Testing for nominal dysphasia

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SUMMARY In this paper we have described the construction of a graded naming test that makes the distinction between object and proper names. This distinction was prompted by a single case study of a patient who showed a specific naming impairment for a particular class of proper names. Naming vocabulary was found to be highly correlated with other measures of verbal intelligence and we have discussed the use of the graded naming test as a tool for clinical assessment and diagnosis. The results of the naming test of the left hemisphere group showed that category-specific naming impairment along the object/proper name distinction is relatively uncommon in any gross form. Object naming was most impaired in patients with lesions of the temporal lobe.

A reduced efficiency in retrieving the name of an object can be the first and only indication of impaired language functioning. This alone makes a sensitive test of naming ability essential for a clinician who wishes to detect the abnormality before it becomes merely a statement of the obvious.

Verbal abilities vary considerably from individual to individual in the general population so it is not unreasonable to assume that naming ability does also. Measures of general vocabulary level correlate highly with other measures of verbal and non-verbal intelligence¹ and it is probable that naming vocabulary skills may be similarly correlated. To date, tests for naming deficits have been based on global measures of current naming ability, such as number of failures or latencies of responses² without taking into account the possible effects of individual variations in optimal levels of functioning. The significance of an individual's present level of performance may be lost unless it can be considered in the context of his other cognitive skills. For example, if one accepts the commonly held view that less frequent items are more vulnerable to word-finding difficulties than better-established well-practised items²⁻⁴ then an individual with an extensive naming vocabulary who develops mild word-finding difficulties may continue to function with no obvious abnormality when presented with items that are common and of high frequency in the context of his own vocabulary. The aim of the present study was to develop a naming test with

items of graded difficulty which allows for individual differences in naming ability.

Evidence of category specificity in the cerebral organisation of language is beginning to emerge from recent studies of language disorders. Selective comprehension deficits and selective naming deficits that are category-specific have now been reported.⁵⁻⁷ In a recent study, McKenna and Warrington⁸ described a patient whose only *intact* naming competence was for the proper name class, countries. In the present study two major semantic categories were selected—object names and proper names. The choice of these particular categories was prompted by our previous single case study⁸ and by the observations of a further patient who had a selective impairment for one class of proper names in an otherwise intact naming vocabulary. We report the neurological and psychological investigations of this patient in Appendix 1.

In the present study we describe the construction of two graded naming tests, for object names and proper names respectively. These tests were standardised on a group of 100 normal subjects, and subsequently a group of 46 patients with localised left hemisphere lesions were tested. The aims of our investigations were threefold:

- (1) To examine the relationship between intelligence and naming ability in a normal population with a view to developing a clinically more useful test.
- (2) To explore the incidence of specific naming deficits in the object and proper name categories in patients with left hemisphere lesions; and
- (3) To obtain further evidence for the anatomical correlates of naming deficits.

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Accepted 13 March 1980

Construction and standardisation of the naming tests

Collection of item pool

Object and proper name items to meet the following criteria were collected:

(1) Items should be sufficiently distinctive to be presented in photographic or pictorial form (for example "sandpaper," "vinegar" would not be suitable).

(2) That the particular responses required should be immediately recognisable from the visual stimulus as being the single response desired, for example a drawing of a "crowd" or "coast" would be too open to misinterpretation and could invoke many responses, such as "people," "mob," "meeting," and "land," "shore," "seaside," etc.

(3) That the visual representation of the items as well as the verbal concept should be well known. This proved particularly difficult to achieve in choosing proper names, for example most authors, however famous, are unknown pictorially.

(4) That there should be stability over time such that the items have "staying power." Therefore many contemporary personalities were not considered suitable.

Following these criteria as closely as possible, a pool of 66 proper names and 61 object names were collected for standardisation.

Measures of intelligence

Obviously the most satisfactory measure of intelligence would have been a comprehensive IQ test such as the WAIS but time factors rendered such a project untenable. As a compromise the Vocabulary and Picture Completion subtests of the WAIS were given. These were chosen on the grounds that they are the verbal and performance scale subtests that correlate most highly with the full scale IQ. Also included were the Nelson and Schonell reading tests⁹ on the grounds that previous studies^{10 11} had shown these to be good indicators of level of intellectual functioning in normal subjects.

Procedure

One hundred volunteers ranging in age from 18 to 76 years acted as subjects. The great majority of these were patients with extracerebral diseases at the National Hospital. Only subjects who had been educated in the normal English system were included. The tests were given in one session, the WAIS subtests being followed by the reading tests and then the 61 object name items and the 66 proper name items.

Selection of test items

From the results obtained for the 61 object names and the 66 proper names, items that were too easy

Fig 1 Control subjects: distribution of scores on the Object Names Test and Proper Names Test.

or too hard to produce good discrimination between the subjects were eliminated, as were items producing ambiguous responses (see criteria (II) for item selection). Thirty object name items and 30 proper name items were selected from the remainder to form two tests of graded difficulty (see Appendix II). The results of the 100 volunteer normal subjects on these two 30-item tests are shown in fig 1.

Results of standardisation

The correlations (product-moment) between each measure of intelligence and each score on the two naming tests are given in table 1.

It has already been established that scores on the WAIS Vocabulary and the Nelson and Schonell reading tests are highly intercorrelated^{10 11} and the present study has shown high correlations between

Table 1 Control subjects: product moment correlations between naming tests and other cognitive measures

	Object names	Proper names
WAIS vocabulary	0.72	0.67
Picture Completion	0.45	0.41
Nelson reading	0.73	0.70
Schonell reading	0.69	0.64

	Object name score	SE	Proper name score	SE
Vocabulary score	$4.32 + (0.38 \times \text{Obj.})$	1.6	$7.55 + (0.26 \times \text{Prop})$	1.7
Nelson score	$-9.55 + (1.83 \times \text{Obj.})$	7.4	$-2.19 + (1.3 \times \text{Prop})$	7.7
Schonell score	$61.95 + (1.40 \times \text{Obj.})$	6.32	$74.06 + (0.95 \times \text{Prop})$	6.71

these tests and the two naming tests. Thus it is clear that spoken vocabulary, naming vocabulary and reading vocabulary are closely related functions. The nonverbal measure of intelligence, Picture Completion, correlated less highly with the two naming tests. The following regression equations were therefore computed in order to predict WAIS vocabulary scaled scores, Nelson reading scores and Schonell reading scores from scores on the naming tests. The standard error for each regression equation is also given.

The means and standard deviations of the scores on the WAIS subtests, reading tests and naming tests are given in table 2. It must be noted that these measures in the present group of normal subjects are shifted upwards from the scores obtained by the population tested by Wechsler and it is therefore not appropriate to normalise the naming test scores on the same scale, that is with a mean of 10 and standard deviation of 3. Nevertheless, tables for naming scores and their intelligence test equivalents can be derived from the above regression equations (for example see Appendix III).

Subjects

The experimental group consisted of 46 patients with unilateral cerebral lesions of the left hemisphere (established by computed tomography or other radiological investigations). Thirty-two of these patients had well-localised space-occupying lesions and the remaining 14 had vascular lesions considered to be restricted to the left hemisphere. Forty of these patients were referred from the National Hospital for Nervous Diseases, the remaining six from the London and Brook Hospitals. Again, only patients over 18 years of age and educated in this country were included. This group of patients with left hemisphere lesions was tested according to the procedure described for the normal subject in the standardisation of the two naming tests. The control subjects, consisting of 100 normal subjects, are described in the previous section.

Results

Group comparisons

The results of the left hemisphere group and the control group were compared using a *t*-test (see table 2). It is clear that the left hemisphere lesion

group is significantly impaired on all these tasks. The question arises as to whether their impairment on the two naming tests merely reflects a generally lowered level of cognitive functioning or whether this group of patients as a whole has nominal deficits independent of their other cognitive deficits. Analysis of covariance¹² partialling out the effects of group differences on WAIS vocabulary, Nelson and Schonell reading scores were computed (table 3). The results showed that the left hemisphere group is significantly poorer in both object and proper naming abilities than the control group even allowing for their impairment in other verbal abilities.

In both the control group and the left hemisphere group the proper names test is significantly harder than the object names test ($t=5.78$, *df* 99, $p<.001$ and $t=2.91$, *df* 45, $p<.01$ respectively). A two-way ANOVA on the results of the two naming tests in the two groups confirmed the significant difference in test difficulty ($F=33.1$ *df* 1,144, $p<.001$) and confirmed the significant difference in group ability

Table 2 Means and standard deviations for control and left hemisphere lesion subjects on all tests and *t*-test data for comparison groups

		Control group (<i>N</i> = 100)	LH lesion group (<i>N</i> = 46)	' <i>t</i> ' test (sig level)
Object names	Mean	22.54	15.15	5.44
	(sd)	(4.3)	(7.15)	($p<.0001$)
Proper names	Mean	20.32	13.28	4.48
	(sd)	(5.8)	(7.06)	($p<.0001$)
WAIS vocab	Mean	12.83	10.00	3.99
	(sd)	(2.25)	(3.73)	($p<.0001$)
Pict com	Mean	11.95	10.07	3.04
	(sd)	(2.39)	(2.65)	($p<.01$)
Nelson	Mean	31.75	22.24	3.14
	(sd)	(10.78)	(14.21)	($p<.01$)
Schonell	Mean	93.57	73.76	4.14
	(sd)	(8.73)	(34.66)	($p<.0001$)

Table 3 Comparison of left hemisphere group and controls on the naming tests using analyses of covariance

Covariate	Tests	(<i>F</i>)	Significance
Vocabulary	Object names	23.9	$p<.0001$
Vocabulary	Proper names	7.6	$p<.01$
Nelson	Object names	33.8	$p<.0001$
Nelson	Proper names	16.8	$p<.0001$
Schonell	Object names	21.7	$p<.0001$
Schonell	Proper names	13.6	$p<.0001$

($F=54.5$, $df\ 1,144$, $p<.001$). There was no evidence for any difference between left hemisphere and control groups in the pattern of object and proper naming abilities since the groups $\times$ test interaction was totally insignificant ($F=0$). The correlation (product moment) between the two naming tests in the control group and in the left hemisphere lesion group was 0.74 and 0.81 respectively. No single patient in the left hemisphere lesion group had an object/proper name discrepancy score exceeding that obtained by any control subject.

Fig 2 Percentage of control and left hemisphere subjects passing each item of the Object Names Test and Proper Names Test.

Item analysis

The 30 items of each naming test were ordered according to item difficulty for the control group and the percentage correct per item for the control group and the left hemisphere lesion group are

shown in fig 2. The left hemisphere group scores are parallel with those of the control group but are at a lower level of competence. The finding that these curves appear parallel suggests that there are no qualitative differences between normal and impaired naming skills. For each subject the naming test results were re-analysed to compare performance on the easy (first 15) items and hard (second 15) items and for each naming test a two-way ANOVA was computed (groups $\times$ item difficulty). For neither the object names test nor the proper names test was there a significant groups $\times$ item difficulty interaction term ($F=140$, $df\ 1,144$ NS and $F=0.51$, $df\ 1,144$, NS respectively), which provides some confirmation that there is no differential effect of item difficulty in the left hemisphere lesion group.

Within hemisphere group comparisons

Since many of the patients in the left hemisphere lesion group did not have a lesion restricted to a single lobe, an inclusive classification was adopted (for example a temporal/parietal lesion case would be allotted to both the temporal and parietal subgroups). However, in order to compare these lesion subgroups with each other, a partially exclusive grouping was adopted, that is the patients with temporal-parietal lesions were excluded from both the temporal and parietal subgroups in computing the significance of the difference between the temporal and parietal subgroups and, similarly, patients with fronto-temporal lesions were excluded from both the temporal and frontal subgroups for the temporal frontal comparison. Thus, for each subgroup comparison the computation is based on two non-overlapping subgroups. This method of analysis has the additional advantage of, to some extent, taking into account a difference in the distribution of size of lesion in each of the three major subgroups. The mean scores and standard deviations for the resulting subgroups are given in table 4 together with the t -tests and their significances for the group comparisons. The temporal group is significantly impaired relative to both the parietal and frontal subgroups on the object names test. On the proper names test the temporal subgroups obtained the lowest mean score but the difference between the subgroups does not reach significance.

Discussion

In this paper we have described the construction and standardisation of a graded-difficulty naming test based on a category distinction of object and proper names. The evidence that naming ability is an intelligence-related skill will be discussed and

Table 4 Comparison of left hemisphere lesion subgroups: mean scores, standard deviations and significance level on the object names and proper names tests

	Temporals (temp. + temp. frontals) (N = 10)	vs	Parietals (parietals + front-par.) (N = 8)	t	Significance
Object names					
Mean	12.4		17.5		
sd	7.6		7.6	2.60	< 0.02
Proper names					
Mean	11.0		14.6		
sd	6.5		8.2	1.43	N.S.
	Temporals (temp. + temp-parietal) (N = 10)	vs	Frontal (frontals + front-par.) (N = 16)	t	Significance
Object names					
Mean	10.6		16.7		
sd	6.9		5.6	4.16	< 0.001
Proper names					
Mean	10.9		13.5		
sd	6.0		7.0	1.68	N.S.

the relevance of this relationship for clinical assessment will be considered.

It was shown that performance on the naming tests correlates highly in normal subjects with spoken vocabulary as measured by the standard vocabulary subtest of the WAIS and with reading vocabulary as measured by the Schonell and Nelson. Furthermore these three tests are generally accepted as robust indices of general intelligence level in normal subjects. The implications of these findings in the clinical context are obvious—in testing for nominal dysphasia it must be helpful to obtain a measure of an individual's present level of functioning on an ordinal scale. This can now be achieved by using a test of graded difficulty. To date, the identification of a minimal or even a mild degree of nominal dysphasia is largely a matter of clinical judgement. However, the present test enables a predicted score on the reading and vocabulary tests to be computed from the score obtained on the naming test. Thus a naming score is converted to a percentile measure, for example for any naming score an equivalent vocabulary scaled score can be computed from the regression equation. This value can be accepted as an indication of the patient's present nominal abilities which can then be compared with other test scores and with a clinical estimate of the patient's premorbid intelligence.

It is hoped that in mild cases of nominal dysphasia a quantitative measure may be illuminating and that in more severe cases of nominal dysphasia where the deficit is obvious a quantitative statement may add to the value of a case description. In addition these naming tests provide a tool for monitoring improvement or deterioration of this language skill in any individual patient.

It has previously been reported by Weisenburg and McBride,¹³ Rochford and Williams³ and Newcombe

*et al*² that high frequency names are less vulnerable to word finding difficulties than are low frequency names. The present results confirm these findings. The performance of the left hemisphere lesion group was depressed but qualitatively similar to that of the control group. There was no differential effect in the left hemisphere group of task difficulty. This was an expected finding which supports the generally accepted view that low frequency items are especially vulnerable to nominal difficulties and reinforces the clinical necessity of a naming test which is graded in difficulty.

Comparison of performance on the object and proper names provided little or no evidence of category specificity in the left hemisphere lesion group as a whole. The groups x tests interaction was totally insignificant and indeed in no single case was there a striking impairment or preservation of object or proper names. The single case study reported in Appendix I, considered in the perspective of these group data, highlights the rarity of the incidence of highly circumscribed and selective deficits in a neurological population. This patient was shown to have a very small lesion due to a minor stroke from which she recovered rapidly. It should be noted that the majority of subjects of this study had larger and more incapacitating lesions.

Finally, as our population were not chosen on the criterion of the presence of aphasia, consideration of the anatomical correlates of nominal dysphasia becomes viable. A number of previous studies have emphasised the association of temporal lobe lesions and nominal dysphasia.¹⁴ Coughlan and Warrington¹⁵ found that although nominal skills were impaired in all lesion groups, the temporal lobe group was significantly more impaired than either the frontal or the parietal lesion groups. The present study replicates this finding and we conclude that although

an integrity of many areas of the left hemisphere is necessary for intact naming skills, word retrieval processes are subserved in the main by structures in the left temporal lobe. It is possible that failure to take into account the problem of task difficulty has led to the opposite view that nominal problems have little or no localising significance.^{16 17}

APPENDIX 1

A single case study of a category-specific naming deficit for names of people. Case report

GBL (Hospital No. A81818), a 55 year old secondary school teacher was admitted to the National Hospital in May 1975 for investigation of intermittent visual disturbances and poor memory. On examination she was found to have a right upper quadrantic field defect. There were no other neurological signs and in particular her language functions appeared normal. Gamma scan was normal but computed tomography showed a small infarct in the region of the posterior temporal branch of the middle cerebral artery of the left hemisphere (fig 3). *Psychological findings* GBL was tested on the WAIS and obtained a verbal IQ of 130 and a performance IQ of 116. On a recognition test (2 choice) for written words she scored 44/50 which is within the average range (scaled score 10)* and on a comparable memory test for faces she scored 48/50 which is within the superior range (scaled score 15)*. Her reading and spelling were entirely normal. On routine testing verbal comprehension, object naming and verbal fluency appeared entirely normal. On the Oldfield naming test she responded quickly and scored 26/26 correct. In contrast on a test of naming well-known personalities her performance was quite impaired: she named only three out of 20 photo-

graphs (scaled score 3)* in spite of having no difficulty in identifying all but two of them by description. (For example, when shown a photograph of Mr Heath, she responded "Conservative, was Prime Minister, organist, comes from the South Coast".) This apparently selective and circumscribed difficulty in identifying people by name was investigated further.

GBL was asked to name the author of 20 well-known books all of which she had read, for example "Who wrote *Pride and Prejudice*?" ; she scored 7/20. Similarly, she was asked to name from their description 20 political and national leaders. She claimed knowledge of all these personalities but she was only able to name nine of them correctly. She did not appear to have comparable difficulty in naming places (towns) on a map. She succeeded in identifying 16 of 20 European towns and 12 of 12 English towns.

Her ability to generate proper names from specific categories appeared to parallel her naming difficulties. She was able to produce 22 town names in 60 seconds but only two political or national leaders and only three English prime ministers in the same time limit. She did rather better with authors, producing nine in the 60 seconds. However, when names of specific people were not required, her performance was very much better; she generated 19 girls names and 14 surnames in separate 60 second periods.

We argue from these results that GBL has a nominal deficit affecting one particular class of proper nouns, (names of people) whilst another class of proper nouns, (names of towns), was spared. Whether naming was from a visual representation or from a verbal description did not appear to affect the severity of the deficit. In conclusion we suggest that GBL provides a further example of a category-specific naming deficit.

*Normalised scores Mean 10, SD 3, Warrington, unpublished.

APPENDIX II

Objects

- 1 Kangaroo _____
- 2 Scarecrow _____
- 3 Buoy _____
- 4 Thimble _____
- 5 Handcuffs _____
- 6 Tweezers _____
- 7 Corkscrew _____
- 8 Sporrán _____
- 9 Tassel _____
- 10 Sundial _____
- 11 Chopsticks _____
- 12 Periscope _____
- 13 Boar _____
- 14 Blinkers _____

Proper names

- 1 Hitler _____
- 2 Eiffel Tower _____
- 3 Henry VIII _____
- 4 Italy _____
- 5 Queen Victoria _____
- 6 Napoleon _____
- 7 Mona Lisa _____
- 8 Ghandi _____
- 9 Joan of Arc _____
- 10 Eros _____
- 11 L Armstrong _____
- 12 Lawrence of Arabia _____
- 13 S America _____
- 14 Taj Mahal _____

Objects

15 Monocle	_____
16 Turtle	_____
17 Trampoline	_____
18 Bellows	_____
19 Shuttlecock	_____
20 Anteater	_____
21 Pagoda	_____
22 Radius	_____
23 Leotard	_____
24 Mitre	_____
25 Yashmak	_____
26 Sextant	_____
27 Centaur	_____
28 Cowl	_____
29 Tutu	_____
30 Retort	_____

Proper names

15 Elizabeth I	_____
16 F Nightingale	_____
17 Mao Tse Tung	_____
18 Shakespeare	_____
19 Castro	_____
20 Canute	_____
21 Harold	_____
22 Kremlin	_____
23 Lincoln	_____
24 Lenin	_____
25 Rasputin	_____
26 Trotsky	_____
27 Parthenon	_____
28 Disraeli	_____
29 Marx	_____
30 Virginia Woolf	_____

APPENDIX III

Prediction of vocabulary from naming scores

Objects (vocab = $4.32 + (0.38 \times \text{object})$)

<i>Objs</i>	<i>Vocab</i>
30	16
29	
28	15
27	
26	
25	14
24	
23	13
22	
21	
20	12
19	
18	
17	11
16	
15	10
14	
13	
12	9
11	
10	
9	8
8	
7	7
6	
5	
4	6
3	
2	5
1	
0	4

Proper (vocab = $7.55 + (0.26 \times \text{proper})$)

<i>Proper</i>	<i>Vocab</i>
30	
29	
28	15
27	
26	
25	14
24	
23	
22	
21	13
20	
19	
18	12
17	
16	
15	
14	11
13	
12	
11	
10	
9	10
8	
7	
6	9
5	
4	
3	
2	8
1	
0	

We thank the physicians and surgeons of the National Hospital for Nervous Diseases and the Brook Hospital for permission to test patients under their care. We are grateful to Professor RW Gilliat for permission to study GBL and to report our findings. We wish to thank Dr Alan M Whiteley who prepared the brain diagram. We are also grateful to Dr RTC Pratt and Dr T Shallice for their helpful comments in the preparation of this manuscript. We would particularly like to thank Dr Hazel Nelson for her invaluable advice in this investigation.

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Correction

It is regretted that the paper "Testing for Nominal Aphasia" by Pat McKenna and Elizabeth K Warrington (*J Neurol Neurosurg Psychiatry* 1980; 43:781-8) was published without fig 3. This appears below together with the appendix to which it refers.

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Case report

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