13 'Little words – No!'

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This is a study of one patient, P.W. (born 1908), a retired civil servant who had a stroke in 1965. This patient has been described at length in Patterson (1978, 1979) and Patterson and Marcel (1977).

The outstanding features of P.W.'s condition are:

1 *Spontaneous speech.* P.W. is a classic and severe agrammatic aphasic. His severity rating on the Boston Diagnostic Aphasia Test (Goodglass and Kaplan, 1972), which encompasses a range from 0 (most impaired) to 5, is 1; and his profile is that of Broca's aphasia.
2 *Speech comprehension.* His auditory comprehension is impaired (and even severely so given syntactically complex utterances) but adequate for conversation.
3 *Phonological manipulations.* A prototypic deep dyslexic, P.W. cannot do any non-lexical phonological coding of written language.
4 *Reading.* Performance varies with word type, but a broad sample of content words (nouns, adjectives, verbs) yields about 50 per cent correct responses when P.W. reads single words aloud. About half of his paralexic reading responses are semantic (e.g. *upset* → 'quarrel').

When invited to read, on one occasion, his response was 'Big words – Yes! Little words – No!' and it is on the 'little words' that this paper focuses. Previous work on function words with P.W. has shown the following:

1 *Reading aloud.* P.W. correctly read only 8 per cent of a list of 60

function words (Patterson, 1979). In addition he had a higher proportion of omissions than in response to content words. This general weakness on function words is a well established feature of the deep dyslexic literature. Thus G.R. read two out of 111 function words correctly (Marshall and Newcombe, 1973), K.F. read 11 per cent of his function words (Shallice and Warrington, 1975) and V.S. read 29 per cent correctly (Saffran and Marin, 1977).

2 *Comprehension.* P.W.'s comprehension of function words appears to be very poor. On auditory presentation of the Token Test he scored four out of fifteen (Patterson and Marcel, 1977). In a variety of other simple tests on prepositions he scarcely scored better than chance (Elvin and Hatfield, 1978). We are not aware of previously published results for other patients with deep dyslexia.

3 *Lexical decision.* On the basis of his reading performance, it might have been thought that function words were rather like nonsense syllables to P.W. However Patterson (1979) has demonstrated that P.W. is able to discriminate function words from non-words in a lexical decision task. He correctly accepted 60 out of 60 function words, making only two false-positive errors on the 60 non-words. Since the non-words closely resembled function words (e.g., *thise, thore, whar, weth*), we must assume that the system responsible for categorisation of visually presented words operates as accurately for function words as for any other.

4 *Auditory-visual matching.* A function word was presented visually and three function words were read out for him to select the correct match. He scored 58 per cent correct (Patterson, 1978), which is better than chance, but very poor.

In this paper we explore further his reading aloud of function words and introduce some new tasks aimed at exploring his comprehension processes.

Reading aloud

Over the last 18 months we have often presented him with lists of function words to read. These trials have been with a number of motives: comparison of function words with words of different

classes; attempts to increase both his reading and his comprehension of function words; and concentration on a small set of words which were cued indirectly (Morton and Patterson, 1977). We have collated all these data and present the results in Table 13.1. The words have been divided into more or less classical grammatical divisions, without too much concern over words which could be members of two or more classes. The errors have been classified into omissions and a variety of other headings which are here illustrated.

TABLE 13.1

		Reading response					
		Correct	*Omission*	*Function word paralexia*			*Paralexia (not function word)*
Word class	*(n)*			*Semantic*	*Visual*	*Other*	
Prepositions and conjunctions	(105)	0.36	0.11	0.05	0.20	0.17	0.10
Adverbs and quantifiers	(129)	0.21	0.14	0.12	0.05	0.23	0.24
Interrogatives	(16)	0.31	0.37	0.06	0.13	0.06	0.00
Auxiliary verbs	(57)	0.11	0.33	0.05	0.14	0.26	0.10
Personal pronouns	(82)	0.22	0.26	0.22	0.10	0.04	0.16
Relative pronouns	(17)	0.00	0.65	0.00	0.12	0.00	0.23
Total	(406)	0.23	0.21	0.10	0.12	0.17	0.17
Cued words	(207)	0.40	0.14	0.06	0.08	0.12	0.20

(a) Semantically related function-word paralexia

me → 'I'
often → 'sometimes'
where → 'whither'
usually → 'sometimes'
us → 'we'
before → 'front of'
we → 'me and you'

(b) Visually similar function-word paralexia (note: these are sometimes the result of a particular reading strategy whereby initial or final letters are covered over until some other word is revealed)

his → 'is'
beside → 'because'
us → 'is'
our → 'or'
about → 'out'
where → 'she' (via the intermediate 'her', so in fact this is a visual paralexia followed by a semantic one)

(c) Other function-word paralexia

both → 'perhaps'
between → 'sometimes'
nor → 'and'
the → 'and'

Because there are not a great many of the following types and there is limited space in Table 13.1, these are not presented separately in the table. But to give the full flavour of his reading responses . . .

(d) Semantic paralexia – not function word

beneath → 'downstairs'
none → 'negative'
if → 'query'
both → 'two'
she → 'woman'
her → 'girl'

(e) Visual paralexia – not function word (and see note for (b) above)

must → 'musk'
yet → 'yak'
what → 'hat'
again → 'gain'
through → 'rough'
when → 'hen'

(f) Visual-then-semantic paralexia – not function word

when → 'chick'
when → 'cockerel'
their → 'throne'
their → 'earl'

Cued-words. One class of function words has been examined separately. These are words for which P.W. has cues to help him to read them. He has accumulated these cues over the years in an exercise book which he occasionally consults. We have added to this set and examined his performance with them (Morton and Patterson, 1977). The cues are of three main kinds:

1 Homophones

been → bean → 'been'
through → threw → 'through'
would → wood → 'would'

2 Syllabic decomposition

even → even(song) → 'even'
after → after(noon) → 'after'
from → from(age) → 'from'

3 Phrase decomposition

the → (God Save) the (Queen) → 'the'
off → (they're) off! → 'off'
here → (hear) hear! → 'here'

The cued words are listed separately in Table 13.1 where it can be seen that the cues are moderately effective so far as his ability to read function words aloud is concerned. Many of his failures on this set arise from paralexias on the intervening word (e.g. *generally*, for which his cue is General Lee, led to the response 'colonel'; *even*, for which his cue is even(song), → 'sunset') or from appropriate decomposition followed by inappropriate selection (e.g. *after* → 'noon').

In Table 13.1 the outstanding features are (a) the appalling

performance with relative pronouns and auxiliary verbs, (b) the frequent semantic paralexias with personal pronouns, and (c) the overall high level of function word paralexias (0.39). This value might be in part a function of the homogeneity of the lists. In a heterogenous list of mixed function and content words, the number of function word paralexias to function words was 10/38 = 0.26. That his overall level of correct reading of function words is higher in Table 13.1 (0.23) than previously reported (0.08) is, we assume, attributable to the fact that both we and P.W.'s speech therapists have been hammering him with these words.

Comprehension

Comprehension of single words: the triad method

It was the occasional occurrence of semantic paralexias in reading function words which alerted us to the possibility that P.W. had more comprehension of these words than revealed by any tasks to date. After one or two false attempts, we settled on a two-alternative forced choice task where he had to indicate which one of two alternative words went with a third word, all presented visually. He was tested on a number of separate occasions, with the nature and extent of the tests varying as we gradually came to understand what we were doing. Oddly enough, *he* seemed to understand what we were doing; we do not mean that he necessarily understood it consciously but rather that he needed minimal instructions. The instruction essentially directed 'choose which one of these two words goes with this third word' together with some easy examples like:

man
boy
woman

We present the data below, by type of word and type of judgement required and with examples. It should be noted that a total of twelve judgements of one type does not usually mean that there were twelve *different* triads of that type. Some specific triads were repeated over the various sessions.

Personal pronouns					*Correct*
(a) *number* e.g.	me us	we	him them	theirs	10/12
(b) *gender*	him her	he	he she	hers	11/12
(c) *person within number*	me him	he	us them	our	9/14
(d) *person across number*	I he	we	they we	she	6/8
(e) *case*	he him	her	my me	our	9/18

Prepositions and adverbs					*Correct*
(a) *space*	beside apart	next to	over under	up	25/31
(b) *time*	now then	later	before after	since	13/18
(c) *frequency*	every few	all	always seldom	rarely	16/20

Demonstratives[1]					*Correct*
(a) *locational*	that this	these	near far	that	2/8
(b) *number*	this these	that	those that	many	12/12

Interrogatives				*Correct*
	who why	person	which why	thing	14/17

Conjunctions				*Correct*
(a) *logical number*	except with	but	instead together	one	12/14
(b) *logical function?*	if though	when	therefore however	because	3/6

Part-of-speech				*Correct*
	this thus	that	if under	by	3/10

Summary of triad data

This technique shows that P.W. can extract quite a lot of information from written function words. The judgements he made reasonably well involved (a) the gender of pronouns; (b) prepositions and adverbs specifying space; (c) prepositions and adverbs specifying frequency; (d) interrogatives; and (e) anything concerning number, whether it be pronouns, demonstratives or conjunctions of logical number. He could not perform judgements based on part-of-speech or case; also, though the amount of data is small, it appears that he could not handle locational demonstratives or conjunctions of logical function. We do not claim to have predicted this pattern, nor entirely to know how to account for it, but the following summary suggests itself: P.W. seems to understand the semantic content of function words, but not the syntactic content. Words specifying gender, space and frequency provide substantive information apart from any role they play in or form they are required to take by their sentential context. It is not clear that the same can be said for variables like case and part-of-speech. Thus we invoke the traditional split between lexical/semantic knowledge and syntactic ability (Caramazza and Berndt, 1978; Marin, Saffran and Schwartz,

1976). Not only does this distinction broadly characterise much of the general reading performance of deep dyslexics and both the speech production and comprehension of Broca's aphasics; it even seems to be germane within the class of function words. Further we note that these results and our interpretation of them are a counter instance to the statement that function words '. . . are not believed to have a specific semantic representation' (Caramazza and Berndt, 1978, p. 910).

Comprehension of single words: other techniques

1 Ordering of words specifying quantity and frequency

We gave P.W. two tests each consisting of seven words which could be ordered from 'least' to 'most'. The seven words were printed on slips of paper and presented to him altogether, in jumbled order. For the quantity words, his ordering was:

none one few some several many all

One of the authors would also produce this order, and the other would reverse *some* and *several*, but in any case we call P.W.'s performance quite good. For the frequency words, his ordering was:

never once seldom usually sometimes often always

We disagree with his placement of *usually*, but again consider his performance adequate.

2 Associating word pairs

Eight pairs of function words like *in-out*, *above-below*, *on-off* were printed on slips of paper, one word to a slip. The sixteen bits of paper were given to P.W. altogether, in jumbled order. He was asked to put them into appropriate pairs (we gave him *yes-no*, which was not one of the test pairs, as an example). He did this at first correctly and then after some thought dissolved three pairs and incorrectly re-paired them as *now-before*, *above-then*, and *after-below*. On another session he got six correct pairs easily, but slowly and incorrectly joined *now-after* and *then-before*. In this test, time-relevant words appeared to cause him difficulty.

3 Picture-word assignments

This test involved simple drawings of two or three objects in some spatial relationship to one another, together with two or three

printed words describing the position of each object. All of the drawings and words are shown in Figure 13.1. For the test, P.W. was given one picture at a time, plus the corresponding two-three words on slips of paper, and asked to assign the words to the pictures. This test was done on five separate occasions (only four for the last picture), and performance is also shown in Figure 13.1. As in the previous test, *before-after* seems especially problematic for P.W. Otherwise, performance was perfect.

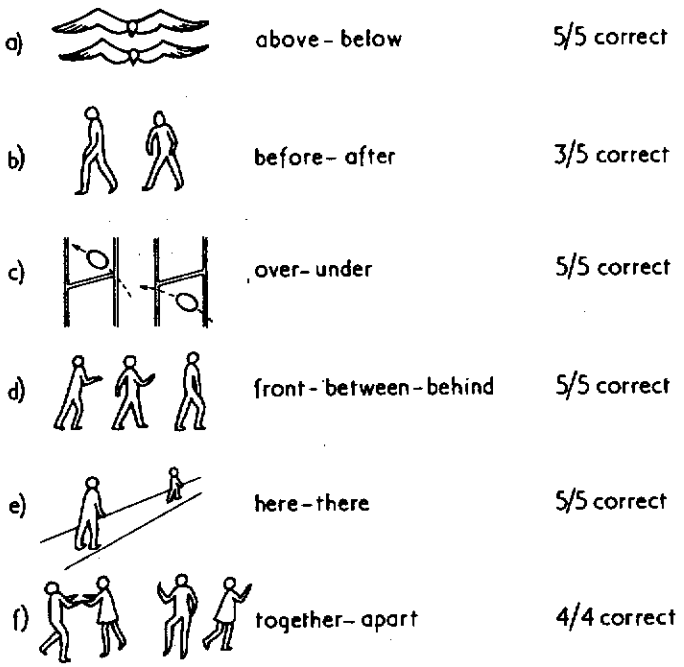

FIGURE 13.1 Pictures, words and performance for the test of picture-word assignments

4 Judgements of appropriateness

Using three pictures (which appear in Figure 13.2), we asked P.W. to say which of a list of function words could appropriately be used to describe the positions of the pictured objects. There were 17 words: *above, below, before, after, right, left, over, under, up, down, beside, between, through, across, around, beneath, behind.* Each was printed on a

slip of paper. With one picture in front of P.W., the 17 words were presented one at a time in a random order. He was to look at each word silently and respond 'yes' if it was appropriate for the picture and 'no' otherwise. His performance was as follows:

Picture 1 (airplanes): By our reckoning, seven of the 17 words are appropriate; he responded positively to six of these but rejected *beneath*. He also accepted two inappropriate words, *right* and *before*.
Picture 2 (houses): We think four words apply here, *right*, *left*, *between* and *beside*; he accepted the first three and rejected the last. Of the remaining 13 words, he incorrectly accepted *up*, *down* and *under*.
Picture 3 (cars): Five words could be considered relevant; he responded 'yes' to *left*, *right* and *before*, but 'no' to *behind* and *after*. Of the 12 inappropriate words, he accepted half (*up*, *down*, *over*, *under*, *above*, *below*). Thus, while his performance on the first two pictures was not bad, on picture 3 it was very poor. We do not understand his acceptance of vertically oriented words for this picture.[2]

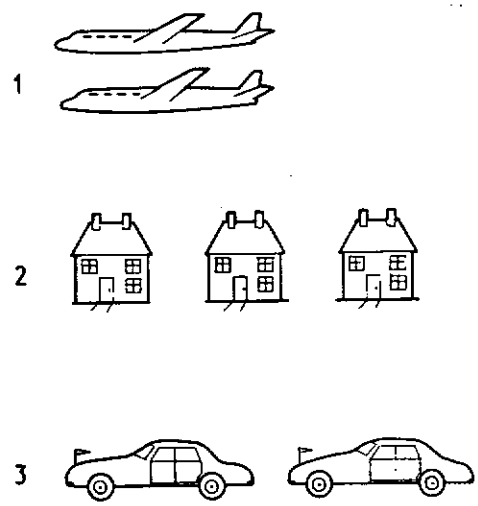

FIGURE 13.2 Pictures for the test of judgements of appropriateness

Comprehension of words in context: prepositions

In a kind of version of the Token Test (De Renzi and Vignolo, 1962), three objects (cup, saucer and pen) were placed on the table, and written instructions of the form *Put the saucer on the cup* were presented to P.W. one at a time. There were 18 such sentences; we wish to discuss a coherent set of 12 which involved six specified relationships (*on*, *over*, *under*, *below*, *in front of*, *behind*) and in effect six matched pairs. That is, the set included both *cup on saucer* and *saucer on cup*, both *pen behind cup* and *cup behind pen*. The order of presentation was of course randomised, and the position of the objects was re-set to neutral after each instruction had been carried out.

For these 12 instructions, P.W.'s performance reflected the correct *dimension* of spatial relationship in 11/12 cases; but only once was his response correct. In other words, he consistently reversed the relationship expressed by the sentence. This is scarcely random, and we infer that his performance was rule-governed – but by the wrong rule. It appears that he assigned the spatial semantics of the preposition to the second noun (i.e. the noun in the same constituent). We have no idea whether the rule has any simple motivation or whether it would generalise to other sentence types. To ascertain whether it would even be consistent, we repeated the test on another session. This time all 12 of his responses preserved the correct dimension; four responses were correct and eight had the relationship backwards. If anything, our problem here is to account for the four correct responses! A variety of factors could be influencing his performance, but we might note that he seems unaffected by a pragmatic preference for *cup on saucer*. Thus, for all three of the instructions *put the cup on the saucer*, *put the saucer under the cup* and *put the saucer below the cup*, he put the saucer on the cup.

Comprehension of words in context: pronouns

1 Action descriptions

The two authors and P.W. sat round a table with a pile of sugar cubes in front of each. The test material consisted of sentences like 'I give one to her' and 'He gives one to you'. Initially we read a set of eight such sentences aloud and asked P.W. to effect the action described by the sentence. He did this correctly for 7/8 sentences.

Then we put a set of eight written sentences in front of him, one at a time, and though we once again read them aloud we instructed him to perform the actions as though he were saying the sentences. Again he was 7/8 correct. His error was on '*they give one to me*', for which he only transferred a cube from K.P. to P.W.; this is not wrong but is incomplete by our implied rules. Initially we assumed that he understood both the semantics of *give* and the pronoun referents. However, recalling that he had performed consistently but incorrectly as a result of a strategy with the prepositions, we then felt that we had accepted his performance too readily. Clearly, a more adequate test would involve a random choice between *give* and *take* as the verb for each sentence. On a subsequent session, therefore, we gave him 16 sentences, eight with *give* and eight with *take* (e.g. *I take one from her*). This time the sentences were presented visually and were not read aloud. On all except one of the items, he treated the subject nouns as donor; that is, for both *I give one to him* and *I take one from him* he transferred a sugar cube from P.W. to J.M. Thus his performance was incorrect for half of the sentences. But his treatment of the pronouns was consistent and error-free. It looks, then, as though P.W. treats *give to* and *take from* as at least approximately synonymous. Indeed, in their underlying transactional meaning, they do refer to the same concept (see Collins and Quillian, 1972, p. 317 for a discussion of this using *buy* and *sell* as examples). The difference between them could be seen as syntactic rather than semantic, and thus P.W.'s difficulty with these expressions would relate to his general dissociation between syntactic and semantic abilities.

2 Grammaticality judgements

P.W. was asked to judge whether each of 16 sentences was acceptable. The eight grammatical sentences were of the sort *They give it to us* and *I gave it to him*; examples of the ungrammatical sentences are *Me gave it to him* and *He gave it to we*. On separate sessions the test was done with visual and auditory presentation, and the results are shown in Table 13.2. He refused to judge three of the visually presented sentences (response = 'pass'). If we assign these equally to the 'yes' and 'no' categories (one each for grammatical and a half each for ungrammatical stimuli), we can calculate approximate d'

(visual) = 1.53 and d′ (auditory) = 1.35. This hardly represents brilliant performance but it is not at chance. He thus seems to have some information about the appropriate case of pronouns though he cannot do case judgements in the triad task. Zurif, Caramazza and Myerson (1972) describe anterior aphasics as having agrammatic intuitions about language. In general, we would accept this as characteristic of P.W.; but his grammaticality judgements are perhaps a bit better than this notion would predict.

TABLE 13.2

	Visual presentation			*Auditory presentation*	
	'Yes'	*'No'*	*'Pass'*	*'Yes'*	*'No'*
Grammatical	4	2	2	6	2
Ungrammatical		7	1	2	6

Summary

In spite of his very impoverished ability to read function words aloud, P.W. apparently has a great deal of lexical/semantic information about them. We are thus inclined to believe that they are treated no differently from content words by the logogen system or the semantic part of the cognitive system. There is however a severe loss of syntactic ability, and to the extent that a judgement required about an individual function word is biased toward its syntactic function, P.W. will be impaired on that judgement. His ability to compute precisely-correct meanings for sentences is, of course, disrupted by his syntactic impairment. He can generate rules for interpretation, but they do not necessarily correspond to those of the language; and if they do, it could at this stage be attributed to luck rather than residual syntactic ability. There is a hint from the grammaticality judgements that his ability to parse sentences is partly functional (see also Andreewsky and Seron, 1975). But it seems that the parser cannot make information available to other parts of the system, in particular the linguistic processor (see Figure 4.3, p.115). Our results do not 'explain' the deep dyslexic's difficulty with function words, but they go some way toward specifying it.

Notes

1 We are aware of the oddity of performance on these next two classes, and hope that it reflects more than our confusion about what constitutes a 'type of judgement'. We had rather thought that the locational demonstrations would behave like prepositions and adverbs of space, but they seem not to do; perhaps he is treating them more as relative pronouns than demonstratives. This topic needs further work.

2 An interesting phenomenon occurred here and in several other tasks as well, which we should note though we cannot explain it. Words like *up*, *over* and *before* in contrast to *down*, *under* and *after* have a property akin to markedness; and whatever this property is, P.W. seems to be sensitive to it. In the appropriateness test, though we did not ask him to specify which object in the picture was described by an acceptable word, he often voluntarily pointed to an object. For his incorrect acceptances on the cars picture, all were in accordance with this 'markedness' concept (at least with our intuitions about it). Thus he pointed to the front car for *up*, *above* and *over*, and to the car behind for *down*, *below* and *under*.

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