

Bilingual aphasia: a filed under construction

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Aphasia in bilinguals is still a new field of study. Till now the literature on bilingual aphasia has been mainly focussed on the description of the various recovery patterns (parallel, selective, consecutive, antagonist) in order to test hypotheses about the representation of two (or more) languages in the brain and to test the roles that different types of acquisition play on the outcome of bilingual aphasia. Nevertheless, there is still a consistent lack of description of cases and even more a lack about studies which deal with the recovery pattern and rehabilitation of those (more and more common) cases. The goal of this paper is to give a general overview about the history and the main theoretical models used in bilingual aphasia. The description of a single case study will be used to exemplify the recovery pattern of a bilingual speaker. Some general guidelines for treatment will be proposed.

A historical overview and recovery patterns

In the late 19th century Pitres was one of the first scientists to study a group of bilingual aphasic patients. His main claim was that both languages could be impaired, but also only one could be damaged. Furthermore, he stated that an impaired language was never totally destroyed rather it was 'hidden', and could recover in time. He stated that in general, the comprehension of the most used language was the first to recover, followed by the recovery of the production abilities. Only later, the second language (L2) will begin to recover. The studies performed in those years, though descriptively very important did not manage to give a consistent description of the phenomena that could occur in case of bilingual aphasia. Paradis (1977) was the one who recently classified all the possible outcomes of bilingual aphasia. He describes seven major types of recovery patterns: in a parallel recovery (L1=L2) both languages

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are similarly impaired and recover at the same rate. In selective recovery, instead, only one of the two languages is recovered (either L1 or L2 or Lx). In differential recovery one language will show one aphasia type and the other language another type. In successive recovery one language is recovered only after the other, whereas in antagonistic recovery L1 increases while L2 decreases and vice versa. The last two types of patterns are alternate antagonistic recovery and mix recovery, where L1 and L2 are mixed. The question is how frequent these recovery patterns are and which ones are the most common. From a study by Fabbro (1996), it was found that 40% of the cases can be considered as parallel recovery (L1 = L2), 32% show a better recovery for the L1 and 28% a better recovery for the L2. Statistically, cases that show recovery of L2 are fewer than cases in which L1 is recovered.

The localisation of L1 and L2 in the brain

In 1891, Freud proposed that the various languages were stored in the same areas, supporting the basic ideas of Pitres. It was Adler in 1889 who proposed that the various languages were represented in the same cortical areas but were controlled by different neuronal networks. This idea was recently supported by Paradis within a theory of linguistic modularity (Paradis, 1999), according to which a general cognitive-linguistic system controls a subsystem for each language. According to this, a general linguistic system divides in as many neurofunctional subsystems as there are known languages. The languages known by a multilingual are thus separated at a functional level, yet at an anatomical one. Accordingly, each language is conceived as a separated and independent neurofunctional system. The various subsystems can be separately impaired, and they can show quantitative and qualitative differences. An extension of the subsystem hypothesis is the “activation threshold hypothesis” (henceforth ATH) (Paradis, 1993). According to this idea, each linguistic item or subsystem has a threshold for activation. Whenever a brain damage occurs into the language areas, it will inhibit (mostly temporarily) the access to a language. The main idea of the ATH is that the more an item or subsystem in the language is stimulated the lower the threshold for its activation will be. The ATH can account for all the recovery patterns described in the literature.

The role of memory

Learning languages implies the use of memory strategies. By now it has been shown that implicit memory is mainly involved in acquiring the mother tongue whereas explicit memory is very active when learning a second language (especially later in life). Moreover these two memory loops have been shown to be located in different parts of the brain. Explicit memory is diffusely present in the cortex, whereas implicit

memory occupies some subcortical structures, the cerebellum and specific areas of the cortex. Recently, a case of selective recovery of L2 reported by Aglioti and co-authors (Aglioti et al., 1996) in an Italian patient exemplified how important the link between how languages are learnt and the outcome in case of aphasia is. The patient described spoke Venetian dialect as her L1 and standard Italian as her L2, which she only learnt at school. After the stroke, which involved subcortical parts of the brain, the patient could only speak standard Italian. In interpreting this case, the authors place indeed emphasis on the role of memory in the acquisition of the first and the second language.

A case study

K.F. was born in a Southtyrolean (North-Italy) village in 1928 in a German-speaking environment and in a German-speaking family. For K.F. the first contact with Italian was in primary school, where she was exposed to it for a few years. Extended contact with Italian began when K.F. married an Italian man at the age of 23. From that moment on her knowledge of Italian constantly improved. By the age of 72, K.F. could be considered a proficient speaker both of Italian and German, i.e. a balanced bilingual. At the age of 72, K.F., right-handed suffered a stroke and a haemorrhage located in the left parietal lobe (computerised tomography data). The relatives reported that her proficiency of the L1 and L2 just before the stroke was balanced and that no differences in the proficiency for L1 and L2 could be seen. K.F. can be classified as High Proficiency Late Acquisition (HPLA) bilingual.

Method

The aim was to follow the recovery pattern of K.F. In order to achieve this goal two main test sessions were performed using Italian and German test batteries: the first, one month post onset and the follow-up three months and 30 days post onset.

For the quantitative assessment, the oral naming test subtests of the Aachen Aphasia Test (AAT) was used both in the Italian (Luzzatti, Willmes and De Bleser, 1991) and in the German versions (Hubert, Poeck, Weniger, Willmes, 1983)

Results

Table 1 shows the percentages of correct words produced in both languages during the first assessment.

Table 1. K.F.'s oral production during the German naming test (% correct words in L1 and L2)

GERMAN ORAL NAMING TEST CORRECT WORDS IN L1 AND L2 (% calculated on the total corpus of correct words)		
	ITALIAN (L2)	GERMAN (L1)
OBJECT NAMING	12%	4%
COLOR NAMING	12%	3%
NAMING OF COMPOUNDS	19%	8%
PICTURE DESCRIPTION	15%	27%
Mean	58%	42%

The results show a discrepancy between the naming performance in German and Italian. Even if the task is strictly conducted in German, only 42% of the correct words are produced in German whilst 58% are represented by Italian words.

The error analysis shows that two main types of errors were produced: phonological paraphasias and neologisms. Moreover, during the oral naming test in German 95% of the phonological paraphasias are stemming from Italian, thus suggesting the fact that Italian is the most activated language. As for neologisms, the percentages are similar between the two languages, with a slight advantage for German. Summing up all errors, 70% originate from Italian. On the contrary, during the Italian oral naming test, no German influences the production in Italian. 83% of the whole corpus is represented by correct Italian words. An overview of K.F.'s production during the first assessment and a comparison between the Italian and German is given in Table 2.

Table 2. Summary oral naming test first assessment

SUMMARY: FIRST ASSESSMENT ORAL NAMING TEST				
%	CORRECT WORDS	NEOLOGISMS	PHONOLOGICAL PARAPHASIAS	NON CLASSIFIABLE
GERMAN NAMING TEST				
ITALIAN	50	3	6	2
GERMAN	36	3	0	0
ITALIAN NAMING TEST				
ITALIAN	83	6	8	3
GERMAN	0	0	0	0

Four months post onset a follow up was performed. K.F. generally improved her verbal production both in Italian and German. For German the percentage of correct Ger-

man words reaches 57%. In Italian, the results from the first assessment are confirmed as well: German does not interfere with the production of Italian. The percentages of correct words, is stable.

Discussion

From our results, we can conclude that K.F. showed selective recovery of her second language, i.e. Italian. Three months after the stroke, Italian (L2) still showed an advantage in the standardised tests, even though the L1 (German) was more retrievable. Our results support Paradis' neurofunctional modularity theory: the L1 and the L2 are modules of a general linguistic system. The fact that both L1 and L2 are available, but to different extents, shows that the general linguistic system is not totally damaged. Moreover, the fact that German (L1) is accessible and that Italian is accessible to a greater extent supports Paradis' subsystem theory in which the two languages are part of a unique cognitive-linguistic system and are supported by two different neurofunctional systems, which can be differently (i.e. quantitatively or qualitatively) impaired. In conclusion, the description of the recovery pattern of K.F. supports theories about the various recovery patterns in bilingual aphasia. Moreover, our data stresses the importance of the role played by proficiency in the localisation of languages in the brain.

Diagnosis and therapy: some guidelines

The number of people who speak more than one language is constantly increasing as the result of people moving from country to country. This will lead to an increasing number of bilingual aphasia cases that will need rehabilitation. One first problem is the assessment. What should be taken into consideration as basic points, before beginning a formal assessment is the number of known languages and the premorbid level of knowledge for L1, L2... L_x. This can be done by interviewing the aphasic person and the family, trying to understand all the "linguistic" habits around the known languages. As far as the formal assessment is concerned, the BAT (Bilingual Aphasia Test) (Paradis 1987) is the most developed battery for the assessment of bilingual aphasia. It covers almost 60 language pairs. The BAT includes a very detailed questionnaire on the history of acquisition of the various languages. Moreover, it assesses all the language abilities, like a standard AAT. Another important question always concerns which of the languages should be treated first. To address this topic some important issues have to be taken into consideration for example the type and degree of impairment for L1, L2, L_x, the sociolinguistic status of the languages and as well the wishes of the patients and of the family. Generally speaking, most of the researchers agree in saying that the language that should be treated is the 'basic' one, meaning the most preserved language (even if not L1).

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