

Language Development and Disorders in AAC: Translating Knowledge into Practice Part 1

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Session Objectives

- Learn how to apply your knowledge of language development and assessment to the design and fabrication of communication displays
- Learn what tests/procedures can be used to assess cognitive/language performance of users of AAC systems

Key Terms

- Speech-**Language** Pathologist
- Augmentative and Alternative **Communication**
- Language vs. Communication
 - **Language** is a system of gestures, **grammar**, signs, sounds, symbols, or words, which is used to represent and **communicate** concepts, ideas, meanings, and thoughts.
 - **Communication** is the process of exchanging information usually via a common system of symbols.

Beyond Syntax and Semantics

- Child learns language to express intentions
- Communicative functions
- Pragmatic rules of discourse
- Language knowledge is involved in comprehending and producing text

Essence of Effective AAC Intervention

- Establishing appropriate intervention goals based upon the augmented communicator's age and **language abilities**
- Selecting and organizing a "vocabulary set" appropriately matched to the user's **language abilities and communication** goals
- Integrating use of the AAC **system** (i.e., enabling **communication**) in functional and meaningful activities

Requisites for Facilitating Language Development in AAC

- Understanding the normal language acquisition process
- Implementing the appropriate intervention strategies and tools for augmented

communicators

The Preintentional Child - (Birth - 8 months)

- Patterns of Performance
 - Demonstrates little evidence of goal-oriented actions
 - Does not carry-out intentional communication

The Intentional Child - (8-12 months)

- Patterns of Performance
 - Does not yet use words
 - Acts on new objects in rapid succession
 - Can imitate on-going actions
 - Begins to engage in joint attention

The Sensorimotor Child - Stage 5 - (12-18 Months)

- Patterns of Performance
 - Uses communicative gestures with stereotyped vocalizations
 - Requests objects, attention, or object removal
 - Understands words when referents are present
 - Acquired 10-30 words
 - Unable to bring an object or action to mind on the basis of a symbol or label

Representational Thought -Stage 6 - (18-24 months)

- Patterns of Performance
 - Understands words when referents are *NOT* present
 - Understands action words out of routines
 - Carries out 2-word conversations
 - Begins to understand questions

Stages of Syntactic and Morphologic Development

- MLU can serve as a predictor of the complexity of language of the young English-**speaking** child.
- MLU
 - relates to age,
 - is reliable,
 - is a good predictor of language development (i.e., utterance complexity - up to an MLU of 4.0)
 - may increase by 1.2 morphemes per year from 18 mos - 5 years

Brown's Stage I - (15-30 months)

- Sentence Length 1.75 morphemes
- 50-60 word vocabulary
- Operations of Reference
 - Nomination
 - Recurrence

- Negation - denial, rejection, non-existence
- Semantic Relations
 - Agent+Action;
 - Action +Object;
 - Agent+Object;
 - Action +Locative;
 - Entity + Locative;
 - Possessor + Possession;
 - Entity+Attributive; Demonstrative+Entity

Early Preoperational - Brown's Stage II - (28 - 36 months)

- Patterns of Performance (MLU - 2.0 -2.5)
 - Begins to use grammatical morphemes
 - -ing without is
 - prepositions "in and on"
 - plurals "s" and "z"
 - Uses 3-4 words declarative sentences
 - Uses negatives
 - Forms interrogatives with rising intonation; "Wh" questions
 - Uses imperatives - "Give me." " I want!"

Brown's Stage III - (36-42 months)

- Patterns of Performance (MLU - 2.5-3.0)
 - Uses the grammatical morphemes for
 - irregular past tense
 - possessive
 - immediate future "gonna"
 - Uncontractible copula (Is she coming?)

Brown's Stage IV - (40-46 months)

- Patterns of Performance (MLU - 3.0-3.7)
 - Articles
 - Regular past tense (-ed)
 - 3rd person regular present tense
 - Uses well-formed negatives
 - Uses tag questions, who, why

Brown's Stage V - (42 - 52+ months)

- Patterns of Performance - (MLU - 3.7 -4.5)
 - Articles
 - Coordination of sentences
 - when, before, after, but, because
 - Uses the grammatical morphemes for
 - 3rd person singular
 - 3rd person irregular (e.g., she has, she does)
 - Uses contracted "she's" and uncontracted "are"

- Contractible auxiliary (e.g. they're)
- Uses the modal verbs "could" and "would"
- Forms questions using how and when

AAC Intervention Strategies

- **The Preintentional Child - (Birth - 8 months)**

- Use symbols that are common **objects**
- Facilitate child-caregiver interactions
- Create opportunities for the child to develop social bonds
- Use **gestures** when interacting
- Teach signs/symbols in meaningful repeated **routines**

AAC Intervention Strategies

- **The Intentional Child - (8-12 months)**

- Use **signs, objects** and spoken words in "play" (i.e., functional and meaningful) routines
- Focus on communicative interactions
- Encourage joint attention in activities

AAC Intervention Strategies

- **The Sensorimotor Child - Stage - 5 (12-18 Months)**

- Facilitate comprehension and use of **objects** and/or **signs**
- Use pictures (e.g., **symbols**) to enhance comprehension (Aided Language Stimulation)
- Provide opportunities to express - "Want"; "Lookit!"; "Don't want!"
- Intervention must focus on referents that are present

AAC Intervention Strategies

- **Representational Thought - (18-24 months) Brown's Stage I - (15-30 months)**

- Use pictures or other symbols (e.g., objects; signs, gestures) to enhance comprehension
- Use pictures/objects to evoke absent objects
- Teach a symbolic means for referencing objects - symbol, sign, pointing, looking
- Stimulate the use of actions, requests, responses to ?s, single words in succession
- Model and stimulate pivot-word utterances (Aided Language Stimulation)
- Use symbols communicatively throughout the course of daily activities, routines and play.

AAC Intervention Strategies

- **Brown's Stage I - (MLU 1.5 - 2.0)**

- Communication displays to include words across grammatical categories enabling expression of:
 - **Operations of Reference**

- **Nomination**
- **Recurrence (more)**
- **Negation - denial, rejection, non-existence (no, don't)**
- **Semantic Relations**
 - **Agent + Action;**
 - **Action + Object;**
 - **Agent + Object;**
 - **Action + Locative;**
 - **Entity + Locative;**
 - **Possessor + Possession;**
 - **Entity + Attributive;**
 - **Demonstrative + Entity**
- Systematically increase size of vocabulary set (50-60 symbols)

AAC Intervention Strategies

- **Early Preoperational - Brown's Stage II - (MLU - 2.0 - 2.5)**
 - Communication displays to include:
 - grammatical morphemes (-ing, -s)
 - single word vocabulary
 - question words
 - negatives
 - Use symbols communicatively throughout the course of daily activities, routines and play.
 - Aided Language Stimulation, Modeling

AAC Intervention Strategies

- **Brown's Stage III - (MLU 2.5-3.0)**
 - Communication displays expanded to include:
 - irregular past tense
 - possessives
 - Use of the copula (is, are, etc)
 - question words - who and why
 - negatives
 - Facilitate use of AAC system in multiple environments within a range of activities.
 - Aided Language Stimulation, Modeling

AAC Intervention Strategies

- **Brown's Stage IV - (MLU 3.0-3.7)**
 - Communication displays expanded to include:
 - Articles
 - Regular past tense (-ed)
 - 3rd person regular present tense
 - Questions words - who, why
 - Use AAC system in a range of spoken and written communication activities.

AAC Intervention Strategies

- **Brown's Stage V - (MLU 3.7- 4.5)**
 - Communication displays expanded to include:
 - Third person irregular (does, has, etc.)
 - Contractions (if high tech device is used)
 - Modal verbs - could and would
 - Question words - how and when
 - Use AAC system in a range of spoken and written communication activities.

Assessing Language Performance

- Testing is not < >
- Testing enables ...
 - Develop a comparative index of children's strengths and weaknesses
 - If tests are reliable, the examiner can have confidence in the results
 - If tests are valid, the examiner will know what abilities are being evaluated
 - Determine children's competencies => functional performance level(s) in order to establish appropriate intervention goals
 - Design/select an appropriate AAC system
 - Document progress and/or outcomes

Functional Performance Measures - (Standardized)

- Receptive Vocabulary (PPVT-III)
- Test of Auditory Comprehension of Language (TACL-3)
- Preschool Language Scale (PLS-4)
- Test of Language Development (TOLD-P3)
- Kaufman Test of Word Order
- Kaufman Test of Spatial Memory
- Stanford-Binet Memory for Objects

Functional Performance Measures (Not Standardized)

- CSH AAC Evaluation Protocol
 - Objective, systematic, measure outcomes
- Test of Symbolic Communication Performance[®] (TSCP)
 - Field Size and Number
 - Grammatical Encoding
 - Categorization Skills
 - Syntactical Performance
 - Navigational Performance

PPVT- III

- "...an individually administered, untimed, norm-referenced, wide-range test ... of receptive vocabulary
- Results (raw scores) can be converted to the following age-referenced

normative scores: SS, %ile, age equivalents.

- Select from a field of 4 - Use optimal response mode (e.g., pointing, eye-gaze, yes/no)
- Reliable measure for persons w/ CP using yes/no.
- Provide deviation and developmental types of norms
- PPVT-III & WISC are highly correlated - (the Verbal IQ correlation is slightly higher than Performance and Full Scale IQ correlations)

TACL - 3

- Designed to test understanding of the structure of spoken language
 - Grammatical Morphemes (i.e., prepositions, noun number, verbs, auxiliary, adjectives, and adverbs)
- Norms 3-0 through 9-11
- Provides age-referenced norms - SS, %ile, age equivalent (language ages)
- Easily adapted for children w/ physical disabilities
- Select from a field of 3 - Use optimal response mode (e.g., pointing, eye-gaze, yes/no)
- No information about whether or not it correlates w/ PPVT or WISC

PLS - 4

- Measures children's receptive and expressive language performance
- "Useful tool for severely involved children"
- Expressive test asks children to name objects, use concepts that describe objects and express quantity, use specific prepositions, grammatical markers and sentence structure.
- Norms Birth through 6 years 11 months
 - Total Language, Auditory Comprehension, Expressive Communication, SS, %ile, Language Age Equivalents
- Information from PLS-4 can be used for a portfolio assessment

Preschool Language Scale

- Receptive
 - Use optimal response mode (e.g., pointing, eye-gaze, yes/no)
- Expressive
 - Use multi-modal approaches for responses (e.g., speech, gestures)
 - Aided AAC device or language board as alternative (Must be familiar with vocabulary contents and organization)

TOLD - P3 -

Grammatical Completion

- Designed to assess children's ability to recognize, understand and use common English morphological forms.
- Measures the ability to complete a partially formed sentence by supplying a final word that has a proper morphological form.
- Norms 4-0 through 8-11
- The following age-referenced norms - SS, %ile, age equivalent (language

- ages)
- Tests that share the same type of quotients as the TOLD-P3 include Kaufman Assessment Battery, WISC

TOLP-P

- Receptive
 - Picture Vocabulary
 - Grammatic Understanding
 - Word Discrimination
- Expressive
 - Oral Vocabulary
 - Sentence Imitation
 - Grammatic Completion

Test of Symbolic Communication Performance[®] (TSCP) Symbol Size and Field Number

Grammatical Encoding

- Grammatical Class rather than “Symbol Set” (e.g., PCS, DynaSyms) often influences symbol recognition and identification performance.
- Nouns Symbols (i.e., people, objects)
 - Easier to identify than adjectives, verbs, etc
 - Most commonly used on early boards
- Symbols of other grammatical classes (verbs, adverbs)
 - Often require teaching
 - Not always included on young children’s early communication displays
- An individual’s ability to recognize symbols needs systematic evaluation & teaching

Categorization Performance

- Directs Vocabulary Organization approach (Topic vs Grammatical)
- Types of Skills Assessed
 - Superordinate
 - Grammatical
 - Visual
 - Auditory
 - Closure

Categorization

Syntactical Performance

- Assesses individual’s ability to form S-V; S-V-O, S-V-Prep/Adj-O; present progressive, article use (i.e., syntactical performance in the range of 28 - 36 months level)
- Tasks
 - Imitation
 - Response to Question

- Picture Description
- Displays differ in complexity in terms of both symbols number and grammatical elements included.

Navigational Performance

- Assesses individual's ability to form S-V; S-V-O, S-V-Prep/Adj-O; present progressive, article use (i.e., syntactical performance in the range of 28 - 36 months level, but done using a navigational device.
- Tasks
 - Imitation
 - Response to Question
 - Picture Description
- Displays differ in complexity in terms of both symbols number and grammatical elements included.

Communication (Language) Boards: Considerations and Ingredients Vocabulary Selection and Organization Considerations

- User's Abilities (M.A. - C.A. Gap)
 - Receptive/Expressive Language
 - Symbol recognition & identification
 - Sequencing skills
 - Categorization skills
 - Association Performance
 - Pragmatic abilities

Vocabulary Selection

- Communication Environments
 - Play activity
 - School activity
 - Home
- Needs
- Interests
- Goals
 - Syntax
 - Pragmatics

Vocabulary Selection

- Select from each of the following domains
 - Core vs. Fringe vocabulary
 - eat, drink vs. pilgrim, Thanksgiving
 - Content vs. Function words
 - play vs. with
 - Concrete vs. Abstract symbols
 - sleep vs. want

Vocabulary Selection

- Topical
 - Goal
 - Organization
 - Random
 - Alphabetical order
 - Use in a dialogue
 - Sequence of events
 - Categories
 - Message selection
 - Integration into functional activities

Vocabulary Selection

- Conversational
 - Create novel messages
 - Single word complex messages
 - Syntactical development considerations
 - Organization
 - Fitzgerald Key
 - Word Categories
 - Frequency of Occurrence
 - Popup Screens
 - Efficiency

Vocabulary Organization

- Fitzgerald Key
 - Approach to teach language to the deaf
 - Format mirrors simple declarative sentence
 - Color-coding utilized
- **Who-Verb- Little words -Words that tell -What -Where -When**

Sample Communication Boards: Manual and High Tech

Symbol Size and Number

Grammatical Complexity

Syntactic Goals

Sample High Tech System

- Gateway[®] 40
 - Targeted Users
 - Physically impaired children with good cognition; Mild - moderate cognitive limitations; Young oral apraxic
 - C.A.- 3 -12 year; MLU 2.5 - 4.5
 - Select symbols from a field of 40 pictures
 - Communicates using a range of 2-3 word telegraphic sentence to syntactically correct sentences

- Has the potential to learn to use word endings, articles and prepositions
- Spelling & reading are among goals and/or abilities

Components Facilitating Syntactical Development

- Gateway[®] 40
 - Fitzgerald Key organization and color-coding
 - Large core vocabulary, selected morphemes,
 - Key Features
 - “Power Strips” for verbs and is - (verb+ w/ colored label)
 - Frequently used “Object” categories on the Main Page - Foods, Clothing, Household, Toys
 - Opposite Strategy for “Descriptive Words”
 - Comprehensive “Questions” popup
 - Systematically organized and pronoun popup
 - Recency Prediction on the Spelling page
- Expressive Language Testing - can score up to 72 months on PLS
- Message Generation - 1.5 Keystrokes per selection

Components Facilitating Pragmatic Development

- 40 Tab Set
 - About Me
 - General information about the user
 - Time to Chat
 - Range of pragmatic functions
 - Time to Learn
 - Calendar, Test, Specials, Blanks for subjects, Month pages, Functions
 - Time to Play
 - Game, book, and jokes, open pages
 - Time to Relax
 - ECU; Return to Gateway All

Gateway 40

- Language Goals and Activities
 - Model and facilitate use of grammatical morphemes
 - -ing and auxiliaries - is, are, was, were
 - plurals “s” and “z”
 - Prepositions “in and on”
 - Stimulate use of 3 - 4 word declarative sentences
 - Teach use of negatives
 - Model use of interrogatives - “Wh” questions

Gateway 40

- Language Goals and Activities (con’t)
 - Teach use of Grammatical morphemes
 - irregular past tense
 - possessive

- immediate future, will “gonna”
- Teach use of Tag Questions

AAC

A Visual Language System

Assessing Visual Performance?

- AAC is a Visual Language System
 - Are there test measures that could yield information that could be used to help AAC practitioners to predict success for navigating, for sentence creation or for helping to guide therapy goals?
- Visual Skills/Abilities Needed for AAC
 - Memory for location
 - Visual sequencing
 - To encode or to navigate
 - To form messages

What Tools and Why?

- Kaufman - Word Order
 - Does ability to recall word order relate to syntactical performance?
- Kaufman - Spatial Memory
 - Is the ability to recall a picture’s location related to their ability to recall device contents and location?
- Stanford-Binet - Memory for Objects
 - Is the ability to recall a sequence of unrelated pictures related to syntactical performance?

Kaufman - Word Order

- An individually administered, untimed, norm-referenced test of sequential memory of orally presented information ...Ages 4.0 to 12.5
- The examiner of names objects and the child is asked to point to pictures of the objects in the same order as was given
- Results (raw scores) can be converted to the following age-referenced normative scores: SS, %ile, age equivalents
- Provide deviation and developmental types of norms

Kaufman - Word Order

The clinician says,

“Cup, Key, Bird”

Kaufman - Spatial Memory

- An individually administered, untimed, norm-referenced test of spatial memory of visually presented information ...Ages 4.5 to 12.5
- The child is shown a page with objects, which is then removed and the child points to the location of the objects on a blank grid

- Results (raw scores) can be converted to the following age-referenced normative scores: SS, %ile, age equivalents
- Provide deviation and developmental types of norms

Stanford-Binet

Memory for Objects

- An individually administered, untimed, norm-referenced test of spatial memory of visually presented information ...Ages 5.11 and above
- The child is shown a sequence of pictures one at a time and then must identify the pictures in the correct order of presentation among an array of other pictures
- Results (raw scores) can be converted to the following age-referenced normative scores: SS, %ile, age equivalents
- Provide deviation and developmental types of norms

Research Questions

- Can AAC practitioners use the “tools” used to assess “normal” children to guide their intervention programs w/ users of AAC?
- Is there a relationship between test scores on the selected visual test measures and scores obtained on the Categorization Skills subtest of the CST Test of Symbolic Communication Performance?

Subjects

Methodology

- Administer battery of tests to all campers at Chatterbox 2003 (PA)
 - CSH Categorization Skills Subtest
 - Kaufman Test of Word Order
 - Kaufman Test of Spatial Memory
 - Stanford-Binet Memory for Objects
 - PPVT-III
 - TACL-3
- Modified Tests to be used with eye-gaze

Outcomes - Standardized Tests

- N=13
- PPVT - III and
 - Binet-Memory for Objects
 - Kaufman Word Order
 - Kaufman Spatial Memory
- Pearson Correlation (2-tailed)
- Significant at .01 level
- Same results w/ when children who used eye-gaze were included (N=18).

Discussion

- What are the implications of the results?

- Children with higher cognitive abilities ($SS \geq 85$) performed better on all measures than children with lower cognitive abilities ($SS \leq 85$)
- The number of words “remembered” on the formal visual measures may be related to syntactical performance (MLU)

Discussion

Outcomes - PPVT -TACL

- N = 11
- PPVT-III and TACL
- Pearson Correlation (2-tailed)
- Not Significant

Outcomes -

Grammatical Categorization

Outcomes -

Grammatical Categorization

- N=13
 - Age 4.67 - 17.5
 - Only campers with functional pointing
- PPVT - III and
 - People,
 - Verb,
 - Places,
 - Things
- Pearson Correlation (2-tailed)
- Significant at .01 level

Outcomes -

Grammatical Categorization

- N=13
 - Age 4.67 - 17.5
 - Only campers with functional pointing
- TACL and
 - People,
 - Verb,
 - Places,
 - Things
- Pearson Correlation (2-tailed)
- Not Significant

Outcomes - Category Closure

- N=12
 - Age 4.67 - 17.5
 - Only campers with functional pointing
 - One subject removed - responses not reliable due to behavior
- Pearson Correlation (2-tailed)

- Significant at .01 level

Functional Performance Measures

- There appears to be a relationship between verbal IQ and performance on visual test measures
- Should these tests become a standard part of an AAC assessment battery
 - NO - Test scores of visual performance, in and of themselves, did not yield useful information
- Abilities/limitations in visual sequencing abilities appear to be related to aided MLU?
 - Entry ages levels may be a key to establishing syntactic expectations
 - Word Order - Age 4
 - Spatial Memory - Age 4-5;
 - Memory for Objects - Age 5-11

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