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DISINTEGRATION OF HIGHER
LANGUAGE FUNCTIONS IN PATIENTS
WITH RIGHT HEMISPHERE DAMAGE

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Background

Material/
Methods:

Results:

Conclusions:

SUMMARY

Clinical observations indicate that patients with right hemisphere damage (RHD) do not show clinical symptoms of aphasia, but still experience serious disturbances in their personal, family, professional and social lives, connected with a certain, not precisely specified disruption of communication. The purpose of our research was to determine the essence of these disturbances.

The study comprised of 12 patients after right hemisphere stroke, including 6 with the primary lesion in the frontal lobe, and 6 in the parietal lobe. The patients' conversations during therapy were recorded and transcribed, and then analyzed using the GSP method (Generic Structural Potential), modified by the authors in the spirit of ethnographic research.

The communication problems in this group of patients were related to disturbances of pragmatics. The most frequently encountered disturbances involved various social behaviors, both linguistic and non-linguistic, including initiating, continuing and ending conversation in a socially unacceptable fashion, difficulties in emotional prosody, and mimicry and gesticulation incongruent with the content of the utterance. These disturbances occurred in both groups (frontal and parietal RHD), although the profile was slightly different for each group.

The complaints of RHD patients and their families concerning their relatively frequent communication problems are related to the occurrence of disturbances of pragmatics. These disturbances have a significant negative impact on the way RHD patients function in society, and therefore appropriate rehabilitation is needed.

Key words: pragmatics, speech act, aprosodia

INTRODUCTION

Since the early 1980s the trend of “functional communications” in aphasiology has made most neuropsychologists aware that the cerebral processes disturbed by aphasia do not constitute the whole of the communication process, or even the whole of the verbal process. There exist other forms and aspects of communication, which in many cases remain intact in spite of the fact that the purely linguistic processes of semantics (selecting words) and syntax (stringing them into grammatical sentences) is greatly hindered or impossible.

Clinical observations indicate that patients with right hemisphere damage (RHD) generally do not show clinical symptoms of aphasia in the classic sense of the word, but still experience serious disturbances in their personal, family, professional and social lives, which are connected with a certain breakdown of communication, whose nature and cause are difficult to specify. The patient seems to speak normally with few or no linguistic errors as such, but has serious problems with initiating communication and conducting an already started conversation to a reasonable conclusion, often offends or annoys listeners, and does not seem to know or care exactly what the point of the conversation is.

The communication problems of RHD patients are rarely diagnosed in any formal sense. One major reason for this is that, on the whole, they occur in natural situations, far less frequently in the context of testing. If they are noted, they are most often ascribed to reactive mental disturbances, depression, personality changes or dementia (Pachalska et al., 2000a; Tłokiński, 1990). For lack of a proper neuropsychological diagnosis, the patient is often left without specialized assistance and suitably oriented rehabilitation.

The range of functions for which the right hemisphere is responsible is not as well known as for the left hemisphere; nevertheless, the overall functional picture of the right hemisphere is becoming more and more intelligible. On the other hand, although the history of neurolinguistic research into communication disturbances caused by right hemisphere damage is comparatively short, the subject is being more frequently recognized as extremely important (Kaczmarek 1984; Absher & Cummings 1995; Tompkins, 2000; Tompkins et al., 2000; Davis et al., 1997; Herzyk, 1992, 1998, 2000; Kadzielawa, 1986; Pachalska et al., 2000a). It must be admitted, however, as Thompson (2000) rightly notes, that aphasiologists relatively seldom show interest in this subject matter, either in their research or in clinical practice.

In recent years reports have appeared in the neuropsychological literature to the effect that the consequences of a focal lesion in the right hemisphere cause not only left paresis, but also other neuropsychological dysfunctions, including problems with higher linguistic functions (Tompkins, 2000; Tompkins et al., 2000; Mackenzie et al., 1997), although from a theoretical point of view it is hard to determine the causes of such disturbances. Among such neu-

ropsychological symptoms associated with RHD, for example, are anosognosia, unilateral neglect, dressing apraxia, and aprosodia; the last of these in fact, was argued by Ross (Ross et al., 1990; Ross, 1981; Ross & Mesulam, 1979) to be the essence of communication disturbances in RHD patients. It is difficult, however, to accept the thesis that an alleged lack of expressiveness in the voice is a sufficient explanation of the difficulties these patients experience when communicating with other people.

The authors of this article, on the basis of their clinical experience and a review of the latest literature in the fields of applied linguistics, neurolinguistics, and neuropsychology, will attempt to defend hypothesis that the key cause of most, if not all the communication disturbances occurring in RHD patients can be included under a different, broader term than “aprosodia” – namely, pragmatics.

Pragmatics in contemporary linguistics and neurolinguistics

In the broadest of terms, pragmatics covers aspects of the verbal communication process which lie outside semantics (lexicon), morphology and syntax, as well as phonology. Some authors use the term “semantics” in a broader sense, that is, the entire system of associating verbal signs with meaning and conveying them to (the knowledge of) other people, through phonology, lexicon, and syntax. In other words, while semantic processes involve coding and decoding an intended message in accordance with the generally accepted system of verbal signs, which is language (expressed by means of a spoken, written or signed text), pragmatic processes decide upon when we speak, how we speak, to whom we speak and why we communicate the message.

In the cognitive approach, a non-modular approach is favored by some for the description of language (Dressler et al., 2000), which means that semantic and pragmatic processes do not take place either separately or in a precisely determined hierarchical sequence, but are mutually combined and influence both one another as well as the final product – the text, in a simultaneous and complementary manner (see Fig. 1).

This has an obvious relationship with the thesis confirmed by the latest neuropsychological research, that the brain functions as a whole on the grounds of the specific participation of mutually related, mutually affecting and diverse cerebral structures, systems, and functional blocks (Canseco-Gonzalez, 2000; Caplan, 2000; Luria, 1996).

The essence of the thesis proposed here consists in the statement that pragmatic functions become disturbed due to right hemisphere damage in a fashion analogous to that in which disturbances of the semantic system are caused by left hemisphere damage.

The very statement that disturbances of pragmatics belong among the characteristic symptoms of right hemisphere damage is not at all new. On the one hand, Van Lancker and Pachana (1998) list disturbances in the sphere

of pragmatics among the most frequently encountered disturbances in RHD patients. Nevertheless, the definition of pragmatics used by these authors, i.e. "use of language in everyday situations," is both narrow and imprecise; thus, after devoting only a few sentences to the subject of pragmatics, the authors in their brief discussion include a sense of humor, aprosodia, the impossibility of recognizing irony, etc. On the other hand, many authors who work on discourse disturbances in patients with right hemisphere damage (Brownell, 2000; Brownell & Joanette, 1993; Ulatowska, 1992; Sherratt & Penn, 1990; Joanette & Goulet, 1990), do not link the concept of discourse with pragmatics, or if they happen to do so, then problems of pragmatics are discussed exclusively in the context of discourse analysis.

There have been many definitions of pragmatics used in the linguistic literature. We can mention those of Levison (1983), who defines pragmatics as "investigation into language use," Leech (1983), who claims that pragmatics deals with "the study of meaning with regard to a concrete situation in question," or Thomas (1995), for whom pragmatics gives "meaning in the process of interaction." This is not the right place to solve disagreements about the essence of pragmatics from the point of view of theoretical linguistics. Yet from the above definitions there emerge some key expressions, just as "use," "a concrete situation," and "the process of interaction," on the basis of which we can make a working definition of pragmatics useful in neuropsychological and neurolinguistic clinical practice.

The word itself, "pragmatics", derives from the ancient Greek noun *pragma*, which in turn is derived from the verb *pratto*, 'do', 'act.' The etymology then suggests that the notion of "pragmatics" refers to a concrete behavior in the "pragmatic" i.e. "practical" sphere (the words "practical" and "practice" being derived from the same ancient Greek root), as opposed to possessing the potential or ability to express oneself in a given language on the basis of knowing the lexical, syntactic and phonological rules of this language. Hence pragmatics is not about using language exclusively in everyday life, but about any language use, i.e. about each and every realization of the communicative potential which we possess when we know a given language. Thus in pragmatics the basic unit is the speech act.

A speech act, like any other action is more or less motivated, so it has a definite aim, which can be distinguished from its semantic content (Frydrychowicz 1999). Although in a speech act the aim of the speaker may be effectively hidden or misunderstood, the fact remains that the aim exists, or, to put it another way, it does not undermine the intentional nature of the speech act. So pragmatics is about using (taking advantage of) this potential, which we are given by the knowledge of how to use language in a concrete situation, here and now, in order to achieve an aim.

The intentionality of a speech act means that, among other things, the speaker through his speech act wishes to bring about a definite result that concerns other people (Frydrychowicz 1999). As presented in other papers

(Pachalska et al., 2000a), the pragmatic dimension of a given speech act occurs in the context of a process taking place between at least two people. Hence the conclusion can be drawn that from the point of view of semantics, single words and sentences or even sounds can be discussed, while we can talk about pragmatics only when all the factors which condition a speech act in a concrete situation, as part of a certain process involving at least two people, traditionally called “speaker” and “recipient,” have been taken into consideration.

The statement that the sphere of pragmatics does not comprise single sounds, words and sentences may lead to a false impression that the term pragmatics means nothing more or less, but so-called “non-verbal communication,” i.e. mimicry, gestures, movements and posture of the body and/or suprasegmental aspects of speech, especially intonation, and the speed and tone of the voice in the process of speaking. Even though all these factors are present in the speech act realized in a concrete situation, which means that they belong to the domain of pragmatics, the sphere of pragmatics encompasses also, or perhaps mainly, the choice of words appropriate to the present situation, the manner of introducing, changing and ending topics, and responding to other people’s utterances. Thus, the subject of interest in pragmatics is the degree to which the character of the present situation dictates the choice of words used in a given speech act and the use of all other means of expression, as well as the way in which those words are received “here and now.”

Let us take as an example a seemingly simple text, “The window is open,” which semantically is unambiguous: we know what each word means and the syntax of the sentence is simple, clear and causes no reservations. The verb “is” indicates that the subject is singular, and belongs to a class determined in the predicate, here to a class of objects which are open. We know from this sentence, without great doubt, that there is a window and also that at the moment it is in one of the two possible states in which a whole, undamaged window appropriately installed in a wall can be, either “open” or “closed”, and that at this moment in time it is in the former state. With regard to semantics, then, the situation is obvious. However, in different concrete situations, by means of this sentence, we can infer entirely different intentions and motivations from the simple statement of the factual state of the window, through a request to close it, to an explanation as to why there is a draft in the room. etc. Depending on who says the sentence, to whom, where and when and with what tone of the voice, it can result in completely different effects, despite the semantic explicitness of the text. It is from pragmatic analysis that we know what the speaker wants in a concrete situation.

To summarize, it should be stressed that semantics and pragmatics constitute two points of view upon one rather complex phenomenon, which is the speech act. Semantics comprises the first place meaning, i.e. the association of verbal signals with a perceived or imagined reality, while pragmatics deals with the intentionality of the speech act (see Fig. 1).

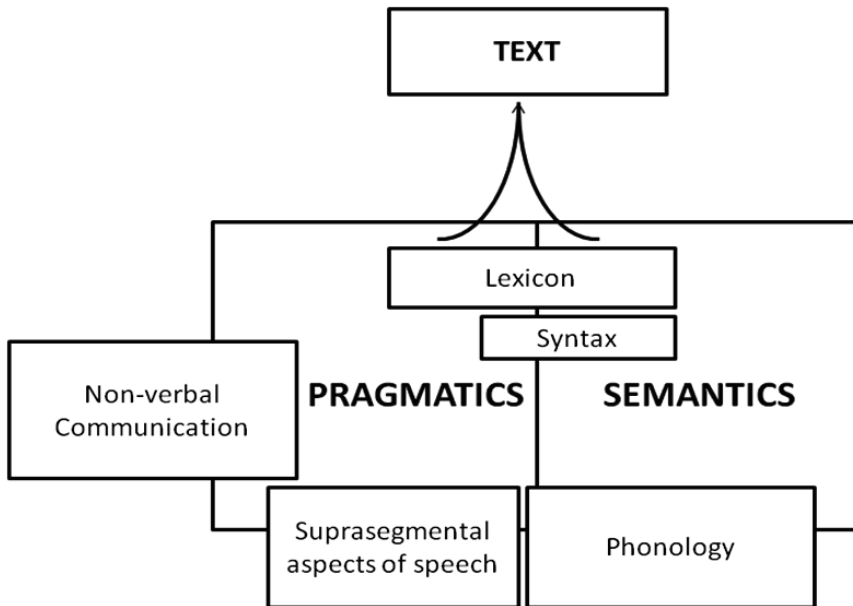


Fig. 1. Pragmatics versus semantics in the process of forming a text (from: Pachalska and MacQueen, 2005)

It is worth emphasizing at this point that research in pragmatics encompasses the speech act as the sum of all utterances aimed at achieving a definite goal; therefore, we can talk about the intentionality of the speech act only holistically. The intentionality of single words and sentences is secondary and results from their role in the course of realizing the speaker's intentions. In consequence, the traditional distinction between a spoken utterance and a written text as products of two different channels of verbal communication takes on a somewhat different shape. Although the properties of the selected channel have an unquestionable influence on the verbal shape of the utterance or text, the choice of the channel is made in the later stage of its formulation (see Fig. 2). Because of this, when discussing the pragmatic

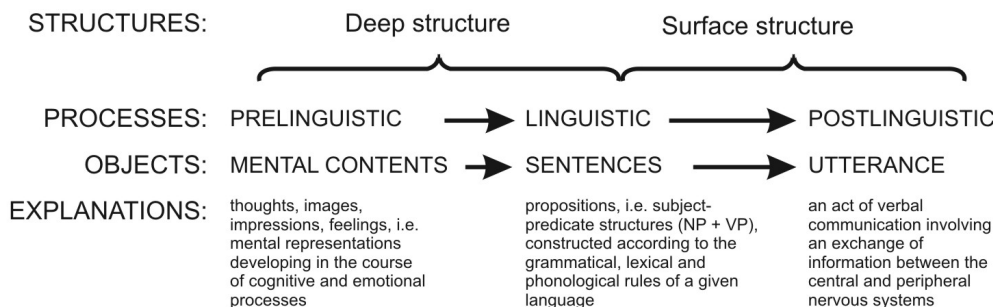


Fig. 2. Process of text formulation (from: Pachalska 2008)

aspects of a speech act, it is more and more frequent that we follow the convention of calling the whole participation of one person in the process of communication a “text,” without prior distinction between written and spoken texts. The term “text” instead of “utterance” better suits the holistic approach to the speech act from the standpoint of pragmatics. For example, in the course of an ordinary conversation, the text is all that one person says during that conversation, whereas the term “utterance” means every fragment of text which is spoken in between the utterances of other people.

As mentioned above, the notion of pragmatics pertains to a speech act envisaged as a process. i.e. a sequence of events related with other events developing in time. As with any other process involving more than one person, a speech act, particularly with regard to pragmatics, develops most frequently according to a pre-selected pattern, called in linguistic literature “genre.” Each such genre, more or less consciously chosen for the purpose of a text, provides speakers with a set of possibilities to choose formulas, called *topoi*, which usually follow each other in a fixed order. Depending on the specificity of the genre, and the discretion, ability and temperament of the speaker, deviations from the expected sequence and shape of *topoi* are possible. However, this is within certain bounds, beyond which the text no longer belongs to the same genre.

Choosing a genre for a given text is conditioned by the purpose of the text, the concrete communication situation, and the selected channel of communication. However, one should remember that every subsequent decision in the heuristic process causes and simultaneously conditions the next decision. For example, a girl who wants to break up with her fiancé must first choose a channel of communication (spoken, written or signed text), and then, depending on the selected channel, she has definite genres to choose from: in the case of the spoken channel it can be a telephone conversation, conveying the news personally or via a third person, while in the case of the written channel it could be a farewell letter, telegram etc. If she chooses, for example, a letter, we all know that it will begin with a *topos* called a “salutation” such as “Dearest Thomas” (or “Dear”), where the choice of the name “Thomas” instead of “Tom” communicates a certain coldness. A deviation from the conventional *topos*, such as “Dear Sir” or “you scoundrel” would communicate a rather extreme attitude, and a different meaning. After the salutation, she may express - though not necessarily - her regret and/or apologies for the pain or mental suffering she has caused. Next, there is the essential information, “We are through,” followed by a justification of the decision or discussion of its consequences; finally (possibly after repeating some of these elements), there is a farewell phrase and a signature. If the same information is relayed by telephone, the text will take on a different shape as regards pragmatics, although the content of the essential information remains principally identical. Different formulas apply to the beginning and the end of the text, but first and foremost, there is the possibility of an immediate reaction on the part of the addressee, which can diametrically change

the situation, and in consequence the text itself, while it is being formed. A face-to-face conversation may proceed analogically, but even here certain formulas (*topoi*) are different from the ones used in a telephone conversation, since different factors come into play which influence the course of the communication process. Relaying the message by a third party has considerably fewer obligatory formulas (at least as regards the girl), but can be interpreted as an expression of contempt or lack of courage, which may be a more or less important factor for the interested party. Finally, the girl in question may personally return to the fiancé, or send by post, a symbol (a ring) as a non-linguistic, but rather meaningful communiqué of the same content, thus saving herself the necessity of explaining the reasons for her decision or to determine its consequences etc.

All in all, what is most crucial here, for the present purposes, is the fact that every choice in this process from concept to text enables us to express certain content (ideas) which cause certain results, but hampers others or makes them virtually impossible. Hence we can conclude that the ability to express oneself in concrete situations is not exclusively conditioned by a well functioning semantic system, but also by the pragmatic system, which clearly indicates that semantics and pragmatics complement each other and mutually depend on each other during verbal communication (being both mutually complementary and interdependent).

The knowledge of “genres” and the *topoi* that compose them, as used in a given society, depends to some extent on one’s education, and is integrally connected with the knowledge of language and culture. Although some genres are more common, and others more specific to a given linguistic community, the formulas (*topoi*) happen to vary. A foreigner with a very good knowledge of the lexical and syntactic rules of a second language may have serious difficulties in the sphere of pragmatics caused by his unfamiliarity with the genres and *topoi* used in a foreign culture, which leads to problems with multicultural communication, not less than those caused by a lack of grammatical and lexical knowledge of the foreign language. This is the case, because, when meeting someone who simply does not speak our language, we principally have to suspend passing judgment on them from a pragmatical point of view, since we do not have the semantic basis to justify such judgments.

Overall, difficulties on the semantic plane are clear and evident, as they appear on the surface of the speech act, whereas speech disturbances which occur on the pragmatic plane, very frequently effectively disturbing the communication process, are not always so distinct. They are rather felt than heard (or read).

Errors in pragmatics

It is commonly known that a foreigner can commit pragmatic errors in a second language. There are, however, other situations, more difficult ones, in which a person may appear “strange” because in their linguistic behavior there are considerable deviations from the pragmatic norms. By this we

mean people with right hemisphere damage, who may experience disturbances in pragmatics parallel to those which can sometimes be noticed in foreigners' speech.

In the context of neuropsychological clinical practice, one of the important problems to solve is the definition and identification of pathology in the sphere of pragmatics, since the assumed norm in this respect can be virtually impossible to determine (Duszak, 1998; Prutting & Kirchner, 1987). It is well known that in aphasiology scientists have had analogous conceptual problems since the beginnings of this discipline: what makes a norm and what a pathology? Similarly, in pragmatics, measuring the degree of deviation from the assumed common norm in precisely determined situations, with so many variables to take into account, hardly constitutes a feasible task. What is more, the definition of pragmatics itself indicates that this notion is applied in real, natural situations, which are generally beyond the sphere of control of researchers, as they are extremely difficult to observe. In this situation, then, it is practically impossible to define a commonly accepted "indicator of pragmatic behavior"

No wonder, then, that standard neuropsychological batteries do not contain pragmatics tests, at least in the meaning of the term proposed here. Nonetheless, ignoring this aspect of communication makes it impossible to obtain a comprehensive portrait of the disturbed functioning of a person with right hemisphere damage. Therefore, the best solution seems to be to assume a clear concept of "pragmatic error." In our opinion, one can talk about a pragmatic error, when against the speaker's intention, the semantic content of the text is negated, undermined or impossible to comprehend because of factors belonging to the domain of pragmatics. It is also important to distinguish between a "conceptual" error occurring at the earlier stages of the process shown in Fig. 2, i.e. in the concept of intention and aim of speaking, and "performance" errors which occur, e.g. while choosing a genre or appropriate topoi.

Semantic and pragmatic errors can be committed by everyone for various reasons. A tired person, or someone who is under the influence of medicine, alcohol, is physically or mentally stressed can at some point display features of speech similar or identical to the clinical traits of aphasia. However, we do not speak of aphasia less a person with brain damage makes linguistic mistakes frequently and regularly, over an extended period of time, and generally gives the impression that they have lost in a relatively permanent manner their ability to avoid committing such linguistic errors, which they used to make relatively seldom or never. Likewise, in the case of pragmatic errors there may occur a pathological state, in which the person is no longer able to avoid making errors in pragmatics. On the grounds of many years of clinical practice, the authors can list a number of different kinds of brain damage that can cause observable disturbances in pragmatics; however, for the purposes of this study, we will concentrate on one large group of patients: those with right hemisphere damage.

Asymmetry and pragmatics

The results of our many years of research allow us to put forward the hypothesis that disturbances of pragmatics should be regarded as key symptoms of right hemisphere damage, just as aphasia is a key symptom of left hemisphere damage. Moreover, since the picture of aphasia is connected to the location of the lesion in the left hemisphere, it also seems highly probable that the place of localization of the lesion in the right hemisphere is not indifferent to the clinical picture of pragmatic disturbances (cf. Pachalska et al., 2000b).

For many years in the specialist literature the essence of the functional asymmetry of the brain has revolved around the “left brain-right brain” dichotomy (Walsh, 2000; Zangwill, 1961). However, an analysis of the latest research results in neurophysiology and neuroanatomy is forcing us to revise this view. Today, we already know that specialized systems and functional blocks which cooperate with one another are located in the whole brain (Walsh, 2000; Zangwill, 1961) along various axes of asymmetry (frontal, sagittal and horizontal). Meanwhile, in the neuropsychological literature, where a functional division has already been made (e.g. frontal, temporal, parietal, occipital lobes), authors do not always take into consideration the importance of the various axes of asymmetry. As an example, in the rich literature on the functions and dysfunctions of the frontal lobes, the authors when discussing various clinical traits of the “frontal complex” only sporadically concentrate on the functional differences between the left and right frontal lobes (Herzyk, 2000; Damasio, 1999; Lebrun, 1995).

It must be emphasized that in the case of the left hemisphere the cooperation of the systems located in various areas in relation to sagittal axis asymmetry is already well known, since in the broadest of terms, damage in the frontal area of the left hemisphere causes coding, ataxic (motor) aphasia, while damage in the posterior area causes decoding, sensory aphasia. A great deal of research has also been devoted to subcortical structures situated below the horizontal axis, the damage of which gives rise to subcortical aphasia (Crosson, 1985; Murdoch et al., 1991; Kadzielawa, 1997; Schneider et al., 1999; Nagaratnam & Gilhotra, 1998). Meanwhile, little has been reported on the results of damage in the frontal and posterior areas of the right hemisphere. In practice there are no studies on the functions of the subcortical structures of this hemisphere. This is most likely because many authors consider the right brain hemisphere more primitive in its organization than the left (Brown, 1988). Yet there are authors who have noticed functional differences within the right hemisphere itself. One of these is Ross (1981), who conducted research into disturbances on the suprasegmental plane of speech (intonation, accent, rhythm) referred to as aprosodia. Ross claimed that, as different areas of the right hemisphere become damaged, different types of aprosody occur: motor, sensory, transcortical and mixed. Prosody, however, constitutes only a small part of the problem. In our view the essence of the problem is pragmatics, and its disintegration as a consequence of right hemisphere damage.

MATERIAL AND METHODS

A qualitative examination of disturbances of pragmatics

In order to make a qualitative analysis of the patients' communicative behavior with disturbances of pragmatics, from considerable clinical material comprising the examination of more than 100 patients with right hemisphere damage, we have selected 12 right-handed patients with one ischemic focal lesion in the right hemisphere, confirmed by CT or MRI. These subjects were divided into two groups of six patients (three women and three men), matched for age and sex. In group A (anterior), the lesions were situated exclusively or mainly in the frontal lobe, while in group P (posterior), exclusively or mainly in the parietal lobe, with one person whose damage was located mainly in subcortical structures (KW, age 59). In carrying out the qualitative analysis further in this paper, every patient will be assigned an identifier, with the letter of the respective group, A or P, an ordinal number (from 1 to 6 in each of the groups) and a letter signifying the sex of the subject (M or F.)

Table 1 contains basic data characterizing each of the patients, while table 2 gives selected neuropsychological parameters.

It should be noted that the intelligence quotient of the subjects is within the norm or just borderline. The lowering of the score is mainly caused by difficulties with performing the non-verbal tests, in particular the ones that test the

Table 1. Biographical information

Subject/ Sex	Age (years)	Education/ Occupation	Localization of lesion	Main clinical signs	Time since stroke
A1 / M	70	Higher/ Economist	Frontal lobe	Left-hand side paresis	46 weeks
A2 / M	50	Secondary/ Driver	Frontal lobe	Left-hand side paresis	29 weeks
A3 / M	64	Secondary/ Driver	Frontal lobe	Left-hand side paresis	121 weeks
A4 / F	70	Secondary/ Dentistry Technician	Frontal lobe	Left-hand side paresis	27 weeks
A5 / F	67	Higher/ Painter-Artist, Monument Restorer	Frontal lobe	Slight left-hand side paresis	28 weeks
A6 / F	64	Higher/ Painter- Artist, Sculptor	Frontal lobe	Hemiplegia	96 weeks
P1 / M	63	Higher / Clergyman	Parietal lobe	Hemiplegia	48 weeks
P2 / M	69	Higher / Musician	Parietal lobe	Hemiparesis	61 weeks
P3 / M	65	Secondary/ Car Mechanic	Parietal lobe	Hemiplegia	42 weeks
P4 / F	61	Higher/ Economist	Parietal lobe	Hemiplegia	127 weeks
P5 / F	52	Higher/ Teacher	Parietal lobe	Hemiplegia	127 weeks
P6 / F	59	Secondary/ Driver	Parietal lobe, Subcortical structures	Hemiplegia	196 weeks

ability to assemble into one logical whole parts of figures (the profile of a face, a boy, a hand). What is worth noting is that some of the subjects experienced considerable memory disturbances. A tendency revealing differences between the groups was noticed: in accordance with the generally accepted assumptions, disturbances are greater in patients with parietal lobe damage.

Table 2. Basic neuropsychological parameters of the subjects

	WAIS-R (norm 100)*			WMS-R**				Frenchay
	I.I.W.	I.I.N.	I.I.C.	PLN max 24	PLO max 24	OWN max 41	OWO max 41	norm 27-30
A1	123	94	109	18	16	32	23	28
A2	94	89	92	13	10	12	9	26
A3	93	88	91	17	15	16	13	26
A4	98	86	92	13	10	11	7	27
A5	121	92	107	20	18	34	20	28
A6	132	99	116	22	20	38	32	28
P1	108	87	98	21	18	35	31	27
P2	109	91	100	19	16	31	26	28
P3	106	89	98	19	16	34	25	26
P4	117	93	105	14	11	13	9	28
P5	114	94	104	21	19	36	30	28
P6	97	87	92	12	10	11	8	27
Average (group A)	110.2	91.3	100.8	17.2	14.8	23.8	17.3	27.2
Min (group A)	93.0	86.0	90.5	13.0	10.0	11.0	7.0	26.0
Max (group A)	132	99	115.5	22	20	38	32	28
SD (group A)	15.6	4.3	9.8	3.3	3.8	11.1	8.7	0.9
Average (group P)	108.5	90.2	99.3	17.7	15.0	26.7	21.5	27.3
Min (group P)	97.0	87.0	92.0	12.0	10.0	11.0	8.0	26.0
Max (group P)	117	94	105	21	19	36	31	28
SD (grup P)	6.3	2.7	4.4	3.4	3.4	10.5	9.4	0.7
Average (total)	109.3	90.8	100.0	17.4	14.9	25.3	19.4	27.3
Min (total)	93.0	86.0	90.5	12.0	10.0	11.0	7.0	26.0
Max (total)	132	99	115.5	22	20	38	32	28
SD (total)	11.9	3.7	7.6	3.4	3.6	10.9	9.3	0.8

* Wechsler, 1981

** Wechsler, 1987

No clinical symptoms of amnesia were found in the patients. In the Frenchay Aphasia Screening Test (FAST) – Polish version (Bitniok, 1998), the patients did not show symptoms of aphasia. The complete neuropsychological profile of the patients does not indicate the presence of dementia, or the development of symptoms of Alzheimer's disease. Thus it is difficult to attribute the disturbances of pragmatics found in these patients to another disease which might coexist with the consequences of a stroke.

Method of examining pragmatics

As mentioned above, tests of pragmatics as such essentially do not exist. This is the case mainly because pragmatics pertains to human verbal behavior in concrete, socially-oriented situations. As we know, a clinical experiment comprising such situations – with the participation of a patient with brain damage – is both difficult to plan, and also to carry out outside the clinic context, such as at home, in a shop, or at a restaurant or an office.

Table 3. Most frequently encountered disturbances of pragmatics in the examined group

Channel of communication	Disturbances of pragmatics:
verbal: on the segmental plane of speech	<ul style="list-style-type: none"> ☒ initiating and ending a conversation in a socially unacceptable fashion ☒ lack of adjustment to the course of conversation steered by another person, in particular, not allowing the interlocutor to change or develop the subject under discussion, interrupting interlocutor's utterance, interjecting completely unjustified comments, returning abruptly to already finished subjects etc. ☒ difficulties in selecting appropriate lexis for the current situation e.g. telling indecent jokes at the improper moment or the reverse: using highly formal language during an ordinary conversation, employing professional jargon in a context not related to work
verbal: on the suprasegmental plane of utterance (intonation, accent, rhythm)	<ul style="list-style-type: none"> ☒ difficulties in expressing emotions by means of the tone of the voice and using a tone which appears to be contradictory to the content of the utterance (aprosodia) ☒ socially unacceptable rate of speech (too fast or too slow)
mimicry-gesture:	<ul style="list-style-type: none"> ☒ facial expression at variance with the content of the utterance ☒ lack of any gesticulation or using gestures which are clumsy, awkward, inappropriate ☒ socially unacceptable touching of the interlocutor (at improper moment) or avoiding contact with the interlocutor
Communication space	<ul style="list-style-type: none"> ☒ difficulties with estimating the communication space (standing too close or too far from interlocutor)
graphic: on the segmental plane of a written text	<ul style="list-style-type: none"> ☒ sporadic swapping of letters "p" for "b", "k" for "g" or the other way round
graphic: on the suprasegmental plane of a written text	<ul style="list-style-type: none"> ☒ deformation of the letter size-too small (micrographia) or too big (macrographia) ☒ sporadic or no punctuation ☒ layout of writing: untypical page layout e.g. leaving a large portion with no writing, irregular placement of lines etc.

Therefore, investigations into pragmatics were made indirectly, treating the research sessions in which routine neuropsychological examinations of patients with post-stroke right hemisphere damage took place, as a particular kind of communication process. The utterances of each patient were recorded on tape, while stimulated discourse was videotaped. The recordings were subsequently subjected to qualitative analysis.

Table 3 contains the most frequently encountered disturbances of pragmatics in the group of patients under examination.

It can be noticed that disturbances of pragmatics comprise various speech acts and channels of communication. The qualitative analysis of the patients' conversations, with the division into frontal lobe damage and parietal lobe damage, was carried out on the basis of the GSP method (Generic Structural Potential) proposed by Ventola (1979) with the authors' own modifications in the spirit of ethnographic research, which is presented by the first author elsewhere (Pachalska & MacQueen, 2002; cf. also Togher & Hand, 1999).

Transcripts of the recorded conversations were made and, following every turn, these were classified and commented upon according to the following formula for each session:

[Gr ^ (?Id)] ^ [Ap-I ^ Ap-D ^ C ^ /Q/ ^ /An/ (?D)(?R)] ^ LT ^ GB

where:

Gr genre

() optional element

// recurring element

[] bounds of mobility (mobile element may occur in any place in a range marked like this)

? mobile element

^ fixed/set/ sequence/progression

The meanings of the abbreviations denoting the elements which appear here are presented in table 4.

On the grounds of clinical experience gained from the examination of many patients, it was noted that patients from group A made characteristic pragmatic errors, which differ from those committed by the subjects in group P. Below we give excerpts from two conversations considered typical of patients from groups A and P. The conversations took place relatively early in the course of examination, in which the patients were asked to copy a picture entitled "A building site" (Pachalska & MacQueen, 2002). In each case the beginning of the conversation was omitted, so the recording begins with an element of type C.

The discussion about artificial flowers in America continues for about 10 minutes, during which the researchers tried to keep up the conversation without directing and without further attempts at centering the patient.

Table 4. Elements of the research session according to the ESP format (Ventol 1979 with the authors' own modifications)

Element	Symbol	Aim
Greeting	Gr	Starting a conversation, signaling the intention to speak
Identification	Id	Identifying speakers, identifying their roles including their status (using title Madam/Sir or you), presence or absence of motivation to talk
Approach	Ap	Ensuring comfort to interlocutors. Initiating an exchange of information by means of "safe" topics (can be "indirect" or "direct")
Approach-Direct	Ap-D	Preliminary exchange of information about topics connected with the interlocutors themselves e.g. about health, appearance, clothes, family and the like
Approach – Indirect	Ap-I	Preliminary exchange of information about the external situation e.g. the weather, environment, events and the like
Centering	C	Moving on to concrete, cognitive, informative subjects, asking questions and receiving answers, which in fact motivate the initiation of this conversation
Question	Q	Asking the subject question directly linked to the aim of the session
Answer	An	Answering a Q type question
Continuation	Cnt	Continuing an utterance interrupted by the interlocutor e.g. with an element of the Enc or Cnt type
Encouragement	Enc	An utterance aiming to encourage the interlocutor to continue speaking
Confirmation Request	Rq	A question or statement aiming to gain or re-gain the interlocutor's attention and/or to obtain confirmation of the reception of the previous communiqué by the second interlocutor
Confirmation	Cnf	Confirming that the previous utterance of the interlocutor has been received and understood
Request for clarification	RCI	A request to clarify the meaning of the previous utterance, when the interlocutor does not know what is happening
Clarification	Clf	An explanation made when the interlocutor is aware that his previous utterance has not been understood; it can but does not have to constitute an answer to an RCI element.
Digression	D	Attempting to change the subject of the conversation, passing onto a new more or less justified topic, instead of the subject proposed by the other interlocutor
Re-centering	R	Trying again to return to the key point of the matter after a digression or a break
Leave-taking	LT	Signaling the need or intention to end the conversation by the interlocutor
Goodbye	GB	Signaling the leaving of the conversation

The following points deserve special attention:

- in point 2 – the sudden digression (D); patient A1 on the whole uses many digressions, but only twice in the course of the conversation analysed here does he answer directly the question asked;

- in point 8 – a digression from a digression
- in point 12 – the assumption of patient A1 that OB1's utterance was addressed to him, and the ignoring of the fact that another patient had entered the room.

Table 5. Conversation between patient A1 and two therapists (OB1 and OB2)

Move no.	Speaker	Utterance	Symbol	Comments
1	OB1	What title will you give this story?	C, Q	This is the task at hand, the patient has already done several of these.
2	A1	Please professor...I am really upset by this, this picture. People have nowhere to live (madam) and here, you know, they're building a kennel for a cat. They're crazy (5 seconds) In my opinion they should not be building a house for a cat, because a cat doesn't need a house, let her sleep on the roof. What boorishness!how about a lift? A kennel could be possibly made for a dog , of anything, but not of bricks (3 sec) a wooden one would be better, has to have a round hatch.	D	What is noteworthy here is the unexpected emotional reaction to a picture in which we see a little boy building a home for a cat from bricks left behind after constructing a house. Patient A1 reacts emotionally many times during the examination. However, no matter what he says he always uses the same tone of voice (speaks very quickly with long pauses) and always has the same facial expression (indifferent or with a slight smile).
3	OB1:	This is absurd, yeah?	Enc	OB1 surprised by the patient's reaction tries to check if that is what he/she means.
4	A1:	Absurd? A dirty trick. In my opinion it's the same with these, with these, this little cloud (picks up a different picture from the same series) like black, as if it was smoke.	Cnt	The patient confirms by repeating the key word from OB1's utterance, but instead of developing the topic, immediately shifts attention to a phenomenon in a different picture which seems to irritate him.
5	OB1:	Well, exactly..[6 sec.], but...[7 sec.]	Enc	OB1 signals that she's listening with understanding, as suddenly the patient stops speaking and is evidently embarrassed.
6	A1:	...but it's so, smoke doesn't go like that, does it? Artists fool people...because such smoke looks more like a rain storm, 'cause, 'cause, the smoke is spiraling up from the chimney...I would say it differently..., if your ears would excuse me, professor...he's an arrogant ass that artist ... the one who did this for you...[5sec.] but he did have imagination [looks at the interlocutor with a smile] the artist, I don't know what you call such an artist.	Cnt	The patient confirms the reception of the signal, however, on criticizing the picture and the artist who made it he changes his tone and seeks a solution. Perhaps he is beginning to fear that his critical comments will offend his interlocutors.

Table 5. Conversation between patient A1 and two therapists (OB1 and OB2) (cont.)

7	OB2:	It was produced by some company..	Enc	OB2 seeing the discomfort of the patient, distances herself/himself to signal that she/he is not offended.
8	A1:	but not a Polish one	D	He introduces a motif which is common in his speech. Incidentally, he has already been informed that OB2 is American.
9	OB2:	No, I think it's Italian	Enc	OB2 doesn't know what's happening, but still wants to sustain the conversation.
10	A1	'Cause.. can't be ours....they are not able to...yes [3 sec.] and here are flowers here, aren't there? I guess they're artificial yeah? Like in America, yeah? Oh professor, Americans love flowers, artificial ones...They're everywhere. They lay there such artificial flowers and you can see...it looks nice, when there is snow and wind, and there are those flowers...they'd freeze after all.	Cnt	The patient does not explain what "strange" thing he can see in the picture and changes the topic. He introduces his favourite topic - his visit to the USA - and begins to describe more closely American reality ignoring the fact that one of the speakers is American.
11	OB1:	[Good afternoon, you're a little late for the session.]	Gr, Ap-D	OB1 turns round and speaks in a low voice to another patient who's just entered the room.
12	A1:	Pardon?	RCl	The patient didn't notice that somebody had come into the room, but is evidently nervous.
13	OB1:	Good.	Cnf	OB1 has just finished talking to another patient, hence Cnf is not addressed to A1 in this case
14	OB2:	Yes.	Cnf	OB2, who was busy changing the cassette in the tape recorder for 10 or so seconds and was silent, signals that she/he still is not taking part in the conversation.
15	A1:	And it looks nice, artificial, yes? Everybody knows that they're plastic, don't they? Americans always make them of plastic, don't they?	Cnt	The patient perceives what OB2 says as an encouragement to continue his story, though later on in his speech he signals uncertainty 3 times by repeating his request for confirmation and looking very quickly one by one at his interlocutors.

- in point 58 – avoidance of answering a question in a way that is hard to understand (the change of the subject by the patient is so drastic and unjustified that the person writing up the script of the conversation checked several times if there was a pause made while recording, but it turned out that there was not).

- in point 64 - an attempt to end the session by the patient without introducing an LT element while the researchers are still participating in the situation (point 65). In addition to this, the attempt to point out the interlocutor's inappropriate behavior was not taken up by the patient.

Many of these elements repeated themselves not only when talking to patient A1, but also with other patients from group A, where frequent, long digressions and lack of a reply to a direct question were observed. Patient A3 concluded by saying, "If you left an umbrella on my bus I would turn aside

Table 6. Continuation of conversation between patient A1 and two therapists (OB1 and OB2)

55	A1:	Well, I liked them, m'am because, ... they're identical. People even looked to see, if of course, because over there ma'am they make them of such material that they look exactly the same as flowers, you would never be able to tell, ma'am,... well, because of course....because the flowers there are like that.	Cnt	The patient's utterance constitutes confirmation of what he already said many times about the subject. What is noteworthy here are the number of empty formulas and false starts.
56	OB2:	Mhm	Cnf	OB2 nods, signaling simultaneously non-verbally to OB1, that it's time to finish the digressions and return to the task.
57	OB1:	Good...but what title would you give this picture?	Cnf, Rc	OB1 confirms receiving the patient's communiqué, but allows him no time to continue with the topic. "Re-centering" takes place.
58	A1:	Well, because I'm retired, I don't work..well, you know.	D	The patient without a single word of objection accepts the sudden closure of the subject, but does not pick up on the topic suggested by OB1. He does not provide any signal of intention to change the subject. What's more the word "because" suggests that for the patient his own utterance constitutes continuation, though there are no reasons for this.
59	OB1:	And how long have you been here in the ward?	D,Q	OB1 tries one more time to change the topic suddenly to see if the patient responds to it.
60	A1:	Since Sunday, yes?.....	An	This time the patient answers the question, though in the already known manner, constantly seeking confirmation.
61	OB1:	That's right, but what title would you give this picture?	Cnf, RC	OB1 confirms the patient's information, but immediately tries to carry out the centering.
62	A1:	[Picks up the picture] this is like a sort of a garden, yes?	Rq	The patient is clearly looking for ground from which to give a title to the picture.

Table 6. Continuation of conversation between patient A1 and two therapists (OB1 and OB2) (cont.)

63	OB1:	Yes.	Cnf	OB1 gives the required confirmation, but gives no more ideas and waits for an answer
64	A1:	Well..how about "In the Garden" [rises]	An	The patient spots marginal details and from them gives the title of the story. After giving the title he considers the conversation to be over.
65	OB1:	Are they already serving supper?	RC	OB1 suggests that the session is not over yet. In a normal situation if the patient answered "No, it's not supper time yet" it would be a signal that he understood his duty to complete the tests during the session.
66	A1:	Can I go now?	LT	The patient does not answer questions but expresses what in his opinion is the essence of the matter.
67	OB1:	Yes, certainly. Goodbye.	LT,GB	OB1 resigns from trying to stop the patient from going.
68	OB2:	Goodbye.	GB	OB2 following OB1 bids farewell to the patient.
69	A1:	[leaves without reaction]	–	No GB.
70	A1:	[returns and looks at the chair]	–	He does not justify his behaviour No Gr, Ap.
71	OB2:	Have you forgotten something?	Ap-D	OB2 tries again to engage the patient in conversation
72	A1:	[leaves without reaction]	–	No GB.

from the route and personally take it back to your house, ma'am." Patient A5, a female painter, when asked to describe her most memorable Christmas, took a sheet of paper and a pencil and drew the history of her disease as a 6-picture story. She summed it up by saying "Last Christmas I fell ill." Patient A3, when asked to repeat a short text called "The lost umbrella" during a memory listening test, started at one point to talk about various objects that he found left by passengers in his bus, which lasted 8 minutes. He concluded by saying, "If you left an umbrella on my bus I would turn aside from the route and personally take it back to your house, ma'am."

In order to compare the differences in pragmatic disturbances between the groups, we will present a conversation with a patient from group P, also recorded at an earlier stage of examination, involving the sequencing of a six-picture story called "The building site." To make the comparison easier, the transcript begins as before, at the appropriate moment. The patient sequenc-

ed the pictures in a seemingly random order, but told the story in a logical manner, successively pointing at the appropriate pictures

After 15 more minutes of examination the conversation resumed as follows:

In this case the following observations can be made.

- In the utterances of Patient 4 there are no digressions (D). The patient tries to answer the questions, but she cannot. (subsequent attempts made

Table 7. Conversation of P4 with two therapists (OB1 and OB2)

No.	Speaker	Utterance	Symbol	Comments
1	OB2:	What title would you give this story?	C	Cf. Table 5, move 1
2	P4:	[Sighs loudly, looks at the picture] Oh dear...[10sec]	Rq	The patient does not confirm that she has heard the question and is ready to answer. Signals embarrassment.
3	OB1:	Yes?	Rq	OB1 checks if the patient is going to say something.
4	P4:	Maybe... [7 sec.]. No, I don't know.	An	The patient has initially some sort of idea, but she either rejects it or is not able to verbalise it.
5	OB2:	So what is this story about?	Q	OB2 tries to help the patient to concentrate.
6	P4:	[Looks at the therapist OB2 for a moment, then looks again at the picture pointing at them one by one] Here are bricks. Here, the building has begun, and here's already a nice little house, here a boy has come, in this one here he built a house for a dog...or maybe for a cat...don't know.	An	The patient returns to her previous task, i.e. she tells the picture story anew.
7	OB1:	And what is most important here?	Q	OB1 tries to help the patient to reach the crux of the matter, to make some choice.
8	P4:	I'm sure that there were only these bricks here before, and then this nice house is built, next to this little boy [8sec.]...don't know...	An	The patient begins to retell the story, but interrupts her own utterance.
9	OB2:	Can we somehow put it in words, which could serve as a title?	Q	OB2 tries once again to bring the task to a successful end.
10	P4:	I simply don't know..I don't know [11sec.] I've never been gifted at this, giving titles..[tears in her eyes and her voice breaks].	An	By giving justification the patient indirectly signals that she can't carry out the task and doesn't want to try any more.
11	OB1:	Ok, then, don't worry, please. Let's move on.	C	Because of the negative emotional reaction OB1 gives up on trying to get the title and goes on to the next task: "centering" .

by the interviewers to direct her course of thinking turn out to be ineffective.)

- The utterances of Patient 4 are characterized by relatively long pauses, which motivate the interviewers to make up auxiliary questions.
- The answers of the patient to the directing questions prove that she does not understand their aim.
- In contrast to patient A1's behaviour, Patient P4 is even excessively polite in the conclusion of the conversation.
- In point 60, the aim and meaning of the OB1 statement is not understood by the patient and is received as an unfavorable remark

The astonishing words "High Commission" were spoken without a trace of irony or humor: the patient, being aware of the fact that she is being questioned by two professors, chooses words which seem to be adequate (before her stroke the patient worked in a managerial post in the tax office).

On the grounds of these experiences a number of hypotheses can be put forward, including the following:

Table 8. Continuation of conversation of P4 with two therapists (OB1 and OB2)

58	OB1:	Very good, you've done an excellent job. You can go and have your supper now.	LT	OB1 signals that the examination is coming to an end and tries to leave the patient in a good mood.
59	P4:	Thank you, thank you very much. I'm very grateful. With the whole of my heart, professor I thank you. [Stands up and takes her crutch]	LT	The patient receives the signal and thanks her interlocutors wholeheartedly for the examination although this is done using a monotonous voice (without melody and stress).
60	OB1:	We'll finish the test tomorrow.	AP-D	OB1 signals that the conversation which is just ending will be continued, which constitutes a forestalling approach.
61	P4:	Excuse me, but is the High Commission not satisfied with my behavior?	RCI	The patient signals surprise at the necessity to continue the examination(also by the tone of her voice).
62	OB1:	No, not at all. The test is rather long and can't be done in one day.	Clf	OB1 realizes that patient 4 did not expect the examination to continue and that she interprets it to be a result of her own shortcomings.
63	OB2:	We simply do not want to tire you out.	Clf	OB2 repeats the idea, because she/he can see that patient P4 does not yet understand what is the matter.
63	P4:	Oh I see. So thank you very much again, High Commission, and goodbye. [leaves the room]	Cnf, GB	
64	OB1:	Goodbye.	GB	
65	OB2:	Goodbye.	GB	

Patients from both groups have serious communication problems with regard not so much to the construction and reception of verbal messages, but their control and understanding of the course of the conversation in a given situation; in other words, they commit a number of pragmatic errors. This hypothesis was proved in further research, as all the conversations held with patients contained some pragmatic mistakes. The most frequent errors encountered in the recorded conversations are presented in table 2.

Group A patients tend to make numerous and long digressions, they often do not answer the questions or do not respond appropriately to the interlocutor's turn (e.g. they ignore C type turns) and pay little attention to rituals of welcoming, addressing, ending and saying goodbye. This hypothesis has also been proved many times in our research.

The patients from group P are generally polite and try to be pleasant, but they do not understand the whole context of the current situation and respond to every following turn of the interlocutor as if it were a brand new task. They do not introduce their own topics, and they do not develop the subjects proposed by interlocutors, they prefer to answer concretely, concrete questions. Further talk with patients confirmed this hypothesis.

Although the results obtained from these and other patients examined by us with right hemisphere damage have provided many valuable observations, both quantitative and qualitative, the analysis presented above serves, in our opinion, as an example of the enormous potential of the GSP method. Without this qualitative research, which emphasizes the relevant issues within the range under examination, it would not have been possible to draw the conclusions proposed by the authors elsewhere (Pachalska et al., 2000a).

DISCUSSION

Knowledge of the rules of pragmatics applicable in a given language group, which in fact belongs to the general resources of linguistic and cultural knowledge, appears to be a constant feature of the adult brain, although at any moment different factors such as fatigue, stress, strong emotion, alcohol or other poisonous substances, can negatively influence the manner in which a person applies and observes these rules and principles. However, in the case of brain damage, certain behaviors which under other circumstances would be recognized as a result of a momentary weakness become characteristic. The patient is no longer capable of behaving differently or can only sporadically follow the rules of pragmatics, but at the cost of great mental effort.

The utterances of patients with right hemisphere damage are generally perceived by people around them as uncultured (rude), ridiculous, bizarre, although the patients themselves are not able to comprehend why other people do not actually understand what they say, why, for example, they laugh at their utterances. Hence complaints are made of the type: "Somehow I can't make myself understood."

The disturbances in pragmatics found in these patients, analogous to the semantic disturbances called aphasia, pose many research questions, which cannot be answered here in more detail. In accordance with the assumptions of qualitative methods, we wish to draw attention to important issues, rather than give final conclusions. Our research and observations have led us to consider further the subject of the brain-behaviour relation, which we will (schematically) outline below.

As previously mentioned, there is substantial neuropsychological literature on the lateralization of brain functions (Herzyk, 1992). Although general descriptions of the left-right asymmetry are well known, there are still many problems to be solved (Damasio, 1999; Grabowska, 1999). This refers in particular to right hemisphere functions, which are far less known than left brain functions, most likely because speech, as the most complicated and fascinating of the human brain's functions, is – as it appears – located comparatively precisely in the left hemisphere. At least since the times of Broca (1865), such a conclusion has most frequently been justified with the observation that damage to certain parts of this hemisphere causes evident disturbances in the patient's ability to build logical words and sentences or to receive other people's utterances. The results of losing the semantic functions of language are immediately noticeable, as aphasia does not belong to the more subtle neurological symptoms. Although it is impossible to question the truthfulness of Broca's findings, it does not constitute the essence of the issue under examination. For a number of years there have been mentions in the neuropsychological literature that the participation of the right hemisphere in (broadly conceived) linguistic performance is considerable. It is not well known, however, what exactly its role in this process may be. The most frequent assumption has been that it regards discourse, i.e. the process of text formation at a level beyond the sentence (Tompkins, 2000; Tompkins et al., 2000; Davis et al., 1997; Brownell & Joanette, 1993; Joanette & Goulet, 1990).

In this context the results of our research into disturbances of pragmatics in patients with right hemisphere damage show a way to solve the problem. With a broader understanding of the concept "pragmatics" we are able to explain why our patients have communication problems from the linguistic point of view. On the basis of this and other research (Pachalska et al., 2000a, 2000b) we put forward the hypothesis that each of the hemispheres has its own particular "clock," not in the strict sense of a "time-measuring device", but more in the sense in which this term is used in computer science to refer to a device sequencing performed functions in an appropriate time relationship (to one another). This means that nearly every action or process that the person performs or observes constitutes a set of separate actions and functions (e.g. stimulating axons, contracting and relaxing muscles), which must be appropriately arranged in time and space for a reaction to take place.

The clock in the left hemisphere is principally diachronic: events and functions are sequenced in a linear manner, i.e. "chronologically," one by one

from beginning to end. Since language constitutes processes mostly, though not exclusively diachronic, which take place in succession over time, the “diachronic clock” of the left hemisphere takes on key significance in building texts from the basic language units (sounds, words, sentences), and damage in this hemisphere potentially disrupting the functioning of the “diachronic clock” frequently causes aphasia in its classic forms (see also Pachalska 1999).

The clock in the right hemisphere is synchronic, which allows the composition of pictures of various polymodal elements integrated into a whole, with figure and background, text and context, which are presented “here and now.” When the “synchronic clock” of the right hemisphere becomes damaged or disrupted, the steering function is assumed by the “diachronic clock” of the left hemisphere, which causes the patient not to see (in a relatively broad and at the same time literal sense of the word) anything around them, but rather what is lying just in front of them. While a patient with deep aphasia frequently lives in his peculiar “eternal” present (time), for a patient with right hemisphere damage there exists only continual movement from the past to the future – the present does not exist (cf. also Pachalska and MacQueen 2005).

In light of the above, one can understand the causes of pragmatic disintegration and the problems related to this, experienced by patients after a right hemisphere stroke. A text, seen as a verbal structure, is a diachronic phenomenon, which is managed by the left hemisphere. In contrast, a text seen as a pragmatic entity must appear in a real context, which is the “here and now”; however, the damaged right hemisphere with its disrupted or destroyed “synchronic clock” does not see this “here and now.” And it is this, in our view, that constitutes the essence of the observed disturbances in patients with right brain damage.

The noticeable differences in symptomatology between patients with frontal lobe and parietal lobe damage, which we have presented above, mainly result from the asymmetry of functions in the sagittal axis (the frontal and posterior areas of the brain), which overlaps the asymmetry of functions in the frontal axis (right-left hemisphere). This is mainly an asymmetry of movement and activity (in the area of pre-frontal, pre-motor and motor) as well as perception and imagination (in primary sensation and association cortex). A patient with a focal lesion in the right frontal lobe frequently acts in an accelerated mode: they seem nervous, sometimes virtually maniacal, speak too fast, act rashly and carelessly. As soon as they begin speaking their accelerated “diachronic clock” leads them forward at full steam, without pausing to look around. Every thought that comes to them must be immediately realized as something urgent, without thinking or reflection as to whether the action is right. This phenomenon is known as lack of planning and control of action. On the other hand, a patient with damage in the posterior areas of the right hemisphere suffers from a constant shortage of information, as a result of which they do not move either forward or backwards, since they do not receive appropriate spatial-visual stimuli to act upon.

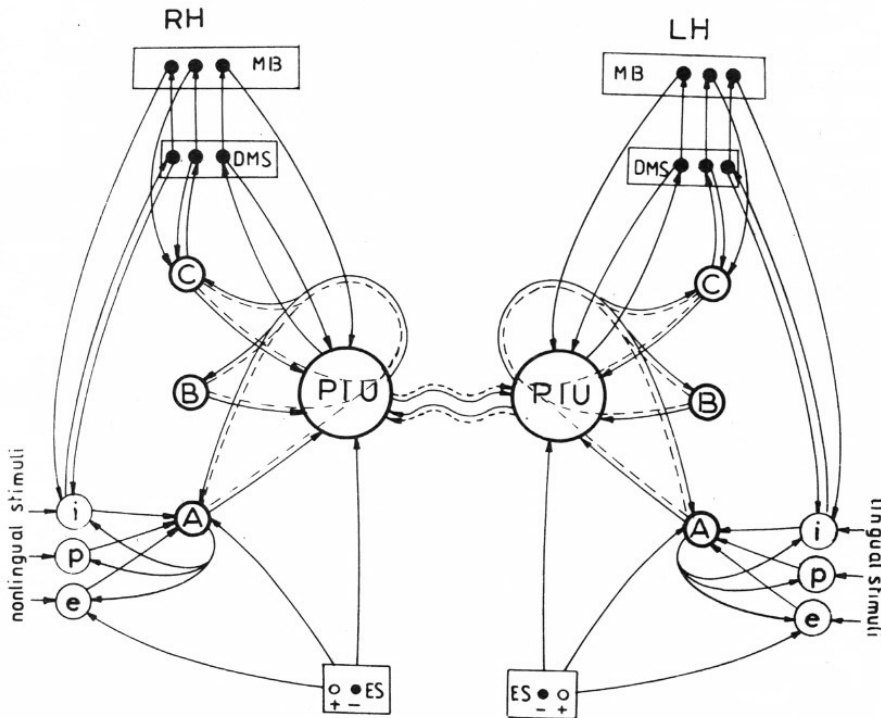


Fig. 3. Neurocybernetic model of brain lateralization [from: Pachalska 1992]

In order to familiarize the reader with these issues, we have developed a neurocybernetic model of brain lateralization (see Fig. 3).

Different stimuli enter the organism via exteroceptors, proprioceptors and interoceptors. Receptor cells are able to react to a given cell-specific stimuli. Depending on the degree of excitation of the cell and intensity of the stimulus, impulses are conveyed to the primary sensory cortex specific to a given analyser: in the occipital lobe (visual impulses), temporal lobe (auditory), and parietal lobe (kinesthetic), where the process of recognition begins, completed later in the monomodal gnostic unit described by Konorski (1969), also called a first degree integrative unit (cf. Pachalska 1992, 1999).

Axons conduct impulses, if the threshold of excitation is exceeded. Stimuli from the monomodal integrative unit are conveyed to a higher level, to the polymodal integrative unit composed of the set of neurons of a given hemisphere, called sets of multiple representation in the process of perception, where the various sensory pictures are merged into complex mental representations, which eventually become the subject's conscious perception.

The activation of engrams of memory images, learned at the perception stage (image memory) and coded in the molecular structures of one or both

of the memory systems (short-term and long-term) is related to satisfying needs and expressing emotions. In the process of creating a memory trace (engram), which is distributed reversibly at the junction of afferent and efferent synapses, from the reproductive junctions, an important role is played by chemical mediators, whose activity is linked to the strength and kind of emotional tension (negative or positive load).

Recalling an engram from memory consists in a cyclic stimulation of neurons of the polymodal integrative unit of one or both brain hemispheres by the short term memory system. The conditions are appropriate then for impulses to circulate around the circuits. These are the physical grounds for imagining situations, which condition the occurrence of a motivated utterance (cf. Pachalska, 1992), which belongs to pragmatics.

On the basis of the information regarding the external and internal situation that reaches the brain, a person takes various decisions and performs concrete actions, but in the first place, plans, analyses and controls the action. A detailed description of the process of changing one type of modality stimuli for other within a poly-modal organizational unit, thanks to the phenomenon of synesthesia, can be found by the reader in a previous work by the first author (Pachalska, 1999:16-18). The appropriately processed information moves to the executive block, and from here on, after a decision is made, it goes to the programming centers in the motor area. It is here that an action program is prepared, which is relayed to the executive organs (muscles) by means of efferent nerve tracts. The planned action takes place, including a motivated utterance.

The significance of lateralization in the above mentioned process consists in the fact that sensory impulses (afferent) processed diachronically by the left hemisphere, and synchronically by the right, simultaneously reach the executive block from analogous sensory areas, while motor impulses (efferent) are sent for simultaneous diachronic and synchronic programming. Interestingly, the simultaneous processing of neuronal information by the two hemispheres with different "brain clocks" does not lead to conflict in a normal situation. Just the opposite: cooperation of the synchronic right hemisphere with the diachronic left hemisphere enables us to experience constantly the inner life called "thinking," as well as purposeful activity in the outside world. As rightly noticed by American neurologist and neuropsychologist Damasio (1999), our subjective mental life is composed of a series of mental states, which over time come in succession, like video film frames, creating the impression of smooth movement. Continuing with this metaphor, one can say that it is the right hemisphere that composes these frames (having a number of paths and channels), whereas the left one arranges them in the right sequence.

The application of this concept of language and speech does not require an excessive effort of imagination. According to Luria (1967), language is essentially a diachronic phenomenon, and certain linguistic disturbances in

his view result from the acquired inability to transform synchronic thinking into diachronic language structures. In light of our considerations, his standpoint could be modified on the grounds of the fact that language has diachronic as well as synchronic features. Words and sentences are developed over time, but still, after full development they constitute a complex whole, in which beginning and end coexist. This whole also contains the entire context, sub-texts, intertext, in a word: the situation. It is only in this sense that one can understand Luria's statement that a speech act, even though it develops in time, constitutes a realization of the speaker's intentions, which is a complex phenomenon and principally a synchronic one.

Summing up, it should be remembered that depriving a speech act of its diachronic aspect causes aphasia, which in the majority of cases is related to left brain damage, while the loss of synchronic features, due to right brain damage, gives rise to grave disturbances in pragmatics. On the other hand, pragmatics itself should be understood in a slightly broader way than thus far, because limiting the domain of pragmatics to expressing and understanding emotions in the voice, on the face or using gestures, leads to a narrowing of our field of vision and formation of a fragmentary picture of frequently unpleasant communication problems experienced by patients after a right brain stroke. This fact allows us to state that so far insufficient attention has been paid to frequent complaints from patients and their families about the recurring mutual communication problems between them.

In order to provide these patients with help, it is not sufficient to issue them with a simple statement that due to right brain damage they experience disturbances in pragmatics. In the diagnosis and rehabilitation of these patients we have to take into consideration the important differences between patients with posterior and frontal lesions in the brain. Patients with frontal lobe damage in the right hemisphere frequently change the subject without a reason and settle matters which are relevant for them, disregarding completely the socially accepted conventions. Conversely, patients with damage in the posterior part of the right hemisphere, although they motivate the change of subject more often, show a tendency to complete their conversation and leave without settling relevant matters.

In the course of diagnosing and rehabilitating these patients, the occurrence of the above behaviors and similar ones frequently leads to conflicts with therapists. For example, the sudden departure of the patient from the room, without giving any reason, may be interpreted as "skipping class," or fatigue and lack of willingness to collaborate, which in turn may result in the stopping of efforts at rehabilitation. If our considerations may to a degree prevent such situations from happening, as well as their unpleasant consequences, the inclusion of pragmatics in neuropsychological issues should easily be recognized as useful.

CONCLUSIONS

As a result of our research it has been found that the complaints of patients with right brain damage, as well as those of their families, regarding relatively frequent occurrences of mutual communication problems, are linked to pragmatic disturbances. These disturbances apply to patients with the primary lesion in the frontal lobes, as well as in the parietal lobes of the right hemisphere, although the picture of these disturbances takes on a slightly different profile in both of these types of damage.

These disturbances exert a significant negative influence on the functioning in society of patients with right hemisphere damage, which means that they require appropriate rehabilitation.

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