

## **Assessment and Intervention of Children's Narratives**

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## **Why are narratives important?**

- Cognitive benefits
  - Mode of thought, LTM
- Social benefits -
  - Social discourse (oral and written)
- Academic benefits
  - Classroom discourse
  - Related to reading comprehension
  - Ability to understand and learn from instruction in language arts, social studies, history, science, and mathematics

## **What is Narration?**

- Type of discourse involving orderly accounts of real or imagined events
- Coherent sequences of utterances with a common theme
  - Characters, actions, complications, resolutions
  - Actions occur in temporal order
  - Causal relationships between characters and actions
  - Character's responses, reactions, feelings, thoughts

## **Non-mainstream Children**

- Narratives hold promise as a descriptive, and potentially diagnostic, tool for examining language development in non-mainstream pre-school children.
  - Narratives are short but informative due to the fact that they reflect the child's ability to integrate various linguistic skills (Hughes, et al, 1997).
  - Similar patterns of narrative schema development have been demonstrated across language and cultural groups (Berman & Slobin, 1994).

## Types of Narratives

(Heath, 1986)

- Scripts - general descriptions of what usually happens in an event.
  - E.g., eating at a fast food restaurant
- Eventcasts - narrating play
- Personal narratives - verbalizations about past experiences (prompted/unprompted).
- Stories - sequence of events that have intentionally produced fictional elements.

## Episode structure

Some robbers entered the Chicago Bank & Trust.

They demanded money and started shooting their guns in the air (Initiating Event). Wonder Woman happened to be driving by when she heard shots coming from the bank. She knew the people inside needed her help (Internal Response). She decided to change into her Wonder Woman suit and get over there (Plan). She climbed up the back wall of the bank and went into an upstairs window (Attempt). Once she got into the bank, the robbers started shooting at her.

## Macrostructure: Episode Structure

- Initiating Event
- Attempt
- Consequence
- Internal Response
- Plan
- Reaction/Ending

She used her magic arm bracelets to knock away the robbers' bullets (At). Then she used her magic lasso to round them up until the police came (At). The police came and took the robbers to jail (Consequence). The bank employees were grateful to Wonder Woman for saving their lives (Response). Once again, Wonder Woman saved the day and showed that crime does not pay (Moral/Ending).

### Analysis of Rocket Boy

- Rocket Boy lived in the year 2550 on the planet Zigvol. As he was flying to school one day, his rocket pack started to sputter. Rocket Boy was scared because he didn't want to be late for school. He thought, I'd better check the pluger hose. He reached back and found the problem - a hole in the pluger hose. Rocket Boy took some gum out of his mouth and covered the hole in the hose. His rocket pack roared to life. Luckily, he made it to school just before the bell rang. Rocket Boy was relieved. He thought, "That's why my parents always say to check the hoses on my rocket pack every day." From that day on, he checked his pack carefully before he went anywhere.

### Microstructure: Cohesion

- Narratives are orderly sequences of utterances
- How each proposition or subsection relates to the text as a whole.
- Conjunctive cohesion - forms such as and, then, but and adverbials such as next, later, therefore
- Reference cohesion - pronouns, demonstratives

### Episode Complexity

- Descriptive Sequence - setting
- Action Sequence - chronology of actions
- Reactive sequence - causal sequence
- Incomplete Episode - IE, A, or C missing
- Complete Episode - IE, A, C + IR or Plan
- Complex Episode - multiple P, IE, or A with a complication
- Embedded Episode - multiple episodes
  - (often C of 1 is the IE of 2)

### Microstructure: Sentence Complexity

- Coordination
  - And, but, or, so
- Subordination (adverbial clauses)
  - Before she ate the porridge, Goldilocks made sure nobody was home.
  - If you want to catch the rabbit, you have to sneak up behind him.

- Infinitives
  - I stopped to look at the giant elephant
  - I want you to go back there and see that elephant.
- Clausal Complements
  - I knew you couldn't stay angry with him for long.
- Relative Clauses
  - Subjective - The boy who told on you got in trouble at recess.
  - Objective - I saw the boy who told on you.

### **Cultural Similarities**

- Structural organization
  - Setting, goal, complications, resolution
- Referential elements
  - Characters, events, temporal & causal relationships
- Evaluative elements
  - Purpose, feelings, values, opinions

### **Literate Language**

- Sentence conjoining and embedding
- Elaborated Noun Phrases
  - The beautiful and talented princess was.....
- Mental and linguistic verbs
- Adverbs, adverbial phrases, adverbial clauses

### **Cultural Differences**

- Narrative volume
- Contexts for social use
- Moral code
- Concern with authority
- Autonomy and self-determination
- Aggression
- Emotional expressiveness

### English Language Learners

- Syntactic and episodic analysis appear to be more reliable indicators of language development in narratives produced by Latino children from low SES and bilingual environments.
  - Syntactic analysis should be consistent with dialectal characteristics of Spanish influenced English
- Further research is needed to characterize normal syntactic development and the application of narrative analysis in diagnosing language impairment in Latino children low SES and bilingual communities.

### Children with Language Impairments

- Macrostructure Level
  - Greater variability
  - Incomplete references to characters and story contexts (Garnet, 1986)
  - Fewer story grammar propositions related to character plans, actions, complications, and reactions (Dollaghan & Campbell, 1992; Gillam & Johnston, 1992; Klecan-Aker & Keltly, 1990; Paul et al., 1996)
  - Lower holistic scores (McFadden & Gillam, 1996)

### Children with Language Impairments

- Narrative Comprehension
  - Difficulty remembering the critical elements in stories and understanding the gist of stories (Bishop, 1997; Bishop & Adams, 1992; Raining Bird & Chapman, 1994)
  - Difficulty drawing inferences (Bishop, 1997; Crais & Chapman, 1987; Ellis Weismer, 1985; Wright & Newhoff, 2001; Yoshinaga-Itano & Downey, 1996)

### Children with Language Impairments

- Microstructure Level
  - Restricted vocabulary (Garnet, 1986; Greenhalgh & Strong, 2001)
  - Fewer complex sentences (Dollaghan & Campbell, 1992; Gillam & Johnston, 1992; Riley et al., 2004)
  - More grammatical errors (Gillam & Johnston, 1992; Liles, Duffy, Merritt, & Purcell, 1995; Scott & Windsor, 2000; Riley et al., 2004)
  - Fewer or problematic cohesive ties (Boudreau & Chapman, 2000; Paul et al., 1996; Strong & Shaver, 1991)

### **WHO model**

- World Health Organization International Classification of Functioning and Disability.
- [www.who.int/classification/icf](http://www.who.int/classification/icf).
- Framework for SLP scope of practice documents
- 3 constructs: 1- Body Structure and Function, 2- Activity/Participation, and 3- Contextual Factors.

### **Assessing Narrative Abilities**

- Narrative samples and analyses
- Test of Narrative Language (Gillam & Pearson, 2004)
- Dynamic Assessment of Narratives (Miller, Gillam, & Peña, 2001).

### **Why assess narration?**

Language is a dynamic system that is embedded in and influenced by the biological, social, cultural, cognitive, and affective domains and contexts we face daily (ASHA Committee on Language, 1983).

Language involves the ability to integrate knowledge of phonology, morphology, syntax, semantics, and pragmatics to create sentences and texts.

### **Narrative Samples**

- Eliciting narratives that differentiate between children with and without LI
  - TNL Stories
  - Personal Narratives in Conversation - Hadley, 1999)
  - Story Creation
    - Wordless Picture Books
    - Picture sequences
    - Single Pictures

### Transcribe the story into C-units

Listen for pauses and sentence ending intonation (rising pitch on questions or falling pitch on statements) as clues for utterance boundaries.

Segment into utterances that contain an independent clause plus its modifiers.

### A C-unit can contain any number of dependent clauses.

- subordinating conjunction - My dog jumped on her because she wanted to.
- adverbial clause - My dog jumped on her right after she came in.
- clausal complement - She thought, I don't even like dogs.
- relative clause - The dog that my brother found jumped up on my friend.
- infinitives - My dog likes to jump up on people.

### Coordinating Conjunctions

- If a subject is stated or restated after the coordinating conjunction segment the utterance just before the conjunction
  - John was yelling. And Susan was laughing at him.
- If no subject is stated after the coordinating conjunction, do not segment the utterances until the next main clause appears
  - Susan was laughing and crying at the same time . John couldn't understand that.

### Try segmenting this story into C-units

When Jennifer was 8 years old her mom helped her build a ship for a school project when Jennifer was taking it to school she dropped it in a mud puddle her ship was broken and dirty Jennifer was very sad and she started crying then she said to herself crying won't help I'm going to fix my ship at school when she got to her classroom she cleaned off the mud and taped the boat back together when her teacher came over she was surprised to see a dirty half-broken ship that was held together with tape Jennifer explained what had happened Jennifer's teacher said you deserve an A for trying your best to solve a problem that made Jennifer very happy.

### Areas of Analysis

- Setting
- Character Information
- Temporal Order of Events
- Causal Relationships
- Grammatical Complexity
- Cohesion
- Dialogue
- Creativity
- Episode complexity

### Story Components

- Setting: Time and Place
  - 2 (Time and Place); 1 (Time or Place); 0 (none)
- Character Information
  - 2 (Name/information); 1 (The Dog, The Cat); 0 (pronouns only)
- Temporal Order of Events
  - 2 (2 or more temporal adverbs); 1 (1 temporal adverb); 0 (no adverbs)
- Causal Relationships
  - 2 (2 or more causal adverbs); 1 (1 causal adverb); 0 (no causal adverbs)

### Narrative Analysis

- Story Components
- Story Ideas & Language
  - Revision - 3 point scale
    - 2 - Above average (upper quartile)
    - 1 - Acceptable (middle 2 quartiles)
    - 0 - Poor (bottom 25%)
- Episode Structure
- Productivity (length)

### Story Ideas and Language

- Complexity of Ideas
- Grammatical Complexity
  - 2 (two or more subordinated clauses); 1 (1 subordinated clause); 0 (no subordinated clauses)
- Knowledge of Dialogue
  - 2 (dialogue for 2 characters); 1 (dialogue for 1 character); 0 (no dialogue)
- Creativity (humor, suspense, surprise)
  - 2 (unusually creative); 1 (somewhat creative); 0 (uncreative)

### **Episode Complexity**

- Descriptive Sequence - setting
- Action Sequence - chronology of actions
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- Incomplete Episode - IE, A, or C missing
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### **Test of Narrative Language**

- 2 dimensional model
- Formats:
  - No picture cues/script-like stories
  - Sequence pictures/personal narratives
  - Single picture of a scene/fictional narratives
- Modality:
  - Comprehension (literal and inferential questions)
  - Oral Narration
- Learning process - opportunity to benefit from models

### **Discriminating Measures**

- Type Story Grammar Propositions
- Number of SG Propositions
- Total Number of Words or Utterances
- Grammatical Complexity
- Number of Different Words
- Holistic scoring
- Grammatical Acceptability

### **Test of Narrative Language**

- No Picture Cues - McDonalds Story
  - Examiner tells a script-like story with an unsolved problem at the end (their order arrives but their mother discovers she left her purse on the kitchen counter at home)
  - Solve problem and then respond to literal and inferential questions
  - Child retells the story.

### **Test of Narrative Language**

- **Sequenced Pictures**
  - Examiner reads a story while child looks at a sequence of 5 pictures
  - Child answers literal and inferential questions about the story
  - Child sees a new series of pictures about a boy who is late for school.
  - Child creates a story to go with the pictures.

### **Sensitivity and Specificity**

- Sensitivity =  $a/(a+b) = .92$
- Specificity =  $d/(d+c) = .87$
- Positive Predictive Value =  $a/(a+c) = .88$

### **Test of Narrative Language**

- **Single Picture Format**
  - Clinician tells a story that corresponds with a fantasy picture about a dinosaur in a cave.
  - Child answers literal and inferential questions about the story.
  - Child creates a story that corresponds to a picture of an alien family landing in the park. Notice the similarities between the Dragon picture and the Aliens picture.

### **Implications for Intervention**

- ⌘ Select targets in which child showed some awareness, but below expectations
- ⌘ Select goals in developmental order
- ⌘ Select goals that will help child in classroom setting

## Language Intervention

### Evidence levels and grades of recommendations

<i>Level</i>	<i>Source of Evidence</i>
Ia	Meta-analysis
Ib	Randomized Clinical Trial
IIa	Controlled study without randomization
IIb	Quasi-experimental study
III	Non-experimental study (correlational and case studies)
IV	Expert opinion, clinical experience

### Evidence-Based Practice

- The conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients.
- The practice of EBM means integrating individual clinical expertise with the best available external clinical evidence from systematic research
- Emphasis on valid, reliable evidence rather than intuition, anecdote, and authority

### Functional Approach

- Literacy-based approach - intervention is structured around children's literature
- Skills embedded within activities requiring the orchestration of many component elements
- Minilessons to focus the child's attention on specific targets

### Therapeutic

- Purposeful
- Repetition and Variation
- Contingent facilitation - Prompts, Cues, Vertical Structures, Growth-Relevant Recasts
- Guided Transfer/ Scaffolding - Model, Practice with guidance, Perform with less guidance
- Metacognitive Awareness of Learning
- Hand over - Cede responsibility to foster independence

### Microstructure Targets

- Morphosyntax
  - Level 1 - Copula be, Aux be
  - Level 2 - Aux inversion (Yes/No questions), Past Tense Modals (should, could, would, might)
  - Level 3 - Wh questions (when, which, why how), Past tense modal inversions (Could I go now?)

### Macrostructure Targets

- Story Propositions
  - Level 1 - Setting, Abbreviated Episode
  - Level 2 - Basic episode, add elements
    - Reaction, plan, internal response
  - Level 3 - Multiple Episodes, Complex episodes

### ■ Clause Structure

- Level 1 - Coordinating with and, Simple infinitive complements (He likes to.....)
- Level 2 - Coordinating with but, or, so, Subordinating conjunctions (because, if, when)
- Level 3 - Complements (I thought.....) Relative clauses

- **Semantics/Lexicon**

- Level 1 - 5 new words per book
  - Graphic organizers
  - Categorization tasks
- Level 2 - 8 new words per book
  - Synonyms/antonyms
  - Classification tasks
  - Association tasks
- Level 3 - 12 new words per book
  - Definitions
  - Functional use

### **Language Intervention Principles**

- **Promote attention**
  - Clinicians can mediate preparatory attention in older clients by communicating their intentions.
  - Clinicians can mediate selective attention by making the intervention targets as salient as possible and by limiting distractions.

- **Phonological Awareness**

- - Level 1 - Rhyming, Sound matching
  - Level 2 - Initial/ Final sound ID, Blending/Segmenting words
  - Level 3 - Blending/Segmenting nonwords, Word Creation (word trees)

- **Plan activities around topics or concepts that are familiar to the learner.**

- Greater prior knowledge leads to more elaborate encoding, increased storage, and a greater variety of retrieval cues.

- **Promote metacognition**

Children should think about their learning processes and talk about what they are learning and how they are learning it.

- **Help learners organize new knowledge**

- Learners can remember much more information when they have organized their knowledge into meaningful chunks.
- Graphic organizers
  - Hyerle's Thinking Maps (Hyerle, 2000)

### **Contingent Responses**

- Demonstrations - repeated but variable use of a sentential or textual pattern.
- Growth-relevant recasts - replies to utterances that a child has just produced that contain semantic and syntactic structures that are more complex than the child's.

- **Provide learners with retention cues**

- Clinicians need to build bridges between intervention targets and learners' knowledge and expectations.
- As suggested by Hudson and Gillam (1998) clinician questions, summaries, drawings and pictures can be internalized by learners as recall cues

### **Recasts**

Expansions - contingent verbal responses that increase the length or complexity of the child's utterance.

- Child: "That board picture was from Jason."
- Adult: "Yea, Jason drew that picture on the board."

### **Expatiations**

- Contingent verbal responses that add new but relevant information to the child's utterance.
  - Child: "Then it fell all over that."
  - Adult: "Yea, the kangaroo fell into the bear's swimming pool."

### **Prompts/Questions**

- Comments and questions that serve to extend what the student has said or written.
  - Child: "He was scared of that monster."
  - Adult: "What did he think the monster would do to him?"

### **Vertical Structuring**

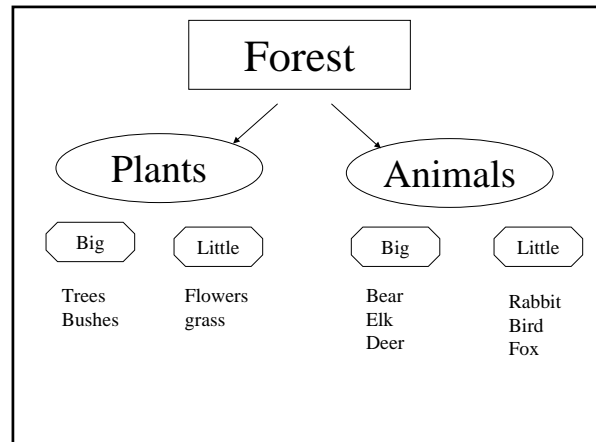
- Clinician asks questions to fill in the pieces of an utterance, then produces the entire utterance for the child.
  - Child: "That moose holding up a hammer."
  - Adult: "What would happen if he dropped it now?"
  - Child: "It would hit his toe."
  - Adult: "If the moose dropped the hammer, it would hit his toe."

### **General Outline**

- Prestory Presentation
  - Graphic Organizers
  - Pre-story discussion
- Picture Walk
- Read Story
- Post Story Presentation
  - Discussion Questions
  - Visual Organizer

### General Outline cont.

- Vocabulary Instruction
- Retelling through Pictography
- Create Retold Books
- Minilessons
  - Practice (writing and telling)
  - Sentence patterns
  - Story patterns



### Mushroom in the Rain

- Activation
  - Knowledge
    - Have you ever eaten a mushroom?
    - How big are they?
    - What makes mushrooms grow?
    - Are there any animals you can think of that could fit under a mushroom?

- Picture Walk
- Read the Story
- Book Discussion
  - Who was in the book?
  - What do we know about the characters?
  - Where did the story take place?
  - When did the story happen?
  - What was the problem in the story?
  - How was the problem solved?
  - Why did the author write this story?
  - Can you think of any other stories like this one?

### **Vocabulary Instruction**

- Keyword/Mnemonic strategies
  - Associated words - synonyms
  - Imagery
- Cognitive Strategy Instruction
  - Semantic Feature Analysis
  - Relationship charts
- Direct Instruction
  - Give and practice meanings - flash cards

### **New Word Book**

- Add 5 - 9 new words from the story
  - Mushroom, crawled, crowded, drenched, huddled, dripping, flicked, merry
- Discuss definitions
- Graphic organizer - related words
- Create 3 x 5 picture/word cards for sentence creation, phonological awareness, and rapid naming activities

### **Vocabulary Use**

- Depth of knowledge
  - Synonyms
  - Sentence contexts
  - Related words
- Practice
  - Retelling stories
  - Writing
  - Using target vocabulary in other activities

### **Pictographic Planning**

- Retelling
  - Rapid drawing
    - Point is to use as a reminder
  - Use of arrows
  - Refer back to the book
  - Limit the number of pictures - 7

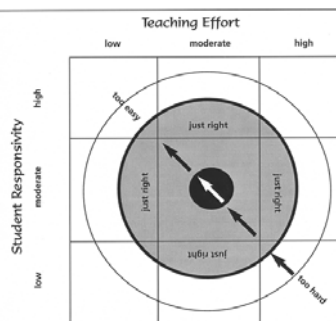
### Discuss Minilessons

- Story Propositions
- Character Development
- Setting/Context
- Dialogue
- Causal Relationships
- Temporal Relationships
- Elaboration

### Tracking Progress

- Teaching Effort
  - Low - directions and concepts are stated only once or twice; only 1 or 2 examples are needed
  - Moderate - short simple utterances; multiple directions; multiple examples
  - High - very short utterances; directions and concepts restated frequently; multiple examples with multi-modality support

### Tracking Student Progress



### Tracking Progress

- Student Responsiveness
  - Low - reluctant to speak; few new ideas; responses are close approximations to examples continual support needed throughout activity
  - Moderate - generates some new ideas; performance reflects an understanding of the activity and concepts; attentive; some transfer
  - High - generates many new ideas; high degree of retention; generalization to unmodeled utterances

### Tracking Progress

Activity	Teaching Effort			Student Responsiveness		
	Low	Med	High	Low	Med	High
Questions	X					X
New Words		X			X	
Syntax: coordinat			X	X		

### Primary Research Question

In comparison to an Academic Enrichment group, which intervention strategy (Computer Assisted Language Intervention, Fast ForWord-Language, or Individual Language Intervention) results in the greatest gains on the composite language score of the Comprehensive Assessment of Spoken Language immediately after intervention and at 3- and 6-months follow-up?

### Comparison of Language Intervention Programs

- 4 year national clinical trial sponsored by the National Institute on Deafness and Other Communication Disorders
- Ron Gillam, Diane Loeb, Sandy Friel-Patti, LaVae Hoffman, Jayne Brandel, Craig Champlin, Linda Thibodeau, Judy Widen, Tom Bohman, William Clarke

### Primary Hypothesis

- If the temporal auditory processing deficit hypothesis of language impairment is correct, children randomly assigned to the FFW-L arm should present greater improvement on the outcome measures than the children in the AE, CALI, and ILI groups.

### Eligibility Criteria

TOLD-P:3	81 or below on 2 clusters
K-BIT	75 - 125
Hearing Screening	20 dBHL at 1, 2, 4K Hz (both ears)
Oral Mechanism	Pass Structure and Function
Parent Questionnaire	English primary language No exclusion items checked
School Records Review	No evidence of exclusion items

### SES

3.2%	Both parents graduated from college
33.8%	One parent graduated from college
44%	One parent attended college
16.7%	One parent graduated from high school
2.3%	Neither parent graduated from high school

### ■ Participants

- 216 children
  - 6 year olds - 58
  - 7 year olds - 78      **M = 7;6**
  - 8 year olds - 80      **SD = .9**
- 135 males
- 81 females
- 1.66 : 1 ratio

### Race and Ethnicity

White (not Hispanic)	84	38.8%
Black/African-American	64	29.6%
White (Hispanic/Latino)	36	16.7%
American Indian	4	2.0%
Asian	1	0.4%
More than 1 Race	10	4.6%
Not Reported	17	7.8%

### **Assessment Phase**

- Data Collection
  - Pretest (June)
  - Immediate Posttest (mid July)
  - 3 month follow-up (October)
  - 6 month follow-up (January)

#### **Blinding**

- Assessors
- Parents
  - On questionnaires, parents guessed their children's treatment assignments at chance levels.

### **Academic Enrichment**

- Computer programs focusing on math, geography and science
  - Magic School Bus: Whales/Flight
  - My Amazing Explorer
  - Dinosaur 3-D
  - Arthur's 1st grade/2nd grade
  - Coin Critters
  - Zurks Rainforest

### **Intervention Phase**

- 4 Arms
  - Academic Enrichment (AE)
  - Fast ForWord-Language (FFW-L)
  - Computer Assisted Language Intervention (CALI)
  - Individual Language Intervention (ILI)

### **Fast ForWord-Language**

- Speech and nonspeech stimuli are modified by an algorithm that prolongs segments and differentially amplifies particular frequencies (Nagarian et al., 1998).
- Acoustic modifications are gradually decreased as children improve on each task.
- Children receive trial-by-trial feedback for correct and incorrect responses.

### Fast ForWord-Language

- |   |   |
|---|---|
| <b>Circus Sequence</b><br>discrimination of tones                               | <b>Phonic Words</b><br>discriminating<br>between minimal pair<br>words  |
| <b>Old McDonald's Flying Farm</b><br>detection of individual<br>phoneme changes | <b>Block Commander</b><br>recalling commands  |
| <b>Phoneme Identification</b><br>matching phonemes to a<br>target               | <b>Language<br/>Comprehension<br/>Builder</b><br>comprehending<br>grammatical<br>morphemes and<br>complex sentences |
| <b>Phonic Match</b><br>Identifying matched syllable<br>pairs                    |   |

### Randomization

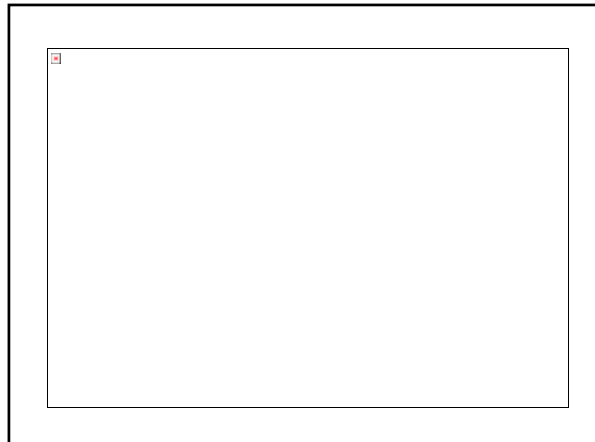
- Stratified by Center and SES
- Assignments opened by research coordinators after pretesting

### Fidelity

- Videotaped each arm daily
- Randomly selected 1 per arm at each center each week
- Viewed at another center
- Checked key points
- Notified of any potential variation from planned intervention

### Computer Assisted Language Intervention

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>■ Earobics<ul style="list-style-type: none"><li>■ Paint by Penguin</li><li>■ Hippo Hoops</li><li>■ Duck Luck</li><li>■ CC Coal Car</li></ul></li><li>■ Laureate<ul style="list-style-type: none"><li>■ Microlads (1-7)</li><li>■ Following Directions</li></ul></li></ul> | <p>None of these programs contained modified speech input.</p> |
|---|--|



## Hypothesis Testing

Mixed model ANCOVA - CASL composite score as the dependent variable and CASL pretest score as the covariate.

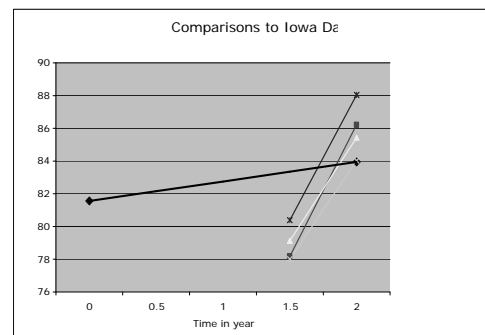
- CASL pretest was related to posttest and follow-up outcomes ( $p < .001$ ).
- Treatment main effect - not significant
- Time main effect was significant ( $p < .001$ )
- Time x Treatment interaction - not significant

## Iowa - CLIP comparisons

	Pre	6-month	2 year	Cohen's d
Iowa	81.56		83.95	.17
AE	78.18	86.23		.72
CALI	79.13	85.44		.64
FFW	78.00	84.03		.52
ILI	80.39	88.04		.73

## Iowa Epidemiological Study

- EpiSLI identification criteria
- 156 children received school SLP services
- CELF-3
  - Kindergarten - 81.556
  - 2nd grade - 83.954
- Posttest age
  - Iowa study - M = 8.01; SD = .37
  - CLIP study - M = 8.10; SD = .93



### Implications

- The children in all 4 arms of the study demonstrated meaningful change on the CASL.
- The children in one arm of the study did not benefit from their experiences to a greater extent than the children in any of the other arms

### Implications

- Children's auditory temporal processing skills improved whether the treatment they received contained modified speech or not.
- Individual instruction that involves intensive daily experiences in listening and responding to language input has a positive effect on the ability to perform a backward masking task, whether that intervention is delivered by a human agent or by a computer software program.

### Secondary Analyses

- Same statistical model - Backward masking as the dependent variable
- Pretest performance was related to posttest and follow-up outcomes ( $p < .001$ ).
  - Treatment main effect - not significant
  - Time main effect was significant ( $p < .001$ )
  - Time x Treatment interaction - not significant

### Social Validation

Parent ratings of syntax and pragmatics on the Children's Communication Checklist.

- Time main effect for syntax and pragmatics
- Treatment main effect - not significant
- Time x Treatment interaction - not significant

## Hypothesis Testing

- Intensity
  - Intensive treatment that combines individual instruction (computer or human) with opportunities for socialization with same-ability peers was more effective than the traditional service delivery model in schools
- Acoustic Modification -
  - Treatment with acoustically modified speech (FFW) did not yield superior outcomes to treatments that did not include modified speech.

## Hypothesis Generation

- Do ability level (CASL pretest) and family circumstance (SES) interact with time and treatment?
  - Time x Treatment ( $p < .01$ )
  - SES x Treatment x Time ( $p < .01$ )
  - CASL pre x Treatment x Time ( $p < .01$ )
  - SES x CASL pre x Treatment x Time ( $p < .01$ )

## Hypothesis Generation

Possible to evaluate the contribution that additional, uncontrolled factors may have had on the outcomes.

Exploratory statistical tests are useful for generating hypotheses for subsequent investigations.

We wanted to know whether a combination of individual language ability (as measured by the pretest CASL score) and family circumstances (as measured by SES) interacted with the dependent variables

## Post Hoc Analyses

- Time X Treatment interaction estimated at four sets of covariate values for CASL pretest and SES:
  - High CASL pretest – High SES (HH),
  - High CASL pretest – Low SES (HL);
  - Low CASL pretest - High SES (LH);
  - Low CASL pretest - Low SES (LL).
- The high values were +1 standard deviation above the mean for this variable and the low values were -1 standard deviation below the mean.

## **Exploratory Analyses**

- **Interactional perspective**
  - Therapy outcomes are influenced by complex interactions between severity of LI, SES, and type of intervention provider (human vs. computer).

## **Review**

- Assessment Contexts
- Narrative Analysis
- Interpreting Results
- Intervention Principles
- Intervention Sequence
- Intervention Targets
- Measuring Progress

## **Clinical Implications**

- **Service Intensity**
  - Intensive summer program shows promise as an effective service delivery
- **Type of Intervention**
  - Computer or clinician-directed
  - Cognitive-Linguistic components - Problem-solving, intensive listening, and repeated responding
  - Opportunities for social interaction with same-ability peers.