

# Disclosure Statement

- I have the following relevant financial relationship(s) in the products or services described, reviewed, evaluated or compared in this presentation.

  - Shirley Ryan AbilityLab salary
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  - Michigan Speech Language Hearing Association speaker's honorarium
- I have no relevant nonfinancial relationship(s) to disclose.

# **Course Description**

- Review aphasia treatment approaches that focus on oral expression by addressing the underlying impairment syntax, semantics, and phonology
  - □ Theoretical background, procedures, and current evidence supporting such treatments
- Issues affecting practical implementation □ Treatment intensity









#### Language and Related Impairments Domain

- Auditory comprehension (e.g., pointing to pictures named); Reading (e.g., matching a written word to a picture); Speaking (e.g., word finding, sentence formulation), and Writing (e.g., writing the names of objects).
- Communication and Language Environment
   Domain
  - Aspects of external context that might facilitate or impede language, communication or participation of people with aphasia such as: Physical environment (e.g., signage, lighting, written supports); Social environment (e.g., attitudes of people, skills of partners); Political environment (e.g., policies supporting participation)

#### The Participation Domain

□ Life Roles (e.g., mother, teacher); Responsibilities (e.g., managing finances, performing a job); Relationships (e.g., engaging in conversation, making friends); Activities of choice (e.g., leisure and recreation, community participation); and Tasks engaged in by an individual – e.g., writing letters, cashing a check

#### Personal Factors/Identity Domain

□ factors such as age, gender, culture, but expands the ICF domain to include internal factors that vary as a consequence of aphasia such as confidence and personal identity.

#### Living with Aphasia Domain

- dynamic interaction of multiple life domains
   captures elements of quality of life (how satisfied someone is with their life).
- Variables that affect treatment outcome

#### age

- premorbid language
- education
- type/extent of lesion
- medical/neurological/behavioral status
- hearing/visual status
- severity of aphasia
- family involvement
- motivation

AND ...... Amount and type of treatment

#### Principles of Experience-Dependent Neural Plasticity

Table 1. Principles of experience-dependent plasticity.

Principle	Description
1. Use It or Lose It	Failure to drive specific brain functions can lead to functional degradation.
2. Use It and Improve It	Training that drives a specific brain function can lead to an enhancement of that function.
3. Specificity	The nature of the training experience dictates the nature of the plasticity.
4. Repetition Matters	Induction of plasticity requires sufficient repetition.
5. Intensity Matters	Induction of plasticity requires sufficient training intensity.
6. Time Matters	Different forms of plasticity occur at different times during training.
7. Salience Matters	The training experience must be sufficiently salient to induce plasticity.
8. Age Matters	Training-induced plasticity occurs more readily in younger brains.
9. Transference	Plasticity in response to one training experience can enhance the acquisition of similar behaviors.
10. Interference	Plasticity in response to one experience can interfere with the acquisition of other behaviors.
	Kleim & Jones, 2008

## Principles of Experience-Dependent Neural Plasticity

Use it or lose it

□ Failure to use specific brain functions can lead to functional degradation

Use it and improve it

□ Training that uses a specific brain function can lead to an enhancement of that function

Kleim & Jones, 2008.

Principles of Experience-Dependent Neural Plasticity

- Specificity The nature of the training experience dictates the nature of the plasticity
- Repetition matters □ Induction of plasticity requires sufficient repetition
- Intensity matters □ Induction of plasticity requires sufficient training intensity

Kleim & Jones, 2008.

# What is "treatment intensity"?

Medication

- 5 mg X, twice a day, for 7 days Behavioral treatment
  - SLT, twice a week, for 8 weeks

Is "SLT" = 5 mg X ?
 Is 60 minutes SLT = 5 mg of X ?

- But this still does not measure "intensity"
- Warren, Fey, and Yoder (2007) and Baker (2012)

  - Dose form i.e. the typical task or activity within which the teaching episodes are delivered (X)
     Dose i.e. # teaching episodes (unique combination of \*active ingredients") per session, number of therapeutic inputs or client acts per session (e.g. 100 trials) (5mg)

## Dosage

- Warren, Fey, and Yoder (2007) and Baker (2012)
  - Dose form i.e. the typical task or activity within which the teaching episodes are delivered
  - □ Dose , i.e., # teaching episodes (unique combination of "active ingredients") per session
  - □ Dose frequency (e.g. 2x per week)
  - Total intervention duration (e.g. 6 weeks)

# Cumulative Intervention Intensity (CII) dose x dose frequency x total intervention duration



# The top ten: Best practice recommendations for aphasia

- Nina Simmons-Mackie, Linda Worrall, Laura L. Murray, Pam Enderby, Miranda L. Rose, Eun Jin Paek & Anu Klippion on behalf of the Aphasia United Best Practices Working Group and Advisory Committee. Aphasiology, 2017, 31:2, 131-151.
- Levels of Recommendation /Evidence
  - Level A: Body of research evidence can be trusted to guide practice
     Level B: Body of research evidence can be trusted to guide practice in most situations
  - Level C: Body of research evidence provides some support for recommendation
  - Level D: Body of research evidence is weak
  - $\hfill\square$  Good Practice Point: Recommendation is based on expert opinion or consensus

1. All patients with brain damage or progressive brain disease should be screened for communication deficits. (Level C)

 People with suspected communication deficits should be assessed by a qualified professional (determined by country); Assessment should extend beyond the use of screening measures to determine the nature, severity and personal consequences of the suspected communication deficit. (Levels B, C).

 People with aphasia should receive information regarding aphasia, aetiologies of aphasia (e.g., stroke) and options for treatment. (Levels A–C).

This applies throughout all stages of healthcare from acute to chronic stages.

4. No one with aphasia should be discharged from services without some means of communicating his or her needs and wishes (e.g., using AAC, supports, trained partners) or a documented plan for how and when this will be achieved (Level: Good Practice Point).

 People with aphasia should be offered intensive and individualized aphasia therapy designed to have a meaningful impact on communication and life. (Level A-GPP depending on approach, intensity, timing).

This intervention should be designed and delivered under the supervision of a qualified professional.

 Intervention might consist of impairment-oriented therapy, compensatory training, conversation therapy, functional/participation oriented therapy, environmental intervention and/or training in communication supports or augmentative and alternative communication (AAC).

b. Modes of delivery might include individual therapy, group therapy, telerehabilitation and/or computer assisted treatment.

c. Individuals with aphasia due to stable (e.g., stroke) as well as progressive forms of brain damage benefit from intervention.

d. Individuals with aphasia due to stroke and other static forms of brain damage can benefit from intervention in both acute and chronic recovery phases.

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6. Communication partner training should be provided to improve communication of the person with aphasia. (Levels A, B)

7. Families or caregivers of people with aphasia should be included in the rehabilitation process. (Levels A–C)

a. Families and caregivers should receive education and support regarding the causes and consequences of aphasia (Level A).

b. Families and caregivers should learn to communicate with the person with aphasia (Level B).

8. Services for people with aphasia should be culturally appropriate and personally relevant. (Level: Good Practice Point)

9. All health and social care providers working with people with aphasia across the continuum of care (i.e., acute care to end-of-life) should be educated about aphasia and trained to support communication in aphasia. (Level C)

10. Information intended for use by people with aphasia should be available in aphasia-friendly/communicatively accessible formats. (Level C)



# Semantics

- The study of meaning in language
- The meaning of a word, phrase, sentence, or text
- Branches of semantics
  - □ formal semantics the logical aspects of meaning, such as sense, reference, implication, and logical form
  - lexical semantics word meanings and word relations
  - conceptual semantics the cognitive structure of meaning























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Additional discourse measures

- Picture Description
- Personal narrative ("stroke story")
- Re-telling an event
- Providing instruction



















# Treatment Protocol (Kiran & Thompson, 2003) Birds / vegetables – grouped according to typicality Typical; intermediate; atypical E.g. Robin; eagle; penguin E.g. Carrot; mushroom; artichoke Procedures Picture naming Category sorting Feature selection Yes/no questions related to features (include acceptable and unacceptable from same category; and features from different category) Picture naming

Semantic Complexity Hypothesis

# Kiran (2008)

Clothing

□ Typical: jeans, blouse, sweater, skirt, pajamas □ Atypical: tie, earmuffs, tights, belt, bandana

Furniture

□Typical: chair, bed, desk, sofa, bookcase

Atypical: rug, trunk, hammock, drapes, wastebasket



# Concrete and Abstract Words (Kiran et al., 2009)

Hospital		Courthouse		Church	
Abstract	Concrete	Abstract	Concrete	Abstract	Concrete
emergency	doctor	truth	trial	grace	hymn
hygiene	injury	guilt	jury	prayer	wedding
science	disease	justice	prisoner	angel	minister
health	medicine	equality	lawyer	baptism	bible
compassion	ambulance	evidence	prison	belief	candle
quiet	surgery	protection	bench	blessing	chapel
recovery	patient	judgment	government	forgiveness	bell
sterile	blood	freedom	prosecutor	holy	organ
insurance	examination	legal	constitution	penance	steeple

# Semantic Feature Training on Generative Naming

- Category Sorting of Word Cards (10 concrete and 10 abstract from each of 3 categories – church, courthouse, hospital)
- Feature selection (given 45 feature cards, asked to select the first 6 features that applied)
- Yes/no feature questions (5 related to target word; 5 to other words in category; 5 unrelated)
- Word-recall (say the target word)
- Generative naming (cues allowed) at end of session only

Sul (Kira	mmary of ( In et al., 2009)	generaliz	zation patterns
	Category Trained	Typicality Trained	Summary of Generalization Patterns
P1	1. Church 2. Hospital	Abstract Concrete	Abstract ⇒ Concrete * Concrete ⇒ Abstract*
P2	1.Church 2. No Tx	Abstract	Abstract ⇒Concrete
P3	1. Hospital 2. Courthouse	Abstract Concrete	Abstract ⇒Concrete Concrete ≠ Abstract
P4	1. Church 2. Hospital	Concrete Abstract	Concrete
*Crite an	rion not reached for a	acquisition durin	g treatment indicating no learning

# Variants of SFA Tasks

- Boyle (2010)
  - □ Approaches that require the participant to generate features
  - requires a deeper level of semantic processing □ Approaches that require the participant to
  - recognize features

# Variants of SFA

#### SFA in Discourse

- Rider, J. D., Wright, H. H., Marshall, R. C., Page J. L. (2008). Using Semantic Feature Analysis to Improve Contextual Discourse in Adults With Aphasia. American Journal of Speech Language Pathology, 17,161–172.
   Peach, R. K. & Reuter, K. A. (2010). A discourse-based approach to semantic feature analysis for the treatment of aphasic word retrieval failures. Aphasiology, 26, 971– 990.

#### SFA in group therapy

Falconer, C. & Antonucci, S. M. (2012). Use of semantic feature analysis in group discourse treatment for aphasia: Extension and expansion. Aphasiology, 26 (1), 64–82.







ocinantio se	and re sort (p	iotares, words, wor	us + pictures)
apple	banana	canoe paddle	capiscum
cayenne pepper	chile	cricket bat	curry
desk	drum stick	guitar	maize
mango	pencil	shelves	star fruit
stop sign	table	turmeric	warning sign
zucchini			







# Light versus Heavy Verbs

- Light verbs: more typical, less complex
   E.g., go, make, put, have, look, say
- Heavy verbs: less typical, more complex
   E.g., run/jog, bake/broil, pack/place, eat/own, stare/glance, shout/explain/whisper/argue
- "Run" has the semantic features of "go" PLUS "manner".





# Linguistic Treatment

- Verb is core (Loverso et al., 1988)
   Access to verbs is often disrupted
  - Verbs are central to sentence production
  - Training
    - Use simple active sentences
    - Train production of verbs together with specific sentence constituents (usually NP) that are assigned various thematic roles by the verb (e.g. agent, theme)
    - Tasks included generating, copying, writing, and repeating the agent and theme for the presented verb, & answering wh-questions about them.

# Verb Network Strengthening Treatment

(VNeST) (Edmonds et al., 2009)

- Semantic treatment to improve lexical retrieval of content words in sentence context
- Promotes systematic retrieval of verbs and their thematic roles
- The meaning of a verb is dependent on its thematic roles
- Bidirectional priming/co-activation of verbs and their thematic roles so that a verb primes its agents (arresting/policeman), patients (arresting/criminal) and instruments (cutting/scissors) and vice versa.

# VNeST: Procedure

(Edmonds et al., 2009)

- Generation of three agents or patients for verb (using who/what & verb cards; if cannot produce 3 words, then can select cards from choice of target plus 3 foils)
- Generation of corresponding agent or patient to complete agent–patient pairs; reads word pair aloud
- 3. Answer wh-questions about agent-patient pair (when, where, why)
- 4. Semantic judgement of sentences read aloud by clinician
- 5. Generation of three agent–patient pairs (repeat steps 1–2, but without cards)





V-NeST Steps	Objective
Step 1: Generation of Multiple Scenarios around the Trained Verb	Promotes activation and retrieval of individual words that compose scenarios
Step 2: The Participant Reads the Triads Aloud (e.g., chef-chop-onion)	Consolidates scenarios and units through oral reading Reinforces basic canonical subject- verb-object sentence order which may be helpful for those with difficulty in basic sentence construction
Step 3: Wh-Questions about a scenario Participant chooses one scenario that s/he generated in Step 1 and answers 3 Wh-questions about it (where, when, why)	Comprehensively engages semantic, world and/or autobiographical knowledge around the event scenarios Focus on plausibility NOT syntactic correctness

ł	VNeST Steps	Objective
	Step 4: Clinician produces simple active sentences containing target verb, Person decides if it's semantically correct.	Auditory comprehension and semantic decision-making
	Step 5: Ask participant, "What verb/action have you been working on?"	Allows opportunity for independent retrieval of the target verb funable to identify, cue "think about everything we have been talking about" if still unable to identify, provide card with verb to read aloud
	Step 6: Step 1 is repeated but no cues are given	Provide opportunity for participant to retrieve words independently after working through all the steps





# Syntax

- The set of rules, principles, and processes that govern the structure of sentences in a given language.
- The ways in which we order specific words to create logical, meaningful sentences
- The sequence in which words are put together to form sentences. In English, the usual sequence is subject, verb, and object.

# Sentence Production: Syntax Stimulation

HELPPS

Targets 11 sentence types arranged in a hierarchy of difficulty

Level A: Delayed repetition of target response

- Level B: Story completion with a self-retrieved target response
- If incorrect response given verbal model of target to repeat

# Sentence Production Program for Aphasia

- Imperative intransitive
- Imperative transitive Wh interrogative – what and who
- Wh interrogative where and when
- Declarative transitive •
- Declarative intransitive
- Comparative
- Yes/no questions

- Wake up
- Drink your milk
- What are you watching
- Who is coming
- Where is the hospital
- When are you landing
- I teach school
- He swims She's taller
- Is it sad ?

#### Sentence Production: Syntax Stimulation - Evidence

- Helm-Estabrooks et al. 1981
- Doyle et al. 1987 Effects of SS limited to grammatical structures taught
  - Generalization of learned forms to novel stimulus conditions is not an automatic consequence of acquisition
  - Effect of training on adequacy of responses may be limited



# Treatment of Underlying Forms

- Premise: training underlying, abstract properties of language facilitates generalization to untrained structures with similar linguistic properties, especially those of lesser linguistic complexity.
- See Thompson, C. K. in Chapey (2001, 2008). Language Intervention Strategies in Aphasia and Related Neurogenic Communication Disorders. 4<sup>th</sup> and 5<sup>th</sup> editions.
- Training wh-questions
   Who / What
   When (Whete
  - □ When / Where

# Wh-questions

- Argument Movement Structure
  - The soldier is pushing the woman into the street
     WHO is the soldier pushing (t) into the street?
  - The boy is kicking the cow in the barn
  - WHAT is the boy kicking (t) in the barn?
- Adjunct Movement Structure
  - The student is helping the doctor in the evening
     WHEN is the student helping the doctor (t)?
  - $\hfill\square$  The guard is protecting the clerk at the store
    - WHERE is the guard protecting the clerk (t)?

# Treatment of Underlying Forms

Clinician says:

- This is PUSHING. It is the action of the sentence. This is THE SOLDIER. He is the person doing the pushing.
- This is THE WOMAN. She is the person (thing) being pushed.
- This is INTO THE STREET. This is the place (time) the pushing occurred.

# Treatment of Underlying Forms

Then demonstrate movement of the sentence constituents using the cards as follows:

The soldier is pushing WHO into the street?

Is the soldier pushing WHO into the street?

WHQ is the soldier pushing into the street ?

# Treatment of Underlying Forms

- Thematic role training
- Sentence building
- Thematic role training
- Practice
- Trial probe task

# Linguistic Treatment

Semantically reversible sentences difficult because of a deficit in mapping semantics on to syntax

- Mapping Therapy (Schwartz et al., 1994)
   Present sentences in written form
  - Used simple active canonical sentences and more complex
  - noncanonical sentences
  - Patient underlines agent, theme etc in response to questions about the logical subject and logical object
     Which one is doing the V-ing
    - What is he/she V-ing
- Results improved comprehension but limited to types of sentences trained

#### Action verbs in canonical sentences

- Simple subject and object NP
- Adjective in subject NP
- Adjective in object NP
- Complex subject NP
- Complex object NP
- Complex subject and object NP
- Susan drinks the soda The old man is fixing it
- Amy washed the playful child
- Tommy's grandfather built the wall
- Jan called the person in
- charge The girl from the office was helping Mary's daughter

#### Action verbs in noncanonical sentences

- Passive
- Cleft object
- Cleft subject
- Object relative (embedded in object NP)
- Object relative (embedded in subject NP)
- Subject relative (embedded in subject NP)
- Amy was pushed by the neighbor It was the window that John
- cleaned this morning It was Sam that cut Joe
- They saw the play that Tom wrote
- The bus that the girl rode was yellow
- The girl that kissed the picture was sad

# TUF - Training Passive Sentences (NP Movement)

- Show: THE GIRL, TICKLED, THE BOY
- PWA reads aloud/repeats
- Rxist explains:
  - This is TICKLED; it is the action of the sentence
  - □ This is THE GIRL; she is the person doing the tickling
  - This is THE BOY; he is the person being tickled
- PWA identifies verb/action, agent, theme on request
- Rxist demonstrates: Moving and Adding Cards:
  - THE GIRL, THE BOY, TICKLED
     THE GIRL, THE BOY, WAS, TICKLED

  - BY, THE GIRL, THE BOY, WAS, TICKLED THE BOY, WAS, TICKLED, BY, THE GIRL
- PWA reads aloud/repeats; rearranges sentences







Carry-over Activities following TUF

- Photos from newspaper/magazines
- Personal photos
- Conversation/groups

# Other Activities

- Modelling appropriate grammatical structures within other treatment protocols (e.g., V-NeST, ORLA, CIAT)
- Targeting other grammatical structures in the language
  - Tense, plural, prepositions, pronouns, adjectives/adverbs



#### Phonological Components Analysis Treatment

Carol Leonard , Elizabeth Rochon & Laura Laird (2008): Treating naming impairments in aphasia: Findings from a phonological components analysis treatment, Aphasiology, 22:9, 923-947

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Phonological Components Analysis Treatment

- First Sound: "What sound does it start with?"
- Final sound: "What sound does it end with?"
- Number of syllables: "How many beats does the word have?"
- First sound associate: "What other word starts with the same sound?"
- Rhymes: "What does this rhyme with?"







#### **Phonological Treatment : Key words**

Beeson, P., Rising, K., Kim, S., Rapcsak, S.Z. (2010). A treatment sequence for phonological alexia/agraphia. Journal of Speech, Language, and Hearing Research, 2(53), 450–468.

#### Candidates:

Difficulty completing phonological tasks:

Rhyme judgment Rhyme production Sound segmentation Phoneme deletion Sound blending Phoneme replacement

Good letter matching Good semantic knowledge

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Goal – to use phonological information to assist in retrieval of orthography

Approach

- □ Establish key words for each consonant and vowel
  - · Find key words that patient can consistently say, read or write
  - Train spelling for key words
- □ Use cuing hierarchy to train sound-letter/letter-sound correspondences for each targeted phoneme
- Train sound blending and segmentation in the context of regular words and non-words

#### Phonological Treatment: Key Words

Write the letter that makes the sound /p/

What is your key word for /p/

Write your key word for /p/

Underline /p/ in your words

Now write the letter that makes the sound /p/

#### "Write the letter that makes the sound /p/."If correct, proceed to the next sound. If incorrect,

- proceed to Step 2.
   "Think of your key word for /p/. Try to write your key word." If correct, say, "Yes, *pie* is your keyword. *Pie* starts with /p/. Underline the /p/ sound in *pie*." If incorrect, go to Step 3.
- Show picture and say, "Your key word for /p/ is pie. Write pie. Now underline the /p/ sound in pie."If incorrect, go to Step 4.
- Provide written model for key word. "Your key word is *pie*. Copy *pie*. Now underline the /p/ in *pie*."

Complimentary phonological training tasks: key words

- Matching sounds to letters in words
- Identification and segmentation of sounds in the beginning and ends of words

Kendall, D. L. et al. Phoneme-based rehabilitation of anomia in aphasia. Brain and Language 105 (2008) 1–17.

- Goal: Develop phoneme sequence knowledge
- Uses individual phonemes and nonword phoneme sequences
- Reinforces multi-modal representations of phonemes via activities that build reciprocal connections between acoustic, articulatory, orthographic and concept representations.
- All consonants and vowels are trained.
- Phonemes initially presented in isolation; then combined into two phoneme combinations (CV and VC), three phoneme combinations (CVC, VCC, CCV), and eventually, into two- and three-syllable combinations.

#### Trains subjects to form concepts of individual phonemes by

- pairing visual depictions of the oropharyngeal articulatory apparatus (conveyed through drawings of the mouth);
- proprioceptive and visual feedback from their own phoneme production, corresponding to the phonemes;
- verbal descriptions of the distinctive oral-motor features of each phoneme.

#### Stage 1 - Consonant-Vowels in Isolation

Exploration of sounds

- Mouth picture; mirror; repetition; knowledge of results (KR); Socratic questioning; voiced/voiceless cognates
- Motor description with Socratic questioning and cues
- Perception task
  - Match heard sound to array of mouth pictures
- Production tasks
  - Repetition and Elicited by various stimuli
- Graphemes
  - □ Match letter tiles to mouth pictures
  - $\hfill\square$  Use graphemes in perception and production tasks





#### Stage 2 - syllables

- Perception task
  - □ Listen to CV, VC. CVC, CCV, VCC, CCVC, CVCC, CCVCC, CVCV combination; arrange mouth pictures, blocks or graphemes
- Production task
  - Say sound combinations when given mouth pictures or graphemes
  - Systematically change one C/V for series of 5-10 real words and non-words
- Knowledge of results and Socratic questioning used throughout Stage 2

 Then, train phonological and orthographic sequence knowledge by training subjects to recognize, distinguish, and manipulate

□one, two and three syllable nonwords

words composed of these phonemes in the form of heard, read, seen and orally produced phonological sequences.

#### Summary – Phonomotor Treatment

(1) always start with multimodal training of phonemes in isolation;

(2) use nonword stimuli first;

(3) then introduce real word stimuli;

(4) employ phonological awareness tasks with all stimuli;

(5) use Socratic questioning;

(6) deliver treatment intensively (if possible); and, importantly,

(7) do not include picture stimuli, so as to limit engagement of lexical-semantic processes.

Madden et al., 2017

Kendall et al., 2008 Phoneme-based rehabilitation of **anomia** in aphasia. Brain and Language 105,1–17.

- 10 subjects received Rx 2hrs/day, 4 days/week, for 12 weeks (96 hours)
- Improvements in
  - Confrontation naming
  - Phonological production and non-word repetition
- Generalization to discourse production
- Maintenance for 3 months

Kendall DL, Oelke M, Brookshire CE, Nadeau SE. (2015) The Influence of Phonomotor Treatment on Word Retrieval Abilities in 26 Individuals With Chronic Aphasia: An Open Trial. Journal of Speech Lang Hear Res. 58(3):798-812.

- Twenty-six persons with chronic aphasia due to stroke were treated, in a staggered (immediate vs. delayed treatment) open trial design, with 60 hr of intensive, multimodal therapy designed to enhance access to and efficiency of phonemes and phonologic sequences.
- There was an absolute increase of 5% in confrontation naming of "untrained" nouns at 3 months, and there were 9% to 10% increases on measures of generalization of phonologic processes.
- The results of this trial demonstrate generalization of training effects on laboratory measures, which were sustained at 3 months, and provide support for the theories that motivated the treatment.