Analyzing Language Development of Physically Impaired Children Using AAC Devices

Gail VanTatenhove, Paul Andres, Meher Banajee
ASHA 2011

Assessment of expressive language development in children who use AAC

- Assessment of expressive language development is essential for ...
  - Intervention planning
  - Measuring progress on language goals
  - Obtaining appropriate and adequate services
  - Obtaining funding
  - Justifying the need for continuation of intervention

Assessment of expressive language development in children who use AAC

- What procedures are used to evaluate typical peers? How do you do an assessment?
  - Formal test procedures
    - Norm-based
    - Criterion-referenced
  - Informal test procedures
    - Language Sample

Why assess using language samples?

- Good for “hard-to-test” students
- More sensitive than standardized tests
- Good reflection of “real-world” language and communication skills
- Effective for intervention planning

Assessment of expressive language development in children who use AAC

- Informal procedures
  - Spontaneous language sample
    - Collection of data
    - Analysis of data
    - Reporting of data
  - Traditional procedures to analyze spontaneous language sample used with typical peers
    - Systematic Analysis of Language Transcripts (SALT)
    - Charneco’s Clinical Discourse Analysis
    - QUAD Profile (Russell Cross, AAC Language Lab)
Language Sample Collection and Analysis

Basic Principles & Tools

Collecting Language Samples

- Typically done in a face-to-face activity
- Activities to elicit a sample might include:
  - Conversation on fixed topics (home, school, pet)
  - Narratives (about a book or movie)
  - Story retelling
- The sample is a set of consecutive utterances from the activity (activities) completed
- Recommended length of sample
  - 50 to 100

Analyzing Language Samples

- Rules:
  - How do you determine the start/stop of each utterance?
  - What do you do with unintelligible utterances?
  - What is a word vs. morpheme?
- What do you calculate and analyze?
  - MLU-M
  - MLU-W

SALT Analysis – Standard Measures

SALT Analysis – Standard Measures
SALT – Follow-up Analysis
- MLU
- Vocabulary – grammatical categories
- Omissions and errors
- Maze summary
- Pause and rate summary

D’Amico’s Discourse Analysis
- Quantity: The quantity of information to be provided.
  - Make your contribution as informative as required.
  - Don’t make the contribution more informative than is required.
- Coherence
- Quality: Try to make your contribution one that is true.
  - Do not say what you believe to be false and represent it as is.
  - Do not say for which you lack adequate evidence.
- Relations: Be relevant.
  - Your contribution to conversation should be appropriate to the immediate needs of each stage of the transaction.
- Manner: This is the art of relating not what has been said but rather to HOW what is said is to be said.
  - Avoid Obviousness of expression
  - Avoid Ambiguity
  - Be brief and orderly

Quad Profile
- Vocabulary – the words an individual uses to build sentences
- Morphology – the way words change within a sentence
- Syntax – the order of words in a sentence
- Function – what is the purpose of the sentence
- Documentation sheet

Using Normal Language Acquisition Models to Study the Language of Children Who Use AAC
- A Brief Retrospective

Expressive Language Development with Children using AAC Systems

Some External AAC Factors Influencing Expressive Language Development
- Vocabulary available to the child is not self-selected.
- The vocabulary has to be visually represented (pictures, symbols, drawings) – all of which have to be learned.
- Vocabulary provided might not be appropriate or sufficient for language to develop.
- Words might not have morphological variations (go, going, went, gone, to go).
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Some External Communication Partner Factors Influencing Expressive Language Development

- Talk too much – partners take the majority of communication turns
- Ask way too many questions, especially yes/no questions
- Fail to recognize and/or respond appropriately to the child's communication attempts
- Provide too few appropriate communication opportunities
- Perpetuate an inherent Language Input – Output asymmetry by not providing visual modeling of the AAC system

Computerized Tools for LSC & LSA

Typically Developing
- Systematic Analysis of Language Transcripts (SALT)
  – Salt Software LLC

AAC Device Users
- Language Activity Monitor (LAM) – AAC Institute
  – Poster 211, 11:00 – 12:30 on Friday November 16
- Performance Report Tool (PeRT) – AAC Institute

LAM Files

- SMP: Single Meaning Pictures
- SPE: SPElling
- WPR: Word PRediction
- OWS: Orthographic Word Selection
- SEM: SEMantic Compaction

PeRT

Section 1: Utterance-Based Summary Measures
- Total Utterances: 15
- Complete Utterances (%): 100%
- Method of Generating Utterances (%): 100%
- Mean Length of Utterance in Words (MLUw): 5.87
- Mean Length of Utterance in Morphemes (MLUm): 7.80
- Average Communication Rate (words/minute): 22.21
- Peak Communication Rate (words/minute): 34.28

PeRT = Performance Report Tool

Section 2: Word-Based Summary Measures
- Total Number of Words: 88
- Different Word Roots: 58
- Core Vocabulary (%): 77%
- Method of Generating Words (%):
Using Language Sample Collection and Analysis with Children who use AAC

What can it tell us?

Looking at language samples helps evaluate progress unique to children who use AAC, such as:

- **Language Representation Methods**
  - What is the person saying with Minispeak codes, single meaning pictures, and/or letters?

- **Rate of Communication**
  - How many words per minute is the person saying?

- **Minutes of Communication**
  - How much time does the person use the AAC device in a day?

- **Fluency**
  - What's the person's "rhythm" when saying a sentence? Is it regular or stop and go?

Looking at language samples of a child who uses AAC helps evaluate progress in the areas of:

- **Pragmatics**
  - Why is the child talking?

- **Semantics**
  - What words does the child use?

- **Syntax**
  - How is the child's word order developing?

- **Morphology**
  - What kind of word endings is the child using?

- **Discourse**
  - How does the child engage in conversation with communication partners?

The Expressive Language Development of Physically Impaired Children using Robust AAC Devices

Two Case Studies with Analysis of Language Samples
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- Have “near normal” receptive language and cognitive skills
- Have access to robust AAC devices
  - core vocabulary & morphology available
  - automated data collection features in the device
- Come from language-rich homes
  - access to the device
  - good partner skills

Diagnosis
- Quadriplegic, Athetoid-CP
- Normal vision and hearing
- No medications or medical issues
- Asperger-like behaviors

- English speaking home and school
- Only child in 2-parent home
- Active in community

Social/Personal

School Placement & Support Services
- BSL classroom with 5 students
- Speech Therapy = 3/week for 60 minutes
- Behavior Specialist = 9 classroom 3/week for 30 minutes
- Receptive language is reported to be WNL but there are “ips”
- Expressive language level is “unknown” – LAM not turned ON
  - All reports – 1 to 2 word utterances
  - Does not initiate communication and is prompt-dependent

Language Abilities

April 2008
- School is getting ready to shift him to a Vantage Lite with Unity®45 in next school year
  - More keys = more vocabulary
  - Encoded with Minspeak Icon Sequences (1–3 selections/word)
- Family contacts private speech-language pathologist to …
  - Provide supports in the transition
  - Conduct on-going therapy at home

June – August 2008
- Summer intervention using a manual communication board with Pixos® to evaluate expressive language potential and prepare for transition to Unity®45 in the Vantage Lite

“Tell me something about him!” (modeled him)
- He-him-his
talk
fun-funny way
- He talk

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Summer Practice with MCB
- Producing 1 and 2 word utterances spontaneously (MLU-M = 1.2, Stage I)
- Using simple noun phrases and verb phrases
- The vocabulary and organization of the MCB does not allow for morphological variations or individual pronouns
- Lots of "unknowns," but it appears that he is developing syntactical skills
  - Needs immediate access to morphological variations and more core vocabulary

August 2008 – December 2008
- Joshua has intermittent access to a Vantage
  - School: Unity® 1 Hit
  - Family/Private: Unity® 2-Hit, then Unity® Full
- School personnel doing device trials
  - Family: Wants Minspeak® & portable device
  - School: Considering other options
- No mounting system for the device
  - Placed on lap tray or other surface

January 2009 – August 2011
- Started 2009 with Vantage with Unity®45 Full
  - Accessed via direct selection
  - Mounted on wheelchair
- ESE with partial inclusion in Gen Ed for reading/math at a supported level
- School-based and private SLP services

August 2011 to Present
- EcoPoint with Unity®45 Full
  - Accessed via direct selection
  - Positioned on wheelchair mount
- New school in a different school district
  - Fully included in general education (4th grade)
- School-based and private SLP services

How were language samples collected?
- Automated Data Collection
  - Language Activity Monitor
  - In device
- Face-to-Face Interaction Sampling
  - Transcribe audio recordings
  - To confirm accuracy of LAM data

Let’s look at the data on Joshua!
What do we see happening with his expressive language output?

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What rules were used to analyze the samples?

Even with automated tools, you are required to “parse” out the language of the sample, based on the rules of the software. (SALT, PeRT)

Analyze this sample for MLU-M

• How are you today?
• What did you do last week-end?
• I am going with my friends?
• We went to see movies.
• It was the coolest.
• Did you like it?
• I liked that one the best.

# of utterances =...
total morphemes =...
MLU-M =

Analyze this sample for MLU-M

1. How are you today?
2. What did you do last week-end?
3. I am going with my friends.
4. We went to see movies.
5. It was the coolest.
6. Did you like it?
7. I liked that one the best.

# of utterances = 7
total morphemes = 42
MLU-M = 6.0

Re-Calculate based on this Key

Key to how the words are stored & retrieved:
• Pre-stored sentence
• Pre-stored phrase
• Pre-stored word (open class)
  — with lists for morphological variations or grammatical options
  — you have to choose what “version” of this word you want
  — you, go, you-go, you-g, whatever, good-better...
• Pre-stored word (closed class)
  — only one option of how to say it
  — with that, this

• How are you today?
• What did you do last week-end?
• I am going with my friends.
• We went to see movies.
• It was the coolest.
• Did you like it?
• I liked that one the best.

How does the encoding/retrieval method alter calculation of a MLU-M?

What “rules” do you use?
Generous Rules
• Ignore how it was retrieved and just count morphemes like he/she is a speaker
  – For Pre-Stored Sentences: Count like a speaker
  – For Pre-Stored Phrases: Count like a speaker
• Give “extra credit” for grammatical metalinguistic knowledge
  – For Words: Count the grammatical marker as a second morpheme for any words that have a specific grammatical marker key

“Extra Credit” & Encoding Method
With the encoding program, Joshua has to intentionally MARK the morphological ending or select the grammatical group.
Shouldn’t he get credit for that?

Strict Rules
• Count any pre-stored phrase or sentence as one morpheme only
• Count any pre-stored compound word as one morpheme unless the words are present as individual words in the sample (weekend — week; end)
• Count Bound morphemes ...
  – ONLY if morphological variations are possible in the pre-stored vocabulary (toy/toys, cool/cooler/coolest, liked/liking/liked). Otherwise count only as one.
• Count irregulars as one morpheme (ate, people, best) — same as if a speaker

Gail’s Rules - Moderate Rules
• Try to follow normal rules as closely as possible, with the exception of pre-stored sentences
  – Count pre-stored sentences as one morpheme only
• Count pre-stored phrases and compound words with “normal” rules
• Open Class Words
  – Count bound morphemes with “normal” rules
  – Give “extra credit” ONLY for irregular nouns, verbs, & adjectives
• Give 0 “extra credit” for grammatical markers for Closed Class Words

RULES
consistency

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Joshua – Vantage Lite

- What is his communication like with direct selection using his hand?
- What does language sample analysis tell me about his expressive language development?
- Three Samples
  - October 2009 (after 10 months of consistent use)
  - October 2010
  - July/August 2011

October 2009
(Sample of Multiple Word Utterances)

- Pronouns: "I" only in pre-stored phrases (I want)
- Noun Phrase:
  - adj + noun (orange, yellow, toy, silver album)
  - prep + noun (after lunch, in box)
  - no plurals, no possessive markers
- Verb Phrase:
  - verb + object (want, DVD)
  - verb + attribute (feel tired)
- Negation: not
- Questions: none (may mark with intonation/expression)

2009 Dashboard

October 2010

- Pronouns: "I" only in pre-stored phrases (I want)
- Noun Phrase:
  - adj + noun (orange, yellow, toy, silver album)
  - prep + noun (after lunch)
  - noun + attribute (they said)
  - noun + location (police box)
  - emerging plural, no possessive markers
  - new prepositions: emerging (is, to, with)
- Verb Phrase:
  - verb + object (watch DVD)
  - verb + attribute (feel happy)
  - no mood/descriptors but some emerging verb tenses
- Negation: not, no, don't (no laughing, don't tell)
- Questions: none
The August 2011 Sample

What's the same?
- Personal pronouns
  - still limited to "1" in phrases
  - some use of "we" (in utterance)
- Few to no Wh questions
  - "why" only example
- Simple noun phrases continue
- Verb phrases:
  - no morphology
  - no modals/auxiliaries other than "can I" (prompted)
- Variations in tones continue

What's new?
- Some articles are emerging
- Plural "n" is used more consistently
- Vocabulary for nouns, verbs, adjectives, adverbs, & prepositions is growing
  - School & private speech therapy geared toward modeling & developing a defined core vocabulary (see chart)

Target Vocabulary of 350+ Core Words
(on wall charts at home & around school)

1. Identify
2. Remind
3. Reference
4. Model

Portable Wall Chart
(in flip book that travels with him)

Most frequently used words

August 2011 Dashboard

Volume of language produced

Time talking per day

Vantage Lite with Hand – development over 32 months

- MLU in Stage II of Brown's Stages (1.5 – 2.5 MLU-M, 21-30 months of age)
- Showing some morphological skills from Stage III (2.5 – 3.0 MLU-M, 31-34 months of age)
- Present progressive
- Regular plurals
- In/On
- Negative "don't"
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Joshua & Direct Selection with Hand

- Observations
  - Access hasn’t improved (operational competency)
  - Slow or stalled growth in linguistic, social, and strategic competencies
  - Behavior is getting worse, as reported by school team, private SLP, and parents

- Conclusions
  - This might be “as good as it gets” in terms of linguistic, social, and strategic competency
  - BUT ……… What is the effect of “operational” factors?
  - Negative behaviors may be a result of communication frustration

Change to EcoPoint:
New Device
Same Language Program
Different Access Method

We are hoping that we’ll see an increase once again in linguistic development with a different access method.

Joshua – EcoPoint

- What is his communication like with direct selection using eye gaze?

- Four Samples
  - August 2011 (2 days after the switch)
  - October 2011
  - February 2012
  - June 2012

Hand vs. Eyes

August 2011 – What was noticed immediately?

- Adjective Morphology (inflectional morphemes)
  - read (red, red)
- Help/Get verbs (auxiliary verbs)
  - I am going to see the movie
  - Dad will come, you should try
  - and can pick them
  - Where are we going ( Inflectional morphemes)
- Questions beyond simple “can I”
  - Would you help?
  - What did you do?
  - Are we going to Olive Garden?

- Questions inversion of subject
  - Verb is moved with “do” support (present/past tenses)
  - Is that nice?
  - Do you want to go?
  - Did you bring your book?
- Articles, determiners & indefinites are increasing
  - ride a bus tomorrow the drink
  - get that out, some more, nothing
- Prepositions & Adverbs, increasing
  - back up, turn it off
  - again now, ready

August 2011 Dashboard

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October 2011

- Language is becoming more complex and complete
  - I want to listen to music 12 minutes.
  - I was laughing. (more helper verbs)
  - She gave him 5 dollars. (more pronouns)
  - Listening to music at school is fun.
  - I'm laughing when I'm listening to music. (contractions, wh-words)
  - Do you want to race?
  - How did he get lost?

February 2012 Changes

- I want the broken robot.
- Ms. Wendy, can I eat applesauce please?
- I want to build your baby's brains through the power of music CD case.
- Read that new animal book.
- I want to have back the Wingo card.

June 2012

- Gradual progress in syntax and morphology:
  - Constructions
  - Conjunctions (conjoining with “and”)
  - Reflexive (himself) and indefinite pronouns (something)
  - Possessives (baby’s)
- More consistent producing sentences instead of talking telegraphically
  - Prompted and rewarded by partners to use sentences
  - Learning the strategic need for full utterances vs. abbreviated talking
- Continuing Concerns:
  - Refine his syntax and morphology
  - Increase his topics and social interaction
  - Restricted interests
  - Obsessive-compulsive repetition of language topics
  - Limited interest in others
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Parts of Speech Used

Minutes Used

Top Ten Words

- Requesting as a primary language function
  - I want
  - I want to
- Changing interests
  - Orange/yellow science toy
  - Books
  - Matching games
  - Music
  - Frogs
- Family life
  - Negotiate schedule and behavior program (afters, star dad)
  - Be polite (please)

Joshua & Direct Selection - Eye Gaze

- Observations:
  - Access has been, but is no longer the key issue
  - Significant growth in linguistic, social, and strategic competencies
  - Behavior problems are 99.9% gone
  - Becoming more social with peers
  - Significant progress made in school

Joshua & Direct Selection - Eye Gaze

- Conclusions
  - It was NOT “as good as it gets” in terms of linguistic competency
  - His language acquisition is following a normal pattern
  - Improved access (operational) made huge differences in the perception of him as “competent”

Just how much more “competent” is Joshua?

The AAC Performance Profile™: A Continuum of Learning
by Tracy M. Kovach, Ph.D.
available from LuxoSystems
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Performance Profile Summary
- Oct 2010-VTL
- Aug 2011-VTL
- June 2012-EcoPoint
- October 2012-EcoPoint

Case Study #2: Lennart

Diagnosis
- Dyskinetic cerebral palsy
- 9 years of age (at this time)
- German speaking home and school
- Youngest of 2 children in two-parent home
- Active in community

Lennart

Social/Personal

School Placement & Support Services
- Currently inclusive education (3rd grade)
- Physiotherapy
- Occupational Therapy
- No speech (no vocalizations)
- Age appropriate grammar, vocabulary and literacy

Language Abilities

LEARNING FROM LENNART

January 2008
PROVISION WITH FIRST COMMUNICATION BOARD
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June 2008
Vanguard Loan with 45 Location Minspeak Program
AccessTracker Mouse

Times of use = availability
Repetition = intent & access
Variability & pattern = exploration
Corroboration of descriptions

June 2008
Daily Logging, Transfers Initiated

September 2008
Vocabulary Program Extended to 84 Location
Target Vocabulary as Guide to Modelling Introduced

October 2008

Language Activity Monitoring (LAM)

November 2008
Light-Tech Extended to Include Spelling

November 2008
Introduction to Rhymes

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- Functional access method
- Lemnart uses and explores growing vocabulary
- Family modelling language verbally and on device
- Lemnart is separating ideas with “clear display”
- Actively listening to words and exploring word endings

December 2008
COMPONENTS IN PLACE FOR CREATIVE USE OF VOCABULARY, MORPHOLOGY AND SYNTAX

January 2009
LONG-TERM OBSERVATION OF DEVELOPMENT OF MORPHOLOGY AND SYNTAX

February 2009
IDENTIFYING DISCRETE UTTERANCES

February 2009
IDENTIFYING SENTENCES

SENTENCES FOR ANALYSIS

GERMAN IN 60 SECONDS
MORPHOLOGY

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Analysis
Noun phrases identified and examined

Results

German in 60 seconds
Syntax

I am full
...but I could still eat yoghurt

Positive
- Data is manageable over long periods
- Fast forward through time
- Unobtrusive
- Easily administered and communicated

Challenges
- System structure influences language production
- Separating language skills from operative skills
- Context and author not viable

LAMAS ASSESSMENT TOOL

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Joshua and Lennart suggest that...

- AAC system users can learn language based on NLA models when given access to the same fundamental core vocabulary available to typically developing speakers.
- Access plays a significant role in the ability of a child to demonstrate, if not develop, grammatical structures.
- Modeling as a factor in expressive language development, needs to be investigated further.
Discussion – “We need ….”

• Greater consistency in strategies/rules used to analyze/report the language development of children using AAC systems.
• For on-going assessment
• For research purposes

Language Analysis Tools that provide information and understanding of the unique aspects of the expressive language output of AAC users.
• Give feedback to developers

Language Sample References