Evidence-based Literacy Intervention for Individuals with Autism Who Have Limited Speech

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Benefits of literacy skills

- Literacy skills are critically important
  - Allow fuller participation in education
  - Enhance employment opportunities
  - Facilitate use of technologies (e.g., Internet)
  - Support personal expression & social relationships (e.g., texting, blogs, Facebook)
  - Allow access to enjoyable leisure pursuits (e.g., reading, surfing the Internet)

Benefits of literacy skills for individuals with limited speech

- Literacy skills are even more important for individuals with autism who have limited speech
  - Expand communication options significantly
  - Increase perceptions of competence
  - Increase self-esteem
  - Provide visual supports to enhance language learning
  - Provide visual supports to potentially facilitate speech production

Challenges in teaching literacy skills to individuals with ASD & limited speech

- It is challenging for individuals with ASD & limited speech to learn literacy skills
  - Limited access to speech
    - Spoken language is the foundation for written language
  - Limited language skills
    - Limited vocabulary & syntax
  - Limited world knowledge
  - Limited means to express themselves
    - Difficulties participating in standard instruction that requires oral responses
  - Limited opportunities for literacy learning
    - Reduced expectations

Literacy outcomes for individuals with ASD

- Many individuals with ASD who have limited speech
  - do not have basic literacy skills
  - are underachieving in literacy skills compared to typically developing peers
- A significant barrier to improving literacy outcomes is
  - the lack of appropriate evidence-based instruction adapted to meet the needs of individuals with ASD who have limited speech
  - existing literacy curricula require spoken responses

Goals of presentation

- Share evidence-based intervention to enhance the literacy skills of individuals with limited speech
  - Describe intervention
  - Share case examples to illustrate intervention and outcomes
- Part of a larger research project supported by
  - The National Institute on Disability and Rehabilitation Research (NIDRR) as part of grant #H133E030018
  - The Augmentative Communication Fund established by the Annual Forklifts Golf Tournament/ Joe Strada Sr. Memorial Fund
  - Hintz Children's Communicative Competence Endowment

Components of effective evidence-based literacy intervention

1. Sufficient time allocated for instruction
2. Appropriate instructional content
3. Appropriate instructional procedures
4. Adaptations to allow active participation of individuals with ASD who have limited speech
5. Positive rapport & motivating instruction

1. Sufficient time for instruction

- Learning literacy skills is a priority
  - It is essential to ensure that sufficient time is allocated for literacy instruction
- Current best practices recommend
  - All students learning to read (K-3) receive at least 90 minutes of literacy instruction per day
  - "At risk" students should receive an additional 40-60 minutes of instruction per day

1. Sufficient time for instruction

- Allocate sufficient time for literacy instruction with students with ASD & limited speech
  - Start literacy instruction at an early age if possible
  - Provide instruction on a daily basis
- However, our research demonstrates that significant literacy gains can be achieved
  - Even if the amount of instruction is less than ideal
  - Even with older students

2. Appropriate instructional content

- Target appropriate content / skills
- Skills targeted are based on recommendations of National Reading Panel (2000)
  - Reading to student & talking about texts
  - Phonological awareness skills
  - Letter-sound correspondences
  - Decoding skills
  - Shared reading
  - Sight word recognition skills
  - Reading and understanding books / other texts
  - Early writing skills

3. Appropriate instructional procedures

- Utilize effective instructional procedures /teaching methods
  - Procedures that result in successful skill acquisition
- Instructional procedures based on recommendations of National Reading Panel (2000)
  - Direct instruction in basic skills
  - Frequent opportunities to apply these skills in the context of meaningful, motivating literacy activities

3. Appropriate instructional procedures
Direct instruction in basic skills

- Model
  - Instructor demonstrates the skill for the student
- Guided practice
  - Instructor provides scaffolding support /prompts to help the student perform the skill successfully
  - Instructor gradually fades the scaffolding support
- Independent practice
  - Student performs the skill independently
  - Instructor provides feedback

3. Appropriate instructional procedures
Direct instruction in basic skills

- Feedback
  - If student performs skill correctly
    - Instructor provides positive feedback
  - If student is incorrect
    - Instructor directs student's attention to error
    - Models the correct response
    - Provides guided practice for student to ensure success
    - Provides additional opportunities for independent practice

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3. Appropriate instructional procedures
Applying skills in meaningful literacy activities

- Provide frequent opportunities to apply skills in meaningful literacy activities
  - Demonstrate purpose of instruction
    - Increase motivation for learning to read & write
  - Enhance generalization of skills
    - Encourage generalization to new materials /contexts
  - Provide additional opportunities to practice skills
    - Build fluency in basic skills
    - Practice integration of skills required to read and write

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4. Adaptations for individuals with ASD who have limited speech

- Adapt procedures to accommodate unique needs of individuals who have limited speech
  - Eliminate the need for spoken responses
    - Adapt instructional tasks so that they do not require oral responses
    - Provide alternative response modes for the student
      - pictures, letters, words, signs as response options
  - Provide insight into areas of difficulty to support instructional decisions
    - Systematic foils and error analysis
  - Compensate for student's lack of speech production
    - Model oral production /rehearsal for student
    - Encourage internal subvocal rehearsal

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4. Adaptations for individuals with limited speech

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5. Positive rapport & motivating instruction

- Build a positive rapport with student
  - Focus on student strengths; build student's confidence
    - Set appropriately high goals; provide sufficient support to ensure success during instruction
- Build intrinsic motivation for learning
  - Ensure that instructional activities are motivating
  - Provide choices
- Ensure student knows what to expect
  - Use written schedule to structure instruction
  - Use written language to augment input & support comprehension /model use of written language
  - Start by using familiar tasks/ response modes

Choose appropriate instructional tasks/ response formats

- When teaching new skills, it is important to only introduce one new learning demand at a time
  - Avoid cognitive overload
- When teaching new literacy skills, start by using response formats that are already familiar to the student
    - E.g., Children trained in PECS may prefer to hand picture to instructor rather than point to picture in a display (familiar response mode)
    - Children with ASD may perform better when choices are held out to them rather than put on a table (offer of choice is made explicit)
- Later introduce new instructional tasks as student develops competence with the target skill
  - Build generalization

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First steps in literacy intervention

- Skills targeted at first stage of literacy instruction
  - **Reading to student & talking about texts**
  - **Phonological awareness skills**
  - **Letter-sound correspondences**
  - Decoding skills
  - Shared reading
  - Sight word recognition skills
  - Reading and understanding books / other texts
  - Early writing skills
- At each stage of literacy intervention, the instructor targets 3-4 skills

Teach phonological awareness skills

- Phonological awareness refers to understanding or awareness of the sound structure of language
  - the ability to notice, think about and manipulate the phonemes or sounds of words (Torgesen, et al., 1994)
- Focus on skills most highly correlated with literacy outcomes
  - Sound blending – blending individual sounds to form words
    - Necessary for reading
  - Phoneme segmentation– segmenting words into individual sounds
    - Necessary for writing

Instruction in sound blending

- Goal
  - The student will blend sounds presented orally & determine target word
- Task
  - Present 4 or more AAC symbols/ pictures & label them orally
  - Say the target word orally with each phoneme extended 1-2 seconds
  - Student must blend the sounds and
    - point to /select the AAC symbol or
    - say/sign the word

Provide visual supports when teaching phonological awareness skills

- Learning phonological awareness skills imposes significant auditory processing demands
  - Some individuals with ASD have significant difficulties with auditory processing
- It may be helpful to use visual supports when teaching phonological awareness skills
  - Use written words when teaching sound blending
  - Use letter cards when teaching phoneme segmentation

## Teaching sound blending with visual supports

- Present written word with illustration covered
- Instructor points to the letters in sequence
  - Says the letter sounds in sequence with each phoneme extended 1-2 seconds
  - If student knows letter sounds, he/she can say them also
- Student must blend the sounds and
  - select AAC symbol /picture from choices provided or
  - say/sign the word
  - student can then uncover illustration to check response


mad

Instruction in phoneme segmentation

- Goal
  - The student will match a target phoneme (sound) presented orally to the AAC symbol /picture that starts with the phoneme
- Task
  - Present 4 or more AAC symbols /pictures & label orally
  - Say target phoneme (sound)
  - Show letter at the same time
  - Student must
    - point to the AAC symbol /picture of the word that starts with the target phoneme or
   - say/sign the word
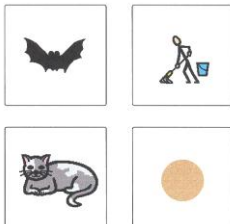
Instruction in letter sound correspondences

- Goal
  - The student will match a target phoneme presented orally to the correct letter
- Task
  - Present several letters
  - Say the target phoneme (sound)
  - Student must select the letter that represents the target phoneme
- Alternative task
  - Show the student a letter
  - Student must say the letter sound

m	y
a	b
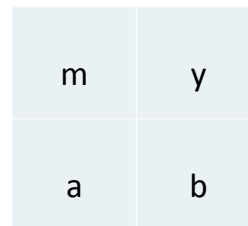
Letter sound correspondence book

- Link target letter sound to words that start with this letter sound
  - Choose words that are familiar & motivating for the student

y
youtube

y
yes
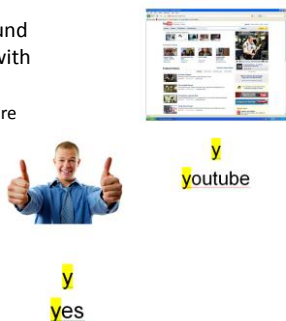
Progression of instruction in letter-sound correspondences

- Teach letter sounds, not letter names
- Introduce letters/sounds incrementally
  - a, m, t, p, o, n, c, d, u, g, h, f, i, s, b, l, e, r, w, k, x, v, y, z, j, q
- Follow these principles in teaching letter sounds
  - Teach lower case letters before upper case ones
  - Teach letters that are used most frequently first
  - Separate in the sequence letters that are similar
  - Teach short vowels before long vowels
  - Teach consonant clusters once most single letter sound correspondences are mastered
  - Adapt letter sound sequence as required to accommodate student needs and preferences

Progression of instruction in letter sound correspondences

- Learning letter sound correspondences is challenging
  - Relationship of letters and sounds is abstract
- Introduce letter sounds one at a time
  - As student masters a letter, introduce a new one
  - Provide regular review of known letters
- Once student knows a few letters/ sounds,
  - Introduce the keyboard in preparation for writing /typing

Adapted keyboard

- Adapt the keyboard
  - letters in lower case
  - target letters highlighted
    - 12 letter sounds acquired

Typical early instructional session 20-25 minutes

5 minutes	Sound blending
5 minutes	Letter sound correspondences
5 minutes	Initial phoneme segmentation
5-10 minutes	Reading books to the student

## Skills targeted in literacy intervention

- Reading to student & talking about texts
- Phonological awareness skills
- Letter-sound correspondences
- **Decoding skills**
- **Shared reading**
- Sight word recognition skills
- Reading and understanding books
- Early writing skills

Next steps in literacy instruction

- Once student
  - Is competent with sound blending and
  - Knows approximately 6-7 letter-sound correspondences
- Teach single word decoding
- Introduce shared reading activities
  - Provide opportunities to apply single word decoding skills in meaningful contexts
- Continue to
  - Teach new letter sound correspondences; review known ones
    - As student learns new letters / sounds, introduce new decoding words
  - Practice phonological awareness skills; build fluency
  - Read to the student & talk about the text

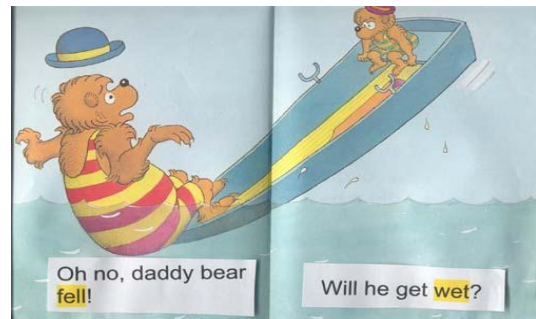## Instruction in single word decoding

- Goal
  - The student will decode a written word & match it to the correct AAC symbol /picture or say/sign the word
- Task
  - Present 4 or more AAC symbols/ pictures; review
  - Present the target written word
  - Student must read the word and
    - point to / select the AAC symbol /picture of the target word or
    - match the word card to the symbol /picture or
    - say/sign the word

bed
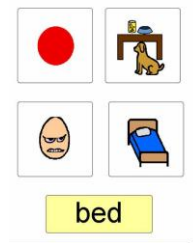
Instruction in shared reading
Apply decoding skills

- Goal
  - The student will decode target written words during shared reading and will match target word to the correct picture or say or sign the word
- Task
  - Present the written sentence with the target word highlighted
  - Read the sentence out loud, pausing at the target word
  - Student must read target word and then
    - Say the word or
    - Sign the word or
    - Point to the picture /AAC symbol of the target word from an array of pictures /symbols

Shared reading of adapted storybooks

Oh no, daddy bear fell!   Will he get wet?

Typical instructional session
30 minutes

5 minutes	Letter sound correspondences • Teach new sounds & review known
10 minutes	Single word decoding
10 minutes	Shared reading activities • Apply decoding skills
5 minutes	Review sound blending & phoneme segmentation skills

Skills targeted in literacy intervention

- Reading to student & talking about texts
- Phonological awareness skills
- Letter-sound correspondences
- Decoding skills
- Shared reading
- **Sight word recognition skills**
- **Reading and understanding books**
- Early writing

Next steps in literacy instruction

- Teach sight word recognition skills
  - High interest words that are difficult to decode
    - Provide instruction in high interest words early on
    - Builds motivation & allows them to experience success quickly
  - High frequency words that are irregular /difficult to decode
- Expand decoding skills
  - Gradually increase range of words
  - Introduce longer, more complex words
- Provide opportunities to apply both decoding & sight word skills during shared reading
  - Gradually increase the number of target words until students are reading full sentences

Instruction in sight word recognition

- Goal /task
  - Present 4 or more written words
  - Say the target sight word
  - Student must select the correct written word from the choices
  - Use this task if sight words are not easily imaged

Spiderman	Power Ranger
Thomas	school

Instruction in sight word recognition

- Alternative goal / task
  - Present 4 or more AAC symbols/ pictures; review
  - Present the target written word
  - Student must read the word and
    - point to / select the AAC symbol /picture of the target word or
    - match the word card to the symbol /picture or
    - say/sign the word

Instruction in decoding
more complex words

- Expand decoding skills
  - Gradually increase range of words
  - Introduce longer words
    - regular cvcc words (e.g., wind, fast)
    - regular ccvc words (e.g., stop, flag)
  - Introduce simple decoding rules
    - silent e /long vowel

Learning to read books

- Once the learner is decoding words, recognizing sight words, and applying these skills consistently in shared reading activities,
  - Continue to expand sight word recognition skills
  - Continue to expand decoding skills
  - Expand participation in book reading
    - Increase number of targeted words per sentence
    - Teach new words in context
    - Transition to reading entire sentences / simple stories

Typical instructional session
30-40 minutes

5-10 minutes	Sight word recognition skills
10 minutes	Single word decoding
15-20 minutes	Book reading activities • Apply decoding /sight word skills

Building reading comprehension

- Reading comprehension is a complex process; the learner must
  - track through sentence from left to right
  - decode or recognize by sight each word in sequence
  - access meaning of words
  - process all words in sequence to derive meaning of sentence
  - relate meaning to prior knowledge to comprehend text
- In order to build reading comprehension skills
  - First ensure student has basic factual understanding of text
  - Then introduce more complex reading comprehension strategies

Ensure basic comprehension skills

- Goal
  - Student will
    - decode or recognize by sight each word in sentence in sequence
    - access meaning of words
    - process all words in sequence to derive factual meaning of sentence
- Task
  - Present 3 or more pictures /illustrations
    - Choose foils carefully so that student must read & understand entire sentence
  - Present the written text
  - Student must read the sentence and point to / select the correct picture
- Alternative Task
  - Student summarizes text using speech, sign, or AAC symbols/ pictures
    - Who? What happened?

Building reading comprehension skills
Answering reading questions

- Student reads the text
  - Initially student reads one sentence/page; answers question
    - Reduce working memory demands
  - Later reads several pages; then answers questions
- Instructor asks appropriate questions
  - Start with simple factual questions
  - Later introduce more complex inference questions
- Student may respond to questions via
  - Speech
  - Signs
  - Pointing to pictures or written choices in multiple choice questions
  - Typing answers /using letter cards

Skills targeted in literacy intervention

- Reading to student & talking about texts
- Phonological awareness skills
- Letter-sound correspondences
- Decoding skills
- Shared reading
- Sight word recognition skills
- Reading and understanding books
- **Early writing skills**

Building writing skills

- Writing skills are also critical in today's society
  - Increased importance with increased use of technology
- Writing should be an integral part of literacy instruction
  - Often neglected
  - Teach writing skills in parallel to reading skills
- Learning to write is more difficult than learning to read
  - Writing imposes additional working memory demands
    - Requires learner to dynamically encode (Ehri, 2000)

Building writing skills

- Skilled writing requires integration of
  - Narrative skills / skills in other genres
  - Semantic, syntactic and morphological skills
    - Language skills to structure sentences /phrases
  - Phoneme segmentation skills
    - Skills to break down words into component sounds
  - Letter sound correspondences
    - Skills to encode sounds into written letters
  - Spelling skills for irregular words
  - Keyboard knowledge and/or handwriting skills
  - Knowledge of conventions of writing
    - Capitalization, punctuation

Writing intervention

- As with reading instruction, writing instruction should include
  - Direct instruction in basic skills
  - Numerous opportunities to apply these skills in meaningful writing activities

Teach basic skills for writing

- Provide direct instruction in basic skills required for writing
  - Phoneme segmentation skills
  - Letter-sound correspondences
  - Keyboard knowledge
    - Adapted keyboard
  - Encoding skills – spelling single words

Apply skills during meaningful writing activities

- Provide opportunities to apply skills in meaningful writing activities
  - Writing simple stories
    - Start with familiar motivating experiences / interests
    - Use photos or pictures as visual supports
    - Initially use word cards to write simple stories
    - Introduce letter by letter spelling as student develops competence with single word encoding
    - Gradually increase the length and complexity of the stories

Research results
Outcomes of literacy intervention

- 3 case examples from larger federally funded research grant
- Participants in larger grant
  - 3 years old to adolescents
  - Wide range of special needs
    - autism, cerebral palsy, developmental apraxia, Down syndrome, multiple disabilities
  - Using various means of communication
    - speech approximations, signs, PECS, speech generating devices (SGDs)
- Results of larger grant
  - 100% of all participants acquired conventional literacy skills
    - 100% of participants with ASD acquired conventional literacy skills
  - Schools & families reported high levels of satisfaction with instruction and outcomes

The art and science of literacy intervention

- The science of literacy intervention
  - Implement effective evidence-based instruction
    1. Allocate sufficient time for instruction
    2. Target appropriate instructional content / skills
    3. Implement effective instructional procedures
    4. Provide adaptations to allow active participation of individuals with autism who have limited speech
    5. Build positive rapport and ensure motivating instruction
  - Monitor effectiveness with each student
   - Adapt instruction as required to ensure individual success

The art and science of literacy intervention

- The science alone is not enough
- The "art" of literacy intervention is also critical
  - the belief and the commitment to the right of all individuals to have the opportunity to learn & seek their full potential

Additional resources

- Website
  - Light, J. & McNaughton, D. *Literacy instruction for learners with autism, cerebral palsy, Down syndrome and other disabilities*. http://aacliteracy.psu.edu
- Webcast
  - Light, J. & McNaughton, D. (2010). *Improving literacy outcomes for individuals with autism spectrum disorders and limited speech.* Webcast presented at http://aacliteracy.psu.edu/index.php/page/show/id/17
  - Light, J. & McNaughton, D. (2006). *Maximizing the literacy skills of individuals who require AAC.* Webcast presented through the AAC-RERC. www.aac-rerc.com
- Instructional resources
  - Light, J. & McNaughton, D. (2009). *Accessible Literacy Learning (ALL): Evidence-based reading instruction for learners with autism, cerebral palsy, Down syndrome and other disabilities.* San Diego, CA: Mayer-Johnson
- Selected publications
  - Light, J. & McNaughton, D. (2009). Meeting the demands of the curriculum for conventional and advanced readers and writers who require AAC. In G. Soto & C. Zangari (Eds.). *Practically Speaking: Language, literacy, and academic development for students with AAC needs.* Baltimore, MD: Paul H. Brookes Publishing Co.
  - Light, J., McNaughton, D., Weyer, M., & Karg, L. (2008). Evidence-based instruction for individuals who require augmentative and alternative communication: A case study of a student with multiple disabilities. *Seminars in Speech and Language, 29,* 120-132.

For further information on literacy intervention, visit http://aacliteracy.psu.edu
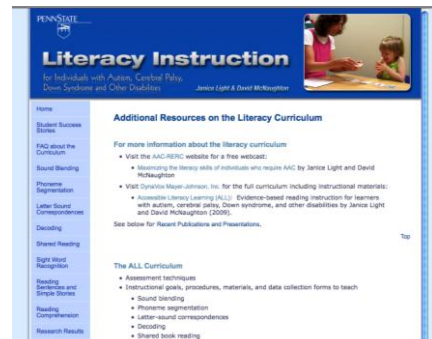
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