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Aphasia: Treatment for Lexical and Sentence Production Skills
CEU Introduction:

Treatment of Lexical Impairments in Aphasia: Focus on the Evidence

“I know what it is—I just can’t think of the word.”

We see these patients every day. In our assessments using pictures, they know what the picture is. They just have trouble thinking of the name of the pictured object. And sometimes they even have difficulty recognizing the word when the clinician provides it. Impairments of lexical processing are an everyday occurrence among our patients with aphasia, and thus, much of our clinical time is devoted to implementing methods and strategies to improve lexical processing. But what do we know about the research that exists evaluating the effects of those methods in systematic investigations?

This issue of the Division 2 Newsletter initiates a series of issues focused on the evidence for what we do in clinical practice. Our goal is to provide practicing clinicians with a body of information to either support our clinical methods or to lend a healthy dose of skepticism and caution about what we do in clinical practice. There are a number of methods that seem tried and true. But when we look at the evidence, we may be surprised that there is less of it than we might have thought.

Robey (2001), in the first issue of this newsletter this year, explained the optimum order of treatment research methods: controlled efficacy studies followed by studies of clinical effectiveness. Often, the efficacy study is preceded by preliminary investigations of treatment effects. Unfortunately, when we look at the evidence for the specific treatment methods we employ in clinical practice (e.g., cueing hierarchies for word retrieval), most of these studies fall into the preliminary investigation stage. We have limited data on the true “efficacy” of the treatment methods we use. Thus we must be cognizant of the weight of the evidence from those studies that have been completed.

In this issue of the Division 2 Newsletter, we have gathered a number of authors to review the evidence for some of the treatments that we use with individuals with aphasia and lexical impairments. This is not an all-inclusive review of all potential methods. Because of limits on space and time, we have selected four different approaches that have been investigated in some detail.

Because comprehension presumably comes before production, Dr. Bev Jacobs starts the newsletter with her review of the evidence for methods used to treat lexical comprehension impairments in aphasia. She reminds us of some of the initial investigations in this area and then reviews a few recent studies focused...
on improving lexical comprehension. This is an area that is ripe for continued clinical research. Then, the newsletter turns toward lexical retrieval impairments. When we think of treatment for lexical retrieval, the first thing that surely comes to mind is cueing hierarchies. Dr. Janet Patterson reviews studies that have evaluated the effects of cueing hierarchies for improving word retrieval in individuals with aphasia. A number of studies have reported positive benefits of cueing hierarchies in treatment, and an efficacy study in this area is surely overdue. The final two papers examine approaches that have been investigated in a number of recent papers. Dr. Lee Ennis reviews studies using comprehension training to incite changes in word retrieval. Dr. Mary Boyle considers studies that use semantic feature analysis, a technique using a strategic method to activate information about words in the context of naming training. Both of these approaches offer potential for positive treatment effects and should be considered as part of the clinical armamentarium.

These papers will bring to mind some of the familiar studies that we read years ago and perhaps will familiarize us with some new treatment research endeavors. As always, it is incumbent upon us as clinicians to judge the merits of each approach for ourselves and to determine which methods would be most appropriate to employ with individuals with lexical impairments in aphasia.

Reference
Sentence Production Treatments for Aphasia

The production of spoken language to convey information about states and events is a uniquely human ability. By stringing words together we are able to express our thoughts and feelings and communicate with each other. In order to express ideas beyond the level of simply labeling, we need to understand how words relate to each other and can be combined; that is, we need to know about grammar. For most of us, this knowledge is acquired relatively painlessly (with apologies to Sr. Eugenia at St. Margaret’s Parish School) and is utilized without much conscious awareness. Words are readily retrieved and combined into sentences, easily modified with respect to tense, case, and sentence format as the situation calls for, and produced with accurate rate and prosody to reflect the intended meaning. However, in individuals with aphasia, where the ease of fluent sentence production is often abruptly disrupted, the ability to formulate even a simple utterance can pose an enormous challenge. For many of these individuals, verbal communication is challenged by difficulty processing the grammatical functions that support the construction of formal language, often referred to as agrammatism. This issue of the Division 2 Newsletter focuses on grammatical impairments associated with aphasia, with special attention to how evidence from research can be used to inform treatment.

Clearly, an exhaustive review of this topic and presentation of all possible interventions for sentence level deficits is beyond the scope of this publication. We present a few examples of interventions, and the evidence concerning their application in aphasia. Each author was asked to discuss the topic from their particular perspective, rather than include all possible viewpoints. Where possible, we have tried to reduce redundancy. We are extremely fortunate that the topics covered are discussed by eminently qualified researchers who are actually doing the work and equally fortunate that these authors are committed to making their information relevant and accessible to practicing clinicians. For some, this will be a review. For others, perhaps some constructs that were a bit cloudy will become clearer. For all of us, having the evidence associated with a particular treatment approach summarized is of benefit.

In the first article, Charlotte Mitchum presents us with a brief review of the syndrome of agrammatism and a cognitive neuropsychological model of normal sentence production that has been used to characterize the deficits associated with sentence production. She then provides a summary of verb-centered interventions that have been applied to the remediation of sentence production. In the second article, Ruth Fink describes the historical background, theoretical underpinnings, and current state of the art of an approach that targets sentence level processing referred to as Mapping Treatment. Cynthia Thompson discusses the challenging concepts of verb-argument structure and complex sentence structure and presents another approach to sentence level intervention, referred to as Treatment of Underlying Forms. The final article by two former students of mine, Virginia Martin and Kristen Kubitz, is a review of a treatment directed at more severe verbal production impairments, Melodic Intonation Therapy. While this is certainly not a new intervention approach, the data bear reviewing in light of recent evidence concerning its effects on neural reorganization.
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A left hemisphere stroke often results in impairment of the auditory verbal comprehension system. Individuals with aphasia who have substantially reduced comprehension are likely to have limited functional communication abilities. They will have difficulty understanding what is said to them as well as monitoring what they say to others. Brookshire (1997) stated that the presence of severe aphasia at one month or more post onset indicates a poor prognosis for recovery of functional use of language. Questions have even been raised regarding the appropriateness of providing treatment for this population (Marshall, 1997). To resolve this question, it would be helpful to review studies that have examined the effectiveness of treatments targeting impaired auditory comprehension in individuals with aphasia.

**Historic Perspective**

Schuell, Jenkins, and Jimenez-Pabon (1964) conceived of the language system as dependent upon auditory control for processing information and for mediating and regulating language through feedback loops. Their belief in the pre-eminence of the auditory system led to treatment principles that were steeped in an auditory emphasis. Schuell and colleagues claimed that, unless treatment is provided to improve the comprehension deficit, prognosis for improvement of oral expression is usually poor, that is, comprehension should be treated and improved in order to treat expressive deficits optimally. Darley (1982) elaborated on Schuell’s “controlled auditory stimulation” procedure for providing auditory input to individuals with aphasia. He also emphasized demonstrating comprehension before treating verbal expression at any level. Eisenson (1984) stated that the first principle of training for auditory disturbances was to teach listening in order to improve understanding of what is heard. All of these authors imply that, if comprehension improves, a beneficial effect on other language modalities, including verbal production, will occur. However, this fundamental assumption about the Schuellian stimulation approach lacks empirical support (Prins, Snow, & Wagenaar, 1978; Rosenbek, 1979). Furthermore, the extent to which comprehension and production of spoken words are mediated by common or distinct cognitive processes remains controversial (Butterworth, Howard, & McLoughlin, 1984; Goodglass & Baker, 1976; Good-glass, Wingfield, Hyde, & Theur-kauf, 1986; Hillis & Caramazza, 1991; Mazzoni et al., 1992; McCarthy & Warrington, 1985).

Methods for retraining comprehension deficits have been proposed that endorse language comprehension as the cornerstone of treatment and emphasize intensive, programmed auditory stimulation (Brookshire, 1997; Duffy, 1994; Marshall, 1986). Duffy defined Schuell’s “stimulation approach” as “an approach to treatment that employs strong, controlled, and intensive auditory stimulation of the impaired symbol system as the primary tool to facilitate and maximize the patient’s reorganization and recovery of language” (p. 148). Brookshire, for example, suggested gradually increasing stimulus fields and complexity levels as skills improve.

Assumptions underlying some traditional aphasia treatment tasks are seldom questioned; among these is the “point-to” paradigm intended to heighten comprehension for spoken messages. This format is similar to tests of language comprehension (listening to a word and selecting from three or four pictures the one that reflects the spoken stimulus). Peach (1993) suggested that, for the most severe comprehension deficits, picture matching accompanied by the spoken name of the item to be matched may provide the most basic level of auditory stimulation. That is, when an individual has difficulty understanding the picture name, it is assumed that matching responses evoke auditory representations of visual stimuli that may underlie subsequent association of meaning with the picture name. Marshall (1997), however, raised questions regarding the effectiveness of the auditory stimulation approach and suggested that stimulation tasks do not improve comprehension because they bear little relation to everyday communication situations.
**Early Evidence of Treatment Effects**

The literature that examines the effects of treatment for lexical comprehension deficits is skeletal compared to the voluminous number of treatment studies of lexical production. Table 1 (on page 9) provides an outline for a number of studies that have been reported. Few studies have directly investigated methods for retraining auditory comprehension, three of which have examined the effects of a “programmed” approach to auditory comprehension training (Burger & Wertz, 1984; Holland & Sonderman, 1974; West, 1973). This approach is based on principles of programmed instruction that include systematic presentation of stimuli, reinforcement of correct responses to stimuli and a specified criterion of accurate responding before the program progresses to an increased level of difficulty.

West (1973) used a systematic retraining program based on items similar to those presented in the Token Test (TT) (DeRenzi & Vignolo, 1962) with a group of individuals with mild or moderate auditory comprehension impairment. Common household items were substituted for the TT colored tokens and study participants were trained to follow commands similar to TT commands (e.g., “Touch the red pencil” versus “Touch the red circle”). Levels of the “experimental treatment program” (ETP) corresponded to parts of the TT, and participants began training at the first level that was not error free on the pre-treatment administration of the TT. Feedback provided for incorrect responses consisted of repetition and demonstration of the correct response to the command. A group of five control participants received “conventional speech therapy” (CST), which consisted of general conversation, naming, memory organization, repetition, and auditory sentence/paragraph comprehension tasks, at essentially the same intensity and frequency as the ETP. When the two groups were compared on pre- and post-treatment TT scores, all ETP participants had improved on post-treatment scores, while participants in the CST group showed no improvement. Post-treatment scores on selected subtests of an aphasia battery reflected no statistically reliable change for either group, (i.e., no generalization effects of training). Holland and Sonderman concluded that their “programming” technique allowed more explicit measurement and definition of the comprehension problem, as well as more exact demonstration of treatment effects. However, the “program’s lackluster effects on the low group” (p. 596) did not offer a promising technique for overcoming severe auditory comprehension impairment.

Burger and Wertz (1984) examined the effects of a systematic program based on items from the Revised Token Test (McNeil & Prescott, 1978) with an individual with Wernicke’s aphasia and severe comprehension impairment. The results of their token training program were similar to the performance of the “low group” participants in the Holland and Sonderman (1974) study. That is, their participant’s performance was highly variable across treatment and generalization phases and minimal change was documented during treatment phases.

Two studies have examined the effects of training for auditory comprehension impairments using Schuell’s “stimulation” approach (Kushner & Winitz, 1977; Marshall & Neuburger, 1984). Kushner and Winitz developed a program consistent with treatment principles proposed by Schuell and colleagues (1964); however, they extended those principles. That is, their “comprehension training,” which they purport to involve spoken input with problem solving (pairwise relationship between sound and meaning), was distinguished from “auditory stimulation training,” which
they defined as “listening” (spoken input without problem solving). Kushner and Winitz examined the effects of comprehension training on production with an individual who developed aphasia after a lobectomy for removal of a mass in the left anterior temporal lobe. In their training task, the clinician presented 19 common noun pictures in stimulus fields that systematically increased in number from one to four. The participant pointed to the picture that the clinician orally named; name repetition and demonstration of correct pointing were provided for incorrect responses. Direct training of oral naming was not provided, but naming was tested throughout comprehension training.

The results of training showed improvement in both comprehension and production of picture names; however, examination of Kushner and Winitz’s data raises a number of questions. For example, comprehension performance was high at the beginning of training (almost 80% accurate) leaving limited room for improvement. Additionally, comprehension perfor-

### Table 1. Summary of investigations of auditory comprehension treatments

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participants</th>
<th>Treatment Task</th>
<th>Stimuli</th>
<th>Treatment Intensity</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>West (1973)</td>
<td>ABA with 2 groups (ETP=experimental; CST=control)</td>
<td>5 ETP, 5 CST (3 fluent, 2 Broca’s aphasia in each group)</td>
<td>ETP- follow spoken commands, 5 levels of increasing difficulty; CST</td>
<td>ETP (common objects varied in size &amp; color); CST (not specified)</td>
<td>20 ETP 30 min. sessions over 6-9 weeks; CST 40 min. sessions 4 x weekly over 5-6 weeks</td>
<td>ETP improved TT &amp; MTDDA scores; CST improved MTDDA scores only</td>
</tr>
<tr>
<td>Holland &amp; Sonderman (1974)</td>
<td>ABA with 2 groups (high vs. low pre-treatment TT scores)</td>
<td>10 “high”, 14 “low” aphasic adults</td>
<td>Programmed instruction for following TT spoken commands</td>
<td>Actual TT tokens &amp; index cards with token shapes, sizes, &amp; colors</td>
<td>Not reported, other than “intensive”</td>
<td>Increased TT score for high, but not low group; no change in MTDDA score for either group</td>
</tr>
<tr>
<td>Kushner &amp; Winitz (1977)</td>
<td>Case study repeated measures (A-B-A-B-A)</td>
<td>1 aphasic adult (left temporal lobectomy)</td>
<td>Point to pictures for spoken names; field increased from 1-4</td>
<td>19 common noun pictures</td>
<td>2-3 x weekly 30 min. sessions (21 total over 2 months)</td>
<td>Increased comprehension and production of picture names; increased PPVT, PICA, &amp; TT scores</td>
</tr>
<tr>
<td>Burger &amp; Wertz (1984)</td>
<td>Single subject repeated measures (A-B-A-C-A)</td>
<td>1 Wernicke’s aphasia</td>
<td>Hierarchical program for following RTT spoken commands</td>
<td>Actual RTT tokens</td>
<td>2 x weekly 1 hour sessions (34 total)</td>
<td>Variable performance across treatment phases; unchanged RTT score; improvement on general language measures</td>
</tr>
<tr>
<td>Marshall &amp; Neuberger (1984)</td>
<td>Single subject repeated measures</td>
<td>4 aphasic adults (2 fluent &amp; 2 nonfluent)</td>
<td>Point-to pictures for spoken names; stimulus field of 4</td>
<td>PPVT pictures; individual sets of 23-25 “unknown” words</td>
<td>12 trials 1-3 days apart</td>
<td>All improved comprehension of picture names; nonfluent participants improved oral picture naming</td>
</tr>
<tr>
<td>Jacobs &amp; Thompson (1992)</td>
<td>Single-subject multiple baseline</td>
<td>1 global aphasia</td>
<td>Identify named pictures &amp; match/sort by category in semantically unrelated field</td>
<td>35 common object pictures in 5 categories</td>
<td>44 sessions over 24 weeks</td>
<td>Limited improvement of trained picture identification; no generalization to untrained comprehension or production tasks</td>
</tr>
<tr>
<td>Grayson, Hilton &amp; Franklin (1997)</td>
<td>Retrospective single case study; crossover A-B-A-C-A</td>
<td>1 jargon aphasia</td>
<td>ST=spoken word-to-object matching; picture category sorting; stimulus fields increased number &amp; relatedness; S+AT=ST plus spoken word-to-picture match of minimal pairs in field of 3</td>
<td>ST (objects, object pictures, &amp; written word associates); S+AT (hand-drawn minimal pair pictures)</td>
<td>ST 5 x weekly 1 hour sessions for 4 weeks followed by S+AT 3 x weekly 15 min. session for 3 weeks</td>
<td>PALPA written &amp; spoken word-to-picture matching test scores increased following ST &amp; minimal pair test scores showed no improvement; scores on minimal pair test improved following S+AT</td>
</tr>
</tbody>
</table>
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Performance was maintained above 80% accuracy following a one-month period without treatment and reflected minimal increase when treatment was resumed for another one-month period. Kushner and Winitz acknowledged, but discounted, the possibility that increased comprehension and production performance could be attributed to spontaneous recovery, as their participant began treatment one month post-onset of aphasia and continued for three months. Improvements on standardized test measures that were evident during the no-treatment period further suggest loss of experimental control, rather than generalization of treatment effects claimed by the authors.

Marshall and Neuberger (1984) also administered comprehension training in a picture-pointing paradigm to individuals with aphasia, two fluent and two nonfluent. Individual sets of pictures were selected for each participant prior to training on the basis of errors (unknown words) across two administrations of the Peabody Picture Vocabulary Test (PPVT; Dunn, 1981). The training procedure followed the PPVT format of presenting a set of four pictures, orally naming one of the four, and instructing participants to point to the named picture. Incorrect pointing responses were followed by repetition of the target word while simultaneously pointing to the correct picture. Following each comprehension training session, the same pictures were presented singly for participants to name; no feedback was provided relative to the accuracy of naming responses. All participants improved on the trained comprehension task and only the participants with nonfluent aphasia also improved on the untrained naming task.

Marshall and Neuberger (1984) concluded that, although comprehension training improved auditory comprehension abilities, it does not result in consistent gains in untreated production tasks for all individuals with aphasia. Differences in their participants’ responses to comprehension training were attributed to differences in comprehension abilities and error patterns on the naming task. Participants with fluent aphasia had poorer auditory comprehension and output monitoring skills than those with nonfluent aphasia. The participants with nonfluent aphasia initially made both semantic errors (naming an associated word) and word substitution errors (naming another word from the stimulus set, instead of the target word).

They continued to produce word substitution errors during training, indicating some retention of the names of the stimuli presented. Additionally, the number of semantic errors decreased as correct naming increased, indicating their ability to monitor output and recognize errors. The participants with fluent aphasia initially made semantic errors, but essentially no word substitution errors. Word substitution errors rarely occurred during training, indicating poor retention of stimulus names between training trials, and semantic errors increased or reflected minimal change, which indicated their inability to monitor their output.

Overall, five studies examined a programmed and/or stimulation approach for auditory comprehension impairments. The effects reported in those studies were fairly modest and the functional ramifications of improvements were not reported.

Recent Perspectives

Rapp and Caramazza (1998) suggested that it is useful to think of a lexical deficit as “an impairment to one or more of the mechanisms thought to be involved specifically in the processing of words. In order to do so, however, we must have a theory of what the possible lexical components might be, how they might function, and, as a consequence, the characteristics of performance we might expect to observe when they are damaged” (p. 189). A theory of lexical processing provides a description of the system in terms of the functional architecture, that is, the components and how they are interrelated, and the internal structure of the components. A number of such models of lexical processing characterize functioning of the components according to representational type (orthographic, phonological, or semantic) and level of processing (input or output) (Ellis & Young, 1988; Hillis, Rapp, Romani & Caramazza, 1990; Rapp & Caramazza, 1998). These models typically propose separate word stores for recognizing and producing spoken words and a central semantic system (SS) that is used for both comprehension and production processes. They also include presemantic modality-specific components for processing phonological, visual-orthographic, and visual-object representations, all of which transmit information to the semantic system in order to activate meaning (i.e., the SS plays a central role in most tasks that involve lexical processing). Once meanings have
been accessed within the SS, that information activates modality-specific output lexicons.

Lexical processing models that posit a central SS for meaningful comprehension and production suggest that damage to the SS would be expected to result in comparable degrees of impairment to input and output processes. Butterworth, Howard and McLoughlin (1984) found that individuals with aphasia made significantly more semantic errors than normal controls in a picture-pointing comprehension task and the incidence of errors correlated significantly with naming performance. Individuals with severe aphasia who have impairment in the SS would be expected to show reduced performance for both comprehension and production tasks. Assessing performance using the same stimuli across lexical tasks (oral and written naming, writing to dictation, repetition, oral reading, and reading and auditory verbal comprehension) provides a picture of error patterns and impaired versus intact components and routes. For example, accurate performance on auditory and visual word-picture matching tasks incorporating related distractors suggests an intact SS (i.e., knowledge of what the spoken or printed word means). Conversely, poor performance on tasks requiring activation of meaning, such as comprehension and naming, is evidence that the SS may be disrupted. Assessments, such as the Psycholinguistic Assessments of Language Processing in Aphasia (PALPA) (Kay, Lesser, & Coltheart, 1992), allow clinicians to distinguish qualitatively different patterns of deficit within a modality. In auditory comprehension, for example, deficits of auditory/phonological processing can be distinguished from semantic deficits (Franklin, 1989). These perspectives have influenced some recent auditory comprehension treatment studies.

Jacobs and Thompson’s (1992) approach to training single word comprehension targeted the SS and tested for generalization of training effects in untrained input and output channels. Given the postulate that individuals with severe aphasia evince an impairment in the SS, treatment focused on semantic tasks might be expected to lead to improvement of the SS. If such improvement occurs, it should influence both input and output modalities. Prior to treatment, Jacobs and Thompson administered a lexical processing battery to an individual with global aphasia. Results indicated he had severe difficulty with both input and output processes (e.g., auditory and visual word recognition and oral and written naming of single words); thus, it was proposed that he had an impaired SS. Stimuli in training tasks were pictures of common objects encountered in everyday life in five categories, only four of which were trained. During training tasks, the clinician randomly presented five semantically unrelated items and required the participant to point to an orally named picture, match the picture with another in the same category (comprehension task), and sort pictures into one of four semantic categories (category sort task). When the participant was unable to point, match, or sort correctly, he was provided with semantic cues related to verb functions (e.g., peel and eat for orange) and superordinate category labels (e.g., food for orange). Untrained input and output channels (printed word matching and oral and written naming) that rely on the SS were tested for generalization of treatment effects throughout the study.

The participant in the Jacobs and Thompson study (1992) showed a minimal treatment effect in the comprehension task. That is, he consistently identified pictures in trained semantic categories with better accuracy (15% to 45%) than pictures in an untrained category (0% to 15%). However, performance on trained categories was not substantially increased from baseline performance (15% to 25% accuracy). Conversely, his category sorting performance, although highly variable throughout the study, was more accurate for the untrained category than for the trained categories. There was little change in accuracy from baseline levels of sorting for trained categories. That is, treatment seemed to improve the participant’s ability to discriminate the untrained category from the trained ones. Untrained input and output task performance also remained essentially unchanged; however, matching printed words to pictures in trained categories was more accurate than matching in the untrained category. The participant’s parallel auditory and visual comprehension performance on trained versus untrained categories suggested a relationship between these input channels. Jacobs and Thompson concluded that extended comprehension training using a controlled, intensive, and semantically based approach had limited effects with the participant in their study.

Grayson, Hilton, and Franklin (1997) also used
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treatment tasks that targeted a presumed underlying semantic deficit with an individual with severely impaired auditory comprehension and unintelligible speech as a result of a left temporoparietal CVA. They assessed their participant with subtests of a model-based battery (PALPA) that focused on input tasks (pre-lexical ability and semantics). The participant’s poor performance on non-word minimal pairs discrimination, auditory word-to-picture minimal pair matching, and auditory lexical decision tests was interpreted as evidence of impaired auditory comprehension at a pre-lexical processing level. Additionally, the participant’s impaired performance on written and spoken word-to-picture matching tests suggested that he accessed little semantic information about heard or seen words as well. That is, the various assessment tasks indicated the participant had a phonological input deficit and a severe semantic processing deficit.

Grayson and colleagues initiated assessment and treatment during the period of spontaneous recovery; however, they repeated tests of selected language processes prior to and after treatment phases. These tests allowed comparison of performance on treated language processes with performance on those that were not directly treated. If no improvement occurred in any process except those receiving specific treatment, Grayson and colleagues argued such improvement directly resulted from intervention, not spontaneous recovery.

Grayson and colleagues (1997) initiated training with multi-modal semantic tasks (semantic treatment) that paralleled those used in assessment, but the majority of treatment stimuli were different from assessment stimuli. Three tasks were used to stimulate the participant’s ability to use his semantic system: (a) selecting named (spoken or written) objects/pictures in stimulus fields that gradually increased from 2 to 6 items and changed in complexity from semantically unrelated to related distracter items; (b) sorting pictures into semantic groups in stimulus fields that gradually increased in number and complexity; and (c) matching written word associates. Feedback for incorrect responses across all semantic tasks included repetition or gesture of the stimulus or additional semantic information. Semantic treatment with a wider variety of stimuli was continued in a second treatment phase along with auditory training (semantic plus auditory treatment). Auditory training consisted of spoken word-to-picture matching with minimal pair rhyming word foils (e.g., pictures of deer, beer, and tear). Assessment following the initial period of semantic treatment showed significant improvement on the written word-to-picture matching test, non-significant improvement on the spoken word-to-picture matching test, and no improvement on the minimal pairs test. Following semantic plus auditory therapy, the minimal pairs and auditory word-to-pictures matching tests showed significant improvement.

While the participant in the study by Grayson and colleagues (1997) demonstrated improvements on formal language tests, how these improvements related to change in his communicative ability is not clear. Conversations with the participant were video recorded prior to and following treatment and analyses of the videos indicated positive post-treatment changes in comprehension and production. However, Grayson and colleagues acknowledged that changes in expressive communication could not be attributed solely to their intervention as opposed to spontaneous recovery due to limitations in the data (e.g., no clear baselines were established on assessments prior to treatment). They concluded that although it may not be possible to obtain stable baselines and experimental control in the clinical setting, early intervention with specific treatment procedures may be crucial to maximizing recovery. That is, the “use of a hypothesis testing approach, which looks at underlying processes rather than just the surface symptoms may be the way forward, even in the initial phases of therapy” (p. 274).

Conclusions

The treatment studies reviewed in this article provide further evidence that individuals with aphasia frequently do not transfer language skills acquired in treatment to similar untrained tasks. The nature of the various training tasks that are commonly used by speech-language pathologists is not yet clearly understood. For example, does “auditory stimulation” differ from “comprehension training,” described by West as “problem solving”? If so, how can the auditory stimulation component be teased out of comprehension training to demonstrate the effectiveness of one versus the other? Regardless of the nature of the “programmed” or “stimulation” training used in these
studies, Rosenbek’s (1979) suggestion over 20 years ago, that assumptions underlying the auditory bombardment notion are in need of revision, remains a good one.

Lesser and Milroy (1993) discussed the increasingly recognized notion that ability to categorize words is fundamental to semantics. The success of the input-based tasks designed by Grayson and colleagues (1997) to strengthen the semantic system using metalinguistic semantic association seems to lend support to that notion. However, it cannot be assumed that semantically based treatment is more effective than other treatment approaches, even when assessment of the lexical processing system indicates disruption in the SS. For example, the semantic tasks used in the Jacobs and Thompson study (1992) presumably targeted the SS by evoking semantic representations and making them more easily accessible during comprehension tasks; however, they had little positive effect.

In summary, while the results of these few comprehension treatment studies are not particularly encouraging, the motivations underlying the research efforts are appreciated. These studies raise more questions than they answer, thereby stimulating clinical thought. Aphasiologists interested in the clinical application of the research procedures described in these treatment studies must consider the effectiveness of any approach in terms of functional outcome, an important issue that was not objectively examined in any of the studies. Functional communication should be enhanced by the use of available skills at different stages of recovery, but it is unlikely to be achieved without correctly targeted direct treatment of the underlying language processing deficit.

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References


The Effectiveness of Cueing Hierarchies as a Treatment for Word Retrieval Impairment

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Providing a cue to elicit a correct response during treatment for word retrieval impairment in persons with aphasia is a time-honored technique. Speech-language pathologists have used cues in many forms for as long as treatment has been delivered to patients (see Nickels & Best, 1996, and Thompson, 1994, for reviews). Intuitively, clinicians and others have provided cues, more or less systematically, to people with aphasia to assist communication. For example, communication partners of persons with aphasia often use cues in a procedure similar to Twenty Questions to narrow the topic. Cues have appeared in many forms in treatment programs, one of which is a cueing hierarchy. What follows is a discussion of the evidence that supports the effectiveness of cueing hierarchies in improving word retrieval in patients with aphasia. The discussion begins with an overview of how cueing hierarchies are created, continues with a presentation of data in support of their use in treatment, and concludes with a summary of the evidence and suggestions for their clinical use.

Creating Cueing Hierarchies

Cueing hierarchies derive from an interaction between the two treatment extremes of operant treatment programs and general language stimulation (Bollinger & Stout, 1976; Linebaugh, 1983, 1997; Linebaugh & Lehner, 1977). Bollinger and Stout described “response-contingent small step treatment” (RCSST) as an example of a procedure that falls between the two extremes. They stated that identifying task hierarchies that are patient-specific is crucial to the success of the treatment. They listed several principles that contribute to the creation of hierarchies: the power of a stimulus cue to elicit a response, the number of stimulus-response pairs, response criterion, and response constancy.

Linebaugh (1983) suggested that cueing hierarchies should employ a patient’s residual skills, be systematic in presentation, and make optimal use of a patient’s preserved repetition, auditory comprehension, reading and writing skills. He identified three principles of cueing hierarchies. First, cues that elicit a response with the least amount of external facilitation are desirable. These cues are the least powerful in the cueing hierarchy, and at the top of it. Second, stimuli should be faded as rapidly as possible. That is, treatment trials should use increasingly less powerful cues in a hierarchy. Finally, patients should be trained to develop self-cues or internal facilitators. Elsewhere in this issue, Boyle notes the importance of this component to Semantic Feature Analysis.

A cueing hierarchy should be individually created for a patient, incorporating the patient’s abilities as well as the clinician’s model of treatment. Tasks at the top of the hierarchy are the most difficult for the client to complete and obligate the use of the least powerful cues by the clinician (e.g., instructions to name a picture). Tasks at the bottom of the hierarchy are the least difficult for the client and require the most powerful cues to be given by the clinician (e.g., imitation). According to the accuracy of the client’s response, the clinician presents more or less powerful cues, moving down and up the hierarchy, as appropriate. The anticipated outcome of the treatment program is that patients will eventually require the least powerful cues to produce a response, and will generalize the use of that cue to other stimulus classes.

Researchers and clinicians have used Bollinger and Stout’s (1976) principles of RCSST to create task hierarchies to facilitate word retrieval. These cueing hierarchies vary on the basis for cue creation (i.e., phonological or semantic cues), in their implementation of the cueing hierarchy (i.e., movement through the hierarchy) and in their success at changing behavior. Cueing hierarchies fall into two types: traditional cueing hierarchies that are implemented in a descending and ascending procedure; and modified cueing hierarchies that are implemented in a descending direction only, with stimulus presentation that ceases upon a correct response by the client. Studies pub-
lished in each category are listed in Tables 1 (on page 22) and 2 (on page 24).

Two other uses of cueing strategies are worth noting. The first category, further defined below, includes studies that have addressed development of a hierarchy of cues (as distinct from implementing a cueing hierarchy). The second category is studies that have used a cueing hierarchy in treatment but have not clearly defined the nature or use of the hierarchy. Studies in the latter category report treatment programs designed to meet their respective objectives, and mention the use of a cueing hierarchy, yet cannot be considered as evidence supporting the effectiveness of the technique because the cueing hierarchy is not adequately specified. This category of studies will not be addressed.

**A Hierarchy of Cues**

Several studies examined cues that facilitated word retrieval in adults with aphasia. Each of these studies described a range of cues that varied in their effectiveness in facilitating word retrieval, that is, in the power of a particular cue. Pease and Goodglass (1978) presented some of the earliest research in this area and suggested that the effectiveness of cues was ordered. They found that two cues were most powerful in aiding word retrieval: the initial phonemes of a word and a sentence completion cue. Other cues (rhyme, location, function and superordinate) were not as beneficial. Their method is typical of many studies that followed, in that participants were engaged in a naming task, with stimuli that varied on a number of dimensions. For example, Li and colleagues (Li & Williams, 1991, 1990, 1989; Li & Canter, 1983) examined grammatical class of the cue and type of cue (phonological or semantic), as well as type of aphasia of the participants. They found that both cues facilitated word retrieval, however the effects varied among participants. Love and Webb (1977) showed that an order of potency of cues existed for persons with mild or severe anomia. Various combinations of written words, sentence completion, and initial syllable cues were presented to two groups of participants. Individual effects were noted, but no group effect favoring a specific cue or cue combination was observed. The one exception was a finding that the initial syllable cue was the least effective in facilitating word retrieval for all participants. This last result contradicts the previous evidence favoring initial syllable cues.

Once cues have been selected, the manner of presentation must be determined. Weidner and Jinks (1983) reported the value of combined cue presentation over single-cue presentation in facilitating naming in persons with mild or severe anomia. Various combinations of written words, sentence completion, and initial syllable cues were presented to two groups of participants. Individual effects were noted, but no group effect favoring a specific cue or cue combination was observed. The one exception was a finding that the initial syllable cue was the least effective in facilitating word retrieval for all participants. This last result contradicts the previous evidence favoring initial syllable cues.

**Traditional Cueing Hierarchies**

Four studies, listed in Table 1, used a traditional cueing hierarchy, which is the method of descending and ascending stimulus presentation. Following presentation of a pictured stimulus, a naming response was scored as correct or incorrect. If the response was correct, the next item was presented. If the response was incorrect, the cueing hierarchy was applied in a descending manner, giving increasingly more powerful cues, until a correct response was obtained. At that point, the cueing hierarchy was reversed, and increasingly less powerful cues were given, until a correct
response was obtained at the level of least powerful cue. The cueing procedure may be repeated as many times as needed for a stimulus item, moving down and up the hierarchy, until a correct response was obtained at the highest response level possible (i.e., the level of the least powerful cue).

Results of the studies in Table 1 suggest that a traditional cueing hierarchy is an effective treatment technique for patients with word retrieval impairments. This conclusion is supported by data showing that the nine patients in these studies achieved predetermined criterion levels in acquiring target items, maintained performance levels from the acquisition phase of treatment (at least for a short period of time), and demonstrated generalization of learned behavior (although patterns of generalization were inconsistent).

**Commonalities in traditional cueing hierarchies:**

One commonality of these studies is a carefully designed experimental procedure (Herson & Barlow, 1976). In all cases the criterion for successful performance was predetermined and dictated the progression of treatment. Each study reported data for baseline, treatment, maintenance, and generalization phases. Another commonality is that, although the authors of each study crafted an individualized cueing hierarchy for their patients, each cueing hierarchy was administered in the same manner (descending and ascending the hierarchy as needed for each stimulus item). Hillis (1998) provides a good example of the procedure used to create a traditional cueing hierarchy.

**Differences in traditional cueing hierarchies:**

Several differences emerge across studies. The cueing hierarchies varied in cue content (e.g., semantic or phonological information), number of steps in the hierarchy, and type of cues (e.g., initial syllable, rhyme). Participants differed on almost every variable measured (i.e., type of aphasia, time post onset). The only common characteristic across participants was presence of a word retrieval impairment, yet, even on this variable, there were differences in severity and level of breakdown in the lexical system. For example, H.G. (Hillis, 1998, p. 653) had multiple “loci of damage within the lexical system”, and J.L. (Varholak & Linebaugh, 1995, p. 256) had “…moderate anomia with well-preserved auditory comprehension.” The studies also differed in the theoretical model of treatment, and the nature of the cueing hierarchy (refer to Table 1). For example, Linebaugh and Lehner (1977) modeled their treatment after programmed instruction and created a cueing hierarchy that had ten levels and three cue areas—verbal, gestural, and articulophonic. Hillis (1992, 1989) evaluated the success of cueing hierarchies to elicit written and verbal naming. She created a six-step cueing hierarchy that incorporated anagrams to train written naming and a seven-step cueing hierarchy that incorporated function cues to train verbal naming. Hillis (1998, p. 655) used a cueing hierarchy to evaluate the effects of treatment derived from a cognitive neuropsychological model of lexical retrieval, versus treatment that was a “tradition-al…all purpose” therapy approach. Other differences among studies appeared in the specific tasks participants were requested to complete within the cueing hierarchy (e.g., matching or picture identification), the performance criteria, the generalization stimuli and tasks, and, of course, the specific participant outcomes.

**Generalization of treatment effects:**

Although all studies using traditional cueing hierarchies included generalization measures, not all studies showed positive generalization results. McNeil and colleagues (1998) made a cogent argument for planning generalization probes in a treatment study to determine what constitutes a stimulus or response class for an individual. They stated that, while the best evidence for effectiveness of a treatment technique is a strong acquisition and maintenance effect plus clear generalization, all three effects are not always present and generalization may not be a requirement for a technique to be judged effective. With this caveat, studies of traditional cueing hierarchies that show acquisition and maintenance effects, but not generalization (e.g., McNeil et al., 1998), may still be considered evidence of effectiveness of a cueing hierarchy.

In each study reported in Table 1, researchers specified untrained items and tasks to which generalization may or may not be expected, and probed for generalization throughout treatment. The items, tasks, and outcomes differed across studies. For example, Linebaugh and Lehner (1977) probed generalization to untrained high and low frequency words every five sessions, while Hillis (1989) probed items from the same semantic category as trained items, and items presented in a different modality (i.e., verbal naming.
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when written naming was trained). The generalization data from these studies did not show a clear effect of treatment, unlike the acquisition data, which did.

While the value of generalization data in determining treatment effectiveness may be questionable (McNeil, Small, Masterson, & Fossett, 1995), the acquisition and maintenance data are unambiguous in demonstrating behavior change as a result of treatment with traditional cueing hierarchies. A traditional cueing hierarchy is a treatment method that can be effective for improving word retrieval in patients with different levels of breakdown in the lexical system and different patterns of linguistic behavior (Hillis, 1998).

**Modified Cueing Hierarchies**

Seven studies, involving eleven participants (see Table 2), used a modified cueing hierarchy, which implemented a descending cueing procedure only (Linebaugh, 1997). The modified cueing hierarchies had steps that presented increasingly more powerful cues to a client, which obligated decreasingly complex responses. At each step, a client’s response was recorded, and when the correct response was given, the cueing procedure ceased. As a result, each client received cues in hierarchical order, however the number of cues varied across stimulus items, according to response accuracy.

**Commonalities in modified cueing hierarchies:**

These studies provide evidence of the effectiveness of modified cueing hierarchies. Each study was carefully designed and included appropriate experimental controls. The modified cueing hierarchies were individually created with respect to the participants’ abilities. Generalization was planned for and probed throughout treatment. All eleven participants showed a clear effect of acquisition. For example, Raymer, Thompson, Jacobs, and leGrand (1993) and Thompson and Kearns (1981) reported that their patients showed baseline data that were low and stable and acquisition data that changed as treatment was applied. Trupe’s (1986) patient, J. S., had baseline data below 20% on all stimulus sets, and showed performance that “improved abruptly with intervention” (p. 166), reaching accuracy levels of 90-100%.

**Differences in modified cueing hierarchies:** The intent of the studies of modified cueing hierarchies varied. For example, Best, Howard, Bruce, and Gatehouse (1997) demonstrated the utility of a cueing aid, a small, portable electronic box with nine letter keys, each of which was paired with the corresponding phoneme. When the patient pressed a letter key, the cueing aid produced the phoneme which assisted the patient in naming stimulus items. Best and colleagues reported that their patient (JOW) showed “highly significant improvement that generalized to naming of untreated items and was maintained over 15 months” (p. 125). In the 1993 study by Raymer and colleagues, the purpose was to demonstrate the utility of a phonologically based treatment to improve oral picture naming, and as noted above, all patients improved.

Other differences among studies are also apparent (refer to Table 2; e.g., number of participants, diagnosis, and time post onset of participants, the number of sessions, and exact method of experimental control). Greenwald, Raymer, Richardson, and Rothi (1995) treated two patients for just over 100 sessions, using three treatment programs for each patient. McNeil and colleagues (1995) treated one patient with Primary Progressive Aphasia for 31 sessions, and Thompson and Kearns (1981, p. 36) treated a patient in whom “auditory comprehension and repetition skills were relatively unimpaired,” for 84 sessions. McNeil and colleagues (1998) and Thompson and Kearns achieved experimental control with a single subject, multiple baseline design, across stimulus items, while Best and colleagues (1997) used control tasks to ensure improvement was not linked to general language improvement. Despite the differences, the evidence from these studies shows that cueing hierarchies were effective in improving naming.

**Generalization of treatment effects:** As in the studies of traditional cueing hierarchies, maintenance and generalization results from studies of modified cueing hierarchies are mixed. For example, Trupe (1986) and Thompson and Kearns (1981) demonstrated maintenance of the trained behavior several months after treatment ended, and all four participants in the study by Raymer and colleagues (1993) showed maintenance, although for different tasks. In contrast, McNeil and colleagues (1995) reported that maintenance was, “…not convincingly demonstrated…” for their patient, perhaps due to the diagnosis of primary progressive aphasia.

Best and colleagues (1997) showed that their
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patient generalized behavior to untrained items; Raymer and colleagues (1993) and Greenwald and colleagues (1995) reported varied patterns of generalization. The participant in the study of McNeil and colleagues (1998) showed no generalization within or across form classes, except for one instance of selective generalization to some stimulus items.

**Group Differences in Cueing Hierarchies**

Two differences, one theoretical and one practical, arise from the procedural differences between traditional and modified cueing hierarchies. The theoretical difference will determine the number of studies the reader accepts as evidence in support of cueing hierarchies. As described by Bollinger and Stout (1976), Linebaugh (1997, 1983), and Linebaugh & Lehner (1977), a cueing hierarchy is to be implemented in descending and ascending order, according to a client’s response and until a correct response is obtained. Accepting this definition leads one to include only the studies using a traditional cueing hierarchy (Table 1) as evidence for the effects of this treatment. Alternatively, one might expand the definition of a cueing hierarchy to include traditional and modified cueing hierarchies (Tables 1 and 2). Each of the studies noted above has followed accepted scientific principles of experimental design and analysis, and the data they contribute can be accepted with confidence; in question is the number of studies accepted as evidence.

Practical differences among the two groups of studies also arise from the procedure for implementing a cueing hierarchy and from one type of outcome data potentially desired from the treatment—the most effective cue type for a patient. Several authors have pointed out the desire to learn which type of cue is most powerful for an individual patient (i.e., Hillis, 1998; Linebaugh & Lehner, 1977; Varholak & Linebaugh, 1995). Knowledge of the cueing power structure for an individual may aid in stimulus and task selection for other treatment techniques, guide maintenance activities, and suggest generalization probes. Traditional cueing hierarchies provide this information; modified cueing hierarchies may or may not. Selection of a specific cueing technique, and determination of the number of studies accepted as evidence for that technique, will be guided by the need for information about the cueing power structure.

**Conclusion**

A cueing hierarchy is an approach to treatment for word retrieval impairment that is potentially effective across patients with impairment that occurs at various levels in the lexical retrieval system. Eleven studies involving 20 patients contribute to the body of evidence for this treatment technique. Cueing hierarchies differ in the number of steps, the specific tasks, and the stimulus items used, and can be implemented in one of two ways: traditional or modified. Naming improvement has been observed in as few as 5 sessions or in over 100 sessions. Results of probes for acquisition of naming behavior consistently show marked change in naming behavior following application of a traditional or modified cueing hierarchy. Results of maintenance and generalization probes are variable, however, suggesting that the long-term effects of this treatment approach are unclear, and may be highly individualized.

A cueing hierarchy can be an effective method of treatment for patients with word retrieval impairments; however, it is only one method to be considered in a treatment program. Other approaches may be as effective or more effective than a cueing hierarchy. For example, Hillis (1998) showed that H. G. made improvement when a cueing hierarchy was the treatment technique, and also when a semantic therapy was used. In selecting a treatment approach, a traditional or modified cueing hierarchy should be created with attention to the implementation procedure of the cueing hierarchy, to a client’s cue power structure, and to individual client performance levels. A cueing hierarchy should not be indiscriminately applied across clients.

Cueing hierarchies can be effective in clinical practice. The quality of evidence for cueing hierarchies is Class III evidence (American Academy of Neurology, 1994, p. 567), “evidence provided by expert opinion, non-randomized historical controls, or one or more case reports” (see Robey, 2001, for further discussion of Classes of Evidence). In addition to reporting the effectiveness of cueing hierarchies, it will be important to establish the efficacy of the technique, that is, to investigate the success of traditional and modified cueing hierarchies as exclusive agents of
change in highly controlled conditions with many patients (Robey).

In summary, clinicians who wish to use a traditional or modified cueing hierarchy as a treatment approach for a client with a word retrieval impairment may do so, confident in the evidence that supports the technique. Successful use of a cueing hierarchy will depend upon several clinical actions to insure the integrity of the technique for an individual client. First, the nature of the word retrieval impairment should be specified as clearly as possible to facilitate selection of appropriate cues. Second, assessment must indicate that the cues are ordered according to their relative stimulus power for the client. Third, stimulus items and classes should be carefully selected for use during the treatment program and generalization probes. Finally, the effect of an individual cueing hierarchy crafted for one client may or may not be successful for another client. Continuous analysis of clinical data will confirm the effectiveness of a cueing hierarchy for a specific client.

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### References


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Comprehension Approaches for Word Retrieval Training in Aphasia

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Some recent treatment approaches for word-retrieval impairments in aphasia have been influenced by cognitive neuropsychological models of lexical processing (See Raymer & Rothi, 2001, for a review). The model of lexical processing depicted in Figure 1 after Ellis & Young, 1988) shows that word retrieval or naming is accomplished when semantics is activated to trigger the meaning for an intended word and a phonological output lexicon is activated to retrieve the phonological form or sound characteristics of the corresponding word. These semantic and phonological processes are implemented in all naming tasks and can be initiated by modality-specific input from visual object representations (e.g., object or picture naming), phonological input representations (e.g., naming to spoken definitions), or orthographic input representations (e.g., oral reading).

(There are alternative non-semantic means to accomplish oral reading as well.)

In contrast, recognition of words and objects requires only activation of modality-specific input and semantic levels of processing. That is, the same visual-orthographic, visual-object, and phonological input processes involved in object and word recognition activate the semantic system that is also integral to production of spoken words. Recognizing this relationship, some researchers have incorporated comprehension treatments to improve word-retrieval abilities in aphasia. This paper examines evidence for the effects of the comprehension approach to improve oral word retrieval abilities in adults with aphasia.

In the comprehension approach, clinicians require patients to perform a series of tasks that activate lexical processing. In some tasks, patients make

![Figure 1. Routes for Comprehension Tasks that Facilitate Oral Naming](Adapted Model of Lexical Processing after Ellis & Young, 1988)
judgments about the meanings (semantic judgments) or the sound characteristics (phonological judgments) of the target words. In another type of comprehension task, patients match words and pictures, as in picture-to-spoken word matching, picture-to-written word matching, and definition-to-picture matching. Table 1 on page 29 lists some investigations that have incorporated a comprehension approach to improve word retrieval, the types of comprehension tasks used, and the number of subjects reported in each investigation. A key feature of studies examining the effects of comprehension treatments for improving word retrieval is the use of repeated practice over periods of time—often incorporating practice with multiple tasks. The results of these studies have suggested that participation in comprehension tasks can improve word retrieval abilities in some patients.

**Comprehension Tasks**

**Semantic Judgment Questions:** One task used in a semantic comprehension approach requires patients to perform semantic judgments about viewed pictures (Nickels & Best, 1996). For example, Ennis and colleagues (Ennis, 1999; Ennis, Raymer, Burks, et al., 2000; Ennis, Raymer, & Rothi, 2000) asked patients to make semantic judgments by responding “yes” or “no” to several spoken questions about a target picture (e.g., cat) (a) “Is it in the category of animals?” (category), (b) “Is this similar to a dog?” (coordinate word), and (c) “Does this chase mice?” (associated word). After the subject made semantic judgments regarding the target picture, the subject was asked to orally name the picture and then rehearse the name with the assistance of the clinician. Thus, spoken and pictured input was paired in the process of activating semantic information, and then the phonological form of the word was activated during the rehearsal phase. However, not all studies using a comprehension approach incorporate such a rehearsal phase.

**Phonological Judgment Questions:** In a phonological comprehension approach, Ennis and colleagues (Ennis, 1999; Ennis, Raymer, Burks, et al., 2000; Ennis, Raymer, & Rothi, 2000) asked their patients to make judgments about the sound characteristics of the target word by responding “yes” or “no” to several questions about the target picture (e.g., cat) (a) “Does this rhyme with bat?” (rhyming word), (b) “Does this begin with ‘k’?” (initial phoneme), and (c) “Does this have one syllable?” (word length). After the patient made phonological judgments regarding the target picture, the subject was asked to orally name the picture, followed by rehearsal of the target word. In another study, Howard, Patterson, Franklin, Orchard-Lisle, and Morton (1985) asked their subjects to perform several phonological tasks (repetition and initial phoneme cue), as well as a rhyming judgment: “Do these rhyme—tent, bent?” Thus, spoken and pictured input was paired in the process of activating phonological information.

**Word-to-picture matching:** Investigators have used practice with matching tasks to improve word retrieval as well. The target picture is paired with either a spoken or written word, and the subject must select the correct picture or word from among semantically-related foils. Howard and colleagues (1985) and le Dorze, Boulay, Gaudreau, and Brassard (1994) asked their patients to point to a picture from an array of three or four items (e.g., car, bus, truck, train) when the examiner verbally named the target picture (e.g., car).

In other investigations, participants matched a picture and a written word from an array of semantically-related foils (Drew & Thompson, 1999; Howard et al., 1985; Marshall, Pound, White-Thomson, & Pring, 1990; Nickels & Best, 1996; Pring, Hamilton, Harwood, & MacBride, 1993). During the training, some investigators permitted their patients to read aloud their written words (Marshall et al., Pring et al.). Others (Howard et al., Drew & Thompson) discouraged their participants from reading the written words aloud as they were interested in isolating the influence of reading comprehension alone in effecting changes in word retrieval. Silent reading of the written word choices kept this task consistent with solely written comprehension input, whereas allowing oral reading of the written words could introduce an additional input from auditory comprehension and potentially influence phonological input and output mechanisms.

**Definition Tasks:** Matching pictures to spoken definitions was one in a series of comprehension tasks utilized in two studies (Drew & Thompson, 1999; le Dorze et al., 1994). The examiner read a definition aloud (e.g., “Point to the animal that meows.”), and the participant pointed to a target picture (e.g., cat) from
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Table 1. Summary of seven studies that utilized comprehension approaches to treatment of word retrieval in adults with aphasia

<table>
<thead>
<tr>
<th>Reference</th>
<th>Subjects</th>
<th>Treatment Tasks</th>
<th>Intensity of Tx</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Howard et al., 1985</td>
<td>15, 9, 8</td>
<td>Auditory word-to-picture matching, written-word to picture matching, semantic &amp; rhyming judgments</td>
<td>4-5 sessions (group)</td>
<td>Semantic improvement &gt; phonological; Semantic better maintenance at 24 hrs</td>
</tr>
<tr>
<td>Marshall et al., 1990</td>
<td>3</td>
<td>Match written word to picture &amp; Written word to spoken definition; word production by patient</td>
<td>Approx. 3 hrs. (case studies)</td>
<td>Improved naming in 2/3 pts; maintained at 2-4 wks</td>
</tr>
<tr>
<td>Pring et al., 1993</td>
<td>5</td>
<td>Match picture to written words; Allowed to read aloud</td>
<td>10 sessions (case studies)</td>
<td>5/5 subjects improved</td>
</tr>
<tr>
<td>LeDorze et al., 1994</td>
<td>1</td>
<td>Match picture to spoken &amp; written words, semantic judgment questions</td>
<td>11 sessions (alternating treatment design)</td>
<td>Superior improvement when target word included in tasks; maintenance only immediate</td>
</tr>
<tr>
<td>Nickels et al., 1996</td>
<td>3</td>
<td>Judgment tasks; written word/picture matching</td>
<td>Varied across subjects (case studies)</td>
<td>2/3 subjects improved naming</td>
</tr>
<tr>
<td>Drew et al., 1999</td>
<td>4</td>
<td>Semantic judgment questions; Written word to picture matching, &amp; Naming to definition *Involved word production by patient</td>
<td>Up to 18 sessions per treatment (single subject crossover design)</td>
<td>Improved oral naming, generalization; good maintenance at 9 weeks; Superior performance with word form for some patients</td>
</tr>
<tr>
<td>Ennis, 1999, 2000a, 2000b</td>
<td>4</td>
<td>Semantic judgment questions plus versus phonologic judgment questions *Involved word production by patient in rehearsal phases</td>
<td>10 sessions per treatment (single subject crossover designs)</td>
<td>Improved oral naming in 2 of 4 for semantic; 3 of 4 for phonologic; some generalization; maintenance at 8 wks</td>
</tr>
</tbody>
</table>

an array of five items (e.g., cat, dog, fox, lion, and sheep). The target word was not provided for the stimulus, so that the patient never heard or read the target word during the task. In another investigation, Marshall and colleagues (1990) utilized a comprehension approach in which the examiner presented a spoken definition (e.g., “Point to the one that chases mice.”) and four written words (e.g., cat, dog, fox, and lion). The participants selected the target word corresponding to the spoken definition.

Definitions were used in a different way by Drew and Thompson (1999), who asked their participants to name the target word after a spoken definition was given. For example, the participant was shown an array of four to five pictures. Then the examiner said, “Say the word that means a tool for driving nails.” If the participant failed to name the target word hammer, the examiner said, “Look at this picture. The thing that drives nails is a hammer. Say hammer.”

**Treatment Results**

Table 1 reviews the results of seven studies examining the effects of comprehension treatments on word retrieval abilities in individuals with aphasia. The table indicates that there were variations among the studies. The range of total treatment times (i.e., number of sessions) varied across investigations from approximately 3 hours to as many as 25 treatment sessions for an individual participant. The number of participants in these investigations varied from as few as one subject in case studies, to 4 in single-subject experimental designs, to as many as 15 in a group study.

Results of comprehension approaches using semantic training tasks in these seven investigations revealed improved word-retrieval abilities in 17 of 20 participants and one group when incorporating spoken and/or written word forms during the course of treatment. Specifically, Pring and colleagues (1993) reported improved oral naming in 5 of 5 subjects, while
Nickels and colleagues (1996) reported success in 2 of their 3 subjects. Marshall and colleagues (1990) demonstrated improvement in oral naming in two of three case studies. Ennis and colleagues (Ennis, 1999; Ennis, Raymer, Burks, et al., 2000; Ennis, Raymer, & Rothi, 2000) reported improved oral naming in 2 of 4 subjects. Drew and Thompson (1999) reported success in all 4 participants. Le Dorze and colleagues (1994) also reported improved oral naming in their subjects when the spoken word form was included. Howard and colleagues (1985) also reported improved word retrieval in their series of semantic treatments in a group of subjects, however the number of individuals who benefited from treatment was not indicated.

**Contrasting Treatment Approaches:** Two studies contrasted semantic comprehension approaches with and without presentation of the spoken or written word form in the course of treatment. Drew and Thompson (1999) reported improved oral naming in 2 of 4 participants in which the word form was excluded from treatment, but additional improvement for both of these participants was reported in phase two when the spoken and written word forms were added. Their remaining two participants failed to show improvement in oral naming until phase two when the spoken and written word form was added. Likewise, in an alternating treatment design, Le Dorze and colleagues (1994) reported improved oral naming in their one subject when the spoken word form was included, but no improvement when the spoken word form was excluded during the treatment protocol. Thus, these two investigations revealed improvements in oral naming in 5 of their 5 participants with a semantic treatment when the spoken or written word forms were included as part of the treatment protocol. In addition, Howard and colleagues (1985) contrasted the effects of two comprehension approaches which utilized either written word forms (i.e., written word-to-picture matching) and or spoken word forms (i.e., “Does a cow eat grass?”). These investigators found substantial improvement in word retrieval in both semantic treatments in which the written word forms or spoken word forms were utilized.

Other comprehension studies contrasted the benefits of a semantic treatment and a phonological treatment within the same subjects. In a group design with 8 subjects, Howard and colleagues (1985) found significant improvement in oral naming with their semantic treatment and a brief benefit with the phonological treatment. Recently, Ennis and colleagues (Ennis, 1999; Ennis, Raymer, Burks et al., 2000; Ennis, Raymer, & Rothi, 2000) used single-subject experimental designs and found a improvement in oral naming in three of four participants using a phonological treatment protocol and in two of four participants using a semantic treatment protocol. One of their participants did not benefit from either treatment. Therefore, it is not clear with the current information whether semantic or phonological training leads to greater benefits.

**Maintenance of Treatment Effects:** The length of time at which maintenance measures were reported varied from study to study, ranging from 30 minutes to as long as 9 weeks posttreatment. Howard and colleagues (1985) reported larger and longer-lasting effects for their semantic treatment at 24 hours post treatment than for their phonological treatment, which had dissipated at 30 minutes post treatment. In contrast, Ennis and colleagues (1999; 2000a, b) found long-lasting effects of both phonological and semantic treatments with an advantage for the phonological treatment at eight weeks posttreatment. Drew and Thompson (1999) demonstrated maintenance at 9 weeks post treatment to a level slightly less than the average performance during the last three treatment sessions. Marshall and colleagues (1990) also showed improved oral naming in two of three participants up to 4 weeks post treatment. Le Dorze and colleagues (1994) reported positive maintenance effects at 48-72 hours post treatment in their semantic treatment utilizing spoken word forms.

**Summary and Conclusions**

These seven studies investigated whether or not lexical comprehension approaches are effective in the treatment of word retrieval impairments in individuals with aphasia. The results suggest that semantic comprehension treatments can lead to improvements in oral naming of pictures, particularly when the spoken and/or written word form is incorporated into treatment. Although most of these studies investigated semantic comprehension approaches, two of them also explored the effectiveness of phonological comprehension
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treatments. The results of phonological comprehension treatments are less clear at this time.

One notable difference in these studies of word retrieval treatment is revealed in their research designs. Historically, aphasia treatment research primarily utilized group experimental designs instead of the more recent single-subject experimental designs. The studies in this paper included group designs (Howard et al., 1985; Marshall et al., 1990), case studies (Marshall et al., 1990; Nickels & Best, 1996), and single-subject experimental research designs (Drew & Thompson, 1999; Ennis, 1999; Le Dorze, 1994). Current research with single-subject experimental designs allows the investigators to observe whether or not individual improvement occurred among participants, whereas in group studies the results are averaged across participants, and it is not evident what proportion of subjects truly found the treatment beneficial. Thus, with single-subject experimental design, it is obvious who benefited from treatment and who did not. Single-subject experimental designs offer a rigorous methodology for the investigations of treatment effects in aphasia and offer more potential for determining which participants may benefit from treatment and which participants may not.

Finally, in these studies most participants were trained for a predetermined length of time as specified by the research design. Therefore, in clinical practice speech-language pathologists could anticipate that periods of treatment may vary from the periods utilized in these studies to achieve maximum benefit for their patients.

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References


Aphasia: Treatment for Lexical and Sentence Production Skills
Impairment of the ability to retrieve and produce words is a common symptom of aphasia, although the severity varies and its manifestation can range from a brief pause in speech to a complete halt in the flow of discourse. Most studies that have investigated methods to improve lexical retrieval impairment have focused on performance in confrontation picture naming tasks. Although one can argue that naming pictures has little pragmatic value (Brookshire, 1997), sometimes it is easier to work on lexical retrieval in the context of confrontation picture naming than to work at a discourse level. For example, Shewan and Bandur (1986) stated that the focus of treatment for lexical impairment should be on “determining what cues or strategies help the client, increasing awareness of effective cues, and increasing their use” (p. 175). The target is known in a picture naming task, which is not always the case in discourse. Knowledge of the target makes it easier to gauge the accuracy of responses and the success of cues or strategies, so that confrontation picture naming sometimes provides the clinician with advantages that discourse level work does not.

Investigations concerned with the effects of techniques to improve confrontation naming can be divided roughly into two categories: facilitation studies and treatment studies. Facilitation studies are generally carried out with participants during a single examination session. They are primarily interested in whether a technique results in immediate improvement in a participant’s ability to name a pictured object, and frequently do not assess whether there is any generalization to untreated items. In the few instances in which maintenance has been assessed, it was tested within minutes or, at most, within 24 hours of the testing session. Examples of facilitation studies include Pease and Goodglass (1978), Patterson, Purrell, and Morton (1983), Li and Williams (1989), and Howard, Patterson, Franklin, Orchard-Lisle, and Morton (1985a).

In contrast, treatment studies generally employ a method across several sessions to evaluate longer-lasting changes in picture naming, making them more like the activities that clinicians typically use with people who have aphasia. Recent treatment studies can be classified into three broad categories: semantically based, phonologically based, and self-cueing.

Semantically based studies attempt to stimulate the semantic system through cues provided by the clinician that activate a word’s meaning. The techniques, such as matching a picture to a spoken word, matching a written word to a picture, or making a semantic judgment about a pictured item, are more conventionally used to target auditory or reading comprehension (e.g., Howard et al., 1985a). These comprehension treatments, discussed by Ennis elsewhere in this newsletter, have successfully improved confrontation naming abilities of participants, and several investigators have reported generalization and maintenance effects. Although these techniques hold promise for improving naming ability, they do not explicitly provide the participants with a means of self-cueing when word retrieval fails, as typically happens even after treatment ends.

Phonologically based studies aim to stimulate the phonological aspects of the naming process and use techniques—such as repetition, phonemic cueing, and rhyming judgments—that activate the sound structure of words. Howard and colleagues (1985b) and Raymer, Thompson, Jacobs, and le Grand (1993) reported improvement of picture naming and generalization to untreated items following phonologically based treatment approaches. As in semantically based approaches, the clinician provides the cues to stimulate the naming process, and, therefore, there is no provision of a means to self-cue explicitly when word retrieval fails for a participant after treatment ends.

Self-cueing studies investigate treatment techniques that, while striving to improve the lexical retrieval process, could also be used by participants as self-cueing strategies during word retrieval failures.
These techniques include PACE procedures, cueing hierarchies, and semantic feature analysis. Patterson presents evidence concerning cueing hierarchies elsewhere in this newsletter. Studies that used PACE procedures include those by Li, Kitselman, Dujsatko, and Spinelli (1988) and by Hinckley and Craig (1998). The remainder of this article will focus on evidence concerning the use of semantic feature analysis as a method for treating lexical retrieval impairments in aphasia.

**Semantic Feature Analysis**

The goal of semantic feature analysis (SFA) treatment is to improve lexical retrieval by accessing semantic networks (Haarbauer-Krupa, Moser, Smith, Sullivan, & Szekeres, 1985; Massaro & Tompkins, 1992). One theory of lexical retrieval hypothesizes that the mental lexicon consists of networks of concepts (Collins & Loftus, 1975; Levelt, 1989). Within these networks, concepts that share semantic features are more strongly related than concepts that do not share semantic features, and concepts that have more features in common are more strongly related than those that have fewer common features. For example, an apple and a cherry would be more strongly related than an apple and a radish. All three share the features of being foods that are red and round, but the apple and the cherry share the additional feature of being fruit, which the radish does not. Theoretically, when features are activated in the semantic networks, the activation spreads to strongly associated concepts and ultimately converges to activate the target concept. The concept, in turn, activates the phonologic information necessary to produce the word that names the target concept.

In SFA treatment, the person with aphasia is encouraged to produce words that are semantically related to the target word. For example, in one version of this treatment, the patient looks at a pictured object (e.g., an apple) and is encouraged to list: the category to which it belongs (fruit), what it is used for (eating), what it does (grows), its physical properties (red or green; round; skin, seeds, and stem), its usual location (on a tree), and anything strongly associated with it (pie) (Boyle, 1997; Boyle & Coelho; 1995; Coelho, McHugh, & Boyle, 2000). The expectation is that, by activating the semantic network surrounding the target in this way, the target itself will be sufficiently activated to allow production of its name.

SFA was originally reported as a technique to improve lexical retrieval in traumatically brain injured (TBI) participants (Haarbauer-Krupa et al., 1985). Massaro and Tompkins (1992) reported that the technique was successful in improving the lexical retrieval ability of two individuals with TBI. Ramage, Holland, Beeson, and Rewega (1999), using a modified version of SFA, reported improvement of word retrieval deficits in a person with mild TBI. To date, there have been four peer-reviewed publications or presentations that have investigated the effects of SFA treatment for lexical retrieval impairments in people with aphasia. All of these studies employed single-subject or case study designs. While these designs tell us a great deal about how the treatment worked for the individuals who participated in the studies, they limit our ability to predict how efficacious it will be for the aphasic population in general. However, because the investigations have used identical or similar methods to study individuals who differed in aphasia type, severity, and etiology, we can begin to hypothesize about which patients might benefit from this treatment.

**SFA Applied to Lexical Retrieval Impairments in Aphasia**

Boyle and Coelho (1995) used SFA to treat a 57-year-old man with Broca’s aphasia who was 65 months post onset of a left frontoparietal ischemic infarction (Table 1 on page 35). His Western Aphasia Battery (WAB) (Kertesz, 1982) Aphasia Quotient (AQ) was 82. After initial baselines for confrontation naming and connected speech were obtained, treatment commenced in three 60-minute treatment sessions per week for a total of 16 sessions. The participant was asked to name pictured objects. The clinician used a semantic feature diagram (Figure 1 on page 36) to prompt the participant to state the category to which the object belonged, its use, its action, its physical properties, its usual location, and something typically associated with it. The clinician wrote the features on the diagram as the participant said them. If the participant could not provide a feature, the clinician provided it orally and in writing. In order to establish and encourage use of the technique, all features were produced for all items, even those that the participant
named on initial confrontation or those that he named during semantic feature production. If the participant was still unable to name the item after the chart was complete, the clinician said the name aloud and required the participant to repeat it and to review all its features. After treatment, the participant’s ability to name both treated and untreated pictures had improved, and this improvement was maintained for 2 months after treatment ended. Measures of connected speech proposed by Nicholas and Brookshire (1993) did not show improvement after treatment, but a measure of social validity (Lomas et al., 1989) improved, indicating that the participant’s daughter judged his spontaneous speech to be better.

Boyle (1997) reported the results of SFA treatment for two individuals with aphasia (Table 1). The etiology of aphasia for both individuals was a single left CVA. One participant was a 70-year-old man with anomic aphasia, 15 months post stroke onset, with a WAB AQ of 90.6. The other was an 80-year-old man with Wernicke’s aphasia, 14 months post stroke onset, with a WAB AQ of 61.2. Baseline and treatment procedures were the same as those used by Boyle and Coelho (1995). The participants were seen individually for three 60-minute sessions per week, for a total of 12 sessions each. Post-treatment measures showed improved confrontation naming of trained and untrained pictures, which was maintained one month after treatment ended. Information about generalization to connected speech and social validity was not reported.

The participant with anomic aphasia achieved a greater degree of accuracy on trained and untrained pictures than the participant with Wernicke’s aphasia. Boyle (1997) speculated that this difference might be due to the more severe aphasia exhibited by the individual with Wernicke’s aphasia. Alternatively, she speculated that Wernicke’s aphasia might impair the lexical retrieval process differently than anomic aphasia or that an interaction of severity and differential impairment might account for the differences in performance. Whatever underlies the performance difference, these studies showed that SFA treatment could potentially be successful with some individuals with anomic and Wernicke’s aphasia, as well as with Broca’s aphasia.

Coelho, McHugh, and Boyle (2000) used SFA to treat a 52-year-old man with moderately severe fluent aphasia (WAB AQ=57) who was 17 months post onset of a traumatic brain injury (TBI) (Table 1).

Table 1. Summary of semantic feature analysis (SFA) treatment studies. All participants were premorbidly right-handed men who were native English speakers. N = number of participants. MPO = months post onset. AQ = Aphasia Quotient. WAB = Western Aphasia Battery. ADP = Aphasia Diagnostic Profiles

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Aphasia Type</th>
<th>Aphasia Severity</th>
<th>Age (years)</th>
<th>MPO</th>
<th>Etiology</th>
<th>Improved naming of treated items?</th>
<th>Generalization</th>
<th>Connected Speech</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boyle &amp; Coelho, 1995</td>
<td>1</td>
<td>Broca’s aphasia</td>
<td>AQ = 82 (WAB)</td>
<td>57</td>
<td>65</td>
<td>L CVA</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes, 2 months</td>
</tr>
<tr>
<td>Boyle, 1997</td>
<td>2</td>
<td>anomic aphasia</td>
<td>AQ = 90.6 (WAB)</td>
<td>70</td>
<td>15</td>
<td>L CVA</td>
<td>Yes</td>
<td>Yes</td>
<td>Not reported</td>
<td>Yes, 1 month</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wernicke’s aphasia</td>
<td>AQ = 61.2</td>
<td>80</td>
<td>14</td>
<td>L CVA</td>
<td>Yes</td>
<td>Yes</td>
<td>Not reported</td>
<td>Yes, 1 month</td>
</tr>
<tr>
<td>Coelho, McHugh, &amp; Boyle, 2000</td>
<td>1</td>
<td>fluent aphasia</td>
<td>AQ = 57 (WAB)</td>
<td>52</td>
<td>17</td>
<td>TBI</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes, 2 months</td>
</tr>
<tr>
<td>Lowell, Beeson, &amp; Holland, 1995</td>
<td>3</td>
<td>conduction aphasia</td>
<td>68th percentile (ADP)</td>
<td>74</td>
<td>16</td>
<td>L CVA</td>
<td>Yes</td>
<td>Yes</td>
<td>Not reported</td>
<td>Yes, 1 week</td>
</tr>
<tr>
<td></td>
<td></td>
<td>conduction aphasia</td>
<td>77th percentile (ADP)</td>
<td>76</td>
<td>9</td>
<td>L CVA</td>
<td>Yes</td>
<td>Yes</td>
<td>Not reported</td>
<td>Yes, 1 week</td>
</tr>
<tr>
<td></td>
<td></td>
<td>anomic aphasia</td>
<td>55th percentile (ADP)</td>
<td>66</td>
<td>30</td>
<td>L CVA</td>
<td>No</td>
<td>No</td>
<td>Not reported</td>
<td>Not tested</td>
</tr>
</tbody>
</table>
A CT scan showed a left temporal fracture and lateral temporal lobe contusion. Baseline and treatment procedures were the same as those used by Boyle and Coelho (1995). Treatment occurred during three 60-minute sessions per week, for a total of 20 treatment sessions. Post-treatment measures showed improved confrontation naming of trained and untrained pictures that was maintained two months after treatment ended. Additionally, this individual demonstrated modest increases from baseline levels on the connected speech measures of words produced per minute and correct information units (Nicholas & Brookshire, 1993).

The individual with TBI studied by Coelho and colleagues (2000) did not achieve as substantial a treatment effect as the individuals with Broca’s aphasia (Boyle & Coelho, 1995) or anomic aphasia (Boyle, 1997) reported earlier. His treatment effect was similar to that achieved by the person with Wernicke’s aphasia (Boyle). The individuals with TBI and Wernicke’s aphasia had lower AQs than those with Broca’s and anomic aphasia, lending support to the speculation that individuals with more severe aphasic impairments might not benefit as greatly from SFA treatment as individuals who are less severely impaired. However, both of these more severely impaired individuals also had fluent aphasias with spontaneous speech that was characterized by frequent paraphasic errors. Therefore, the possibility that aphasia type might contribute to the smaller treatment effect in a way that is not entirely related to severity cannot be ruled out.

The individual with TBI (Coelho et al., 2000) demonstrated generalization to connected speech, unlike the participant with Broca’s aphasia (Boyle & Coelho, 1995). Coelho and colleagues pointed out that their participant with TBI produced more than twice the amount of connected speech per minute (words per minute and correct information units per minute) than the participant with Broca’s aphasia both before and after treatment. Thus, his more robust connected speech may have provided more potential for generalization than did the sparse connected speech output of the individual with Broca’s aphasia.

Lowell, Beeson, and Holland (1995) applied a modified version of SFA treatment to three men, each of whom had suffered a single left CVA (Table 1): BB, a 74-year-old with conduction aphasia who was 16 months post onset and at the 68th percentile of aphasia severity (Aphasia Diagnostic Profiles, Helm-Estabrooks, 1992); BG, a 76-year-old with anomic aphasia who was 9 months post onset and at the 77th percentile of aphasia severity; and SB, a 66-year-old with conduction aphasia who was 30 months post onset and at the 55th percentile of aphasia severity. Prior to

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**Figure 1.** Semantic feature analysis chart. See text for a description of how the chart is used.
treatment, the clinician presented each target picture to each participant and prompted him to complete an SFA diagram for it. From the semantic features that were generated, the participant selected four that he considered most meaningful for each picture. These four semantic features were written on index cards and subsequently read aloud by the participant and the clinician during treatment sessions as the target picture was presented, after which the participant was asked to name the target picture. After baseline measures were obtained, treatment commenced in three sessions per week, for a total of 17 to 19 sessions across participants. One individual with conduction aphasia (BB) and another with anomic aphasia showed improved naming of treated and untreated pictures that was maintained for one week after treatment ended. The other participant with conduction aphasia (SB) never reached criterion and showed no substantial improvement on treated or untreated items. Lowell and colleagues reported that this individual performed in the low-moderate range on a battery of nonverbal cognitive tests that were administered as part of an unrelated study. They speculated that his cognitive limitations, perhaps in combination with his more severe aphasia, might have limited his ability to benefit from the treatment. These results support those in the previously reported studies that suggested that SFA treatment can improve lexical retrieval in individuals with different aphasic syndromes, but that severity of aphasia may limit or preclude benefits from this treatment. Because participants with moderate aphasia have benefited from SFA treatment (Boyle & Coelho, 1995; Boyle, 1997; Coelho, McHugh, & Boyle, 2000), it seems likely that the cognitive limitations that Lowell and colleagues reported for their patient were more responsible for his failure to benefit from the treatment than was the moderate severity of his aphasia.

Discussion

SFA treatment has improved lexical retrieval to varying degrees in six of seven individuals with aphasia reported. Participants who benefited from the treatment had mild or moderate aphasia secondary to stroke and included individuals with Broca’s (N=1), anomic (N=2), conduction (N=1), and Wernicke’s aphasia (N=1), as well as one person with fluent aphasia secondary to TBI. Individuals with moderate aphasia made less substantial improvement in treatment than those with mild aphasia, and a participant with moderate aphasia and cognitive impairment did not derive any benefit from the treatment. It should be noted that none of these individuals had significant motor speech disorders, so there is no information about how a motor speech disorder might influence the outcome of SFA treatment.

Although length of treatment ranged from 12 to 22 sessions, it is likely that substantial improvement can occur for most individuals in fewer sessions. For reasons relating to research design, most of these studies treated lists of words sequentially, and therefore the participants had to stay in treatment until all lists had been treated. However, inspection of participants’ treatment graphs indicates that those who benefited from treatment achieved the level of improvement that they would ultimately maintain by the eighth or ninth treatment session. Given the current limitations on treatment reimbursement, SFA treatment might provide appropriately selected patients with improved lexical retrieval in a reasonable time period. Additionally, maintenance effects up to two months have been reported (Boyle & Coelho, 1995; Coelho, McHugh, & Boyle, 2000). However, these effects were obtained for treatments lasting 12 to 22 sessions and it is not clear that such robust effects would hold for shorter treatment periods. Nonetheless, Boyle’s (1997) participants, who were only treated for 12 sessions, maintained their improvements for 1 month following treatment, suggesting that treatment of at least this length can have moderately lasting effects.

Boyle and Coelho (1995) and Lowell and colleagues (1995) hypothesized that SFA treatment yields positive generalization and maintenance effects because the patient actively participates with the clinician to generate the semantic features. This feature generation procedure is practiced repeatedly during treatment, and it is possible that the participant is able to internalize the process and use it as a strategy when naming difficulties occur. The process has the added advantage that, if a person generates the features aloud as he is searching for a word, he will probably provide the listener with sufficient information that the target can be guessed, even if the individual is ultimately unable to self-cue its name.
Although generalization to untreated pictures has been demonstrated for six individuals, changes in connected speech were only reported for two (Boyle & Coelho, 1995; Coelho, McHugh, & Boyle, 2000). One individual demonstrated improvements in connected speech, and the other did not. As noted previously, this difference may have been related to the relatively sparse connected speech of the person who did not improve. It is difficult to base such judgments on results from two participants, however, and further investigation is necessary to assess the influence of SFA treatment on connected speech.

Finally, while evidence from seven individuals allows us to make some preliminary hypotheses about which individuals with aphasia might benefit from SFA treatment and about how long treatment might need to last, it is too small a number to permit reliable conclusions about these matters. Additional investigations are necessary exploring the influence of type and severity of aphasia, the impact of accompanying deficits, and the effects of SFA treatment on discourse and on participation in life.

Formerly the director of speech-language pathology services at Burke Rehabilitation Hospital in White Plains, New York, Dr. Mary Boyle is now an associate professor in the Dept. of Communication Sciences and Disorders at Montclair State University.

References


Aphasia: Treatment for Lexical and Sentence Production Skills

Verbs and Sentence Production in Aphasia: Evidence-Based Intervention

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Agrammatism

For some individuals with aphasia, verbal communication appears to be limited by disruption to the grammatical functions that support the construction of formal language, yielding a language disorder commonly known as agrammatism. In this review, we support a view of agrammatism as a largely heterogeneous disorder that is best understood on the basis of individual patterns of production observed in aphasic speech.

Grammatical disturbances of spoken production associated with aphasia were once believed to arise, in certain cases, from a unitary impairment that yielded a predictable set of symptoms. Agrammatism was characterized by nonfluent, effortful speech marked by omission of free and bound grammatical morphemes and poor production of verbs relative to nouns. The clustering of symptoms suggested to theoreticians that a single neuroanatomical site must normally support syntactic function and that damage to that component of language (i.e., the syntactic component) would yield a syntactic impairment (Caramazza & Zurif, 1976). Further evidence in favor of a central syntactic deficit was obtained when carefully constructed tests revealed that the grammatical production impairment (Saffran, Schwartz & Marin, 1980) was accompanied by a syntactic comprehension impairment (Berndt & Caramazza, 1980; Schwartz, Saffran, & Marin, 1980). These studies set the stage for several years of intense debate regarding the theoretical underpinnings of agrammatism.

Studies of agrammatism since the early 1980s repeatedly demonstrated that the complex patterns of grammatical impairment actually observed in aphasic speech were not captured by the idealized versions of agrammatism held up for theoretical study (see Berndt, 1991; Goodglass, 1993, for detailed historical discussions). The syntactic deficit hypothesis proved false as the symptoms once considered to arise as one were shown to dissociate in virtually every direction. Another major problem of many studies was exclusive focus on non-fluent speakers, as fluent speakers have been shown to demonstrate many of the features associated with agrammatism (Goodglass, 1993).

The view of agrammatism as a multi-component processing disorder that is observed in many forms of aphasia has led to an important shift in the focus of many language researchers. When studies of aphasic production were focused on syndrome identification, “group” studies predominated because the goal was to classify aphasic speakers by group (Broca’s aphasia, Wernicke’s aphasia, etc.) in order to compare “types” of aphasia to one another. An important goal at the time was to establish neuroanatomic correlates of co-occurring symptoms in order to learn something about how cognitive functions are organized in the brain (Geschwind, 1965). More recently, emphasis has shifted toward identifying and exploring individual performance patterns (Caramazza, 1986) from both fluent and nonfluent aphasic speakers, whose symptoms are characterized in detail (Berndt, 2000). Some experimental “grouping” continues, though it is often on the basis of the presence or absence of a particular symptom (Badecker & Caramazza, 1985) and is accompanied by an analysis of individual performance (e.g., Berndt, Haendiges, Mitchum, & Sandson, 1997).

The increased attention to individual performance patterns has yielded a complex theoretical basis for the study of agrammatic sentence production. In order to establish an organizing framework for interpreting aphasic symptoms, many researcher—and increasing numbers of clinicians—take the approach of comparing aphasic per-formance to normal performance on a particular cognitive task. This line of research is rooted in the discipline of Cognitive Neuropsychology. (See Coltheart, 1984, for a summary of this perspective; see Hillis, 2001; Mitchum & Berndt, 1995; Seron & De-loche, 1989, for discussions of its relevance to aphasia treatment.) In this approach, the goal of assessment is to explain how normal function has been disrupted by aphasia, rather than to obtain a clinical classification. Cognitive analyses offer a method of interpreting rather than diagnosing aphasic language.