The effects of background color and symbol arrangement as syntactic cues in augmentative and alternative communication

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Why this matters

Some children do not develop functional speech and need other means to communicate. Augmentative and alternative communication (AAC) offers these children a tool to get their needs met. One common approach to AAC is to display a variety of pictures in an array. The child then points to the picture that represents the concept she or he wishes to convey.

Image courtesy of www.classinc.net

Speech language pathologists (SLPs) organize and design AAC displays based on the evidence and recommendations offered by experts. The aim of the current study was to examine one evidence based practice and one expert recommendation.

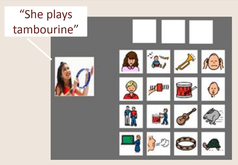
Question #1

Research suggests that symbol arrangement facilitates speed of locating a single target (see e.g., Wilkinson & McIlvane, 2013). We hypothesized that symbol arrangement would likewise result in faster reaction times when sequencing multiple symbols.

Question #2

SLPs frequently color code the background of symbols (Thistle, 2013), yet previous research suggests that background color does not facilitate speed of locating a target (Thistle & Wilkinson, 2009; Wilkinson & Coombs, 2010). We hypothesized that background color would hinder younger children's reaction time, but increase older children's reaction time when sequencing multiple symbols.

Methods

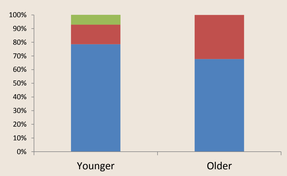


- 3 ½ - 4 years, n = 14
- 5 – 7 years, n = 29
- All participants completed 4 sessions, each with a different array layout
- Software recorded reaction time and accuracy measures
- Language and cognitive assessments

Results

A repeated measures ANOVA revealed a statistically significant main effect of arrangement, $F(1, 41) = 11.99$, $p = .001$, $\eta^2 = .226$, where symbol arrangement resulted in faster reaction times than no symbol arrangement. No other analyses reached significance.

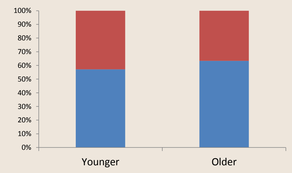
Question #1: Participants were faster when symbols with white background were grouped by word class category than when they were not grouped.



The average difference highlights the advantage of grouping particularly for younger participants

	Grouped	Shuffled
Younger	3.3s	1.3s
Older	1.6s	1.9s

Question #2: Roughly equal numbers of participants were faster when symbols were grouped with white background compared to when grouped with background colors.



The average difference was also roughly equal across conditions

	White	Color
Younger	1.9s	1.8s
Older	1.6s	2.1s

Conclusions

The results suggest three main conclusions:

- Symbol arrangement matters for most participants
- Background color matters for some participants
- When a feature provides an advantage for a participant, the advantage is potentially meaningful

Clinical Implications & Future Research

SLPs should organize symbols on the AAC display based on some arrangement. The specific arrangement may be less important than the fact of arrangement. Extending previous research (Wilkinson & McIlvane , 2013), the current study illustrated the facilitative effects of arrangement based on category membership (e.g., word class).

SLPs should be cautious in their use of background color. As an implicit cue, it results in slower reaction times in many children. Additional research should explore the effects of making the cue explicit through instruction.

Individual variability illustrates the need for an assessment tool that identifies conditions for optimal responding. Communicating via aided AAC is much slower than spoken communication. Some participants gained valuable time when using a display with some features, while others were faster with different features. In order for an SLP to design a display that is best suited for a specific child, the SLP needs to identify what pattern of response that child demonstrates.

References

Thistle, J. (2013). Speech language pathologists' decisions when designing aided AAC displays: A survey. *Unpublished Manuscript*.

Thistle, J. J., & Wilkinson, K. M. (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.

Wilkinson, K. M., & Coombs, B. (2010). Preliminary exploration of the effect of background color on the speed and accuracy of search for an aided symbol target by typically developing preschoolers. *Early Childhood Services*, *4*, 171–183.

Wilkinson, K. M., & McIlvane, W. J. (2013). Perceptual factors influence visual search for meaningful symbols in individuals with intellectual disabilities and Down syndrome or autism spectrum disorders. *American Journal on Intellectual and Developmental Disabilities*, *118*(5), 353–364.

Contact and acknowledgements

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