The Effects of Literacy Interventions on Single-Word Reading for Individuals who use Aided AAC: A Systematic Review

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Introduction

- In today's world, the acquisition of literacy skills is necessary to participate successfully in education, employment settings, and society.
- The acquisition of literacy skills is especially important for individuals with complex communication needs (CCN) who use augmentative and alternative communication (AAC) (Foley & Wolter, 2010; Light & McNaughton, 2013).
- Up to 90% of individuals with CCN enter adulthood without functional literacy (Foley & Wolter, 2010).
- Without the acquisition of literacy, individuals who use AAC are bound to be restricted in their participation in:
    - Education
    - Employment
    - Relationships
    - Society
- **Thus, there is urgent need to find effective ways to promote literacy among individuals who use AAC and prevent such negative outcomes.**

Several skills play a role in literacy development (e.g., phonological awareness skills, letter-sound correspondences, decoding, etc.). Ultimately, individuals need to **integrate** these skills to read a wide range of texts fluently with comprehension.
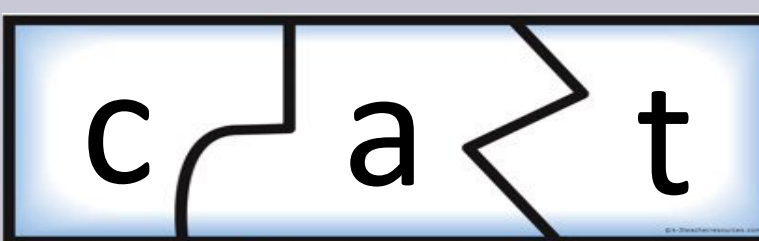
One critical step of literacy learning is instruction in reading **single words**. When approaching a written word, an individual either:
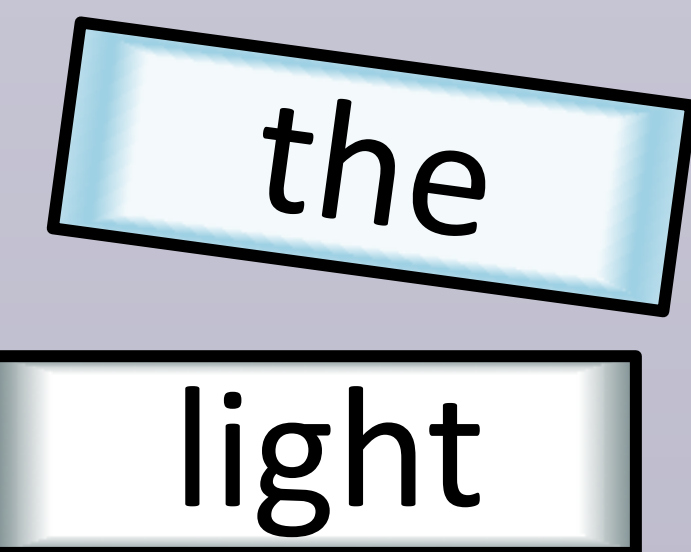
Decodes the word

Recognizes the word by sight
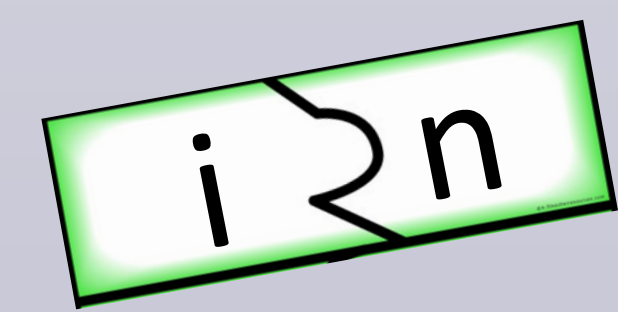
If decoding, the individual looks at the letters, retrieves the sound of each letter, blends the sounds, and thus determines the word.

Or an individual may focus primarily on the orthography of the word and associate it with its referent by sight.

Single word reading is vital, as once an individual with CCN can decode or recognize a few words by sight, this opens the door to meaningful, reading experiences (Light, McNaughton, Weyer, & Karg, 2008)
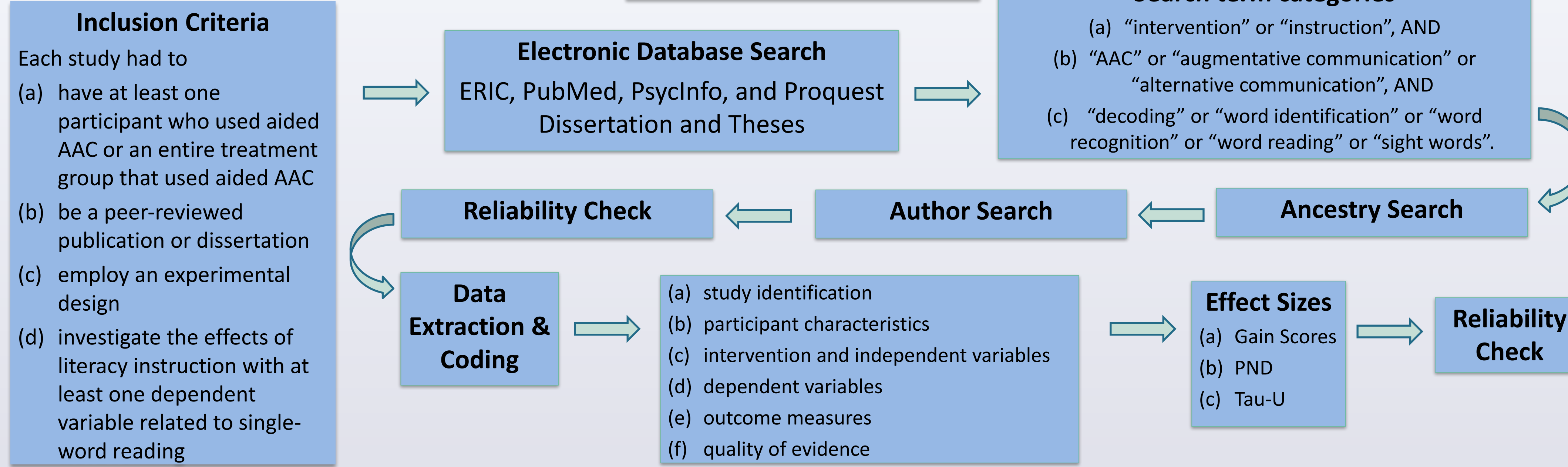
Purpose of Review

To investigate the effects of literacy instruction on single-word reading of individuals who use aided AAC.

(a) What are the effects of literacy interventions on the single-word reading of individuals who use aided AAC?

(b) Do effects differ across participant and intervention characteristics?

Methods

Inclusion Criteria

Each study had to
(a) have at least one participant who used aided AAC or an entire treatment group that used aided AAC
(b) be a peer-reviewed publication or dissertation
(c) employ an experimental design
(d) investigate the effects of literacy instruction with at least one dependent variable related to single-word reading

Electronic Database Search
ERIC, PubMed, PsycInfo, and Proquest Dissertation and Theses

Search term categories
(a) "intervention" or "instruction", AND
(b) "AAC" or "augmentative communication" or "alternative communication", AND
(c) "decoding" or "word identification" or "word recognition" or "word reading" or "sight words".

Reliability Check ← **Author Search** ← **Ancestry Search**

Data Extraction & Coding
(a) study identification
(b) participant characteristics
(c) intervention and independent variables
(d) dependent variables
(e) outcome measures
(f) quality of evidence

Effect Sizes
(a) Gain Scores
(b) PND
(c) Tau-U

Reliability Check

Results

The systematic search identified 24 individuals across 9 single-case experimental design studies.
Across participant, intervention, and outcome characteristics, these individuals were able to acquire single-word reading skills.

Participant Characteristics

- ranged from 6 to 22 years of age
- 11 (46%) were female and 13 (54%) were male
- Autism spectrum disorder (ASD) and cerebral palsy (CP) were the most prevalent diagnoses (42%)
- Type of aided AAC
    - 16 used a speech-generating device (SGD), 7 used low-technology AAC, 1 used a combination of the two

Effects?

Very Large Effects

Across all ages	Across all Diagnoses
Elementary (60-144 mo)	ASD, DS, CP, Intellectual
Adolescent (12 – 17 years)	Disability, Other
Adult (≥ 18 years)	

Intervention Characteristics

Intervention Approach

- 4 studies took a phonological approach, 4 studies took a sight-word approach, 1 study took a combination approach
- All in one-on-one setting
- Averaged 12 intervention sessions per participant
- Educators served as interventionists in 4 studies, Researchers in 5 studies
- Various instructional strategies were used

What was being measured?

- All studies had same dependent variable: Accuracy of reading single words
- Studies varied in measurement task used (*see below*)

Effects?

Very Large Effects across all intervention approaches, all interventionists, and interventions using various instructional strategies.

BUT, the largest effects were those studies that:

- Used a Phonological approach or Combination approach
- Included error correction and error analysis
- Had intervention implemented by educators, rather than researchers
- Included 15 or more intervention sessions
- Used the following measurement tasks
    - Text-spoken Choices
    - Text-Picture Choices
    - Spoken Word-Text Choices

Various measurement tasks

Text-Spoken Choices

Instructor presents written word.

dog

Instructor presents four spoken choices. Learner chooses from the spoken choices.
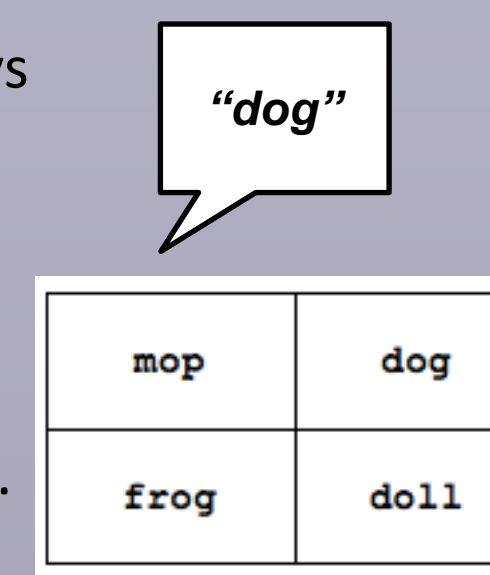
"Your choices are MOP, DOG, DOLL, FROG. Is it MOP?" [waits for response], and so on.
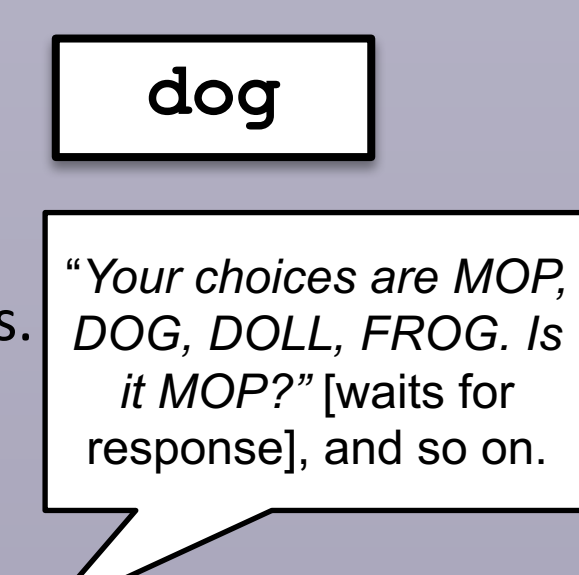
Text-Picture Choices

Instructor presents written word.

dog

Learner chooses a picture.

Spoken Word-Text Choices

Instructor says a word.

"dog"

Learner chooses a written word.

mop	dog
frog	doll

Picture-Text Choices

Instructor presents a picture.

Learner chooses a written word.

mop	dog
frog	doll
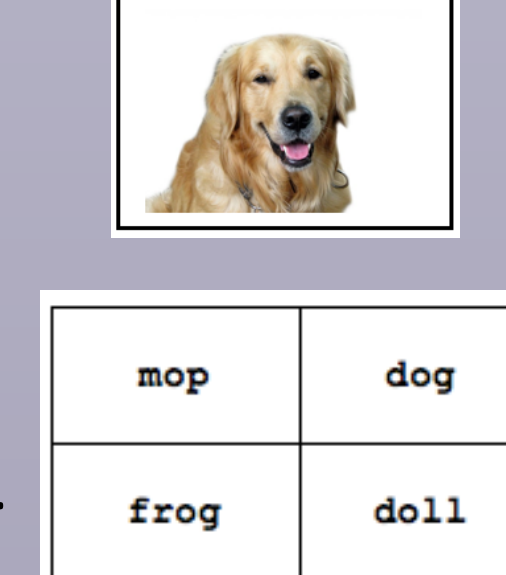
Discussion & Implications

Participants

It is not well understood which participants benefit most from which interventions.

Most participants were elementary school-aged children or adolescents with ASD.

- More research is necessary for specific age groups and diagnoses, with increased specificity when describing participants.
- Highlights the need for research with young children and adults who use AAC.

Educators must not allow individuals' ages, prior literacy experiences, and current language skills to impact their expectations for future skill acquisition.

Intervention

Instructional Approach

The effects of interventions including phonological awareness and phonetics instruction were greater than those that focused on sight-word instruction alone.

- Without fluency in foundational phonological skills, reading will require significant cognitive resources for individuals with CCN.
- There is still the need for sight-word identification, as not all words are decodable. Although both approaches were individually very effective, the combination of both bolstered the intervention effectiveness.

Educators should take both a phonological and sight-word approach to intervention by teaching the skills to decode as well as recognize whole words.

Instructional Strategies

The instructional strategies across the studies reveal the importance of direct and systematic instruction, appropriate scaffolding (e.g., modeling, time delay, etc.), feedback, and the use of error correction and analysis.

- Corrective feedback provides increased opportunities for learners to respond and practice new skills.
- Identifying learners' patterns of responses through error analyses can provide valuable information on how to adapt instruction as well as future interventions.

With both approaches, evidence-based instructional strategies are necessary to ensure success.

Alternative Response Modes

Learners with CCN are unable to participate via spoken responses and thus instructors must use adaptations to measure intervention outcomes and progress. There were four distinct tasks used to assess single-word reading across the studies.

- The demands of the tasks vary.
- LEAST DEMANDING → do not require phonological recoding
    Text-Spoken Choices
    Spoken Word-Text Choices
- MOST DEMANDING → require phonological recoding
- Closer to actual reading demands
    Picture-Text Choices
    Text-Picture Choices

Educators may need to adapt tasks to compensate for learners' inability to provide oral responses. It is necessary to be cognizant of the demands of reading and carefully analyze the tasks to replicate these demands.

Conclusion

- Across participant, intervention, and outcome characteristics, individuals who used aided AAC successfully acquired single-word reading skills with appropriate instruction.
- It is essential that professionals provide opportunities for individuals who rely on AAC to develop foundational literacy skills in order to increase their likelihood of becoming successful readers and participating fully in life.

Included Studies

*Ahlgrim-Delzell, L., Browder, D., & Wood, L. (2014). Effects of systematic instruction and an augmentative communication device on phonics skills acquisition for students with moderate intellectual disability who are nonverbal. Education and Training in Autism and Developmental Disabilities, 49, 517-532.
*Caron, J. G. (2016). Effects of adapted instruction on the acquisition of letter-sound correspondences and sight words by pre-adolescent/adolescent learners with complex communication needs and autism spectrum disorders. (Doctoral dissertation, The Pennsylvania State University).
*Coleman-Martin, M. B., Heller, K. W., Cihak, D. F., & Irvine, K. L. (2005). Using computer-assisted instruction and the nonverbal reading approach to teach word identification. Focus on Autism and other developmental disabilities, 20, 80-90.
*Crowley, K., McLaughlin, T., & Kahn, R. (2013). Using direct instruction flashcards and reading racetracks to improve sight word recognition of two elementary students with autism. Journal of Developmental and Physical Disabilities, 25, 297-311.
*Fallon, K. A., Light, J., McNaughton, D., Drager, K., & Hammer, C. (2004). The effects of direct instruction on the single-word reading skills of children who require augmentative and alternative communication. Journal of Speech, Language, and Hearing Research, 47, 1424–1439.
*Heller, K. W., Fredrick, L. D., Tumlin, J., & Brineman, D. G. (2002). Teaching decoding for generalization using the nonverbal reading approach. Journal of Developmental and Physical Disabilities, 14, 19-35.
*Hetzroni, O. E., & Shalem, U. (2005). From logos to orthographic symbols: A multilevel fading computer program for teaching nonverbal children with autism. Focus on Autism and Other Developmental Disabilities, 20, 201-212.
*Swinehart-Jones, D., & Heller, K. W. (2008). Teaching students with severe speech and physical impairments a decoding strategy using internal speech and motoric indicators. The Journal of Special Education, 43, 131–144.
*van der Meer, L., Achmadi, D., Cooijmans, M., Didden, R., Lancioni, G. E., O'Reilly, M. F., ... & Green, V. A. (2015). An iPad-based intervention for teaching picture and word matching to a student with ASD and severe communication impairment. Journal of Developmental and Physical Disabilities, 27, 67-78.