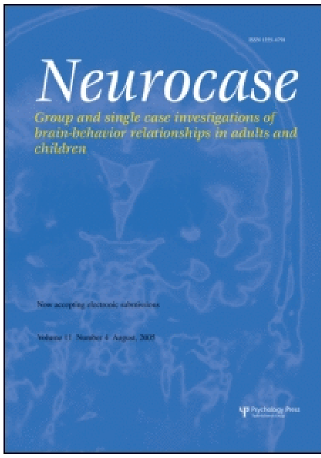

Neurocase
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713658146

Semantic loss without surface dyslexia

Matthew A. Lambon Ralph [a]; Andrew W. Ellis [a]; Sue Franklin [a]
[a] University of York, Heslington, York, UK

Online Publication Date: 01 October 1995

To cite this Article: Ralph, Matthew A. Lambon, Ellis, Andrew W. and Franklin, Sue (1995) 'Semantic loss without surface dyslexia', Neurocase, 1:4, 363 — 369

To link to this article: DOI: 10.1080/13554799508402380
URL: http://dx.doi.org/10.1080/13554799508402380

Neurocase (1995) Vol. 1, pp. 363–369

Semantic Loss without Surface Dyslexia

Matthew A. Lambon Ralph, Andrew W. Ellis and **Sue Franklin**
University of York, Heslington, York, UK

Abstract

Recent models of reading, including some computational models, suggest that error-free performance in reading aloud may be reliant, at least in part, on support from the semantic system. Such models predict that, following semantic impairment, a pattern of acquired dyslexia known as 'surface dyslexia' will be an inevitable consequence. We present data from a patient with dementia of Alzheimer type who shows a severe semantic impairment but near error-free performance on reading aloud real words (including low-frequency, irregular, abstract words) and non-words. The data are discussed in light of various models of reading and in relation to previously reported cases.

Introduction

In a series of recent papers, Patterson, Hodges and their colleagues have reported a number of patients who show a combination of semantic impairment and a particular form of reading disorder known as 'surface dyslexia' (e.g. Patterson and Hodges, 1992; Graham *et al.*, 1994; Patterson *et al.*, 1994). All these patients have some form of progressive dementia, either a generalized atrophy (e.g. DAT) or a more circumscribed atrophy [e.g. progressive fluent aphasia or semantic dementia (Snowden *et al.*, 1989)]. Within these patient groups, there are a number of converging indicators of semantic impairment. For example, the patients show poor word comprehension, both spoken and written. In tasks such as matching words to pictures, they make semantic errors; for example, pointing to a picture of a knife in response to the word 'fork'. They also make semantic errors in object naming. They show a reduced ability to generate exemplars from categories such as types of animal, and have an impoverished fund of general knowledge. In comparison, other components of language, for example syntax and phonology, may be relatively spared. Unlike DAT patients, the semantic dementia patients also show preserved perceptual skills, non-verbal problem-solving abilities and episodic memory.

Surface dyslexia is a pattern of reading disorder in which the patient reads words with regular, consistent spellings (e.g. mint) better than words with irregular, exception spellings (e.g. pint). Their errors tend to take the form of misreading irregular words as if they were regular; for example, misreading colonel as 'kollonel' or trough as 'trow' (Patterson *et al.*, 1985). Such errors suggest a reliance on the application of sublexical letter–sound correspondences to words which, prior to their brain lesions, they would have recognized and pronounced as familiar whole units.

The association between semantic impairment and surface dyslexia observed by Patterson and Hodges has been similarly reported by Breedin and co-workers (1995), Bub and colleagues (1985) and Warrington (1975) among others. Patterson and Hodges have proposed a theory to account for this co-occurrence between semantic impairment and surface dyslexia (Patterson and Hodges, 1992; Patterson *et al.*, 1994). It should be noted that this theory closely reflects aspects of the performance of a connectionist model of 'normal' and impaired reading (see simulation 4: Plaut *et al.*, 1995). According to the theory of Patterson and Hodges, there is a mechanism that directly computes phonology from orthography. This direct computation is capable of reliably translating print into sound for all words with regular, consistent spellings. Also, it can accurately convert frequently encountered irregular words from print to sound. In the case of less common irregular words, however, the direct mapping process requires support from semantic representations of those words if they are to be pronounced correctly. In the absence of such support the words will tend to be regularized.

This theory makes the strong prediction that impairment to semantic representations should invariably be accompanied by surface dyslexia. There are, however, a number of patients already reported in the literature who are problematic for this view. The first is case WLP reported by

Correspondence to: M. A. Lambon Ralph, Department of Psychology, University of York, Heslington, York YO1 5DD, UK.

Schwartz and colleagues (1979) and Schwartz and co-workers (1980). As Patterson and Hodges (1992) acknowledge, during WLP's progressive dementing illness, there was a stage at which she showed comprehension deficits indicative of semantic impairment but was able to read various exception words correctly, even though she showed surface dyslexia later in the course of her illness. This is the very pattern of impairment that the Patterson and Hodges hypothesis excludes, namely semantic impairment without surface dyslexia.

Similar patterns of preserved reading aloud in the context of impoverished semantics have been found in other cases of DAT. These cases include patients who could read all, or nearly all, English irregular words correctly (Cummings *et al.*, 1986; Friedman *et al.*, 1992; MB in Raymer and Berndt, 1994) and three Japanese DAT patients who were able to read correctly an entire set of 50 kanji words until the very last stages of their progressive illness (Sasanuma *et al.*, 1992). Furthermore, unlike the direct correlation between comprehension and reading aloud found in some patients with lobar atrophy (e.g. Patterson and Hodges, 1992) or DAT (Patterson *et al.*, 1994), other studies have found no such correlation. Coslett (1991) failed to find an association between comprehension and reading of irregular abstract words in the patient WT. Following an embolic infarction to the left posterior superior temporal lobe, she was unable to write to dictation, comprehend, or repeat abstract words but was able to read them aloud perfectly well. Similarly, no association was found by Raymer and Berndt (1994: SC and MB) for irregular words in general nor by Sasanuma *et al.* (1992) for kanji.

In a more recent paper, Cipolotti and Warrington (1995) have reported data from a patient DRN with lobar atrophy who showed a relatively pure breakdown in semantic memory with preservation of other cognitive and memory abilities, the pattern of impairment known as semantic dementia or progressive fluent aphasia (e.g. Snowden *et al.*, 1989; Hodges *et al.*, 1992). They made a detailed study of DRN's ability to read aloud and define a corpus of words, including low-frequency exception words. If we focus on this specific group of words, then it is clear that DRN showed a strong dissociation between preserved reading aloud and impaired defining (e.g. 95% versus 14%, and on a second set 96% versus 39% respectively). These data also pose a problem for the Patterson and Hodges model in its current formulation.

There are a number of points about patient DRN and the methodology employed by Cipolotti and Warrington which might weaken the force of this case as a falsification of the Patterson and Hodges hypothesis. First, impaired definition was the *only* evidence adduced for semantic impairment in DRN: there was no converging evidence from other naming and comprehension tasks. Poor definitions might result from semantic impairments, but could also reflect, at least in part, word-finding difficulties or other output problems.

There may be potential problems in the way that DRN's definitions were scored. Cipolotti and Warrington described their scoring criterion as 'lenient ... taking into account the patient's word retrieval problems'. They scored definitions in which only superordinate information was provided (e.g. dog→'an animal') as incorrect. Patterson and Hodges are not explicit about how much semantic support is required to enable a low-frequency exception word to be read correctly. It may be that superordinate information would suffice. If so, then some of the words classed as being misdefined by DRN may have activated enough semantic information for correct reading aloud.

Thirdly, DRN's definitions were better for abstract than concrete nouns. This is an unusual pattern: semantic impairment is normally reflected in better performance on concrete than abstract words (e.g. Plaut and Shallice, 1993; Franklin *et al.*, 1994). It is not clear from the theory of Patterson and Hodges how the imageability of words might affect accuracy in impaired reading. With regard to normal readers, Strain and colleagues (1995) argue that semantic support for the reading of low-frequency exception words will be stronger for words with concrete meanings than for words with abstract meanings. Hence the words most prone to error in surface dyslexics with semantic impairment should be low-frequency, exceptional, abstract words such as *suave*, *caste* and *guise*. This pattern of impaired reading has been reported before (e.g. Howard and Franklin, 1988; Franklin *et al.*, 1995). Furthermore, Strain and colleagues (1995) have shown that normal readers have particular problems in reading aloud words of this type when under time pressure. Thus, on the one hand, the model may claim that semantic representations are important in reading all low-frequency, exceptional words. Since abstract semantic information appears to be generally prone to damage then one might expect that patients with impaired semantics will find low-frequency, exceptional, abstract words the most difficult to read aloud. If this position is correct then a patient with intact reading but relatively poor semantics for abstract words would be problematic for the model. On the other hand, the model of normal reading may be conceived in terms of semantic support being greater for concrete words. If this is the case then semantic damage may critically affect the reading of concrete rather than abstract words. Consequently, the pattern of semantic impairment shown by DRN would be a problem for this latter formulation of the Patterson and Hodges model. Without a clear description of the Patterson and Hodges model in this respect (or the inclusion of imageability within the simulated semantic route of the Plaut *et al.* connectionist model), it is hard to adjudicate between these two positions. However, a patient with semantic damage greater for abstract items but intact reading aloud, taken with DRN's opposite pattern of semantic breakdown, must cause problems for whichever interpretation of the model is correct.

We suggest that the Patterson–Hodges theory would be falsified by a patient who shows a severe semantic impairment favouring concrete over abstract items but who can nevertheless read low-frequency, exceptional, abstract words normally. We present such a patient here.

Patient history

DC was born in 1910. She attended school until the age of 14 years. She went into domestic service until 1947 when she married. During her married life she maintained the house and family. In 1993, DC presented with memory problems. At home, she had been frequently leaving the gas on, burning pans, losing her keys, etc. Direct questioning revealed memory problems – she was only able to give her name and the town in which she lived; and was unable to give her age, the time, day of week, month, season, year, the names of family members, etc. Medical examination revealed mildly high blood pressure, borderline hypothyroidism and dementia-type symptoms. A diagnosis of dementia of Alzheimer's type was made.

When the present tests were conducted in 1995 her spontaneous speech was well structured and fluent, although relatively simple in content with occasional word-finding difficulties. In line with her original medical assessment, her autobiographical memory was extremely poor (she only recalled her own name and the town in which she lived), as was her episodic memory in general.

Semantic tests

Semantic impairment was evident in comprehension and naming.

(a) Word–picture matching

DC was given the word–picture matching task from the Psycholinguistic Assessment of Language Processing in Aphasia (PALPA) battery (Kay *et al.*, 1992). This required her to point to one of five object pictures in response either to a written word or to a word spoken by the experimenter. The five pictures depict the target word (e.g. button), a close semantic distractor (zip), a more distant semantic distractor (bow), a visually similar object (a coin) and an unrelated object (a banknote). DC scored 26/40 correct in the written version, making seven semantic (six close semantic, one distant) and seven 'don't know' errors, and 25/40 in the spoken version where she made nine semantic (seven close semantic, two distant) and six 'don't know' errors. With reference to the no response errors, it should be noted that DC could not be encouraged to pick a specific picture from the test array but rather was adamant that she 'didn't know' what the word meant.

(b) Object naming

DC was presented with three different sets of object pictures to name on different occasions. She named 29/40 of the items from the PALPA naming test correctly, 24/40 of the target items from the word–picture matching test, and 75/140 of a third set of object pictures. Overall, 46 of her 92 naming errors (50%) were semantic in nature (e.g. axe→hammer; bear→'dog or cat or cow'). The remaining errors were 16 (17%) circumlocutions, 28 (30%) 'don't knows' and three (3%) visual.

(c) Category naming

Patients with semantic impairment have difficulty generating exemplars from semantic categories. DC was quite unable to do this task, but her comments indicated that she understood what was required. Thus, when given the category 'breeds of dog' she said, 'We have always had a dog, but I can't remember any of the different types'.

Reading aloud versus defining

On separate occasions DC was asked to read aloud and to define 40 object names from the PALPA picture naming test. Half of these have regular spellings and half have irregular spellings. She also read and defined on separate occasions 120 words from Shallice *et al.* (1983) which have regular, mildly irregular or very irregular spellings.

DC was also given the low-frequency items from the 'Surface list' of words from Patterson and Hodges (1992) which contains 42 regular and 42 matched exception (irregular) words. For these she was asked to read each word first, then to give its definition immediately afterwards.

In order to maximize the possibility of retrieving any semantic information when giving definitions, DC was always encouraged to give all the information she could on each item by repetition of the question 'What does it mean?', together with probe questions such as 'What kind of animal is it?', 'What do you use it for?', 'Which part of your body is it?' and so on.

Each definition was scored on two different criteria. The first was a lax criterion similar to that used by Cipolotti and Warrington (1995). The definition was scored as correct if DC gave any relevant information about the word (particularly in view of her word-finding difficulties), but was scored incorrect if, despite the probe questions, she only gave superordinate information, put the word into a sentence without revealing any additional information about the meaning of the word, gave an inappropriate definition, or responded with 'don't know'.

A second, very lax criterion was used, under which each item was scored as correct if DC gave any appropriate information about the item whatsoever, including superordinate information or any additional word given in her utterance that was semantically or associatively related to the target item. An incorrect score was given if she put the word into a sentence without revealing any further information, gave an inappropriate definition, or responded with 'don't know'. Examples of DC's definitions are given below with their appropriate scores.

(1) Scored as correct with both lax and very lax criteria:
  (a) sandal: 'Something to put on feet'
  (b) blunder: 'Made a mistake or something'
(2) Scored as incorrect under lax criterion but correct under very lax:
  (a) trout: 'A fish'
  (b) worm: 'I don't like worms ... [E: where do you find them?] ... underground'
  (c) mince: 'Eating mince pies ...'
(3) Scored as incorrect with both criteria:
  (a) hoop: 'Like a hoop'
  (b) swear: 'Not to swear. Something I don't do'
  (c) heart: 'Don't know'

In order to establish that the scoring adhered to the criteria, the definitions were scored separately by the first author and by a second rater who was unaware of the purpose of the study. Overall, the inter-rater agreement was extremely high (96% for the lax criterion and 96% for the very lax criterion). Discrepancies were settled by agreement.

The results of DC's reading and defining of the word sets are presented in Table 1. As can be seen, DC's reading aloud was very accurate. She made no errors on the PALPA object names, just four errors on the lists of Shallice *et al.*, and two on the Surface list. The Shallice *et al.* lists were also given to four age-matched, healthy control subjects to read aloud. They made two, three, six and six errors each, placing DC's score firmly within the normal range. In contrast, DC's defining was very poor at around 20–25% on the lax criterion and 50% on the very lax criterion.

Further investigation of DC's reading and defining

As DC seemed to have greater problems in comprehending abstract words, a stringent test of her reading would be abstract, exceptional words of low frequency. List 1 from Strain *et al.* (1995) manipulates frequency, regularity and imageability across 96 items, while list 2 manipulates regularity and imageability for a set of 64 low-frequency words. DC was asked to read-then-define these lists. The results are shown in Table 2. Overall, DC read 94/96 of list 1 and 60/64 of list 2 correctly. The four control subjects made zero, one, one and two errors on list 1, and one, one, two and five errors on list 2. Thus DC is within the normal range on both lists for reading aloud.

In contrast, she was again severely impaired at defining the meanings of these words. It can be seen from DC's

Table 1. DC's reading and defining of three word lists (number correct)

Test	Word type	Read aloud	Definition: lax criterion	Definition: very lax criterion
Object labels from PALPA	Irregular	20/20	5/20	12/20
	Regular	20/20	2/20	11/20
	Total	40/40	7/40	23/40
Shallice *et al.* (1983) Levels of regularity	Very irregular	36/40	13/40	21/40
	Mildly irregular	40/40	10/40	18/40
	Regular	39/40	3/40	14/40
	Total	115/120	26/120	53/120
Patterson and Hodges (1992) Surface list	Exceptional	40/42	13/42	24/42
	Regular	42/42	11/42	19/42
	Total	82/84	24/84	43/84

Table 2. DC's reading and defining of word sets from Strain *et al.* (1995) (number correct)

Test	Word type	Read aloud	Definition: lax criterion	Definition: very lax criterion
Strain *et al.* (1995)	Low I	46/48	10/48	14/48
	High I	48/48	16/48	27/48
List 1	Low frequency	46/48	12/48	23/48
(Regularity × Frequency	High frequency	48/48	14/48	14/48
× Imageability)	Exc	47/48	13/48	22/48
	Reg	47/48	13/48	19/48
	Total	94/96	26/96	41/96
Strain *et al.* (1995)	Low I, Exc	13/16	3/16	4/16
	Low I, Reg	16/16	3/16	6/16
List 2	High I, Exc	15/16	1/16	5/16
(Regularity × Imageability	High I, Reg	16/16	6/16	10/16
for low-frequency words)	Total	60/64	13/64	25/64

I, imageability; Exc, exceptional; Reg, regular.

definitions on the items from the Strain *et al.* (1995) list 1 that her performance was better for the high imageability items than for the low imageability items (significant for both the lax criterion: binomial test, $P = 0.02$; and the very lax criterion: binomial test, $P = 0.0001$). There are no significant differences if the items are split by frequency or regularity, nor is there an interaction between imageability and frequency (lax criterion $\chi^2 = 3.77$, n.s.; very lax criterion, $\chi^2 = 1.01$, n.s.).

Other reading tests

(a) Lexical decision

Three lexical decision tests were given to DC, all taken from the PALPA battery. In each she was shown randomly interleaved words and non-words and was asked to say whether each one was 'Real' or 'Made up'.

The legality lexical decision task contains 30 words and 30 non-words which are made up from illegal letter strings (e.g. lbao). The Frequency × Imageability lexical decision task varies the frequency of occurrence and the imageability of 60 word targets. The 60 non-words in this task are all legal and word-like. Finally, a lexical decision task was included which has 30 words varying on spelling–sound regularity and 30 non-words, with half the non-words being pronounced like real words (pseudohomophones, e.g. brume), while the other half are simple non-words (e.g. durl).

DC made no errors on the legality lexical decision task. She made three errors on the Frequency × Imageability task – all false positive responses to non-words. The mean score for 26 control subjects on these non-words (PALPA norms) is 59.88 (s.d. = 0.45). She made four errors on the third lexical decision task (two false positive errors to pseudohomophones and two to ordinary non-words). Control subjects score a mean of 14.52 (s.d. = 0.75) on the pseudohomophones and 14.89 (s.d. = 0.32) on the non-words (PALPA norms). Thus, DC shows a very high level of performance in lexical decision though she may lie just outside the normal range in her tendency to accept a few non-words as real words.

(b) Non-word reading

DC was asked to read aloud 24 non-words of three to six letters in length (PALPA test of non-word reading) and the 30 non-words from the third of the above-mentioned lexical decision tasks. She read 23/24 and 29/30 correctly.

Discussion

DC's reading aloud of words was very good, indeed at normal levels. Even on the theoretically critical set of low-frequency, abstract exception words she performed again within the range of control subjects. Overall she made just 12 errors, of which nine were regularizations (e.g. chasm → 'chazm', suave → 'swayve') and three visual errors (stingy → 'sting', yore → 'york', mow → 'meow'). Normal control subjects made similar sorts of errors including regularizations and visual errors.

DC was also good at lexical decision and non-word reading, but her definitions of words were extremely poor. Thus she could provide no substantive semantic information for half of the words which she nevertheless succeeded in reading correctly. If DC is compared with Cipolotti and Warrington's (1995) case DRN, the two patients show similar levels of accuracy at reading aloud. DC's overall ability at defining is, if anything, worse than DRN's (overall figures: DC defined 24% of words scored on the lax criterion; DRN defined 49%), but DC shows the more common pattern of better performance on concrete than abstract words.

Another difference between the present study and that of Cipolotti and Warrington (1995) is that converging evidence for a semantic impairment is available for DC in the form of impaired naming and word–picture matching with semantic errors predominating in both tasks. She also understood but was unable to perform the category fluency task. We do not believe that DC's poor defining was due to a failure to understand the task or its general cognitive demands. She was continually prompted by the tester to give as much information as she could when defining, and some of her definitions were of good quality (e.g. mattress → 'something you sleep on'; iron → 'to smooth your dresses or clothes'). DC could also cope perfectly well with the demands of the novel metalinguistic task of lexical decision.

DC's pattern of intact single word reading with very poor semantics, like that of WLP (Schwartz *et al.*, 1979, 1980) and DRN (Cipolotti and Warrington, 1995), effectively undermines the Patterson and Hodges (1992) theory that surface dyslexia is an inevitable consequence of semantic breakdown. It also undermines the Plaut *et al.* (1995) theory that semantic support is required for the reading of (at least some) exceptional words by normal readers.

These patients establish that semantic impairment can reach a severe level without a patient necessarily becoming surface dyslexic. But what kind of reading model can account for their reading performance in the context of semantic impairment? There are at least two possible candidates. First, a dual-route model of reading allows for the possibility of semantic impairment without surface dyslexia: intact reading can proceed in this model via the sub-lexical and lexical, non-semantic routes without the need to refer to central semantic representations (see Coltheart and Funnell, 1987; and Ellis and Young, 1988, for further discussion). Alternatively, a single-route model might be adopted (for example, see simulations 1–3; Plaut *et al.*, 1995) in which correct reading aloud may proceed via this single route alone, again without the need of semantic support. However, Plaut and colleagues note that the current single-route simulations do not adequately capture the full range of reading performance found across the range of patients with acquired surface dyslexia.

Are there alternative explanations of the patient data that allow the present Patterson and Hodges theory (and simulation 4 of Plaut *et al.*, 1995) to escape relatively unscathed? Two possible alternative explanations have been put forward. First, Patterson *et al.* (1995) suggest that 'another hypothesis which may explain this apparent discrepancy is that the nature of the semantic memory impairment in AD differs from that in lobar atrophy in some yet unidentified way that is critical to the reading process'. This explanation seems relatively unlikely for two reasons. Unlike the DAT patients described, who do show performance like DC (Schwartz *et al.*, 1980; Cummings *et al.*, 1986; Friedman *et al.*, 1992; Sasanuma *et al.*, 1992; MB – Raymer and Berndt, 1994), other DAT patients show a correlation between surface dyslexia and severity of semantic impairment (Patterson *et al.*, 1994). Secondly, Cipolotti and Warrington's (1995) case DRN has a progressive lobar atrophy but, as described in the Introduction, he has intact reading despite a semantic impairment. Thus, there seem to be both lobar atrophy and DAT cases described, all with semantic impairments, either with accompanying surface dyslexia or with intact reading.

The second explanation involves the notion of individual differences in reading (Patterson *et al.*, 1995; Plaut *et al.*, 1995). If these individual differences are viewed in terms of a continuum, some readers may rely more heavily on the support from semantic representations, while at the opposite extreme, others may develop good oral reading without any support from semantics (of which children with hyperlexia may be an extreme example). Consequently, following damage to semantic representations, the first group would show a correlation between severity of semantic impairment and degree of surface dyslexia, while the latter group may show little or no surface dyslexia. Although this explanation does seem post hoc, it is a possibility. However, the Patterson and Hodges model originally stemmed from the notion that the link found between surface dyslexia and damage to the semantic route for reading was not just an associative relationship, it was a causal one. The notion of individual differences is invoked to predict that the association is not inevitable, yet it is this association on which the original model was based. Therefore, to keep this approach viable, it seems necessary to specify an independent psychological criterion for quantifying individual differences in patients' premorbid systems for reading aloud, and hence, whether they should show evidence of surface dyslexia following semantic impairment.

Acknowledgements

We are grateful to Karalyn Patterson and an anonymous reviewer for useful suggestions for revisions. This study was conducted while M.A.L.R. was in receipt of a studentship from the Engineering and Physical Sciences Research Council. We would like to thank Dr Linda Brown for her kind assistance, the staff at the day service that DC attended, and in particular we thank DC for her patience in completing our study with her.

References

Breedin SD, Saffran EM, Coslett HB. Reversal of the concreteness effect in a patient with semantic dementia. Cognitive Neuropsychology 1995; 11: 617–60.

Bub D, Cancelliere A, Kertesz A. Whole-word and analytic translation of spelling to sound in a non-semantic reader. In Patterson KE, Marshall JC, Coltheart M, editors. Surface dyslexia: Neuropsychological and cognitive studies of phonological reading. London: Lawrence Erlbaum Associates, 1985.

Cipolotti L, Warrington EK. Semantic memory and reading abilities: a case report. Journal of the International Neuropsychological Society 1995; 1: 104–10.

Coltheart M, Funnell E. Reading and writing: one lexicon or two? In: Allport DA, MacKay DG, Prinz W, Scheerer E, editors. Language perception and production: shared mechanisms in listening, reading and writing. London: Academic Press, 1987.

Coslett HB. Read but not write 'idea': evidence for a third reading mechanism. Brain and Language 1991; 40: 425–43.

Cummings JL, Houlihan JP, Hill MA. The pattern of reading deterioration in dementia of Alzheimer type: observations and implications. Brain and Language 1986; 29: 315–23.

Ellis AW, Young AW. Human cognitive neuropsychology. Hove, UK: Lawrence Erlbaum Associates, 1988.

Franklin S, Howard D, Patterson K. Abstract word meaning deafness. Cognitive Neuropsychology 1994; 11: 1–34.

Franklin S, Howard D, Patterson K. Abstract word anomia. Cognitive Neuropsychology 1995; 12: 549–66.

Friedman RB, Ferguson S, Robinson S, Sunderland T. Dissociation of mechanisms of reading in Alzheimer's disease. Brain and Language 1992; 43: 400–13.

Graham KS, Hodges JR, Patterson K. The relationship between comprehension and oral reading in progressive fluent aphasia. Neuropsychologia 1994; 32: 299–316.

Hodges JR, Patterson K, Oxbury S, Funnell E. Semantic dementia: progressive fluent aphasia with temporal lobe atrophy. Brain 1992; 115: 1783–1806.

Howard D, Franklin S. Missing the meaning. Cambridge, MA: MIT Press, 1988.

Kay J, Lesser R, Coltheart M. PALPA: Psycholinguistic Assessments of Language Processing in Aphasia. Hove: Lawrence Erlbaum 1992.

Patterson K, Hodges JR. Deterioration of word meaning: implications for reading. Neuropsychologia 1992; 30: 1025–40.

Patterson KE, Marshall JC, Coltheart M. Surface dyslexia: Neuropsychological and cognitive studies of phonological reading. London: Lawrence Erlbaum Associates, 1985.

Patterson K, Seidenberg MS, McClelland JL. Connections and disconnections: acquired dyslexia in a computational model of reading processes. In: Morris RGM, editor. Parallel distributed processing: implications for psychology and neurobiology. Oxford: Clarendon Press, 1990.

Patterson K, Graham N, Hodges JR. Reading in Alzheimer's type dementia: a preserved ability? Neuropsychology 1994; 8: 395–407.

Patterson K, Suzuki T, Wydell T, Sasanuma S. Progressive aphasia and surface alexia in Japanese. Neurocase 1995; 1: 155–65.

Plaut DC, Shallice T. Deep dyslexia – a case-study of connectionist neuropsychology. Cognitive Neuropsychology 1993; 10: 377–500.

Plaut DC, McClelland JL, Seidenberg MS, Patterson KE. Understanding normal and impaired word reading: computational principles in quasi-regular domains. Psychological Review 1995; in press.

Raymer AM, Berndt RS. Models of word reading: evidence from Alzheimer's disease. Brain and Language 1994; 47: 479–82.

Sasanuma S, Sakuma N, Kitano K. Reading kanji without semantics: evidence from a longitudinal study of dementia. Cognitive Neuropsychology 1992; 9: 465–86.

Schwartz MF, Marin OSM, Saffran EM. Dissociations of language function in dementia: a case study. Brain and Language 1979; 7: 277–306.
Schwartz MF, Saffran EM, Marin OSM. Fractionating the reading process in dementia: evidence for word-specific print-to-sound associations. In: Coltheart M, Patterson KE, Marshall JC, editors. Deep dyslexia. London: Routledge and Kegan Paul, 1980.
Shallice T, Warrington EK, McCarthy R. Reading without semantics. Quarterly Journal of Experimental Psychology 1983; 35A: 111–38.
Snowden JS, Goulding PJ, Neary D. Semantic dementia: a form of circumscribed cerebral atrophy. Behavioural Neurology 1989; 2: 167–82.
Strain E, Patterson KE, Seidenberg MS. Semantic effects in single word-naming. Journal of Experimental Psychology: Learning, Memory and Cognition 1995; 21: 1140–54.
Warrington EK. The selective impairment of semantic memory. Quarterly Journal of Experimental Psychology 1975; 27: 635–57.

Received on 7 June, 1995; resubmitted on 28 July, 1995; accepted on 1 September, 1995

Semantic loss without surface dyslexia

Matthew A. Lambon Ralph, Andrew W. Ellis and Sue Franklin

Abstract
Recent models of reading, including some computational models, suggest that error-free performance in reading aloud may be reliant, at least in part, on support from the semantic system. Such models predict that, following semantic impairment, a pattern of acquired dyslexia known as 'surface dyslexia' will be an inevitable consequence. We present data from a patient with dementia of Alzheimer type who shows a severe semantic impairment but near error-free performance on reading aloud real words (including low-frequency, irregular and abstract words) and non-words. The data are discussed in light of various models of reading and in relation to previously reported cases.

Journal
Neurocase 1995; 1: 363–69

Neurocase Reference Number:
O22

Primary diagnosis of interest
Dementia of Alzheimer's type

Author's designation of case
DC

Key theoretical issue
- The relationship between semantic impairment and surface dyslexia

Key words: surface dyslexia, semantic impairment

Scan, EEG, and related measures
None

Standardized assessment
None

Other assessment
Detailed assessment of reading aloud and comprehension. Written lexical decision and non-word reading results reported (PALPA battery).

Lesion location
- Generalized atrophy presumed

Lesion type
Progressive atrophy presumed

Language
English