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Psychoorganic Syndrome of Developmental Age in Logopedic Diagnosis and Therapy

SUMMARY

Speech development disorders in children with injuries to the anterior part of the frontal lobes in the early stage of life do not stem from strictly linguistic difficulties as in the cases of alalia, or from realization difficulties as in dysarthric cases, but are caused by disturbances of the controlling verbal function, and manifest themselves as linguistic interaction disorders, difficulties in acquiring pragmatic language rules and in the realization of the emotional, modal, informative and action function of utterance. Diagnostic and therapeutic difficulties with regard to children with injuries to the frontal brain parts arise from the fact that previous studies failed to define the general criteria for classifying this group of disorders into a separate category of deficits, which are called frontal lobe syndrome in the case of adults. This problem is illustrated in the article by the case of a 20-year-old girl, who suffered an extensive injury to both frontal lobes as a result of a craniocerebral injury at the age of four months. The picture of disorders in the socio-emotional, communicative-linguistic and cognitive spheres in the studied girl during her childhood and adolescence and in early adulthood, and its dynamics reveal a difference in comparison both with intellectual disability and frontal lobe syndrome in adults.

Key words: speech development, craniocerebral injury, prefrontal region, frontal lobe syndrome, speech disorders, logopedic diagnosis and therapy

PSYCHOORGANIC SYNDROME AS A DIAGNOSTIC ENTITY

Psychoorganic syndrome (POS) is a condition in which, due to an organic brain injury, the patient suffers from persistent mental disorders manifested in the behavioral, socio-emotional, cognitive and communicative spheres (Bilikiewicz, Strzyżewski, 1992; Herzyk, 2005). The International Statistical Classification of

Diseases and Related Health Problems – ICD-10) (Puzyński, Wciórka, 2000) distinguishes three forms of psychoorganic syndrome: in adults – 1) characteropathic (characteropathy) and 2) dementia, and in children – 3) oligophrenic (oligophrenia). Frontal lobe syndrome (Lat. *syndroma frontale*) is part of organic personality disorders and behavior caused by the diseases, injuries or dysfunction of the brain (F.07.0) and is diagnosed in persons with damage to frontal structures, acquired in adulthood. It is characterized by a significant change in the established patterns of premorbid behavior, particularly in the emotional-motivational and behavioral spheres (Cummings, Mega, 2003). Disorders of cognitive processes affect mainly or exclusively the planning of actions or prediction of their probable consequences. All these deficits manifest themselves in linguistic behaviors (Pačalska, 2003).

The specificity of symptoms of frontal lobe syndrome stems from the special structural-functional organization of the frontal lobes (Lat. *lobus frontalis*), which are described as the largest (30% of the surface of the human brain cortex) and the latest developed part of the telencephalon (Lat. *telencephalon*) (Kaczmarek, 1993; Bannister, 1998). Owing to numerous connections with the reticular formation (Lat. *formatio reticularis*), the lobus limbicus (Lat. *lobus limbicus*) and with the hypothalamus) (Fix, 1887) within the frontal lobes, especially in their frontal part (prefrontal cortex – PFC), the information coming from different parts of the brain is integrated. The prefrontal cortex is regarded as performing the role of the regulator of executive functions associated with planning and controlling the course of cognitive processes and with regulation of behavior (Kłosowska, 1977). Executive functions determine a person's ability to adapt to the rules of social behavior, to take rational actions, and the ability to formulate his/her own judgments (Jodzio, 2008).

In patients with frontal lobe syndrome, the processes of self-cognition and self-awareness are disturbed, in particular: insight disorders, false convictions about the external environment or one's own condition with an accompanying sense of the reality of experienced fictions (delusion), a lack of feeling of illness and incomplete awareness of the objectively existing disorders (anosognosia), emotional indifference to one's own limitations (anosodiaphoria) and concrete attitude towards reality (Herzyk, 2005). Furthermore, damage to the frontal region may cause diverse disorders, *inter alia*, in perception, attention, memory, or thinking, which may also accompany damage to other parts of the brain.

The symptoms of frontal lobe syndrome manifest themselves first of all as disturbances of independent intentional and rational activity (there occurs dissociation between knowledge and action with exposure to external stimulation), as difficulties in planning complex tasks and taking right decisions, and as dis-

turbances to relations with other persons (impulsiveness, nervousness, aggressive behavior, absence of inhibitions, flat affect). A lack of insight into one's own conduct makes it impossible to modify undesirable behavior, which significantly impedes the patient's functioning in society (Maruszewski, 1970) and restricts the selection of rehabilitation techniques. Several categories of symptoms are specified in the psychopathological picture of frontal lobe syndrome (Lezak, 2004; Jodzio, 2008):

- 1) problems with starting an activity – patients are characterized by a lack of drive and spontaneity, seldom initiate any actions, confine themselves to routine self-service activities, in intense conditions there is impoverished reactivity, apathy, and mutism;
- 2) problems with stopping action – patients find it difficult to stop their own reactions, react impulsively, especially because of negative information, and do not inhibit impulsive reactions;
- 3) difficulties with making behavioral and mental switching – because of deficits in alternating attention (mental flexibility), patients are unable to modify motor functions: there is stereotypization of behavior and perseverance of actions (disturbance of the brain mechanisms of stimulation and inhibition, and thereby difficulties with suppressing activity caused by an earlier stimulus);
- 4) a lack of self-awareness – patients do not perceive the committed errors;
- 5) a concrete attitude towards reality as a result of disorders in abstract thinking: patients understand messages literally, and have difficulties with planning and channeling their behavior in various situations.

These disorders manifest themselves in social relations and pertain to social cognition relating to the state of mind of other persons as well as to self-cognition and self-awareness (Krukow, 2011):

- 1) self-regulation of social behaviors – impulsiveness in interpersonal contacts, a lack of spontaneous reactions, disturbed organization of complex activities, weak motivational processes;
- 2) social self-awareness – denial of problems in social relations, inadequate behavior towards other people, inability to predict the behavior of others and to plan one's own behavior accordingly;
- 3) sensitivity to social signals – a deficit of empathy, egocentric attitude, insensitivity to the behavior of others, difficulties with accepting another person's viewpoint;
- 4) communicative pragmatics – stereotyped linguistic behaviors, disorders in comprehending metaphors, difficulties in decoding the state of another person's mind, disorders of the prosodic aspects of utterances;

- 5) dynamics of social behaviors – loss of initiative in interpersonal relationships, inability to adjust one's own behavior to the performed social roles, a lack of emotional sensitivity in relations with family and friends;
- 6) observance of the rules of social co-existence – breaking the rules of social distance, outbursts of aggression, difficulties with modification of one's own behavior in response to signals from other persons.

Speech disorders in persons with the damaged anterior part of frontal lobes do not stem from strictly linguistic or realization difficulties but are caused by disturbances in the controlling verbal function of (Łuria, 1967) and manifest themselves as disturbances to linguistic interaction and as difficulties in realizing communication skills, especially with regard to the pragmatic functions of language distinguished by S. Grabias (1997): emotional, informative, modal, and action functions.

DIAGNOSTIC PROBLEM

In clinical practice, psychoorganic syndrome is diagnosed in adults because according to the Polish certification standards in force, the psychopathological symptoms of damage to the prefrontal brain areas at the developmental age are diagnosed as intellectual disability. However, in a large group of patients certified as intellectually disabled there are cases of persons who were born healthy, but during the early developmental period, due to focal brain injuries within the frontal structures or disturbance in the development of these structures (e.g. as a result of untreated craniosynostosis¹), they developed developmental disorders first of all in the socio-emotional, behavioral and motor spheres². The specificity of psychopathological symptoms found in children with damaged frontal structures, differences in pathomechanisms, dynamics of the clinical picture at individual developmental stages, possible forms of treatment, therapy and education, their neurocompensatory capabilities, and because of that the prognosis of their functioning in adult life necessitates the interpretation of these cases as a separate

¹ Craniosynostosis is a defect consisting in the premature fusion of one of the seams of the child's skull, which prevents the normal growth and normal development of the brain. The frequency of its occurrence is estimated at 1:2000 births, consequently, 200 children with craniosynostosis are born in Poland every year. Frontal craniosynostosis is one of the many kinds of this defect and is characterized by a specific shape of the head termed trigonocephaly. In order to prevent neurodevelopmental disorders, the defect is usually treated by operation (Larysz, 2013).

² In logopedic classifications, the psychoorganic syndrome resulting from focal damage to frontal structures at the developmental age has not been presented so far as a separate speech pathology entity. There are only developed logopedic standards for diagnostic-therapeutic management in case of oligophasia as a result of mental retardation in children (Jęczeń, 2008; 2015) and the psychoorganic syndrome in adults (Panasiuk, 2015).

category of developmental disorders that requires distinct diagnostic procedures and special forms of logopedic therapy³.

The diagnostic problem concerns a twenty-year-old woman, who, when 4 months old, sustained an extensive brain injury within both frontal lobes. The assessment of her development and current functioning in the emotional, cognitive and linguistic-communicative spheres over the span of 20 years – from infancy to early adulthood – showed the specificity of the psychopathological picture that cannot be matched to any diagnostic entities recognized in children with brain injuries. The clinical picture obtained in this longitudinal study indicates that the patient's case should be interpreted as a developmental variant of frontal lobe syndrome

FRONTAL LOBE SYNDROME IN DEVELOPMENTAL AGE – A CASE STUDY

Clinical Characteristics

The subject was born in spontaneous labor at term, from first pregnancy, whose course was normal and received 10 points on the Apgar scale. In the fourth month of her life, the child had an accident: the baby carriage, in which she slept, rolled down a hill and overturned, and the child fell out from the carriage onto the highway, straight under the wheels of the coming car. The girl was taken to hospital, a USG of her head was made, and she was sent to the neurosurgery department to have post-traumatic hematomas removed, located in both frontal lobes. After the operation, a USG examination of the head was made, in which it was found that choroid plexuses were homogeneous and symmetric, and ventricles III and IV were not dilated; however, an asymmetric pattern of the lateral brain ventricles (with the dimensions of 24 mm in proportion to the skull size of 110 mm) with a preponderance on the right was revealed. The girl was provided with medical care at the Neurological and Pediatric Outpatient Clinic.

In the neuroimaging follow-up examination using computer tomography, which was carried out on the girl at the age of 8, an extensive malacic area was found at the base of the frontal lobe on the right side, and to a lesser degree on the left. It was also shown that there was a dilation of the CSF spaces in the right temporal region, with the undilated ventricular system, and the uneven thinning of the calvarial bones in the temporal regions of both hemispheres. In comparison with

³ The development of medical knowledge and entries in the successive systems of classification of neuropsychiatric diseases (ICD, DSM) show that some neuropsychiatric disorders previously diagnosed in adults only are now also diagnosed in pateinst in developmental age, e.g. schizophrenia or depression.

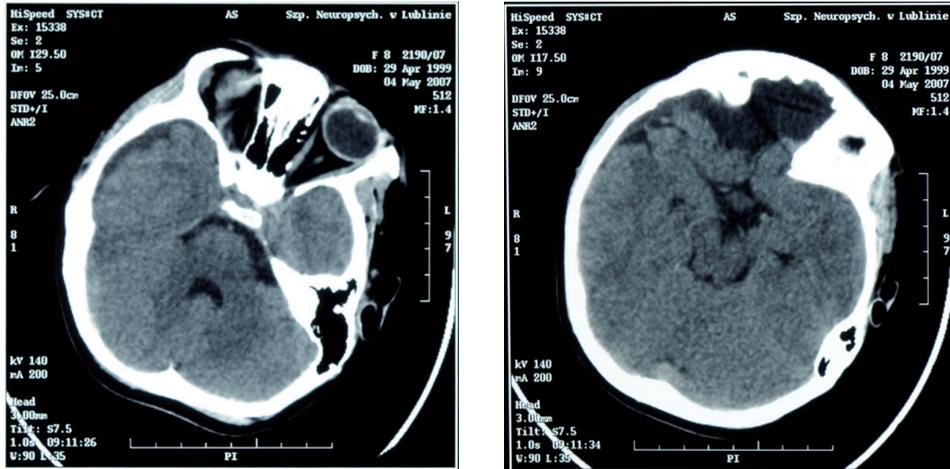


Fig. 1. A CT examination of the 8-year-old girl after craniocerebral trauma

the earlier results of tomography examinations, the current picture of the skull and the brain was recognized as stationary.

Despite extensive organic changes in the brain tissue revealed in the neuroimaging examination, the results of the EEG examination were good: “the EEG record verging on the norm with visible groups and series of free theta waves of 4-4.5-7 Hz with amplitude of up to 45-85 μ V from the anterior brain region. Standard activation in the form of ventilation moderately intensifies the frequency of occurrence of the presented changes. The basic transition is maintained for the age of the subject girl, fairly numerous and not very regular at 7-7.5-12 Hz with an amplitude of up to 45-75 μ V interlaced with single free theta waves of 4-6 Hz with an amplitude like the background. Alpha attenuation responsive”. It follows from the description that the bioelectric activity of the brain did not show the paroxysmal characteristics (post-traumatic epilepsy), and the maintained basic transition was a good prognostic for the child’s further development.

During neurological and pediatric evaluation, severe motor activity and emotional disorders were reported. At the successive stages of life until adolescence, the girl was under constant neurological and psychiatric monitoring, pharmacological treatment being oriented towards alleviating psychomotor hyperactivity symptoms.

PEDAGOGICAL AND PSYCHOLOGICAL ASSESSMENT

The results of pedagogical-psychological examinations of the girl at the age of six indicated her disharmonious cognitive development, difficulties with direct-

ing attention and controlling emotions. A detailed assessment of the girl's cognitive development was conducted by a developmental psychologist, based on tests and observations; the evaluation showed "a significantly lowered level of perceptual-intellectual abilities, a small stock of general knowledge, disorders of remembering processes; a comparatively well developed perceptiveness; a well developed ability to understand and define words associated with everyday life; short-term top-down attention; motor hyperactivity; impulsiveness, chaotic action; efficient in establishing social contacts; exhibits aggressive behavior". On the basis of being certified as having mild intellectual disability, the girl was sent to an integration class for education.

It should be said that the symptoms described in the developmental psychologist's opinion gain a different status with regard to the pathomechanism in question, i.e. the focal changes in the prefrontal cortex and in the structures of the right brain hemisphere after the sustained craniocerebral injury, found in clinical diagnosis and the results of neuroimaging examination: "the significantly lowered level of perceptive-intellectual abilities" does not correlate with the results of EEG examination – these are within the developmental norm, and in the case of the girl in question, the lower capabilities in this area stem first of all from deficits in attention and short-term memory, "good perceptiveness" is a result of difficulties in directing attention and selecting stimuli from the environment, "the well developed ability to understand and define words related to everyday life" stems from the dependence of verbal reactions on the situational context and relevant observations, while in the case of the girl, "the skill in establishing social contacts" involves breaking the norms of social behavior, failure to keep distance from unknown persons, and viscosity in interactions with others.

The interpretation of psychopathological symptoms found in the child from the angle of focal brain injuries would allow identification in them of the picture characteristic of frontal dysfunctions attribute a different diagnostic value to them. Therefore, a significant postulate in formulating a psychological-pedagogical assessment of the child with neurological disorders is to connect the clinical picture with neurological diagnosis and the results of instrumental examinations.

The psychological examination with the WISC-R test was repeated when the child was 10 years old. It confirmed the lowering of intelligence quotient (I.Q. on the full scale was 70) on the verge of mild mental impairment, disharmonious development of individual intellectual functions with a slight preponderance of verbal-conceptual skills over perceptive-executive abilities (relatively the best developed was visual-motor coordination, the ability to create wholes owing to finding internal relationships between elements – anticipation of the end product, whereas below average was the ability to think abstractly and create concepts, the ability to perceive relationships between concepts, to distinguish between essential and non-essential features, reasoning by analogy, recent auditory memory,

as well as understanding the basic rules and norms of social conduct). In light of the results of this test, arithmetical reasoning and the ability to abstractly conceptualize and spatially visualize were classified as being at the level of mild mental disability. The girl was able to carry out only simple mathematical operations, counted on concrete things up to 20, did not know mathematical signs, and had difficulties with a distinguishing set.

According to the teacher's assessment, the girl, then a fourth-grade student at primary school, showed inadequate general knowledge and vocabulary, slowness in learning, a weaker ability to understand complex situations and to reasonably interpret them, to plan and predict the consequences of her activities, weaker graphomotor skills (she reproduced simple forms, painted up a space confined by an outline, she made a drawing at the stage of a cephalopod). On the basis of observations, it was concluded that although she is a cheerful child with a positive disposition, the girl displayed features of psychomotor hyperactivity and attention deficit (she has an increased need for movement, she often gets up when working at the desk, does not complete an activity, she is easily deconcentrated, distracted, does not fulfill complex instructions, is easily discouraged, saying "I don't know", "I can't", or she performs actions automatically and unreflectively). It was recommended that, because of these difficulties, the girl's activity should constantly be reinforced and directed, and the rules of organization of her work at school should be consistently applied. At the same time, it was demonstrated that the girl showed a keen interest in the environment she is in, and high cognitive curiosity, was spontaneous in direct contact, eager to cooperate, behaved appropriately as the situation required, showed no adaptation difficulties, no aggressive or self-aggressive behaviors. The child also showed a strong emotional bond with her parents, liked talking about herself, her family, and interesting events. She easily interacted socially, but had difficulties with respecting established norms and rules (e.g. she tried to treat a prohibition situation as a game, which gratifies her in contact with adults), and often tried to attract attention of others. She conversed with others, expressed joy over her own achievements and felt satisfaction with the fulfilled task.

The psychological-pedagogical counseling center recommended the continuation of education under the integration system enabling the child's cognitive and social development, and, in order that the child could concentrate better in class, it was suggested that the child should have a permanent seat in the first desk, right in front of the teacher. Pedagogical recommendations to the teachers emphasized the need "to motivate the girl to work during lessons through short, clear instructions like 'write down', 'check', or 'prepare', to relieve the pupil's stress by directing her activities (distributing exercise books, cleaning the blackboard, passing the chalk, etc.), to define the boundaries of behavior and space (consent to a larger space and greater freedom of movement), to establish clear rules of behavior in

specific situations, to consistently enforce the fulfillment of instructions/orders, tasks, and actions, to modify and calm undesirable behaviors using positive and negative reinforcements, to perceive and support the child's strengths, to develop her self-reliance in everyday life, develop social skills, to teach how to cope in specific situations, train task-readiness and the ability to completely fulfill activities (both at school and at home), and to avoid helping the child out".

The girl completed primary and junior high school in the integration education system with a great help of the assisting teacher and with huge involvement of the parents. However, on account of the growing difficulties in the socio-emotional and cognitive spheres, she was certified as intellectually disabled, and at the next stage of education she was referred for special education at a vocational school, where she was trained for the profession of confectioner. After she finished the school, she did not start professional work, but remains as an adult in the care of her parents.

LOGOPEDIC ASSESSMENT

The girl's speech was examined when she was five: there were delays in the development of all her language subsystems. The level of her language skills corresponded to the abilities of a three-year-old child. Stimulation of speech development during logopedic therapy and in the home environment produced evident progress. At the age of 6, the girl eagerly made verbal contact (was able to introduce herself, give her age, address, name the first names and place of work of her family members, she pointed to and named individual body parts, she distinguished and named the current season of the year, defined the purpose of everyday articles and the physical features of objects (large – small, high – low/short), used adjectival expressions, understood verbal instructions with a complex grammatical and semantic structure, but she fulfilled only those tasks she was interested in at the moment. At the age of 8, the child realized utterances using simple and compound sentences, with very few agrammatisms appearing in their structure. However, the semantic and pragmatic coherence of her utterances and monologues was profoundly disordered. The girl was not able to tell a picture story, did not take its contextual and emotional contents into consideration, failed to make conclusions and understand the sense of the whole, cf.

B. *Tutaj jest historia pewnego misia, chciałabym, abys mi tę historię opowiedziała. Popatrz na wszystkie obrazki i opowiedz, co przydarzyło się misio-wi.* [Here's a story of a teddy bear, I'd like you to tell me this story. Look at all the pictures and tell me what happened to the teddy bear.]

P. ...

- B. *Co widzisz na pierwszym obrazku?* [What do you see in the first picture?]
- P. *Jak dziewczynka z chłopaczkiem robią te... misio...* [A girl with a boy doing these... teddy bear...]
- B. *Co robią?* [What are they doing?]
- P. ...
- B. *Zobacz, oni się schylają, wyciągają ręce... Co chcą zrobić, jak myślisz?* [See, they are stooping down, holding out their hands... What do you think they want to do?]
- P. *Wziąć go za rączki.* [Take him by the hands]
- B. *Yhy. Biorą go razem?* [Mnh – They are taking him together?]
- P. *Biorą go na rączki... za rączki i idą.* [They are taking him by the hands... by the hands and walking]
- B. *A tutaj zobacz, czy oni chcieli razem bawić się tym misiem?* [And here, look, did they want to play with the teddy bear together?]
- P. *Tak.* [Yes]
- B. *Razem? Zobacz, jak oni teraz wychylili się i ciągną misia każde w swoją stronę.* [Together? Look, they are leaning over and pulling the teddy bear each to their own side.]
- P. *Nie chcieli.* [They didn't want to]
- B. *A jak oni chcieli się bawić?* [How did they want to play?]
- P. *Chciały mu rękę wyrwać!* [They wanted to tear his hand out]
- B. *Chcieli mu rękę wyrwać? A może oni nie chcieli bawić się razem, w związku z tym szarpali w swoją stronę. Jaki jest skutek tego, że żadne z nich nie ustąpiło, że nie potrafili sobie zorganizować wspólnej zabawy? Co się stało?* [They wanted to tear his hand out? Maybe they did not want to play together so they pulled him each to their own side. What is the effect of the fact that neither gave in, that they could not agree to play together? What happened?]
- P. *Jak misio nie ma ręki.* [That the teddy bear does not have a hand]
- B. *Tak, oberwana jest ręka. Więc spróbuj jeszcze raz opowiedzieć, jak to było.* [Yes, the hand is torn off. So, try to tell me what happened once again]
- P. *Wyciągają rękę, biorą go za rączki, wrywają mu rękę i nie ma rączki.* [They hold our a hand, take him by the hands, and tear his hand off and he does not have a hand]
- B. *Ale popatrz, oni się po prostu o tego misia kłócą, szarpiają tym misiem. Co można powiedzieć o tych dzieciach? Potrafią się bawić razem?* [But look, they are simply quarreling about the teddy bear, they are tugging the teddy bear. What can we say about these children? Can they play together?]
- P. *Potrafią. Chłopczyk z tą dziewczynką potrafią.* [They can. The boy and this girl can]

- B. *Ale zobacz, jaki jest efekt tej zabawy. Zabawka jest popsuta.* [But see what the result of this game is. The toy is broken]
- P. [Takes off her sweater, gets up from the table, comes up to her father].
- B. *A jak myślisz, oni chcieli bawić się razem tym misiem, czy osobno?* [What do you think? Did they want to play with this teddy bear together or not?]
- P. *Czekaj, ja się rozbiorę, bo gorąco mi.* [Wait, I have to take it off because I'm hot.]
- B. *Chcieli bawić się razem tym misiem?* [Did they want to play with teddy bear together?]
- P. *Nie!* [No]
- B. *A czy można powiedzieć, że oni są przyjacielscy względem siebie?* [And can we say they are friendly to each other?]
- P. *Tak! ... Nie!* [Yes! ... No!]
- B. *Nie są przyjacielscy. Czy oni chcą się podzielić zabawką?* [They are not friendly. Do they want to share the toy?]
- P. *Nie.* [No]
- B. *Nie chcą się podzielić. Czy jest to dobra cecha?* [They don't want to share it. Is it a good feature?]
- P. *Nie.* [No]
- B. *Nie jest to dobra cecha. Do czego ona doprowadza?* [It is not a good feature. What does it lead to?]
- P. *Że wyrwali mu rękę i temu... i misiówi jest... biedny jest.* [That they tore his hand and this... and the teddy bear is ... poor he.]
- B. *Oczywiście, doprowadziło to do zepsucia zabawki. Jaki tytuł byś tej historii dała?* [Certainly, it resulted in the broken toy. What title would you give to the story?]
- P. ...
- B. *O czym jest ta historia?* [What is the story about?]
- P. *Jak chłopczyk z dziewczynką...* [How a boy and girl ...]
- B. *Dwa albo trzy wyrazy, króciutko.* [Two or three words, very briefly]
- P. [Counts the pictures.] *Raz, dwa, trzy... Jak chłopczyk z dziewczynką yyy... idą sobie z misiem.* [One, two, three... About the boy with the girl... walking with a teddy bear.]
- B. *A zobacz, jaki tytuł jest tu zapisany?* [Look, what title is written here?]
- P. [reads on the other side of the flash-card.] *„Smutny miś”.* [A Sad Teddy Bear]
- B. *A dlaczego ten miś jest smutny?* [Why is the teddy bear sad?]
- P. *Następny obrazek...* [Next picture...]
- B. *Zapytam cię jeszcze raz: dlaczego taki jest tytuł tej historii? Dlaczego ten miś jest smutny?* [I'll ask you once again: why is the story titled like this? Why is the teddy bear sad?]

- P. ... [Takes out hairpins from her hair, puts them on the table, does not answer the question].
- B. *Czy zabawki są do tego, żeby się o nie kłócić, czy żeby się nim bawić?* [Are the toys for quarreling over or playing with?]
- P. *Żeby się nimi bawić.* [For playing with]
- B. *Czy te dzieci bawią się, czy kłócą się o zabawkę?* [Are the children playing or quarreling about the toy?]
- P. *Kłócą się.* [Quarrelling.]
- B. *Tak. Dlatego miś jest smutny.* [Yes. That's why the teddy bear is sad]

The logopedic opinion prepared for the certification commission diagnosed motor alalia (according to ICD-10 – F80.1 – developmental aphasia or speech expression disorders resulting from developmental pathology or brain damage – developmental aphasia, expressive type), which manifested itself in the girl's difficulties in planning and carrying out complex actions, and in formally, semantically and pragmatically formulating coherent monologic utterances as a result of deficits in inner speech. The utterances formulated by the child were formally and semantically simplified, with predominant linguistic stereotypies. Limitations in understanding stemmed from deficiencies in passive vocabulary and difficulties in understanding abstract concepts (e.g. those referring to categories of time: *week, month, and year*).

In this context of the picture of cognitive and language disorders, especially conspicuous were emotional, cognitive and communicative difficulties symptomatic of the manifestations of damage to the frontal brain structures. The girl was impulsive, emotionally unstable, and unable to analyze and control emotional states. She constructed inappropriate judgments about reality, she had difficulties in abstracting, synthesizing and drawing conclusions, and did not understand temporal relations. Hence, she did not structure sequences of events according to logical or temporal criteria. Nor did she observe the linguistic rules of social behavior, displaying viscosity in interpersonal relationships, stiffness, conventionality and compulsiveness in communication (“getting confused, entangled”, persistent turning to the same thought). She showed no tact or sense of the situation, her behavior in relations with adults and peers broke the rules of social coexistence (fits of physical aggression). She found it difficult to assess situations and predict the consequences of her actions (“being aware of”).

She was chaotic in actions, and had difficulties in remembering the pattern of complex motor activities (e.g. while dancing), in planning the sequences of complex operations (disorders of inner speech) and in carrying them out (deficits of working memory). Nor could she rationalize the undertaken activities and decisions, or correct her behaviors.

The logopedic therapy carried out systematically from her 5 to 10 year of age produced considerable progress in her language skills. The child was characterized by a high dynamics of language development, made up for delays at all levels of her organization of language, and learned to read and write. At mid-school age, as compared with her highly developed language skills, communication skills disorders began to be clearly manifest. The disharmonious development of linguistic and communicative competence did not correspond to symptoms of oligophasia, the great dynamics of regression of disorders under the influence of systematic pedagogical-psychological-logopedic therapy being a significant indicator of the child's development potential.

CLINICAL DIAGNOSIS

The whole of symptoms of brain damage diagnosed in the then six-year-old girl largely corresponded to the picture of psychoorganic syndrome, coded as F07 in ICD-10 and defined as "personality and behavioral disorders caused by disease, injury or dysfunction of the brain", which encompasses reduced perseverance in purposeful activities, altered emotional behavior, displaying of needs and urges without taking consequences and social rules into considerations, and inability to correct one's behaviors. However, some of the symptoms attributed to this syndrome, e.g. disorders of cognitive processes (suspicion, paranoid attitudes) changes in the tempo and coherence of verbal utterances (prolixity, stickiness) or altered sexual behaviors are diagnosed in adults whereas they could not possibly occur in the child at this stage of development. The girl at the age of six, with alalia, had not yet learned narrative structures that organize knowledge about reality, not gone through the phase of sexual maturation, her personality was only developing. However, at the successive stages of development, particularly in adolescence and early adulthood, the symptoms of frontal lobe syndrome fully manifested themselves in her. This diagnosis was not verified, however. The brain injury, which she sustained in early childhood and the consequent deficits in the cognitive, socio-emotional and linguistic-communicative sphere were interpreted in terms of intellectual disability, thereby limiting methods of therapeutic effect and prognosis for the future.

Table 1. Specificity of psychoorganic syndrome in developmental age as compared with intellectual disability and alalia

Development sphere	Intellectual disability	Psychoorganic syndrome in developmental age	Motor alalia
motor	disordered	disturbed	disordered
emotional	disordered	disordered	secondarily disturbed
social	disordered	disordered	secondarily disturbed
Development sphere	Intellectual disability	Psychoorganic syndrome in developmental age	Motor alalia
cognitive	disordered	disordered	secondarily disturbed
linguistic	disordered	disturbed	disordered
communicative	disordered	disturbed	secondarily disturbed
metacognitive	disordered	disordered	secondarily disturbed

Source: Author's own study.

The picture of disorders in psychoorganic syndrome in developmental age concerns the emotional, social and cognitive sphere as well as executive functions, with some disturbances in the motor, linguistic and communicative development. Logopedic treatment successfully compensated for motor and linguistic deficits, whereas the persisting difficulties in respecting communication rules and disorders in the socio-emotional and cognitive sphere should be treated as a consequence of both biological and developmental factors, and psychosocial, therapeutic and system-related (school) ones.

DIAGNOSTICATION OF PSYCHOORGANIC SYNDROME IN DEVELOPMENTAL AGE

The classical diagnostic procedure in logopedics includes description of the disordered behavioral functions, and identification of pathomechanism, which enables predicting limitations in the patient's functioning, and selecting therapeutic measures. In the case of frontal lobe syndrome resulting from damage to the frontal structures in developmental age, the goal of logopedic diagnosis, because of interference psychiatric and neurological symptoms, is not only to indicate disor-

ders in linguistic behaviors stemming directly from brain injury but also to identify psychogenic symptoms determining interaction disorders.

Diagnostication of psychoorganic syndrome in developmental age is an organized and finished sequence of multi-specialist procedures which should include:

1. Neurological examination (assessment of neurological state, pointing out the pathomechanism and establishing the location of brain injury);
2. Psychiatric examination (assessment of mental state, pointing out psychopathological symptoms, determination of secondary emotional-behavioral disorders);
3. Psychological and/or neuropsychological testing (assessment of emotional state and higher cognitive functions);
4. Pedagogical examination (assessment of developmental capabilities and the educational environment);
5. Logopedic examination (assessment of competence and interactive, communicative and language skills).

The results of the completed examinations serve to comprehensively assess the patient, which consists of the following stages:

1. Diagnosis of organicity – pointing out the pathomechanism of the disorder (*organic versus* functional causes);
2. Diagnosis of location – determining, based on pathological symptoms, the type, range and location of brain damage (e.g. *focal versus* multifocal *versus* disseminated);
3. Functional diagnosis – establishing psychopathological symptoms and their profundity, and point out the kind and range of retained skills;
4. Logopedic diagnosis – description of linguistic behaviors, pointing out which skills are retained and which are suppressed, defining the specificity of disorders and their mechanisms, finding and pointing out the co-occurring speech pathology entities.

The techniques used in logopedic examination are: interview, targeted observation, analysis of medical documents and results of specialist examination, as well as experimental-clinical tests to assess the quality, effectiveness and acceptability of verbal and non-verbal linguistic behaviors in different communicative situations.

NEUROBIOLOGICAL BASIS OF TREATMENT OF DISORDERS IN PSYCHOORGANIC SYNDROME IN DEVELOPMENTAL AGE

Contrary to widely-held convictions about the irreversibility of disorders caused by organic changes in the brain and claims about a strict relationship between neuroplasticity and the structural and functional specialization of brain

structures, according to which the most complex functions in phylo- and ontogenetic development have a more complex specialization and encounter greater limitations of plasticity (Herzyk, 2005), the therapy of persons with frontal lobe syndrome in developmental age may produce measurable effects⁴. The improvement of interaction with the environment creates a chance of the patient's active life and the fulfillment of various social language roles.

When planning the therapy of children and adolescents with frontal lobe syndrome, it is also necessary take into account the considerable compensatory capabilities of the developing brain. Neurogenesis fulfils a special role in the damaged brain (Pogorzelski, Drozdowski, 2001; Goldman, Plum, 1997; Gage et al., 1998; Eriksson et al., 1998). In connection with the resultant injury and/or functional inactivation of specific brain structures, spontaneous repair (neurocompensatory) changes are activated in order to again reintegrate cerebral functions. Although damage to the nerve cell body (perycaryon) results in its irreversible death and causes long-lasting loss of function, and axotomy may result in the death of the axon, the regeneration, reconstruction of interneuronal connection, may, however, occur, and consequently, restoration of synaptic transmission. The sprouting of the proximal section of the severed axon enables synaptogenesis and reconstruction of damaged junctions between neurons according to three mechanisms:

1. sprouting at the proximal end;
2. sprouting of the ends of non-damaged axons and growth of collateral sprouting that occupies free sites left by dead distal axon sections, which may cause either effective compensation for the function of the damaged region or the formation of abnormal interneuronal connections resulting in negative functional effects (this occurs when axonal paths are not completely severed);
3. formation of synaptic connections by the regenerating proximal axonal sections on the neurons of the non-damaged nerve path (proximal sprouting), and, as a result, the formation of a large network of branches, some of which produce functionally permanent interneuronal connections (this occurs when a given brain region is innervated by two neighboring nerve paths) (Kinalski, 2008).

At the damaged place the density of neuronal connections changes, while in the adjacent area, on the basis of compensatory reorganization, multilineuronal systems arise providing the bases for the regeneration of functions previously realized by the damaged region. Therapy and self-regeneration can produce these extremely beneficial phenomena and then channel and intensify them.

⁴ For several years, the widely adopted paradigm of irreversibility of organic changes within the brain has been challenged. This has been caused, *inter alia*, by the discovery of neurotrophic factors, i.e. a group of substances causing the formation neurons, *inter alia* the brain-derived neurotrophic factor – BDNF discovered in 1989 –(Kerschensteiner et al., 2003).

This is a type of adaptive neuroplasticity influenced by biochemical factors like: adrenaline, amphetamine, acetylcholine, rehabilitation effect (kinesiotherapy) and external (non-specific) factors that include environmental and behavioral activities. It is the kind of everyday activity that can largely impact modifications of multineuronal systems by increasing the number of dendritic branches and density of synaptic areas (Radajewska, 2013). All these mechanisms require systematic and channeled stimulation, because otherwise they may form or activate abnormal connections of neuronal networks, thus additionally disturbing the already malfunctioning conduction of stimuli in the damaged brain areas (Nowak, Nowak, 2004). The repair processes of the brain are known to be the fastest and the largest in children. With years, there is a decrease in the number of nerve cells, neuronal systems and receptors ensuring the optimum functioning of the brain, including cognitive abilities.

Due to considerable adaptation difficulties, patients with frontal lobe syndrome require at least a discreet (if not constant) control of their activities and support in relations with other people, both by the therapist and their family and caregivers. Therapy programs should be prepared individually, according to the possibility of including persons from the close and distant family and friends. Measurable results of treatment of patients with frontal lobe syndrome can be spoken of only when their rehabilitation is conducted as part of a multi-specialist team (psychiatrist, psychologist, logopedist) with the cooperation of their family.

Interaction theory, recently developed in the field of logopedics, opens new prospects in the treatment of children with psychoorganic syndrome. In light of this theory, the logopedic goals of therapeutic measures encompass such aspects of linguistic functioning as the interpretation of the world, emotional assessment of the phenomena of reality, rules of verbal and non-verbal behaviors taking social, situational and pragmatic determinants of communication into consideration. Therapy of persons with frontal lobe syndrome in developmental age aims to improve their clinical condition, and rehabilitate their executive functions as well as linguistic, communication and interaction skills. Its result should be the normalization of the patient's functioning in the family and the professional and social system.

THERAPY OF DISORDERS IN PSYCHOORGANIC SYNDROME IN DEVELOPMENTAL AGE

The symptoms of temporal lobe syndrome affect the mental sphere (Aleksandrowicz, 2000), and because of limitations in activities of daily living and disturbances in building interpersonal relations they require systemic psycho- and logotherapy, whose goal is first of all to prevent the patient's invalidization. At the

early stage of convalescence, psychotherapy is channeled first of all towards emotionally supporting the patient and helping cope with situational stress, while long after the patient became ill, it is meant to improve emotional control and insight into the patient's functioning, executive functions, and to prevent depression and giving-up attitudes.

Logopedic therapy should involve stimulation and regulation of the correct understanding and creation of verbal and non-verbal interactive behaviors, as well as the comprehension and use of linguistic social, situational and pragmatic rules in communication situations. The efficacy of speech therapy in cases of frontal lobe damage is always determined by the ability to enter into relationships with the environment. Techniques for interaction improvement should be practical and apply to the patient's daily needs and the range of his/her social activity (the drama method can be used to train daily communication situations and more complex cognitive-linguistic problems, e.g. as in the case of discussion, conflict-solving, argumentation, etc., analysis of communication situations presented on video or in the graphic material; or playing various linguistic roles can be planned, which, recorded using the multimedia, can be subsequently analyzed, assessed and corrected). The task of the logopedist is therefore to build and regulate the patient's interactions with his/her family and friends and with the broader social environment.

Therapy must be directed at overcoming motor deficits, emotional disorders, difficulties with functioning in a social group, at developing higher cognitive functions, stimulating speech and communication development, as well as at developing the patient's control of his/her behavior.

CONCLUSIONS

Developmental disorders caused by neurological factors can manifest themselves as specific or non-specific symptoms. Psychoorganic syndrome in developmental age leads to non-specific symptoms manifested in the motor, emotional, cognitive and social-communicative sphere. These symptoms, if they occur in children, are interpreted as intellectual disability. However, in the case when a child with intellectual potential suffers a brain injury within the prefrontal structures in the early period of development, s/he displays a special paradigm of symptoms that should be interpreted in terms of neuropsychological deficits which can be rehabilitated because of two kinds of neuroplasticity: developmental and compensatory.

Developmental plasticity is the ability of the developing brain to create many new neural connections on account of acquisition of various skills, e.g. learning to walk, development of speech, etc., which ensures adaptation of the young organ-

ism to the environment as a result of interaction with it. The impact on dynamic neuroplastic processes in developmental age is exerted by both the expression of specific genes and the proper level of stimulation of neurons by environmental stimuli. The most important feature of developmental neuroplasticity is the phenomenon of overproduction and death of nerve cells (apoptosis), and the accompanying loss of functionally unused synaptic connections.

Compensatory (post-injury) plasticity refers to the ability of the damaged brain of a child or adult to create a new network of neural connections, following which the function of the damaged nerve tissue is taken over by another undamaged structure, and, consequently, the recovery of specific skills, e.g. comprehension or production of utterances. As a result of damage to the nervous system, two antagonistic processes occur simultaneously in the brain: disintegration of connections due to degenerative changes, and compensation due to neuroplasticity, which may take place directly after damage but also long after one became ill.

Human developmental potential is actualized in constant contact with the external world. Therefore, the rehabilitation of interaction in patients with the symptoms of frontal lobe syndrome in developmental age should be organized at the same time as part of outpatient therapy and also in the prepared social environment, in which a significant role is played by the family, peers, and distant social environment.

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