Treatment for Lexical Retrieval Failures Following Aphasia

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Purpose

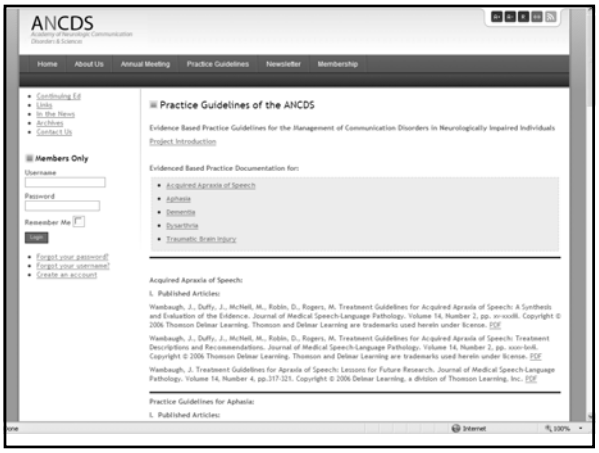
- Identify models of lexical processing that underlie recent approaches to treatment for word finding difficulties following aphasia
- Develop intervention plans for individuals with word finding problems based upon the unique characteristics of their aphasia.
- Describe the evidence associated with the described procedures and make informed decisions regarding their appropriateness

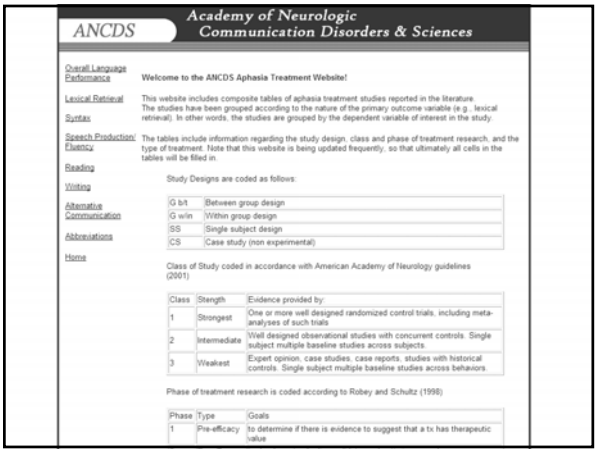
Levels of Evidence

Table 1. Levels of evidence for studies of treatment efficacy, ranked according to quality and credibility from highest/most credible (Ia) to lowest/least credible (IV) (adapted from the Scottish Intercollegiate Guideline Network, www.sign.ac.uk).

Level	Description
Ia	Well-designed meta-analysis of >1 randomized controlled trial
Ib	Well-designed randomized controlled study
IIa	Well-designed controlled study without randomization
IIb	Well-designed quasi-experimental study
III	Well-designed nonexperimental studies, i.e., correlational and case studies
IV	Expert committee report, consensus conference, clinical experience of respected authorities

American Speech-Language-Hearing Association, 2004





Guidelines for Coding Class of Study

(American Academy of Neurology, 2001)

Class	Strength	Evidence provided by:
1	Strongest	One or more well designed randomized control trials, including meta-analyses of such trials
2	Intermediate	Well designed observational studies with concurrent controls. ***Single subject multiple baseline studies across subjects***.
3	Weakest	Expert opinion, case studies, case reports, studies with historical controls. ***Single subject multiple baseline studies across behaviors***.

http://www.u.arizona.edu/~pelagie/ancds/index.html

Treatment Approaches

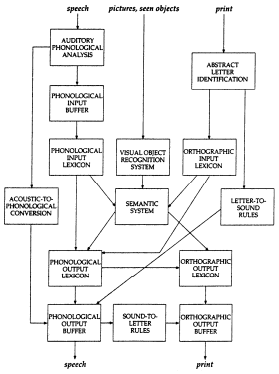
- Impairment-based
  - Stimulation
  - Linguistic
  - Processing/Cognitive
- Based on Activity Limitations or Participation Restrictions
  - Functional (patient-oriented)
  - Social (partner-oriented)

Cognitive Approaches

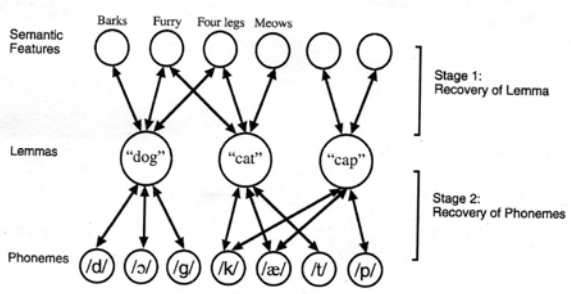
- Make use of cognitive analyses and cognitive neuropsychological models
- Begin with identifying impaired cognitive processes and representations underlying language tasks
- Treatment focuses on remediation of impaired cognitive processes, compensation via the intact cognitive processes, or both

Hillis & Newhart, 2008

Kent, 2000



Kay, Lesser, & Coltheart, 1996



Wilshire & Coslett, 2000

Semantic Treatment

- Lexical-semantic deficits characterized by two-way deficits incorporating production and comprehension
- Model-based treatments requiring patients to distinguish words on their semantic features likely to be effective
- Goal is to demonstrate generalization from treatment to spontaneous speech

Howard et al., 1985; Visch-Brink et al., 1997

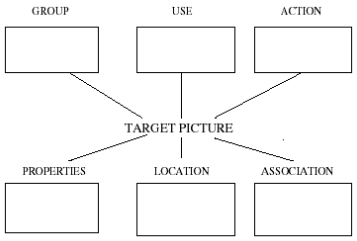
Semantic Treatment

- Matching spoken/written words with pictures
- Semantic judgment (yes/no, either-or questions)
- Matching definition to picture
- Sorting by category
- Identifying semantically-related words
- Matching words by syntagmatic (positioning) or paradigmatic (substitution) relationships
- Matching words with antonyms
- Determining implied meanings of adjectives and exclamations
- Identifying part-whole relationships
- Identifying semantically-anomolous sentences
- Semantic definitions
- Identifying text anomalies, types, and errors

(Howard et al., 1985; Visch-Brink et al., 1997; Drew & Thompson, 1999)

Semantic Treatment: Nouns

Semantic Feature Analysis



Haarbauer-Krupa et al., 1985; Boyle & Coelho, 1995; Boyle, 2004

FIGURE 1. A schematic representation of concept relatedness in a stereotypical fragment of human memory (where a shorter line represents greater relatedness).

"Semantic Feature Analysis Treatment for Anomia in Two Fluent Aphasia Syndromes"

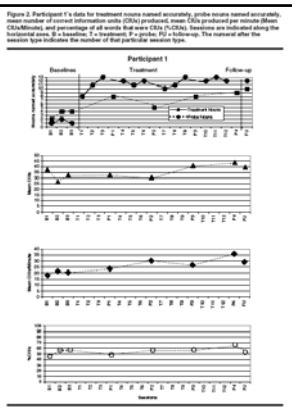
- Level IIb single subject design with replication
- Investigated outcomes of SFA in 2 participants (anomic, Wernicke aphasia) with breakdowns at different levels of lexical processing
- Examined whether greater numbers of exemplars promotes better generalization
- Assessed whether direct assessment of word retrieval difficulty in discourse would provide better estimate of across-context generalization than previous measures (i.e., CIU analysis)

Boyle, 2004

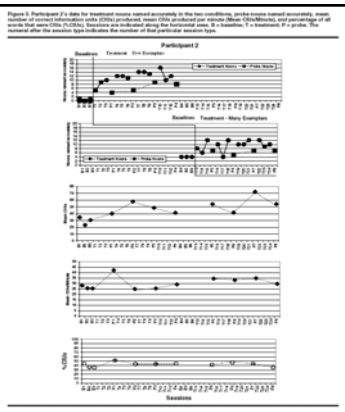
Method

- Stimuli
  - Confrontation naming – sets of treatment and probe items from Snodgrass and Vanderwart line drawings, supplemented for P1
  - Discourse – Nicholas & Brookshire (1993) stimuli for CIU analysis
- Design – Multiple baseline design across behaviors replicated across conditions for P2
- Treatment – SFA with either few (same set of pictures each sesssion) or many (different sets of pictures) exemplars

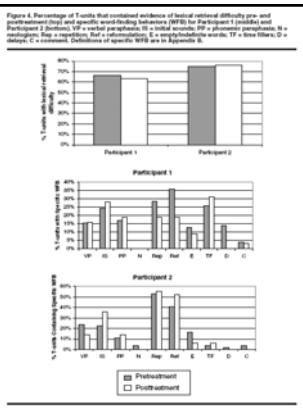
Boyle, 2004



Boyle, 2004



Boyle, 2004



Boyle, 2004

Results

- SFA treatment improved ability of participants to name treated and untreated items
- Using many exemplars does not enhance generalization to untrained items
- Participants demonstrated improvement on some discourse measures
- Evidence of overt word finding difficulty in discourse did not decrease for either participant

Boyle, 2004

Complexity effects: Semantics

- Semantic feature treatment applied to typical or atypical exemplars of category items
- Training on typical examples produced no generalization to intermediate or typical examples but training on atypical examples produced generalization to naming of intermediate and typical examples
- Suggests atypical examples convey more information about category than do typical examples

Kiran & Thompson, 2003

"Intensive semantic intervention in fluent aphasia: A pilot study with fMRI"

- Level IIb single subject design
- Treatment based on assumptions regarding widely distributed neuronal network supporting semantic processing
- 55 y/o RH AA Male 5 mos s/p L parietal-temporal stroke with diagnosis of Wernicke Aphasia
- Treatment - Semantic judgment tasks
  - Questions related to categorical, associative, structural or perceptual aspects
  - Sorting tasks based on subordinate and superordinate categories (no overt verbal response required)

Davis & Harrington, 2006

Results

- Increased auditory comprehension (WAB classification: Wernicke → Conduction aphasia)
- Improved naming (quantitatively and qualitatively); generalized to untrained items
- Improved noun retrieval suggested in narrative sample
- fMRI
  - Verb generation task: Increase in sub-threshold activation on lesion side
  - Text-listening task: Strong R lateralization before treatment strong → L lateralization after treatment

Davis & Harrington, 2006

Discussion

- Intensive decision-based semantic intervention resulted in improvements in naming and auditory comprehension
- Generalization to untrained items supports treatment targeting semantic networks
- fMRI results support behavioral results: Change in activation pattern for story listening task suggests peri-lesional recovery of a portion of Wernicke's area corresponding to increase in auditory comprehension

Davis & Harrington, 2006

Phonological Treatment

- Phonological question tasks
  - rhyming comprehension
  - syllable number verification
  - initial phoneme verification
- Oral word reading
- Word repetition
- Phonological cuing hierarchy (rhyming word, initial phoneme, repetition

Raymer & Gonzales Rothi, 2008

Phonological treatment: Nouns

"Treatment for aphasic phonological output planning deficits"

- Level IIb single subject design
- Participant – 84 yo, RH woman w/single infarct of L posterior insula and parietal lobe operculum
- Symptoms
  - Disproportionate difficulty in oral expression
  - Better oral reading relative to naming and repetition
  - Writing superior to oral production

Peach, 1996

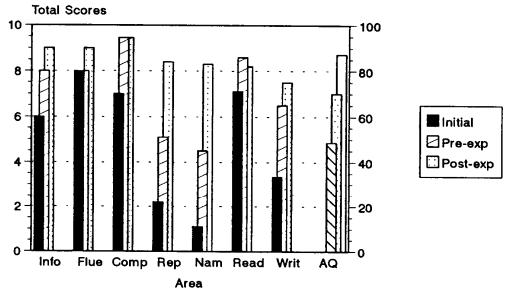


Figure 2. Initial, preexperimental, and postexperimental scores by area for the Western Aphasia Battery (Info = Information Content; Flue = Fluency; Comp = Comprehension; Rep = Repetition; Nam = Naming; Read = Reading; Writ = Writing; AQ = Aphasia Quotient).

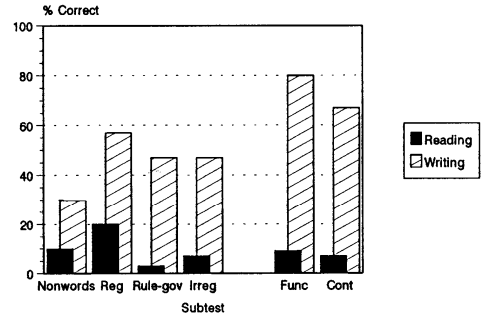


Figure 3. Preexperimental scores for selected reading and writing subtests of the Battery of Adult Reading Function (Reg = Regular words; Rule gov= Rule governed words; Irreg = Irregular words; Func = Functor words; Cont = Content words).

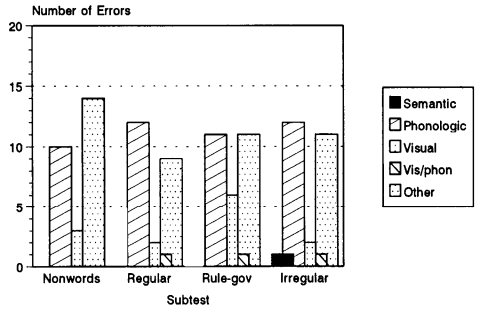


Figure 5. Preexperimental distribution of error types by reading subtest of the Battery of Adult Reading Function.

Treatment

- Oral reading of bisyllabic words
- Patient writes items produced in error to increase phonological salience of target words through orthographic-phonologic conversion
- All phonemes produced in error paired with phoneme in key word (another word with target phoneme in initial position that is read with high success)
- Word repetition

Peach, 1996

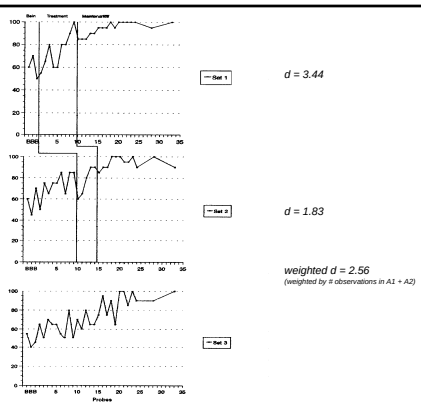


Figure 6. Percentage of correct oral reading of training and generalization items across all phases of the study.

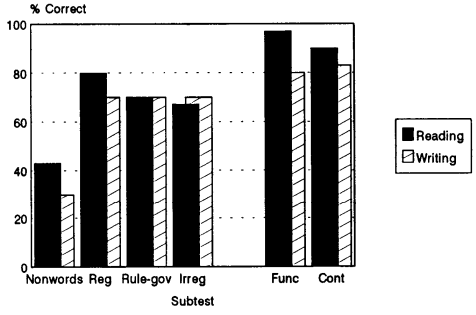
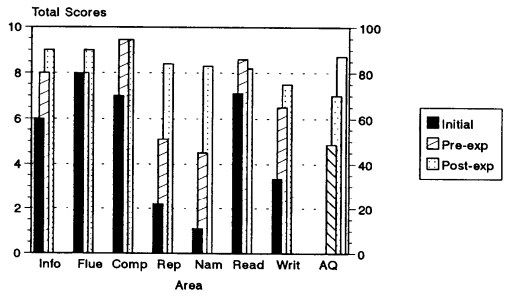


Figure 7. Postexperimental scores for selected reading and writing subtests of the Battery of Adult Reading Function (Reg = Regular words; Rule gov = Rule governed words; Irreg = Irregular words; Func = Functor words; Cont = Content words).



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"Phonological Therapy for Word Finding Difficulties: A Re-evaluation"

- Level IIb single case series
- Investigate "choice" as variable underlying improved outcomes following semantic vs. phonologic approaches
- Test effectiveness of two phonologic cuing techniques (word initial CV spoken, written letter cue)
- Identify relationship b/w responsiveness to cues in facilitation and treatment
- Assess generalization for phonologic treatment

Hickin, Best, Herbert, Howard, & Osborne, 2002

Method

- Eight participants with varying aphasias
- Materials
  - 200 pictures divided into 2 sets based on baseline naming accuracy, randomly assigned as treatment and control sets
  - Treatment set divided into two sets, 50 for phonologic cues, 50 for orthographic cues
  - 20 additional personal items identified
- Schedule
  - Once per week for 8 weeks
  - All treated items seen once each session

Hickin et al., 2002

Cuing conditions

- Facilitation (one cue per picture)
  - Three conditions: Control - Extra time (5 sec.); Single cue; Choice (target & distractor)
  - Four cue types in each condition: CV spoken, CV written, rime, repetition
- Treatment (phonological & orthographic)
  - Three cues: first phoneme + schwa; if unsuccessful, then syllable; if still unsuccessful, then whole word; distractor provided after each cue; whole word modeled and repeated if necessary
  - Number of distractors increased gradually across sessions, i.e., one, two, or three distractors
  - Order of cues and stimulus type varied

Hickin et al., 2002

Results

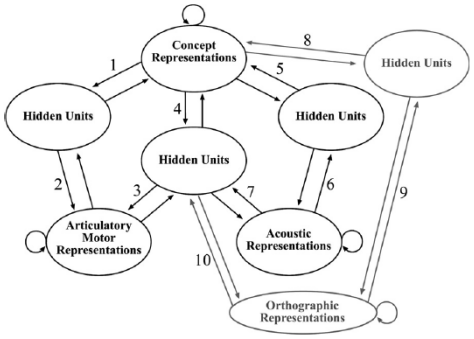
- Overall improvement in 7/8, statistically significant for treated vs. untreated items in 5/7
- Generalization to untreated items in 1/7
- Significant correlation between effects of facilitation and treatment outcome

Hickin et al., 2002

"Phoneme-Based Rehabilitation of Anomia in Aphasia"

- Because all domains of a connectionist network of phonological function are heavily interconnected, assumed that input to any domain within network will engage all domains instantly
- If so, successful phonological treatment should generate patterns of neural activity in corresponding domains (conceptual, articulatory, acoustic, orthographic) when a phoneme is inserted into any domain of the network

Kendall et al., 2008



Connectionist Model of Phonological Processing

Kendall et al., 2008

"Phoneme-Based Rehabilitation of Anomia in Aphasia"

- Tested hypothesis that word retrieval may be improved by training phoneme sequences
- May establish phoneme sequence knowledge and phonological awareness that can be engaged by concept representations for words containing those sequences
- Goal of treatment is to enable naming via the indirect concepts-articulatory motor pathway (pathway 4-3)

Kendall et al., 2008

Method

- Ten participants with aphasia due to single LH stroke and > 6 months post onset
- AOS excluded
- Evidence for impaired phonological function as demonstrated on *Comprehensive Test of Phonologic Processing* and *Lindamood Auditory Conceptualization*
- 96 total hours of treatment (2h/day, 4days/week x 12 weeks)

Kendall et al., 2008

Treatment

- Modified *Lindamood Phonological Sequencing Program*
- Seeks to instantiate multi-modal representations of phonemes via activities that build connections between acoustic, articulatory, orthographic, and concept representations
  - Trains development of concepts for individual phonemes
  - Trains phonological/orthographic sequence knowledge for 1-3 syllable nonwords

Kendall et al., 2008

Results

- For *Object and Action Naming Test*, ES=1.63 (SD=1.77), graphs visually judged to show generalization for 8/10 participants
- For Phonologic Production, ES=6.83 (SD=3.58), visual evidence for treatment effect for 10/10 participants
- For Discourse Production:
  - Word Count: ES=1.49 (SD=1.46), visual evidence for generalization in 4/6
  - CIU: ES=1.64 (SD=1.57), visual evidence for generalizatin in 4/6

Kendall et al., 2008

Results

Task	ES (SD) Post 1 Wk *ES (SD) Post 3 Mo*	Visual Evidence of Generalization
Object and Action Naming Test	1.63 (1.77) *1.53 (1.91)*	8/10 *6/8*
Phonologic Production	6.83 (3.58) *5.73 (2.50)*	10/10 *4/7*
Nonword Repetition (Sequence Knowledge)	0.95 (1.33) *1.12 (1.51)*	6/7 *5'6*
Discourse Production		
Words	1.49 (1.46) *1.47 (1.54)*	4/6 *1/5*
CIUs	1.64 (1.57) *1.44 (1.68)*	4/6 *4/5*
Control (Limb praxis/*TONI)*	0.64 (2.04) 0.93 (2.26)	2/8 *3/7*

Kendall et al., 2008

Conclusions

- Tentative evidence to suggest focusing treatment at level of phonological processor may improve naming
- Improved BNT and COWA scores at 3 months post suggest once patients provided adequate phonological sequence knowledge, they may continue to build working vocabulary
- Auditory perception abilities may be at least one indicator of success with this treatment

Verb treatments

"Response to Contrasting Verb Retrieval Treatments…"

- Level IIb single subject design
- Greater verb retrieval impairments associated with nonfluent aphasia/left frontal opercular lesions
- Influenced by familiarity, semantic complexity, argument structure
- Verb retrieval failure may undermine sentence formulation leading to nonfluent output

Raymer & Ellsworth, 2002

Method

- Participant
  - 54 y/o woman with transcortical motor aphasia
  - Mildly impaired performance on naming and comprehension for nouns, verbs suggesting semantic dysfunction
- Stimuli – 60 verbs consistently misnamed on baseline testing w/comparable argument structure complexities
  - 20 in semantic treatment set
  - 20 in phonologic treatment set
  - 20 in control set (rehearsal)
- Generalization: Sentence production in response to sets of 60 verb pictures used for treatment

Raymer & Ellsworth, 2002

Treatment

- Picture presented for naming aloud followed by feedback re: response accuracy
- Followed by two yes/no questions to develop word retrieval strategy followed by rehearsal phase
  - Phonologic treatment (word sound):
    - Does ["target"] begin with …?
    - Does ["target"] rhyme with…?
  - Semantic treatment (word meaning):
    - Is ["target"] similar to…?
    - Is ["target"] have to do with ….?
- Control phase items treated using repetition and rehearsal only; 10 new items to gauge spontaneous recovery

Raymer & Ellsworth, 2002

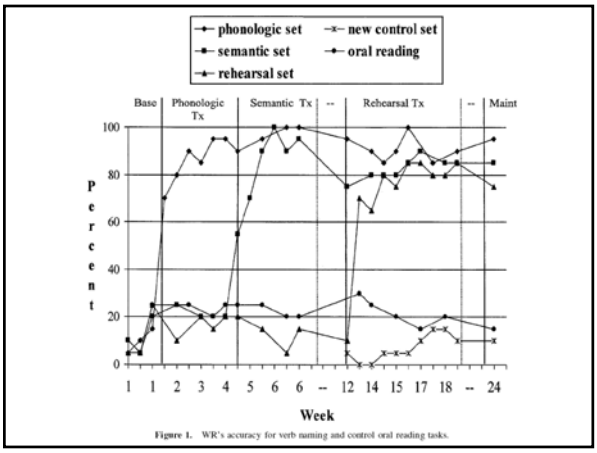


Figure 1. WR's accuracy for verb naming and control oral reading tasks.

Conclusions

- Semantic, phonologic, and rehearsal treatments all induced verb naming improvements
- Manifested in increased ability to produce sentences using these verbs
- Suggests semantic activation whenever words retrieved in context of picture presentation regardless of treatment type

Raymer & Ellsworth, 2002

Comparing Treatments

- Semantic and phonologic treatments consisting of pre-stimulation phase and response-contingent cueing hierarchy ending with repetition of target word
- Object Naming
  - 4 participants with primarily either lexical-semantic, lexical-phonologic, or mixed lexical-semantic/lexical phonologic deficits
  - Positive responses to both treatments for object naming with apparent preference for semantic treatment.
- Action Naming
  - 4 participants with predominately lexical-semantic deficits, 1 with mixed lexical-semantic/lexical-phonologic deficits
  - Comparable but inconsistent positive effects for both treatments for action naming across participants.

Wambaugh, 2003; Wambaugh et al., 2001, 2004

"Application of semantic feature analysis to retrieval of action names in aphasia"

- Level IIb single subject design
- Addressed whether SFA would result in improved naming of trained and untrained action items
- Investigated potential of SFA to provide compensatory strategy for improving generalization of action word retrieval to untrained items
- Assessed the effects of SFA treatment on the production of content generally and verbs specifically during discourse

Wambaugh & Ferguson, 2007

Method

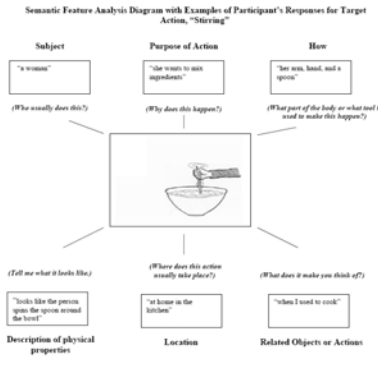
- Participant
  - 74 yo, RH, Caucasian woman
  - 4 years, 2 months post onset
  - Single, left parietal CVA
- Naming Stimuli – 40 actions for Object and Action Naming Battery, divided into 4 lists
- Discourse Stimuli – Picture description and procedural discourse items from CIU analysis
- Design – Single-subject multiple baseline design across behaviors

Wambaugh & Ferguson, 2007

Treatment

- Items presented in random order
- Participant asked to "use an action word to describe the picture"
- 30-second response window provided to employ feature strategy as compensatory strategy
- SFA modified to accommodate verbs by targeting lexical information and thematic information while adhering as closely as possible to original SFA features

Wambaugh & Ferguson, 2007



Wambaugh & Ferguson, 2007

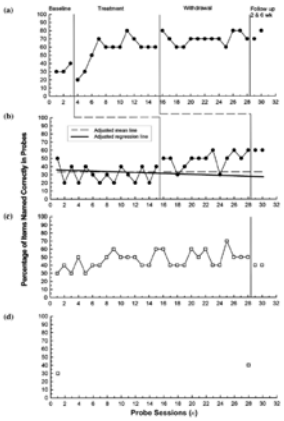


Table 2.
Production of content during discourse for 74-year-old female participant.

Measure	Pretreatment	Posttreatment
Total Words	408	770
Total Sample Time, s (min)	532 (8.9)	558 (9.3)
Words Per Minute	46	82.8
Total CIUs	208	497
CIUs Per Minute	23.4	53.4
%CIU	51	65
Verbs, *n* (% of total CIU)	68 (32)	144 (29)
Nouns, *n* (% of total CIU)	70 (34)	167 (34)
Other Grammatical Forms, *n* (% of total CIU)	70 (34)	186 (37)

CIU = correct information unit

Wambaugh & Ferguson, 2007

Outcomes

- Improved accuracy of naming trained items (d-index: List 1=1.5, moderate effect; List 2=1.76, medium effect)
- No generalization to naming of untrained items
- Increases in accuracy of object naming on post-testing
- Absence of general retrieval strategy of reviewing features for failed verbs
- Substantial increase in discourse production likely due to general facilitating effect

Wambaugh & Ferguson, 2007

Semantic Feature Analysis of Word Retrieval Failures in Discourse

- Poor generalization of SFA treatment effects to discourse production has led to reconsideration of how this might best be improved
  - Boyle (2004a) suggested that more direct measurement of word retrieval difficulty in discourse would yield more consistent across-context generalization
  - Boyle (2004b) also suggested using SFA as a compensatory strategy in discourse tasks to facilitate retrieval of failed nouns and verbs
  - Rider et al. (2008) treated naming for closed sets of nouns drawn from contextual samples to improve discourse production

Peach & Reuter, 2008

Semantic Feature Analysis of Word Retrieval Failures in Discourse

- Treatment for improved retrieval of objects and actions in discourse might best be served by targeting such failures as they appear during discourse tasks
- Approach is appealing because:
  - it increases the ecological validity of the stimulus items
  - it relies on response generalization rather than stimulus generalization as in most previous studies
  - improvements in word retrieval should, by default, result in improved discourse production
- Potential for approach to have positive effects on picture naming, i.e., generalization in the reverse direction from which it is typically assessed

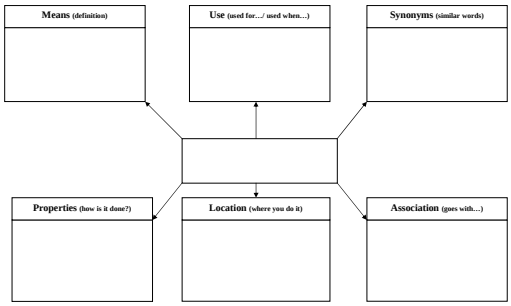
Peach & Reuter, 2008

Semantic Feature Analysis of Word Retrieval Failures in Discourse

- Connected speech probed to identify lexical retrieval errors (nouns and verbs) to serve as treatment items
  - Picture description
  - Procedural discourse
- Target words subjected to semantic feature analysis
- Daily homework assigned targeting retrieval failures in conversational speech

Peach & Reuter, 2008

VERB DIAGRAM



Peach & Reuter, 2008

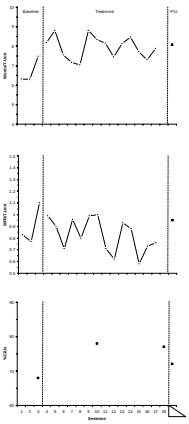
Types of Lexical Retrieval Errors (German, 1991)

- Verbal Paraphasia
- Semantic paraphasia
- Superordinate
- Coordinate
- Subordinate
- Attribute
- Circumlocution
- Unrelated Verbal Paraphasia
- Verbal Phonological Paraphasia
- Perseveration
- Initial sounds
- Phonemic Paraphasia
- Neologism
- Repetition
- Reformulation
- Empty/Indefinite words
- Time fillers
- Delays
- Comment

Peach & Reuter, 2008

	Participant 1	Participant 2
Age	77	62
Gender	F	F
Native language	Serbian	Filipino
Primary language	English	English
Education	16	20
Occupation before retirement	Inspector	Physician/Nurse
Time post onset of aphasia (months)	2	14
Site of lesion	Medial left parasagittal frontal lobe	Left insula and internal capsule genu
Western Aphasia Battery		
Fluency	9	6
Comprehension	9.9	7.1
Repetition	9.4	8.8
Naming	7.8	5.3
Aphasia Quotient	90.2	70.3
Reading	98	10.8
Writing	77	13.5
Language Quotient	90	66.5
Aphasia classification	Anomic	Anomic
Correct Information Units (CIUs)		
Total Word Count	807	362
Total CIUs	548	140
%CIUs	68	39
Object & Action Naming Battery		
Objects (List A) – 81 items	71	48
Actions (List A) – 50 items	35	26

Participant 1



$d_1 (A_1B) = 1.79$

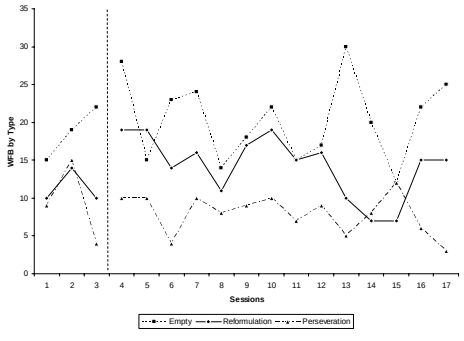
$d_1 (A_1A_2) = 2.61$

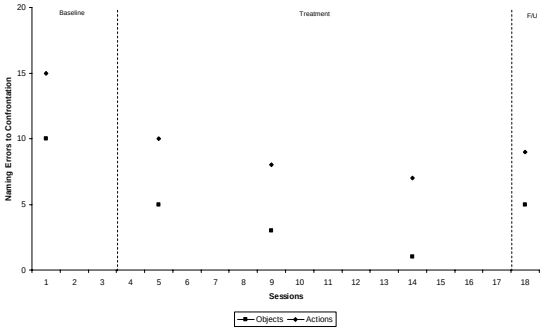
$d_1 (A_1B) = -0.42$

$d_1 (A_1A_2) = 0.28$

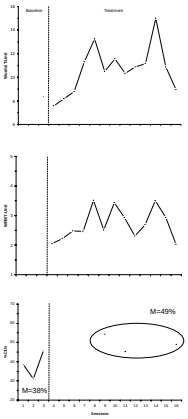
A_1B = 10% increase

A_1A_2 = 4% increase





Participant 2



PND* = 85%

****Percentage of Non-Overlapping Data***

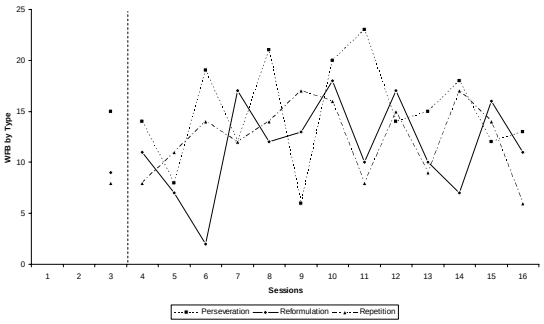
Interpretation:

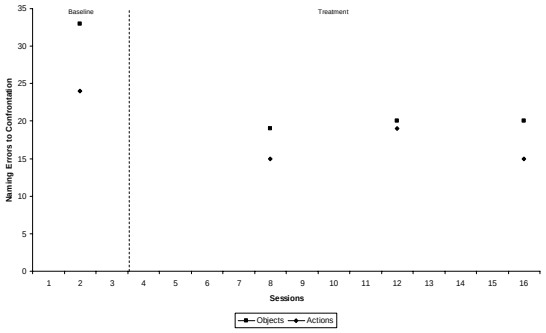
>90% = very effective
70-90% = effective
50-70% = questionable
<50% = ineffective

Scruggs & Mastropieri, 2001

PND* = 31%

11% increase in %CIUs





	Participant 1		Participant 2	
WAB Subtest	*Pre*	*Post*	*Pre*	*Post*
Information Content	9	9	8	9
Fluency	9	9	6	6
Comprehension	9.9	9.8	7.1	8.4
Repetition	9.4	9.2	8.8	8.4
Naming	**7.8**	**8.6**	**5.3**	**6.5**
Aphasia Quotient	90.2	91.2	70.3	76.6

"Treatment of naming in nonfluent aphasia through manipulation of intention and attention…"

- Intention – Ability to select among several competing actions for execution and initiation ("executive attention")
- Attention – Ability to select one source of information among multiple competing sources for further processing
- Intention mechanisms associated with frontal action systems; attention closely associated with posterior sensory cortices

Crosson et al., 2007

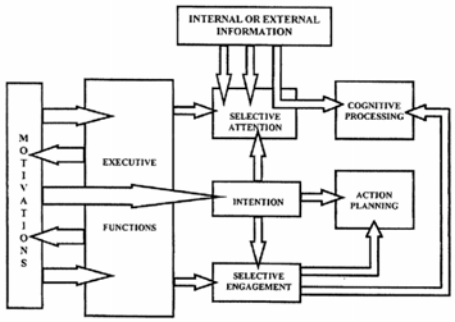


FIGURE 14.1. Schematic representation of relationships among selective attention, intention, selective engagement, motivation, and executive functions

Crosson, 2000

"Treatment of naming in nonfluent aphasia through manipulation of intention and attention…"

- Language performance affected by attention deficits in patients with parietal lesions when stimuli presented on either left vs. right sides
- Left Pre-SMA areas underlying intention for word generation and complex hand movements found to overlap; pre-SMA connected to lateral prefrontal cortex (LPFC)
- May be possible to exploit role of right LPFC in recovery from aphasia by pairing complex hand movement of left hand with naming treatment

Crosson et al., 2007

Table 1. Demographic variables and aphasia scores for naming-severity strata

	Age *M* (*SD*)	Edu. *M* (*SD*)	M/F	Months Post	WAB AQ *M* (*SD*)	BNT *M* (*SD*)
Moderate (n = 12)	58.13 (11.22)	12.50 (0.84)	6 M/6F	32.43 (22.10)	73.33 (9.30)	33.00 (8.45)
Severe (n = 11)	61.22 (16.38)	12.89 (3.37)	9 M/2F	41.22 (40.81)	58.74[1] (18.90)	12.82 (9.48)
Profound (n = 11)	57.25 (10.87)	15.29 (4.46)	2 M/9F	59.50 (69.05)	25.53[1] (12.16)	1.50[1] (2.32)
Total Sample (N = 34)	58.96 (12.80)	13.55 (3.42)	17M/17F	44.75 (47.80)	53.32[1] (24.75)	16.73[1] (15.21)

[1]Due to an oversight one participant (profound impairment) did not receive a baseline Boston Naming Test (BNT), and 5 participants (4 severe impairment, 1 profound impairment) did not receive a baseline Western Aphasia Battery Aphasia Quotient (WAB AQ). Means (*M*) and standard deviations 3(*SD*) in the corresponding cells were calculated without these subjects' data (i.e., no missing value algorithm was used to replace missing scores).

*Patients stratified by severity of word finding impairment using picture naming performance on a list of 40 words including similar numbers of high, medium, and low frequency items.

Crosson et al., 2007

Intention Treatment

- Picture naming trials presented on computer monitor with alerting stimuli and correction procedures (as necessary)
- Accompanied by complex LH movement (lifting lid on a box and pressing button on a device within the box) to initiate picture presentation
- Three phases using unique sets of 50 items; complex movement replaced with non-meaningful circular hand gesture in trial 3 to allow use outside therapy

Crosson et al., 2007

Attention Treatment

- Picture naming trials presented on computer monitor in left hemispace with alerting stimuli to left of center and correction procedures (as necessary)
- Alerting stimuli disappear, pictures appear immediately in upper, middle, or lower portion of left side
- Three phases using unique sets of 50 line drawings of objects with changes in number and duration of alerting stimuli over each phase

Crosson et al., 2007

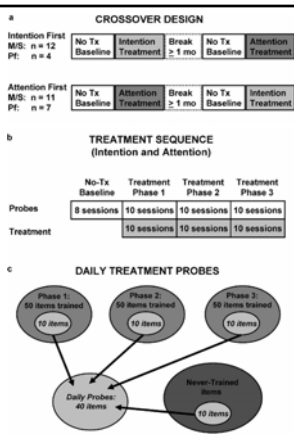


Table 2. Change in % accuracy from baseline performance for all probes (a) and untrained probes only (b)

a) All probes
Moderate and severe naming impairment

	Mean BL	Mean Δ	*SD* Δ	Effect size	*t* (*df*)
Intention treatment	46.15	20.23	12.11	1.67	8.00 (22)‡
Attention treatment	51.94	16.32	12.46	1.31	6.28 (22)‡
Profound naming impairment					
	Mean BL	Mean Δ	*SD* Δ	Effect size	*t*
Intention treatment	6.21	9.50	10.56	0.90	2.98 (10)*
Attention treatment	6.68	8.90	11.87	0.75	2.50 (10)*

b) Untrained probes only
Moderate and severe naming impairment

	Mean BL	Mean Δ	*SD* Δ	Effect size	*t* (*df*)
Intention treatment	43.21	15.86	18.15	0.86	4.14 (22)‡
Attention treatment	49.95	11.17	14.92	0.75	3.59 (22)†
Profound naming impairment					
	Mean BL	Mean Δ	*SD* Δ	Effect size	*t*
Intention treatment	5.00	2.73	7.32	0.37	1.24 (10)
Attention treatment	5.49	4.57	6.76	0.68	2.24 (10)*

Mean BL = mean % accuracy on baseline picture-naming probes; Mean Δ = mean change in % picture-naming accuracy from baseline to phase 3; *SD* Δ = standard deviation of change in % accuracy from baseline to phase 3; effect size = effect size (mean/*SD*) for mean change in % accuracy.
*$p < .05$; †$p < .01$; ‡$p < .001$.

Moderate and Severe Word-Finding Impairment Only

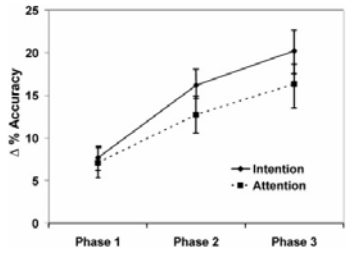


Fig. 2. Average change in percent accuracy from baseline performance for picture naming probes. The change in percent accuracy from baseline for both the intention and attention treatments is shown. Change in percent accuracy was calculated as the difference between average performance on daily picture-naming probes for each phase minus average baseline performance. During the intention treatment, patients showed a faster rate of gain ($p < .05$) in performance than in the attention treatment. Error bars represent the standard errors of the mean.

Results: Moderate to Severe Impairment

- Improved naming performance during both treatments
- Significantly greater increments between phases on intention vs. attention treatment
- Generalization to untrained stimuli, but greater on intention vs. attention treatment

Crosson et al., 2007

Results: Profound Impairment

- No differential response to two treatments
- Fewer patients with treatment gains and generalization to untrained items

Crosson et al., 2007

Conclusions

- Greater incremental improvement observed for intention vs. attention treatment in nonfluent aphasia patients with moderate to severe naming impairment
- Intention component appears to be active treatment constituent
- Improvement during attention treatment confounds degree to which improvement after intention treatment is related to intention manipulation

Crosson et al., 2007