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Representation of the world in patients with aphasia

SUMMARY

Human intellectual capabilities are the result of Nature's creative activity: this view is present in the opinions of many scholars and thinkers. The phylogenetically and ontogenetically earlier processes, automatic and unconscious, are covered by intentional, conscious, planned and controlled functions shaped late in the development of the human species and formed in the late stage of every individual's development. According to the Herder-Humboldt thesis, utterances contain a certain form of thinking, hence it should be expected that the aphasic disintegration of speech produces changes at the level of cognitive structures in aphasic persons. Cerebral pathomechanisms that have a direct or indirect impact on the processes of human cognitive processes have been mostly identified and described. Cognitive disorders in persons with neurological conditions manifest themselves differently, depending on: the etiology of brain damage, the range and location of pathological changes in nervous tissue, the course of a neurological disease, stages of its treatment, and rehabilitation results.

Key words: aphasia, language, cognition, concrete attitude, abstract attitude

INTRODUCTION

The assumptions of humanist evolutionism that explain the development of the species of *homo loquens* raise a question about the nature of the human mind and language. Cognitivism, cognitive psychology, artificial intelligence theory, logic, philosophy, mathematics, and recently even quantum physics and a whole set of newly emerged sciences of the brain – *neuroscience* – contribute to building models of the mind, and in the context of these theories, language usually also appears. The fundamental problem of cognitive theory still remains the relationship between language, thinking and reality. The problem of the cognitive role of language becomes one of primary importance in the description of speech disorders. The question how a person who cannot learn an ethnic language or cannot, in

aphasia, use it freely, interprets himself and the world is a crucial problem for logopedics (Grabias 2001, 2007). It also appears that the results of studies on speech pathology can shed new light on the problem of language/cognition relationship.

RESEARCH PROBLEMS

The methodological foundation for our discussion on the relationship between disordered language structures in aphasia and the functioning of cognitive structures in aphasic patients will be the Herder-Humboldt hypothesis, which means, in Adam Schaff's interpretation, that man thinks by means of language. Since language, by imposing the form of thinking, creates the picture of reality, which (picture) is consistent with the view of the world fixed in a language, and the use of language is a projection of social experiences residing in language stereotypes (Schaff 1967: 13–17; Grabias 1997a, 2007), the following research questions should be asked:

1. In the case of acquired speech disorders, does the knowledge of the world, previously learned through language, also disintegrate?
2. Do disorders in the actualization of linguistic symbols by aphasic persons mean that the concepts assigned to these words also disintegrate?
3. Do language disorders destroy the ordered and categorized picture of reality in patients with aphasia, and does the aphasic language, structured according to special rules, lead to a different picture of the world?

The solution to the foregoing problems can be arrived at closer by analyzing the utterances of patients with disorders of the dominant hemisphere and aphasia (Panasiuk 2012).

Research material

Studies covered 100 persons with brain injuries within the central part of the left hemisphere, and with aphasia diagnosed in logopedic examination. The procedure for selecting the group of subjects comprised clinical assessment, social characteristics and the results of neuropsychological and neurologopedic assessment. Logopedic examination took the type and severity of disorders into consideration. Kinds of aphasia were diagnosed based on Alexander Luria's typology. When the brain injury was extensive or when the contact with the patient was so short that it was impossible to analyze the structure of disordered speech functions and to determine the basic defect, only clinical typology was accepted.

Table 1. Characteristics of the subject group by kind and severity of aphasic disorders

Type of speech disorders	Severity of speech disorders					
	discrete	slight	moderate	severe	profound	TOTAL
PART I						
Aphasic subjects diagnosed according to the clinical classification of aphasia						
Motor aphasia	–	3 (1.5%)	5 (2.5%)	3 (1.5%)	3 (1.5%)	14 (7.0%)
Sensory aphasia	–	–	1 (0.5%)	1 (1.5%)	4 (2.0%)	6 (4.0%)
Motor-sensory aphasia	4 (2.0%)	4 (2.0%)	7 (3.5%)	4 (2.0%)	14 (7.0%)	33 (16.5%)
TOTAL	4 (2.0%)	7 (3.5%)	13 (6.5%)	8 (4.0%)	21 (10.5%)	53 (26.5%)
CZEŚĆ II						
Aphasic subjects diagnosed according to A. Luria's classification of aphasia						
Kinesthetic motor aphasia	–	2 (1.0%)	3 (1.5%)	1 (0.5%)	3 (1.5%)	9 (4.5%)
Kinetic motor aphasia	–	3 (1.5%)	2 (1.0%)	9 (4.5%)	2 (1.0%)	16 (8.0%)
Dynamic motor aphasia	–	1 (0.5%)	1 (0.5%)	2 (1.0%)	–	4 (2.0%)
Acoustic-gnostic aphasia	–	1 (0.5%)	2 (1.0%)	1 (0.5%)	2 (1.0%)	6 (3.0%)
Acoustic-mnestic aphasia	1 (0.5%)	3 (1.5%)	4 (2.0%)	–	–	8 (4.0%)
Semantic aphasia	–	2 (1.0%)	2 (1.0%)	–	–	4 (2.0%)
TOTAL	1 (0.5%)	12 (6.0%)	14 (7.0%)	13 (6.5%)	7 (3.5%)	47 (23.5%)
TOTAL I and II	5 (2.5%)	19 (9.5%)	27 (13.5%)	21 (10.5%)	28 (14%)	100 (50%)

Source: own study

The linguistic analyses were based on utterances spoken by the patients during logopedic examinations and in different communication situations related to the undergoing treatment, rehabilitation, speech therapy, and social/family events. Interaction participants were usually close friends and family, acquaintances, and sometimes rehabilitators, therapists, doctors and other medical personnel. The empirical material was analyzed taking the social profile, and the clinical and psychological assessment of individual patients. The aim of the analysis was to determine linguistic behaviours characteristic of the subjects.

Theoretical foundations of investigations

In light of the single factor (anti-localization) theory of the organization of higher mental functions, the brain functions as a whole and its structures are equipotential. Representatives of this conception (John Hughlings Jackson, Pierre Marie, Henry Head, Kurt Goldstein) assumed that each higher cognitive function (including speech) has different levels of its cerebral organization. This hierarchy of linguistic behaviors was differently described by various authors; the behaviours were presented within the continuum:

1. intellectual (free) – automated (involuntary);
2. symbolic – non-symbolic;
3. abstract – concrete.

The abstractness *versus* concreteness of linguistic behaviours can be referred to the category of cognitive style understood as “the preferred way of cognitive functioning, corresponding with a person’s individual needs” (Matczak 2000: 761). In the cited interpretation the manner of realizing individual needs by a person is the result of his choice of a specific form of orientating himself in reality, “which a person is willing to select out of those available to him”, i.e. his cognitive style is “one that he spontaneously uses most often.” The cognitive style as interpreted by Czesław Nosal “concerns the relatively constant way of organizing cognitive functions, through which he [a person] spontaneously balances his individuality determined by the type of temperament and profile of personal experience, with the objective demands of the environment – a situation or a task” (Nosal 1990: 147).

Then, according to the foregoing author, when a task situation does not provide explicit instructions on how to execute the task, a person chooses the way consistent with his inclinations and preferences, whereas when the demands are specified, a person can function in a different way. It should be assumed that in aphasia such adjustment of cognitive functioning to the requirements of a particular situation is limited. The potential of behaviours of an aphasic person is determined by his neurological deficit, hence a certain style of cognitive functioning is the only one possible.

Several dimensions are distinguished in the characteristics of cognitive functioning:

1. field-dependence – field-independence;
2. reflectivity – impulsivity;
3. abstractness – concreteness (Nosal 1990).

The dimension of dependence on *versus* independence from the data field serves to define the degree to which perception is determined by the general organization of the perception field. Field-dependence manifests as a tendency to perceive globally: parts are experienced as fused with a whole, which may cause difficulties in maintaining the picture of a field fragment in the context of the entire field and is defined as passive-global orientation. Field-independence is associated with a tendency to distinguish particular parts and to see them as relatively independent of a whole, which makes it easy to differentiate field fragments in the context of the whole and is termed active-analytical.

The second dimension, reflectivity *versus* impulsivity is identified by means of two indicators: the speed of finding solutions and their correctness. Reflectivity is expressed in a tendency to reflect, which causes fewer errors to be made, while impulsivity manifests in a tendency to answer immediately, thus increasing the number of errors.

The last dimension, abstractness *versus* concreteness, defines preferences concerning the level of generality of the categories applied. A tendency to use more general categories, for example to classify by logical criteria, is an exponent of abstractness, while concreteness consists in using less general categories – classification by referring to direct relations between objects.

In light of the theory of cognitive styles, information processing is hierarchical. Several levels of processing are distinguished:

1. the level of creating representations of external environment as short-term perceptual images: the main information processes at this level are: modeling, dividing and searching the field, which contains primary or unstructured data;
2. the level of formation of cognitive representations as conceptual categories;
3. the level of information structures constituting individual experience, i.e. knowledge and self-knowledge structured within cognitive models;
4. the level of information structures – programs determining goal-oriented activity, for examples processes of programming and controlling the course of behavior, and processes of decision-making to change goals or strategies for their implementation (Nosal 1990).

In light of the current state of knowledge it should be assumed that aphasic disorders manifest not only through language deficits but also in the change of the way of orientating oneself in the reality. In the interpretation by Kurt Goldstein (1948) – one of the representatives of the antilocalization theory of human cogni-

tive abilities – the human organism is a complex system with a specific configuration of factors¹. Human abilities are less impacted by external influences: they are more influenced by the adaptive effects of the organism itself. The actualizations of potential mechanism are enabled by environmental conditions. Among human abilities the principal position is occupied by the ability to abstract or, on the basis of the conceptual assessment of situation, to undertake diverse free actions, and to plan and program acts in new situations. Goldstein developed a set of behaviours connected with the adoption of the abstract attitude (Latin *abstraho*; abstract), which include:

1. to freely assume a mental set;
2. to initiate a particular act or perform it by an external order;
3. to freely shift from one sphere of action to another;
4. to hold in mind simultaneously various aspects of a situation;
5. to respond to several unrelated stimuli;
6. to grasp the essentials of a given whole, to break it up into parts and synthesize them into a whole again;
7. to detach the Ego from the outer world.

The opposite of abstract attitude is concrete attitude protecting the *status quo* for the human organism. Concrete action is determined by the exigencies of a particular situation, current sensations and sensual experiences of the cognitive subject: it usually pertains to daily, habitual actions. Each brain injury – in Goldstein's interpretation (1948) – upsets the proportions between abstract and concrete attitude² in such a way that in a person's behaviour the concrete (Lat. *concretus*–mixed, fused) attitude prevails which is characterized by the following properties:

- a) linking of verbal reactions with stimuli operating at the moment;
- b) close dependence of linguistic behaviours on the earlier produced verbal responses to a situation;
- c) excessive focusing of utterances on situation-related details;
- d) a tendency to describe objects because of their usefulness;
- e) inability to classify objects by some characteristic (form, material, colour).

¹ Goldstein's theory is confirmed by the observations of Ward Halstead and Arthur L. Benton (Wolska 2000). The general assumptions of Goldstein's theory are discussed by Anna Bolewska (1985).

² Experimental studies carried out by Kurt Goldstein demonstrated that disorders in the abstractness/concreteness relationship occur after frontal injuries, which manifests in language in disorders of free, volitional speech. Diana van Lancker (1972), when defining the dichotomy of automated and free speech, interprets the former as the ability to say conventional greetings, interjections, curses, stereotyped expressions and the like (which is also an attribute of emotional speech), and the latter as the ability to make new, original sentences.

Abstractness (categoriality) and concreteness (non-categoriality)³ are qualitatively separate levels of mental regulation. Goldstein's theory is the starting point for the following hypothesis: Disorders of the cognitive function of speech in aphasia cases manifest in an increase in the linguistic exponents of the concrete attitude towards reality in the utterances of aphasic persons. The abstract attitude based on more complex neurophysiological, neuropsychological and linguistic mechanisms develops in the later period of human development and is more prone to disintegration due to injuries and/or disturbances in the work of the brain. The ability to abstract makes a person distanced towards reality, thus broadening his perspective of viewing the world. The concreteness that replaces it binds a person to a specific state, it does not allow him to abstract from established associations and situational contexts. The least resistant to aphasic disintegration are automatized, involuntary behaviors, underlying which are behavioral mechanisms.

THE CONCRETENESS OF LINGUISTIC BEHAVIOURS IN APHASIA

The paradigm (described by Kurt Goldstein, 1948) of exponents of concrete attitude towards reality should be treated as symptoms of dysfunctions of the interactive and cognitive functions of language. The mechanism of the dysfunctions should be associated with two separate factors: a) biological determinants i.e. organic brain injuries and/or disturbances in the brain's functioning (Zeigarnik 1969), b) socio-situational determinants i.e. an individual's established personal experience (Warchala 2003: 88). In persons with aphasia there is interference of the two factors: on the one hand, neurological changes cause mobility disability, and cognitive and communication disorders, which in turn cause limitations in the sphere of social functioning, while on the other hand, the reduction of life activity to the biological and material sphere in the situation of illness and convalescence, and a deficit in cognitively and communicatively diversified situations causes limitations in the functioning of compensatory-adaptive processes at the neurobiological level, which again consolidates the tendency for standardization of linguistic behaviours, increases their dependence on situational context, and there is a reduction of variant behaviours in similar communicative and life situations⁴.

³ This dichotomy corresponds to two Aristotelian orders: logical and psychological. The logical order, specific to the human mind, allows one to recognize in things that which is general, and thereby essential. The psychological order defines the ways of arriving at this knowledge. These are perceptions, with which cognition begins (Tatarkiewicz 1998).

⁴ The organization of daily life of persons with motor disability, neuropsychological deficits and speech disorders is of standard type in Poland: their life activity is confined to the rhythm defined by hygienic/nursing and rehabilitation procedures. Patients continually subjected to routine activities can hardly accept any changes in the daily rhythm (e.g. they feel lost when the established

In the case of aphasia, actualization of linguistic signs requires the occurrence of a real situation⁵. Words refer to a concrete fragment of reality, less often – and only in residual forms of aphasia – to the image of this reality. In severe forms of aphasia the action of any stimulus (auditory, visual, sensory, etc.) may release a pathological realization of a word or quasi-word, which, in the sound form, can take the form of a system unit, sometimes even a sequence of words forming a quasi-sentence. The uses of these forms do not relate to a specific linguistic meaning or do not refer to elements of reality, they are uttered involuntarily, alienated from meaning. Each time they are merely a possible behaviour not controlled by the patient, a reaction to the occurrence of sensory and /or emotional stimulation. Disordering of the intentionality category in this type of vocal behaviours deprives them both of communicative and cognitive functions.

In milder forms of aphasic disorders the patient's verbal responses are closely related to the currently operating verbal stimuli, which the patient automatically imitates. Such automatic repetitions of words or passive reading of written down words is only the result of stimulating the sensory system. Echolalic repetitions of semantic patterns after the interlocutor (frequent in aphasic patients) should also be treated as manifestations of a similar pathology. The majority of linguistic behaviors of aphasic persons involve simple conditioning and imitation, a particularly distinctive example being pantomimic behaviours.

Interactions in which aphasic persons participate usually involve situations relating to their daily life. The subjects of conversations are also usually emotionally important to the aphasics and are connected with their family, general feeling, treatment and therapy, they are embedded in here and now, their information content seldom goes beyond the limits of the current time, or sensorily perceived space, and seldom goes beyond the experienced emotions. To recall words, it helps to refer them to a specific situation, experienced by the patient, in which these words are usually used⁶. The factor that decides the relative permanence of

order is modified on holidays or during family celebrations). These observations provide a significant premise for persons taking care of the patients: while creating stable conditions providing a sense of security to them, the carers should not give up stimulating the patients' adaptive skills under the changing socio-situational-pragmatic conditions.

⁵ This is so in every act of communication, in a way. Although messages inform about the most objective matter, from the sender's point of view an utterance always relates to something, whereby it is of concrete value to him (Furdal 1990). However, the case is different with patients with brain injuries. A concrete factor that may release vocal behaviour and sometimes verbal can be also a stimulus entirely meaningless to the patient who only reacts to it in an automatic and passive way.

⁶ Lev Vygotski described the behaviour of a patient with aphasia and right-sided paresis, in whom the ability to repeat the heard words, understand speech and writing was reported; however, he was unable to repeat the sentence "I can write with my right hand", each time replacing the word "right" with "left" because paresis actually prevented him from writing with his right hand. To repeat the sentence that contained an element inconsistent with reality was impossible for him (Vygotski 1982–1984). A similar case was described by Jakobson. To a patient suffering from selection

certain linguistic structures in aphasia is their standard and formulaic nature, and thereby a high degree of automation in programming them in typical communicative situations⁷.

These situationally determined behaviours comprise first of all signs and indications of emotions: exclamations and interjections (often *nomina sacra*). Linguistic behaviours with a high emotional charge are accessible to the overwhelming group of aphasic patients, even those with profound aphasia. By means of them the patients express their – most negative – emotions. Hence a large group consists of curses, sometimes very rude, sometimes said in a foreign language. These manifestations of expressiveness, also typical of colloquial language, are a group of the most situational-context dependent expressions out of verbal behaviours. They are more often used by patients with the left-hemisphere damage because they belong to “emotional language” and “limbic language” opposed to “intellectual language” and “rational language”⁸. Aphasia is characterized by disorders of the “rational language” level or the ability to use language most freely while “limbic language”, i.e. emotional language, is still accessible to the patient (Maruszewski 1966), enabling him to produce automated, involuntary utterances.

Another type of automated behaviours is polite expressions (greetings, good-byes). Even if some group of patients cannot produce them verbally, almost all of them signal those with a gesture⁹. Individual experiences of persons should therefore be regarded as the element of meaning which is the least susceptible to disintegration, most established in the conceptual structure, and which determines the way the persons with brain injuries recognize and explain events associated with a specific situation. A situation builds individualized profiles of meanings. Human experiences are different, people may perceive situations differently, and thereby assign personal meanings to events embedded in a situation.

aphasia the context is a necessary factor determining the form of utterance. Hence the patient cannot say the sentence “It is raining” if this judgment does correspond to reality. The more an utterance is based on context or consituation, the greater the likelihood of appropriate linguistic behaviours (Jakobson, 1964).

⁷ Automation of speaking or generating of text on the periphery of attention takes place with the participation of the extrapyramidal system, which is older than the pyramidal system associated with free and creative speaking (Łączkowska 1993: 161).

⁸ Manifestations of “limbic speech” observed in aphasic patients confirm Jackson’s late nineteenth-century views that every function, including speech, has different organization levels, the highest level being disordered in pathological cases. Speech – according to the scholar – can be examined at (a) the logical (intellectual) level and (b) the emotional level. At the intellectual level a person expresses what he thinks, and at the emotional – what he feels.

⁹ Joanna Przesmycka-Kamińska (1980) emphasizes that socially ritualized behaviors are retained in aphasic patients. For example, patient E. B. described by the author uttered distorted *dzie dobry* [goo’ morning], while another patient – W. W. – had a strongly established habit of greeting persons in the environment. Unable, however, to program verbal behaviors, he produced a repeated single word and bowed.

Concretizing of thinking can also manifest in giving a proper name to define a representative of a class (e.g. dogs) or it can be specified by defining the *differentia specifica* for the *genus proximum*. To an aphasic patient a word ceases to be a symbol of things but it becomes a specific thing, hence in the next example names are not given, but a specific experience associated with the use of referents of these names is evoked.

A distinctive tendency observable in aphasic utterances is that patients focus on details in describing reality (detailedization), which, consequently, disturbs the overall character of interpretation of its phenomena. The overwhelming majority of information is detailed enumerations of sense-perceived objects and their features. The names used in utterances have specific, concrete meanings; there are absolutely no categorial names in them, which can to some extent be treated as an exponent of a spoken variant (Wilkoń 1987) or colloquial style (Bartmiński 1993), but in the case of the studied texts the intensity of the phenomenon goes far beyond the standards of daily communication. These symptoms should be linked with difficulties in abstracting from personal, concrete experiences in interpreting the phenomena of reality.

Experiencing of reality impacts such a use of language in which its pragmatic dimension is evident. The foundation on which language abilities in ontogeny develop is action and it is the connection of language with action, as being most established, that is a strategy compensating for difficulties in actualizing words. The actualization of word is often possible only when it is behaviourally provoked by the sensory experience of its referent whereas it is far more difficult when the words are to refer to the notional sphere. The mechanism of coding utterances is based on personal experience, it refers to the memory of a situation, which is noticeable in many neologisms created because of spatio-temporal contact (metonymy) and in periphrases, in whose semantic structure the defining of the function of an object is one of the best associated features. Function as a feature of an object, most often referred to when defining names in the cases of naming disorders, shows how strong are the associations of a name and its meaning with the sphere of personal and concrete actions. It turns out that the meaning of a word is coded the strongest on the pragmatic aspect of a linguistic sign.

In the utterances of moderate and severe aphasic persons, generalization process disorders are observable. Patients use categorial names less often while the use of subordinate words (hyponyms) is better retained in them. The categorization of objects¹⁰ by abstracted features can also cause difficulties. Aphasic distur-

¹⁰ The issues of categorization mechanisms are associated with Marvin Minsky's (2007) conceptual frame theory, which is facing the problem of how complex kinds of knowledge are represented in the mind. The author points out the role of concepts here and different kinds of schemas (frameworks, constructs, scripts). But he emphasizes that the mind in contact with the chains of causal variability of the environment creates more and more complex cognitive schemas represent-

bances in using lexical-semantic categories are also confirmed by the results of examining verbal fluency. Categorization processes in patients with brain injuries are limited to the perception level, or the interpretation of sensory data using contextual clues, attitude, and previously required experiences (Nęcka, Orzechowski and Szymura 2006).

In aphasiological literature there are often statements about disorders found in aphasic patients, in the explication of figurative language. It is pointed out that the meanings superimposed upon the basic meaning of words used in collocations or proverbs are reduced to real meanings, the metaphorical content of this type of expression being often unintelligible. This kind of interpretation of the material appears to stem partly from methodological errors. Uneducated or young persons, in whose individual language there are no representations of certain collocations or proverbs, while doing tests consisting in interpreting collocations or sayings, apply their only accessible interpretation of these constructions, i.e. real-semantic¹¹. Educated persons, who had high linguistic skills prior to falling ill, did not commonly make this kind of errors, and if they happened to erroneously explain a construction based on metaphoric meaning, the presentation of the correct meaning was an effective example allowing them to correctly solve other tests of this kind. Interpretation of proverbs did not cause serious difficulties, and after some hesitation the majority of subjects were able to assign correct meanings to the proverbs¹². This does not mean that brain injuries do not cause difficulties in understanding metaphors, yet proverbs and collocations typical of the colloquial variant of language function in popular circulation at the concrete level of usage - consequently, they do not require metalinguistic analyses not accessible to aphasic patients. The metaphoric character of these constructions is today associated exclusively with the mechanism of their origination. Popularized in colloquial language, they become linguistic clichés denoting standard meanings (Bartmiński, Panasiuk 2001), the interpretation of which does not require reference to their underlying metaphoric linguistic processes (Lakoff and Johnson 1988). The occurrence of such formulas in the utterances of aphasic patients was always provoked by a specific communicative situation, and it was usually difficult to explain their meaning. In these cases it is difficult to determine conclusively the cause of the committed errors in identifying the meanings of proverbs: ignorance of them or

ing the changing context. Furthermore, variability of the environment makes it necessary to modify schemas.

¹¹ Of especially local and individual character is the knowledge of collocations. For example, the phrase "sharp tongue" was commonly applied by inhabitants of Silesia to a person who speaks a lot but in Lublin this meaning referred to a malicious person.

¹² Twentieth-century research tradition (Jacques Lacan, Claude Lévi-Strauss, Yuri Lotman, Vyacheslav V. Ivanov, Roman Jakobson) interprets metaphor and metonymy not so much as rhetorical figures or stylistic factors but it links the operations of metonymization and metaphorization to thinking, imagination and artistic creativity (Kordys 1991).

concretization of the language. A decisive factor in determining the ability of aphasic patients to interpret superimposed meanings can be the understanding of a linguistic joke, allusive expressions, poetic compositions. The material collected using such texts often showed metalinguistic limitations that manifested in difficulties with recognizing metaphoric meanings. It should be also added that most aphasic patients correctly selected illustration material for the metaphoric expressions presented to them. This ability is conditioned by the competence of the right hemisphere, which recognizes the meaning of pictures and activates associative and connotative connections between the names of the objects seen.

Aphasic patients as senders sporadically actualized linguistic structures that would indicate the metaphorical way of structuring and interpreting reality¹³, for example some of them who often provoked situational comedy were at the same time not responsive to linguistic humor and could not use it despite having retained comparatively good conversation skills. Common among the subjects were problems with verbally explaining the metaphor mechanism. According to Jakobson (1989) such difficulties should be explained by the loss of metalanguage. The injured language hemisphere has no access to the model of its own cognitive mechanism. Research confirms that in aphasic persons a difficulty arises in realizing messages with a metalinguistic function. It appears that the disorder of metalanguage should be treated as a distinctive feature of aphasia.

APHASIC DISORDERS AND SPEECH ONTOGENY IN THE MIRROR IMAGE THEORY

Natural language is a multi-level structure. This hierarchical order exists not only in the sense given to the organization of the language system by Ferdinand de Saussure (1991), who distinguished its subsystems, and, in each of the subsystems – units (from simple to complex ones: phonemes, morphemes, sentences). The levels of language can be also examined in terms of dynamicity and functionality. The dynamicity of linguistic structures should be associated with the order of their acquisition in ontogeny, and also, as Roman Jakobson (1968) maintained, with the order of disintegration in aphasia. Functionality results from the role performed by language in various spheres of human activity: conversation, naming and describing elements of reality, structuring the knowledge about it, and finally, in explaining the signs and rules of language.

¹³ It should be emphasized that the analysis of lexical-semantic phenomena in aphasia cases shows that the frequency of the metaphorical way of naming the objects of reality is fairly low; nor are there marked significant differences in this respect between persons with motor aphasia and sensory aphasia. This observation is at variance with Jakobson's theory (1989), in which the demarcation line in distinguishing the two types of aphasic disorders is dominance of one of the mechanisms of semantic changes: metonymy or metaphor.

It should be assumed that both human linguistic and mental abilities are gradable. This is fully evidenced by studies on the development of speech and thinking in ontogeny. Since Jakobson (1989) the rules of disintegration of linguistic structures in aphasia have been interpreted in relation to the order of their development in the child's speech¹⁴. Are the regularities of language disintegration indeed a reversal of the stages of its acquisition, and aphasia can be understood as a mirror image of language ontogeny¹⁵? The problem needs clarification.

According to Bluma W. Zeigarnik (1969), human thinking, consolidated in the process of upbringing and teaching, and developing based on diverse experiences in the course of life, does not deteriorate after brain injuries in the reverse order to the stages of its development in ontogeny. The disintegration of linguistic abilities in aphasia does not, as Jakobson (1989) claimed, proceed, according to the mirror image law in relation to the rules of the evolutionary development of language in phylo- and ontogeny, but it is rather related to the statistics of linguistic experiences and mechanisms underlying programming of utterances. A number of regularities can be observed in speech ontogeny¹⁶.

¹⁴ We should recall here Roman Jakobson's methodological postulate (1968), confirmed in the study by Józef T. Kania (1969/70), that linguistic phenomena in aphasia be examined in the broad context of phenomena characteristic of the normal development of the child's speech. However, the comparison of observations on the development of the child's speech with phenomena observable in aphasia provokes a number of controversies. There are named important anatomical, physiological and mental differences under which the processes of growth on the one hand, and, on the other, of disintegration of language skills take place (Kania 1969/70).

¹⁵ R. Jakobson's "mirror image theory" (1968), according to which language structures acquired the earliest in ontogeny are the most resistant to disintegration in aphasia, applies to formal structures understood as units from particular levels of the language system as presented by F. de Saussure (1991). The analogy referred to here between the order of acquisition and disintegration concerns another kind of structures, i.e. the cognitive structures, which develop together with language and disintegrate with it in the case of aphasia.

¹⁶ According to Piaget (1992) language is not an exclusive tool and way of representing the world, nor it is an indispensable condition for development of thinking, yet owing to its communicative function it is a constructional factor for thinking. Speech ontogeny is thus an outcome of many spheres of the child's cognitive activity and, according to Piaget, occurs in stages. The stages of development of intelligence in the child's ontogeny occur, in J. Piaget's opinion, in the following temporal order: a) the stage of sensorimotor intelligence (up to 2 years of age) – the child orientates himself in the reality, learns the characteristic features of objects, their differences and relationships between them; in this period the development of specific concepts begins; b) the stage of preoperational intelligence (from 3 to 6 years of age) – the child familiarizes himself with symbolic actions based on the words, he begins to communicate with the environment by means of language, and realizes some features of objects (e.g. size), and acquires the ability to evaluate and assess; c) the stage of concrete operations (6/7–10/11 years of age) – the child can define the concept of quantity and classes; d) the stage of formal, hypothetical-deductive operations (from the age of 11) – the child can think logically, abstractly and verbally. Each next stage results from the assimilation or actions complementing a deficit in the previous stage, and from the actualization of opportunities created by these changes, hence the conception came to be called constructivist. The transition between the

Before the child acquires the inventory of linguistic signs and rules that enables him to make grammatically correct and meaningful sentences, he already fulfils his communicative intentions by using non-verbal signs (vocalization, gesture, facial expression). It is pragmatic goals that underlie linguistic communication and are stimuli to the development of the child's speech.

Another step in language acquisition is the development of observations. When the child has acquired the sensory way of structuring the world and distinguishing its phenomena, words function as labels of specific objects and are used in the referential function to name sense-perceived and delimited elements of non-linguistic reality. It follows from psychologists' findings that the stage of conceptual thinking (based on creating classes) is preceded by concrete thinking in speech development, the word is associated with a set of objects linked by some perceptual features rather than with an abstract concept that would capture their most essential features in common¹⁷.

The next stage in language development is connected with the development of concepts¹⁸, when the character of linguistic behaviour is no longer inseparably linked to sense perception, but the signs of language perform a symbolic function and define classes of objects and relationships between objects. Linguistic behaviours begin to go beyond the limits of time and place of speech, and the child uses language to indicate the content that is not his current sensory experience: the categories contained in the language are the foundation of mental representation of the world. It was found that in the child's development there are two higher, structural phases of creating concepts. In the first phase (2–4 years of age), the child can assign to the acquired concepts only objects that are referents of a name. He has the equivalent of what is termed a "concrete concept." About the age of six, the second phase appears, in which the child can already classify objects by general criteria, and determine the hierarchy of concepts.

At the next stage of speech development, reflection on the word as an element of the language system develops. This knowledge, formalized in the process of school education and called metalinguistic competence, manifests, for example,

earlier and later stage occurs gradually and in a discrete way: behaviors characteristic of the earlier stage are successively replaced by behaviors specific to the later stage and gradually disappear. The rule is that the earlier development stage is the foundation of the subsequent stage.

¹⁷ In the study devoted to the process of creating concepts in ontogeny, based on experimental studies, the author distinguishes three basic stages of the process, which he treats as the reflection of the actual development of thinking. These are the stage of syncretes, stage of complexes, and the conceptual stage (Vygotski 1989: 96–163).

¹⁸ Biological-physiological-psychological foundations of speech were omitted by traditional linguistics. It was neurology that described what happens between stimulation and perception of language; psychology explained what the mechanisms of generalization and systematization of concepts are. Logopedics, treating speech as a biological, mental and social phenomenon at the same time (Grabias 1997a), combines experiences of different disciplines into one theoretical system.

in the feeling of the formal and contentual quality of linguistic signs. The child's maturity in each of the foregoing spheres is reflected in the structures of language (Kwarciak 1995; Kupis-Krasowicz 1999).

It is this kind of dynamically acquired hierarchy of linguistic expressions that can be the criterion for structuring the levels of the functioning of language in particular cases of aphasia and can be the indicator of its severity. The multilevel nature of the function of linguistic signs manifests most clearly in the study of the lexicon, assuming that reference is not a characteristic of lexemes understood as elements of the language system but of textual words. It is in the use of a word that the whole potential contained in particular units of the system is concretized because all units of the lexicon that make up an utterance take part in its reference to specific fragments of reality. Each lexicon unit, on account of the context in which it appears, can have a different reference. The referential features revealed in utterances allow the division of the lexicon into four levels: (1) communicative, (2) concrete-situational, (3) conceptual, and (4) metalinguistic, as has been presented in Table 2.

Table 2. The levels of functioning of the lexicon of natural language¹⁹

Levels	Objective	Relational
1. Communicative	1. <i>tree</i> (as message; that which I want to tell about; which I am told about)	1. <i>this, that</i>
2. Concrete-situational	2. <i>tree</i> (a specific one; the one I can see)	2. <i>on, under, far away</i>
3. Conceptual	3. <i>tree</i> (as such; the one I have in mind)	3. <i>since, because, although</i>
4. Metalinguistic	4. <i>tree</i> (as a sign; the one I am defining)	4. <i>allegedly, admittedly, therefore</i>

Source: own study.

The four levels of the lexicon, distinguished based on the functional criterion, develop in turn in the ontogeny of language, and they disintegrate in the reverse

¹⁹ The presented model of the levels of language functioning is an extension of Elzbieta Wierzbicka's concept for the purposes of this description (2000). Originally, the model comprised three levels of the lexis of natural languages: sensory, mental, and metatextual in the objective and relational aspects.

order in aphasia. The ontogenetically earliest forms of word activation become most resistant to aphasic disorders²⁰.

- a) the communicative level – associated with the realization of the communicative function of language
- b) the concrete-situational level – associated with judging about sensorily experienced metalinguistic reality,
- c) the conceptual level – associated with structuring of the knowledge about reality in cognitive models presented in cognitive categories,
- d) the metalinguistic level – associated with judging about a linguistic sign itself.

Two aspects can be distinguished at each level:

1. objective, when reference relates to a phenomenon itself of reality, distinguished at the same level;
2. relational, when reference covers the relationship of a phenomenon in relation to other phenomena of this level.

The most susceptible to disintegration is the metalinguistic level, the latest acquired in ontogeny. Aphasic patients exhibit the greatest difficulties in defining names, finding word synonyms, or – in the case of persons who used a foreign language before they fell ill – in giving equivalent expressions in this language (equonyms), or in creating constructions based on similarity of (metaphoric) meanings. This kind of difficulty in actualization of linguistic signs evidences the inability to freely use elements within one linguistic code or to convert from one code to another. Disturbances in the use of words in the metalinguistic function occurred in all cases of aphasia, problems of metalinguistic nature were reported in all the patients studied, while in the patients with discrete of language disorders the ability to carry out metalinguistic operations was the only symptom of aphasic difficulties.

In persons with a high degree of aphasic disorders a word was not associated with a class of phenomena but, closely linked to the current context, it fulfilled a labeling function. The ability to actualize a word was found only in the situation when the object being named was in the field of the speaker's sense perception²¹.

²⁰ Experimental studies conducted on animals by Pavlov and his associates also confirm the thesis that in pathological conditions the first to be disordered is that which developed the latest. For example, artificially developed conditioned reflexes tend to be disturbed following brain illnesses far faster than unconditioned reflexes. The function of the second signal system is disturbed to a greater extent than the function of the first system.

²¹ In Józef Koziński's interpretation (2000) the categories of: abstractness-concreteness are discussed as follows: a person whose cognitive structures are characterized by a high degree of concreteness interprets the world as sequence of perceived objects, he cannot create concepts with a higher degree of generality, his cognitive structures operate in the linear system (e.g. an oligophrenic was against including the concepts "radio" and "newspaper" in the category of the "mass media" because "they say on the radio, and it is written in the newspapers"). On the contrary, a person whose

The least susceptible to disintegration in aphasia cases was the actualization of a word in its communicative function. The interactive needs of patients with the most severe aphasic disorders caused them, when faced with difficulty in verbalizing intentions, to use all kinds of signs (verbal, distorted verbal, and non-verbal) to express their needs.

The ability to use a word to denote objects of linguistic, mental and physical reality, and their mutual relationship is associated with perceptual and realization skills²². The basis for correctly naming objects, rightly formulating thoughts or properly interpreting the meaning of the heard words are neurophysiological and neuropsychological mechanisms. Brain injuries disturb the proper functioning of these mechanisms, causing aphasic disorders in which the dominant ones are disorders in understanding names or in saying them.

NEUROBIOLOGICAL MECHANISMS OF LINGUISTIC BEHAVIOURS IN APHASIA

Speech is the result of biological, mental and social factors (Grabias 1997b). The information on external reality, provided by receptors, is processed by the brain – the regulator of human behaviour. Reception is the basis for the rise of sensations and is controlled with the participation of the mind. There are many features of a referent that are filtered by the structure of a receptor itself while others are identified (perceived) in a specific way with the participation of the controlling function of the brain responsible for distinguishing and identifying an object. The brain is predestined first to distinguish semantic units (e.g. words) and then their elements devoid of meaning. The processing of information takes place both according to the rules arising from the brain structure (fields of the first order – where sensations arise, second- and third-order fields – where perceptions arise), and according to the rules created and learned through own experience or experience of other people, encoded in linguistic structures²³ (Obuchowski 1982: 12).

structures are highly abstract can create a hierarchical system with an increasing degree of generality by abstracting from concrete reality, can manipulate with general concepts, has a better orientation in the world, and can solve theoretical problems.

²² Difficulties in the semantic interpretation of the heard words are usually accompanied by mnemonic disorders or by disorders of neodynamics of memory traces. The occurrence of memory disorders combined with lexical difficulties confirms that the condition for correct functioning of the semantic system is the proper understanding of words and the possibility of actualizing it. Disorders of memory of words appear *inter alia* in dissociation between the sounding and meaning. This mechanism indicates that naming disorders are secondary to perceptual disorders.

²³ The brain is predestined first to distinguish semantic units (e.g. words) and then their elements (segments) devoid of meaning.

In light of Ivan Pavlov's neurophysiological conception of organization of behaviours (1951), subsequently developed by Kazimierz Obuchowski (1982), there are three levels of orientation in external reality: a) concrete, b) hierarchical and c) creative. The concrete system is common to humans and animals. Its operation is based on the cortical process of differentiation of similar stimuli. Within it there is the monoconcrete system, which allows differentiation of stimuli with one modality and the polyconcrete system – responsible for processing stimuli with different modalities. The existence of the second system, developed only in humans, is derived from the ability to abstract and generalize the countless signals of the first system and the ability to analyze and synthesize generalized signals. This ability ensures a person's unlimited orientation in the environment²⁴. The highest level of organization of experiences is associated with the creative code. Operations carried out at this level involve creative activity, which, according to Obuchowski (1982), manifests in illumination and in initiation.

The role of these systems (concrete, hierarchical, and creative) in the organization of human behaviour is diverse. If aphasic disorders occur there is a condensation of concrete behaviours organized by the first signal system, and a reduction in abstract behaviours associated with the operation of the hierarchical system.

The concrete level enables collecting data experienced through sense perception of different segments of reality, and organization of appropriate reactions, including verbal. The word analyzed at this level is linked to a situation; it does not exist outside of the current, mentally experienced context. The linguistic behaviors in question are regulated by the first signal system, which is, as it were, a matrix reflecting the world. In Jerzy Konorski's theory (1969), the system of referential meanings is reduced to perceptual images of words. In this system specific stimuli from the external world stimulate particular behaviors, whereas a person, while identifying reality through the senses, is able to produce appropriate linguistic behaviours as long as they are stimulated by context. Within the concrete system some behaviors of patients with brain injuries should be interpreted as manifestations of action at the monoconcrete level. The point is all cognitive and linguistic processes which are of conditioned-reflex nature. The monoconcrete code operates on the probabilistic (statistical) basis and is closely connected with personal experience, it ensures fluent performance of specific, including verbal, but reflex-based actions.

²⁴ Among the scholars continuing Pavlov's conception there are different positions concerning the interpretation of the character of the second signal system. Some try to derive the formation of the most complex concepts from conditioned reflexes of increasingly higher order, while others tend to discern separate laws governing the second signal system. According to the latter position, the second signal system uses as stimuli the symbols that substitute for them, rather than real objects or actions. Substitution can take place through linguistic signs (verbal or written), they can be also substituted for by gestures and facial expressions.

In connection with aphasia, there is an increase in the frequency of linguistic realizations that are free and reactive activity. The phenomena of perseveration of verbal, vocal and non-verbal behaviours are represented in great numbers. Perseverations of mind set, pathologically repeated sound sequences, sometimes corresponding to texts, sentences or words, copied gestures, facial expressions and body movements arise from internal or external stimulation and become activated outside of the sender's will. Vocal behaviours may be limited to reflexes conditioned by specific stimuli, they are a passive reaction triggered only in response to given signals. Persons with left-sided brain injuries more often structure reality through models of sensory cognition²⁵ rather than through abstract categories established in conceptual structures. The majority of intentional linguistic behaviours of aphasic patients can be described as manifestations of action at the poly-concrete level²⁶, which (action) enables patients with brain injuries to realize the pragmatic functions of language in social interactions.

The second signal system, hierarchical, takes part in abstraction processes and enables the formation of semantic relationships between information coming from the concrete system. The word processed at this level ceases to be a conditioned signal, but it becomes a symbol of a class of phenomena, which makes it possible for the mental models of world representation to arise. Within the abstract

²⁵ The mechanism in question found its interpretation in analytical philosophy, according to which some names (to which observation sentences can be reduced) are characterized by their linkage to the sense-perceived object. We are talking about utterances like: *It's raining [Pada]*, *It's getting cold [Robi się zimno]*; *This is a rabbit [To jest królik]*, which, unlike sentences of the type: *People are mortal [Ludzie są śmiertelni]*, are occasion sentences, i.e. true in some situations and false in others. That is probably why aphasic patients find it very difficult to use abstract irrational numbers, which do not refer to anything or to which individual expressions cannot be assigned. According to Willard van Orman Quine (1999), perception sentences are the first stage of language acquisition in ontogeny and are that which connects language with the real world which is talked about in this language. Interpretation of these communicative behaviors that are expressed in the use of observation sentences can be carried out by each interaction participant. It is sensory contact with reality, shared by the text sender and receiver, that is the basis for interpretation of reality. This phenomenon appears to be just as subjective and individual as the internal nervous network of the cognitive subject. What intersubjectifies this cognition is the code common to interaction participants. Aphasic speech disorders make the objectification of cognitive experiences difficult, both from the perspective of the sender-patient and the receiver-patient.

²⁶ Bluma W. Zeigarnik (1983) described mentally impaired persons (oligophrenics) who combined into one category the words "pot", "onion", carrots", and "parsley" as the names of objects necessary to cook soup. In the same way reality was structured by nomads of Caucasus, who were described by Luria (1976). Categorization by the pragmatic criterion is not, however, associated exclusively with the level of intelligence or education. The experiment carried out by Jack Warchala, which concerned the criteria for categorizing the phenomena of reality by students showed that the way of structuring the world is influenced by sociocultural determinants – students with rural background and those who lived in rural areas exhibited a tendency to organize phenomena by situational and pragmatic criteria, which distinguished them from students living in town (cf. Warchala 2003).

system, gradability is possible. In aphasia there is disintegration of the hierarchical system. Words are used in the concrete code which is why patients attribute to them a different meaning from that assigned to them by the hierarchical level. There are visible difficulties in the mental interpretation of reality (e.g. structuring of its phenomena takes place because of physical, sense-perceived similarity rather than by classes established in linguistic structures in the form of names of categories). What takes place is the reduction of hierarchical operations for linear operations. A person with aphasia finds it difficult to go in his judgments beyond the limits of habitual, specific associations. He is unable to abstract from concrete features of objects, while his access to knowledge of mental phenomena is limited (Zeigarnik 1969).

The creative code characterized by the highest degree of abstractness organizes the linguistic behaviors whose result is the creation of new reality. In verbal terms, it can manifest in poetic creativity, in non-verbal – in other art forms. Brain injury and aphasia cause a reduction of abstract attitude in a person, but the most susceptible to disintegration is the highest organized creative code. There are well-known cases that men of letters, while retaining conversation abilities, lost the possibility of creation by means of words²⁷. Operations on the creative code are not accessible to persons with brain injuries²⁸, hence aphasic phenomena should not be interpreted through mechanisms of creation but only of possible realization, and by the pathology-determined inability to make a free choice (Panasiuk 2014).

CONCLUSIONS

According to the Herder-Humboldt thesis, utterances contain a certain form of thinking, hence it should be expected that the aphasic disintegration of speech produces changes at the level of cognitive structures in aphasic persons. Abstract thinking consisting in drawing conclusions from assumptions is not accessible to patients, while concrete thinking consisting in the observation of phenomena in the environment, and in constructing judgments based on these current observations, becomes the only way of structuring the phenomena of reality (cf. Kotarbiński 1990).

²⁷ The eminent Belgian neurolinguist Yvan Lebrun (1988) described the case of the well-known French symbolist poet Charles Baudelaire, who, because of brain injury and aphasia, lost the ability to create poetry, while he retained conversation abilities (Pačalska 1999: 29).

²⁸ Studies show that the transition from the creative (metalinguistic) code takes place by means of the polyconcrete (picture) code, which explains the low linguistic abilities associated with the hierarchical code in eminent people. Literature on the subject presents Einstein as an example (Jakobson 1989; Kaczmarek 1995).

The linguistic material does not provide evidence that the mechanism of language difficulties in aphasia cases is associated with disturbance of the relation between word and object, which may also manifest with disorders of the categorizing function of language or the “system of linguistic generalizations” (Kogan 1962). Brain injury causes disturbances at the highest level of a function, therefore in light of the single-factor theory, aphasia should be understood as a speech disorder at the intellectual (Jackson, Marie), symbolic (Head), or abstract (Head) (Maruszewski 1966) levels. A feature of aphasic disorders is the concretization of language and difficulties in adopting by an aphasic person a free and reflective attitude towards extra-linguistic.

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