The Effects of Menu Location on Eye Gaze Fixation Patterns within AAC Visual Scene Displays

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Visual scene displays (VSDs)

A VSD is one type of AAC display in which representations of concepts are embedded in an integrated scene (e.g., photograph)

Benefits of VSDs:

- Capture the **social interactions** in which children learn language
- Provide contextual and event-based support for language learning



Why examine eye gaze on VSDs?

•VSDs represent language concepts visually

•Therefore, it is important to understand how individuals that use AAC attend to, perceive, and make sense of the visual information of the display (Wilkinson & Jagaroo, 2004; Wilkinson, Light & Drager, 2012).





•How do we get this information?

Eye-tracking research technology

•Eye-tracker rapidly samples the position of the participants' eyes while looking at an image

•Data provided allows us to examine what elements within the image receive attention and for how long (among other variables)

•*Note: this technology differs from AAC devices that are controlled by eye gaze access



Previous investigation of eye gaze in photographs

Humans in photographs attract visual attention, even when they are small, offset, and next to potentially distracting items in the background (Wilkinson & Light, 2014)



Current Investigation

Furthers previous research by examining eye gaze fixation patterns on stimuli that resemble actual VSDs $% \left(\mathcal{V}_{n}^{2}\right) =0$



Question:

In these more socially complex scenes containing two children engaged in a shared activity, what attracts attention within the VSD?

Free viewing for 5 seconds

Participants

group	number	CA (average)	PPVT age equivalent (average)
ASD	16	14;7	4;2
DS	15	17;8	4;6
IDD	15	15;11	5;11
TD	20	4;1	5;1



Participants across groups are attending to the meaningful events within the VSD (children and shared activity).

The background does not serve as a distraction.

Even with higher social demands (2 human figures), we do not see gaze aversion away from humans in participants with ASD. However, AAC systems that utilize VSDs are often more complex than a single picture.

Particularly, children must be able to visually attend to and navigate between various displays within a dynamic display system.

This is often achieved through the use of a <u>navigation menu</u> with links to subsequent pages.

Navigation menu

•Light et al (2011) found that young children were able to successfully navigate AAC technologies when the navigation menu was:

- (1) Available at all times
- (2) Included thumbnails (smaller images) of actual displays



Question:

What attracts attention in these visually complex stimuli that include both a main VSD and a navigation menu?





Question: What percentage of fixation time do participants spend on the children and shared activity when the navigation menu is on the top? Percentage of fixation time on the children Percentage of fixation time on the activity 100% 100% 90% 90% 80% 80% 70% 70% 57% 54% 60% 53% 52% 60% 50% 50% 40% 40% 30% 30% 23% 18% 18% 16% 20% 20% 10% 10%

Participants across groups spend a greater percentage of fixation time on the children compared to the shared activity within the VSD in the bar top condition.

IDD

0%

TD

ASD

DS

IDD

Question: What percentage of fixation time do participants spend on the children and shared activity when the navigation menu is on the bottom?





With the exception of participants with DS, participants across groups spend more time fixating on the children in the menu top condition compared to menu bottom

0%

ТD

ASD

DS

Participants across all groups spend more time on the shared activity in the menu bottom condition compared to the menu top condition.

DS

IDD

We verified that this pattern was true regardless of the contents of the main VSD. In other words, it was not due to the pictures themselves, but rather because of the location of the menu.





Clinical Implications

 $\left(2\right)$ We can change patterns of visual attention based on the location of the navigation menu

• Depending on the location of the menu, we may promote visual attention to different elements



Limitations and future analyses

LIMITATIONS

- •Small sample sizes limit generality •Did not examine effect of
- experience
- •Examined only two bar location conditions
- •Did not examine cued viewing data

FUTURE ANALYSES AND RESEARCH

•Use of more functional, ecologically valid tasks

•Examine relationship between eye gaze and actual selection (via motor response)

- •Examine left and right menu locations
- •Examine cued viewing data

References

Light, J., Jakobs, T., Drager, K., Chew, K., Guthrie, S., Mellman, L., & Riley, K. (2011). The effects of AAC technologies with just in time programming on the communication of children with complex communication needs. *Manuscript in preparation*.

Wilkinson, K. M., & Light, J. (2014). Preliminary study of gaze toward humans in photographs by individuals with autism, Down syndrome, or other intellectual disabilities: Implications for design of visual scene displays, *Augmentative and Alternative Communication*, 30, 130-146. doi:10.1044/1092-4388(2011/10-0098)

Wilkinson, K. M., & Jagaroo, V. (2004). Contributions of principles of visual cognitive science to AAC system display design. Augmentative and Alternative Communication, 20, 123-136. doi:10.1080/07434610410001699717

Wilkinson, K. M., Light, J., & Drager, K. (2012). Considerations for the composition of visual scene displays: Potential contributions of information from visual and cognitive sciences. *Augmentative and Alternative Communication*, 28, 137-147. doi:10.3109/07434618.2012.704522

