

LINGUISTIC ASPECTS OF BILINGUAL APHASIA

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Introduction

The study of aphasia in bilinguals (here used to refer to people with command of more than one language) is of potential interest in discovering what bilingualism implies in terms of brain functioning, and what role is played by relations of cerebral dominance for language. Most of the discussion in this area has been devoted to comparisons in the rate and manner of dissolution and recovery of the patients' languages, and to speculations on possible factors contributing to differences found. In a comprehensive review of the literature Paradis (1977) has categorized the modes of recovery, summarized the hypotheses proposed to account for differential modes, discussed relevant studies on lateralization, and devoted considerable space to clarifying different conceptions of the possible types of bilingualism.

From the point of view of linguistic theory, there are at least two questions to be asked in the study of bilingual aphasia:

- 1) To what extent do structural differences among the languages of the bilingual contribute to differences in recovery patterns?
- 2) What does the study of aphasia in bilinguals tell us about the processing mechanisms underlying use of more than one language?

The first question has been raised by Goldstein (1948) and by Luria (1960), among others, and will be taken up in section 2. The second question will be the main topic of this paper. In order to try to provide a starting-point for answering this question, I have studied a number of individual case reports, with the aim of documenting the specific descriptions of the patients' linguistic performances. Many of the case reports are fragmentary, based on only a very short time post-trauma (less than one month), second-hand reports, or otherwise unreliable. In citing the literature I have only included those reports in which some descriptive mention of the patient's language appears, other than that he/she could or could not speak or comprehend a given language.

Linguistic relevance

The kinds of differences dealt with in most reports and reviews are global: The patient is reported to speak one language better than another language or not at all, or it is reported that he can or cannot comprehend one or more of the disturbed languages. Reports are almost always in terms of degrees of disturbance, according to the type of aphasia, so that the patient is seen as making more errors of a particular type in one language than in another. Only one patient (Albert and Obler, 1975, see below) has been reported as having different aphasic symptoms in one language than in another (Broca's aphasia for English, Wernicke's aphasia for Hebrew). If there are differences in aphasic patients' abilities to use their languages which are directly relatable to structural differences among the languages, these have not been described in sufficient detail to establish their existence (but see section 2). This is a central question, then: It may be the case that bilingual aphasics do not differ in any interesting linguistic way from healthy bilinguals or from monolingual aphasics.

The apparent lack of structurally related differences in bilingual aphasics may stem from different factors:

- 1) The closer the aphasic's disturbances are to the phonetic or the semantic level, the more general and universal the defects are likely to be, because of the dependence of these levels on common human characteristics - the auditory and articulatory apparatus and cognitive structures, which are assumed to be less closely related to the structures of particular languages than to properties of human beings in general.
- 2) Related to this is the fact that phonetic and semantic feature distortions may so affect the total output as to make it uninterpretable: On the one hand, comprehension of single lexical items may often be intact in agrammatic patients, but the effect of syntactic disturbances and phonological defects make the relative contribution of this kind of comprehension ability difficult to assess. On the other hand, a disturbance of sentence or word semantics may distort the assessment of an otherwise intact syntactic organization. These factors complicate the description of the patient's abilities, and therefore the comparison of them.
- 3) A third related factor is the lack of a uniform technique for describing the linguistic aspects of the disorders, and this is due on the one hand to the difficulties inherent in the aphasic disorders, but also

to the lack of agreement on the appropriate questions to ask and observations to make. This in turn is a consequence of our limited understanding of aphasia in general. Paradis (1977) rightly suggests that standardization of reports is essential for purposes of comparison, and that any report should include "at least the following information: Patient identification, age, sex, occupation, level of education; for each language, the age at which it was acquired, the way in which it was learned (at school, as a medium of instruction or as a second language, with direct or indirect method, from the environment with or without formal instruction and of what kind of instruction, whether reading or writing was learned and when), and the time until which it was used; the cause of the aphasia; a description of the aphasic symptoms and of the pattern of recovery; and, when available after autopsy or during surgery or from brain scans or other tests, the neuroanatomical findings". While this is already a monumental list of requisites for the clinician, it is still not enough for linguistic purposes, because the form and content of the description of aphasic symptoms is not specified. Until a uniform method for linguistic description is worked out, we may not be able to correctly assess whether or not observations about bilingual aphasics really have anything interesting to add to linguistic science. In the meantime, we can ask in what areas of linguistic performance interesting differences might be likely to be found; we can also speculate, for the time being, on the significance of negative results. This might help us in the future to ask linguistically more relevant questions.

Specific problem areas

1. Phonological systems

One aphasic syndrome which affects phonological systems is that called phonetic disintegration (Alajouanine's term, cf. Shankweiler and Harris, 1972) or apraxia of speech (Darley). This is a phonological disturbance not due to dysarthria (impairment of the speech-producing musculature or its immediate innervation), and it is characterized by great variation and unpredictability of occurrence of segmental errors. Consonants are most affected, particularly fricatives, affricates and some consonant clusters, more than vowels. Lack of evidence to the contrary, and the feature-based nature of this disorder suggests that it affects all languages equally.

The emphasis by structural phonemicists on the language-particularity of phonemes does not seem to be supported by reports on bilingual aphasics. I have seen no reports of a particular phoneme being "lost" in one language while a corresponding one is preserved in another. Minkowski (1964) reports difficulties with a particular phoneme (/r/ and /r/-combinations); he does not note that this is particular to any of the patient's languages, and since it is unusual for the ability to use a single phoneme to be disrupted, it may be that this patient had premonitory difficulties with this particular sound, or that other segments were not as saliently distorted. Luria (1977) bases his analysis of Wernicke's aphasia on an inability to interpret speech phonemically (but see Blumstein, Baker & Goodglass, 1977); if the phonemic system of each language were as particular to it as he suggests, we would expect that there might be some differences among languages for (mild) Wernicke's aphasics, but this does not seem to be the case.

As to generative analyses of dialect differences related to rule-ordering differences, aphasic disturbances seem to be so gross as to disallow the possibility of testing potential correlates of these features of the grammar. On the other hand, there is a syndrome related to prosodic organization which may be related to this problem, called the "foreign accent" syndrome. Monrad-Krohn reports on a Norwegian woman whose language problem consisted of a foreign, German-sounding accent, which caused her considerable anguish in Nazi-occupied Norway, and which she could not control. Whitaker (Leeds, 1975) has reported on several similar cases, referred to the Mayo clinic because of their involuntary "foreign accents". This problem is not directly related to aphasia in bilinguals, however, as these patients were monolinguals, and the nature of the prosodic factors contributing to the "foreign accent" has not been extensively described. Prosodic interference has been reported, however, in bilingual aphasics. Ovcharova (cited in Paradis, p. 77) reported on a patient who spoke Bulgarian with a Turkish accent. Stengel and Zelmanovicz (1934) - one of the most carefully documented reports in the literature - report on a patient with severe dysarthric, together with aphasic disturbances. The patient's speech was extremely difficult to reproduce graphically, due to the dysarthric disturbances, and difficult to interpret because of the degree of mixture of Czech and German, lexically, morphologically and even at the syllable level. Paraphasic and agrammatic symptoms were impossible to attribute to one language, and this extended to the "Sprach-

melodie, in der die Worte und Sätze produziert wurden". This report has often been cited as indicating that Czeck intonation was used for German sentences, but as far as I can see, German intonation patterns were reported to be used for Czeck utterances as well. This seems to indicate a relative independence of the prosodic pattern of intonation relative to the segmental or lexical content. Another patient, reported on by Albert and Obler (1975), spoke a fluent paragrammatic Hebrew "with a smattering of Hungarian", and interference from English, while she was reported to be non-fluent and agrammatic when speaking English. It is unfortunate that this patient's speech was not recorded on tape, not only because it was unique, but because it would have provided a possibility of comparing what seemed to be opposing prosodic disturbances for the two languages. In English, the patient produced no spontaneous speech, and her output was described as hesitant and effortful, whereas in Hebrew such a "press of speech" was found that the investigator had to interrupt her. What prosodic influence did the "smattering" of (native) Hungarian have on the paragrammatic Hebrew speech?

The general clinical impression of most fluent aphasic speech, even almost totally unintelligible jargon, is that the intonational structure of the patient's utterances is relatively - and sometimes quite strikingly - intact. Can clear differences in the intonation of jargon-producing bilingual patients be discerned? These and other reports on different "accents" need to be much more carefully documented. Identifying particular accents is difficult even for the trained observer, and unless they are supplemented by objective phonetic description, reports may reflect more about the observer's previous experience and expectations than the actual phonetic output (Bannert, personal communication). There has been some interest in a possible bilateral representation for prosodic features (cf. van Lancker, 1972); if the right hemisphere is involved in the preservation of seemingly adequate intonational structure, is this language-specific? Preservation of word-level prosody has been noted by Hécaen et al. (1966) whose French-Vietnamese speaking patient - reported as a "crossed" aphasic, that is, right-handed and right-dominant for language - was found to have retained all six Vietnamese tones, although the method for testing this was not stated. At the sentence level, this patient's speech was reportedly relatively fluent in Vietnamese, but with many hesitations and self-corrections, while in French they report that speech was not fluent, difficult, with many breaks and repetitions of syllables. It is not

clear exactly what the differences were, in that the fluent Vietnamese was characterized as having so many breaks; it may be that the differences were more due to segmental timing difficulties in French, giving an impression of greater fluency in the native language, or, the preservation of tones in Vietnamese may have contributed to the impression of fluency. Here is certainly a need for precise phonetic description. Voinescu et al. (1977) also report a correct "speech flow" despite breaking off because of word-finding and phonetic difficulties; they note that there was no abnormality for "primary accent" [sentence-stress?]. Their patient apparently had correct syllable stress in all four of his languages, which included Greek, Romanian, Russian and German, as well as correct "syntagmatic correlation and grammar usage". This is one of the few (perhaps the only) studies in which an objective measure related to fluency was attempted: They checked response time per total number of words spoken (in a structured interview) and on this basis did not find any differences in fluency among the languages. The percentage of word-finding stops was similar for all the languages, as was the reduced communicative content of the speech.

To summarize, one phonological area in which there seems to be some possibility of establishing structure-related differences among the languages of aphasic bilinguals is prosody. On the whole, however, the evidence seems to indicate that the difficulties which appear, even when there is differential recovery, appear for all languages in a similar manner, except when one language has features (tones, particular phonemes) that another lacks, and these are preserved. If this is true, this means that established phonological systems are, in processing terms, the same.

2. Writing systems

Although not directly related to language-specific processing mechanisms, differences in the use and accessibility of different types of writing systems can sometimes be an indicator of the nature of the linguistic impairment. Where the languages of the patient are represented in radically differing types of script, as in the case of Lyman, Kwan & Chao's (1938) patient who spoke Chinese and English, differences in the (in)ability to use one or another type of script may be related to the type of aphasia: One type of script makes demands on one kind of processing to a greater extent than another. This patient had a left parieto-occipital tumor,

which was removed, and his difficulties were limited mostly to writing and reading. In English, when the patient could not recognize the whole word at one try, he frequently spelled out the word, and could then retrieve the whole. For Chinese, the disturbance was greater, and the possibility of spelling out as a strategy was not available. During recovery, the patient began to make some use of drawing the Chinese characters in the air, which often helped him to recognize the form of the word. In this case, where the problem was one of visual interpretation of linguistic units, a language-specific difference was clear, but this was a question of the phonological basis of the English alphabetic system of representation as opposed to the non-phonetic, morphological representation of Chinese representation. There were no differences in speech processing.

These differences are related to the reports of differing ability among (monolingual) aphasic patients in using the phonetic-based (katakana and hiragana) Japanese writing systems, as opposed to the "ideographic" kanji system (cf. Sasanuma and Fujimura, 1973; Sasanuma, 1977). That the differences in ability to use one or the other system are related to the degree of disturbance in phonological processing in general, as opposed to differences in the internal representation of a particular language, is shown by the case of Watamori and Sasanuma (1976), a bilingual (English-Japanese) patient, who "initially manifested equally severe impairment in both English and Japanese involving all language modalities with moderate impairment of reading and auditory comprehension and severe impairment of oral production and writing". Therapy was conducted in English (in Japan): "auditory and reading comprehension improved almost simultaneously in both English and Japanese. In contrast, oral language production and writing abilities improved markedly only for the treated language (English)". The differences in writing performance may be ascribed on the one hand to the therapy conditions, but also are related to the mode of representation: At first, the patient produced correct, but meaningless kana (phonetic-based) symbols; after nine months, the patient began to be able to write kanji symbols in response to pictures, and these too were correct in form but not appropriate in meaning. After 14 months, the patient began to write the correct forms. Differences in oral production were almost certainly due to the effect of therapy as the recovery of phonemes was parallel for both languages (despite their different phonological structure) and clearly related to monolingual recovery patterns.

Perhaps the most famous case of differences among languages in terms of reading ability alone is that of Hinshelwood, 1902, who believed in separate anatomical storage for different languages. His patient was primarily alexic (in English), with some deficit in auditory comprehension. Surprisingly, the patient could read Greek with no difficulty, Latin with slight difficulty, and French worse than Latin but still better than English. (He also read musical notes as fluently as before.) In spontaneous speech in English, word-finding difficulties were noted. After three months there was marked improvement in his reading, and in his speech: "Sometimes he spoke very fluently, but now and again he was at a loss for the proper word". Unfortunately, only reading aloud was tested for the languages other than English; there is no mention of whether auditory comprehension, writing, or reading comprehension was differentially disturbed in the various languages, nor is there any report on differences in speaking.

Luria also reports on a similar case involving ability to write French and Russian, and this is a reason for his suggesting that structural differences may play a role in recovery (Luria 1960).

3. Morphology and syntax

It is in these areas that we would expect to find the linguistically most interesting differences. Unfortunately, it is also here the linguistic analysis of the patient's deficits are most difficult to document.

Because of the complexity of the morphological and syntactic systems, it is particularly important that objective measures be developed. One danger is that the clinician's hypotheses about the reasons for the disturbances in the different languages may bias what he hears, and consequently what he reports. The unusual facts (from a linguistic point of view) noted by Krapf (1957) may be a case in point: Krapf's report deals with psychiatric factors in bilingual aphasic recovery. His first patient was reported to have a "grave reduction" of English (his first language) during the first few weeks, especially during the visits of his domineering mother. When English began to be recovered, Krapf noted a general preference for words of Latin origin rather than those of Saxon origin, and he reports that the patient "had a much greater difficulty in finding those words in Spanish [second language] which have feminine gender than those with masculine gender". About his second patient, Krapf makes the following remarks:

he was manifestly incapable of finding words in Spanish [second language, learned when he began a new life in South American at age 50] when speaking with his wife or the nurses and when speaking on subjects of 'primary vital necessity'. He was moreover almost equally aphasic for German [first language] when conversing with the physician or with other men and when the conversation touched on more general and abstract themes. When he was put in a situation which required him to communicate with his wife and his physician at the same time, he became frankly anguished, with a great motoric disquiet and copious sweating and became in these two languages so paraphasic that it was almost impossible to make out what he wanted to say. In this situation, the grammatical structure of his language remained completely latin, even when he was using germanic words, which contrasted clearly with his manner of speaking when he was alone with his wife. [emphasis added]

Krapf's psychoanalytic orientation and his belief in a regression theory of aphasia need not have distorted his observations of his patients' linguistic performance; on the contrary, his unusual point of view could be useful in drawing to attention facts which might otherwise be overlooked. The problem is that in absence of any examples, we have no way of independently judging the linguistic validity of the observations, in particular, of interpreting what was meant by "latin grammatical structure", and in establishing the accuracy of the observation regarding gender. It may also be asked how much of the second patient's difficulties with words of "primary vital necessity" were due to the facts that the patient was 50 years old when he began to learn Spanish and that he used primarily German, rather than Spanish, in his home. Similarly, it has been reported that monolingual aphasics have more difficulty with abstract, especially non-picturable words than with concrete, picturable ones (Gardner & Zurif, 1975; Richardson, 1975; Goodglass, Hyde & Blumstein, 1969), and it may be that conversations with the physician (in German) were more likely to show this difference than conversation with the nurses.

The so-called "telegram style" speech of agrammatic patients has been reported in many languages, and seems to be related more to the nature of the impairment than to specific languages. Indeed, the fact that the "telegram-style" characteristic of patients with anterior lesions has been described by French, German, Italian, Russian, Swedish, and English-speaking neurologists, among others, testifies to its universality. One impor-

tant question relates to several studies of the rate and order of recovery of specific grammatical morphemes: Studies of this kind have been done in English (cf. Goodglass, 1976, for a review), and it is likely that similar studies for monolinguals of other languages would give comparable results. No systematic study of this kind has been done for bilingual aphasics.

Mixing of words and inflections of different languages has been reported in several instances (cf. Paradis, p. 77-78 for review), in speaking, repetition tasks, and in writing. Of the 16 cases cited by Paradis, (including one deaf-mute reported by Leischner, who mixed in writing), I have studied 13, and none of these give enough documentation to make any systematic study. Of interest, however, is the fact that, according to L'Hermitte et al., interference is rare in predominantly expressive patients. This is corroborated by Paradis' summary: Of the 16 cases cited, one is diagnosed as motor aphasia with alexia and agraphia (Minkowski 1927 - mixed German words and phrases with Swiss dialect; this patient spoke only agrammatic German for the first five months, and it was only after more than a year that Swiss-German began to be as good as German, at which time the interference gradually disappeared), a second as motor aphasia (Weisenburg & McBride, 1935), a third also as motor aphasia (Stengel & Zalmanowicz, 1933 - this patient also had considerable anomia, see above) and a fourth with motor aphasia (L' Hermitte et al. 1966 - the interference here was limited to the temporary "disappearance of the specific prosody of Hungarian" related to agrammatism).

But it must be noted that whether there actually is a predominance of mixing of language elements in non-anterior, as opposed to predominantly Broca-type patients, cannot be determined on the basis of this data alone: At first glance, it would seem that the predominantly motor (anterior) aphasics make up roughly a third of all the cases reported. But, as Paradis has pointed out these numbers are in fact meaningless, because the classifications used are not at all uniform, and because so many cases were reported only because of their unusualness.

An unusual case is that of Ovcharova (1968, cited by Paradis)

whose spoken Turkish [first language] was almost unimpaired but who spoke Bulgarian with a Turkish accent and used Turkish word order and grammatical structures. Moreover, this patient often replaced Bulgarian with Turkish phrases. Interestingly, whereas in the patient's spoken language, interference was unidirectional, in his written lan-

guage, interference was reciprocal. He would substitute some Bulgarian (Cyrillic) letters in his Turkish writing, which was the more impaired. (Paradis, p. 77)

There are some apparent differences between the morphological and syntactic levels: Minkowski=(1964) reports that in German (first language) for his patient (a professor of psychology in South America) "Vocabulary and grammatical forms were satisfactory but more or less reduced, particularly for a man of his high culture" and that syntax was "almost normal" in German but very defective in Spanish and French. Here again, lack of examples makes this finding difficult to interpret. Word-finding was defective in all the languages, but moreso in the latter two, although naming of objects was not apparently very different. There were no problems in reading aloud or silently in German or Spanish. Voinescu et al. (1977) report that gender, number, case, tense, person endings were almost constantly correct and free of interference, (Greek, Romanian, Russian, German), whereas word order was normal with the exception that the patient sometimes used Romanian-like structures in German. Different correct forms for negation were used in all four languages. In cases where there is interference at the morphological level, this is not generally true of the syntactic level (e.g., Stengel & Zalmanowicz, 1933) but this observation is misleading, because the syntactic level is so disturbed as to make comparison impossible.

4. Semantic organization

Differences among the languages of the bilingual aphasic in word-finding are among the most commonly cited. This is not so surprising, since inability to find a word is one of the easiest deficits to notice and to describe, and since word-finding difficulties are often found in connection with most kinds of aphasic disorders, to some degree. There are different types of word-finding difficulties, however. Benson (1977) has outlined five different forms of anomia: 1) word production anomia: The patient seems to know the word, but not be able to initiate its production, or the patient seems to know about the word, but not to have its phonological form accessible, 2) word selection anomia ("brain dictionary anomia"): The patient can often describe the function of the referent, may use the name in circumlocution, and can often point to objects he/she can't name, 3) semantic anomia: The patient does not usually give a functional descrip-

tion, and does badly on recognizing objects named by the experimenter, 4) category specific anomia: e.g., for colors, body parts, hospital or illness-related terms - the patient may lack names in a specific category or be better in a certain category than in general, 5) modality specific anomia, where naming difficulties are related to a specific modality (tactile, visual, auditory, etc.) which is not often classified as aphasic. More research specifically directed to differences in these terms among the languages of bilingual aphasics might yield a source of data relevant to the compound/coordinate/subordinate distinctions. Smirnov & Faktorovich (1949) report on a patient with differential recovery, who after two years named objects "easily in Russian and quite satisfactorily speaks this language". There were apparently "no traces of sensory or amnesic aphasia" at this time for Russian. In Turkmenian, however, the patient "struggles to name". Promoting did not help, and the patient repeated incorrectly. Ladinsky and Mracek (1958) report use of different strategies for different languages: When speaking Bulgarian and Greek, (his first languages) he used Czech (L₃) for words he couldn't produce, but when speaking Czech he used circumlocutions.

It should be noted that there can be discrepancies between the patient's ability to name objects ("confrontation naming"), his ability to recognize correct names and reject false cues, and the presence or lack of word-finding difficulties in spontaneous and evoked speech. One of the ingenious tests for recognition ability was developed by Pitres (1895) and his coworkers. Their patient apparently had no comprehension at all of his premorbid languages, except for some French words. They presented him with cards on which were printed the names of several referents, in the different languages he knew. After some time, the patient noticed that the same concepts appeared in different languages and was able to divide the cards into appropriate groups; after a few weeks of training he was able to read the words which, prior to this test, he had not been able to do.

Conclusion

While very little can be concluded on the basis of the evidence so far collected on aphasia in bilinguals, several important questions can be raised for future research.

1) Until there is evidence to the contrary, the negative data suggest that when established phonological systems are disrupted, the disrupt-

tion affects all available languages in the same way. If a language's phonological system is in one respect inherently more difficult for an aphasic (allows more consonant clustering in syllable structure, for example), then in absolute terms we might expect slightly more simplification in that language than in another, when the patient has a phonological disturbance, but we would not expect different segments to be difficult in different languages.

2) While at first glance we might expect more highly inflectional languages to be more affected by agrammatic disturbances than less highly inflected ones, it appears that the information-load on these grammatical markers is similar whether they are morphologically bound or not. Testing for both comprehension and production is needed to establish this.

3) If it is true that mixing of language units occurs more frequently in patients with posterior lesions (although not exclusively, and see Paradis (1977) for discussion of the related problem of switching), to what should this be attributed? Might this have to do with language structure or with a reduction in the posterior aphasic's ability to attend to the internal structure of his utterances?

4) No studies have documented the use of word order in bilingual aphasics. Is SVO the most preferred order? Some differences have been reported among different kinds of aphasics according to the percentage of subject and object deletions, insertion of superfluous lexical material, and the use of pronouns. Are there language-related differences? (Tsvetkova & Glzman, 1975)

5) Finally, there is a need for testing the effects of different distortions in the output of aphasics - particularly, but not only in the area of prosody - on what investigators "hear". Aphasic speech, like the speech of very young children or foreigners is not only often difficult to interpret, but may also become easier with practice. Even with objective standardized tests, the results may depend in part on how much time the investigator has been able to spend on listening to the particular patient - and in the case of the bilingual aphasic in particular, on how native-like the investigator's competence is in the languages tested. A particularly fluent second-language speaker may suffer considerable loss in comprehension in the presence of noise, as compared to a non-native. Data on the observer should be reported in studies of bilingual aphasics.

References

- Albert, Martin & Obler, Loraine, 1975, "Mixed polyglot aphasia". Paper presented at the 13th Annual Meeting of the Academy of Aphasia, Victoria, B.C. Oct. 7, 1975
- Benson, Frank, "Anomia", presentation delivered at the Joint Meeting of WFN Research group on Aphasia and Neurologic Rehabilitation, Göteborg, Sweden, September 5-8, 1977
- Blumstein, Sheila, Baker, Errol & Goodglass, Harold, 1977, "Phonological factors in auditory comprehension in aphasia", Neuropsychologia 15:19-30
- Bychowski, Z., 1919, "Über die Restitution der nach einem Schädelsschuss verlorenen Umgangssprache bei einem Polyglotten", Monatschrift für Psychologie und Neurologie 45:183-201
- Dedic, St., 1926, "Zur Aphasiefrage", Zeitschrift für die gesamte Neurologie und Psychiatrie 106:208-213
- Dimitrijević, D., 1940, "Zur Frage der Sprachrestitution bei der Aphasie der Polyglotten", Zeitschrift für die gesamte Neurologie und Psychiatrie 168: 277-281
- Gardner, Howard & Zurif, Edgar, 1975, "BEE but not BE: Oral reading of single words in aphasia and alexia", Neuropsychologia 13:181-190
- Goldstein, Kurt, 1948, Language and Language Disturbances, N.Y.
- Goodglass, Harold, 1976, "Agrammatism" in Whitaker & Whitaker, eds, Studies in Neurolinguistics Vol. 1, N.Y.: Academic Press
- Goodglass, Harold, Hyde, M.R. & Blumstein, Sheila, 1969, "Frequency, picturability and availability of nouns in aphasia", Cortex 5:104-119
- Gloning, Ilse & Gloning, K, 1965, "Aphasien bei Polyglotten, Beitrag zur Dynamik des Sprachabbaus sowie zur Lokalisationsfrage dieser Störungen", Wiener Zeitschrift für Nervenheilkunde 22:362-397
- Hécaen, H., Mazaro, G., Ramier, A., Goldblum, M.C. & Merienne, L., 1971, "Aphasie croisée chez un sujet droitier bilingue", Revue Neurolinguistique 124:319-323
- Hegler, C., 1931, "Zur Aphasie bei Polyglotten", Deutsche Zeitschrift für Nervenheilkunde 177:236-239
- Hinshelwood, James, 1902, "Four cases of word-blindness", Lancet 1:358-363

- Krapf, E.-E., 1957, "A propos des aphasies chez les polyglottes", Encéphale 46:623-629
- Ledinský & Mraček, 1958, Vliv poranění temporálního laloku dominantní hemisféry na řečové funkce u polyglota", Československá neurologie 21(3): 207-210
- L'Hermitte, R., Hécaen, H., Dubois, J., Culioli, A. & Tabouret-Keller, A., "Le problème de l'aphasie des polyglottes", Neuropsychologia 4:315-329
- Luria, A.R., 1960, "Differences between disturbances of speech and writing in Russian and in French", Int. J. Slav. Linguistics Poetics 3:13-22 (cited in L'Hermitte et al. 1966)
- Luria, A.R. & Hutton, J. Thomas, 1977, "A modern assessment of the basic forms of aphasia", Brain & Language 4(2):129-151
- Lyman, R., Kwan, S.T. & Chao, W.H., 1938, "Left occipito-parietal Brain Tumor with observations on Alexia and Agraphia in Chinese and English", Chinese Medical Journal 54:491-516
- Minkowski, Mieczyslaw, 1964, "Sur un nouveau cas d'aphasie avec des réactions polyglottes particulières", Comptes Rendus du Congrès de Psychiatrie, et de Neurologie de Langue Française, Marseilles, 1264-1274
- Minkowski, Mieczyslaw, 1963, "On Aphasia in Polyglots" in Problems of dynamic Neurology (ed., Halpern, Lipman) Jerusalem: Hebrew Univ., 119-161.
- Minkowski, M., 1928, "Sur un cas d'aphasie chez un polyglotte", Rev. Neurol. 35:362-366
- Monrad-Kohn, G.H., 1957, "The third element of speech: prosody in the neuropsychiatric clinic", J. of Mental Science 103:326-331
- Paradis, Michel, 1977, "Bilingualism and aphasia", Studies in Neurolinguistics Vol. 3, ed. Whitaker and Whitaker, Academic Press
- Pitres, A., 1895, "Etudes sur l'aphasie chez les polyglottes", Revue de médecine 15:889 ff.
- Richardson, John T., 1975, "The effect of word imageability in acquired dyslexia", Neuropsychologia 13:281-288
- Sasanuma, Sumiko, 1977, "A therapy program for impairment of kana-syllabary in Japanese aphasic patients". Paper presented at the Joint Meeting of WFN Research Group on Aphasia and Neurologic Rehabilitation, Göteborg, Sweden, September 5-8, 1977

- Sasanuma, Sumiko & Fujimura, Osamu, 1973, "Selective impairment of phonetic and non-phonetic transcription of words in Japanese aphasic patients: Kana vs. Kanji in visual recognition and writing", Cortex 7:1-18
- Schulze, A.A.F., 1968, "Unterschiedliche Rückbildung einer sensorischen und einer ideokinetischen motorischen Aphasie bei einem Polyglotten", Psychiatrie, Neurologie und medizinische Psychologie 20:441-445
- Shankweiler, Donald & Harris, Katherine S., 1972 (1966), "An experimental approach to the problem of articulation in aphasia" in Sarno, ed., Aphasia: Selected Readings, N.Y.; Appleton-Century-Crofts, 126-135
- Smirnov, B.L. & Faktorovich, N.Y., 1949, "Problem in polyglots", Nevropat. i Psikh. 18:26-28
- van Lancker, Diana, 1975, "Heterogeneity in Language and Speech: Neurolinguistic Studies", U C.L.A. Working Papers in Phonetics 29
- Tsvetkova, L.S. & Gluzman, J.M., 1975, "A Neurolinguistic analysis of expressive agrammatism in different forms of aphasia", Linguistics 154/155:61-76
- Voinescu, I., Vish, E., Sirian, S. & Maretsis, M., 1977, "Aphasia in a polyglot", Brain and Language 4(2):165-176
- Watamori, T.S. & Sasanuma, S., 1976, "The recovery process of a bilingual aphasic", J. of Communication Disorders 9(2):157-166