The Cognitive Demands Checklist →
Thinking about Thinking for AAC

An interactive online source designed to provide summaries from literature in fields of AAC and cognition.

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Introduction

Challenge: To date limited discussion and research about the cognitive skills demanded of user for AAC technologies.

Goal: To develop a literature resource to help describe the cognitive demands that various features of AAC devices or apps place on the person with complex communication needs

Targeted Users: AAC clinicians and device developers

Current Efforts: Year 5 of the RERC on AAC.

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Value statements

All humans are learners.

Individuals have unique learning styles.

Learning to communicate is a basic human right.

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What *Thinking about Thinking for AAC* is

A tool to answer: "What does this device or app demand cognitively from the user?"

- Provide literature references about the cognitive demands of specific features of AAC technologies
- Provide opportunity for clinicians to consider and compare the cognitive demands of AAC technologies
- Identify available research gaps that exists regarding the cognitive demands of AAC technologies and apps to guide future directions
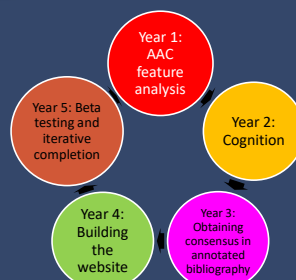- Inform the design of AAC technologies

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What *Thinking about Thinking for AAC* is NOT

- *NOT* an assessment tool.
- *NOT* a prerequisite list of cognitive skills needed before AAC technology is introduced.
- *NOT* a list to determine eligibility for potential device trial, purchase or training.
- *NOT* a list of cognitive skills needed before trialing or purchase.
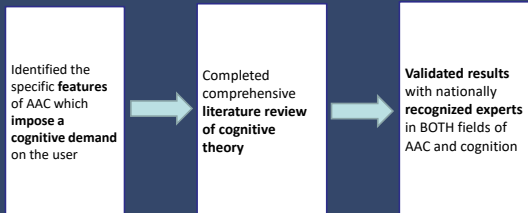- *NOT* a base to eliminate AAC options for individuals who may rely on AAC technologies.

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Five Year RERC on AAC project based on the KT4TT Stage Gate Model

Year 1: AAC feature analysis

Year 2: Cognition

Year 3: Obtaining consensus in annotated bibliography

Year 4: Building the website

Year 5: Beta testing and iterative completion

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Development Process

Where to start?

Identified the specific **features** of AAC which **impose a cognitive demand** on the user

Completed comprehensive **literature review of cognitive theory**

Validated results with nationally **recognized experts** in BOTH fields of AAC and cognition

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Cognition

- The human mental processes of acquiring, using and understanding knowledge.
- There are many domains that are used to describe these thought processes.
- The *Thinking about Thinking for AAC* examines three cognitive domains:
  - Attention
  - Memory
  - Executive function

Cognition Resources

- NIH Toolbox- Cognitive measures
- Weschler Adult Intelligence Scale-5
- Cattell-Horn-Carroll theory on the structure of human cognitive abilities (CHC)
- Lezak's Neuropsychological Assessment
- Theoretical approaches to cognitive rehabilitation
- Baddeley's model of working memory
- Educational and developmental theory
- Instructional design
- Human-computer interface

Attention

Attention is generally defined as a system of cognitive processes including:

- **Sustained** attention, the ability to maintain attention to task
- **Selective** attention, ability to maintain focus while filtering out distractions
- **Alternating** attention, ability to switch focus between tasks
- **Divided** attention, the ability to process or attend to two different demands simultaneously.

Examples of attention demands for AAC

- *The user must focus on a cursor as it moves from box to box on a grid for auto scanning.*
- *The user must attend to the accuracy of a selection while typing an intended message on the keyboard.*

Memory

Memory is the ability to take in information, encode it, store it, and retrieve it at a later time.

Examples of memory demands for AAC

The user must retain the intended phrase-length message while generating the message word by word.

The user must remember the content and location of stored messages with a dynamic multilevel display.

Executive Function

Executive function refers to a set of complex, higher order processes involved in the planning, organization, regulation, and monitoring of goal-directed behavior.

Example of an executive function demand for AAC

The user must
1. *initiate navigation through multiple pages*
2. *choose the most efficient navigation path*
3. *monitor performance & correct errors*
4. *locate and select the target symbol with in a dynamic multi-level display*

AAC SGD Feature matching resources

- AAC Device Assistant *(AAC TechConnect, 2012)*
- AAC Feature Match Checklist *(Harris, Ryder, & Totten, 2010)*
- Feature Match Comparison Chart *(Oklahoma Assistive Technology Center, 2013)*
- Rocky Bay *(Positive AACtion Information Kit 2010)*
- Select pages from Feature Match Checklist *(Marfilius & Fonner 2012)*

AAC App Resources

- AAC Apps Feature Comparison *(Crawford & Watson, 2011)*
- Feature Matching Communication Applications *(Gosnell, 2011)*
- iPad Apps for Complex Communication Support Needs: Augmentative and Alternative Communication *(CALL Scotland, 2015)*
- Quick Feature Matching Checklist *(Beady, 2014)*
- Rubric for Evaluating the Language of Apps for AAC: RELAAACs *(Parker & Zangari, 2012)*
- Select pages from Feature Match Checklist *(Marfilius & Fonner 2012)*

AAC features with cognitive demands

- 43 app or device features identified to have a cognitive demand
- Did not include features that have an operational demand only
- Features organized into four categories
  - Access (n= 7)
  - Language (n= 17)
  - Display (n= 11)
  - Output (n= 8)

Making the annotated bibliography

Literature review: Key words: Attention, memory or executive function *+ designated feature.*
i.e.: **Memory + direct selection for AAC**

Recent evidence rule: within past ten years UNLESS sentinel article

Consensus: Articles read independently by at least two team members, annotating relevant citations; relevance then verified

Annotated bibliography: Added reference and summary to database to make information easily accessible to clinicians

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Thinking about Thinking for AAC: Two Parts
Part One: An online interactive library

Select specific feature

Cognitive demand literature provided

Part Two: A downloadable PDF

Containing an annotated bibliography and a summary of literature findings.

Selected literature references and summaries were generated by multiple members of RERC on AAC team during consensus process.

Method: Local beta testing

- Identify expert representatives of the following fields:
  - AAC experts (including clinicians, industry and designers)
  - Cognition experts
- Try *Thinking about Thinking for AAC* site with three different AAC technologies.
- Use "think out loud" procedure to gain qualitative information about their experience
- Provide questionnaires for quantitative feedback
  - Rate value as a clinical/design resource
  - Rate usability of website and overall design

Results from Beta n=10

Beta Participant Affiliation	Cognitive Expert	AAC Expert	Industry Rep	General Clinician
Faculty from SLP programs	1	1		
OT/ATP (child/adult provider)		1		
Home health SLP (adult provider)		1		
Outpatient SLP (child/adult provider)	1	1	2	3

Feature checklist: iPad with Go Talk Now

Access
- **Direct Selection**: With a body part

Language
- **Representation:** Photographs

Display
- Static Display
- Visual Scene Display
- Hot spot

Output
- **Speech Output:** Digitized (Recorded) Speech

Feature checklist: Tobii T-10

Access

Indirect Selection:
Row-Column Scanning

Language
- **Organization:** Categories/Group/Themes
- **Rate Enhancement:** Word/Message Prediction
- **Representation:** Text

Output
- **Speech Output:** Synthesized Speech

Display
- Dynamic display
- Keyboard
- Color
- Message Window
- Grid Display

Average Ratings by Local Beta Testers

	Strong Agreement	Mild Agreement	No Opinion	Mild Disagreement	Strong Disagreement

- The website is easy to navigate
- It would be helpful to an expert clinician
- It would be helpful to a novice clinician
- The pdf report provides useful references
- The structure is intuitive
- Literature summaries are clearly stated
- The feature definitions clearly stated
- Cognitive domain definitions clearly stated
- It may influence how I problem solve
- It is practical for a busy clinical setting
- It increased my awareness of which features impose cognitive demands
- I am likely to use it

Qualitative Feedback

"I would have found this helpful during my AAC class, to supplement other resources we learned about. Obviously it's not an assessment tool but at least it's a place to start."

"I wonder if this was study was on adults or peds? It would be interesting to find out if the cognitive demand is the same."

"Glad for this resource because there are people who do not refer clients to me because they believe that the client cannot benefit from AAC/use of technology because of cognitive reasons"

"This is hard information to take for someone who has not considered cognition before. It needs to be simpler. Maybe it's the examples; they are good but need to be simplified somehow."

"It stimulates a lot of clinical questions and gets people thinking about cognition, which is good. The cognitive demands of AAC are an afterthought; this emphasizes to learn &develop cognitive skills is important and can happen with consistent teaching and instruction"

Qualitative Feedback

"I could use citations in writing a funding report to support my recommendations."

"The summaries take a long time to get to the 'meat' or gist of the literature. (What does this say exactly?)."

"I could use when talking about parents or family members to justify a programming decision (e.g. photographs as a symbolic decision)for an individual's AAC device."

"Need to separate adult/child literature"

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Lessons learned

- Additional research is needed for cognitive demands of AAC device features.
- Many studies that do exist are **NOT** representative of AAC users.
- Literature that does exist may discuss impact theoretically but does not empirically investigate the cognitive demand of feature.

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Expected outcomes

- Web-based application
- Free of charge to AAC stakeholders
- Marketed through AAC stakeholder groups and industry conferences

http://www

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RERC on AAC

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