Language Intervention in Autism: The Implications of Neurobiological Research

INTRODUCTION

Understanding the current research on the neurobiological basis of autism will provide SLPs with the knowledge needed to address questions from parents of children with ASD. We will discuss the progress being made in identifying early biomarkers for ASD, which may help SLPs in early identification of children at risk for ASD. We will also discuss what the neurobiology of ASD suggests about how individuals with ASD process information differently and how these differences can be accommodated by making changes in the environmental input controlled by SLPs.

LEARNING OUTCOMES

You will be able to:

- describe the effects on language and cognitive processing of the neurofunctional differences associated with autism
- apply the understanding of a neurofunctional model of autism to intervention planning for young and low-functioning children with autism
- develop intervention plans for verbal children and adolescents with autism based on a neurofunctional model of autism

PROGRAM HISTORY

Live webinar:
Tuesday, December 9, 2014
3:00–5:00 p.m. Eastern time
3:00 p.m. ET
2:00 p.m. CT
1:00 p.m. MT
12:00 p.m. (noon) PT

On-demand webinar:
December 11, 2014– December 9, 2015

APPROVED PROVIDER ASHA CONTINUING EDUCATION AMERICAN SPEECH-LANGUAGE-HEARING ASSOCIATION

ASHA Professional Development is approved by the Continuing Education Board of the American Speech-Language-Hearing Association (ASHA) to provide continuing education activities in speech-language pathology and audiology. **See course information for number of ASHA CEUs, instructional level and content area.** ASHA CE Provider approval does not imply endorsement of course content, specific products or clinical procedures.

This course is offered for 0.2 ASHA CEUs (Intermediate level, Professional area).

FACULTY

Diane L. Williams, PhD, CCC-SLP, is the Anna Rangos Rizakus Endowed Chair in Health Sciences and Ethics and an associate professor in the Department of Speech-Language Pathology at Duquesne University in Pittsburgh, PA. She received her doctorate in speech-language pathology from Bowling Green State University and completed a post-doctoral fellowship in autism at the University of Pittsburgh. Williams received a Research Career Development Award from the National Institute of Deafness and Other Communication Disorders with an emphasis on functional magnetic resonance imaging (fMRI) research in autism. She currently uses neuroimaging to study social cognition and language processing in autism in collaboration with colleagues at the University of Pittsburgh and Carnegie Mellon University. Williams is an ASHA Board Recognized Specialist in Child Language with 35 years of clinical experience with individuals with autism, from toddlers through adults. She is the author of *Developmental Language Disorders: Learning, Language, and the Brain*, a summary of research on the neurological basis of developmental disorders and the application of this research to the learning process. Williams is also the author of numerous scientific articles related to the neuropsychological and neurobiological basis of autism.

FINANCIAL DISCLOSURES

Speaker received financial compensation from ASHA for this presentation. She is an associate professor at Duquesne University, received research funding from the National Institutes of Health from 2004–2012, and receives book royalties from Plural Publishing.

NONFINANCIAL DISCLOSURES

None

MODERATOR

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ASHA

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EVIDENCE-BASED PRACTICE

It is the position of the American Speech-Language-Hearing Association that audiologists and speech-language pathologists incorporate the principles of evidence-based practice in clinical decision making to provide high quality clinical care. The term *evidence-based practice* refers to an approach in which current, high-quality research evidence is integrated with practitioner expertise and client preferences and values into the process of making clinical decisions.

Participants are encouraged to actively seek and critically evaluate the evidence basis for clinical procedures presented in this and other educational programs.

Adopted by the Scientific and Professional Education Board, April 2006

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LANGUAGE INTERVENTION IN AUTISM: THE IMPLICATIONS OF NEUROBIOLOGICAL RESEARCH

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DISCLOSURE

- Financial
  - Associate professor at Duquesne University
  - Received financial compensation from ASHA for this presentation
  - Research funding from NIH
  - Book royalties from Plural Publishing
- Nonfinancial
  - None

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LEARNING OUTCOMES

- Describe the effects on language and cognitive processing of the neurofunctional differences associated with autism
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NEUROFUNCTIONAL DIFFERENCES IN AUTISM:

EFFECTS ON LANGUAGE AND COGNITIVE PROCESSING

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AUTISM SPECTRUM DISORDER (ASD)

- A neuro-developmental disorder
  - In ASD, the way the brain responds to environmental input results in a cascade of problems in learning and social functioning

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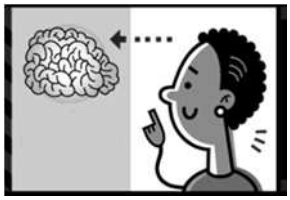
BASIC ASSUMPTIONS ABOUT ASD

- Individuals with ASD learn and act differently because their brains function differently
- Environmental input can influence their learning but may not change the underlying basic neurophysiological differences



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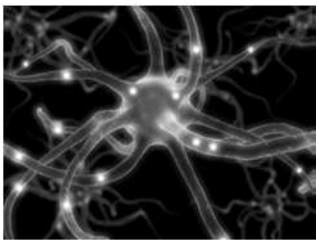
ASD IS A NEURAL SYSTEMS DISORDER

- Abnormal connectivity occurs:
  - At the level of the neuron
  - Structurally, in white matter pathways
  - Functionally, during cognitive processing between key regions
  - Across multiple large-scale brain networks



(Minshew & Williams, 2007; Uddin, Supekar, & Menon, 2013; Williams et al., 2013)

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COGNITIVE STRENGTHS AND WEAKNESSES

Intact abilities

- Attention
- Sensory perception
- Elementary motor
- Simple memory
- Formal language
- Rule-learning
- Visuospatial processing

Cognitive weakness

- Complex sensory
- Complex motor
- Complex memory
- Complex language
- Concept formation

(Minshew, Goldstein, & Siegel, 1997; Williams, Goldstein, & Minshew, 2006)

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NEUROCOGNITIVE MODEL OF AUTISM

- Because of neurobiological differences, ASD is dynamically realized as the person with ASD processes information
- Problems become more pronounced as the mismatch between cognitive resources and the demands of the processing task increase

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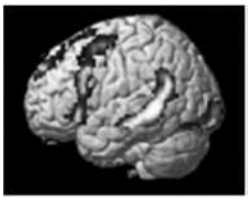
WHY LANGUAGE IS AFFECTED

- Language learning and use is affected because it requires coordination across a number of processing centers
- Comprehension and production must be integrated with social and/or textual context and flexibly adapted to meet those demands



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NEW INSIGHTS INTO HOW INDIVIDUALS WITH ASD PROCESS LANGUAGE

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LANGUAGE LEARNING IN TD INFANTS

Occurs through a combination of computational, cognitive, and social skills that:

- Focus the child's attentional resources to faces, biological motion, and voices
- Reduce the cognitive processing load

(Kuhl, 2010)

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ASD: PROBLEM WITH AUTOMATIC PROCESSING

- Behavioral, evoked response potential, and neuroimaging evidence is converging to suggest that individuals with ASD have a problem with these innate implicit or automatic cognitive processes

(Carter, Williams, Lehman, & Minshew, 2012; Eyler, Pierce, & Courchesne, 2012; Gervais et al., 2004; Jones & Klin, 2013; Scott-Van Zeeland et al., 2010)

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SOME AUTOMATIC PROCESSES FOR LEARNING LANGUAGE

- Preferential processing of human speech
- Statistical learning
- Automatic verbal encoding of information
- Formation of concepts/prototypes

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IMPLICATIONS OF LACK OF AUTOMATIC PROCESSING

- Effects of ASD occurring long before the behavioral signs
- Early identification essential for the most effective remediation

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EYE LOOKING DECLINES

- Eye-tracking study:
  - Children later diagnosed with ASD decline in fixation to eyes on videos of human faces from 2 to 6 mos. of age
  - Behavior being investigated as an early identifier for ASD

(Jones & Klin, 2013)

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LACK OF LEFT VISUAL FIELD BIAS

- Distinguished between 11-month-old infants at high risk and at low risk for ASD
- Potential predictor of ASD

(Dundas, Gastgeb, & Strauss, 2012)

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QUESTIONS AND ANSWERS

To ask a question, type your question into the chat box on the lower left side of your screen and then click the “Send” button.

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IMPLICATIONS FOR INTERVENTION WITH YOUNG AND LOW-FUNCTIONING CHILDREN

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ASSUMPTIONS ABOUT INTERVENTION

- A teacher/therapist cannot directly change the way the brain of a child with ASD learns or processes language
- A teacher/therapist CAN change the environmental input
- CAN get adults to do the work that the brain of the child cannot do

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WHAT WORK SHOULD THE ADULT BE DOING?

Preferential Processing of Human Speech

ATTENDING TO SPEECH

- Reduce competing auditory information as much as possible → human voice needs to be obvious point of attention
- Clearly pair language with what the words are referring to

(Parish-Morris, Hennon, Hirsh-Pasek, Golinkoff, & Tager-Flusberg, 2007) 22

MAKING THE CONNECTION

- Make sure the child is attending or handling the object as it is named

- Child may not use perceptual cues such as shape and may focus on other parts of an object

(Tek, Jaffery, Fein, & Naigles, 2008)

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ADAPT ENVIRONMENTAL INPUT

- Some children have extreme difficulty with attaching meaning to the spoken language they hear
- Visual input may help them to process spoken language
- Use of picture symbols may help the child to understand object-referent association

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SPECIFIC TECHNIQUE: AIDED LANGUAGE STIMULATION

- Method by which an adult pairs a spoken word with a point to a visual representation of the word
- Used to improve the child's ability to comprehend the language directed to him/her

(Drager et al., 2006; Goossens', Crain, & Elder, 1992, 1994)

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Visual representations are presented on boards of nine to 20 pictures, but fewer may be needed for some children who have trouble processing multiple stimuli

From Goossens', Crain, and Elder (1994)

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WHAT WORK SHOULD THE ADULT BE DOING?

Statistical Learning

LANGUAGE MODELING

- Give the child input that has clear word boundaries:
  - Single words
  - Phrases/sentences with clear prosodic cues

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FOR EXAMPLE:

- Use reduced amounts of language so child does not have to have to separate it from the spoken language stream

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EBP APPROACHES CONSISTENT WITH THIS IDEA

- Slower speaking rate

(Weismer & Hesketh, 1996)

- Emphatic stress

(Weismer & Hesketh, 1998)

- Melodic Intonation Therapy/Music Therapy

(Whipple, 2004)

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WHAT OTHER WORK SHOULD THE ADULT BE DOING?

- Over-repetition of associations between spoken words and referents because of possible difficulty extracting this information from a limited number of exposures



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SPECIFIC TECHNIQUE: CORE VOCABULARY

- Focus on a small number of vocabulary words

- Repeat words within a single context and across contexts

- Words chosen relevant to a particular child

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WHAT WORK SHOULD THE ADULT BE DOING?

Automatic Verbal Encoding of Information

HYPOTHESIS ABOUT LANGUAGE PRODUCTION

Child may be storing experiential knowledge in a visual form and not recoding into language

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AIDED COMMUNICATION

- Example: Picture Exchange Communication Systems (PECS)
  (Bondy & Frost, 1998; Ganz & Simpson, 2004)
- Reminder: Representation needs to be at a level the child can easily understand to reduce the processing load

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SPEECH GENERATING DEVICES

- A recent meta-analysis of treatment studies indicates that SGDs or voice output devices are effective in increasing the communication skills (and spoken language) in children with ASD

(Ganz et al., 2012)

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QUESTIONS AND ANSWERS

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IMPLICATIONS FOR INTERVENTION WITH HIGH-FUNCTIONING CHILDREN

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WHAT WORK SHOULD THE ADULT BE DOING?

Automatic Verbal Encoding of Information

LANGUAGE MEDIATOR

- Because information may not be automatically encoded into language, the adult may need to help the child bridge the gap
  - E.g.: Verbalizing the steps of a procedural task
  - E.g.: Verbalizing emotional reactions

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ADDITIONAL THOUGHTS

- Child may struggle to tell you "what's in his/her head"
- Help child to construct a narrative version of an experience to share
- Externally create what is typically inner self-talk to regulate behavior
- "Social stories" fit in here
  - Gray (2010)

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CREATING A NARRATIVE

- Start with what the child knows and has actual experience with→
  - Personal narratives
  - Procedural discourse
- Child more likely to be able to encode into language because doesn't have to create, organize, and produce the words

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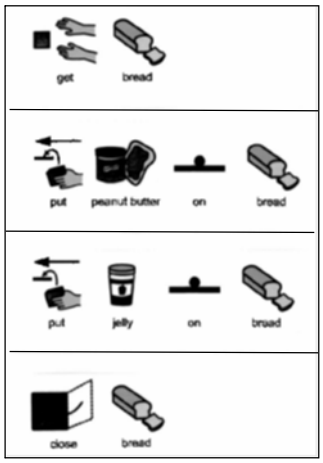
1. Visual organizer for procedural discourse
2. Picture support for retelling steps of science experiment
3. Graphic organizer for compare/ contrast



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ADDITIONAL IDEAS

- Photos of child doing an activity
- Video modeling with videos of the child doing an activity
- Videos of a similar activity to help child use words needed for telling about the activity (like available on Internet)

See Shane et al. (2012)
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ADDITIONAL CONSIDERATIONS

- Ascertain pre-knowledge of semantic content or pre-teach unfamiliar semantic content so child has the words to express his/her knowledge/ideas
- "Scripts" may be a response to problems with linguistic coding of information

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WHAT WORK SHOULD THE ADULT BE DOING?

Formation of Concepts

LEARNING A PROTOTYPE

- Start with one example for a word (the most prototypical)
- Then introduce additional examples once the word has been learned



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RELATIONSHIP TO WORD RETRIEVAL PROBLEMS

- Problems with underlying concept formation may be evidenced later as a weakness in word retrieval
- Particularly in situations with increased demands for cognitive processing

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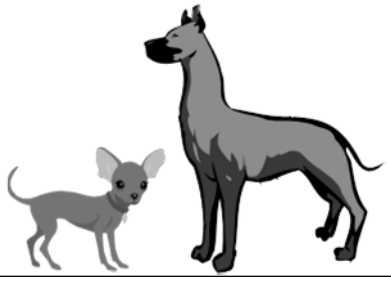
ABSTRACT CONCEPTS

- May need extreme examples for more abstract concepts
- Use associations from child's experience for other abstract concepts



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BEYOND WORD CONCEPTS

- Categories or prototypes are not just restricted to words
- All types of information are stored in our brain as prototypes or cognitive schemas

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COGNITIVE SCHEMAS

- This cognitive function helps us in new situations→ what we already know that is similar

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EXPERIENTIAL BASE

- Some indication that adults with ASD use their experiences to help them interpret language

(Williams et al., 2013)

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EXPERIENCE PROMOTES ADAPTIVE FUNCTIONING

- Even if are not forming prototypes/schemas in a typical way, an experiential store may help adaptive functioning

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QUESTIONS AND ANSWERS

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CONCLUSIONS

- Individuals with ASD learn and act differently because their brains function differently
- Environmental input can influence learning
- Adult mediators need to adapt input to maximize the child's potential

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THANK YOU

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- For more information:
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    - http://pittautismresearch.org
    - http://www.ccbi.cmu.edu
  - E-mail:
    - williamsd2139@duq.edu

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COMPLETION FORM INSTRUCTIONS

To earn credit and receive a certificate of completion, submit your completion form online within 5 days.

Individuals:

1. Launch the course.
2. Fill in and submit the completion form.

Groups:

1. Use the auto-enroll link from your group leader (the person who purchased the course) to enroll as an attendee.
2. Follow the steps above.

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