The use of picture/word matching tasks to assist word retrieval in aphasic patients

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Abstract

Three single case studies and a small group study were undertaken to examine the effects of using picture to word matching tasks as a therapeutic technique in aiding word retrieval in aphasic patients. Two of the former were successful despite differences in the patients' abilities at the therapeutic task. The benefits of the therapy continued for periods after it was completed. The third was not successful preventing any general conclusion from being drawn and indicating the need for further study to determine which patients may benefit. The group study used a similar therapeutic task but patients were asked to carry it out in their own homes and without a therapist present. Treated items showed significant gains compared with controls, there was evidence of some improvement on semantically related untreated items and the gains continued to be significant 1 month after treatment ended.

Introduction

There is increasing concern that therapies for communication disorders be evaluated. In the area of aphasia therapy there are encouraging signs of progress. In contrast with earlier studies, which examined the broad effects of a variety of therapies, often poorly defined, on a heterogeneous sample of aphasic patients, recent studies have used single or small numbers of patients with a particular problem for which a specific treatment is to be evaluated (e.g. Jones 1986), de Partz 1986, Byng 1988, Byng and Coltheart 1986). The scale of these studies make them much more accessible to the practising clinician. Any patient may become the subject of an efficacy study, which may occur within the course of normal clinical practice (Pring 1986).

This change in the style of efficacy research follows similar changes in theoretical research. Ten years ago this followed a predictable course. Patients were placed in categories that they had occupied for a century or so. Research compared the categories, and differences found supported the classification while concealing potentially important individual variation between patients consigned to the same category. Now there are no shortage of theoretical opinions favouring the abandonment of any form of classification (Ellis 1987, Carammaza and McCloskey.

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In essence this demonstrates that patients are as alike as our assessments will allow them to be. As these are refined and deficits more minutely examined, similarities between patients diminish rapidly. Theoreticians have learnt what clinicians always knew: that no patients are really the same. As a result, single case studies have assumed new importance in theoretically motivated research and this enthusiasm is spilling over into efficacy research. There is room for a little pragmatism here, however. Patients may all be different but some are more different than others. Small group studies of patients with a common disability (even in the context of other dissimilar disabilities) offer the advantage of cautious generalization to other patients that single case studies do not permit.

Although single case studies offer greater accessibility to efficacy research, they do not diminish the demands of experimental methodology. As in any experiment, alternative explanations of change in performance must be controlled for. Improvement must be shown to be due to the specific effects of the therapy and must not be accounted for either by naturally occurring recovery of function or by more general benefits of receiving therapy; moreover, it should be shown to persist over time and, if possible, to assist the patients communication in situations outside the clinic. In addition, there is the problem that linguistic performance is difficult to assess and particularly difficult to render into meaningful numbers for the sake of statistical analysis.

It is not surprising, therefore, that therapy research has best developed in areas where these problems are minimized. Anomia is one such area. It is a prominent feature of the difficulties experienced by many patients. Although it occurs in conjunction with a variety of other problems it may show sufficient similarity across patients to persuade us that the same forms of therapy may be beneficial to many of them. That immediate difficulties may often be overcome by presenting a phonemic cue and/or by giving extra semantic information is a beguilingly simple indication of the procedures that might be used in therapy, though optimism needs to be tempered by the persistency that word-finding difficulties often show. Anomia is quite apparent in spontaneous speech but its assessment therein is not straightforward. The use of confrontation naming, although an artificial task, appears to tap similar skills (but see Hadar, Jones and Mate-Kole 1987) and has the advantage of giving a simple numerical representation of performance.

In this paper we first present a simple model of naming. Next we review studies of its remediation and, finally, present further experimental data. In the latter, three single case studies and a small group study examine the effects of using semantic discrimination tasks on patients' subsequent ability to name pictures.

**Picture naming**

Figure 1 presents a model of picture naming together with some components of comprehension and production of single words in other modalities. It will be familiar to those who adopt a cognitive neuropsychological approach to aphasic language who will also note that some components of this model, unnecessary for present discussion, have been omitted for clarity (See Morton 1985, Patterson and Shewell 1987).

The model suggests that pictures are first 'recognized' by a recognition system. In common with the input lexicons used for spoken and written words, this system distinguishes known from unknown objects or pictures and may react to their frequency of occurrence but does not, in itself, comprehend them. This is the function of the semantic system. In the present model this system is common to the three forms of input: pictures and spoken and written words. Whether these should share or access different semantic systems has been recently debated (Riddoch, Humphreys, Coltheart and Funnell 1988, Shallice 1988, Humphreys and Riddoch 1988). For present purposes, a model using a common system will be employed. This approach is compatible with reaction time studies carried out on non-aphasic subjects in which two sorts of event have been observed to reduce reaction times to word and picture stimuli. Repetition effects occur when the same or a very similar stimuli (the same
word in a different print or handwriting or a different view of the same object) are used, semantic priming effects occur when semantically related items are presented in succession. The latter is a briefly enduring effect but applies across modalities (Carr, McCauley, Sperber and Parmelee 1982), while the former, though much longer lasting, may only be observed within the same modality (Morton 1979; Warren and Morton 1982).

A notable feature of the model is that comprehension of words or pictures does not require access to their names. These are stored in the phonological output lexicon and for pictures, unlike spoken or written words, can only be accessed via the semantic system. The lack of a route by which pictures may be named without comprehension is a source of controversy (Ratchiff and Newcombe 1982) resting in part on the failure to demonstrate convincingly this dissociation in patients. A further feature is the existence of separate stores for word phonology and orthography. Marked differences between spoken and written naming are commonly found and suggest a site of deficit below the semantic system and affecting one output system more than the other. Although our studies will only be of spoken naming, it is not uncommon to find patients who resort to writing to assist spoken naming, an ability that may assist treatment. Finally, the model suggests that each output system has a response buffer, a memory store in which output information is stored while response motor programmes are initiated.

Use of this model reveals the apparently simple confrontation naming task to be vulnerable in several ways. Failure to reach the semantic system would result in failure of comprehension as well as naming. Such as deficit would more correctly be described as a visual agnosia and was not shown by any of the patients we shall report. Equally, patients whose errors were mainly phonetic or articulatory were excluded. Their difficulties must arise after accessing the phonologal output system. Our patients typically showed difficulties that may be associated with problems in the semantic system, the phonological output lexicon or the route between them. Their errors consisted of circumlocations, omissions and phonological and semantic errors.

Two sorts of difficulty might cause naming problems in this area of the model. Patients might access the semantic system adequately but be unable to access the appropriate phonology. Such a patient might produce an omission or circumlocution but probably not a semantic error that they would know to be incorrect. Alternatively patients might have a 'semantic deficit'. This would occur when the general but not the specific semantics of the pictured item are accessed resulting in several related words being partially activated at the phonological stage. The patient has sufficient information to comprehend partially the word, to circumlocute or gesture in a way that demonstrates this, but naming may produce semantic errors.

In the latter group the difficulty should be apparent in tasks that require a semantic decision without a spoken response. Several studies have demonstrated this. Typically, semantic discrimination tasks in which a spoken word must be matched against a picture presented among semantically related foils are used. Gainotti (1976) tested a large random sample of aphasics and found semantic errors in naming to be strongly associated with those in auditory comprehension. In a second study Gainotti, Miceli, Caltagirone, Silveri and Masullo (1981) divided patients according to their predominant form of naming error. Semantic confusions on input tasks were related to semantic, anomic and neologistic naming errors but not to phonetic or phonemic transformations. Butterworth, Howard and McLoughlin (1984) found semantic impairment on comprehension tasks to be significantly related to semantic though not neologistic naming errors. They also found the relationship to be independent of the type of aphasra exhibited by the patient (in contrast with the view that semantic errors are a feature of fluent aphasra) and that there was no one-to-one correspondence between errors on the two tasks. The last finding is important since it indicates that the problem arises from a generalized difficulty to specify the correct semantics of a word rather than the loss of semantic descriptions for particular words (see also Gainotti 1987).

Gainotti, Silveri, Villa and Micelli (1986) divided 13 patients into a group of eight who showed a deficit on semantic discrimination tasks and five who did not. The group with lexical semantic impairment made significantly more semantic errors in naming, whereas the group without made significantly more omissions (though some semantic errors occurred as well). Evidence was also presented that those patients without a comprehension difficulty had greater implicit knowledge of the word they were trying to retrieve. They were more likely to identify the first letter correctly and benefited more from phonemic cueing, though, in neither case, significantly.

The latter part of these results are somewhat confusing. If patients without a semantic deficit have targeted a specific phonology one could anticipate that partial phonological knowledge might be available when naming itself fails. It is unclear, therefore, why the first sound should offer much assistance to them. In contrast, patients with a semantic deficit who make semantically related responses appear to be undecided between different target phonologies and a phonological cue might be expected to assist them. Examination of the individual patients in Gainotti et al. reveals a high level of variability among patients of both kinds though there clearly are patients in the semantic deficit group who do not benefit from cues.

A globally aphasic patient, J.C.U., reported by Howard and Orchard-Lisle (1984) is relevant here. She is not reported to make semantic errors in naming but her performances is so poor as to give little opportunity for this. Nevertheless, she is much aided by phonological cues and produces semantic errors when an inappropriate cue is given. It would appear that J.C.U. is partially activating several related phonologies; the cue enables one of these to prevail resulting in either correct namings or semantic errors. J.C.U. has a semantic deficit; when asked to match a written or spoken word to a picture she failed when foils were from the same category. She fits the picture drawn above but not the trend of Gainotti et al. 's data; her semantic deficit leaves her unsure which the appropriate phonology is and, consequently, cues assist her.

E.S.T., a patient reported by Kay and Ellis (1987) is an anomic without a semantic deficit. E.S.T. did not make semantic errors in naming nor could he be induced to do so by inappropriate cues. His naming was related to frequency; he named many high-frequency pictures, those of intermediate frequency gave errors with phonological similarities to the target and were assisted by phonological cues and, lowest-frequency words were rarely named. E.S.T. succeeded on all the single-word comprehension tasks administered except those involving abstract concepts; thus for the pictures used in the naming tasks there was no evidence of a semantic deficit. Contrasting E.S.T. with J.C.U. Kay and Ellis suggest that patients with semantic deficits will fail on comprehension tasks that require precise semantic knowledge, will benefit from phonemic cues but also show miscuing effects and will not experience tip of the tongue effects. Patients with a phonologically based anoma will show the reverse effects.
These studies support a dichotomy between forms of anoma that do and do not compromise lexical semantics. As with many dissociations, however, it is probably wiser to expect that patients will present with differing degree of both problems and only rarely as pure cases of either.

**Therapy studies**

Studies of the treatment of word-finding difficulties are well represented in the literature. Small group studies of treatment effects using broadly similar patients have been the chosen methodology.

As previously stated, clinical experience suggests that phonemic cues or the provision of semantic information aid immediate naming. Whether either method has longer-term benefits and whether generalization to untreated items occurs are less clear. These are important for estimating the clinical potency of the methods and the latter also influences choice of experimental methodology. Most studies have assumed that untreated items will improve little and may act as controls. Following from the above, studies have examined the effects of either phonological or semantic assistance. The general impression that semantic methods are superior has influenced the present studies. The evidence is not entirely unequivocal on this, however.

Formal investigation of the immediate effects of cues was undertaken by Myers-Pease and Goodglass (1978). Twenty patients with naming difficulties from differing diagnostic groups were tested (analysis by group showed significant differences in severity in the order Wernicke’s > Broca’s > anomics). Six different cues were used. Phonological cues were either first sounds or rhymes, semantic were superordinate, function or location cues and sentence completion cues were also used. First sound cues were significantly more effective than all others and sentence completion was significantly better than the three semantic cues. The more severe patients (mainly Wernicke’s) benefited least and only from first sound cues. Milder patients benefited more from all forms of cue.

In contrast are the findings of Patterson, Purell and Morton (1983) who used first sound cues and repetition of picture names prior to naming. While confirming the immediate benefits of the phonological cue, no benefits were found beyond the immediate cuing situation. Howard, Patterson, Franklin, Orchard-Lisle and Morton (1985a) confirmed the brief effectiveness of phonological cuing (Experiment 4). Using repetition, a rhyming word as cue or a rhyme judgement involving the picture name, no benefit over controls was found 15 or 30 min after cuing.

Various forms of semantic activity, though less successful in immediately eliciting the picture name, appear to have greater success as longer-term facilitators of its retrieval. Howard et al. (1985a) tested this in three experiments. In the first, patients were asked to indicate which of five assorted pictures matched a spoken word. Naming was better than that of controls 20 min later. The second repeated the procedure with sets of pictures from the same semantic category as the target. Benefits were obtained 24h afterwards. By comparison a condition in which a spoken word and picture associated with the target were matched gave no advantage over controls. A third experiment confirmed these results for a written word to picture matching task and for a condition in which patients answered questions about the picture. Both gave significant results 20 min later. At a later test after 2 weeks, treated items appeared to have declined only a little but were no longer significantly better than untreated items which showed some improvement.

These results suggest that tasks which require access to the semantic system may benefit subsequent naming. By comparison, phonological cues that may be assumed to operate by activating entries in the phonological output lexicon appear to have immediate but little lasting benefit. It might be assumed that the more demanding the semantic task the more assistance would result. This is not a straightforward conclusion, however, as was indicated by the failure of associated items to improve naming.

Although these results have important consequences for therapy, a further qualification might be made. Experiments of this kind evaluate the methods therapy might use rather than therapy itself. The results follow a single, highly structured session whereas therapy is both more prolonged and more various. It is possible that using a mixture of techniques may be more effective though some are individually less beneficial than others. Reports of the use of more varied techniques over longer periods of time have had encouraging results. Wiegler-Crump and Koenigsknecht (1973) used pictures from five categories employing repetitive presentation in different modalities as suggested by Schuell, Jenkins and Jimenez-Pabon (1969). Four patients were treated for 18 1-h sessions over a 6- to 9-week period. Improvement was found on items drilled in therapy, on undrilled items from the same category and on items in an untreated category. This appears to be a most positive result, therefore, indicating generalization of benefits to untreated items both within and without the categories used. It poses a problem in experimental design, however, since improvement is sufficiently extensive to have affected the untreated group, which were a potential control. Since the patients were a minimum of 3 months post-onset and had had little previous therapy, a possible if uncharitable explanation might be that improvement owed something to spontaneous recovery and to general rather than specific effects of therapy.

A further study examining therapy rather than individual treatments is that by Howard et al. (1985b). Semantic and phonological treatments were compared. The former was represented by matching a spoken or written name to one of four semantically related pictures and answering questions about the picture’s referent. The latter included phonemic cues, repeating the picture name and judging whether the name rhymed with another word.

The results of this experiment were rather complicated and need careful consideration. Two sorts of controls were used: pictures that were not seen during therapy (controls) and pictures that were named but not treated during therapy (naming controls). The latter were presented for naming an equivalent number of times to the activities undertaken with treated pictures. The analysis was in three parts. A day-by-day analysis during treatment showed that treated items improved significantly more than naming controls. A second analysis examined naming on treated pictures, naming controls and controls 1 and 6 weeks after treatment. After 1 week, both forms of treatment were significantly better than controls but only phonological treatment significantly exceeded naming controls. After 6 weeks, neither treatment was significantly better than either type of control. Additionally, a comparison of the treatments using all pictures (treated and both controls) gave a significant result favouring semantic therapy. This result can have different interpretations. First, it must be due primarily to the 1-week assessment and secondly it applied to all items used, including controls. This could mean that semantic but not phonological therapy caused generalization to other untreated (and unrelated) items. Alternatively, we could recall that naming controls represent the effects of repeated
naming and conclude that phonological but not semantic therapy exceeds this. The fact that semantic naming controls were significantly better than phonological ones favours the former conclusion but it is a close run thing. Finally, the entire set of pictures from which the experimental items were drawn were retested 6 weeks after a set of different pictures of the same objects.

The results of these studies differ between those in which a single brief intervention is used and those where repeated interventions and, consequently, a closer approximation to therapy are used. In the former, only semantic cues have lasting effects though their duration is in some doubt. In the latter, the effects of both phonological and semantic interventions were apparent up to a week later with the suggestion that generalization may be greater when semantic tasks are used. It remains unclear whether this difference is due to the repetition of treatment sessions, the variety of the interventions or whether the overall improvement disguises differing merits in the component therapies.

These studies are most consistent as to the effects of semantic processing tasks. In view of this, the three single case studies and group study which follow investigate the use of a semantic discrimination task.

Single case studies

Case 1. R.S., a 45-year-old company director, suffered a left hemisphere CVA in November 1986 resulting in dysphasia and right hemiplegia. When seen in September 1987 his comprehension appeared functionally intact but speech was handicapped by a general anemia and a particular difficulty in retrieving verbs. Omissions predominated and semantic errors did not occur, although semantically related items were sometimes used as cues to aid the retrieval of the appropriate name.

Testing of semantic ability showed R.S. to be similar to E.S.T. (Kay and Ellis 1987). On a test (Kay, Lesser and Coltheart 1989) in which a spoken or written word is matched with one of five pictures that include semantic and visual distractors, he scored 39/40 with one semantic error to auditory presentation. On an auditory version of the Coltheart (unpub.) synonym matching test in which pairs of high- or of low-imagery words are judged for similarity of meaning, he scored 36/38 for high- and 26/38 for low-imagery items. The latter score is poor but is comparable to E.S.T. who also had difficulty with abstract semantics. R.S. also completed the pictorial version of the Pyramids and Palm trees test (Howard and Orchard-Lisle 1984). This tests ability to use semantic associations between objects in a more worldly way, asking, for example, in the item from which the test is named, a picture of a pyramid to be paired with a palm tree rather than a tree from more temperate chimes. In this he made three errors, which is just within normal performance.

R.S. readily discriminated between correct names and inappropriate but semantically related names of pictures. He could not be induced into making semantic errors even with inappropriate cueing. In a test, 30 pictures were presented for naming. When R.S. failed to name, a phonological cue was provided. Appropriate cues (e.g. /tr for tiger) were found to assist naming. Misleading cues (// for lion with a picture of a tiger) did not produce semantic errors as they had for J.C.U. With written stimuli, R.S. also performed adequately. Given a single written word which he had to match to one of four other written related words (e.g. fog—bolt, mist, lock, steam) he was correct on 14 of 15 occasions.

Although R.S. made some errors on these tasks he is clearly more similar to E.S.T. than to J.C.U. Although he was poor at confrontation naming he did not make semantic errors and could not be induced to do so by inappropriate cues. His major area of deficit appeared to be in the semantics of low-imagery words. Like E.S.T., R.S.'s semantics underlying pictures that could not be named appeared to be substantially unimpaired.

R.S.'s ability to read aloud single words was almost unimpaired. He read all classes of words well and when given the high- and low-imagery words from the Coltheart (unpub.) assessment he read them without error. Hence he could read abstract words that he had difficulty comprehending and words corresponding to pictures that he could not name. This suggested that he was making use of the direct route from input to output lexicons where the phonologies of the words were available to him. These results suggest that his naming difficulties arose neither in the semantics system nor the phonological lexicon but within the route connecting these.

This observation influenced therapy. R.S. was able to access semantics from written words and pictures and could make semantic discriminations between them. Equally he could access phonology in reading words. The therapy task used involved matching a picture with one of five related written words. To do this R.S. must access semantics; if he is asked to read the words aloud he is also accessing their phonology. Optimistically, he would be reinforcing links between word semantics and phonology by so doing.

R.S. was given 50 drawings to name. Names were low-frequency words (mean frequency 4.6 per million (Kucera and Francis 1967)). These were divided randomly into two groups of 25 with the constraint that each group included eight that were named correctly. One group was treated, the others acted as controls. Over a 2-week period, about 3h of therapy time was devoted to semantic matching tasks with the treated group. Each drawing was presented with five written words which R.S. read aloud. He was required to select the correct name, the other four being semantically related items. When retested at the end of the 2 weeks, R.S. was significantly better on treated (20/25) than untreated items (10/25, \( \chi^2 = 6.75, p < 0.01 \)). The therapy was discontinued but a further month later R.S. was retested. Treated items continued to show a significant advantage over untreated (18/25 versus 9/25, \( \chi^2 = 5.16, p < 0.05 \)).

These results show improvement on the treated items, which is maintained 1 month later, but no generalization to the untreated control items where only a modest change occurred. In view of this one might argue that this is a classic example of clinical significance being overlooked in the search for statistical significance. This issue will be discussed further at the end of this paper. For the present there was an indication that the effects of treatment might be broader. Generalization might have occurred to items that were semantically related to the treated ones and particularly to those used as foils in the discrimination task. At the end of the treatment period, R.S. was asked to name 12 pictures of words that had been foils and named 11 correctly. Unfortunately he was not tested on these before treatment but the level of naming is much higher than he achieved on other items.

Case 2. J.S. is a 76-year-old retired civil servant with dysphasia and a right hemiplegia following a left hemisphere CVA in January 1988. After a period of intensive speech therapy, physiotherapy and occupational therapy she was discharged to a nursing home in May 1988.

J.S. was well motivated and co-operative, although anxious and emotionally labile. Initially she presented with functional comprehension for simple everyday
conversation and hesitant nonfluent output with severe word retrieval difficulties and mild oral and articulatory dyspraxia. She had a limb apraxia, a severe dressing apraxia and was unable to write. At 3 months post-onset there was relatively little improvement in language skills. As she was frustrated by her poor expressive language, which was limited to social phrases and a few high-frequency nouns, an early focus of therapy was single word naming. The study below formed a part of this.

I.S.'s errors in naming were evenly divided between phonemic and semantic paraphasias. The latter suggested that a semantic deficit contributed to her naming problem. This was confirmed by tasks requiring a semantic decision without naming. On the word to picture matching test (Kay et al. 1989) she scored 25/40 for auditory and 19/40 for written presentation. This is a poor performance, particularly for written stimuli. The possibility that auditory errors might have been due to poor phonemic discrimination was ruled out because on a test where a picture was displayed with the question 'Is it a...?' I.S. made no errors with phonemically similar items but scored only 14/20 when semantic distractors were used.

On synonym matching with high- and low-imagery items (Coltheart unpub.), she scored 24/38 and 21/38 for auditory and 26/38 and 24/38 for written presentations (only 26/38 is significantly above chance). On the Funnell related word test (Funnell 1983) where a written word must be matched against one of two others, she scored 13/16 when the distractor was unrelated (e.g. mitten: plate glove) and only 7/16 (chance) with related distractors (e.g. mitten: sock glove). On the picture version of Pyramids and Palm Trees she scored 34/50.

I.S.'s results on all these tests are unambiguously poor. In contrast, her reading aloud of single words was quite good. On the Coltheart regular/irregular word test, for example, she read 32/39 and 31/39 correctly. Since she had difficulty reading non-words and, from the above results, was unlikely to be using the impaired semantic route, it appears that, like R.S., she was able to read aloud by the direct route between input and output lexicons. Supporting this view, she showed no effects of regularity, imagery or grammatical category on reading, making errors primarily on longer words or words with consonant clusters. This suggests that the therapy used with R.S. might also work with I.S. The major difference between them was I.S.'s markedly greater semantic deficit. Consequently she might be expected to experience more problems with the therapeutic task and the therapy itself might be less efficient.

One hundred drawings were presented to I.S. for naming and divided into four groups. One group was treated during an initial 2-week period, and a second during the next 2 weeks. The other groups remained untreated. Two further control measures, which would be unlikely to improve given the nature of the therapy, were also used. Auditory comprehension of grammatical constructions, as measured by TROG (Bishop 1982), was 50/80 and reading non-words was 7/30 (Coltheart unpub.).

I.S. was seen four times per week during these periods but the demands of other therapy including a good deal of counselling and support meant that only about 29/2 h in each 2-week period was devoted to this therapy. Two tasks were used. In each, four semantically related written words were presented and I.S. was required either to match one of them to a drawing or a spoken definition. In each, errors were pointed out and she was asked to correct herself.

The scores (out of 25) for the four groups at successive testing are shown in Table 1. These scores support the view that improved naming followed treatment and was maintained thereafter. After the first period of treatment, Group 1 was significantly better than Group 2 ($\chi^2 = 6.10, p<0.02$); following the second treatment period, Group 2 was significantly better than Groups 3 and 4 ($\chi^2 = 11.86, p=0.01$) as was Group 1 ($\chi^2 = 5.69, p<0.02$). (Groups 3 and 4 involve a slightly lower starting point but the results remain significant when allowance is made for this.)

It is clear from these results that while there was a slow improvement in the untreated groups, treated items showed much stronger improvement which, for Group 1, was largely maintained after 2 weeks without treatment. Transfer of the patient prevented further work on Groups 3 and 4, which would also have allowed further assessment of the durability of improvements. On the two other control tasks there was little change (TROG 52/80 and reading nonwords 9/30) supporting the view that the changes seen were directly related to treatment. Surprisingly, however, there was improvement on the word to picture matching test (36/40 auditory, 38/40 written (25/40 and 19/40 before treatment) and on auditory synonym matching (high 13/32/38, low 1/36/38 (previously at chance)) after treatment. These tests resemble the treatment task. Either this ability has spontaneously improved or treatment has led to general improvement in this area. The latter would be surprising since the treatment items had little semantic overlap with the items on the tests. Even if the former were true, however, it could not explain the improvement in naming, which was specific to the treated items.

Case 3. F.W., a 76-year-old woman, suffered a left hemisphere CVA in May 1987. After a period in hospital she was discharged to a nursing home. When therapy began in October 1986 her speech was marked by severe word finding problems and some degree of dyspraxia. F.W. found it difficult to adjust to her illness and therapy was often handicapped by her distressed emotional state. She was prescribed antidepressants but her mood swings continued and her performance in therapy was often very variable.

In order to get a general picture of her naming she was given 120 line drawings to name. These varied in frequency, length and word type. She rarely failed to produce a response of some kind. On 41 occasions it was correct. On 38 occasions she produced another word as a response and of these, 13 could be classified as semantic naming errors. Twenty-five responses could not be recognized as any word and a further 10 appeared to be literal paraphasias. The latter bore a recognizable relationship either to the target word or to a word semantically related to the target. Her responses suggested an effect of frequency but statistical analysis failed to confirm this. Length had no effect on naming. When naming failed, cues were given. Phonological cues elicited correct naming on 39% of occasions and first letter names on 21% of occasions they were given. Giving additional semantic information about the target only once led to a correct naming.

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<th>Group</th>
<th>Before treatment</th>
<th>After 2 weeks</th>
<th>After 4 weeks</th>
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<tr>
<td>Group 1</td>
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<td>Group 4</td>
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Semantic errors in naming should indicate a semantic comprehension deficit. The results of the word to picture matching test (Kay et al. 1989) supported this. On auditory presentation, F.W. scored 28/40, seven of her errors being to the close semantic distractor. On visual presentation she scored only 23/40 with 13 close semantic errors.

F.W. was given 50 further drawings (mean frequency 13.8 per million (Kucera and Francis 1967)) correctly naming 17. These were divided into control and treatment groups (9/25 and 8/25 correct). Treatment consisted of matching pictures against one of four written words consisting of the correct name and semantically related distractors. This was introduced into her therapy sessions over a 3-week period. Several short sessions were devoted to the treatment, which in total comprised about 3½h. Reassessment showed that only a slight improvement had occurred and similar treatment was continued for a further 3 weeks and another reassessment carried out (Table 2). There is clearly no difference between the treatment and control groups but overall performance at the third assessment was significantly better than that before treatment (McNemar test, $\chi^2 = 6.10$, $p < 0.02$).

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<th>Table 2. F.W.'s scores (out of 25) for treated and control groups at successive testing.</th>
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<td>Treated group</td>
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Discussion

These studies were carried out in the context of normal clinical practice. The patients received relatively small amounts of treatment time and much that they did receive was devoted to other concerns. For the therapists involved, the assessment of the effects of therapy did not compromise the provision of therapy itself. These points are worth making because more data on the effects of therapy are needed and research by therapists in the course of treatment will contribute greatly to this.

A disadvantage of this approach is that single case studies will often be used and their results cannot be generalized to other patients. Studies therefore need to be replicated with other patients. Here the present results were somewhat confusing. Those for R.S. and I.S. were both positive and showed effects persisting for periods after treatment. R.S. did not show a semantic deficit while I.S. did. In view of this, one might have anticipated that they would require different forms of therapy. That similar therapy benefited both suggests that the semantic discrimination tasks used may benefit a variety of patients. It failed to help F.W., however. A plausible explanation for this may be found in her poor adjustment to her disabilities and her fluctuating emotional state. If this explanation is incorrect, as F.W.'s general improvement suggests, the issue as to which patients will benefit from the approach remains unclear.

Two other criticisms of this approach to therapy should be considered. The first is that the therapeutic task is a tedious one. However, the patients did not appear to find it so. The relatively simple task with its high success rate appeared to be reassuring.

picture/word matching tasks

The second criticism is that studies of this kind are able to show statistically significant effects without being of great benefit to the patient. The argument would be that only a few words are treated, that evidence for generalization to related untreated words is not substantial and that no evidence has been presented that benefits cross the boundary between the clinic and real life. These criticisms are dealt with in greater detail in the final discussion; for the present they set the context for the group study to be reported.

Group study

The task used in the studies above can be adapted for the patient to carry out alone or with a relative or volunteer assisting. Improvements from the therapy could then be achieved without competition for the time available with the therapist. To test this, patients were taught who read single words better than they named pictures. They were given a semantic discrimination exercise similar to those used above, which they were to carry out at home for a short period each day over the course of 2 weeks. During this time patients continued their normal treatment regime while with their therapists. In most cases this consisted of more general types of therapy conducted in group settings.

Design

One hundred and twenty drawings of objects with low-frequency names (mean frequency 7.6 per million (Kucera and Francis 1967)) were selected. The pictures were in four groups matched for frequency and two of the groups were also selected so that pairs of pictures were semantically related. The first of the latter groups was used in therapy.

The task was similar to those previously used. A picture was presented with four written names. These were the correct name (e.g. harp), the name of the semantically related picture from the second group (guitar), the name of another semantically related object not included in the pictures (violin) and the name of an unrelated object from the third group of pictures (comb). As a result, improvement could be assessed on pictures used in therapy, on related pictures used as semantic foils in therapy, on pictures whose names were seen in therapy but which had no semantic relationship to the treated items and on items not used in any way during the therapy.

Subjects

Initially patients were taught who read the picture names but much less good at naming the pictures. R.S., reported above, was included as being typical of the type of subject required. Other patients used had less good single word reading but all read at levels above their picture naming performance.

Procedure

Patients were assessed on naming the pictures and on their reading of the corresponding words. They were also tested on at least two of three tasks [written word to picture matching (Kay et al. 1989), Pyramids and Palm Trees (Howard and Orchard-Lisle 1984) and written synonym matching (Coltheart unpub.)] requiring semantic discriminations without a verbal response. The results are shown in Table 3.
Table 3. Reading, naming and semantic test scores for patients in the group study.

<table>
<thead>
<tr>
<th>Patients</th>
<th>Reading</th>
<th>Naming</th>
<th>Written word to picture matching</th>
<th>Pyramids and palm trees</th>
<th>Written synonym matching</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. S.</td>
<td>120</td>
<td>64</td>
<td>40/40</td>
<td>49/52</td>
<td>36/38</td>
</tr>
<tr>
<td>M. H.</td>
<td>120</td>
<td>84</td>
<td>39/40</td>
<td>49/52</td>
<td>26/38</td>
</tr>
<tr>
<td>B. J.</td>
<td>115</td>
<td>84</td>
<td>40/40</td>
<td>52/52</td>
<td>38/38</td>
</tr>
<tr>
<td>W. H.</td>
<td>113</td>
<td>89</td>
<td>37/40</td>
<td>44/52</td>
<td>36/38</td>
</tr>
<tr>
<td>D. L.</td>
<td>93</td>
<td>87</td>
<td>40/40</td>
<td>---</td>
<td>35/38</td>
</tr>
<tr>
<td>P. B.</td>
<td>75</td>
<td>51</td>
<td>35/40</td>
<td>47/52</td>
<td>37/38</td>
</tr>
<tr>
<td>E. H.</td>
<td>70</td>
<td>19</td>
<td>38/40</td>
<td>---</td>
<td>37/38</td>
</tr>
</tbody>
</table>

Those for the semantic tasks indicate relatively slight semantic difficulties and suggest that the patients are more similar to R.S. than to I.S. or F.W.

After the initial assessment, the patient was given a folder containing the trials of the matching task. These were divided into 10 sections and marked with the day of the week on which each was to be carried out. Each section contained 60 matching tasks, two for each item. Patients were instructed that they might seek assistance if they required it but none reported doing so and examination of returned folders showed no evidence of errors. All the patients appeared to have completed the tasks with some diligence but without difficulty or requiring more than a few minutes per day.

At the end of the 2 weeks, reassessment of naming of the entire set of 120 drawings was carried out and some time later a third follow-up assessment was undertaken. One patient could not be retested at follow-up and there was some variation of its timing for the others. The mean period was 32.6 days with a range from 21 to 54 days.

Results

The results are illustrated in Figure 2, which shows the mean levels of improvement in naming in each of the conditions at reassessment after treatment and at follow-up.

Two analyses were carried out. First the pre- and post-treatment scores for the seven patients were examined using an analysis of variance. This revealed a significant effect of time of test (F(1,6) = 21.65 p<0.01) reflecting the superior performance overall after treatment and a significant effect of conditions (F(3,18) = 3.76 p<0.05). The important result, however, was a strongly significant interaction between time of test and conditions (F(3,18) = 14.53 p<0.0001). Simple main effects revealed that the treated items had improved very significantly (F(1,17) = 61.82 p<0.0001). Semantically related pictures had also improved significantly (F(1,17) = 6.51 p<0.005), but pictures whose names were seen during therapy narrowly failed to reach significance (F(1,17) = 3.04 p<0.01) and unseen items were not significant (F(1,17) = 1.49). The interpretation of the comparison between semantically related pictures and pictures seen during therapy requires caution. Though one achieves significant improvement and the other does not, the actual difference between them is very small.

The second analysis compared the follow-up scores for six subjects with their initial scores. This again showed significant effects of time of testing (F(1,5) = 26.59 p<0.01) and of conditions (F(3,15) = 8.84 p<0.01) and the interaction of the two

(F(3,15) = 10.33 p<0.001). Simple main effects indicated that significant improvement had been maintained for the treated pictures (F(1,18) = 53.73 p<0.0001) and for semantically related pictures (F(1,18) = 9.96 p<0.01) but that the small improvements in control pictures whose names were seen during therapy (F(1,18) = 1.59) and those unseen during therapy (F(1,18) = 1.02) fell well short of significance.

Discussion

In these experiments we have used tasks that required matching pictures with their written names in the presence of other semantically related written items. The assumption was that these tasks would reinforce links between the semantics of the pictures activated by the discrimination task and their phonologies activated in the output lexicon.

In two of the single case studies, treated pictures showed improved naming that was still present 2 and 4 weeks later. A noteworthy feature of these studies was the similar improvement in patients with and without a semantic component to their naming problem. This suggests that similar treatment may benefit both kinds of patient. Two factors prevent us from drawing this conclusion firmly, however, and indicate the need for further investigation. First, I.S. showed substantial improve-
ment in two of the semantic tasks during the therapy period casting some doubt on her original scores and classification as a patient with a semantic deficit. Second, the result was not replicated in the group study simply because the patients used there had only mild semantic deficits (see Table 3).

The same approach failed to benefit the third patient. The inconsistency needs to be resolved and prevents us from drawing too optimistic a conclusion. Such lack of consistency is particularly apparent in single case studies and may be discouraging. It is not a reason for rejecting them, however. Indeed the opposite is true. Group studies may be misleading precisely because they obscure such inconsistencies.

In the group study, highly significant improvement was found, which was still present over a month after treatment ended. There was also evidence that pictures semantically related to the treated items showed some improvement, which was maintained at follow-up. Improvement here was relatively small and little more than that in unrelated items whose names appeared. However, it was significant, whereas the latter was not. This was achieved in a treatment programme that the patients completed outside normal therapy. It is notable that none had any difficulty completing the therapy task though some had an anomia with some degree of semantic deficit (see Table 3).

In these studies only a few words benefit directly from therapy with no clear evidence of generalization to other words or to spontaneous speech. The criticism that results such as these achieve statistical significance without convincingly demonstrating clinical worth must therefore be answered. Obviously more evidence of generalization would be welcome but even without it there are several reasons for persisting with research of this kind. Howard et al. (1985b) point out that the therapy time required is quite small. This is also true here, and in the group study the therapy time was additional to time spent with therapists. Such criticism would also be diminished if generalization to untreated semantically related items was unambiguously present. The present results suggest that it does take place but they probably underestimate its potential. Although the experiment was designed to assess the effect on related pictures, the materials used were not ideal. Essentially there were 30 pairs of related pictures each potentially from a different semantic domain. It is reasonable to believe that work with a similar number of items from one or a few domains might show much greater generalization from treated to untreated items. Research on this issue would be welcome.

Criticism of efficacy research of this kind miss an important point. A distinction should be made between research that seeks to show that therapy works and research that tries to evaluate the methods which might be used in therapy. Though structured in some ways to resemble therapy, these studies were of the latter kind. The positive results obtained suggest that the method should be used particularly if it can be carried out by patients without supervision. It would not be expected, however, that therapeutic use would follow the formality required in experimental situations. The method should be adapted to the needs of individual patients and would be used alongside other therapies. Moreover, there are many activities already used in individual and group therapy that make similar demands to the task evaluated here. The results obtained here make it reasonable to assume that these are beneficial to patients. Finally, observations during the administration of these experiments suggested that additional therapeutic gains were occurring, not least the insight developed by the patient into the naming process and an enhanced capacity to self-cue.

References


