Evidence-based Strategies in Augmentative and Alternative Communication (AAC) and Applied Behavior Analysis (ABA) for Autism and Developmental Disabilities

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Program

- AAC in Autism Introduction
  - Picture Exchange Communication System (PECS)
  - Speech-Generating Devices (SGDs)
- Moving from PECS to SGDs and iPads
- Effects of iPad-based Interventions
- Verbal Behavior (VB) Review
- Selection-based vs. Topography-based VB
- Programming Selection-based VB using SGDs
- General Recommendations

Autism Spectrum Disorders (ASD)

Triad of symptoms with
1. Impairments in language and communication
   - Deficits in language can range from completely nonverbal to acquiring the ability to speak.
2. Impairments in social interaction
   - Results in lack of motivation to communicate with other people – even when these individuals have acquired some language competence and use.
3. Restricted and repetitive patterns of behavior
   - Pre-occupation with restricted patterns of interest can impede social and communicative development.

Language Difficulties

When expressive language develops, first word often spoken between 2-3 yrs., but early language marked by
- Delay in development of intentional communication
- Greater propensity to use challenging behavior to communicate
- Limitations in joint attention, range of communicative functions, higher proportion of imperatives
- Repetitive or idiosyncratic language
  (Prelock, 2006)

Proportion of Nonverbal Children with ASD

- Autism includes a “delay in, or lack of the development of spoken language” (American Psychiatric Association, 2000)
- 14-25% of children diagnosed with an autism spectrum disorder (ASD) present with little or no functional speech (Lord & Bailey, 2002; Lord, Risi, & Pickles, 2004)
  - Autistic disorder only: 50% of children are functionally non-verbal
  - No sufficient natural speech or writing to meet their daily communication needs (Light, Roberts, DiMarco, & Greiner, 1998) => Candidates for intervention in augmentative and alternative communication

Disclosure Statement

Oliver Wendt is Chief Science Officer for SPEAK MODalities, LLC.
Other Developmental Disabilities (DD)

- Intellectual Disability: umbrella term for large range of syndromes and conditions that result in cognitive impairment
  - Commonly experience significant difficulty with spoken communication
  - Many do not use speech as primary mode of communication
  - High incidence of problem behavior
- Cerebral Palsy
  - Unique motor control issues
  - Up to two thirds also experience intellectual disability

Proportion of Nonverbal Children with DD

- Prevalence of Intellectual Disability is between 1-3% worldwide (WHO, 2001)
- ID may be largest proportion of school-age individuals that require AAC supports
- Up to 38% of preschool-age children with ID have AAC needs (Beukelman & Mirenda, 2013)
- AAC is crucial part of service delivery to this population (National Joint Committee for the Communication Needs of Persons with Severe Disabilities, 2003)

AAC and Autism

- AAC strategies particularly used in ASDs/DDs:
  - Manual signs and gestures
  - Pictographic symbols sets/systems
  - High technology speech generating devices (SGDs) for synthesized and/or digitized speech output
- Practitioners face difficult task selecting a suitable approach
- Evidence-based practice (EBP):
  - Using research outcomes as a major basis for clinical and educational decisions (Lloyd, 2001)

Evidence-based Strategies in AAC

EXCHANGE-BASED GRAPHIC SYMBOL SETS

Picture Exchange Communication System (PECS)

- Structured behavioral intervention program to teach use of visual-graphic symbols for communication (Bondy & Frost, 1994)
- Teaches to make requests by handing/exchanging symbols for desired items

Picture Exchange Communication System (PECS)

- Picture Exchange Communication System (PECS) protocol (Bondy & Frost, 1994)
  - Phase I: Physical Exchange
  - Phase II: Expanding Spontaneity
  - Phase III: Picture Discrimination
  - Phase IV: Sentence Structure
  - Phase V: Responding to “What do you want?”
  - Phase VI: Responsive and Spontaneous Commenting
Why Choose PECS?
- Requires very few prerequisites
  - Only prerequisite individual can clearly indicate wants and needs
- First skill taught in PECS is requesting
  - Often targeted in early instruction of individuals with developmental disabilities due to motivational considerations (Reichle & Sigafoos, 1991)
- Systematically targets spontaneous communication acts, a particular deficit in autism
- PECS graphic symbols are highly iconic
  - Can be easily recognized by the learner and are more recognizable by communicative partners

PECS: Empirical Evidence
- Systematic reviews (particularly meta-analyses) are preferred evidence to document empirical support:
  - Preston and Carter (2009)
    - Increase in communication skills in most learners, effects on problem behavior reduction and increasing natural speech less clear
  - Hart and Banda (2010)
    - Increases in functional communication skills in all but 1 subject
  - Flippin, Reszka, and Watson (2010)
    - “Promising but not yet established evidence-based intervention for facilitating communication in children with ASD ages 1–11 years”

PECS Summary
- Considerable empirical support for using PECS as a beginning communication strategy
- Overall shows strong effectiveness for teaching initial requesting skills
- Some evidence to indicate: more effective than manual signing in terms of requesting
- Effect is less clear for other outcome variables such as speech production, social or challenging behavior
- When treatment goals is speech production ⇒ no sufficient evidence to inform practice in favor of PECS or manual signing
  - In general, mixed results on this outcome measure

PECS Summary (cont.)
- Methodological issues in PECS studies
  - Often lack investigation of maintenance
  - Skill generalization sometimes reported, but what counts as generalization varies greatly
  - Participant descriptions lack detail
  - Sparse reports of treatment integrity

⇒ PECS appears as a promising intervention that presents with emerging empirical support, but critical questions are still to be answered

Speech-Generating Devices (SGDs)
- Portable, computerized devices producing synthetic or digitized speech output when activated
- Graphic symbols are used to represent messages, activated by finger, switch, head stick, etc., selecting a symbol from the display
- LightWRITER
- BIGMack

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SPEECH-GENERATING DEVICES
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SGDs (cont.)
- Fixed Display
  - Graphic symbols located in separate squares of a grid, organized into rows and columns
  - Limited vocabulary
- Dynamic Display
  - Selection from a display results in a new array of graphic symbols
  - Larger vocabulary sets

SGDs (cont.)
- Visual Scene Displays
  - Language concepts are embedded into contextual scenes
  - Objects and events within the photograph are then used as symbols for communication
  - May be used in a dynamic display system
- Example of a child with ASD using an SGD:
  - http://www.youtube.com/watch?v=s4GAX-IXE_k&NR=1
- Example of synthetic speech output:
  - http://www2.research.att.com/~ttsweb/tts/demo.php#top

⇒ Not ideal for learners with severe autism due to sensory processing difficulties

Why Choose SGDs?
- Allows composing more detailed messages
  - Enable user to communicate very precise requests and prevent communication breakdown
- Voice output (aka speech output) may facilitate acquisition and maintenance of communication skills
- Producing speech can be perceived as more natural
  - Better intelligibility
  - Easier to get attention
  - Higher likelihood of receiving a listener response
- iPads and other tablet devices are
  - Lightweight and portable
  - Cost-efficient compared to dedicated SGDs
  - Easy to program
  - Highly motivating to use
  - Socially appealing (peer acceptance)
SGDs: Empirical Evidence

Baseline Video Clip

PECS Phase I Video Clip
End

PECS Phase II Video Clip
End

ProxTalker Phase II Video Clip
Beginning

ProxTalker Phase V
End

iPad Phase
End
- Moving from Mid-Technology (ProxTalker) to High-Technology (iPad)

Demo IPAAC app (c) Purdue University
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**SPEAKall!**
- Originally developed by Purdue Engineering Students
- The purpose is to help teach the process of constructing simple sentences and early symbol vocabulary
- Customizable to each child’s specific needs
- Seamlessly connects with PECS or ProxTalker intervention
- Selection Area on top replaces PECS book
- Sentence Strip at bottom speaks selected graphic symbols
- **DOWNLOAD ON ITUNES:**
  - Search for “speakall!”
  - Free version
  - SPEAKall! Premium ($24.99)
  - SPEAKall! Premium Plus ($39.99)

**SPEAKall! Benefits**
SPEAKall! is based on Rigorous Scientific Research

**Brain Imaging Evidence**
Pre-treatment brain activity
Post-treatment brain activity
Behavioral Evidence
SPEAKall! Benefits
SPEAKall! allows an easy transition from exchange-based communication to using a tablet device.

SPEAKall! Benefits
SPEAKall! is an autism-friendly app that reduces cognitive load and minimizes sensory difficulties.

Autism Apps can be Noisy Places for Those Who Cannot Process It

- Difficulty to filter out salient and truly important incoming stimuli from a stimulus-rich environment (Minshew & Williams, 2007)
- For the beginning communicator with autism, graphic symbols should be carefully chosen and not be presented alongside other conflicting visual stimuli on the screen
- Hierarchical organization of graphic symbol vocabulary increases cognitive load

Case Example: Difficulty with Hierarchical Organization

SPEAKall! can be used with children, adolescents AND adults.
Evidence-based Strategies in AAC

SPEAKall! Benefits
SPEAKall! allows parents to be involved in intervention

SPEAK MODalities
Future Products
- SPEAK together!
  - Cloud-based data management
- SPEAK cloud!
  - Cloud-based content/Sharing of content
- SPEAK one!
  - Cause and effect, tablet candidacy
- SPEAK more!
  - Training of language and generalization

Hands-On Exercises
- How to Program SPEAKall!
  - Basic Navigation
  - Play Mode
    - Learner Selection
    - Learner Settings
    - Preferences
    - Screen Lock
  - Administrator Mode
    - Learner Profiles
    - Media Collections
    - Add Activities
    - Manage Activities

Check out “SPEAK MODalities” YouTube channel for tutorials!

SPEAKall! Resources
- Website: www.speakmod.com
- YouTube Channel: http://www.youtube.com/channel/UCNg-ywou0ESwl_wwPDvhGUOG
  OR SEARCH: SPEAK MODalities
- Facebook Site: https://www.facebook.com/speakmod

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Evidence-based Strategies in AAC
EFFECTS OF IPAD-BASED AAC

Participant Characteristics

<table>
<thead>
<tr>
<th>Participant</th>
<th>Dx*</th>
<th>Communication Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>“1”: Male, 10 yrs.</td>
<td>severe autism</td>
<td>limited speech – vocalizations, gestures</td>
</tr>
<tr>
<td>“2”: Male, 13 yrs.</td>
<td>severe autism</td>
<td>limited speech – vocalizations, jargon</td>
</tr>
<tr>
<td>“3”: Male, 10 yrs.</td>
<td>severe autism</td>
<td>highly echolalic, jargon, no functional, meaningful words</td>
</tr>
<tr>
<td>“4”: Male, 12 yrs.</td>
<td>severe autism</td>
<td>mainly nonverbal with few vocalizations, some gestures</td>
</tr>
</tbody>
</table>

*based on ADOS and CARS scores

iPad and SPEAKall!
Participant 3 - Baseline

iPad and SPEAKall!
Participant 3 - Middle Stages

iPad and SPEAKall!
Participant 3 – End
Conclusions

- Findings provide support that AAC can have facilitative effect on natural speech development
  - There may be a particular role for shaping echolalic utterances
  - Refute myth that AAC prevents speech
- Confirm augmented input may enhance expressive and receptive communication development
- Confirm PECS principles (behavioral) hold true regardless of modality
Evidence-based Strategies in AAC

Benefits of Parent Involvement

- Involving parents as trainers can maximize benefits of speech-language interventions (Kaiser et al., 2000)
  - AAC interventions can be expensive
  - Often lack of qualified personnel
  - If parents can be trained to conduct AAC intervention at home, children may obtain more consistent benefits from AAC without extra costs
- Little research in AAC and ASD on parent-training (Park et al., 2011)

Training Approach

- Parent-implemented intervention: Parents receive comprehensive training
  - General workshop at parent support group
  - Written instructions
  - Modeling and role playing
  - Video resources
  - Sole trainer for child, clinician only provides feedback
- Two clinicians with advanced PECS training independently checking sessions for treatment integrity.
- Treatment schedule was 2 days/week, with 1-2 sessions each day

Parent Training

- 1. Conduction a preference assessment. Repeat this every 5 trials.
- 2. Put a bag of the preferred snack item on the table and have the corresponding graphic symbol displayed in SPEAKall!
- 3. Trainer 1: place iPad in front of the child and entice with the preferred item.
- 4. Trainer 2: provide prompting for dragging and dropping graphic symbol onto sentence strip. Fade out over time.
- 5. Trainer 1: once sentence strip is activated, give desired item to child and say the item name.
- 6. Give the child time to consume the snack item or play with the preferred toy.
- 7. Trainer 1: press “return cards” button to start a new trial. Begin to entice with the desired item again.
- 8. Switch communication partners. Make sure child can request at least 3 different items before moving on to the next phase.

Parent Training (cont.)

- Modeling of intervention steps
- Role-playing with clinician
- Treatment integrity checklists for each phase
- Need to have 100% correct during role-play

Training materials:
- Cheat sheets
- YouTube videos

www.youtube.com/channel/UCNq-yegu0ESeLaePDvG8GUQg
Participant Characteristics

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age/Gender</th>
<th>Dx*</th>
<th>Communication Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sally</td>
<td>7 yrs./Female</td>
<td>severe autism</td>
<td>some echolalia and scripted speech, less than 15 functional words</td>
</tr>
<tr>
<td>Leo</td>
<td>8 yrs./Male</td>
<td>moderate-severe autism, dual diagnosis: Down syndrome</td>
<td>no vocalizations, no functional speech</td>
</tr>
<tr>
<td>Stan</td>
<td>6 yrs./Male</td>
<td>severe autism</td>
<td>vocalization and jargon, no meaningful words, no functional speech</td>
</tr>
</tbody>
</table>

*based on ADOS and CARIS scores

Participant Sally

Phase 1 – One-symbol Requests

Phase 2 – Distance and Persistence

Phase 3 – Symbol Discrimination

Phase 4 – Sentence Structure
Participant Sally
Phase 5 – “What Do You Want?”

Participant Sally
Phase: iPad Fadeout

Participant Sally
Maintenance and Generalization

Current Progress: Participant Leo

Current Progress: Participant Stan

Families That Dropped-out
Discussion

- Results underscore the potential of including parents for maximizing benefits of AAC intervention in autism
- Clinicians should recognize the value of joint parent-professional partnerships, and develop expertise for parent training
- PECS principles (behavioral) and instruction can be combined with parent training

Discussion (cont.)

Potential limitations to parent-implemented intervention:
- Burden on family schedule
- Ability to handle problem behavior
- Finding trained personnel to work with

Parent Perspective

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Questions ???

References


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References: PECS to SGDs


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