

Keeping an Eye on Access: Practical AAC Evaluation Strategies for Tough Motor Cases

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Jackie Kearns, CCC-SLP
Speech-Language Pathologist

 Cleveland Clinic Children's



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Welcome, Disclosures, Agenda

Disclosures

- Financial
 - Jackie Kearns, MA, CCC-SLP is a paid employee of The Cleveland Clinic
 - Speaker stipend received for this presentation
- Nonfinancial: None

Agenda

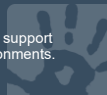
- Access Factors
- Eye-Gaze Evaluation
- Trial Interpretation
- School-Day Implementation



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Learning Objectives

1. Identify at least three motor, visual, or postural factors that influence access method selection for AAC users with complex motor needs.
2. Describe a systematic process for evaluating eye-gaze access, including calibration, positioning, and performance variability.
3. Analyze AAC trial data to differentiate motor, visual, and cognitive contributors to access challenges and inform feature-matching decisions.
4. Explain considerations for device positioning and mounting that support safe, consistent, and effective AAC access across school environments.



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Factors That Influence AAC Access

*Motor • Visual • Postural • Task and
Language • Environmental*



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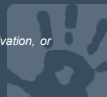
Why Access Performance Is Multidimensional

AAC access performance reflects the interaction among:

- Motor control
- Vision and visual processing
- Positioning and postural support
- Task and language demands
- Device features and settings
- Environment and communication partners
- Fatigue, comfort, and motivation

Difficulty accessing AAC should not automatically be attributed to cognition, motivation, or the access method itself.

(Bauerman & Light, 2002)

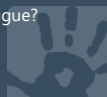


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Motor Factors to Observe

- Is the movement intentional and repeatable?
- What is the available range of movement?
- Can the person initiate and stop the movement?
- Can the movement be isolated from other body movements?
- Does accuracy vary by direction or target location?
- How much effort does the movement require?
- Does performance change with support, repetition, or fatigue?

Describe the functional movement before interpreting why it occurs.



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Identifying a Potential Access Movement

Look for a movement that is:

- **Intentional:** Occurs in response to a meaningful opportunity and can be distinguished from spontaneous or involuntary movement.
- **Available:** Can be produced frequently and predictably enough for the intended communication task.
- **Detectable:** Can be reliably recognized by the device or communication partner.
- **Sustainable:** Can be used without excessive effort, pain, rapid fatigue, or disruption of posture or breathing.
- **Functional:** Supports successful communication—not only activation of a target.

(Burdette & Light, 2009)

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Identifying a Potential Access Movement (cont.)

Observe across conditions:

- Different positions and levels of support
- Meaningful versus unfamiliar activities
- Early versus later in the session
- Different target locations
- More than one session, when possible

The goal is not perfect movement. The goal is the most reliable, efficient, sustainable, and acceptable movement available for the intended task.

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Use Motor Observations to Generate Hypotheses

Observation	Possible Access Challenge	What to Investigate
Limited movement range	Cannot reach all targets	Device position, target layout, arm support, alternative access
Difficulty stopping movement	Passes or activates nearby targets	Target spacing, keyguard, support selection on release
Variable movement	Inconsistent selections or false activations	Stabilization, activation method, target size and spacing, alternative access
Difficulty isolating movement	Activates unintended targets or switches	Access-site support, switch placement, acceptance/release settings
Performance declines over time	Reduced accuracy or loss of posture	Effort, fatigue, breaks, positioning, backup access

A diagnosis helps generate hypotheses. Functional performance determines what should be trialed.

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What Might Be Contributing to Access Performance?

Domain	Questions to Investigate
Motor	Does support, stabilization, target size and spacing, or activation method change performance?
Visual	Does performance vary by target location, visual complexity, glare, contrast, or duration?
Postural	Does head, trunk, pelvic, or access-site support change performance?
Task/language	Does performance change with familiar vocabulary, lower language demands, or self-generated messages?
Environment/partner	Does lighting, noise, cueing, wait time, or partner familiarity change performance?
Cognitive	What concerns remain after motor, visual, postural, language, task, sensory, and response demands have been made as accessible and interpretable as possible?

One observation may have several explanations. Generate multiple hypotheses before assigning a cause.

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When is Direct Access Still a Reasonable Hypothesis?

Continue a Direct Access Trial When:

- Selections appear intentional
- Performance improves with positioning and support
- Targeting improves when target size, spacing, or activation method changes
- The person can communicate functionally for at least some activities
- Effort and fatigue appear manageable or can be reduced.

Compare access methods using functional accuracy, rate, effort, endurance, cueing, consistency, and user preference—not accuracy alone.

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When is Direct Access Still a Reasonable Hypothesis? (cont.)

Consider Comparing Another Access Method When:

- False or accidental activations remain frequent across supported conditions.
- Required movement causes excessive effort, pain, or rapid fatigue
- Important areas of the display remain inaccessible.
- Communication remains inefficient despite reasonable adaptations.
- Another method supports more accurate, efficient, sustainable, or preferred communication.

Compare access methods using functional accuracy, rate, effort, endurance, cueing, consistency, and user preference—not accuracy alone.

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What Factors Would You Investigate?

Case: A 9-year-old student reaches toward a speech-generating device with the right hand. The student frequently selects icons above the intended target, leans forward during selections, and becomes less accurate after approximately four minutes. Performance appears worse when sunlight reflects on the screen.

- Identify one motor factor.
- Identify one visual factor.
- Identify one postural factor.
- What would you change or investigate first?
- What data would tell you whether the change helped?



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Creating the Conditions for Access



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Visual Abilities and Display Demands Affect Access

Vision Can Affect:

- Visual Attention: Can the individual locate the communication display?
- Target Acquisition: Can they accurately find the desired symbol?
- Visual Scanning: Can they efficiently move between targets?
- Motor Planning: Can they visually guide purposeful movement?

Visual Access Difficulties May Look Like:

- Missed Selections
- Overshooting targets
- Slow Communication
- Inconsistent accuracy
- Poor Endurance
- "Not Interested"

Visual barriers may be misinterpreted as motor or cognitive difficulties unless visual access is intentionally investigated.

(McCarty et al., 2011)


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Cortical Visual Impairment (CVI) & AAC: What Matters Most

- Visual complexity may interfere with access
- AAC display adaptations should be individualized. Variables to investigate may include:
 - Internal symbol complexity
 - Array complexity
 - Spacing/crowding
 - Contrast and color characteristics
 - Target location
 - Visual latency
 - Competing visual information

(McCloskey et al., 2011; Wilkinson & Jorgensen, 2004)



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Display Features to Investigate

- Symbol representation, including photographs and line drawings when clinically relevant
- Internal symbol complexity
- Target size
- Spacing and visual crowding
- Contrast and background detail

(Wilkinson & Jorgensen, 2004)



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Display Features to Investigate (cont.)

- Consistent target locations
- Dimming or hiding non-target elements
- Visual scene displays when appropriate
- Navigation supports
- Personally meaningful images



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What Does “Simplification” Actually Change?

Simplification Simultaneously Changes:

- Visual crowding
- Target size
- Motor precision
- Linguistic choice demands
- Working memory
- Probability of guessing

If performance improves when the display is simplified, something about the display mattered—but we still don't know what. Isolate target size, spacing, visual complexity, and language demands before drawing a conclusion.

MacGregor et al., 2013

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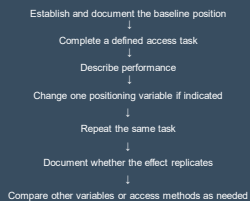
Vision and Positioning are Interconnected

Where the body is changes where—and how—the person can look, reach, and access



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Positioning is Part of the Access Evaluation



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Is the Position Safe and Sustainable?

Comfort and safety

- Is the person comfortable?
- Are there signs of pain or distress?
- Are breathing and swallowing supported?
- Is skin protected from pressure or friction?
- Can the person change position or signal a need for repositioning?
- Can the position be sustained without excessive effort?

(Buckner & Light, 2002)

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Is the Position Safe and Sustainable? (cont.)

Functional Stability

- Is the pelvis adequately supported for this person and task?
- Does lower-body support improve comfort or access?
- Can the person sustain a functional trunk and head position?
- Is the intended access movement free to occur?
- Does support reduce compensatory movement without restricting intentional movement?
- Are mobility controls and other necessary equipment accessible?

The goal is not perfect posture. The goal is a safe, comfortable, sustainable position that supports intentional access.

(Buckner & Light, 2002)

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Signs Positioning May Be Contributing to Breakdown

Observation	Positioning Hypotheses to Investigate
Repeated leaning or reaching with the trunk	Device may be too far away; trunk or arm support may be insufficient
Sliding or loss of upright position	Pelvic, trunk, or lower-body support may be inadequate
Head turns or tilts during access	Device location, viewing angle, eye-tracking alignment, or head support may be contributing
Accuracy declines over time	Postural fatigue, general fatigue, tracking or task demands may be contributing
Performance changes after repositioning	Positioning may be affecting access; repeat the condition
Device moves during activation	Surface or mount stability may be affecting selection

These observations generate positioning hypotheses. Test one change and repeat the same task.

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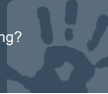
Is the Device Positioned for the Access Method?

Direct Selection

- Is the necessary display area within comfortable reach?
- Is the device stable during selection?
- Would arm or wrist support reduce compensatory movement?
- Is there enough clearance for a keyguard or other access support?

Eye Gaze

- Is the tracker operating within its specified range?
- Can the tracker consistently detect the eyes?
- Does the screen angle support comfortable viewing and tracking?
- Is the head-to-device relationship stable?



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Is the Device Positioned for the Access Method? (cont.)

Head Tracking

- Can the person use a sustainable range of head movement?
- Can the cursor reach all necessary screen areas?
- Does head support stabilize posture without blocking intentional movement?
- Are cursor gain and speed appropriate?

Switch Access

- Is the switch site repeatable and sustainable?
- Is activation force and travel appropriate?
- Can the person release the switch?
- Is the switch securely positioned without interfering with other movements?



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What May Be Adjusted—and When to Request Support

Within their training, scope, and local policies, SLPs may trial or adjust:

- Temporary device angle and distance
- Tabletop stand placement
- Lighting and glare
- Software settings
- Task and display demands
- Temporary arm or access-site support during a trial
- Documentation of the successful setup



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What May Be Adjusted—and When to Request Support (cont.)

Consult appropriately trained team members for:

- Wheelchair seating components
- Head supports
- Complex wheelchair mounts
- Changes affecting transfers or mobility
- Hardware stability or safety concerns
- Weight or center-of-gravity concerns
- Changes involving feeding, respiratory, or other medical equipment

(Buckner & Light, 2002)



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Designing AAC Trials That Answer Clinical Questions

*From observations to defensible
feature-matching decisions*



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AAC Trials Support Clinical Decision-Making

AAC trials are used to:

- Test specific access hypotheses
- Compare configurations and access methods
- Determine which conditions change performance
- Examine functional communication
- Identify features required for success
- Document variability and limitations



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Use Both Controlled and Functional Tasks

Access exploration

- Simple, engaging tasks with low language demands

Controlled comparison

- Same task while one defined variable changes

Functional communication

- Self-generated messages during meaningful interaction

Generalization check

- Different partners, settings, positions, and times



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Access Exploration: Establish a Starting Condition

Activity Examples

- Pop the bubbles
- Activate music/buttons
- "Find the start" (large target)
- Eye gaze: follow moving object

What You Observe

- Whether the person understands the activity
- Whether intentional activation is emerging
- Target locations that are accessible
- Cueing required
- False activation
- Tracking or pointer stability
- Effort and engagement



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Separating Access Performance From Task and Language Demands

Task	Access data available	Additional demands
Find a named symbol	Selection accuracy, latency, location errors	Receptive language, symbol knowledge, visual search
Select a target when it appears (e.g., Whack-a-Mole)	Acquisition time, false activation, location effects	Sustained attention, anticipation
Choose between meaningful options (e.g., Feed the Character)	Selection accuracy, preference, expression	Understanding of options, motivation
Follow an AAC Direction (e.g., Simon Says AAC)	Selection response, cueing, latency	Receptive language, understanding of the expectation, working memory

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Change One Demand While Preserving the Task

Using the same activity (e.g., "Feed the Bear")

To investigate language or task demands:

- Use familiar vocabulary
- Reduce instruction length
- Compare prompted identification with self-generated selection



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Change One Demand While Preserving the Task (cont.)

To investigate visual-display demands:

- Change spacing while preserving target size.
- Change target size while preserving the number of choices.
- Reduce glare or dim non-target elements.

To investigate motor or postural demands:

- Stabilize the device.
- Add arm or wrist support.
- Change activation method while preserving the display.



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Define the Data Before the Trial

Measure	Operational Question
Functional Accuracy	How many intended messages or selections were completed out of how many opportunities?
False Activation	How often did an unintended activation occur?
Latency	When does timing begin and end?
Cueing	What type and level of support were provided?
Consistency	Does performance replicate across trials or sessions?
Endurance	How long is performance sustained before a defined decline?
Efficiency/rate	How much successful communication occurs per unit of time?
Repair	Can the person recover from or correct an error?
Preference/effort	Which method does the person prefer, and how effortful is it?



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Describe, Hypothesize, Test, Interpret

Describe	Hypothesize	Test	Interpret
Misses six of 10 targets on the right	Calibration, position, visual field or attention, reach, glare	Test separately; reposition; recalibrate; move the same target; reduce glare	State which manipulation changed performance and what remains uncertain
Accuracy declines after three minutes	Fatigue, posture, tracking, task demand, discomfort	Check posture/tracking, break, repeat same task	Determine whether the effect replicates
Nearby targets activate	Offset, crowding, motor variability, dwell	Check calibration, change spacing or dwell separately	Identify the feature supported under that condition

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Turning Testing into a Game

Activity Examples

- "Find the star anywhere!"
- "Catch it!" (random target movement)
- "Treasure hunt"

What You May Observe

- Target acquisition across screen locations
- Latency under a defined task
- False activation
- Tracking or pointer stability
- Change over repeated opportunities

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When Performance Changes During a Trial

Observed Changes:

- Accuracy declines after two to three minutes.
- Latency increases.
- False activations increase.
- The person looks away or stops participating.
- Posture or tracking changes.
- Hypotheses to consider
- Fatigue or discomfort

Possible Contributors:

- Postural decline
- Tracking or calibration change
- Increased task or language demand
- Sensory or environmental load
- Reduced task meaning
- Need for a break or desire to stop

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When Performance Changes During a Trial (cont.)

Next steps

- Check position and tracking.
- Ask or observe whether a break is needed.
- Document time to decline.
- Repeat the same condition after rest.
- Compare another task or setting.



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Both Students Achieve 80% Accuracy. Are the Results Equal?

Student A

- 8/10 intended selections
- Typical selection time: 3 seconds
- Independent
- No false activations
- Performance sustained for 10 minutes

Student B

- 8/10 intended selections
- Typical selection time: 11 seconds
- Four false activations
- Verbal cueing on six opportunities
- Accuracy declines after three minutes

(Bowerman & Lupton, 2002; Pitt & Bowerman, 2002)

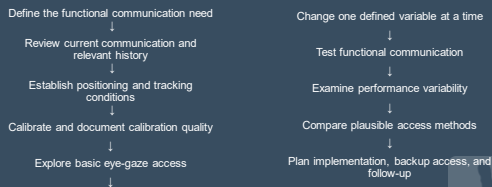

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A Systematic Eye-Gaze Evaluation



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The Eye-Gaze Evaluation Process



(Patterson et al., 2016, 2021; Vaseghian et al., 2022)

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What Could Eye Gaze Make Possible?

Before beginning an eye-gaze trial, identify:

- Where the person's current communication methods work
- Where communication or participation currently breaks down
- What the person wants or needs to communicate
- Which people, activities, and environments matter most
- What eye gaze might allow the person to do more independently, efficiently, or consistently
- Which current communication methods should remain available during the trial

(Patterson et al., 2016, 2021; Vaseghian et al., 2022)

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Is Eye Gaze a Reasonable Access Hypothesis?

Consider an eye-gaze trial when:

- Gaze appears potentially usable for intentional access, or intentional gaze may be teachable
- Other access methods are limited, inefficient, or fatiguing
- The person visually attends to meaningful people, objects, or screen events
- Eye gaze could address an unmet communication or participation need
- Positioning, vision, and environmental variables can be investigated
- The person is willing to participate in the trial

(Patterson et al., 2021; Vaseghian et al., 2022)

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Is Eye Gaze a Reasonable Access Hypothesis? (cont.)

Do not require:

- Perfect visual fixation
- Immediate calibration success
- Established symbol discrimination
- A particular cognitive score
- Consistent performance in one session
- Complete absence of other access methods

(Patterson et al., 2021)



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Establish and Document Trial Conditions

Person

- Comfort, alertness, and willingness
- Head and trunk position
- Pain, fatigue, and regulation
- Glasses or contact lenses
- Relevant vision information
- Reliable signals for yes, no, stop, help, and break

(Patterson et al., 2021)



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Establish and Document Trial Conditions (cont.)

Device and Environment

- Tracker and software
- Device height, angle, and distance
- Mount or stand stability
- Lighting and glare
- Track-status indicator
- Seating and supports
- Time of day and trial order

(Patterson et al., 2021; Vandermeer et al., 2022)



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Position the Person and Device

- Can the person sustain a comfortable head and trunk position?
- Is the intended access movement free to occur?
- Is the device within the tracker's specified operating range?
- Can the tracker consistently detect the eyes?
- Does the screen angle support comfortable viewing?
- Is the mount or stand stable?
- Are glare and uneven lighting minimized?
- Can the setup be reproduced?

(Patterson et al., 2021; Thompson et al., 2022)

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Calibrate—and Document What Happened

- Calibration method and number of points
- Position of the person and device
- Glasses and lighting
- Areas of stronger or weaker calibration
- Cueing or support provided
- Whether recalibration changes performance
- Whether calibration remains stable over time

(Patterson et al., 2021)

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What Calibration Can—and Cannot—Tell You

Calibration May Tell You	Calibration Cannot Tell You
Whether the tracker detected gaze under that condition	Whether the person understands the language system
Whether spatial alignment appears usable	Whether eye gaze supports functional communication
Whether positioning or setup may need adjustment	Whether eye gaze is the best long-term access method
Whether recalibration changes tracking	The person's cognitive ability

Successful calibration does not establish functional eye-gaze communication. Unsuccessful calibration does not automatically rule it out.

(Patterson et al., 2021; Shallice & Wilson, 2006)

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Explore Basic Eye-Gaze Access

Begin with:

- Engaging, meaningful screen events
- Large, visually clear targets
- Targets in different screen locations
- Low-language-demand activities
- Opportunities to intentionally start and stop an activity
- Short trial blocks

(Patterson et al., 2011; Scalet & Wilkins, 2004; Weiskopf et al., 2010)



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Explore Basic Eye-Gaze Access (cont.)

Observe:

- Target acquisition
- Ability to remain on the target
- Dwell completion
- False activations
- Tracking loss
- Spatial offset
- Performance by screen location
- Cueing, effort, and engagement

(Patterson et al., 2011; Scalet & Wilkins, 2004)



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Change One Defined Variable

Possible variables:

- Position or postural support
- Device height, angle, or distance
- Calibration
- Target size
- Target spacing
- Dwell time

Possible variables:

- Selection feedback
- Filtering or smoothing
- Visual complexity
- Lighting or glare
- Trial duration

(Patterson et al., 2011; Scalet & Wilkins, 2004)



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Change One Defined Variable (cont.)

Start with a baseline:

- Change one variable
- Repeat the same task
- Compare performance
- Determine whether the effect replicates

(Patterson et al., 2011; Swain & Milgram, 2016)

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Match Settings to the Observed Breakdown

Observed Breakdown	Feature to Investigate
Target activates while the person visually explores the display	Longer dwell, confirmation method, or pause region
Gaze reached the target but cannot remain long enough to select	Shorter dwell, larger target, feedback, or shorter trial
Accurate selections occur but communication is extremely slow	Shorter dwell, navigation changes, prediction, or another selection method
Cursor appears unstable	Track status, position, calibration, lighting, mount stability, and device-specific smoothing
Cursor responds too slowly after smoothing	Reduce smoothing or adjust cursor response using the device's specific controls

(Swain & Milgram, 2016)

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Test Functional Communication and Examine Variability

Test functional communication:

- Make a meaningful choice
- Direct another person
- Reject or stop
- Comment
- Ask for help
- Navigate to relevant vocabulary
- Generate a novel message
- Repair a misunderstood message

(Patterson et al., 2018, 2021; Swain & Milgram, 2016; Veale et al., 2022)

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Test Functional Communication and Examine Variability (cont.)

Compare performance across:

- Beginning and end of the trial
- Before and after a break
- Different times of day
- Different positions
- Familiar and unfamiliar tasks
- Games and communication
- Therapy and classroom settings
- Different communication partners
- More than one session



(Patterson et al., 2018, 2021; Davies & Milosavljevic, 2014; Weissman et al., 2022)

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Compare Plausible Access Methods

Every access method involves tradeoffs. Compare methods across multiple dimensions—not speed alone.

Method	Movement or skill to investigate	Variables to Test	Outcomes to compare
Direct Selection	Repeatable reach or isolated movement	Position, support, target size and spacing, keyguard activation, activation method	Functional accuracy, rate, effort, endurance, repair
Head Tracking	Sustainable controlled head movement	Cursor gain, smoothing, dwell/click method, target layout, head support	Functional accuracy, rate, effort, endurance, repair
Eye Gaze	Usable gaze under relevant conditions	Calibration, track status, target size and spacing, dwell, lighting, position	Functional accuracy, rate, effort, endurance, repair
Switch Scanning	Repeatable activation and usable timing	Switch site, activation force, scan pattern/rate, acceptance/release	Functional accuracy, rate, effort, endurance, repair

(Patterson et al., 2021; Davies & Milosavljevic, 2014)

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When Eye-Gaze Access Breaks Down

Return to the evaluation process before abandoning the access method



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When Eye Gaze Performance is Not Functional

Poor eye-gaze performance does not, by itself, show that eye gaze is not a viable access method.

The breakdown may involve:

- Tracking or calibration
- Positioning or mounting
- Visual access
- Dwell or activation settings
- Display or language demands
- Task familiarity
- Fatigue, pain, or endurance
- Partner cueing or wait time
- Environment
- The access method itself



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Eye-Gaze Troubleshooting Sequence

- Confirm comfort, willingness, and a reliable way to request a break.
- Check hardware connection and track status.
- Check position, distance, angle, glasses, lighting, and mount stability.
- Identify the observable breakdown.
- Recalibrate if indicated.



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Eye-Gaze Troubleshooting Sequence (cont.)

- Change one defined variable.
- Repeat the same task.
- Test the change during functional communication.
- Repeat across time or settings.
- Compare another access method when appropriate.



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Consistent Offset or Increasing Drift

Observe:

- Is the offset consistent across targets?
- Does it occur in one screen region?
- Does it increase over time?
- Does track status change?
- Has head or device position changed?

Test:

- Reposition and repeat
- Check mount stability
- Recalibrate
- Repeat after a break
- Compare another screen angle or target arrangement

A change following repositioning, recalibration, or rest supports that variable as a contributor; replication is still needed.

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Is the Problem Target Acquisition or Selection?

Observation	Questions to Ask	Variables to Test
Cursor does not reach the target	Is tracking stable? Is there spatial offset?	Calibration, position, target location, device angle
Cursor reaches but will not remain	Is dwell too long? Is fixation difficult?	Dwell, feedback, target size/spacing, task duration
Target activates unintentionally	Is gaze being used to explore the display?	Dwell, confirmation method, pause region, layout
Nearby target activates	Is there offset, crowding, or tracking instability?	Calibration, spacing, target arrangement, position

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Slow Selection, Visual Rest, or Disengagement?

- Is gaze moving between relevant targets?
- Does the person return to the screen independently?
- Does the performance improve with additional wait time?
- Does a break improve performance?
- Is the task meaningful and understood?
- Is the person communicating through another modality?
- Is tracking stable throughout the task or trial?

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What is the Person Communicating Through Their Response?

Refusal, avoidance, looking away, or inconsistent participation may communicate:

- Pain or discomfort
- Fatigue or visual rest
- Excessive effort
- Sensory overload
- Lack of task meaning
- Confusion
- Need for control or break
- Inefficient access
- Preference for another communication method



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What is the Person Communicating Through Their Response? (cont.)

Ask:

- Does the person have a reliable way to "stop", "no", "help", and "break"?
- Does participation improve when the task becomes meaningful?
- Does support, rest, or another access method change performance?
- Is the person choosing not to participate?



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Which Access Methods Would You Compare?



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Case 1: Inaccurate Direct Touch

7-year-old with spastic CP

- Reaches toward icons but frequently misses
- Accuracy improves with larger targets
- Fatigues after several minutes

Which access methods or configurations would you prioritize for comparative trial?

- A. Direct touch
- B. Eye gaze
- C. Switch scanning
- D. Head tracking



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Case 2: Inconsistent Arm Access

9-year-old with athetoid CP

- Inconsistent arm control
- Good head control
- Can visually track targets consistently

Which access methods or configurations would you prioritize for comparative trial?

- A. Direct touch
- B. Head tracking
- C. Eye gaze
- D. Switch scanning

What variable would you investigate first?



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Case 3: Limited Hand and Arm Access

11-year-old with severe motor impairment

- No functional hand/arm use
- Inconsistent eye gaze calibration
- Reliable single head movement

Which access methods or configurations would you prioritize for comparative trial?

- A. Eye gaze
- B. Switch scanning
- C. Head tracking

What variable would you investigate first?



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From Trial Data to Clinical Conclusions

When performance breaks down, what does the pattern actually tell us?



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Case: Improvement With Display Reduction

6-year-old using direct touch AAC

- Frequently misses icons
- Performs better when:
 - Display reduced from 45 to 9 icons
- Still reaching accurately
- Describe the performance change without assigning a cause.
- What variables changed when the display was reduced?
- What hypotheses does the result support?
- What variable would you isolate next?
- What conclusion would not yet be justified?



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Case: Eye Gaze and Partner-Assisted Scanning

10-year-old trialing eye gaze

- **Eye gaze**
 - Target-selection accuracy: 55%
 - Frequent tracking loss
 - Average selection time: 8 seconds
 - Performance varies by screen location
- **Partner-assisted scanning**
 - Selection accuracy: 85%
 - Requires consistent partner presentation
 - Average selection time: 12 seconds
 - Performance sustained for 10 minutes



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What Can We Actually Conclude?

Display-reduction case

- Performance improved when display demands changed.
- This supports a **display-demand contribution**.
- It does **not** tell us whether size, spacing, visual complexity, or language demand caused the improvement.



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What Can We Actually Conclude? (cont.)

Next: isolate those variables.

Eye gaze vs. partner-assisted scanning case

- Partner-assisted scanning currently supports greater accuracy and endurance.
- Eye-gaze performance shows tracking loss and location variability.
- This supports **continued investigation of eye-gaze access variables**, not a conclusion that the student "cannot use eye gaze."
- Partner-assisted scanning should remain available while those variables are investigated.



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What Information Informed Your Decision?

Look beyond the accuracy score:

- Did the person select what they intended?
- What kinds of mistakes occurred?
- How long did selections take?
- How much cueing or partner support was needed?
- Was performance consistent across opportunities?
- Could the person sustain it?
- How much effort did it require?
- Which method did the person prefer?

(Huckmiller & Light, 2010; Elliott et al., 2012)



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From Trial Data to Feature Matching

Recommend features before products



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Access Fit Is Not the Same as Language Fit

Access trials help determine:

- How the person selects
- Which positioning or support is needed
- Which target and activation features improve access
- How performance changes over time
- Which methods should remain available



(Bauer et al. 2013, 2014; Smith & Wilson, 2014)

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Access Fit Is Not the Same as Language Fit (cont.)

Language assessment helps determine:

- Vocabulary needs
- Language organization
- Grammar and word forms
- Navigation
- Literacy access
- Partner modeling
- Long-term growth



(Bauer et al. 2013, 2014; Smith & Wilson, 2014)

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Link Data to Features—Not Diagnoses or Products

Trial Finding	Feature Implication Supported	Conclusion Not Yet Supported
Performance improves with arm support	Support or stabilized direct access should be investigated	A particular language system
False activations decrease with longer dwell	Longer dwell may improve selection under that condition	Eye gaze is the final method
Performance improves with spacing preserved across trials	Increased spacing may be beneficial	Vocabulary should be reduced
Switch scanning is sustainable but slow	Scan pattern/rate and prediction should be investigated	Switch scanning is unsuitable
Stable symbol location improves navigation over time	Consistent location may support learning	One proprietary system is required

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What Might Those Features Look Like in Real Systems?

If your trial suggests a need for...	Features to Look For	Examples to Explore
Larger targets / fewer selections per page	Flexible grid sizes; vocabulary that remains available as grid size changes	TD Snap, TouchChat/WordPower, Grid
Reduced visual complexity	Ability to hide/reveal vocabulary; customizable page layouts; visual supports that can be systematically adjusted	TD Snap, LAMP Words for Life, Grid, TouchChat
Motor consistency / stable target locations	Vocabulary locations remain predictable; limited movement of frequently used words	LAMP Words for Life, motor-planning-based WordPower configurations

These are examples for exploration—not prescriptions.

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What Might Those Features Look Like in Real Systems? (cont.)

If your trial suggests a need for...	Features to Look For	Examples to Explore
Eye-gaze access	Eye-gaze compatible interface; dwell/selection customization; accessible navigation; ability to adjust target size/spacing	TD Snap, Grid, Communicator
Switch/scanning access	Customizable scanning patterns, timing, selection method and navigation	Grid, TD Snap, Communicator
Significant fatigue / high access effort	Efficient navigation; high-value vocabulary accessible with fewer selections; customizable shortcuts	Multiple systems—compare efficiency during actual trials

These are examples for exploration—not prescriptions.

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Participation is the Goal

The "best" system is not the one with the most vocabulary—or the highest access accuracy. It is the one that supports meaningful participation.

ACCESS

Can they get to the vocabulary?

- Accurate enough for functional communication?
- Sustainable across the day?
- Accessible across positions and environments?
- Motor/visual demands manageable

LANGUAGE

Do they have something worth accessing?

- Vocabulary for more than requesting?
- Language that meets current needs?
- Capacity for language growth?
- Vocabulary organization they can learn?

PARTICIPATION: Can the person communicate what they want to communicate, with the people they want to communicate with, in the activities that matter?

(Brockman & Light, 2002)

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Participation is the Goal (cont.)

The "best" system is not the one with the most vocabulary—or the highest access accuracy. It is the one that supports meaningful participation.

EFFICIENCY

Can they use it when communication is happening?

- Reasonable time and effort?
- Manageable navigation demands?
- Sustainable with fatigue?
- Acceptable level of partner support?

PARTICIPATION: Can the person communicate what they want to communicate, with the people they want to communicate with, in the activities that matter?

Feature matching is the process. Participation is the outcome.

(Brockman & Light, 2002)

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From Trial Findings to Feature Requirements

If the trial shows...	The recommendation should consider...
Accuracy improves with forearm support	Supported direct access
Errors decrease with increased spacing	Adjustable target spacing
Stable locations improve performance	Consistent vocabulary locations
Performance declines with fatigue	Efficient access and backup options
Position changes affect access	Reproducible positioning/mounting
Navigation limits functional communication	Efficient access to needed vocabulary

The goal is to describe what the system must support—not to name the system yet.

87

Write a Defensible Feature-Matching Statement

Weak:

The student needs a motor-planning AAC system.

Better:

With forearm support and device stabilization, direct-touch accuracy increased from 60% to 90%, false activations decreased from three to one per 10 opportunities, and performance remained stable for eight minutes. The recommended system must support stable target locations, increased spacing without unnecessary vocabulary reduction, supported direct access, and a portable backup method.



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Final Feature Matching Check

ACCESS

- Can the person reliably access the vocabulary they need?
- Is the access method sustainable?
- What supports or settings are required?

LANGUAGE

- Does the system provide sufficient vocabulary for current communication?
- Can language and literacy grow without sacrificing access?

Do not sacrifice meaningful language for access—but do not provide robust language that the person cannot functionally access.

(Brockman & Light, 2002)



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Final Feature Matching Check (cont.)

PARTICIPATION

- Can the person use it during meaningful activities?
- Is communication efficient enough to participate when interaction is happening?
- Does the person prefer and accept the configuration?

Do not sacrifice meaningful language for access—but do not provide robust language that the person cannot functionally access.

(Brockman & Light, 2002)



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Recommend, Implement, and Reassess

The recommendation should identify:

- Access method and configuration
- Required positioning/support
- Settings or display features that affected performance
- Language/display features required
- Functional communication demonstrated
- Limitations and variability
- User preference
- Backup access

(Brockman & Light, 2002)



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Recommend, Implement, and Reassess (cont.)

A recommendation must also answer:

- Can others reproduce the successful setup?
- Can communication remain available across activities and environments?
- What happens when the primary configuration cannot be used?

Trial success becomes meaningful only when it can be implemented in daily life.

(Brockman & Light, 2002)



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From Trial Success to School-Day Access

The question shifts from "Can the student use it?" to "Can the student use it where and when communication happens?"



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When Trial Success Does Not Transfer

In therapy

- Eye gaze used from the wheelchair with a floor stand
- Accuracy above 80%
- Stable tracking across 10-minute functional trials

During the school day

- Device placed on a classroom desk
- Student rotates their head to see the screen
- Frequent tracking loss and reduced accuracy
- Device removed during lunch, specials, and transportation because the setup is difficult to move

(Karlsson et al., 2021)

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What Changed Between Therapy and the Classroom?

Trial Condition	School-Day Change	Possible Effect
Wheelchair positioning	Position varies across activities	Reduced postural or head stability
Floor stand	Device placed on a desk	Screen angle and distance change
Stable viewing position	Student rotates their head	Tracking becomes less reliable
Dedicated trial time	Ongoing classroom demands	Increased fatigue and distraction
Setup remains available	Device removed in some settings	Loss of communication access

Before changing the access method, determine whether the successful conditions changed.

(Karlsson et al., 2021; Billewicz et al., 2024; Karlsson et al., 2021)

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Reproducing Access Requires Team Collaboration

Team Member	Question they help answer
AAC SLP	What conditions support functional communication and language access?
OT	What upper-extremity, access-site, and daily-activity supports are needed?
PT	What postural, mobility, seating, and transfer factors affect the setup?
ATP/AT Specialist	What device, access technology, and mounting features are required?
Rehab engineer or equipment vendor	Is the proposed hardware compatible, stable, and safely installed?
Teacher and school staff	Can the setup be implemented during actual school routines?
Student and family	Is the setup comfortable, acceptable, and realistic to use?

(Karlsson et al., 2021; Billewicz et al., 2024; Karlsson et al., 2021)

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A Mount Must Be Safe, Functional, and Usable

Safe

- Stable during access and movement
- Does not interfere with wheelchair controls, brakes, or transfers
- Cables are secured
- Feeding, respiratory, and other equipment remain accessible

(Buckmaster & Light, 2002; Anderson et al., 2001)



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A Mount Must Be Safe, Functional, and Usable (cont.)

Functional

- Maintains the device at the required angle, distance, and location
- Does not obstruct vision or interaction
- Works with the wheelchair, desk, tray, and expected activities

Usable

- Quick-release or swing-away components work as intended
- Trained staff can adjust or remove it
- Setup demands are realistic
- Communication remains available whenever possible

(Buckmaster & Light, 2002; Anderson et al., 2001)



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Test the Configuration Across the School Day

Environment	What Might Be Tested
Classroom	Is the device stable, visible, reachable, and continuously available?
Wheelchair mobility	Does the mount interfere with driving, transfers, vision, or interaction?
Cafeteria	How do positioning, glare, spills, and feeding equipment affect access?
Specials and recess	Is the system portable? What backup access is available?
Transportation	How is equipment secured, and how can the student communicate?
Emergency situations	Is an immediately available low-tech or partner-assisted method established?

The primary configuration may not work in every environment. Plan equivalent or backup access rather than removing communication.

(Buckmaster & Light, 2002; Anderson et al., 2001)



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Build a School-Day Access Plan

1. Preserve successful access

- What position, device location, and tracking conditions must be reproduced?

2. Determine mounting needs

- What mounting features are required?
- Who must assess safety, compatibility, and installation?

3. Maintain communication across environments

- Where can the primary configuration be used?
- Where is an alternative or backup method needed?

(Kernston et al., 2021)



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Build a School-Day Access Plan (cont.)

4. Support implementation

- Who sets up and checks the system?
- How will the setup be documented?
- Who needs training?
- When will performance be reassessed?

The plan must be safe, reproducible, available throughout the day, and acceptable to the student.

(Kernston et al., 2021)



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The Final Question: Does It Support Participation?

Access: Can the person reliably and sustainably reach the vocabulary?

Communication: Can they produce meaningful and novel messages?

Implementation: Can the successful conditions be reproduced across activities and environments?

Continuity: Is communication still available when the primary configuration cannot be used?

(Brockmeier & Light, 2020; Bollenbass et al., 2024; Kernston et al., 2021)



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Questions?

Feel free to contact me:
Jackie Kearns, CCC-SLP
kearnsj@ccf.org

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