IQ.

Improved reading ability improves achievement & self-esteem,
END

QUESTIONS?