Comparison of Text vs. Picture Symbol AAC Systems to Maximize Outcomes for Children With ASD

ASHA 2022 Technical Session Handout

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Lauramarie Pope, M.S., CCC-SLP (lep161@psu.edu)

Penn State University

Background

1. At least a third of children on the autism spectrum do not develop speech that is functional to meet their daily communication needs (Rose, 2016) – AAC is essential to support language and communication, social development, participation in education, and future life outcomes (Ganz et al., 2012)
2. AAC systems can vary across multiple features – one critical element is how vocabulary items are represented (Mirenda & Locke, 1989)
    a. Clinicians often emphasize the importance of 'transparency' in making decisions about how to represent vocabulary – that is, how much a symbol looks like the target concept (Pampoulou, 2017)
    b. For nouns, digital photographs are generally considered the most transparent form of symbol representation, and written words the least (Mirenda & Locke, 1989)
3. Many commercially available AAC vocabulary sets use picture symbols to represent vocabulary, and this is the most common type of symbol representation included by clinicians in AAC systems (Pampoulou, 2017; Thistle & Wilkinson, 2020)
    a. However, picture symbols may not be the best fit for all children on the autism spectrum with complex communication needs
        i. Some research suggests that transparency may not be a strong constraint in learning symbolic representations for these children (Angermeier et al., 2008), and written text may be equally – or more – learnable than picture symbols (Holyfield, 2021)
        ii. Many children on the spectrum demonstrate unexpected strengths in literacy acquisition (Westerveld et al., 2017)
    b. Additionally, many early language concepts are difficult to represent in line drawings or pictures (e.g., "more," "big"), and the pre-existing picture symbols for these concepts (developed by adults) do not align with how they are conceptualized by both children without disabilities and those on the autism spectrum (McCarthy et al., 2018; Worah et al., 2015)
4. Written text offers the greatest independence and generative capacity for communication for individuals who use AAC (Light & McNaughton, 2013)
    a. Functional literacy skills are also essential for gaining full access to mainstream technology (e.g., the internet and social media) and to educational, social, and vocational opportunities (Light & McNaughton, 2013)

Methods

1. Research question: Are there differential effects on the percent accuracy of independent identification of AAC symbols during shared adapted book reading associated with symbol representation type (i.e., picture symbols vs. text) for young children on the autism spectrum?
    a. Is there any impact of word class (noun, verb, descriptor) on relative rates of learning?
2. Adapted alternating treatments design with six children ages 3-9 with a diagnosis of ASD and complex communication needs
3. Two lists of equivalent vocabulary drawn from the MacArthur-Bates Communication Development Inventory:
    a. List A: owl, frog, donkey, drink, wash, run, hot, hungry, little
    b. List B: bee, turtle, monkey, eat, splash, sleep, cold, thirsty, big
    c. Each list presented in a 3x3 grid-based AAC app on an iPad in either written text or picture symbols and block randomized across participants: three learned List A in text and List B in picture symbols, and the reverse for the other three participants
4. Shared adapted book reading activity with the researcher with opportunities for active participation for participants through activation of target vocabulary on the AAC system

a. Each session included a probe shared adapted book reading activity for one condition (e.g., text) without feedback on response accuracy to test for symbol identification accuracy, followed by
b. An instructional shared adapted book reading activity in the same representation condition (e.g., text) with modeling, corrective feedback, and opportunities for independent practice

5. Generalization to using the same AAC displays to comment during shared video viewing

Results and Discussion

1. Initial recognition of symbols (a measure of symbol transparency)
    a. Four out of six participants did not immediately recognize any of the targeted picture symbol or text representations in the initial probe session before beginning instruction
        i. None of these symbols were transparent to these four participants
        ii. One participant (Isabella) recognized over half of the targeted picture symbols without instruction, and went on to learn the remaining picture symbols
        iii. One participant (Adam) recognized over half of the targeted picture symbols, but did not learn any additional symbols in either condition (picture symbols or text) over the course of the study
2. Learning of symbols
    a. One participant (Isabella) quickly learned all the picture symbols, but also demonstrated learning in the text condition
        i. Potentially more powerful to start with picture symbol AAC representations, but quickly introduce literacy instruction and transition to written text to promote more generative communication
    b. One participant (Uma) learned over half of both the targeted picture symbols and text at a comparable rate
        i. Given the power of text for both AAC communication and life outcomes, start with written text representations
    c. Three participants (Henry, Edgar, Lucas) had difficulty understanding and learning both picture symbols and text within the grid format
        i. Different symbol representation types (e.g., digital photographs) and/or layouts (e.g., visual scene displays) may be a better fit for these participants at present
        ii. The instructional design may not have been an effective context to promote learning
    d. One participant (Adam) recognized over half of the targeted picture symbols, but did not learn any additional symbols in either condition (picture symbols or text) over the course of the study
        i. The instructional design may not have been an effective context to promote learning
        ii. Different symbol representation types (e.g., digital photographs) and/or layouts (e.g., visual scene displays) may be a better fit for learning new AAC symbols, while capitalizing on those Adam already recognizes at picture symbols
3. Age and familiarity with AAC
    a. The youngest participant (Uma – 3 years old) who had no prior exposure to AAC and demonstrated no initial recognition of any symbols, learned the most text words and generalized this to two-symbol combinations to describe a video, while the oldest participant (Adam – 9 years old) – who had used a picture symbol grid-based AAC system for many years and initially recognized over half the picture symbols – demonstrated no additional learning in either picture symbol condition and limited generalization of even known picture symbols
4. Impact of word class
    a. Nouns were identified most accurately and descriptors least accurately across sessions by participants, ***regardless*** of whether they were represented in picture symbols or text
        i. Nouns and concrete verbs may be intrinsically easier concepts to learn and use expressively in AAC systems, no matter how they are represented

Clinical Implications

1. Individualized dynamic assessment for AAC symbol representations, including multiple symbol types, is critical to maximize learning and communication for children on the autism spectrum with complex communication needs

    a. Additionally, different organization and layout of those symbols, and/or more child-directed, naturalistic instructional procedures may be a better fit for children who are beginning communicators
2. Children who are older or have more exposure to a certain type of symbol representation will not necessarily have better skills to learn more of that same symbol type, while younger children on the autism spectrum without exposure to AAC symbols may show skills that exceed what would be expected for neurotypical children
3. Picture symbols – even for nouns – may not be immediately transparent to many young children on the autism spectrum, and still require instruction (if they are the best fit symbol representation type for that child)
4. Some young children on the autism spectrum can learn and use written text to communicate via AAC without direct literacy instruction and with relatively minimal teaching
    a. Direct literacy instruction is still critical for all children, especially those who rely on AAC
5. Nouns are inherently easier to learn and use expressively in AAC systems, regardless of the symbol representation type (text or picture symbols), suggesting that these types of vocabulary concepts are most appropriate for beginning communicators with complex communication needs who use AAC

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