

NAMING PEOPLE IGNORING SEMANTICS IN A PATIENT WITH LEFT FRONTAL DAMAGE

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ABSTRACT

Studies about proper name anomia generally assume that persons' names are harder to recall than other semantic information one knows about them and that name retrieval is not possible without biographical knowledge. We describe a patient, SB, who, after a left frontal haemorrhage, was unable to recall any biographical information about people she could name. Moreover, she had a normal score in an Object Picture Naming Test, but gave confabulatory answers in a Semantic Questionnaire involving the same items. The role of frontal function in producing this pattern of impairment is discussed, together with the possible existence of a direct route from visual perception to proper name retrieval.

Key words: proper names, anomia, dysexecutive syndrome, frontal lobe

INTRODUCTION

Traditional cognitive models of face recognition (Bruce and Young, 1986) assume a multi-step sequential processing that, for familiar faces, progresses from the formation of a structural description of the presented face to name retrieval. Successful naming is dependent on previous access to semantic information.

The prevailing account of proper name anomia is that persons' names are harder to recall than other facts one knows about them, as, for instance, their occupation (Cohen and Burke, 1993). This may be due either to the fact that names of people are nonwords and most phonologies can be plausible for a name (Brennen, 1993), or that between people and their names there is a one to one representational correspondence (Cohen, 1990; Hanley, 1995; Semenza and Sgaramella, 1993). Burton and Bruce (1992)'s interactive activation model of face recognition and naming proposes a slightly different explanation: names and semantic information may not be stored in separate boxes, but rather mixed together with the pool of all semantic information. The difference between names and other information is that names are unique to a particular person, while other information may be shared by several people, thus implying different levels of activation and retrieval.

As far as the relationship between proper names and biographical knowledge is concerned, familiar face recognition models assume that the activation of biographical knowledge is a mandatory mediation of the two-way route that links visual and lexical representations (Valentine, Brédart, Lawson et al., 1991; see Cohen and Burke, 1993, for a critical review). Apparently, this is compatible

with data from brain-damaged patients: indeed, proper name anomia is associated with intact semantic knowledge of famous and familiar people (Fery, Vincent and Brédart, 1995; Hittmair-Delazer, Denes, Semenza et al., 1994). However, a few cases of intact naming in the absence of biographical information retrieval are reported. Williams and Smith (1954) described a TBC patient who could not give any information about people he could name perfectly, but this case was not explored in detail. More recently, Brennen, David, Fluchaire et al. (1996) have described the case of an Alzheimer patient who was unable to identify two persons (Catherine Deneuve and Serge Gainsbourg), she could name. The implication of such examples for cognitive models of face processing and naming deserves consideration, since a name recall without biographical information suggests a direct route from face perception to name production.

A few data also come from experiments on people naming conducted on normal subjects. While it is extremely rare that a person's name can be retrieved without recalling information (Hanley and Cowell, 1988), Stanhope and Cohen (1993) have discussed the serial access assumption by comparing the ability to learn proper names, occupations, or both when they are associated with unfamiliar faces. Recall of both names and occupations was not better than recall of names or occupations alone. This finding was thought to contradict the hypothesis that semantic information facilitates the retrieval of names.

Data from patients with disturbances in object naming show a comparable pattern of dissociation. When subjects are unable to give semantic information about an object, they are also unable to name it (Warrington, 1975), while it is possible to recall information about it, without being able to retrieve its name (Barbarotto, Capitani and Laiacona, 1996).

We report the case of a patient, SB, who following a left frontal haemorrhage, proved unable to give any information about people she could correctly name; her answers showed consistency over different trials. There were also a few items in which the opposite dissociation appeared, namely she was able to provide some semantic information in front of a famous person's picture, whose name she could never produce. In no case could SB produce both semantics and names. Object picture naming was normal but she produced abnormal answers on a semantic knowledge questionnaire. However, in no case did the patient produce semantic information about objects without being able to name them.

CASE REPORT

SB was an 86-year-old right-handed woman, with 5 years of education, previously employed as a housekeeper, who suddenly developed a confusional state, with disorientation in time and space and marked confabulation. On neurological examination, she did not show any focal sign. A brain CT-scan revealed a left hyperdensity with a diameter of approximately 3 cm in the frontal polar area, extending from the inferior surface up to 4 cm. The lesion was a haemorrhage, which caused a slight compression over the anterior horn of the left lateral ventricle (see Figure 1). The patient was alert. No other clinical problems emerged in the following weeks. Her daughter reported that, before the stroke, she had been perfectly autonomous.

A marked frontal syndrome was evident. The patient was easily distracted during test sessions: a person walking in the street, seen from the window, as well as a word written

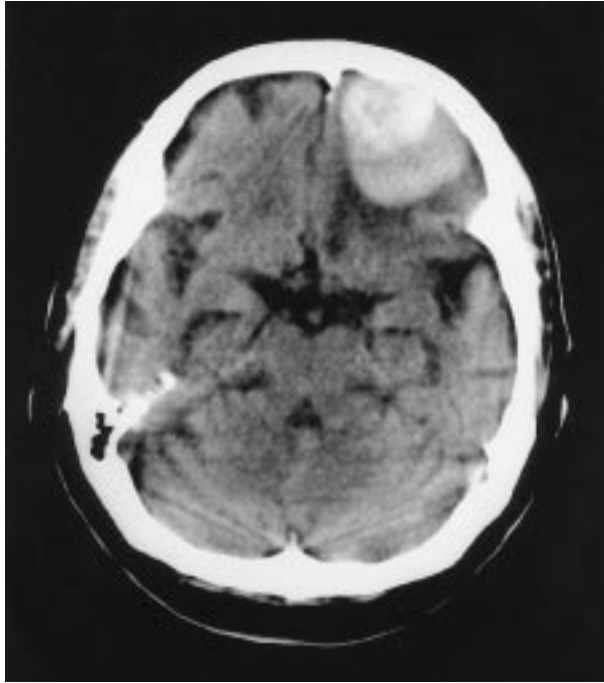


Fig. 1 – CT-scan image showing SB's frontal haemorrhage.

in the background of a picture were sufficient to capture her attention. If she met somebody while walking in the hospital ward, she addressed him/her, asking whether he/she was waiting for her. She perseverated in her answers in a very strong way: when asked about her native town (Nodica, near Pisa), she tended to place every event and people in Pisa. SB also showed florid confabulation: she insisted that she was at the hospital to work and explained that she was doing some cleaning with the three women sharing the room with her. Sometimes she said she was in Rome, she did not consider the place a hospital, and could not make out why the examiners were dressed as doctors. Each time she was taken to the testing room, she brought her towel, soap and brush, guessing that she was going for a shower.

Neuropsychological Examination

A thorough language investigation was hard to complete, because of the distractibility of the patient and her prominent utilization behaviour. However, SB's speech was fluent, uttered with normal prosody, without word-finding difficulties or articulatory problems. Her comprehension and repetition were good. SB performed at a normal level (Table I) on the Token Test (De Renzi

and Faglioni, 1978) and on a picture naming test (Capitani, Laiacona, Barbarotto et al., 1994).

Since her everyday behaviour suggested confabulation and ongoing amnesia, we assessed SB's performance on some specific cognitive fields. Formal testing for episodic memory could not be performed because the patient did not pay attention to most of the tests presented by the examiner, if they required sustained attention (for example, a short story or a word list). Only tests that could be answered with an immediate verbal response or action could be completed. Beyond executive tests, we assessed SB's performance on famous faces to explore at least in part her remote memory, while learning was impossible to formally check.

The following tasks were given.

1. Assessment of Frontal Functions

SB was submitted to a number of tests to check her executive competence: Raven Coloured Progressive Matrices, Digit Cancellation Task, Dual Task (consisting of a digit span combined with a tracking task) (Baddeley, Della Sala, Gray et al., 1997), Wisconsin Card Sorting Test (WCST), Verbal Fluency on phonological cue (see Table I).

The patient was also given a Confabulation Battery (Dalla Barba, Cipolotti and Denes, 1990; Papagno and Muggia, 1996). The first two sections of the battery tap autobiographical memory with 10 questions on personal semantic memory and 10 on personal episodic memory. There are then 10 questions of general semantic memory, and 10 semantic and 10 episodic questions for which the correct answer should be "I don't know" (e.g. "What was Marilyn Monroe's father's job?" or "What dress did you wear on April 27th last year?").

While the score on Raven PM was in the normal range, the patient's performance on all of the other frontal tests was severely impaired (Table I).

SB's answers on the confabulation battery (Table II) confirmed her strong tendency to produce impulsive, variable and inappropriate answers (for instance, she said that Gorbachev had a factory in Pisa, but that he was not a friend of hers), as well as "passe-partout" answers (e.g. asked how much money did she

TABLE I
Neuropsychological Examination

Language	SB's scores	Cut-off scores
Token Test	30	29
Picture Naming	63/80 (78%)	67%
Executive function	SB's scores	Norms
Raven Coloured PM	26	18
Dual Task	30%	89%
Wisconsin Card Sorting Test	0	3
Digit Cancellation Task ¹	22.8	31
Verbal fluency on phonological cue ²	1	17

¹ Spinnler and Tognoni (1987).

² Novelli, Papagno, Capitani et al. (1986).

spend on the 16th of May, SB answered “the least I could”. Asked at what time she went to sleep on the 6th of July, she answered: “perhaps I stayed up all night”). On the whole, her performance was adequate on autobiographical questions, for those that are expected to elicit unique, automatic responses, such as “When were you born?”, “How many children have you got?”, while, when the question required an active process of search, such as for the question “Which was your last job?”, SB produced a confabulatory response.

TABLE II
Confabulation Battery

	Correct	Uncorrect	Confabulation
Personal semantic memory	7/10	2/10	1/10
Personal episodic memory	6/10		4/10
General semantic memory	1/10		9/10
“I don’t know” semantic questions	9/10 ¹		1/10
“I don’t know” episodic questions	5/10 ¹⁺²		3/10

¹ The performance to an “I don’t know” question is considered correct when the patient answers “I don’t know”.

² The patient gave a “passe partout” answer.

2. Assessment of Face Identification

SB was submitted to the following three tests to assess her ability to recognize famous faces: a face familiarity test, a face identification test (Faglioni, Cremonini and De Renzi, 1991), and a face naming test (Papagno and Capitani, 1998). The performance on the first two tests is reported in terms of error scores. Raw error scores were transformed into standardized error scores, following Faglioni et al. (1995). SB’s scores and normal cut-off scores are reported in Table III.

Familiarity Check Test: 36 displays of four faces were presented (one famous, three unknown distractors of the same sex and comparable age). SB was required to point to the only famous face in each display, without being requested to provide the name. The patient performed in the normal range and in five cases she produced the name even if unrequested.

Famous Face Identification Test: 32 displays of four famous faces were presented (all of the same sex, age and semantic area). SB was requested to point to the face corresponding to the person named by the examiner.

SB performed below the cut-off score. Sometimes she spontaneously gave the correct name of other famous faces shown as distractors: for example, when asked to point to Togliatti (former Communist party leader), she correctly identified him, but also pointed to De Gasperi, correctly retrieving his name. When asked about their occupation, she answered that they were businessmen from Pisa, still alive (both are dead, and were well-known Italian politicians of the fifties). This ‘spontaneous’ naming with inability to produce semantic information appeared for seven more people.

Famous Faces Naming Test: SB was presented fifty pictures of famous people randomly intermingled with fifty unknown pictures and asked to identify those who were famous and to name them. Moreover, for each famous person, the patient had to answer three multiple choice questions (concerning the

person's profession, nationality and whether he/she was alive or not). SB named correctly 10 people, for none of whom, however, she was able to provide semantic information. In particular when she was offered four alternatives about their profession, she tended to choose the last told by the examiner. When she could not provide the name, a semantic cueing was given, but this did not improve her performance. She did not falsely recognize any unknown people, and she failed to recognize as famous just six of the famous people. This test was repeated twice, with comparable results.

TABLE III
Face Recognition Tests

Face Familiarity ¹	0.43	n.v. < 1.42
Face Identification ¹	3.75	n.v. < 2.99
Faces Naming	10/50	

¹ The figures correspond to standardised error scores (Faglioni et al., 1991).

Overall, SB tended to name correctly people who were famous between 1930 and 1980, while she never named people who became famous in more recent years (like Alberto Tomba or Silvio Berlusconi). She added semantic information, only if asked, never spontaneously, but apparently in a random and perseverative way (see Appendix). By contrast, there were 4 items, in which SB provided some semantic information of famous faces she was unable to name. Dustin Hoffman was identified as an actor, Modugno as a singer and Kennedy as an American, but none of them was named, and in front of Breznev's picture, the patient said that he was from Pisa (as well as almost everyone she saw) at the time when communism was dominant there.

Once she identified someone, say, as a singer, she often perseverated attributing the same profession to the following stimuli.

SB never produced a name when provided with semantic information, nor retrieved any correct semantic information if given a name.

3. Assessment of Semantic Knowledge

SB was submitted to a battery in order to assess if the semantic impairment affected also other categories beyond proper names. Tests included a picture pointing test, a semantic questionnaire, verbal fluency on semantic cue and a silly sentences judgement test (Table IV).

Picture Pointing Test: 80 items from the Snodgrass and Vanderwart set (Snodgrass and Vanderwart, 1980) were presented in quadruplets, each made up of pictures belonging to different categories. SB had to point to the object named by the examiner. Her performance was normal: she produced 4 errors only with tools.

Semantic Questionnaire: This is a multiple choice test, consisting of 80 items (Capitani et al., 1994), which were the same used in the naming and pointing to picture tests. For each item, there were 4 questions tapping knowledge of its semantic attributes, in a supraordinate hierarchical order. The test had to be

TABLE IV
Semantic Memory Tests

	SB's performance	Cut-off score
Verbal fluency on semantic cue ¹	11	25
Semantic questionnaire	not completed	
Picture pointing	76/80	
Silly sentences	30/32	

¹ Novelli, Papagno, Capitani et al. (1986).

interrupted as SB tended to choose the answers without paying attention to the question, distracted by any noise or surrounding stimuli. Usually, she gave a correct answer to the supraordinate question, while tended to repeat the first or last attribute suggested by the examiner in the subordinate questions. For instance, she said that a sofa was something to sit on, but also that it might be made out of glass; or she answered that mushrooms were vegetables, growing upon trees.

Verbal Fluency on Semantic Cue: The patient had to produce as many words as possible of a given category (makes of cars, fruit, animals). SB's score was poor.

Silly Sentences: 32 sentences were presented, half plausible and real, half semantically impossible. SB judged correctly as plausible the 16 true sentences, but also two out of the 16 silly ones (she asserted to the propositions that nuns can be bought in shops and cods usually carry passengers across the sea).

DISCUSSION

We report a patient, who, following a left frontal haemorrhage, was found to be unable to give semantic information about people she was able to name. In a few instances, she showed the opposite pattern of deficit, i.e. proper name anomia with preserved semantics. While the latter dissociation is well known, the former is much rarer. It consistently appeared in about 20% of items (10/50). Although this number is not high, the mere fact that such a condition was present deserves attention and an attempt to explain it. The patient's difficulty in giving biographical information of people she was able to name might be interpreted following two hypotheses: either semantic information about people was lost, or it could not be accessed, due to her dysexecutive disorder. In both cases she could not make an explicit use of semantics.

Role of Frontal Damage

A possible explanation of SB's difficulties in accessing and correctly using semantic information can be sought in the dysexecutive syndrome (perseveration, distractibility, impulsivity, utilization behaviour, confabulation) from which she suffered, as a consequence of the frontal lesion. The production of biographical information requires a strategic search inside the semantic field,

coupled with an efficient output monitoring activity. This has been found impaired in frontally damaged patients (Shallice and Burgess, 1991; Goldstein, Bernard, Fenwick et al., 1993; Shallice and Burgess, 1993; Della Sala, Laiacona, Spinnler et al., 1993). Naming faces, being a highly constrained task, because of the unique relation proper names bear to their referents, may be considered less demanding of frontal skills than semantic information retrieval (Papagno and Muggia, 1996). On this view, a patient with strategy, choice and monitoring difficulties may find the wide array of semantic information which interacts with a face more taxing than a single face-name link. The presence of a unique answer (the name) is more likely to block a dishinibited behaviour. What is a difficult task for the patient with a language deficit (the anomic) may become easier for the patient with an executive deficit (the frontal).

SB's behaviour in answering autobiographical episodic and semantic questions supports our hypothesis that a strong constraint helps frontal patients to produce the correct answer. Indeed, SB showed difficulties if the questions required some kind of processing, search and recollection (Conway, 1992), while she answered correctly and without hesitation to questions like her birthday, or birthplace, which represent a "unique reference" type of questions. When the answer required a generative process, the patient failed to produce a correct answer. This finding is in line with Moscovitch's (1989) account on frontal impairment of recall, which assumes that retrieval of memories implies a strategic and an associative component. The former, an active process needed to reconstruct the context where memory is embedded, would be impaired in frontal patients. Moreover, perseveration revealed the patient's difficulty in choosing the right answer in the semantic system. Perseveration, indeed, has been reported in cases of failure to access specific information in semantic memory (Sandson and Albert, 1987; Papagno and Basso, 1996).

SB's performance on common names suggests that more "executive control" is required for semantic categorization than for picture naming (Glaser, 1992).

Naming Faces Ignoring Semantics

SB's behaviour does not allow to settle the question of whether her impairment was due to loss or inaccessibility of her semantic memories, since in no occasion did SB produce biographical information for the 10 celebrities she was able to name. Nor could her semantic knowledge be assessed with grouping or sorting tests based on category or subordinate information, since the patient was totally unable to perform them. The hypothesis that semantic information was lost would be in keeping with the apparent consistency of SB's answers: the same 10 celebrities were named on three consecutive trials, always without providing any correct semantic information, while for three people correct biographical information was always available, but never was their name. Nevertheless, some hints suggest that she could avail herself of covert knowledge of famous people biographical data. One example was that though she was unable to give any information about Sophia Loren, when given her name, she said, in front of the picture of Mother Teresa of Calcutta, that she was "Sophia Loren *playing* this sister of Calcutta", implying that she knew Sophia

Loren's occupation. Even the vague feelings expressed about Mussolini's "bad songs" and Berlusconi's "desire of attention" (see Appendix) may suggest that the information was not completely lost, but its retrieval was hindered by her dysexecutive disorder. It is, however, difficult to explain why a "frontal" dysfunction should always affect the same items.

Be it due to a storage or an access defect, the present dissociation, together with the previous cited reports, suggests that the production of proper names can use an alternative route going directly from perception to naming and bypassing associative semantic knowledge. This route is likely to be much weaker than that running via semantics, but may be preferred when frontal damage prevents strategic retrieval. If its use is not successful, SB makes a last though vain attempt to exploit the semantic route.

Dissociation between Perceptual and Associative Attributes

Common names of animals, vegetables/fruits and objects elicited a dissociation similar to that described for faces and proper names: while no naming defect emerged, SB answered at chance to a semantic questionnaire. This pattern is similar to that observed in SE, a herpes simplex encephalitis patient (Laws et al., 1995) who could correctly name many animals from their pictures, despite making errors in generating associative information about them. The authors suggested that sensory information was sufficient for naming being the kind of knowledge crucial for identifying an animal. They also suggested that some attributes may not be directly stored, but "constructed" as and when needed. Moreover, since active cognitive operations are necessary to assemble correct information beyond a simple differentiation, patients suffering from dysexecutive deficits may be expected to fail in generating or even choosing associative semantic features about the perceived stimuli.

A similar explanation may account for SB's behaviour with faces: visual knowledge was sufficient to achieve correct naming and familiarity judgement, while frontal damage hampered the use of semantic information and facilitated confabulation.

Conclusion

Two main inferences can be drawn from our patient, one regarding people's names and the other common names. As far as the former is concerned, a direct automatic route from visual perception to name retrieval can be hypothesized. Although we cannot exclude that a covert semantic route was followed at least in some cases, the retrieved information was not explicitly employed. Furthermore, when SB showed anomia for people's names, semantic information (either provided by the examiner or spontaneously retrieved by the patient) did not help name retrieval.

As far as common names are concerned, SB's performance on a semantic questionnaire for objects, animals, vegetables and fruits seems to suggest that her prominent dysexecutive disorder caused difficulty in retrieving, organizing and monitoring semantic knowledge. "Identification procedures" (salient

properties, as suggested by Smith, Medin and Rips, 1984) were still possible, because they were automatic processes, while the executive disorder impaired “reconstruction” of retrieval, because of SB’s impulsivity and lack of control. However, this was still compatible with correct naming.

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APPENDIX

Some Sample of SB's Answers

First examination

BERLINGUER (former Secretary of the Italian communist party, now dead): Berlinguer, I don't know what he does. E: Is he dead or alive? SB: I don't know, alive perhaps.

PERTINI (former Italian President, now dead): This is Pertini, but I don't remember who he was. E: Is he dead or alive? SB: I don't know, nobody told me.

ANDREOTTI (former Italian Prime Minister): That one is Andreotti, I know him, he is from Pisa, I think he is a worker.

GORBACHEV: Gorbachev, he has a factory in Pisa.

MUSSOLINI: This is Mussolini, he must be alive, nobody told me he was dead, he used to sing bad songs.

COSSIGA (previous Italian President): Oh, that one is Cossiga, I used to see him in that show on Saturday night.

BAUDO (anchorman): That one is Baudo, I think he was at the government.

MANFREDI (actor): Manfredi. I don't know what he does.

PRINCE CHARLES: Charles, from America.

Second examination

BERLUSCONI (President of an Italian right-wing party): Berlusconi, I know, he is the one with his hat and his whistler, asking for a big place.

GORBACHEV: He is Gorbachev, he is the master of this place.

MUSSOLINI: Mussolini, he is an actor.

ANDREOTTI: Andreotti, he was an actor.

BAUDO: Baudo, he went to Rome and made a disaster.

BRAMIERI (comic actor from Milano, recently dead): Bramieri, he is alive, he is from Rome.

COSSIGA: Cossiga, I think he sings.