

Phonological naming therapy in jargon aphasia: Positive but paradoxical effects

JO ROBSON, JANE MARSHALL, TIM PRING, AND SHULA CHIAT

Department of Clinical Communication Studies, City University, London

(RECEIVED November 1, 1997; ACCEPTED March 2, 1998)

Abstract

This article is a single-case investigation of phonological naming therapy. The individual involved had fluent jargon speech, with neologisms, verbal paraphasias, and paragrammatisms. The jargon was underpinned by a severe anomia. Content words were rarely accessed either in spontaneous speech or naming. Single word investigations highlighted some preserved skills. Auditory comprehension, at least for concrete words, was relatively intact and although nonwords could not be repeated, words could, and at a level which was far superior to naming. The patient also had some ability to respond to phonological cues. These results suggested that phonological representations were preserved and that there were some intact semantic abilities. It seemed that the naming disorder was primarily due to an inability to access phonology from semantics. Therapy took a phonological approach. The patient was encouraged to reflect upon the syllabic structure and first phoneme of pictured targets. Subsequently, she was required to use this partial phonological knowledge as a self-cue. It was hypothesized that this therapy might equip the subject with a self-cuing naming strategy. Posttherapy investigations of naming demonstrated dramatic improvements, which generalized to untreated items. However, there was little evidence that these were due to a self-cuing strategy. Performance on phonological judgment and discrimination assessments, which required conscious phonological reflection, was unchanged, and there were no signs that the patient was self-cuing during naming. Reasons for these paradoxical results are discussed. (*JINS*, 1998, 4, 675–686.)

Keywords: Jargon aphasia, Anomia, Phonological therapy, Self-cuing strategy

INTRODUCTION

Anomia, or word finding difficulty, is one of the most common aspects of aphasia. Indeed, it is rare to find a person with aphasia without this problem. The presentations of anomia vary greatly, however. In some cases the problem causes hesitancy and omissions, while in others there may be a wide variety of speech errors.

Several commentators suggest that neologistic jargon aphasia may be an unusual and striking manifestation of anomia (e.g., Butterworth, 1985; Ellis et al., 1983). This view is supported by evidence that neologisms follow hesitations, suggesting that an unsuccessful word search has taken place (Butterworth, 1979). There is also evidence that neologisms substitute for low frequency content words, while high frequency content and function words may be realized

correctly (e.g., Butterworth, 1979). Further evidence from longitudinal studies has shown that some people with jargon aphasia evolve into anomic speakers (e.g., Panzeri et al., 1987).

This view suggests that the rehabilitation of jargon aphasia might try to improve the word finding abilities of these patients. However, therapy studies of people with jargon aphasia are rare (but see Robson et al., 1998) and few, to our knowledge, have attempted to remediate the word finding problem. The dearth of studies may reflect the particular problems of therapy with these patients. One problem is the lack of self-monitoring that is often present (Maher et al., 1994; Marshall et al., 1998; Shuren et al., 1995). Without such monitoring, patients may be unaware of their speech problem and of the need for rehabilitation. A second problem is that auditory comprehension is often poor (Butterworth, 1985). This may contribute to the monitoring deficit and may impede the administration of therapy tasks.

Although there are few reports of word finding therapy with jargon speakers, there are numerous studies showing

Reprint requests to: Jo Robson, Department of Clinical Communication Studies, City University, Northampton Square, London EC1V 0HB, U.K. E-mail: J.Robson@city.ac.uk

that other people with aphasia respond positively to such therapy (see Nickels & Best, 1996, for a review). However, the extent of generalization and maintenance of improvement varies from study to study. Commonly, only items that have been directly treated, or that appear in therapy, improve (e.g., Howard et al., 1985a, 1985b; Marshall et al., 1990; Pring et al., 1990, 1993). Widespread improvements to both related and unrelated words are rare, but have occasionally been observed (e.g., Best et al., 1997).

Although naming therapy appears to work it is unclear how it does so. One question is whether therapy should focus on the semantic or phonological properties of words. Semantic therapy involves tasks like matching a word to a picture, making judgments about the meaning of a word or responding to definition cues; whereas phonological therapy may involve rhyme, syllable, or first-phoneme judgments or responding to phonological cues. Howard et al. (1985a) found that semantic tasks were more effective than phonological tasks in facilitating naming. However, the duration of therapy was critical. When this was increased, both semantic and phonological techniques were successful (Howard et al., 1985b). Furthermore, Le Dorze et al. (1994) point out that the semantic therapies in these studies also give phonological or orthographic information as spoken or written words were also presented. When they removed these from their therapy, no positive effects were achieved.

The success of semantic or phonological therapy may depend on the site of the naming deficit. Cognitive neuropsychological models of lexical processing (see Figure 1) suggest that naming may fail for a number of reasons. In some cases there may be a central semantic impairment (e.g., Hillis et al., 1990; Howard & Orchard-Lisle, 1984), while in others there may be a problem accessing entries in the phonological output lexicon, or within the lexicon itself (e.g., Kay & Ellis, 1987; Raymer et al., 1993).

Several commentators have argued that treatment for anomia should be guided by a cognitive neuropsychological analysis of the problem (e.g., Greenwald et al., 1995; Hillis, 1993; Le Dorze & Pitts, 1995; Lesser, 1989; Nettleton & Lesser, 1991; Rothi et al., 1991). In simple terms, we might expect that therapy would be most effective if it employs tasks that engage the deficient processing level. However, the relationship between impairment and treatment content appears to be less straightforward. People without a semantic disorder profit from semantic therapy (Marshall et al., 1990) and, perhaps more surprisingly, individuals with semantic problems gain from phonological therapy (Raymer et al., 1993). It seems that either approach can be effective, and that choice of therapy is not directly determined by the impairment site (see Caramazza, 1989; Hillis & Caramazza, 1994, for further discussion about the relationship between the cognitive analysis of the impairment and therapy).

The nature of the task is not the only unresolved issue. Another is *how* the task works. One hypothesis is that therapy gives the individual a conscious, problem solving technique, which compensates for their specific processing difficulties. We shall call this the *strategic hypothesis*. In

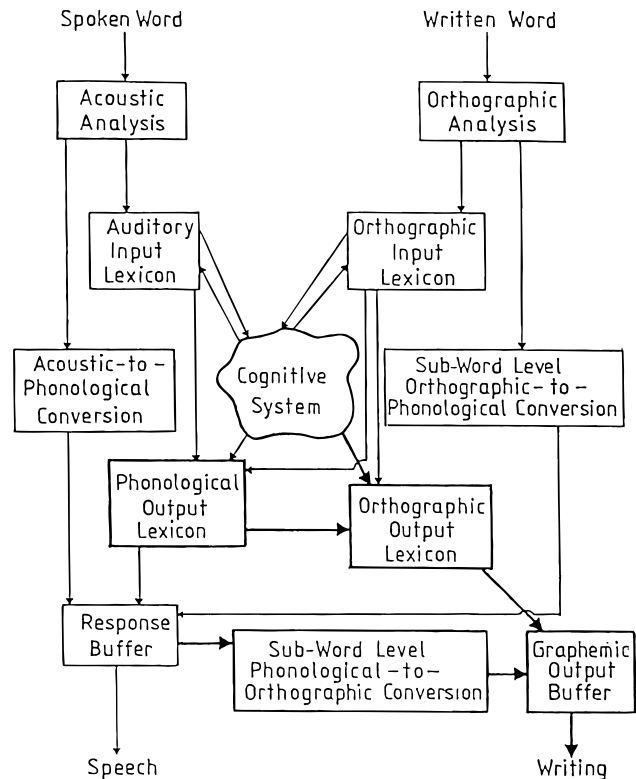


Fig. 1. A model of lexical processing (from Patterson & Shewell, 1987).

essence, the person is encouraged to perform the task in a new way, often by calling upon relatively preserved abilities. Adoption of this approach may be underpinned by the assumption that the processing system itself is not amenable to direct restitution.

An example of therapy which achieved strategic gains was that carried out by Nickels (1992, 1995). The patient in this study, T.C., had a severe anomia. Written naming was better than spoken naming indicating that the problem was partly in accessing phonology. The presence of semantic errors in all modalities pointed to an additional semantic deficit. Non-word reading and writing were impossible, suggesting that the sublexical processing routes were unavailable. Nickels aimed to improve spoken naming via a reading-aloud strategy. This would enable T.C. to draw upon his relatively preserved writing as a route to phonology. Following De Partz (1986), the therapy focused on conversion from orthography to phonology. T.C. was taught to associate letters with relay words and then segment the first phoneme of the word for pronunciation. In a deviation from De Partz's original program, T.C. was encouraged to incorporate this letter to sound conversion skill into a naming strategy. As a result of this therapy, T.C.'s spoken naming improved to the level of his written production. Nickels explains this by suggesting that T.C. could visualize the written word, convert the first letter to a phoneme and cue his naming. This interpretation was supported by overt, posttherapy use of the first phoneme strategy.

Strategic problem solving, so strongly featured in Nickel's program with T.C., is arguably present in all aphasia therapy. Most therapists employ carefully structured questions, cues, and feedback, presumably to help a client to develop a better understanding of their problems and how to tackle them (see Byng, 1995, for discussion). However, this need not mean that all gains are strategic. It is possible that, through conscious and deliberate practice, therapy may partially restore the on-line functioning of the language system. Several commentators suggest that such direct effects on the language system are possible, even though their precise nature is poorly understood (see, e.g., Caramazza, 1989; Howard & Patterson, 1989, for discussion).

This study investigates a phonologically based naming therapy carried out with G.F., a person with jargon aphasia. Therapy encouraged G.F. to think about the phonological structure of target words. It aimed to develop a phonological self-cuing strategy and thereby improve naming. As well as pre- and posttherapy evaluations of naming, tests of phonological awareness, such as syllable and first phoneme judgments were carried out. We hypothesized that these tasks would improve if a phonological strategy were employed. Strategic gains would also be signaled by overt self-cuing after therapy. A conscious strategy for the retrieval of word phonology might assist words other than those employed in the therapy tasks. Consequently, the experimental design allowed for the assessment of generalization to untreated words. The maintenance of treatment effects was also assessed by a further assessment 8 weeks after therapy had ceased.

THE PATIENT

G.F. suffered a left CVA in 1994 at age 55 years. It resulted in a dense right hemiplegia and a severe jargon aphasia. A CT scan revealed a large acute infarct with mass effect in the territory of the left posterior cerebral artery and the posterior branches of the left middle cerebral artery.

Following her CVA, G.F. received 3 months of intensive therapy at a medical rehabilitation center. She was then discharged home and continued to receive domiciliary support. This study began in January 1996 when she was 24 months postonset and when other language therapy had ceased.

G.F. is married with one adult son and two grandchildren. Prior to her CVA she worked as an orthopedic masseuse. She is a right-handed monolingual English speaker who left school at age 18 years.

Language Presentation

Investigations of input

G.F.'s comprehension, although impaired, was usually adequate for conversational purposes. Despite this, she experienced some difficulty in formal tests of sentence comprehension. On the Test of Reception of Grammar (Bishop, 1982) she scored 56/80 and passed just eight blocks.

Table 1 presents the results of single word input tests, most of which are drawn from the Psycholinguistic Assessments of Language Processing in Aphasia (PALPA; Kay et al., 1992). Although impaired, G.F. is well above chance on most of the auditory tests, indicating that she can discriminate, identify, and comprehend concrete words. The Pyramids and Palm Trees Test (Howard & Patterson, 1992) also shows her non-verbal semantic skills to be virtually unimpaired. Her results decline markedly with abstract words. There is a significant imageability effect in Lexical Decision (40/40 vs. 32/40, $\chi^2 = 8.88, p < .01$) and Synonym Judgments (26/30 vs. 17/30, $\chi^2 = 6.64, p < .01$). We can conclude that the semantic representations of low imageability words are impaired or inaccessible.

Although G.F.'s auditory comprehension is relatively preserved her written comprehension is not. When matching words to pictures she is significantly stronger in the spoken than the written modality (39/40 vs. 28/40, McNemar $\chi^2 = 7.69, p < .01$) (Leach, 1979). It seems that there are specific problems in accessing semantics from written words.

Table 1. Results from single-word input tests

PALPA		
Test Number	Title	Score (%)
–	Pyramids and Palm Trees Test (all picture version)	90
2	Same–Different Discrimination Using Word Minimal Pairs	86
5	Auditory Lexical Decision	
	High imageability words	100
	Low imageability words	80
	Nonwords	75
	Total	82
47	Spoken Word to Picture Matching	97
49	Auditory Synonym Judgments	
	High imageability words	87
	Low imageability words	57
	Total	72
48	Written Word to Picture Matching	70

Investigations of output

Immediately after her CVA, G.F.'s speech consisted of fluent neologistic jargon. In the following months the number of neologisms declined, although they were still present in her speech. Other features of her output were empty English jargon, verbal paraphasias, and paragrammatisms (see Table 2).

G.F.'s single-word production was assessed using PALPA Test Number 53 (Kay et al., 1992). This test has 40 low frequency, high imageability words to be named from pictures, repeated, and read aloud. The tasks were administered on separate occasions to avoid priming. The results are shown in Table 3.

The naming section of the test had been administered 6 months prior to this study. On this occasion G.F. scored zero. She now scored 1, which was significantly worse than her repetition (McNemar $\chi^2 = 16.05$, $n = 80$, $p < .001$) and her reading aloud (McNemar $\chi^2 = 5.82$, $n = 80$, $p < .05$). Most naming errors were *no responses* often accompanied by comments on her failure to name the item. She also made verbal paraphasias and occasional neologisms and semantic errors. G.F.'s error awareness was good. She rejected all her errors, including those that were semantically related to the target.

The naming task was extended to explore the effects of cuing. When G.F. could not respond, she was provided with either a semantic or phonological cue. Semantic cues were information about the category of the item and its function. Phonological cues consisted of the first phoneme of the word plus *schwa*. Semantic cues were ineffective. G.F. was irritated by them, often responding with comments such as "I know what it is." In contrast, phonological cues were mildly facilitative. G.F. was supplied with 15 such cues which elicited the target on five occasions.

G.F.'s reading aloud and repetition and her response to phonological cues suggested that she retained phonological representations but had difficulty accessing them. To explore this hypothesis, two further tests of repetition were administered. In the first, G.F. was asked to repeat 30 non-words (PALPA Test Number 8). She performed very poorly on this task, just three items being correct. In the second, G.F. was asked to repeat 75 high- and 75 low-imageability

Table 2. Sample of spontaneous speech

<i>Therapist:</i>	Tell me what you did over Easter.
<i>G.F.:</i>	I was quite . . . erm . . . that's why I can't get /'weəd/ keep . . . erm makes me very erm here up here makes him all /s/ all /'seʔbr' taid/ but these come and I can't it might be because I had another /'mɪŋsɪŋ/ no sort of erm I mean but /tə/ when you cough you different but when you right when you lie to her . . . see I'm I'm how can I put . . . its the work I can meet it all but /ətə/ I . . . I must /kɪ/ when I torn this off that's it but with this I'm cold.

Table 3. Results of Single Word Production Assessments (PALPA)

PALPA Test Number 53	Correct	VP	PE	SE	Neol	NR
Naming	1	11	1	2	4	21
Repetition	19	5	2	3	0	11
Reading Aloud	10	6	2	3	1	18

VP = Verbal Paraphasia.

PE = Phonological Error.

SE = Semantic Error.

Neol = Neologism.

NR = No response—including aborted responses and empty circumlocutions.

words (matched for frequency). She was significantly more successful with the high imageability set (20/75 vs. 33/75, $\chi^2 = 4.93$, $p < .05$).

G.F.'s inability to repeat nonwords suggested that she could not use the acoustic-to-phonological conversion route (see Figure 1). Consequently, she must repeat words by accessing the phonological output lexicon. The imageability effect, and occasional semantic error, indicates use of the semantic route but the advantage of repetition over naming suggests some use of the route that connects the auditory input lexicon with the phonological output lexicon.

G.F.'s repetition suggested that phonological representations were available to her and accessible by summing activation from both lexical routes. Her poor access to phonology in naming may be attributable to two factors. Imageability effects suggest that a semantic deficit is present. However, G.F. made few errors in comprehending concrete words and when semantic errors occurred in naming, she was always aware of them. Thus her primary problem with these words appears to be in accessing their phonology.

Conclusions From the Investigations and Therapy Rationale

G.F.'s communication was hampered mainly by her output problems. Her jargon reflected a severe word finding problem and very few content words were accessed either spontaneously or in naming tasks. The results of comprehension and repetition tests indicated that the impairment was mainly due to an inability to access phonology from semantics. G.F. was clearly aware of her word finding problems and could introspect on their nature. Her comments suggested that she continually experienced tip-of-the-tongue states and she hinted at some phonological awareness of words, with such comments as "I had it there and then it went." These insights were consistent with the diagnosis of impaired phonological access. They also suggested that her partial phonological knowledge could be exploited in therapy.

The assessment results, G.F.'s own insights and her response to phonological cues suggested that therapy should work at the phonological level. Assessment also high-

lighted a number of skills that are unusual in jargon aphasia and which could be recruited in therapy. Firstly, G.F. was very aware of her impaired naming, was frustrated by naming tasks, and greeted errors with instant rejection. This awareness differentiates G.F. from many other individuals with jargon aphasia (e.g., see Marshall et al., 1998) and made her very willing to participate in naming therapy. Secondly, G.F. had some useful auditory input skills. She could not only comprehend concrete words, but also do phonological discrimination tasks with them; for example, she could match words to picture in the presence of phonologically related distractors. This again suggested that G.F. had some latent phonological skills and might gain from a phonological strategy for naming.

The Design of the Therapy Study

The therapy design aimed to address four questions:

1. Will phonological therapy improve G.F.'s ability to name treated words?
2. Will naming of untreated words that are phonologically related to the treated set improve?
3. Will naming of untreated words that are phonologically unrelated to the treated set improve?
4. Will phonological therapy improve G.F.'s ability to reflect upon the phonology of treated and untreated words, in a way consistent with the acquisition of a phonological strategy?

These questions were addressed by four assessments carried out before therapy commenced, immediately after therapy, and 8 weeks after therapy had ceased. The assessments comprised the following:

Picture naming assessment

G.F. was asked to name 72 black-and-white drawings. Phonological cues were offered, in the form of the initial consonant plus schwa, after failures to name an item or errors and responses recorded. The drawings consisted of 24 treated and 48 untreated words. Treated words began with the consonants: /k/, /b/, /s/, /f/, /m/, and /n/. The untreated words were divided into *phonologically related* and *unrelated* sets. The former began with the same consonants as the treated words, the latter began with the consonants (/g/, /p/, /ʃ/, /v/, /dʒ/, /tʃ/). The sets were balanced for frequency and syllabic structure each having 12 single syllable and 12 bisyllabic words. Thus the treated set contained four words beginning with /k/, two with one syllable and two with two syllables. None of the tested words began with clusters.

First phoneme judgment with pictures assessment

Two pictures were shown and G.F. was asked to decide whether their names began with the same phoneme. The stim-

uli were the three sets of items from the naming task. Each pair of items was drawn from the same set. Thus two stimuli from the treated set were *key* and *cup* (same) and *key* and *boy* (different). Each target item appeared four times in the test, twice in a positive and twice in a negative pairing.

First phoneme discrimination assessment

G.F. heard two words spoken by the examiner. As above, she had to decide whether the words began with the same initial phoneme. The word pairs were those used in the first phoneme judgment task.

Syllable judgment assessment

G.F. was shown a black-and-white picture of a single item. She then had to think of the name of the item and judge the number of syllables in that name. Judgment was made by pointing to cards showing the numerals 1 or 2. The stimuli consisted of the 72 items assessed in the naming task.

The three judgment and discrimination assessments evaluated G.F.'s ability to reflect upon the phonology of treated and untreated words. They required a range of skills. For example, First Phoneme Judgment required her to access phonological information about two words and to segment off and compare their initial phonemes. Syllable Judgment also required phonological knowledge and the ability to analyze syllabic structure in a conscious way. Although demanding, these skills were analogous to the phonological self-cuing strategies promoted in therapy. We therefore hypothesized that if G.F. acquired these strategies, her performance on the judgment and discrimination tasks should improve.

In addition to these assessments, a number of single word comprehension and production tasks that were carried out prior to therapy were readministered when therapy was completed. These aimed to control for generalized spontaneous recovery and to highlight which aspects of processing may have improved.

In summary, the therapy design aimed to explore whether therapy improved naming and whether the effect had generalized to untreated items either phonologically related or unrelated to the treated set. If therapy introduced a self-cuing strategy consistent with the strategic hypothesis, the following pattern of results would be anticipated:

1. Naming should improve.
2. Naming attempts may be accompanied by overt self-cuing; for example, G.F. may be observed initially producing the first phoneme of an item and then the whole word.
3. Performance on the phonological judgment tasks should improve, as these depend upon the ability to manipulate and reflect upon phonological information in a conscious way.

Alternatively, evidence of improved naming without overt self-cuing and without gains on the phonological tasks would challenge the strategic hypothesis. This would suggest that, rather than applying a self-cuing technique, G.F. has recovered some on-line access to lexical phonologies.

Therapy

Forty therapy sessions took place over a 6-month period between February and August, 1996. Each lasted 20 min and were carried out by the first and second authors in G.F.'s home.

Therapy used a number of tasks designed to encourage G.F. to reflect on the phonology of the treated items. She was invited to make judgments about the initial phonemes and syllable length of stimuli and later to use these judgments to facilitate word production. It was hoped that therapy would improve G.F.'s partial ability to access phonology and to use it consciously as a self-cue.

The therapy stimuli consisted of the 24 treated items and 50 additional words. The additional stimuli respected the phonological constraints of the treated items; each began with one of the same six initial consonants and had one or two syllables. They were also common, picturable objects, most of which were present in G.F.'s environment. Care was taken to avoid the set of related items which were used to monitor for the generalization of treatment effects. All therapy tasks treated the core set of 24 treated items and a random selection of the additional items. G.F. was not tested on the additional items at the end of treatment, nor was the identity of the core items revealed to her.

Studies have suggested that naming therapy may simply train items encountered during therapy. We hoped to avoid such training by including a large number of words in therapy and to offer greater scope for generalization. The tactic also prevented items from becoming overly familiar, and compelled G.F. to make genuine attempts to access novel phonological information during the therapy tasks. This was done to foster the development of the desired phonological strategy.

In a further attempt to avoid a training effect, tasks were practiced first with pictures and then with nonpicture stimuli. The latter consisted of real objects, spoken descriptions of items in the therapy room and spoken descriptions of items not in the immediate environment. As in all other tasks, G.F. was required to make a judgment about the phonology of the identified item. Nonpicture stimuli were usually introduced as G.F. became more proficient at a task and more able to tolerate increased task demands.

Therapy was hierarchically planned so that the introduction of new activities provided a gradual increase in the demands of the task. Each level of task is discussed below. Although the order of tasks was set prior to therapy, no formal criteria were established for moving between levels. New tasks were introduced once G.F. was consistently successful on the previous activity. This decision was made on the basis of the clinician's judgment and in consultation with

G.F. who was able to monitor her own performance. In addition therapy sessions periodically reviewed tasks from earlier stages.

Therapy tasks required G.F. to reflect upon the syllable length and the initial phoneme of treated items. These were initially targeted in separate tasks. Later, G.F. judged stimuli on both features. The final stage required her to judge the syllable structure and first phoneme and then attempt to name the item, using this information consciously as a self-cue. Naming practice was not used in the earlier stages of therapy although G.F. often attempted to name items spontaneously. When this was achieved she was given positive feedback. When she had difficulty the target was presented to her for repetition. This was to avoid frustration with failed naming attempts. The stages of therapy are outlined below.

Syllable judgment tasks

In these G.F. was asked to point to a card showing either the numeral 1 or 2 to indicate the number of syllables in a word. Initially, she rated the length of spoken stimuli where the syllables were emphasized through exaggerated intonation and stress. Once successful at this, normal spoken presentation was adopted and a picture supplied with the spoken word. Later, the picture was presented in isolation with the spoken stimulus given only when G.F. failed to make a judgment. Here she had to access the phonology internally rather than have it provided. Finally, stimuli were identified from objects in the therapy environment or through verbal description by the therapist. At each level, judgment errors were indicated and the spoken word given to allow G.F. to revise her decision. If necessary, syllabic information was highlighted for G.F. as in the earlier tasks.

Initial phoneme judgment tasks

Initially, G.F. had great difficulty providing the first phoneme of a picture name. Judgments were made by pointing at the corresponding grapheme on a card. It was stressed that the first sound was important and stimuli with irregular grapheme phoneme correspondences (such as *knife*) used to illustrate this point. In fact, sound-letter confusions were almost never suggested in G.F.'s initial phoneme judgments. In this respect, it is probable that her poor residual orthographic knowledge was advantageous in helping to avoid such confusions.

In each task, G.F. was given a word and asked to point to its first sound. In the first level she selected the initial phoneme from a choice of two that had no shared phonetic features. Later levels enlarged the choice and opposed initial phonemes that were phonetically similar; for example, two plosives. In the final level, G.F. was asked to identify the initial phoneme from the complete set of six initial consonants used in therapy.

As with the syllable judgment tasks, the spoken name was supplied with the picture during the initial levels of therapy. Then the picture alone was presented. Interestingly, G.F. found it very difficult to discriminate the initial phoneme

from the spoken word and judgments appeared to improve when the picture stimulus was presented alone. Error responses were indicated to G.F. and the correct phoneme identified and supplied auditorily. As before, tasks moved from picture stimuli to real objects in the environment and, finally, to verbal description of items.

Dual judgment tasks

In these tasks, G.F. was required to judge both the syllable structure and first phoneme of a picture name. This was done by pointing to the number 1 or 2 on a chart and to the relevant phoneme from a choice of six. Error responses were identified and G.F. asked to revise her judgment. If she could not, the correct phoneme was identified by the therapist and supplied auditorily.

Judgment tasks with naming

The final level of therapy encouraged G.F. to use accessed phonological information as a self-cue. As above, she was required to judge the syllabic structure and first phoneme of a picture's name. Having accessed the phoneme she was encouraged to produce the sound and use it as a self-cue in naming. If she was unable to articulate the phoneme, it was supplied by the therapist. G.F. was then asked to repeat the phoneme and attempt to name the item.

Although these steps were planned, and sometimes followed, G.F. often forced us to amend them. Often she followed the phonological judgments with immediate and successful naming of the picture. Latterly, pictures were named before the judgments had been made. The conscious cuing process was often unsuccessful. In particular, G.F. frequently had difficulty articulating the first phoneme, even after a successful judgment. Thus this final stage of therapy was the least productive. It was either made redundant by successful naming or could not be mastered.

Results of Therapy

Naming

Table 4 shows the number of items in each set named without a cue at the three assessments. Overall, G.F.'s naming significantly improved after therapy (McNemar $\chi^2 = 25.7$, $n = 432$, $p < .001$) and this gain was maintained at follow-up (McNemar $\chi^2 = 19.9$, $n = 432$, $p < .001$). Turning to the individual sets of items, analyses showed there to be

significant improvements in all three. In other words, G.F.'s naming of the treated and control items improved and these improvements were well maintained at follow-up (treated items pre vs. post: McNemar $\chi^2 = 8.6$, $n = 144$, $p < .01$, pre vs. follow-up: McNemar $\chi^2 = 6.75$, $n = 144$, $p < .01$; phonologically related controls pre vs. post: McNemar $\chi^2 = 5.8$, $n = 144$, $p < .05$, pre vs. follow-up: McNemar $\chi^2 = 4.0$, $n = 144$, $p < .05$; unrelated controls pre vs. post: McNemar $\chi^2 = 8.1$, $n = 144$, $p < .01$; pre vs. follow-up: McNemar $\chi^2 = 6.1$, $n = 144$, $p < .05$). It seems that therapy brought about generalized and robust improvements in naming.

The majority of G.F.'s errors in each assessment period were *no responses*, often accompanied by comments about her failure to name the item. She made occasional semantic errors (20 over three assessments), which were normally higher in frequency than the target (e.g., "arm" for *shoulder* and "mountain" for *valley*) and were always recognized as errors by G.F. She made few phonological errors and equally few responses consisting of fragments of the target phonology (only 13 errors over all were of this type, and they occurred equally before and after therapy). On no occasion did G.F. first produce a fragment of the target phonology and then the entire word.

Response to cues

Table 5 presents G.F.'s ability to respond to first phoneme cues at each assessment. Cues were only offered after failed naming attempts, so fewer items were cued after therapy than before. Her rate of successful use does not change across assessments (χ^2 values not significant) nor were there differences between the groups of items. Cues lead to a correct response on approximately 25 to 30% of occasions.

Phonological judgment and discrimination assessments

Table 6 gives the results of the phonological judgment and discrimination assessments. G.F. remained poor on all these tasks, performing either at or close to chance. Only First Phoneme Judgment showed any improvement. G.F. was unable to do this before therapy, whereas her score overall was just above chance immediately after. However, even this level of performance was not maintained at follow-up. It seemed that G.F.'s ability to reflect upon the phonological structure of these words was largely unaffected by the therapy program.

Table 4. Scores on the Picture Naming Test pretherapy, posttherapy, and at follow-up

Item set	Pretherapy	Posttherapy	Follow-up
Treated items	6/24	18/24	16/24
Phonologically related controls	5/24	14/24	12/24
Phonologically unrelated controls	2/24	12/24	10/24
Total	13/72	44/72	38/72

Table 5. G.F.'s responses to phonological cues in picture naming pretherapy, posttherapy, and at follow-up

Item set	Number of cued items	Number of correct responses with cue (%)
Treated items		
Pretherapy	18	5 (28)
Posttherapy	6	2 (33)
Follow-up	8	3 (37)
Phonologically related controls		
Pretherapy	19	7 (37)
Posttherapy	10	2 (20)
Follow-up	12	2 (17)
Phonologically unrelated controls		
Pretherapy	22	6 (27)
Posttherapy	12	4 (33)
Follow-up	14	4 (28)

Other assessments

Performance before and after therapy on a range of other tests is shown in Table 7. These tests were administered as a control for spontaneous recovery and to offer insights into what aspects of processing may have been improved by therapy. Five of the assessments measured skills that were not specifically targeted by therapy. No improvement was seen on any of these. Three tested semantic skills (The Pyramids and Palm Trees Test, Auditory Synonym Judgment, Written Word to Picture Matching). The others were Nonword Rep-

etition and Written Naming. This confirmed that therapy had not coincided with a period of spontaneous recovery. The lack of improvement in written naming is interesting. The First Phoneme Judgment task used in therapy provided G.F. with information about the first letters of many of the words by default (since letters and phonemes often shared visual representations). Despite this, the Written Naming test showed no improvement. It seems that G.F. had used the therapy materials purely to focus on phonology. No generalization was made to writing.

PALPA Test Number 53 involves the naming, repetition and reading aloud of 40 low frequency words. If therapy had brought about a generalized improvement in accessing output phonology these tasks should improve. Table 7 shows that this was indeed the case. The Naming Section is particularly encouraging, since the improvement from a very low initial score is dramatic and because there is a repeated baseline measure to confirm that G.F.'s performance was static before the start of therapy. The score for reading aloud improved but not significantly so. Reading is presumably handicapped by G.F.'s poor processing of written input.

Observations about spontaneous speech

G.F.'s spontaneous speech was not formally evaluated after therapy. However, recorded samples of connected speech showed a new ability to access specific vocabulary, which was almost entirely absent prior to therapy (see Table 8). We were also encouraged by positive comments from both G.F. and her family. They reported that conversation was easier with G.F. and that she was more confident in speaking to others. Perhaps most strikingly, she was now attempting to use the telephone.

Table 6. Performance on the phonological judgment and discrimination assessments

Test	Pretherapy	Posttherapy	Follow-up
First Phoneme Judgment			
Treated items	unable	34/48	31/48
Phonologically related controls	unable	32/48	33/48
Phonologically unrelated controls	unable	32/48	23/48
Total	unable	98/144	87/144
First Phoneme Discrimination			
Treated items	22/48	27/48	–
Phonologically related controls	32/48	30/48	–
Phonologically unrelated controls	29/48	32/48	–
Total	83/144	89/144*	–
Syllable Judgment			
Treated items	17/24	17/24	–
Phonologically related controls	12/24	13/24	–
Phonologically unrelated controls	13/24	16/24	–
Total	42/72	46/72*	–

*Nonsignificant gain, McNemar Test.

First Phoneme Discrimination and Syllable Judgment Assessments were not readministered at follow-up because of the lack of improvement posttherapy.

Table 7. Performance on supplementary assessments of comprehension, naming, repetition, and reading aloud

Test	Pretherapy 1	Pretherapy 2	Posttherapy
Pyramids and Palm Trees Test (all picture)		47/52	45/52*
Auditory Synonym Judgment		43/60	43/60*
Written Word to Picture Matching		28/40	31/40*
Nonword Repetition		3/30	3/30*
Writing the names of the treated items		impossible	impossible
PALPA Test 53			
Picture Naming	0/40	1/40	17/40**
Repeating the picture names		19/40	30/40**
Reading aloud the picture names		10/40	16/40*

*Not a significant gain.

**Significant gain (McNemar test).

DISCUSSION

The results show that therapy brought about significant improvements in picture naming. This improvement generalized to untreated items, including those that were phonologically distant from the treated set, and was well maintained at the follow-up assessment. Greatly improved naming was also seen in the posttherapy assessment of naming using PALPA Test 53. This change was particularly impressive in view of her very poor performance prior to therapy and lack of change over the previous 6 months.

Studies of naming therapy have previously found that improvement is limited to items that are directly treated in therapy (Howard et al., 1985a, 1985b; Marshall et al., 1990; Pring et al., 1990, 1993). The failure of therapy to generalize to untreated items has allowed studies to use a methodology in which untreated words act as controls for improvement due to factors other than therapy. Since G.F. named untreated items better after therapy, her results are open to the explanation that her language skills have improved more generally. Several factors counter this possibility, however. G.F. was 2 years postonset at the time of this study which is inconsistent with her continuing to show spontaneous recovery. There is also the evidence from PALPA Test 53 that her pretherapy naming ability was stable. Her performance on that test was consistently poor over the 6 months prior to therapy but improved dramati-

cally with therapy. Additionally there is no suggestion in G.F.'s scores on tests of semantic processing or of writing that a more general language improvement has occurred. It seems that the changes in G.F.'s naming can only be attributed to the specific content of therapy.

The results also exclude the possibility that G.F. has learned a small set of words through repeated exposure to them during a prolonged period of treatment. The therapy design tried to avoid this, by including a wide range of items in addition to those treated. The generalization seen in the results suggests that this tactic was successful. This general improvement in naming is also consistent with the hypothesis which motivated the study, that through therapy G.F. might learn a self-cuing strategy. Prior to therapy, G.F. often claimed to have a fleeting impression of a word's phonology. Therapy aimed to enhance this access to phonology by encouraging her to think about a word's syllabic structure and first phoneme. The generalized positive effects on her naming suggest that she has learned a strategy that can benefit naming generally.

Several other aspects of the results challenge the strategic hypothesis, however. First, G.F.'s naming after therapy showed no overt signs of self-cuing. There were no occasions when she accessed part of a word and went on to name it nor were there signs of her judging a word's syllabic structure prior to naming. She either named promptly and fluently or was unable to do so. In this respect she differed from other patients who have learned strategies. T.C. (Nickels, 1992) overtly used his first letter strategy to cue his naming after therapy. Similarly the individuals studied by Greenwald et al. (1995) were observed using phonological cues taught in therapy. A second source of evidence comes from G.F.'s performance on the phonological judgment and discrimination assessments. Performance on these was virtually unchanged after therapy. These assessments explored G.F.'s ability to make judgments about an item's phonology, which was an essential component of the strategy targeted by therapy. Her failure on these assessments after therapy was surprising, since she had done similar tasks during therapy. There, however, she was sup-

Table 8. Posttherapy sample of connected speech

Describing a picture of a woman in hospital with a broken leg.	
<i>G.F.:</i>	She . . . um . . . um . . . I know what it is . . . um here that's the hospital . . . and um that's a bag um . . . sister . . . flower . . .
<i>Therapist:</i>	What's happened to her?
<i>G.F.:</i>	She's in the . . . the . . . oh wait a minute . . . that's her . . . she's hurting . . . its her leg.

plied with cues and feedback from the therapist. In the assessments, such support was not available. It appears that G.F. cannot perform such judgments independently, which in turn suggests that she is not using the intended phonological strategy to aid her naming.

Further evidence comes from G.F.'s response to therapy. With assistance from the therapist, G.F. was able to perform the therapy tasks with a high level of success. An exception to this was the final stage in which she was invited to convert her phonological judgments into a self-cue. Consistent with her failure on this stage of therapy was the lack of any evidence that G.F. was cuing herself during the posttherapy naming assessments.

A final source of evidence comes from G.F.'s naming responses when phonological cues were provided for her. Both prior to and after therapy cues elicited target words with a consistent 25-to-30% rate of success. If G.F. had acquired a phonological self-cuing strategy to aid her naming a similar success rate might be expected. In fact, the results were much more impressive than this. For example, with the treated set she tripled her naming performance. It seems that therapy had brought about improved phonological access, rather than purely an ability to self-cue.

Dismissing the strategic hypothesis on the grounds that overt signs of cuing were not seen may seem somewhat speculative. An alternative explanation is that G.F. was using an internalized strategy after therapy, which was not overtly detectable during naming. For example, rather than articulating the first phoneme, she may have created an internal visual representation of the phoneme to use as a cue. However, even such internalized cuing would be expected to have resulted in hesitations, whereas G.F.'s posttherapy naming, when successful, was rapid and automatic in nature. Her poor performance on and failure to improve her written naming with therapy also make access to word orthographies seem an unlikely naming strategy.

A second possible objection to the conclusion that she had not acquired a strategy might be that the phonological assessments were too difficult. As a result they may have failed to detect skills that were acquired in therapy. For example, the First Phoneme Judgment and Discrimination Assessment required her to compare the phonemes of two words, and this additional demand may have caused her to fail. However, this was not true of the Syllable Judgment Assessment. Here only one item was judged, in a manner which was very similar to the task used in therapy. It seems that G.F. could make these judgments when therapeutic support was available but could not do so independently. This limitation would seriously preclude the use of a self-directed phonological strategy.

The lack of overt self-cuing and the unchanged performance on the phonological judgment assessments suggest that G.F.'s naming gains do not reflect the acquisition of a strategy as was intended in the design of the therapy. We are left with the rather paradoxical conclusion that therapy to promote a conscious self-cuing strategy has brought about improved access to the lexicon without use of the strategy.

This access was not confined to naming, but was also evident in her improved repetition.

A previous study of phonological naming therapy, conducted by Best et al. (1997), produced similarly paradoxical results. The subject in this study, J.O.W., was severely anomic, with evidence of a semantic lexical deficit. A number of therapy approaches were attempted, the most successful of which involved picture naming with computer generated phonemic cues. After presentation of a picture, J.O.W. was required to select the first letter of its name from the keyboard (he was corrected if he made the wrong choice). The computer then converted the letter into a phonological cue. J.O.W. was asked to repeat the cue and then attempt to name the picture.

This treatment brought about significant naming gains that generalized to untreated items and were maintained 15 months after therapy had ceased. However, J.O.W.'s progress could not be directly attributed to the computer aid, since naming without the aid was equally good (indeed marginally better). As with G.F., generalization of the therapy effect ruled out explanations in terms of repeated practice with the treated items. Spontaneous recovery could also be dismissed, as naming prior to therapy was stable and control tasks were unaffected.

J.O.W.'s therapy gains might be explained if he had learned the strategy of accessing the first letter of the word and converting it directly to a phonological cue without the aid of the computer. As with G.F., there was little evidence that he was doing this. First, his letter-to-sound conversion skills remained poor, despite therapy. Second, he was not observed to self-cue after therapy. Best et al. therefore argue that therapy altered the automatic processes of word production. They suggest that it enabled J.O.W. to exploit converging sources of activation to aid word retrieval.

Although difficult to explain, the results of G.F.'s therapy are consistent with the theoretical interpretation of her naming deficit. Based on her response to phonological cues and her performance in repetition and reading aloud, we hypothesized that she retained but failed to access entries in her phonological lexicon. The results of therapy support this impaired access hypothesis. If G.F. had lost lexical entries, therapy would have to reinstate them. We would then expect item specific treatment effects, not generalized improvement as seen in G.F.'s naming.

G.F.'s own descriptions of her naming problems are consistent with an access deficit. She has often described the experience of having information about the phonological form of words available to her in a way that is too fleeting or too incomplete to allow naming. Her response to the therapy seemed to corroborate this view, since, with support, she was able to carry out tasks that required such phonological information. Contrary to our expectations, G.F. was never able to use this knowledge to cue herself. Rather, it seems that its repeated evocation brought about improved access to the lexicon without recourse to the intended strategy.

We conclude with three more general observations. There is a general perception that it is difficult to treat the lan-

guage disorders found in jargon aphasia. Consistent with this feeling, relatively few therapy studies have been reported. This study showed that the naming disorder that has been widely argued to play a part in the jargon can respond to phonological therapy. Of course, the results of single case studies of therapy provide a poor basis for speculations about the outcome of therapy with other patients and replications are to be encouraged. In some ways, G.F. was unusual. She had good self-monitoring and relatively preserved auditory input. These skills were crucial in enabling her to participate in therapy. Without them, therapy may prove more difficult and less successful.

Although the patient in this study undoubtedly benefited from therapy, some readers may question the cost effectiveness of the treatment, given that it extended over 6 months. However, despite the long duration, the actual treatment time was only 14 hr (or 40 20-min sessions). G.F. needed an extended regime, partly because of health difficulties, and partly because she was unable to tolerate long treatment sessions. It is possible that other clients could cope with a more intensive and, therefore, more efficient administration of the program. We would also suggest that elements of this therapy could be administered by a trained assistant or carer, providing regular input was available from a therapist to monitor the patient's progress and modify the tasks where necessary. This approach could dramatically reduce the cost implications.

A number of authors have argued that cognitive approaches to rehabilitation should be based upon both a cognitive neuropsychological analysis of the impairment and an explanation as to the means by which therapy may remediate the deficit (Caramazza, 1989; Hillis & Caramazza, 1994). This is clearly important if therapists are to assess impairments and select therapies reliably. The treatment of word finding provides something of a dilemma for this commendable objective. Studies have reported positive results but we are some way from understanding how therapy operates. There appears to be no clear match between the underlying deficit and the form of treatment offered (Marshall et al., 1990; Raymer et al., 1993). In many cases the effects of therapy are limited to a set of words which have been treated, in others generalization to other words occurs. Finally, in cases such as that reported here, therapy seeks to provide a strategy for improved performance only for performance to improve without obvious use of the strategy. While the positive results of therapy in these studies is welcome, there is clearly no room for complacency.

REFERENCES

- Best, W., Howard, D., Bruce, C., & Gatehouse, C. (1997). A treatment for anomia combining semantics, phonology and orthography. In S. Chiat, J. Law & J. Marshall (Eds.), *Language disorders in children and adults* (pp. 102–129). London: Whurr.
- Bishop, D. (1982). *Test for reception of grammar*. London: Medical Research Council.
- Butterworth, B. (1979). Hesitation and the production of verbal paraphasias and neologisms in jargon aphasia. *Brain and Language*, 8, 133–161.
- Butterworth, B. (1985). Jargon aphasia: Processes and strategies. In S. Newman & R. Epstein (Eds.), *Current perspectives in dysphasia* (pp. 61–95). Edinburgh, U.K.: Churchill Livingstone.
- Byng, S. (1995). What is aphasia therapy? In C. Code & D. Muller (Eds.), *Treatment of aphasia: From theory to practice* (pp. 3–17). London: Whurr.
- Caramazza, A. (1989). Cognitive neuropsychology and rehabilitation: An unfulfilled promise? In X. Seron & G. Deloche (Eds.), *Cognitive approaches in neuropsychological rehabilitation: Neuropsychology and neurolinguistics* (pp. 383–398). Hillsdale, NJ: Lawrence Erlbaum Associates.
- De Partz, M-P. (1986). Reeducation of a deep dyslexic patient: Rationale of the method and results. *Cognitive Neuropsychology*, 3, 149–177.
- Ellis, A., Miller, D., & Sin, G. (1983). Wernicke's aphasia and normal language processing: A case study in cognitive neuropsychology. *Cognition*, 15, 110–145.
- Greenwald, M., Raymer, A., Richardson, M., & Rothi, L. (1995). Contrasting treatments for severe impairments of picture naming. *Neuropsychological Rehabilitation*, 5, 17–49.
- Hillis, A. (1993). The role of models of language processing in rehabilitation of language impairments. Special Issue: Cognitive neuropsychology and aphasia treatment: An opportunity for applied research. *Aphasiology*, 7, 5–26.
- Hillis, A. & Caramazza, A. (1994). Theories of lexical processing and rehabilitation of lexical deficits. In M.J. Riddoch & G.W. Humphreys (Eds.), *Cognitive neuropsychology and cognitive rehabilitation* (pp. 449–484). Hove, U.K.: Lawrence Erlbaum Associates.
- Hillis, A., Rapp, B., Romani, C., & Caramazza, A. (1990). Selective impairment of semantics in lexical processing. *Cognitive Neuropsychology*, 7, 191–243.
- Howard, D. & Orchard-Lisle, G. (1984). On the origin of semantic errors in naming: Evidence from the case of a global aphasic. *Cognitive Neuropsychology*, 1, 163–190.
- Howard, D. & Patterson, K. (1989). Models for therapy. In X. Seron & G. Deloche (Eds.), *Cognitive approaches in neuropsychological rehabilitation: Neuropsychology and neurolinguistics* (pp. 39–64). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Howard, D. & Patterson, K. (1992). *Pyramids and palm trees*. Bury St. Edmunds, UK: Thames Valley Test Company.
- Howard, D., Patterson, K., Franklin, S., Orchard-Lisle, V., & Morton, J. (1985a). The facilitation of picture naming in aphasia. *Cognitive Neuropsychology*, 2, 49–80.
- Howard, D., Patterson, K., Franklin, S., Orchard-Lisle, V., & Morton, J. (1985b). The treatment of word retrieval deficits in aphasia: A comparison of two therapy methods. *Brain*, 108, 817–829.
- Kay, J. & Ellis, A. (1987). A cognitive neuropsychological case study of anomia. Implications for psychological models of word retrieval. *Brain*, 110, 613–629.
- Kay, J., Lesser, R., & Coltheart, M. (1992). *PALPA: Psycholinguistic Assessments of Language Processing in Aphasia*. Hove, U.K.: Lawrence Erlbaum Associates.
- Leach, C. (1979). *Introduction to statistics: A nonparametric approach for the social sciences*. Chichester, UK: Wiley.
- Le Dorze, G., Boulay, N., Gaudreau, J., & Brassard, C. (1994). The contrasting effects of a semantic versus a formal-semantic

- technique for the facilitation of naming in a case of anomia. *Aphasiology*, 8, 127–141.
- Le Dorze, G. & Pitts, C. (1995). A case study evaluation of the effects of different techniques for the treatment of anomia. *Neuropsychological Rehabilitation*, 5, 51–65.
- Lesser, R. (1989). Some issues in the neuropsychological rehabilitation of anomia. In X. Seron & G. Deloche (Eds.), *Cognitive approaches in neuropsychological rehabilitation: Neuropsychology and neurolinguistics* (pp. 65–104). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Maher, L.M., Rothi, L.J., & Heilman, K.M. (1994). Lack of error awareness in an aphasic patient with relatively preserved auditory comprehension. *Brain and Language*, 46, 402–418.
- Marshall, J., Pound, C., White-Thomson, M., & Pring, T. (1990). The use of picture/word matching tasks to assist word retrieval in aphasic patients. *Aphasiology*, 4, 167–184.
- Marshall, J., Robson, J., Pring, T., & Chiat, S. (1998). Why does monitoring fail in jargon aphasia? Comprehension, judgement and therapy evidence. *Brain and Language*, 63, 79–107.
- Nettleton, J. & Lesser, R. (1991). Therapy for naming difficulties in aphasia: Application of a cognitive neuropsychological model. *Journal of Neurolinguistics*, 6, 139–157.
- Nickels, L. (1992). The autocue? Self generated phonemic cues in the treatment of a disorder of reading and naming. *Cognitive Neuropsychology*, 9, 155–182.
- Nickels, L. (1995). Reading too little into reading? Strategies in the rehabilitation of acquired dyslexia. *European Journal of Disorders of Communication*, 30, 37–51.
- Nickels, L. & Best, W. (1996). Therapy for naming disorders (Part I): Principles, puzzles and progress. *Aphasiology*, 10, 21–47.
- Panzeri, M., Semanza, C., & Butterworth, B. (1987). Compensatory processes in the evolution of severe jargon aphasia. *Neuropsychologia*, 25, 919–933.
- Patterson, K. & Shewell, C. (1987). Speak and spell: Dissociations and word class effects. In M. Coltheart, G. Sartori, & R. Job (Eds.), *The cognitive neuropsychology of language* (pp. 273–294). London: Lawrence Erlbaum Associates, Inc.
- Pring, T., Hamilton, A., Harwood, A., & Macbride, L. (1993). Generalization of naming after picture/word matching tasks: Only items appearing in therapy benefit. *Aphasiology*, 7, 383–394.
- Pring, T., White-Thomson, M., Pound, C., Marshall, J., & Davis, A. (1990). Picture/word matching tasks, some follow-up data and second thoughts. *Aphasiology*, 4, 479–483.
- Raymer, A., Thomson, C., Jacobs, B., & Le Grand, H. (1993). Phonological treatment of naming deficits in aphasia: Model-based generalization. Special Issue: Cognitive neuropsychology and aphasia treatment: An opportunity for applied research. *Aphasiology*, 7, 27–53.
- Robson, J., Pring, T., Marshall, J., Morrison, S., & Chiat, S. (1998). Written communication in undifferentiated jargon aphasia: A therapy study. *International Journal of Language and Communication Disorders*, 33, 305–328.
- Rothi, L.J., Raymer, A., Maher, L., Greenwald, M., & Morris, M. (1991). Assessment of naming failures in neurological communication disorders. *Clinics in Communication Disorders*, 1, 7–20.
- Shuren, J.E., Smith-Hammond, C., Maher, L.M., Rothi, L.J.G., & Heilman, K.M. (1995). Attention and anosognosia: The case of a jargonaphasic patient with unawareness of language deficit. *Neurology*, 45, 376–378.