



## Rationale

- It is important that **AAC display design** is evidence-based and grounded in understanding visual-cognitive processes.
- Visual Scene Displays (VSDs)** are an AAC display that embeds language concepts within a meaningful photograph. A **navigation bar** may be required in order to navigate between displays.
- Most of the research on the visual-cognitive processing demands of VSDs has investigated visual attention to simple VSDs.
- No studies to date have **investigated both visual attention and motor selection** and the relationship between these behaviors.
- This investigation used **mobile eye-tracking research technology** to investigate visual attention and motor selection of participants with **Down syndrome (DS)** when selecting a cued target in an AAC display (including a main VSD and a navigation bar of thumbnail VSDs).

## Research Questions

- What is the relationship between visual fixation and motor selection to a target?
- Do these vary across participants and/or navigation bar location (top, bottom, left, right)?

## Methods

- First study to utilize mobile eye-tracking research technology (Tobii Pro Glasses 2) with individuals with Down syndrome
- Wearable eye tracker designed to capture natural viewing behavior
- Two sensors per eye which track eye orientation and movement.
- Camera on bridge of nose captures what participant is looking at



## Participants

- 8 participants with Down syndrome

Chronological age	Mean: 21.8yrs Range: 13-34yrs
PPVT standard score	Mean: 49.6 Range 26-73

## Procedures

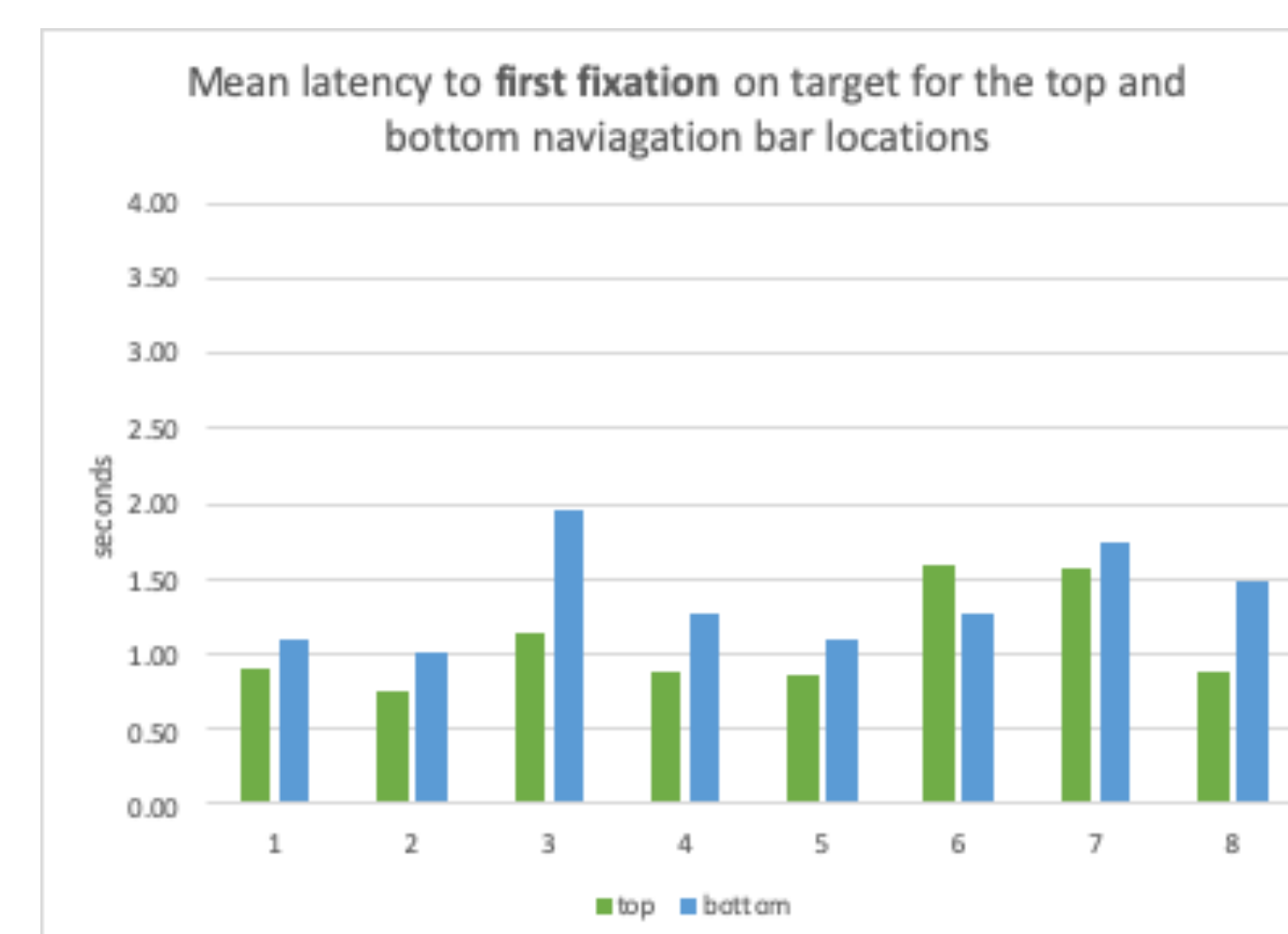
- Participant saw a screen with a red dot in the center (left-hand picture below) and heard an auditory cue (e.g. "Touch the kids with the ball")
- The screen then showed a main VSD and navigation bar with mini VSDs (center picture below). Navigation bar location varied
- Once they touched the cued target in the navigation bar, the target became the main VSD (right-hand picture below)



## Results

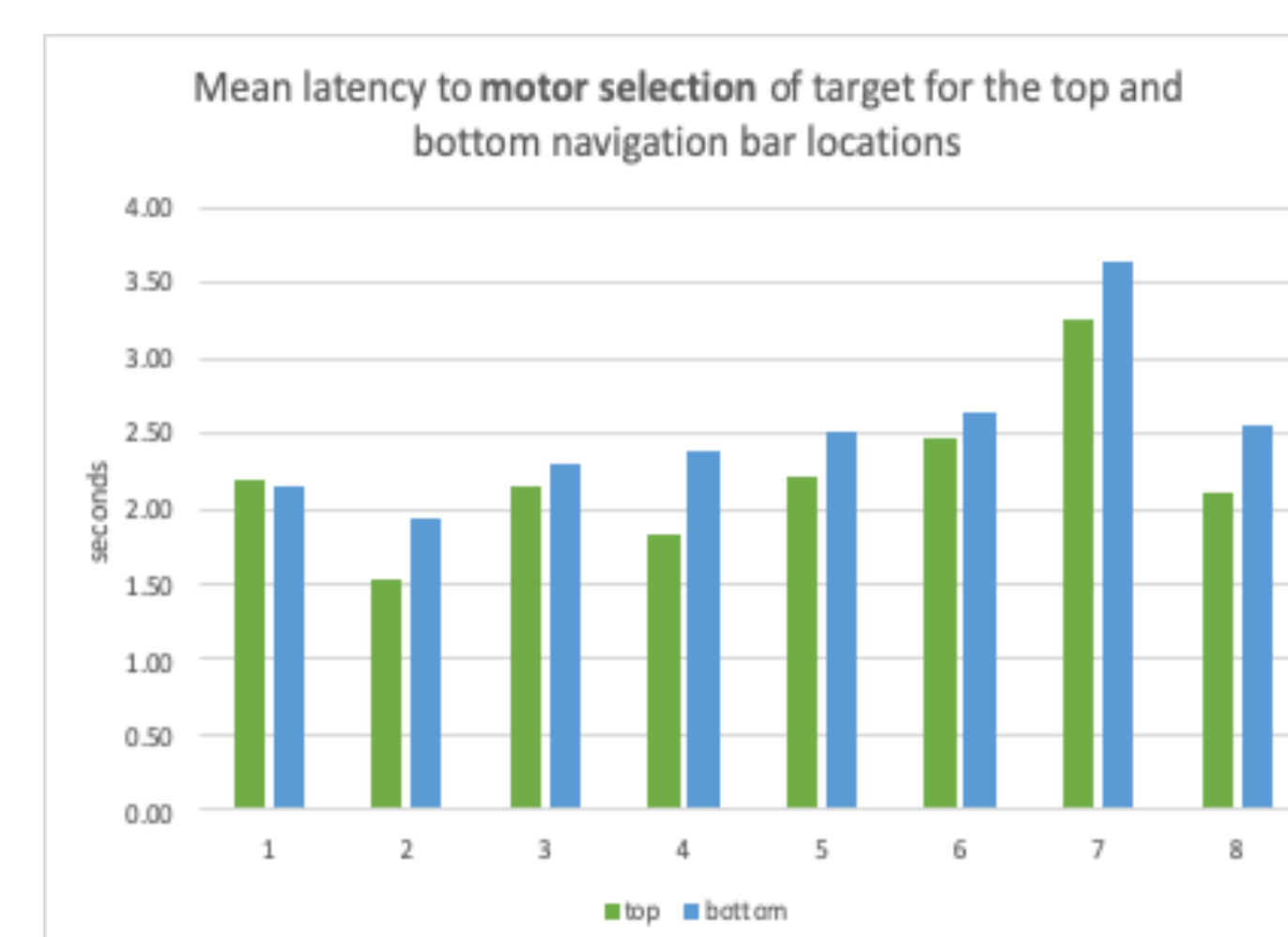
## Latencies to first fixate and select a cued target:

Graphs below illustrate the comparison for each participant between latency to first fixate on the target and select the target in the navigation bar when the bar is located at the top or bottom.



## First Fixation Latency:

- most participants were faster to fixate on the cued target located in the top bar location
- potential benefit of the top bar location.



## Motor Selection Latency:

- most participants were faster to select the cued target located in the top bar location
- potential benefit of the top bar location.

## Correlation between first fixation and motor selection of a cued target

- Pearson's correlation between visual fixation latency and motor response latency demonstrated a strong correlation between visual and motor responses.
  - Pearson's  $r = .475$ ; one-tailed  $p < .000$

## Discussion &amp; Implications

## Q1: What is the relationship between visual fixation and motor selection?

- Preliminary findings suggest a potential benefit for both visual attention and motor selection when the navigation bar is located at the top of the display.
- Preliminary data shows a similar pattern in the latency data for both the visual fixations and the execution of a motor selection to a target.
- Data on eye gaze and visual attention may serve to predict how individuals interact with and select from VSD displays.

## Q2: Is there variation across participants and/or navigation bar location?

- Most participants (75%) demonstrated a faster speed of fixation and motor selection when the bar was located at the top.
- Top bar location is farthest to reach for motor selection, further supporting an advantage of top bar location
- Attention to the children's faces in the main VSD display may facilitate shorter latencies for top bar location
- These preliminary data suggest a potential advantage of the top navigation bar location compared to bottom in VSD displays for most participants with Down syndrome.
- Previous research investigating visual cognitive processing of VSD displays also found an advantage for the top bar location for visual fixation. The current study extends these results by including measures of motor selection. (O'Neill et al, 2019)

## Conclusions

- Eye tracking research technology may be valuable for obtaining information regarding how to design AAC displays.
- Future research is needed to further explore the relationship between bar location and motor selection in additional populations.

## Scan QR for references and handout



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