Investigation of Eye Gaze on AAC Visual Scene Displays with a Navigation Menu by Individuals with Autism Spectrum Disorder, Down syndrome, and Intellectual and Developmental Disabilities

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Acknowledgements

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RERC on AAC

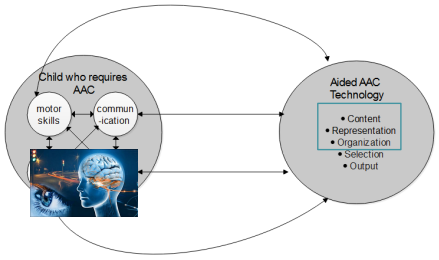
NATIONAL INSTITUTE ON DISABILITY, INDEPENDENT LIVING, AND REHABILITATION RESEARCH
NIDILRR

What is the goal?

Adoption and meaningful use

How to we achieve this goal?

Fit

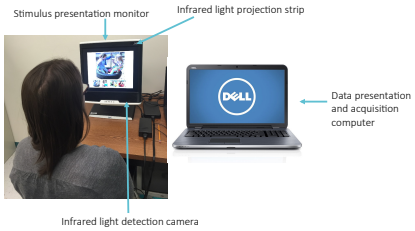


Visual cognitive processing and AAC

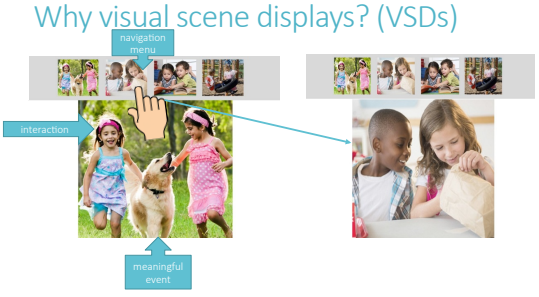
- Communication via AAC requires the use of an external display that is accessed and represented visually
- Processes of visual cognition are critical to using AAC:
  - **Visual attention**: required to perceive images/concepts on displays
  - **Visual recognition:** (objects, people, faces): required to discriminate between and identify concepts
  - **Spatial representation:** (ability to imagine objects/images in space): required to recall where something is on a display

Wilkinson & Jagaroo, 2004

Experimental Setup



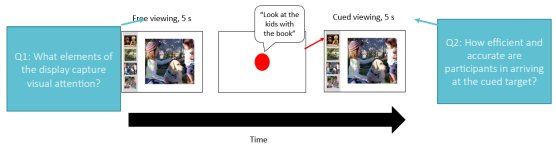
Why visual scene displays? (VSDs)



Participants and stimuli

Participants: Individuals with typical development, autism, Down syndrome, and intellectual and developmental disabilities

Procedures and Questions



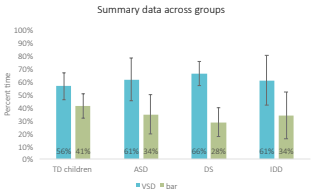
Q3: How does the location of the navigation menu affect attention and performance?

Participants

group	number	gender (% male)	CA mean range	PPVT SS mean (sd) range	PPVT age equivalent	sampling %
TD children	20	50%	4;1 (3;2-5:2)	114 (14) 87-137	5;1 (2;6-7;4)	67
ASD	16	100%	14;7 (7;4-19;5)	37 (24) 20-90	4;2 <1;11-10;1	65
DS	15	40%	17;8 (9;10-34;11)	52 (17) 22-74	4;6 2;7-11;10	67
IDD	15	47%	15;11 (10;7-25;0)	53 (23) 20-81	5;11 (<1;11-9;11)	68

Q1: What elements of the display capture visual attention?

Q1a. How is attention divided between the main VSD and the navigation menu (bar) during free viewing?



Question 1a Implications

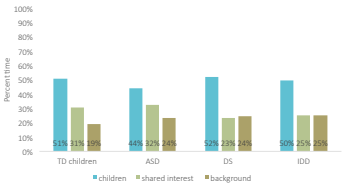
- Large and prominent human figures in VSD did not preclude attention to menu
- Small human figures in menu did not distract from VSD

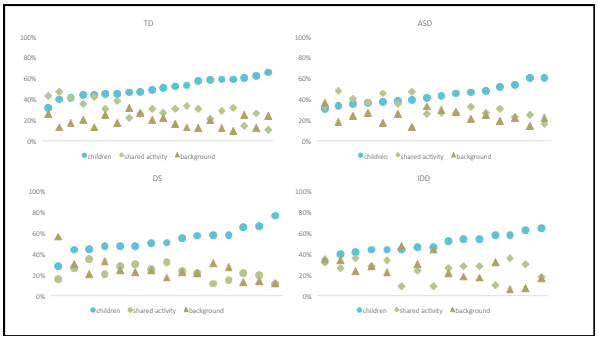
- The use of a navigation menu with thumbnails of possible displays, which has ben shown to reduce the learning demands of navigation (Drager et al., 2004), also appears to facilitate desirable patterns of visual attention

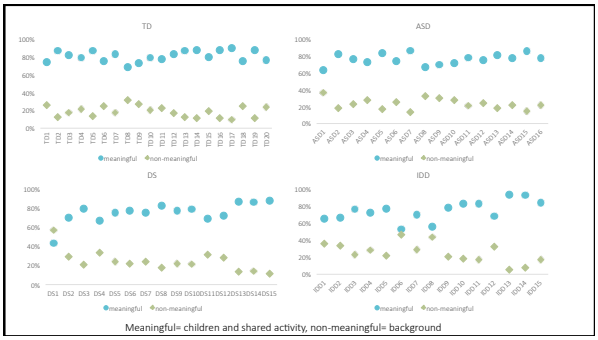
Q1: What elements of the display capture visual attention?

Q1b. What attracts attention within the VSD?

Summary data across groups

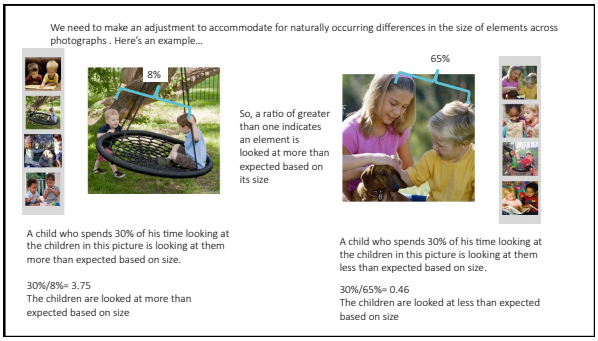


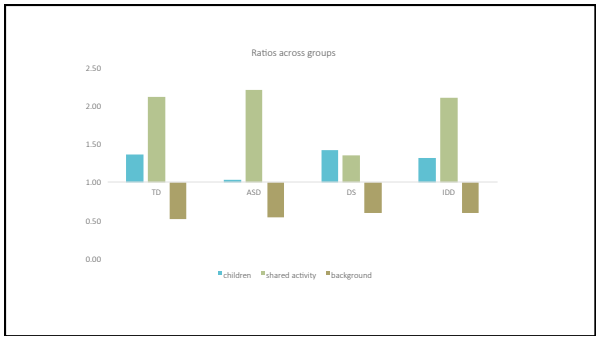


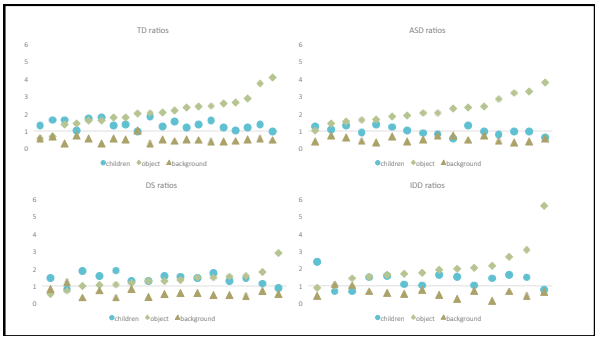


Meaningful= children and shared activity, non-meaningful= background


TD
DS
ASD
IDD


We need to make an adjustment to accommodate for naturally occurring differences in the size of elements across photographs . Here's an example...
8%
65%
So, a ratio of greater than one indicates an element is looked at more than expected based on its size
A child who spends 30% of his time looking at the children in this picture is looking at them more than expected based on size.
30%/8%= 3.75
The children are looked at more than expected based on size
A child who spends 30% of his time looking at the children in this picture is looking at them less than expected based on size.
30%/65%= 0.46
The children are looked at less than expected based on size


Ratios across groups
2.50
2.00
1.50
1.00
0.50
0.00
TD
ASD
DS
IDD
children
shared activity
background

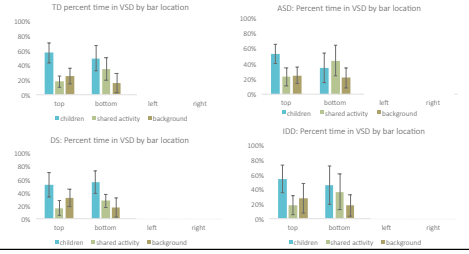

TD ratios
ASD ratios
DS ratios
IDD ratios
children
object
background

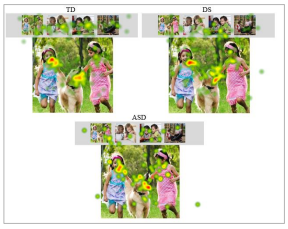
Question 1b Implications

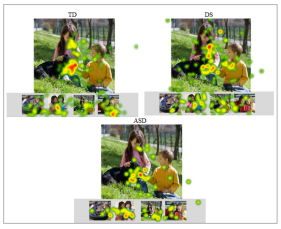
- The same elements that are included in VSDs in order to scaffold language (humans and shared events), attract preferential attention from participants across groups
  - Attention to shared event may indicate gaze following
  - Participants attended to these elements without becoming distracted by background items
  - These elements may confer advantages for language learning and visual cognitive processing
- When we adjust for the size that the elements occupy,
  - Participants with ASD do not look at children significantly more than expected based on size
  - Participants with DS spend less time on the shared activity

Q3: How does the location of the navigation menu affect attention and performance?

Q3a. How does the location of the menu affect attention during free viewing?







Question 3a Implications

- The location of the navigation menu may affect how attention is allocated, particularly in the VSD
- Optimal placement may vary based on diagnostic category
  - Placement at the top may promote attention to the human figures for individuals with ASD
  - Placement at the bottom may promote attention to the shared event for individuals with DS

Next steps: VSD Activation

Explore visual attention plus selection using a tablet, which more closely simulates an AAC device

What is the relationship between visual attention (eye gaze) and motor behavior (selection)?