

# Speech-Language Pathology & Applied Behavior Analysis



## *Implementation of Speech Generating Devices (SGDs) Using a Behavior Analytic Framework*

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# LEARNER OUTCOMES



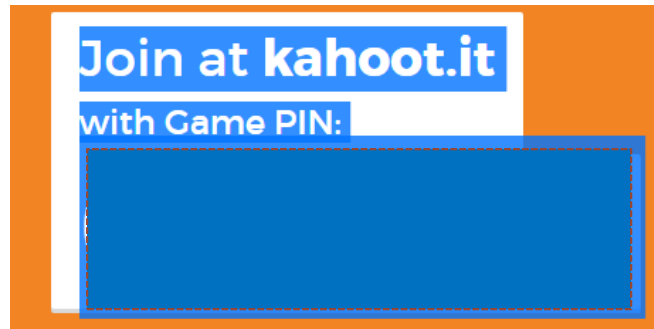
- The participant will identify the levels of evidence for use of a speech generating device (SGD) specific to the ASD population as compared to the evidence that is cited in evidence-supported treatment (EST) summaries.
- The participant will identify the required components for assessment, goal development, and programming of the SGD in order to match the learner's communication needs and preferences.
- The participant will identify appropriate communication targets to measure in order to determine learner skill acquisition with respect to their individualized communication needs.

# WELCOME



GRAB A DEVICE AND GO TO  
[HTTPS://KAHOOT.IT/](https://kahoot.it/)

ENTER THE PIN



MAKE UP A NICKNAME ( GO AHEAD MAKE IT  
FUN)

GET READY TO PLAY!!!!

# Background Information



- **DEFINITION OF AAC**
- **HISTORY OF AAC USE FOR ASD**
- **DEFINITIONS PERTINENT TO AAC AND ASD**
- **EXAMPLES OF AAC:**
  - AUGMENTATIVE COMMUNICATION
  - ALTERNATIVE COMMUNICATION INCLUDING HIGH TECH DEVICES (VOCAs, SGDs), MID TECH AND LOW TECH SYSTEMS

# DEFINITION OF AAC



## **International Society of Augmentative and Alternative Communication (ISAAC)**

*“... a set of tools and strategies that an individual uses to solve everyday communicative challenges. The mode in which communication occurs is secondary, as long as the intent and meaning are understood by the communication partners. The mode of communication can be speech, text, gestures, body language, touch, sign language, symbols, pictures, speech-generating devices, etc. Everyone uses multiple forms of communication, depending on the context and our communication partner.” ([ISAAC, 2016](#))*

**ISAAC’s definition has a focus on forms of communication.**

# DEFINITION: AAC



## American Speech-Language-Hearing Association (ASHA)

*“It is the position of the American Speech- Language- Hearing Association that communication is the essence of human life and that all people have the right to communicate to the fullest extent possible. No individuals should be denied this right, irrespective of the type and/or severity of communication, linguistic, social, cognitive, motor, sensory, perceptual, and/or other disabilities they may present.” (Augmentative and Alternative Communication, 2016)*

**ASHA’s definition has a focus on areas of research, clinical, and educational practice.**

# HISTORY OF AAC



- The use of alternative methods of communication can be traced back to classical Rome and ancient Greece when Plato was writing about sign language used by deaf Athenians around 385 B.C.
- There are also manual languages documented for the deaf in European cultures between the sixteenth and eighteenth centuries. These manual languages were also used by Native Americans who had a system of gestures to interact with other tribes, which led to the creation of a complex method of communicating between speakers of multiple languages.
- These were the foundations of a field we know today as Augmentative and Alternative Communication (AAC).

# HISTORY OF AAC WITH INDIVIDUALS WITH DISABILITIES



- The use of AAC began in the 1920s when professionals started using communication boards to treat individuals with severe disabilities.
- Modern use of AAC began in the 1950s and 1960s with the earliest electronic communication device, the Patient Operated Selector Mechanism (POSM).
- During the 1960s and 1970s, the use of manual sign language and then graphic symbol communication grew greatly.
- In 1966, Barry Romich and Ed Prentke created the Prentke Romich Company. In 1969, the company produced its first communication device, a typing system based on a discarded Teletype machine. Today PRC is one of the main manufacturers of dedicated AAC devices.
- It was not until the 1980s that speech-generating AAC began to emerge as a field in its own right. Rapid progress in technology, including microcomputers and speech synthesis, paved the way for communication devices with speech output and multiple options for access to communication for those with physical disabilities.

# HISTORY OF AAC USE FOR ASD



- Professionals began applying the principles of behavioral psychology in the 1960s to help individuals with autism and related disabilities communicate.
- Speech-Language Pathologist, Beverly Vicker, from the University of Iowa State Hospital-School documented her efforts to create communication boards for people with varied disabilities in her book “Nonoral communication system project 1964–1973”.
- A major advance in the field came in 1971 when Shirley McNaughton of the Ontario Crippled Children’s Centre started working with Blissymbolics.

# HISTORY OF AAC USE FOR ASD



- Picture Exchange Communication System (PECS) was developed in 1985 by Andy Bondy, PhD and Lori Frost, CCC-SLP specifically for children with ASD. It is currently the only manualized AAC system with empirical evidence for children with ASD.

... And today, the use of aided and unaided, low-tech, mid-tech and hi-tech AAC is prevalent with individuals with complex communication needs, including individuals on the autism spectrum.

# 30 YEARS OF AAC RESEARCH

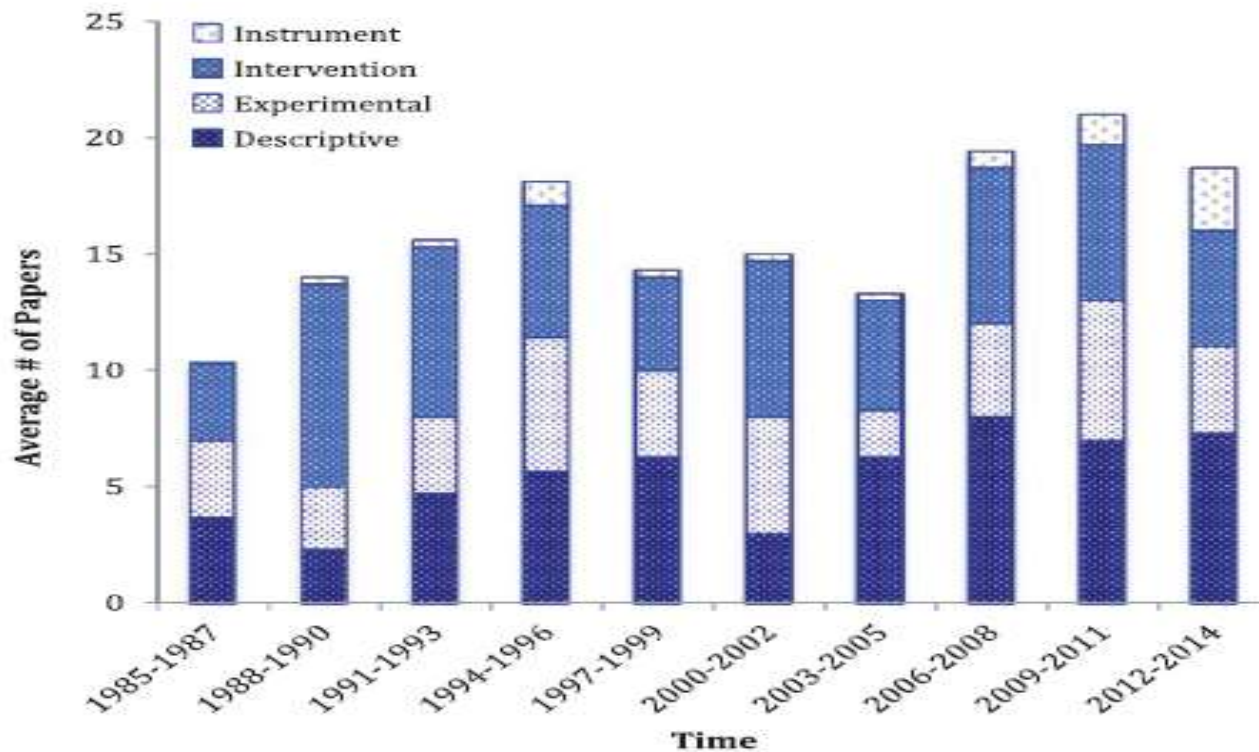


Figure 2. Number and types of research papers published between 1985 and 2014 (presented as average number of papers per year during 3-year time spans).

# 30 YEARS OF AAC RESEARCH

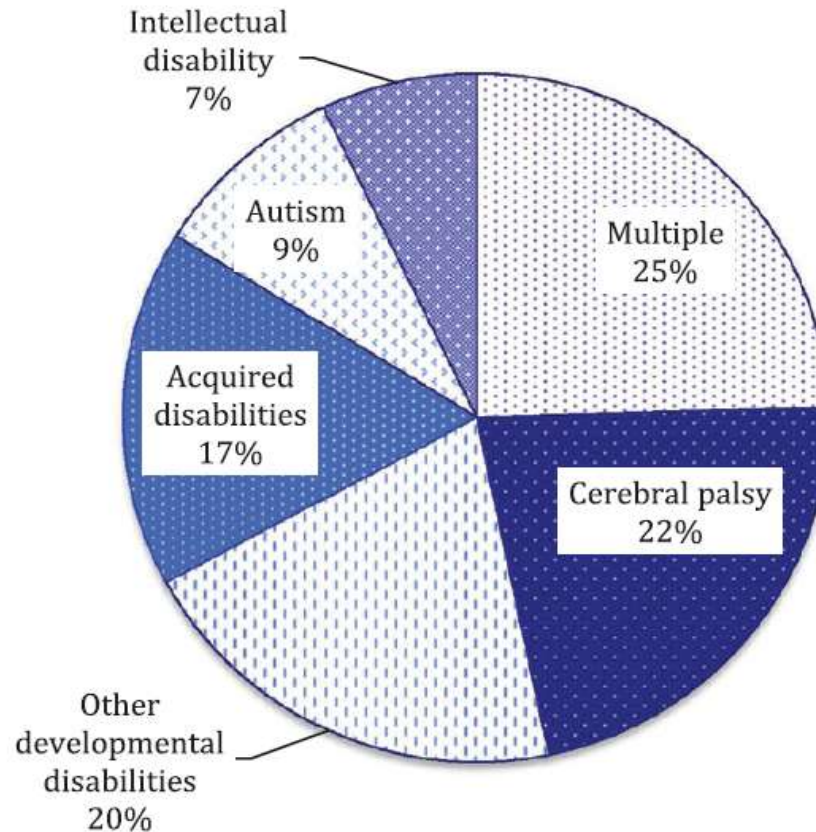
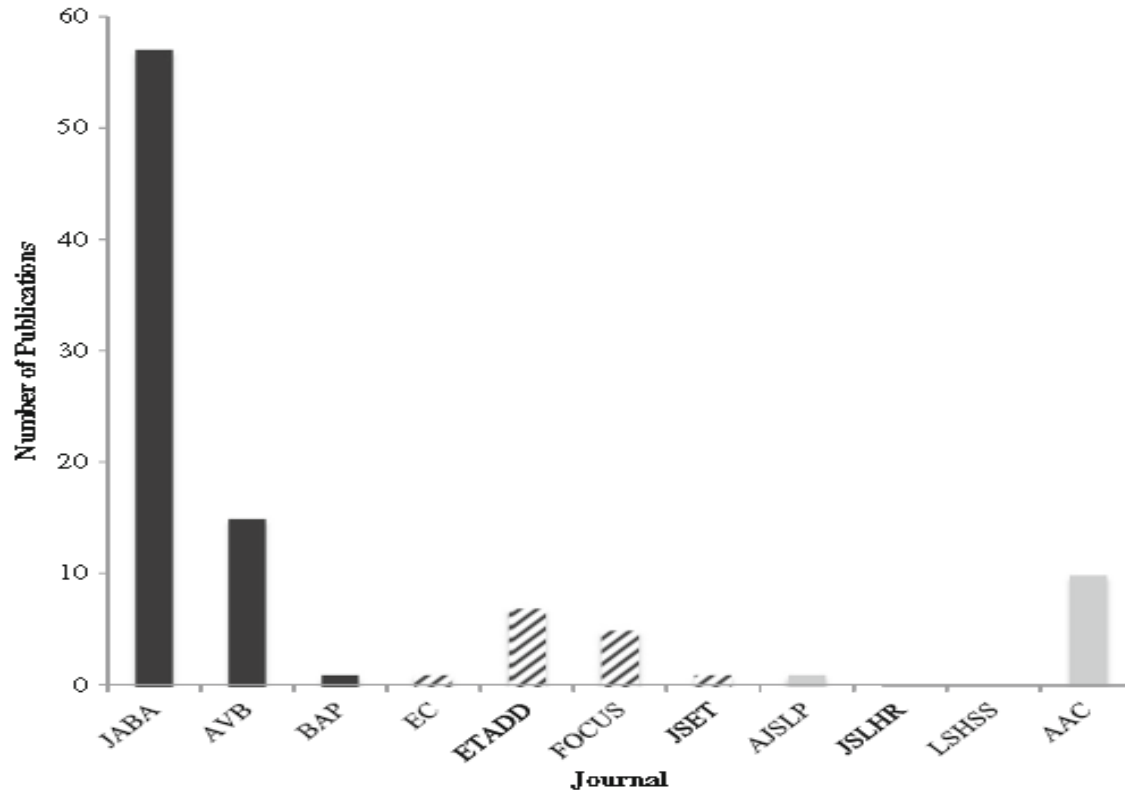


Figure 4. Percentage of intervention research papers published between 1985 and 2014 that included an individual with the listed disability.

# 10 YEARS OF MAND RESEARCH



**Fig. 1** Frequency of mand publications by journal and sets of journals. *Black bars* show applied behavior analysis journals, *lined bars* show special education journals, and *gray bars* show speech-language pathology journals

# AIDED VERSUS UNAIDED AAC



AAC systems may be roughly classified into one of two categories ([Beukelman & Mirenda, 1998](#); [Romski & Sevcik, 1988](#))

- "Aided" AAC: a book, picture, item, board, or device. Aided AAC utilizes external materials ranging from low-tech systems to mid-tech systems to high-tech devices. Behavior-analytically speaking, these are selection-based systems.
- "Unaided" AAC: no book, board or device. Unaided AAC modes do not require the use of external materials. Behavior-analytically speaking, these are topography-based systems.

# AIDED AAC



- Paper/Pencil
- 2D symbols
  - ✦ Photographs
  - ✦ Simple line drawings (PCS, Picsyms, Dynasyms, Makaton drawings, Imaginart, Rebus, Pictograms)
  - ✦ Complex line drawings (Blissymbolics, Unity vocabulary with Minspeak symbols, Gateway with DynaSym symbols, orthographics)

# AIDED AAC



- **3D objects or symbols**

- ✦ **Tangible symbols with the simplest representations**

- Real objects
    - Miniature objects
    - Partial objects

- ✦ **Tangible symbols with abstract representations**

- Braille
    - Tactile 2D symbols (Blissymbolics, Makaton symbols)

# UNAIDED AAC



- **Unaided systems with the simplest representations**
  - Gestures
  - Vocalizations
  - Touch
  - Body Language
  - Facial Expressions
- **Unaided systems with the simplest representations**
  - American Sign Language
  - Fingerspelling
  - Sign Languages (Sign English, Signed English, Signed Exact English I and II, Key-Word Signing, Makaton signs, British Sign Language, etc.)

# DEFINITIONS PERTINENT TO AAC AND ASD



## What Do All The Other Acronyms Mean?

- PECS – Picture Exchange Communication System
- SGD – Speech Generating Device
- VOCA – Voice Output Communication Aid
- LAMP – Language Acquisition through Motor Planning
- ALgS or ALS – Aided Language Stimulation
- PODD - Pragmatic Organisation Dynamic Display

# EXAMPLES OF AIDED AAC



- AUGMENTATIVE COMMUNICATION
- ALTERNATIVE COMMUNICATION INCLUDING HIGH TECH DEVICES (VOCAs, SGDs), MID TECH AND LOW TECH SYSTEMS

# AIDED AAC OVER THE YEARS



The patient-operated selector mechanism (POSM or POSSUM), was developed in the early 1960s



Mayer-Johnson Picture Communication Symbols on an O-ring



Dynavox T10 – Visual Scene Display



Word Power



Pocket PC



Tobi Snap Core



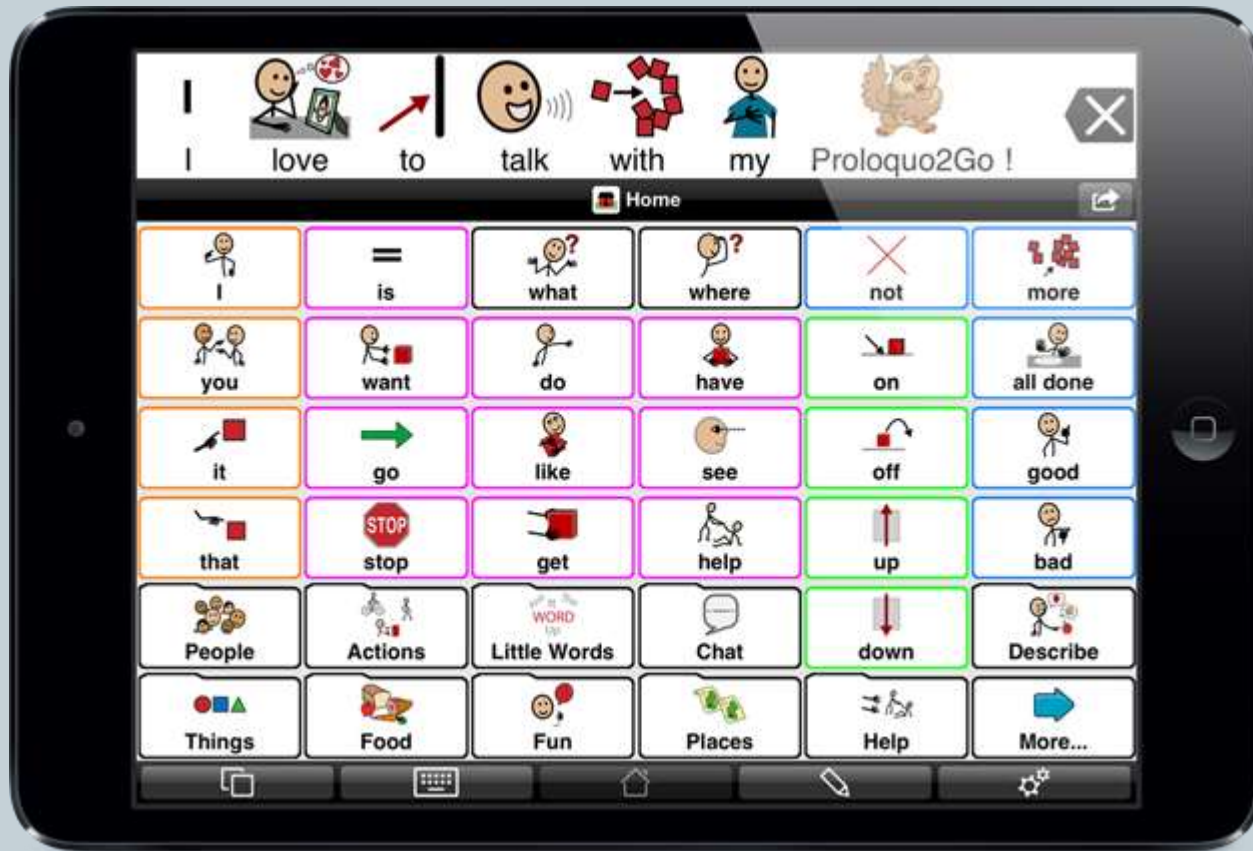
Zygo Laptop



Canon Communicator



# COMMON AAC APPS



[Proloquo2Go](#)

# COMMON AAC APPS



LAMP Words For Life

# AND MORE AAC APPS



<a href="#">1. AlexiCom AAC</a>	<a href="#">21. My Choice Pad Lite: NEW</a>	<a href="#">41. Sounding Board: NEW</a>
<a href="#">2. Answers: Yes/No Free</a>	<a href="#">22. My Talking Phone</a>	<a href="#">42. SFY Speak4Yourself Lite: NEW</a>
<a href="#">3. Augie Free (Free version not currently available in US)</a>	<a href="#">23. MyTalk Tools</a>	<a href="#">43. Speech Button: NEW</a>
<a href="#">4. Autism 5-Point Scale EP (Autism Help)</a>	<a href="#">24. Neo Julie (also Kate and Paul)</a>	<a href="#">44. Speech Buttons Free</a>
<a href="#">5. Com App</a>	<a href="#">25. Noni Lite</a>	<a href="#">45. Sono Flex Lite</a>
<a href="#">6. Comunicador Personal Adaptable(Spanish)</a>	<a href="#">26. OneVoice-AAC</a>	<a href="#">46. Speak All</a>
<a href="#">7. Communicate Mate Female: NEW</a>	<a href="#">27. Phrase Board</a>	<a href="#">47. Speak for Yourself LAT Kids</a>
<a href="#">8. Communicate Mate Male: NEW</a>	<a href="#">28. Pic A Word</a>	<a href="#">48. Spubble Lite</a>
<a href="#">9. Connect Cards:NEW</a>	<a href="#">29. Pics Aloud Lite</a>	<a href="#">49. Talk Assist</a>
<a href="#">10. DIME Lite</a>	<a href="#">30. Picture Card Maker</a>	<a href="#">50. Talking Cards Lite: NEW</a>
<a href="#">11. FreeSpeech: NEW</a>	<a href="#">31. Picture Board</a>	<a href="#">51. Talking Text</a>
<a href="#">12. Functional Communication System Lite: NEW</a>	<a href="#">32. PocketAAC-Lite</a>	<a href="#">52. Talk Tommy</a>
<a href="#">13. Gabby Tabs Lite: NEW</a>	<a href="#">33. Say Hi AAC</a>	<a href="#">53. Talk to Me 100 (free version has 9 locations)</a>
<a href="#">14. Grid Player</a>	<a href="#">34. See and Say Lite: NEW</a>	<a href="#">54. Talk 4 Me</a>
<a href="#">15. iBlissymbols Lite</a>	<a href="#">35. Scene &amp; Heard Lite</a>	<a href="#">55. Tap to Talk</a>
<a href="#">16. iComm Education</a>	<a href="#">36. Small Talk Aphasia (Male &amp; Female)</a>	<a href="#">56. Touch Chat Lite</a>
<a href="#">17. iPhonic Lite</a>	<a href="#">37. Small Talk Conversational Phrases</a>	<a href="#">57. Verbally</a>
<a href="#">18. iPicto Lite</a>	<a href="#">38. Small Talk Daily Activities</a>	<a href="#">58. VocaBeans EN</a>
<a href="#">19. Locabulary Lite</a>	<a href="#">39. Small Talk Intensive Care</a>	<a href="#">59. VoiceSymbol AAC</a>
<a href="#">20. MetaTalk Lite</a>	<a href="#">40. Small Talk Pain Scale</a>	<a href="#">60. and so many more ....</a>

[Free AAC Apps or Lite Versions](#)

# EST and EBP for SGDs



- **EVIDENCE SUPPORTED TREATMENTS FOR SGDs**
- **EVIDENCE-BASED PRACTICE FOR SGDs**

# EVIDENCE BASED PRACTICE



Evidence Based Practice includes the integration of:

- (a) clinical expertise/expert opinion, and
- (b) external scientific evidence, and
- (c) client/patient/caregiver perspectives/values

to provide high-quality services reflecting the interests, values, needs, and choices of the individuals we serve.

(Source ASHA: <https://www.asha.org/Research/EBP/Introduction-to-Evidence-Based-Practice/>)



# EVIDENCE BASED PRACTICE



- Studies have shown that there is often a disconnect about what SLPs and BAs understand about EBP and how consistently they implement EBP in reality ([Patricia J. McCabe, 2018](#))
- The clinician must not only understand the components of EBP but must also separate the process of ‘practice’ from *techniques / programs / treatment packages / materials or stimuli*
- Empirically-supported Treatment (EST) vs Evidence-based Practice (EBP)
- What are SGDs and can they have ‘evidence’?

○ Treatment

○ Treatment package

○ Material/Stimuli

○ Process



## Evidence Based Practice

Can we say that **AAC** has 'evidence' for individuals with ASD?

Can we say that **SGDs** are EBPs for ASD?



# BEHAVIOR AS COMMUNICATION



- “All behaviour is communication”
  - common thread within SLP forums
  - leads some professionals to recommend specific treatments to be used *at all times* (e.g., Aided Language Stimulation)
  - May lead to *differences in competence and outcomes which are reported* (e.g., defective mands/tacts are given meaning without correction)
- Important distinction when implementing and measuring outcomes when utilizing AAC systems
  - What behaviours/activities would you look for which would not meet the criteria for ‘communication’?

# PRESUMPTION OF COMPETENCE



- **Presumption of Competence** has become a mantra for many SLPs and AAC 'specialists' as well as parents/caregivers of non-vocal children
  - What is the harm in presumption of competence?
  - Does this meet the test of an EBP?
- Presume **Potential** → **Teach** to Competence

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# PREREQUISITES FOR SGD USE



- SLPs (especially those whose practice is restricted to AAC) advocate that there are NO prerequisite skills for AAC use
  - **Picture Exchange Communication System (PECS)**

Are there prerequisites that are required to begin this manualized treatment?
  - **Speech Generating Devices (SGDs) / Voice Output Communication Aids (VOCAs)**

What skills are required in order to effectively access and demonstrate skills with these devices?

# PREREQUISITES FOR SGD USE



- **Speech Generating Devices (SGDs) / Voice Output Communication Aids (VOCAs) Prerequisite skills**
  - **Selection skills** → gross and fine motor skills (refined proximal point); accuracy for increasing array sizes
  - **Access skills** → gross and fine motor skills (task analyses for accessing the app, swiping up/down)
  - **Visual Discrimination skills** → simple conditional discriminations
  - Tolerates **delayed access to reinforcement** → immediate reinforcement is often impossible due to speech output delays embedded within the app/device

# AIDED LANGUAGE STIMULATION (MODELING)



**Aided language stimulation** (ALS or ALgS) is a communication strategy, where a communication partner **teaches symbol meaning** and **models language** by combining his or her own verbal input with selection of vocabulary using the Augmentative and Alternative Communication (AAC) system.

# AIDED LANGUAGE STIMULATION (MODELING)



Pre-requisites to using ALS as a tool to yield behavior change

- Prior to using **modeling** as a tool that would yield a change in the learner without direct teaching, the learner should have solid foundation skills such as:
  - generalized imitation skills
  - sustained joint attention
  - tolerates a delay accessing a reinforcer

# AIDED LANGUAGE STIMULATION (MODELING)



## Why have pre-requisites to ALS?

If the learner does not exhibit these skills then the addition of aided language stimulation is unlikely to be of benefit.

In the interest of SLP & ABA collaboration, a recommendation is to collect data to determine the effect of ALS - sessions with ALS and sessions without ALS and compare.

*There is a great need to have treatment comparisons and component analysis studies with learners using AAC to determine which methods yield the best outcomes.*

# CORE VOCABULARY



- Using **common, high-frequency spoken English words**, on an AAC display, to enable a user to construct their own complex sentences.
- This approach is used in lots of **high tech systems** but not used as much in low tech due to the difficulty of arranging vocabulary for access.

# CORE VOCABULARY



## Developmental Approach

- Use of dev. Vocabulary lists (e.g., Lahey & Bloom, 1977, etc.)
- Early developing words based on language acq. principles

## Environmental Approach

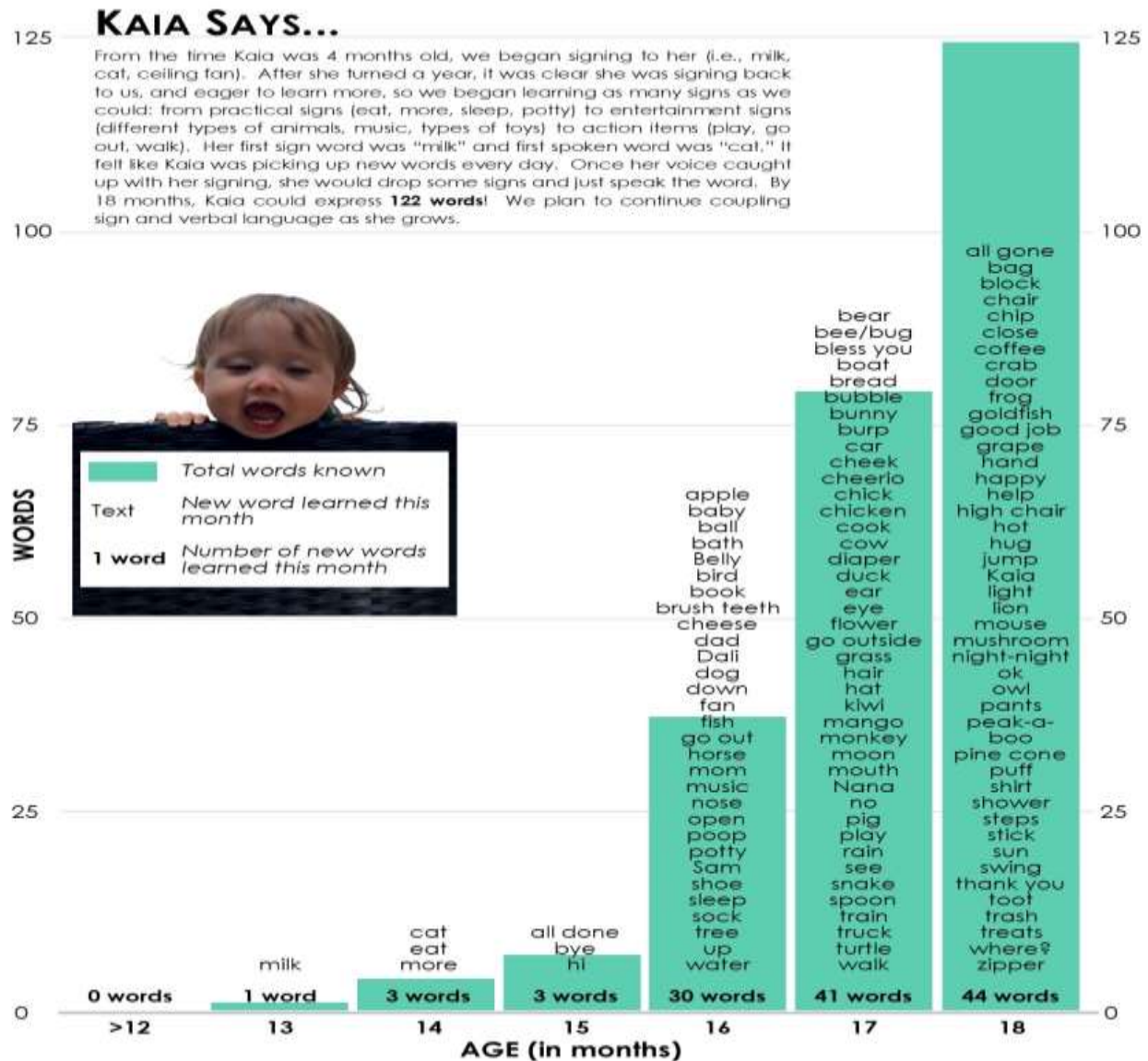
- Follows an ecological inventory process
- Words are chosen for specific communication environments
- Fringe Words

## Functional Approach

- Functional words
- Based on communication 'functions' (SLP field) such as:
  - Requesting
  - Commenting
  - Greeting
  - Protesting

# Vocabulary

Core vs Fringe –  
typical toddler  
from 12 months  
to 18 months



[Jadedali, accessed July 30, 2018](#)

# Vocabulary

- Core vs Fringe – typical toddler from 0 months to 18 months
- [accessed 2018, r/dataisbeautiful Reddit post](#)

## My Son's First Words



# VOCABULARY

## 0 to 17 months



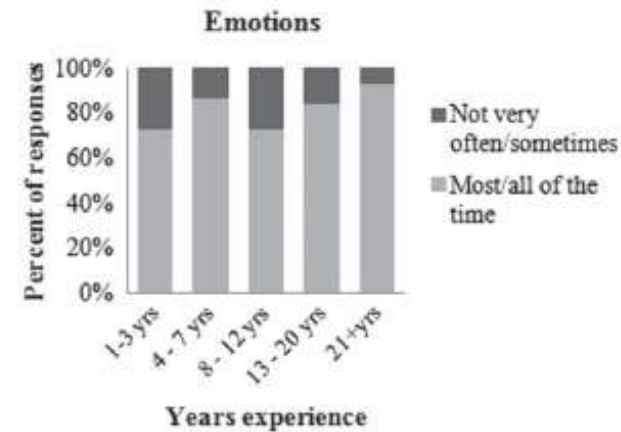
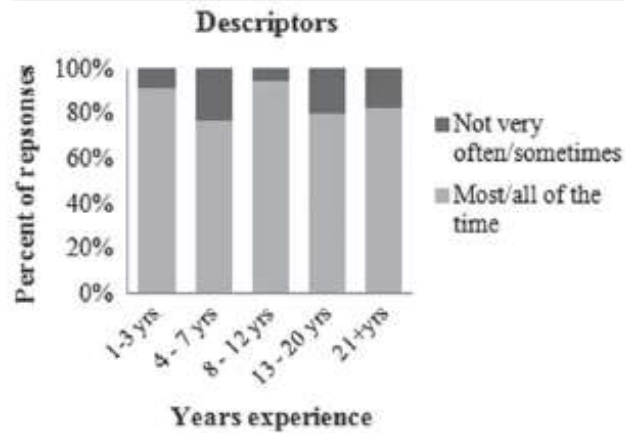
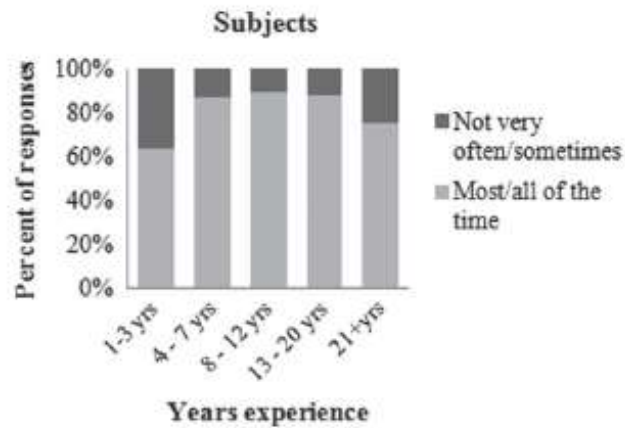
### First 10 words

1. Uh-oh
2. Dada
3. Mama
4. Kitty
5. No
6. Car
7. Toot
8. Ball
9. baby
10. papa

### ASD - First 10 words?

1. ---
2. ?
3. ?
4. Tact?
5. --
6. ✓
7. --
8. ✓
9. --
10. ?

# CORE VOCABULARY



(Thistle & Wilkinson, 2015)

# CORE VOCABULARY



- Core Vocabulary lists extracted from typical American preschool children between 2 and 3 years of age. (Banajee, 2003)
- Different from the vocabulary that individuals with severe intellectual disabilities or developmental disabilities (e.g., ASD) use on a daily basis.
- Core vocabulary is not a new concept. Core vocabulary is, indeed, universal. It is also culturally dependent. There does not seem to be THE CORE VOCABULARY, but rather a fluctuating core vocabulary that depends on the user and each linguistic environment.
- Thus, cultural sensitivities must also be taken into account as per ethical and professional codes (for both SLPs and BAs)

# CORE VOCABULARY



- Teaching **core vocabulary** first to people with little-to-no established verbal behavior has no conceptual backing in any kind of evidence-based scientific principles.
- Intervention (and research) needs to be based on established scientific principles of learning, human development, and/or human physiology.
- Asserting that a word(s), frequently emitted by typically developing populations past a certain age neither tells us the exact conditions (both speaker and listener) under which it is emitted, nor does it tell us how the word came to be established in the speaker's repertoire prior to that age.

# CORE VOCABULARY



- Thus, a frequency count (i.e., *core vocabulary for preschool aged learners*) cannot inform intervention and any intervention established from a simple frequency count cannot be considered conceptually sound.
- Often professionals who call upon "developmental literature" for their treatment decision-making, **erroneously use or misapply** the developmental literature.
- ***Language does not start at 2 years of age and cultural patterns vary.***

(Tardif, T., Fletcher, P., Liang, W., Zhang, Z., Kaciroti, N., & Marchman, V. A., 2008)

# MOTOR PLANNING THEORY



- Motor learning refers to:

**a set of “internal processes associated with practice or experience leading to relatively permanent changes in the capability for movement”**

([Schmidt & Lee, 2005, Pg. 302](#))

- Is this relevant for SGD use? Does this feature take precedence over other features?
- Is it feasible that the technology will remain stagnant for years or at the very least that the display can remain the same from introduction (i.e., 12 month dev. age) through to adult competency?

# SGD EFFECT ON SPEECH DEVELOPMENT



- There is a widely held fear that AAC use may have a negative impact on verbal language development  
([Schlosser and Wendt, 2008](#); [Sigafoos et. al, 2003](#))
- SLPs and AAC practitioners are quick to tell parents/clients that AAC use will not inhibit oral language development and in fact, may increase spoken output.  
([Gevarter et al., 2013](#); [Schlosser and Wendt, 2008](#))
- ***Is this true for individuals with ASD using SGDs?***  
([Patch et al., 2018](#); )

# Examining the Effects of AAC Intervention on Verbal Language in Children with Autism Spectrum Disorders: A Systematic Review

Alison R. Joseph, B.A., Emily V. Mortner, B.A., & Alexandra F. G. Patch, B.A.



## Background

- ❖ Many children with Autism Spectrum Disorder (ASD) are non-verbal or minimally verbal<sup>1,2</sup>
- ❖ Augmentative and Alternative Communication (AAC) is an external system used to support communication, which may include the Picture Exchange Communication System (PECS) or Speech Generating Devices (SGDs)<sup>2</sup>
- ❖ AAC is a common intervention for children with ASD<sup>2</sup>
- ❖ There is a widely held fear that AAC use may have a negative impact on verbal language development, but research shows this is not the case<sup>3</sup>

## Objective

- ❖ To determine whether AAC intervention will increase verbal communication in children with ASD

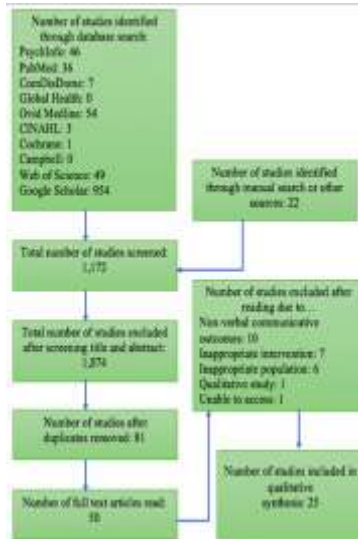
## Methods

### Systematic Review Protocol:

- ❖ **Inclusion criteria:** 0-17;11 years old, diagnosis of ASD, research within the past 10 years, peer-reviewed, quantitative studies
- ❖ **Exclusion criteria:** Publications in languages other than English, qualitative studies
- ❖ **Intervention:** Aided AAC [e.g. Picture Exchange Communication System (PECS), Speech Generating Device (SGD)]
- ❖ **Outcome:** Verbal language (e.g. words, word approximations, meaningful verbalizations)
- ❖ **Boolean Sentence used for search strategy:** (Autis\* Spectrum Disorder OR ASD OR Autis\*) AND (Verbal Communication OR Speech Development OR Verbal Language Development OR Verbal Development) AND (Augmentative Communication OR Augmentative AND Alternative Communication OR Assistive Technology)
- ❖ Manual search yielded an additional 22 articles

## Results

Figure 1. Flow Chart



Studies analyzed in this systematic review: 22  
Remaining 2 articles not analyzed as they were literature reviews used exclusively for background information.

Table 1. Quality Analysis of Included Studies

Evidence Level*	Number of Studies	Study Design
Level 1	7	Meta Analysis (3) Systematic Review (2) Randomized Control Study (2)
Level 2	16	Single-subject (16)

**Measurements:** The majority of studies used event recording of verbalizations to quantify data. Of all the studies collected, only three used formal measures.

**PECS:** Some studies showed that PECS has the potential to increase verbal language. However, there were mixed results across studies.<sup>4,5</sup>

**SGDs:** The two studies that conducted a statistical analysis showed significant gains in expressive language with SGD intervention.<sup>7</sup> Most other studies found varied results.<sup>8</sup>

**PECS vs. SGD:** A comparison of PECS and SGDs suggested that both forms of AAC benefit verbal language outcomes when compared to baseline, with no clear advantage to using one over the other.<sup>6</sup>

## Limitations

- ❖ The research currently lacks randomized control studies (RCTs), replication, and longitudinal studies.
- ❖ Heterogeneity of intervention protocols and participant characteristics reduces generalizability of results.
- ❖ Clinical significance is low due to reduced generalizability of results, lack of robust evidence, and lack of significant changes due to intervention.

## Conclusions

- ❖ AAC does not hinder spoken language.
- ❖ AAC will increase overall communicative acts, but not necessarily verbal output.
- ❖ There is not enough research evidence at this time to support using AAC interventions to increase spoken language in children with ASD.

## Recommendations

- ❖ Conduct more RCTs and replicate methodologically rigorous studies
- ❖ Consider communicative function of AAC use in future studies
  - ❖ Request vs. comments
- ❖ Conduct more research on forms of AAC other than PECS
- ❖ Use more formal measures
- ❖ Conduct a longitudinal study to determine what happens once the child learns how to functionally use the device
- ❖ More analysis of confounding variables of studies (e.g. subjects' baseline characteristics, intervention environment, interaction partners)

## Selected References

1. National Autism Association. (2017). *Autism fact sheet*. Retrieved from <http://nationalautismassociation.org/resources/autism-fact-sheet/>
2. Brunner, D. L., & Seung, H. (2009). Evaluation of the Efficacy of Communication-Based Treatments for Autism Spectrum Disorders: A Literature Review. *Communication Disorders Quarterly*, 31(1), 15–41. <https://doi.org/http://dx.doi.org.ezproxy.uvm.edu/10.1177/1525740108324097>
3. Schlosser, R. W., & Wendt, O. (2008). Effects of augmentative and alternative communication intervention on speech production in children with autism: A systematic review. *American Journal of Speech-Language Pathology*, 17(3), 212–230.
4. Schreibman, L., & Stahmer, A. C. (2014). A randomized trial comparison of the effects of verbal and pictorial naturalistic communication strategies on spoken language for young children with autism. *Journal of Autism and Developmental Disorders*, 44(5), 1244–1251. <https://doi.org/10.1007/s10803-013-1972-y>
5. Greenberg, A. L., Tomaino, M. E., & Charlop, M. H. (2014). Adapting the Picture Exchange Communication System to elicit vocalizations in children with autism. *Journal of Developmental and Physical Disabilities*, 26(1), 35–51.
6. Beck, A. R., Stoner, J. B., Bock, S. J., & Parton, T. (2008). Comparison of PECS and the use of a VOCA: A replication. *Education and Training in Developmental Disabilities*, 198–216.
7. Almirall, D., DiStefano, C., Chang, Y.-C., Shire, S., Kaiser, A., Lu, X., ... Kasari, C. (2016). Longitudinal effects of adaptive interventions with a speech-generating device in minimally verbal children with ASD. *Journal of Clinical Child and Adolescent Psychology*, 45(4), 442–456. <https://doi.org/10.1080/15374416.2016.1138407>
8. Olive, M. L., de la Cruz, B., Davis, T. N., Chan, J. M., Lang, R. B., O'Reilly, M. F., & Dickson, S. M. (2007). The effects of enhanced milieu teaching and a voice output communication aid on the requesting of three children with autism. *Journal of Autism and Developmental Disorders*, 37(8), 1505–1513.

# SGD EFFECT ON SPEECH DEVELOPMENT



- Does the speech output positively/negatively effect the learner's vocal verbal behaviour?
  - 2 studies that used behaviour programs (i.e., JASPER+EMT+SGD and EMT + SGD) found a positive outcome for increased speech output:
    - Study 1 – 61 participants with ASD with 17 novel words at the onset (caveat → the increase in spoken words, although significant in the first study, was part or a behaviour package and not SGD use alone)
    - Study 2 – 3 participants with ASD – vocalizations were not reported separate from SGD and gesture use for manding
- ([Almirall et al., 2016](#); [Olive et al., 2007](#))

# SGD TRIAL AT SPC



- Nine IBI teams within Surrey Place Centre took part in the trial with 9 participants selected for the study
- Achieved a minimum of Phase IIIb (good conditional visual discrimination skills – 2D to 3D match to sample skills) in the Picture Exchange Communication System (PECS).
- Vocabulary size between 25 and 100 icons in their current communication system (items should cross a number of categories – objects, people, places, actions, activities, food, drink, etc.).
- Manding rates → minimum of 15 mands per hour.

# METHOD AND RESULTS



- In addition, for some specific children additional data was collected:
  - frequency of vocalizations with PECS vs. SGD use
  - frequency of eye contact with PECS vs. SGD use
  - accuracy of manding (i.e., correspondence checks) while using the iPad
- **Vocal behaviour initially reduced in some of the clients**
- Systematic use of behaviour techniques/programming was required to re-establish echoic behaviour with the SGD

# SGD EFFECT ON SPEECH DEVELOPMENT



- AAC intervention alone may not facilitate large gains in vocal speech for individuals with limited vocal imitation skills  
([Gevarter et al, 2013](#); [Schlosser and Wendt, 2008](#)).
- For those with limited echoic skills, the addition of intervention components that target vocalization may be necessary to see speech gains  
([Brady et al., 2015](#); [Gevarter et al, 2016](#))
- Behavioural methods such as differential reinforcement, reinforcer delay, and echoic prompting may be required in order to maintain previous vocal production and/or increase speech during SGD use  
([Gevarter et al, 2016](#))

# SGD EFFECT ON SPEECH DEVELOPMENT



- Sigafoos et al. (2011) found no differences when speech output was:
  - Long
  - short
  - no output
- Thompson & Koudys (2018) – ABAI presentation: there was a reduction in individual performance for 2 out of the 3 participants following **transition from the human voice during PECS to the SGD speech output** – speculation that it had to do with the timing of the speech production on the device  
→ speaks to need for careful, ongoing monitoring and support during a transition period

# EVIDENCE SUMMARY FOR SGDs



- **Speech Generating Devices (SGDs)** – aided/selection-based systems
  - Large effect sizes for the use of SGDs (although very few studies with individuals with ASD alone)
  - Not a manualized intervention
  - Most common (and highest effect size) was for skills targeting communication (i.e., manding only)
  - Additional studies needed to determine effect on social skills, academics, and challenging behaviours.

# EVIDENCE SUMMARY FOR SGDs



- Overall, there appears to be a marked preference for SGD over other types of AAC.
- Not sure of the 'why' but there is a definite preference → individual's right to self-determination

# EVIDENCE SUMMARY FOR SGDs



- Lorah et al. (2015) underscore the point that,

*“the research is not about “iPads<sup>®</sup> as SGD” but rather is about the combination of hardware, software, and training protocols. All three must work together to provide support for the individuals...”*

# EVIDENCE SUMMARY FOR SGDs



- With increasing media coverage and pressure by parents to obtain the latest “miracle” for their ‘child’ the balance between client satisfaction and professional ethics becomes more difficult.
- However, SLPs (and BCBAs) must maintain their professional standards and ethical obligations “to evaluate the effectiveness of services rendered and of products dispensed,” and to “provide services or dispense products only when benefit can reasonably be expected” (ASHA, 2010).

# MYTHS & MISCONCEPTIONS



- AAC will hinder vocal/verbal speech development. *Not exactly, but it does not guarantee vocal/verbal speech development either.*
- Children don't need to match pictures or receptively identify pictures before using AAC. *But a learner needs to have visual discrimination skills.*
- Children do not have to start with low-tech systems before SGD. *But there is some benefit in that children will learn reciprocity, joint attention and social approach. Those are often difficult skills for children with ASD and then add the response effort with an SGD?*
- There are no cognitive or behavioral pre-requisites to SGD use. *There is no research that supports "no pre-requisite skills even for high tech AAC". A good question is "Why would you not want to consider a students' current skills when evaluating appropriate AAC supports?"*

# Assessment to Implementation



- **ASSESSMENT**
- **FEATURE MATCHING**
- **SELECTION OF THE SGD**
- **IMPLEMENTATION**

# Assessment



- **PREVERBAL COMMUNICATION SCHEDULE (PCVS)**
- **ESSENTIALS FOR LIVING (EFL)**
- **ABLRSr, VB-MAPP, PEAK**
- **COMMUNICATION MATRIX**
- **PECS PHASE IIIB TRANSITION CRITERIA**

# CLIENT CHARACTERISTICS



- Assess your individual client's needs:
  - Pre-requisite skills
  - Ability of the 'device' to grow along with the skills of the client
  - Investigate products beyond Apple™ products for increased customization and programming
  - Develop more systematic and manualized training and implementation protocols
  - Assess effects beyond verbal repertoires (e.g., academics)

# PREVERBAL COMMUNICATION SCHEDULE

- PVCS – not currently in print

## Pre-Verbal Communication Schedule

Chris Kiernan and Barbara Reid

Name of Student: .....

Age: ..... yrs ..... mths

School or centre: .....

Schedule completed by: .....

Date: .....

Comments: .....

### Notes on scoring

Items in the PVCS are scored either Yes – No, Usually (U), Rarely (R), Never (N) or, in the case of test items, in terms of the number of correct responses. Methods of scoring are described fully in the manual.

Two score sheets are provided at the front of this booklet. Score Sheet 1 gives a picture of the overall performance of the student. We would suggest that you cross through with a red felt pen any section where the student scores on all or nearly all of the items in a section. Where the student scores on around half of the items (e.g. 4 Usually and 1 Rarely out of 10 items), cross through with a contrasting colour. Sections where none or only one or two items are scored can be left blank.

Score Sheet 2 looks at the student's communication in terms of the functional use of communicative responses. Six categories of communication are identified. Item numbers are reproduced on Score Sheet 2. Within the Schedule these items are highlighted and coded with initials after the item number. The categories are Attention Seeking (AS), Need Satisfaction (NS), Simple Negation (SN), Positive Interaction (PI), Negative Interaction (NI) and Shared Attention (SA). The score sheet consists of a profile on which the scores from these six categories of communicative behaviour and of scores on the Imitation and Understanding sections can be recorded. Score Sheet 2 also represents the Short Form of the PVCS.

Full scoring details are given in the manual.

© 1997 Kiernan and Reid

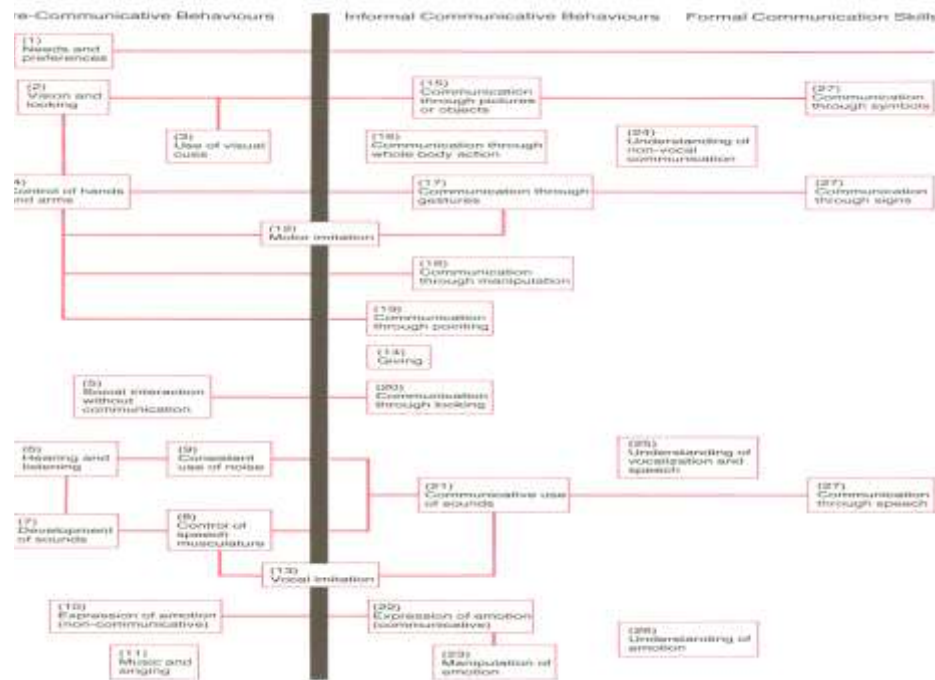
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nferNelson  
understanding potential

# PVCS ASSESSMENT



- Pre-Verbal Communication Schedule



# ESSENTIALS FOR LIVING (EFL)

## ESSENTIAL FOR LIVING

Patrick McGreevy  
Troy Fry  
Colleen Cornwall



**A Communication, Behavior  
and Functional Skills  
Curriculum, Assessment  
and  
Professional Practitioner's  
Handbook**  
for  
Children and Adults  
with Moderate-to-Severe  
Disabilities

For more information... [www.essentialforliving.com](http://www.essentialforliving.com)

or, please contact us directly...

Patrick McGreevy  
[patrick@essentialforliving.com](mailto:patrick@essentialforliving.com)  
407-415-5241

Troy Fry  
[troy@essentialforliving.com](mailto:troy@essentialforliving.com)  
952-412-6206

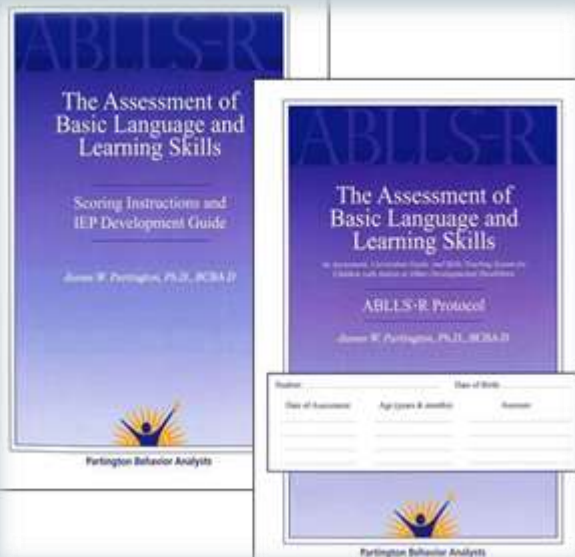
### • Alternative Method of Speaking (AMS) comparison tool AMS

H	hearing
S	sighted
HI	Hearing impaired
VI	Visually impaired
HVI	Hearing and visually impaired
Am	Ambulatory
Nam	Nonambulatory
A	Active
I	Inactive
FM	Fine motor coordination
<FM	Limited or no fine motor coordination
MI	Motor imitation
<MI	Limited or no motor imitation
M	Matching
<M	Limited or no matching
PB	Moderate or severe problem behaviour
-PB	No moderate or severe problem behaviour

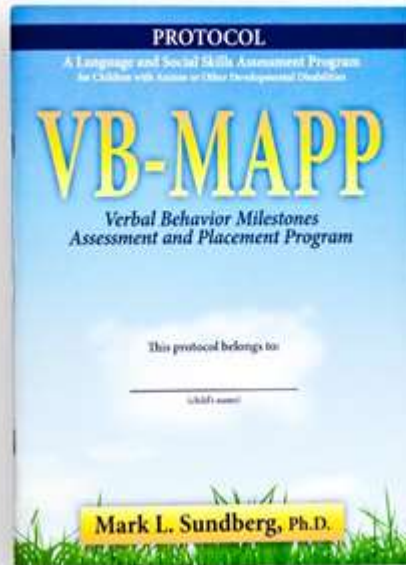
# COMMON AX & CURRICULUM TOOLS



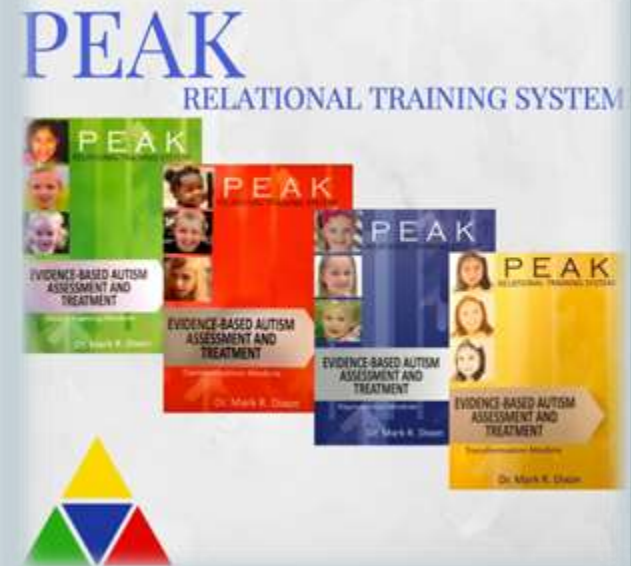
- ABLLSr



- VB-MAPP



- PEAK



# COMMUNICATION MATRIX



- Communication Matrix
- The Communication Matrix is a free online assessment tool created to help professionals and family members support people with severe communication disorders

<u>Pre-Intentional Behavior</u> I  <u>Intentional Behavior</u> II  <u>Unconventional Communication</u> III  <u>Conventional Communication</u> IV  <u>Concrete Symbols</u> V	<b>A1</b> Expresses Discomfort I	<b>A2</b> Expresses Comfort I					<b>A3</b> Expresses Interest in Other People I		
	<b>B1</b> Protests II	<b>B2</b> Contrasts an Action II	<b>B3</b> Obtains More of Something II			<b>B4</b> Attracts Attention II			
	<b>C1</b> Refuses or Rejects Something III	<b>C2</b> Requests More of an Action III	<b>C3</b> Requests a New Action III	<b>C4</b> Requests More of an Object III	<b>C5</b> Requests a New Object III	<b>C6</b> Requests a New Object III	<b>C8</b> Requests Attention III	<b>C9</b> Shows Affection III	
	<b>C1</b> Refuses or Rejects Something IV	<b>C2</b> Requests More of an Action IV	<b>C3</b> Requests a New Action IV	<b>C4</b> Requests More of an Object IV	<b>C5</b> Requests a New Object IV	<b>C6</b> Requests a New Object IV	<b>C8</b> Requests Attention IV	<b>C9</b> Shows Affection IV	<b>C10</b> Greets People IV
	<b>C1</b> Refuses or Rejects Something V	<b>C2</b> Requests More of an Action V	<b>C3</b> Requests a New Action V	<b>C4</b> Requests More of an Object V	<b>C5</b> Requests a New Object V	<b>C6</b> Requests a New Object V	<b>C7</b> Requests Objects that are V	<b>C8</b> Requests Attention V	<b>C9</b> Shows Affection V

# COMMUNICATION MATRIX



- [Communication Matrix Intro video](#)

## Seven Levels of Communication

- [Level I. Pre-Intentional Behavior](#)
- [Level II. Intentional Behavior](#)
- [Level III. Unconventional Communication](#)
- [Level IV. Conventional Communication](#)
- [Level V. Concrete Symbols](#)
- [Level VI. Abstract Symbols](#)
- [Level VII. Language](#)

# TYPICAL DEVELOPMENTAL NORMS



Age	Receptive ID	Tacts
8 months	5	--
12 months	50	5 - 10
18 months	100+	20 – 50
24 months	300+	2-word phrases 100 – 300 tacts
36 months	500+	MLU 3.0 1,000 tacts
48 months	1500+	MLU 4.0 1,600 tacts

# TYPICAL DEVELOPMENTAL NORMS



- Typical child development research demonstrates that single word mands begin around 9 to 12 months of age and by **18 months** of age the toddler consistently uses approximately **50 unique** single word mands made up of a mixture of nouns and verbs

# TYPICAL DEVELOPMENTAL NORMS



- Typical child development research demonstrates that two-word mands begin around 18 to 24 months of age and by **30 months** of age the toddler consistently uses **2 – 3 word mands** made up of a mixture of nouns, verbs, attributes, and grammatical markers (e.g., tense, possession, plural, pronouns, etc.)
- A typical **3 year old** (i.e., Level 3 of the VB-MAPP), uses a vocabulary of approximately **1100 – 1200 words** and understands more than that.

# TYPICAL DEVELOPMENTAL NORMS



- A typical speaker will communicate at a rate of about **160 – 220 words/minute**
- A typical AAC device user may communicate at a rate of up to about **30 words/minute**
  - Do we see this in practice with individuals with ASD??

# PECS TO SGD TRANSITION GUIDELINES



## PECS<sup>®</sup> to SGD: Guidelines and Recommendations for a Successful Transition

### *Position Statement:*

*Pyramid Educational Consultants' position regarding providing speech generating devices (SGD) including touch screen tablets with apps is that best and evidence-based practice for teaching functional communication and social interaction for individuals with ASD who are not speaking is to begin intervention with PECS, and to transfer to an SGD only after spontaneous, functional, picture-based communication skills have been established and the learner has mastered Phase IV of the PECS protocol. This sequence assures that the learner has acquired independent social approach, picture discrimination, communicative persistence, and the building of multi-picture sentences.*

# ASSESS THE NEEDS OF THE ENVIRONMENT



- Effects on the family
- Effects on peer interactions
- What happens with use in the community
- Relative costs involved:
  - ✦ Time
  - ✦ Training
  - ✦ Maintenance
  - ✦ Acquisition of the device

# ASSESS THE SKILLS OF THE LEARNER



## AAC Evaluation Genie

- Looks at the child's ability to target
  - Visual identification and discrimination
  - noun, function, & verb vocabulary
  - Category recognition, inclusion, & exclusion
  - Word association
  - Core vocabulary
  - Unity icon
  - Picture description
  - Word prediction



[AAC Genie - Apple app store](#)

# ASSESS THE NEEDS OF THE INDIVIDUAL



- Question isn't..."What type of technology will be best for the specific individual?"...but rather
- What 'job' or 'jobs' does the individual need to do?
- Future proofing skill development for new technology

# Feature Matching



- **ASSESSMENT OF FEATURES AVAILABLE ON SGDs**
- **MATCHING OF REQUIRED FEATURES TO INDIVIDUAL PROFILES**

# FEATURE MATCHING



“The feature matching process focuses on identifying the strengths, skills and needs (current and future) of a person who is a candidate for augmentative communication and matching the features of available (or potentially available) augmentative communication tools, devices and strategies to that person”

- Shane and Costello, 1994

# FEATURE MATCHING



## AAC/SGD PRIMARY FEATURES

Language Representation Methods	Vocabulary	Methods of Utterance Generation
<ul style="list-style-type: none"><li>• Single Meaning Pictures</li><li>• Alphabet-Based Methods</li><li>• Multiple meaning icons (Semantic Compaction)</li></ul>	<ul style="list-style-type: none"><li>• “Core” – high frequency words</li><li>• “Fringe” –specific words</li><li>• Both “core” and “fringe”</li></ul>	<ul style="list-style-type: none"><li>• SNUG (spontaneous novel utterance generation)</li><li>• Pre-stored sentences</li><li>• Multiple methods to generate messages</li></ul>

# FEATURE MATCHING



## PRIMARY SGD FEATURES RELEVANT TO BEGINNING LEARNERS WITH ASD

Language Representation Methods	Vocabulary	Methods of Utterance Generation
<ul style="list-style-type: none"><li>• Single Meaning Pictures</li></ul>	<ul style="list-style-type: none"><li>• “Fringe” –specific words</li></ul>	<ul style="list-style-type: none"><li>• SNUG (spontaneous novel utterance generation)</li></ul>

# FEATURE MATCHING



## AAC/SGD SECONDARY FEATURES

User Interface	Control Interface – Selection Methods	Outputs
<ul style="list-style-type: none"><li>• Symbols (types/set)</li><li>• Display size/type</li><li>• Number of locations on display</li><li>• <b>Color coding</b></li><li>• Navigation, number of pages, and/or displays</li><li>• Automaticity</li><li>• Human Factors</li></ul>	<ul style="list-style-type: none"><li>• Direct Selection</li><li>• Keyboard, head pointing, eye gaze</li><li>• Touch activation type/sensitivity settings</li><li>• Scanning (Switches)</li><li>• Physiological (EMG, EEG/BCI, etc.)</li><li>• Morse Code</li></ul>	<ul style="list-style-type: none"><li>• <b>Speech</b></li><li>• Display</li><li>• Electronic/Infrared/Radio Frequency</li><li>• Data logging (language activity monitor)</li></ul>

# FEATURE MATCHING



*Fitzgerald Key* – **Colour Coding** to enhance or facilitate efficiency in symbol location

- Originally developed for individuals with CP and intact language to assist in locating grammatical word classes for efficiency
- Often recommended (>43% of SLPs) for all AAC/SGD users, however, there are no studies to date that support this practice → especially for individuals with ASD

(Thistle & Wilkinson, 2015)

# FEATURE MATCHING

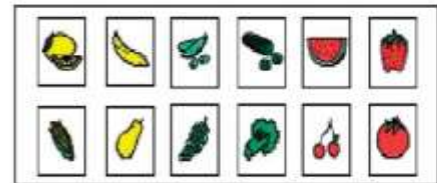
*Fitzgerald Key* – **Colour Coding** to enhance or facilitate efficiency in symbol location

- Some effects noted for neurotypical individuals when the background colour matches the item (e.g., yellow for banana) but not effective if the background colour was not representative of a consistent colour for an item (e.g., car).

([Thistle & Wilkinson, 2009](#))

FIGURE 1. Examples of the experimental color conditions. The Picture Communication Symbols ©1981–2007 by Mayer-Johnson LLC. All rights reserved worldwide. Used with permission.

Condition A: relevant foreground,  
white background



Condition B: white foreground,  
background color associated with  
identity



Condition C: white foreground,  
background color not associated  
with identity



Condition D: relevant foreground,  
background color not associated with  
identity



# FEATURE MATCHING



- Both older and younger participants showed a statistically significant **increase of locating a target when the foreground of the drawing was colored with no background color.**
- Although the reasons why this effect might have occurred are not yet clear, it would suggest that if clinicians seek to foster a client's ability to find a target on a display, the foreground color of the target line drawing rather than its background may be the most critical aspect to consider.  
([Thistle & Wilkinson, 2009](#))
- However, in an alternating treatment design study, four children successfully learned & maintained recognition of new vocabulary, regardless of the level of color included in the symbols. Hetzroni and Neeman (2013) provide evidence that, *although pervasive and easily incorporated, symbols may not need to have color to be learned and used.*  
([Hetzroni & Ne'eman, 2013](#))

# FEATURE MATCHING



## SECONDARY SGD FEATURES RELEVANT TO BEGINNING LEARNERS WITH ASD

User Interface	Control Interface – Selection Methods	Outputs
<ul style="list-style-type: none"><li>• Symbols (types/set)</li><li>• Display size/type</li><li>• Number of locations on display</li><li>• Navigation, number of pages, and/or displays</li><li>• Human Factors</li></ul>	<ul style="list-style-type: none"><li>• Direct Selection</li><li>• Touch activation type/sensitivity settings</li></ul>	<ul style="list-style-type: none"><li>• Speech</li><li>• Display</li><li>• Data logging (language activity monitor)</li></ul>

# FEATURE MATCHING



## AAC/SGD TERTIARY FEATURES

Cosmesis, Peripheral & Integrated Features	Manufacturer/Vendor Resources	Clinical Service Delivery
<ul style="list-style-type: none"><li>• Appearance: color, size, design</li><li>• Portability &amp; Battery life</li><li>• Computer, phone internet access</li><li>• Switches &amp; mounting systems (multiple; wheelchair)</li><li>• Electrode peripherals &amp; caps</li></ul>	<ul style="list-style-type: none"><li>• Training (face-to-face; webinars)</li><li>• Technical support</li><li>• Repair support &amp; loaner programs</li><li>• Warranties</li><li>• SGD Funding support</li></ul>	<ul style="list-style-type: none"><li>• Trained &amp; experienced AAC professionals</li><li>• Evaluation &amp; Treatment</li><li>• Consultation</li><li>• Telerehabilitation capabilities</li><li>• SGD Funding Support</li></ul>

# FEATURE MATCHING



## TERTIARY SGD FEATURES RELEVANT TO BEGINNING LEARNERS WITH ASD

Cosmesis, Peripheral & Integrated Features	Manufacturer/Vendor Resources	Clinical Service Delivery
<ul style="list-style-type: none"><li>• Appearance: size, design</li><li>• Portability &amp; Battery life</li><li>• Computer,</li></ul>	<ul style="list-style-type: none"><li>• Training (face-to-face; webinars)</li><li>• Technical support</li><li>• Repair support &amp; loaner programs</li><li>• Warranties</li><li>• SGD Funding support</li></ul>	<ul style="list-style-type: none"><li>• Trained &amp; experienced AAC professionals</li><li>• Evaluation &amp; Treatment</li><li>• Consultation</li><li>• SGD Funding Support</li></ul>

# Selection of an SGD



- **TYPES OF SGDs**
- **ASSESSMENT AND SELECTION PROCEDURES**
- **EBP – FACTORS TO CONSIDER**

# TYPES OF SGDs AND APPS



- Questions to Consider

1. Dedicated device or app?

- Less than 10 dedicated device manufacturers
- No empirical support for any one device over another (MANIPULANDUM only)
- More expensive, however, may be covered by health insurance
- Difficult process to acquire → AAC/AT clinic evaluation

2. Apps

- 100+ different apps with various features
- ~15 – 20 that would be considered robust in terms of features and longevity
- no empirical support for any one app over another (STIMULI only)
- Less expensive, sometimes free, generally not covered by health insurance
- Easier to acquire for parents and SLPs

# ASSESSMENT AND SELECTION PROCEDURES



- Questions to Consider

- 3. Decisions regarding:

- one device for everything vs. multiple devices with one dedicated for communication (for all activities including academics, choice boards, etc.)
- layout/organization
- vocabulary selection
- types of symbols
- colour coding
- access methods
- responsivity of the buttons
- voice output features
- device specific features (e.g., guided access, editing, keyboard access, etc.)
- technical support and training

# ASSESSMENT AND SELECTION PROCEDURES



- Questions to Consider
- 4. Additional hardware required for safety and use of the device:
  - Protective case
  - Handle
  - Carrying strap/handle
- Responsibility for charging the device
- Training others to program/error correct with the device
- Updating of software and regular back-ups

# EBP – FACTORS TO CONSIDER



- Questions to Consider

- 5. Evidence-based Practice considerations

- Learner preference (preference assessment between ‘old’ system and ‘new’ system)
- Learner’s competence with the ‘new’ device vs. the ‘old’ system → must be at or above previous levels
- Parent/caregiver preference and buy-in
- Community and school buy-in

The [SETT Scaffold for Consideration of AT Needs](#) – may be a useful framework to assist in the selection of the SGD and future goals.

# Implementation of the SGD



- **PROCEDURES FOR IMPLEMENTATION**
  - LAYOUT / ORGANIZATION
  - ACCESS
  - FEATURES
  - BASELINE DATA
- **REQUIRED DATA COLLECTION**
- **EBP CONSIDERATIONS**

# PATHWAYS FOR IMPLEMENTATION



Learner  
1

- SGD purchased
- Capture MO
- ITT / VB manding program

Learner  
2

- PECS user
- Transition to SGD
- ITT / VB manding program

# PROCEDURES FOR IMPLEMENTATION



- It is important to determine the **layout and organization** of the SGD prior to programming and introducing the device to the individual
- SGDs vary with respect to **features** which may/may not meet the needs of the client
- Implementation will vary depending upon whether the learner has had previous experience with AAC (e.g., PECS) vs. a learner who has never had any experience with AAC.

# PROCEDURES FOR IMPLEMENTATION



- Decide on the **organization structure** which will lead to communication growth for the particular individual
  - Traditional Subject + Verb + Object organization
  - Category folders → actions, objects/things, people, places, food & drink
  - Functional Use organization → organized around activities such as playground, meal time, academics, home, circle time, etc. so that all pertinent vocabulary is included within that page

# PROCEDURES FOR IMPLEMENTATION



- Additional **features** to consider:
  - picture types – line drawings vs. photographs, B & W vs. coloured
  - picture size and corresponding grid size
  - access on the dynamic display (e.g., ‘pages’ or scrolling to access additional vocabulary items)
  - availability of a message window to see the constructed message
  - voice type → digitized/synthesized vs. recorded speech
  - voice age and gender – should match that of the client
  - voice volume and customization for speech

# PROCEDURES FOR IMPLEMENTATION



- Consider the learner as to whether you require the sentence to be automatically 'cleared' with the next sentence construction or if you will teach the individual to clear the sentence him/herself
- Determine the number of types of access strategies that you will teach the learner
- To return to the 'home' page
- To repair a mistake
- To communicate in the absence of the device

# REQUIRED DATA COLLECTION



- A key factor in SGD **layout and organization** is speed and efficiency – data collection is required in order to assist in the determination of most effective and efficient layout
  - Length of time required to generate the message
  - The number of ‘button presses’ required to generate a typical message
  - The ease and accuracy required to access the most frequently used vocabulary
  - Access skills (swiping, use of various back/home buttons, backspacing/delete, etc.) which are required for effective use

# REQUIRED DATA COLLECTION



## Collection of Baseline Data (if PECS → SGD transition)

- Total number of pictures currently used
- Average length of utterance (i.e., average number of pictures used within a sentence)
- Longest sentence length used
- Rate of PECS use per day
- Rate of spontaneous vs. prompted communication
- Average time or number of steps required to produce an average 'sentence'

# PROCEDURES FOR IMPLEMENTATION



- Follow the PECS protocols and steps to ensure consistency -> manualized intervention as much as possible

## PECS to SGD: Guidelines and Recommendations

- Implementation of an SGD should follow standard behaviour analytic language intervention programming
- Written programs should be developed for each skill/step in the transition
- Data should be collected in order to assess progress and problem solve errors



### PECS<sup>®</sup> to SGD: Guidelines and Recommendations for a Successful Transition

#### Position Statement:

Parental Educational Consultants' position regarding providing speech generating devices (SGD): Including much across subjects with data is that best and evidence-based practice for teaching functional communication and social interaction for individuals with ASD who are not speaking is to begin intervention with PECS, and to transfer to an SGD only after spontaneous, functional, picture-based communication skills have been established and the learner has mastered Phase IV of the PECS protocol. This sequence ensures that the learner has acquired independent social approach, picture discrimination, communicative persistence, and the building of multi-picture sentences.

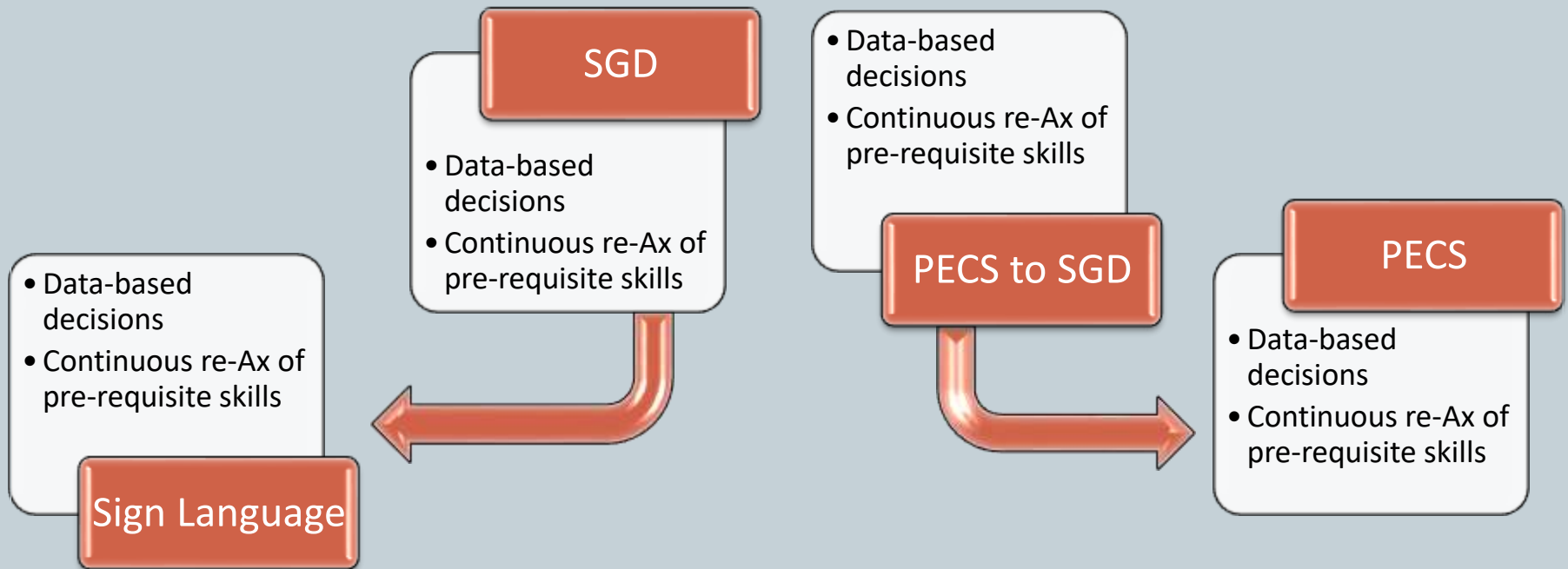
#### Introduction

The Picture Exchange Communication System<sup>®</sup> (PECS<sup>®</sup>) is an evidence-based augmentative/alternative communication system that is often chosen as a communication intervention for learners with autism or other complex communication needs who are not developing spoken communication. Speech language pathologists and other developmental service providers often plan to transition from PECS to a speech-generating device (SGD) for long-term use after learners successfully progress through the PECS protocol, particularly for those learners who do not develop speech following extended use of PECS and complementary interventions. Effects in the current document, we present and describe recommendations for best practices associated with this transition, from assessment of the learner and the device prior to the transition from PECS through to intervention planning and assessment of the learner's successful independent use of the SGD.

When considering adapting or transitioning a communication system, it is important to consider the definition of communication. Communication involves behavior directed to another person who then modulates action in a response, which may be tangible (e.g., an object or activity) or social (e.g., shared attention). Of particular relevance to individuals with autism or other complex communication needs, communications need to be initiated spontaneously and completed independently in order to be effective in real world contexts. While teaching these skills using high-tech devices may be possible, extensive experimental research has strongly produced solid evidence that PECS is a strong results in swift increases in spontaneous and functional picture-based communication in 100% of 100% of autism and related developmental disabilities. Experimental research also further suggests that PECS training produces notable positive effects on speech and social development in some children with autism. In particular, recent research suggests that PECS is equally as effective for facilitating speech compared to more directly speech-based approaches in young children with autism who display very low spoken words. Therefore, our position is that best and evidence-based practice for children with autism who are not speaking is to initiate PECS training, and to transfer to an SGD only after spontaneous functional picture-based communication skills have been established via the PECS protocol. The guidelines below

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# DECISION MAKING PATHWAY



# PROCEDURES FOR IMPLEMENTATION

## Introduction of the SGD using the Implementation Checklist for SGD as a guide

- The National Professional Development Center on ASD has developed implementation steps and an implementation checklist for using a SGD.
- The Implementation Checklist for SGD is a task analysis for introducing and working through the transition process from current communication system to iPad use.

National Professional Development Center on  
Autism Spectrum Disorders

### Module: Speech Generating Devices (SGD)

#### Implementation Checklist for SGD

Franzone, E., & Collet-Klingenberg, L. (2008). *Overview of speech generating devices for children and youth with autism spectrum disorders*. Madison, WI: The National Professional Development Center on Autism Spectrum Disorders, Waisman Center, University of Wisconsin.

**Instructions:** The Implementation Checklist includes each step in the process of implementing use of an SGD. Please complete all of the requested information including the site and state, individual being observed, and the learner's initials. To assure that a practice is being implemented as intended, an observation is always preferable. This may not always be possible. Thus, items may be scored based on observations with the implementer, discussions and/or record review as appropriate. Within the table, record a 2 (implemented), 1 (partially implemented), 0 (did not implement), or NA (not applicable) next to each step observed to indicate to what extent the step was implemented/addressed during your observation. Use the last page of the checklist to record the target skill, your comments, whether others were present, and plans for next steps for each observation.

Site: \_\_\_\_\_ State: \_\_\_\_\_  
Individual(s) Observed: \_\_\_\_\_ Learner's Initials: \_\_\_\_\_

Skills below can be implemented by a practitioner, parent, or other team member

Observation Date	1	2	3	4	5	6	7	8
Observer's Initials								
Planning (Steps 1 – 5)								
Step 1. Identifying and Setting Up the Device	Score**							
1. Select an appropriate device, taking into account how the information is displayed, the learner's present and potential abilities (e.g., attention span, experience with symbols, ability to establish joint attention), portability of the device, available training and technical assistance, and funding sources.								
2. Introduce the device to the learner by having a device with few symbols and/or buttons with nothing on them.								
3. Include desirable and undesirable symbols to facilitate the learner's ability to discriminate.								
Step 2. Introducing Direct Support Persons to the Device								
1. Team members are identified and trained in how to program and use the device.								
2. One or two key members of the team are identified as primary contacts regarding its use.								

\*\*Scoring Key: 2 = implemented; 1 = partially implemented; 0 = did not implement; NA = not applicable

# EBP CONSIDERATIONS



- Treatment integrity is important when teaching the critical skills necessary for transition to the SGD
- Difficult to keep up with the technology and the lag in scientific 'evidence' for each of the platforms and apps
- Therefore.....data will be required in order to make valid judgements about the effectiveness of the device and/or app for each client
- Difficult to generalize most of the evidence to date as there is no manualized approach to programming / using each device or app

# RECOMMENDATIONS



- If the use of an SGD-AAC intervention is decided upon, we suggest that:
  - the device, system or app be used in a trial evaluation prior to purchase,
  - members of the evaluating team have appropriate knowledge and skills to assess, implement and use data to guide potential changes to device/app layout or change device/app itself, and
  - the individual receiving SGD-AAC is motivated to engage in communication, or that the device is being used to foster interest in communication skills, social interaction and academic skills

# GUIDING PRINCIPLES FOR SGD USE



# Summary



- **EMPIRICAL SUPPORT TO DATE**
- **BEST PRACTICE AX**
- **BEST PRACTICE TX**

# EMPIRICAL SUPPORT TO DATE



- Empirical evidence to support the use of SGDs with learners with ASD is **weak** as a standalone treatment
- SGDs for ASD use for increasing **speech output** is strengthened when used as part of a behaviour treatment package
- SGD use for ASD is strongest for **manding** only
- Adequate empirical support for the use of **salient symbols** (i.e., iconic) over abstract symbols (e.g., Unity/minspeak, Bliss, etc.)
- Currently not enough empirical support to make definitive statements about features such as **core vocabulary, colour coding, motor planning, layout/organizational structures, voice type**, etc.
- Mixed study results regarding SGD effect on **speech**: negative, neutral, and positive results for a few learners

# BEST PRACTICE: ASSESSMENT



- No standard assessment for determining appropriate AAC prerequisites nor for AAC system choice
- Thorough assessment/review of learner characteristics and foundation skills is required as part of EBP decision-making
- Learner's skills + professional's clinical competence + caregiver support/buy-in + empirical support for each aspect of the SGD = Evidence-based Practice

# BEST PRACTICE: TREATMENT



- No manualized treatment approach currently
- SGD implementation is most successful when included as part of a behavioural treatment package
- Steps to Implementation:
  - Baseline skill assessment
  - Written program to target goal(s)
  - Data collection with fidelity checklists
  - Mastery criteria determined for each target goal
  - Data-based decision making
  - Expansion of communication/SGD use across verbal operants
  - Generalization and maintenance of targets across people and settings

# BEST PRACTICE: TREATMENT



- Difficulty with ‘teaching’ using SGDs
  - Problem interfering behaviours (i.e., scripting, non-functional use, etc.) → function is not communicative
  - Error correction – individualized for the learner (e.g., sequencing errors, defective mands/tacts/intraverbals, scrolling behaviours, etc.)
  - Speech/button behaviour
  - Back-up system (technology failures)

# BEST PRACTICE - SUMMARY



- Know your learner: skill sets, developmental level, interfering behaviours, etc.
- Know your target goals: manding, tacting, intraverbals, use of written language within communication (e.g., spelling part of the message)
- Know the literature with respect to AAC / SGDs as it applies to the ASD population
- Know your team members and their philosophies and be prepared to discuss the evidence or lack thereof
- Use EST and EBP for determining the appropriate SGD and implementation
- Remember SGDs and Apps are just stimuli and not synonymous with communication

# Future Directions



- **FUTURE RESEARCH NEEDS**

# FUTURE DIRECTIONS



- Comparative AAC studies are required
- Use Single Subject Experimental Designs (SSED) to assist in selecting AAC strategies (e.g., alternating treatment design)
- Additional studies are required to assess the accuracy and validity of various assessment tools (e.g., EFLS, PVCS)
- AAC for ASD studies:
  - vocabulary selection
  - effect on vocalizations/speech
  - key features (layouts, grid size, organization, voice output)
  - Beyond manding – other verbal operants
  - Generalization and maintenance across all settings (i.e., long-term outcomes)

# FUTURE DIRECTIONS



Greater collaboration is required among clinicians, researchers, individuals who use AAC, and their families to implement state-of-the-art research methods to investigate the impact of innovative AAC services on short-term and long-term outcomes in the real world.

(Light & Mcnaughton, 2015)

# References



- **REFERENCES**
- **RESOURCES**
- **MATERIALS**

# REFERENCES



- <https://www.asha.org/Research/EBP/> (retrieved July 29, 2018)
- <https://www.asha.org/public/speech/disorders/aac/> (retrieved July 29, 2018)
- <https://www.isaac-online.org/english/what-is-aac/> (retrieved July 29, 2018)
- <https://www.nidcd.nih.gov/health/american-sign-language> (retrieved July 29, 2018)
- <https://en.wikipedia.org/wiki/Fingerspelling> (retrieved July 29, 2018)
- <https://www.rehab.research.va.gov/jour/02/39/6/sup/vanderheiden.html> (retrieved July 31, 2018)
- Albis, J. & Reed, F. G. (2012). Modified stimulus presentation to teach simple discrimination within Picture Exchange Communication System Training. *Journal of Speech-Language Pathology and Applied Behavior Analysis*, 5, 42-46.
- Almirall, D., DiStefano, C., Chang, Y-A., Shire, S., Kaiser, A., Lu, X., Nahum-Shani, I., Landa, R., Mathy, P., & Kasari, C. (2016). Longitudinal Effects of Adaptive Interventions With a Speech-Generating Device in Minimally Verbal Children With ASD, *Journal of Clinical Child & Adolescent Psychology*, 45:4, 442-456, DOI: 10.1080/15374416.2016.1138407
- Banajee, M., Dicarlo, C., & Stricklin, S. B. (2003). Core vocabulary determination for toddlers. *Augmentative and Alternative Communication*, 19(2), 67–73.
- Brady, N. C., Storkel, H. L., Bushnell, P., Barker, R. M., Saunders, K., Daniels, D., et al. (2015). Investigating a multimodal intervention for children with limited expressive vocabularies associated with autism. *American Journal of Speech-Language Pathology*, 24, 438–459.

# REFERENCES



- Beukelman, D., & Mirenda, P. (1998). *Principles of assessment*. In D. Beukelman & P. Mirenda (Eds.), *Augmentative and alternative communication* (2<sup>nd</sup> ed.). Baltimore: Paul H. Brookes Publishing Company
- Beukelman, D., & Mirenda, P. (2013). *Augmentative and alternative communication: Supporting children and adults with complex communication needs* (4th ed.). Baltimore: Brookes Publishing Co.
- DaFonte, M. Alexandra and Boesch, Miriam C. (2018) *Effective Augmentative and Alternative Communication Practices: A Handbook for School-Based Practitioners*. Taylor and Francis
- Gevarter, C., O'Reilly, M. F., Kuhn, M., Mills, K., Ferguson, R., & Watkins, L. (2016). Increasing the vocalizations of individuals with autism during intervention with a speech-generating device. *Journal of Applied Behavior Analysis*, 49, 17–33. <https://doi.org/10.1002/jaba.270>.
- Gevarter, C., O'Reilly, M. F., Rojeski, L., Sammarco, N., Lang, R., Lancioni, G. E., et al. (2013). Comparing communication systems for individuals with developmental disabilities: A review of single-case research studies. *Research in Developmental Disabilities*, 34, 4415–4432. <https://doi.org/10.1016/j.ridd.2013.09.017>.
- Hetzroni, O. E., & Ne'eman, A. (2013). Influence of colour on acquisition and generalisation of graphic symbols. *Journal of Intellectual Disability Research*, 57, 669 – 680. doi:10.1111/j.1365-2788.2012.01584.x
- Light, J., & McNaughton, D. (2015). Designing AAC research and intervention to improve outcomes for individuals with complex communication needs. *Augmentative and Alternative Communication*, 31, 85–96.
- Lorah, E.R., Parnell, A., Whitby, P.S., Schaefer Whitby, P., & Hantula, D. (2015). *Journal of Autism and Developmental Disorders*, 45(12), pp. 3792-3804. <https://doi.org/10.1007/s10803-014-2314-4>

# REFERENCES



- McCabe, Patricia J. (2018). Elizabeth Usher Memorial Lecture: How do we change our profession? Using the lens of behavioural economics to improve evidence-based practice in speech-language pathology, *International Journal of Speech-Language Pathology*, DOI: 10.1080/17549507.2018.1460526
- McNaughton, D. & Light, J. (2015). What We Write about When We Write About AAC: The Past 30 Years of Research and Future Directions, *Augmentative and Alternative Communication*, 31:4, 261-270, DOI: 10.3109/07434618.2015.1099736
- Olive, M. L., de la Cruz, B., Davis, T. N., Chan, J. M., Lang, R. B., O'Reilly, M. F., & Dickson, S. M. (2007). The effects of enhanced milieu teaching and a voice output communication aid on the requesting of three children with autism. *Journal of Autism and Developmental Disorders*, 37(8), 1505–1513.
- Patch, Alexandra F G; Mortner, Emily V.; and Joseph, Alison R. (2018). Examining the Effects of AAC Intervention on Oral Language in Children with Autism Spectrum Disorders: A Systematic Review. *Communication Sciences and Disorders: Systematic Review Publications*. 2. <https://scholarworks.uvm.edu/csdms/2>
- Pennington, R. C., Ault, M. J., Schmuck, D. G., Burt, J. L., & Ferguson, L. L. (2016). Frequency of mand instruction reported in behavioral, special education, and speech journals. *Behavior Analysis in Practice*, 9, 235–242. <https://doi.org/10.1007/s40617-015-0095-7>
- Ronski, M. A., & Sevcik, R. A. (1988). Augmentative and alternative communication systems: Considerations for individuals with severe intellectual disabilities. *AAC: Augmentative and Alternative Communication*, 4(2), 83-93. <http://dx.doi.org/10.1080/07434618812331274667>

# REFERENCES



- Schlosser, R. W., & Wendt, O. (2008). Effects of augmentative and alternative communication intervention on speech production in children with autism: A systematic review. *American Journal of Speech-Language Pathology*, 17, 212–230.
- Schmidt, R. A., & Lee, T. D. (2005). *Motor control and learning: A behavioral emphasis (4th ed.)*. Champaign, IL, US: Human Kinetics.
- Shane, H. Costello, J. (1994, November). Augmentative communication assessment and the feature matching process. Miniseminar presented at the annual convention of the American Speech Language Hearing Association, New Orleans.
- Sigafoos, J., Didden, R., & O'Reilly, M. F. (2003). Effects of speech output on maintenance of requesting and frequency of vocalizations in three children with developmental disabilities. *Augmentative and Alternative Communication*, 19, 37–47.
- Sigafoos, J., Wermink, H., Didden, R., Green, V.A., Schlosser, R.W., O'Reilly, M.F. & Lancioni, G.E. (2011). Effects of Varying Lengths of Synthetic Speech Output on Augmented Requesting and Natural Speech Production in an Adolescent with Klinefelter Syndrome, *Augmentative and Alternative Communication*, 27:3, 163-171, DOI: 10.3109/07434618.2011.610355
- Tardif, T., Fletcher, P., Liang, W., Zhang, Z., Kaciroti, N., & Marchman, V. A. (2008). Baby's first 10 words. *Developmental Psychology*, 44(4), 929-938.
- Thistle, J.J., & Wilkinson, K. (2015). Building Evidence-based Practice in AAC Display Design for YoungChildren: Current Practices and Future Directions, *Journal of Augmentative and Alternative Communication*, 31(2), pp. 124-136. DOI: 10.3109/07434618.2015.1035798

# REFERENCES



- Thistle , J. J. , & Wilkinson, K . (2009). The effects of color cues on typically developing preschoolers' speed of locating a target line drawing: Implications for augmentative and alternative communication display design. *American Journal of Speech-Language Pathology* , 18, 231 – 240. doi:10.1044/1058-0360(2009/08-0029)
- Thompson, K., & Koudys, J., (2018). Vocal behaviour during the transition from the Picture Exchange Communication System (PECS) to a Speech Generating Device (SGD): Impact of teaching strategies and speech output, Presentation at ABAI, San Diego, CA.
- Vicker, Beverly (1974). *Nonoral Communication System Project: 1964-1973*. Iowa University, Iowa City. University Hospital School. <https://eric.ed.gov/?id=ED101486>

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