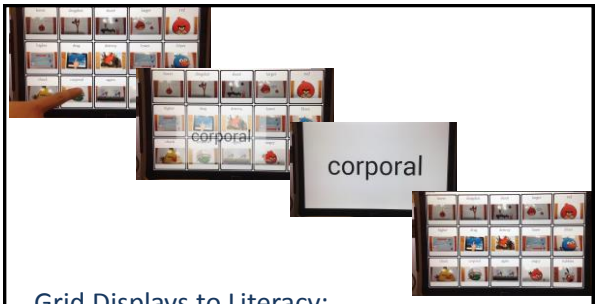

Grid Displays to Literacy: Effect of dynamic text on word reading for individuals with ASD

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- NIDILRR is a Center within the Administration for Community Living (ACL), Department of Health and Human Services (HHS). The contents of this presentation do not necessarily represent the policy of NIDILRR, ACL, HHS, and you should not assume endorsement by the Federal Government.

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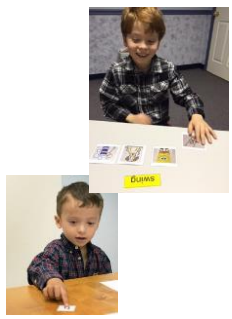
Problem:

- More than 90% of individuals with CCN enter adulthood without literacy skills (Foley & Wolter, 2010)
- As a result, they are severely restricted in education, employment, healthcare, & community living



Limitations of current AAC technologies/apps with picture symbols

- Individuals with CCN who are nonliterate typically use AAC systems/ apps with picture symbols
- The design of these apps does not support literacy learning
  - Text may be displayed above picture symbol, but individuals do not attend to static text (Brown et al., 2015)
  - Text may be displayed in message bar upon selection of picture symbol, but displacement of text from picture selection does not support learning association

cookie

Potential Solution:

- AAC technologies to support transition from graphic symbols to literacy (T2L)
  - Transition to literacy (T2L) is a software feature for AAC technologies /apps
  - T2L provides dynamic presentation of text with speech output when a picture symbol is selected
    - Conceptualized & developed by Light, McNaughton, Jakobs, & Hershberger (2014)
- T2L provides a first step in the transition from use of picture-based AAC technologies /apps to literacy

Transition to Literacy (T2L) Software Features

- **Transition to literacy (T2L)** software feature
  - Individual selects a picture symbol from AAC display
  - Written word appears dynamically
  - Written word is spoken by the app
- 2 apps
  - Grid-based T2L app developed by Saltillo (Hershberger)
  - VSD T2L app developed by InvoTek (Jakobs)
    - Incorporated into SnapScene by TobiiDynavox

Research-based design of T2L feature

- Design of T2L feature is grounded in the state of the science in visual cognitive processing, literacy instruction, and instructional design (Light et al., 2014)
  - Individual selects graphic symbol from personalized AAC system
    - Literacy learning is driven by the individual's interests & needs and utilizes personally relevant vocabulary, thus increasing motivation & engagement (Light & McNaughton, 2009)
  - Text is dynamically presented on the screen
    - Movement is strong attractor of visual attention, increasing learner's attention to the text (Wilkinson & Jagaroo, 2004)
  - Text is paired with graphic symbol & speech output
    - Direct active pairing supports learning of association between written word & referent (picture symbol and/or spoken word) (e.g., Browder & Xin, 1998)
  - Text is consistently incorporated into communication
    - Integration of literacy supports into AAC provides increased opportunities for functional learning & use throughout the day (Light & McNaughton, 2014, 2015).

T2L feature for AAC apps A first step in the transition to literacy

- T2L apps are intended to **complement, not replace** literacy instruction
- Current T2L apps
  - only support sight word acquisition
  - are a **first step** in technologies that provide a direct bridge from picture-based systems to literacy
- Future developments are required to further support the full transition to literacy

Aims/ Questions:

- The purpose of this study was to investigate the effects of dynamically displaying text within graphics-based grid display AAC app, in order to support the transition from AAC graphic symbols to literacy for individuals.
- Specifically, the primary research questions were:
  - (a) What is the effect of exposure to dynamic text within graphics-based grid displays, on the acquisition of single-word reading of 12 words, by individuals with ASD, CCN, and limited literacy skills?
    - (b) Are the effects generalized to text-only AAC grids displays?
    - (c) Are the effects generalized to use of text-only displays during a communication opportunity?
    - (d) Are the effects maintained by the individuals with ASD and CCN?

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Methods:

- This study implemented a single-subject, multiple-probe, across-subjects design with 5 participants

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Participants:

- 5 Participants:
  - All males
  - Ages 6-14
  - 4 diagnosed with ASD ("Severe" diagnosis on CARS Assessment), 1 diagnosed with "characteristics of ASD"
  - All attend Autism support classes with 1:1 support
  - All identified as having complex communication needs
    - Ranging from scripted speech, echolalic speech, to no speech and use of AAC apps on iPad

Participants: Reading Skills

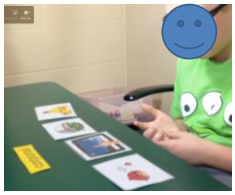
- Identify all letter-sounds
- 150-300 sight words
- Not decoding

- Also administered WRMT-III (modified) and TACL-3
  - <1% for all subtests

Materials:

Sight Word Probe Materials (how we assess learning)

- Word printed on yellow
- Images representing targeted words
- All "Angry Birds" related words
  - Shared interests across participants
  - Age appropriate
  - App is available for leisure on iPads
  - Selected words that would expand their vocabulary and that they didn't already know
- Words range in length (4-8 letters)
  - Examples:
    - Corporal
    - Chuck
    - Destroy
    - Drag
    - Slingshot
    - shoot



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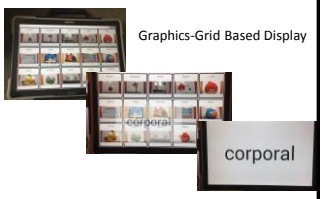
Materials

Exposure Materials ("intervention")

- NovaChat Device (15 button display)
- T2L Software Features
  - dynamically displaying text
  - Text emerging from its graphics-based referent within the AAC software
  - Speech output with exact match to dynamic text



Graphics-Grid Based Display

Generalization Phase: Transitioned to text

Procedures:

- Prior to starting – trained all participants on photographs that represent targeted words. 90% accuracy or better before starting
- Four phases:
  - (a) baseline condition (prior to exposure to tablet technology);
    - Present word & 4 photograph choices
      - Choices include: the correct word and one photo of a word that starts with the same initial letter
  - (b) exposure to tablet technology with the AAC applications;
    - 12 words total (and 2 models)
      - Showed picture- was told to match/find the picture on the AAC T2L app
      - 4 exposures to the word per session (word was on the screen for 3 sec)
  - (c) generalization to different task (to text only display)
    - 3 conditions
      - GP → Text only display on T2L app, provided with picture – and prompted to find the right word
      - GO → Text only display on T2L app, provided with "find __" prompt and participant was to locate the correct word from the array of 15
      - Communicating about a scene
  - (d) maintenance of acquired sight words
    - Same as baseline

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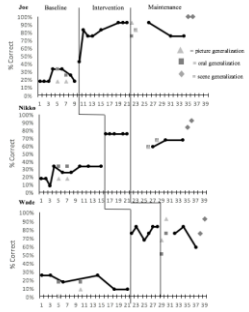
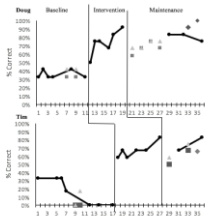
Results:

+69% after,92s of exposure per word

+50% after,60s of exposure per word

+62% after,72s of exposure per word





+45% after,72s of exposure per word

+56% after,72s of exposure per word

Figure 1. Percentage of single-words read correctly, per participant, out of 12 trials, in probe tasks

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Exposure Data:

Table 4
Intervention exposure data

Participant	Total Number of sessions before maintenance phase	Total # of exposures to each word during intervention	Total exposure time, per word, during intervention (in seconds)
J	8	32	96s
N	5	20	60s
W	6	24	72s
D	6	24	72s
T	6	24	72s

Results Summary:

- All of the participants demonstrated increases in the single word reading, of the targeted 12 words, when introduced to T2L app
  - gains of >+45% (range 45%-69%) from baseline with minimal exposure time
  - 100% non overlapping data for all participants
  - Maintaining above baseline (probes at 1, 2 and 3 months post exposure)
  - All generalizing the single words to a new task (and harder task)

Conclusion & Future Research Directions:

- Increases in single word reading with minimal exposure time.
  - These apps/software features are intended to complement, not replace, literacy instruction
  - Study provides some foundation for how AAC supports with T2L software features could be combined with instruction
- Replication – more T2L studies for readers with more advanced literacy skills with different diagnoses.
  - Communicative context
  - Different partners providing the intervention (SLPs/Para) more consistently

Questions?

For Handouts:
http://aac.psu.edu