Effects of Dynamic Text and Speech Output in an AAC App with Graphic Symbols
On Single-Word Reading of Individuals with Autism Spectrum Disorder and Complex Communication Needs

Jessica Caron, Janice Light, Christine Holyfield, & David McNaughton

The Pennsylvania State University

INTRODUCTION

- Due to intrinsic and extrinsic challenges, many individuals with CCN and ASD are unable to read or write at grade level (Koppenhaver & Yoder, 1993; Foley & Wolter, 2010) and these reading deficits then persist through adolescence into adulthood.
- Although literacy instruction (including sight word instruction) is imperative, improved features within AAC technologies could also be used to complement instruction and infuse literacy learning into daily communication.

There is an urgent need to better understand how design features in AAC systems can support improved literacy outcomes for individuals with complex communication needs.

Challenges with current systems:
Grid-based AAC systems commonly use paired text and graphic symbols to represent concepts that individuals communicate with. Previous research demonstrated that static pairing of print and graphic symbols, blocks word learning.

Potential Solution:
Changes to AAC system design, specifically dynamic text paired with speech output upon selection of a graphic symbol, could potentially lead to better literacy outcomes for individuals who use AAC (Light et al., 2014). *See figure in Materials for an example of the AAC system dynamically presenting the word "red."*

RESEARCH QUESTIONS

- **What is the effect of the AAC app with T2L on the acquisition of sight-word acquisition of 12 words, during a highly structured task, by individuals with ASD, complex communication needs, and limited literacy skills?**
- **Are the effects maintained once exposure to the AAC app with T2L features is terminated?**
- **Do the participants generalize the sight-word skills to a text-only AAC grid display?**
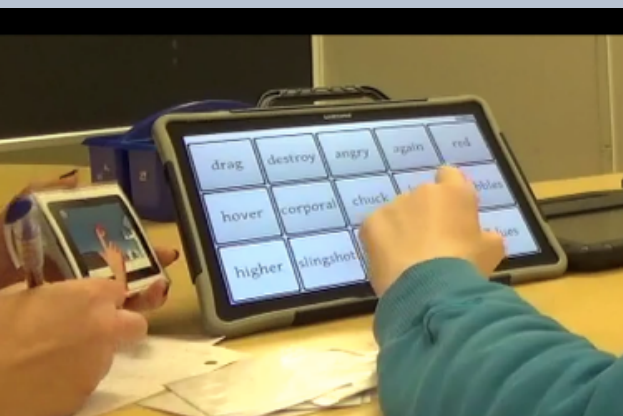
- **Transition to Literacy (T2L) software feature (Light et al., 2014) was used within a NovaChat 12 (Saltillo) with Grid-Based AAC Display of motivating words**
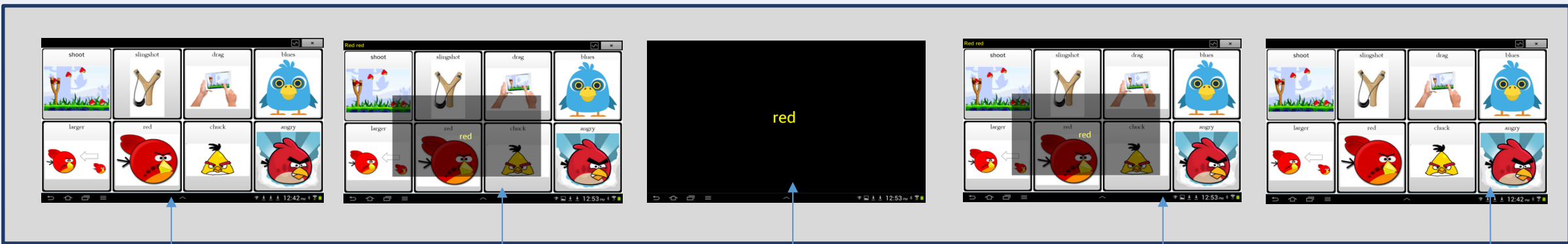
1. The individual selects the graphic symbol (e.g., red)

2. The text dynamically appears from the graphic icon that was selected

3. The word is spoken from the device, the text replaces the grid and stays on the screen for 3 seconds

4. The word dynamically disappears back into the graphic icon that was selected

5. The grid is back to original view – with statically paired graphic symbol and text

RESULTS

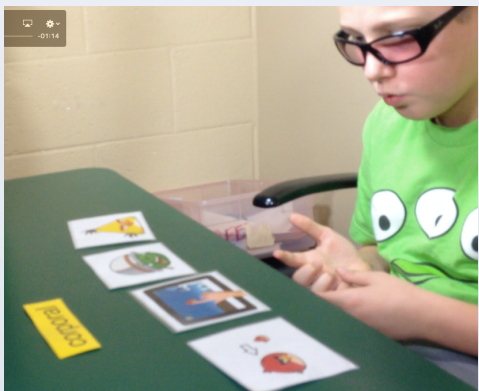Percentage of sight words read correctly, per participant, out of 12 trials
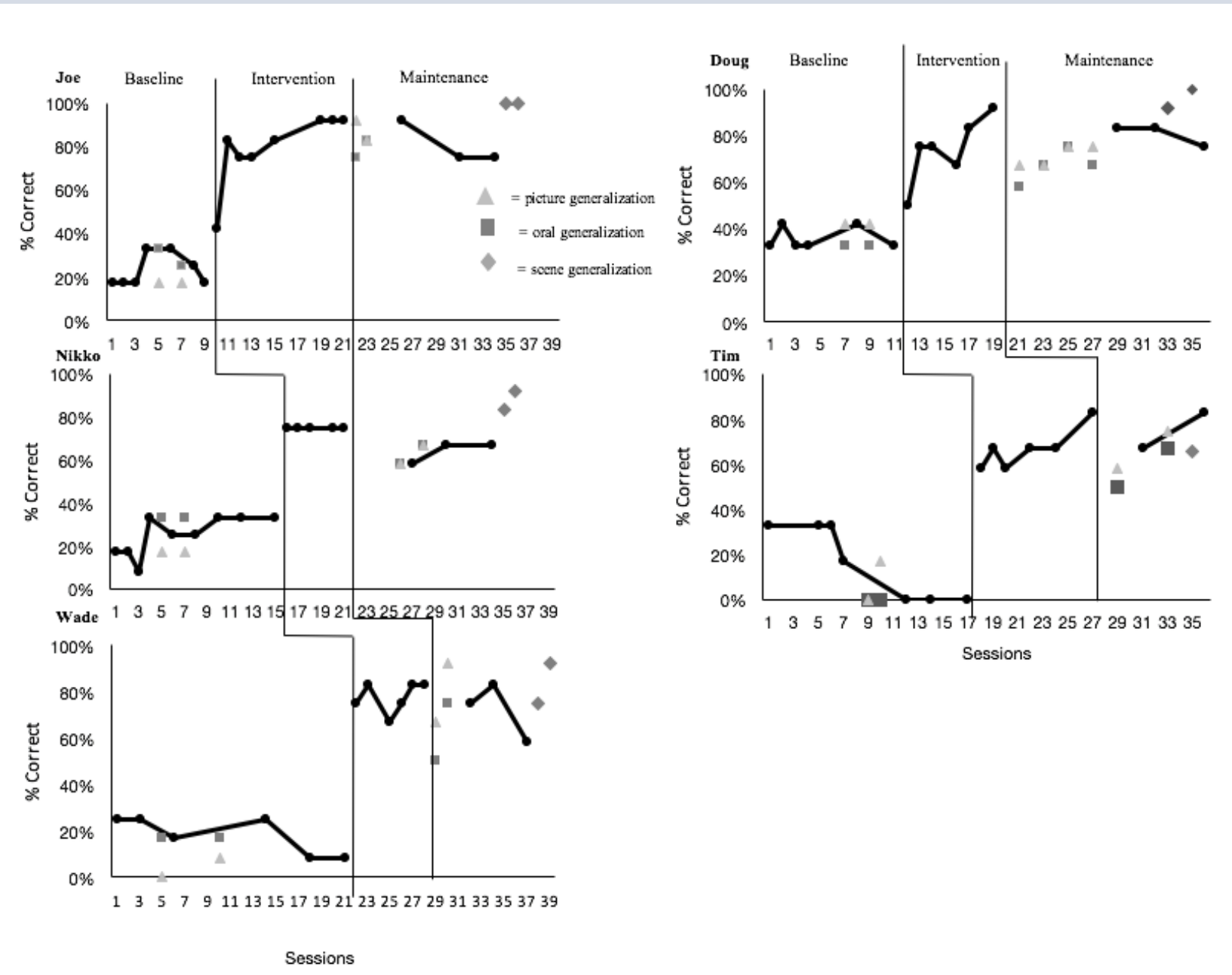
Dynamic text exposure summary:

Participant	Total # of sessions	Total # of exposures to dynamic text	Total dynamic text exposure time per word (in seconds)
Joe	8	84	96
Nikko	5	20	60
Wade	6	24	72
Doug	6	24	72
Tim	6	24	72

The five participants in this study learned to recognize the targeted sight words in 20 to 32 exposures to the dynamic text T2L features (approximately 1-2 min of exposure per word).

All participants demonstrated gains from baseline. The exposure to the AAC app with T2L features resulted in strong effects on sight-word performance (NAP greater than .85) (Parker & Vannest, 2009), with NAP calculations resulting in 100% non-overlapping data for all participants. In addition, the participants generalized their learning to a text-only AAC display, a significantly more difficult task.

METHOD

- Design: A single-subject multiple probe across participants
- IV: AAC app with transition to literacy (T2L) software features (i.e., dynamic text and speech output upon selection of a graphic symbol)
- DV: Accurately reading 12 target words
- Participants:
  - 5 males with ASD
  - Ages 6;3 – 14;0
  - 4 individuals participated in ASD support classrooms with 1:1 aides and 1 individual was included in a learning support classroom with 1:1 support
  - 2 individuals used AAC throughout the day (Nikko and Wade), 3 individuals used scripted speech, often with delayed echolalia

PROCEDURES

Baseline	Intervention	Generalization	Maintenance
-Sight word probes - Probe = Assessment and includes researcher presenting 4 images and 1 word	-Sight word probes (assessment) -Image matching task with device with T2L feature -4 exposures per word, per session	-Sight word probes (assessment) with text-only display	-Sight word probes (assessment) -Short-term: 2-4 weeks after last intervention session -Long-term: 8-16 weeks after last intervention session

DISCUSSION

- While technological changes have been made to hardware, AAC software has remained relatively static in design. Research to explore innovative, evidence-based design changes to AAC systems to enhance language and literacy learning and improve communication performance is needed.
- This study provides preliminary evidence that redesigning graphics-based AAC software to include T2L features; when used in a highly structured manner, can result in improvements in sight-word reading.
- The direct **active pairing (both between the text and graphic symbol and between text and speech output) can support** learning of the association between a written word and its referent.
- Research is needed to explore the T2L software features with a variety of settings and populations
- Note: The app is intended to be used to complement, not replace, literacy instruction.

ACKNOWLEDGEMENTS