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Assessment of the language, communication and interaction competences and skills of a patient with aphasia following aneurysm clipping and diagnosed symptomatic epilepsy

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The article describes a case of a patient with aphasia, diagnosed with symptomatic epilepsy seizures after aneurysm clipping. A speech therapy diagnosis was made, consisting of patient observation, analysis of clinical documentation and speech test results. The subject was diagnosed with disorders of linguistic competence and skills caused by the presence of acoustic-mnestic aphasia. Their consequences are dysfunctions in terms of communication and interaction skills and abilities.

KEY WORDS: aphasia, aneurysm, epilepsy, speech therapy diagnosis

Introduction

The objective of the article is an assessment of the condition of language, communication and interaction competences and skills

of a patient diagnosed with aphasia, following aneurysm[1] clipping and with a diagnosis of symptomatic aphasia.[2]

The speech therapy diagnosis of patients with broad neurological medical histories requires the consideration of an interdisciplinary assessment and of factors that could influence the present condition of the communication skills of the patient. In most such cases, communication dysfunctions are complicated, and are the consequence of other cognitive functions as well.

Research methodology

The article uses research material concerning a 58-year-old male.[3] The data was collected according to the assumption of the clinical and experimental approach[4]. During the diagnostic procedure, the

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[1] An intracranial aneurysm is a consequence of an illness of cerebral arteries, forms on an artery wall as a prominence that, when growing, reduces artery wall thickness. It bursts due to excess blood pressure, causing an intracranial haemorrhage (conf. W. Kozubski, P.P. Liberski, *Neurologia*, Wydawnictwo Lekarskie PZWL, Warszawa 2014, p. 526).

[2] Epilepsy is a set of somatic, vegetative and mental symptoms that may emerge due to diverse morphological and metabolic changes of the brain (J. Jędrzejczak, *Padaczka*, [in:] *Neurologia*, ed. by W. Kozubski, P.P. Liberski, Wydawnictwo Lekarskie PZWL, Warszawa 2014, pp. 662–666). It can influence language skills and competences, but the scope and character of disturbances depends on the type, intensity and cause of the epilepsy, and the location of the damage. Adults with epilepsy frequently complain of diverse language "difficulties", mainly in terms of oral fluency or the ability to express words, however, usually, the problems are not as severe as to be classified as typical aphasia (conf. www.epilepsy.com/article/2014/3/types-language-problems-epilepsy). An exception are cases, in which seizures develop due to changes such as an aneurysm or stroke located in an area important for speech. Functional magnetic resonance imaging (fMRI) tests showed that epilepsy influences the consolidation of the linguistic network (conf. www.epilepsy.com/article/2014/3/types-language-problems-epilepsy).

[3] The patient consented to the research and its publication.

[4] Conf. J. Panasiuk, *Język a komunikacja w afazji*, Wydawnictwo UMCS, Lublin 2019, p. 112.

interview, observation, data taken from medical documentation, psychometric tests as well as free proprietary research techniques and tools were used, selected so as to clearly show the modalities of pathological changes observed in the patient.[5] The procedure involved data collection, analyses and explanation.[6]

The first measure taken was to confirm the MMSE[7] results. Subsequently, the language, communication and interaction skills of the patient were assessed on the basis of observations, free conversations as well as diagnostic attempts from the publications: *Metody badania afazji*[8] and *Badanie neuropsychologiczne*[9] A (formal[10], semantic[11] and verbal[12])[13] dictionary fluency test[14], and an attempt at confrontation naming[15] were also carried out.

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[5] Conf. A. Hamerlińska-Latecka, *Logopedia a metodologia badań społecznych*, [in:] *Problemy badawcze i diagnostyczne w logopedii*, ed. by I. Jaros, R. Gliwa, Wydawnictwo UŁ, Łódź 2018, pp. 19–34; T. Pilch, T. Bauman, *Zasady badań pedagogicznych. Strategie ilościowe i jakościowe*, Wydawnictwo Akademickie „Żak", Warszawa 2001, p. 78; M. Przybysz-Piwko, *Dobór prób badawczych – podstawa opisu i interpretacji stanu języka, (kompetencji językowej) u osób z afazją*, [in:] *Metodologia badań logopedycznych z perspektywy teorii i praktyki*, ed. by S. Milewski, K. Kaczorowska-Bray, Harmonia, Gdańsk 2019, pp. 198–212; R.K. Yin, *Studium przypadku w badaniach naukowych*, Wydawnictwo UJ, Kraków 2015; Z. Jaworska-Obój, *Studium przypadku jako metoda diagnozy klinicznej*, [in:] *Materiały do nauczania psychologii. Seria III. Metody badań psychologicznych*, ed. by L. Wołoszynowa, Wydawnictwo PWN, Warszawa 1985, pp. 334–349.

[6] J. Panasiuk, *Metodologia badania afazji a praktyka logopedyczna*, [in:] *Metodologia badań logopedycznych z perspektywy teorii i praktyki*, ed. by S. Milewski, K. Kaczorowska-Bray, Harmonia, Gdańsk 2019, pp. 172–197.

[7] The *Mini Mental State Examination* is a screening tool used to assess the presence and progress of dementia (conf. D. Perkin, *Neurologia w praktyce lekarza ogólnego*, Via Medica, Gdańsk 2003, p. 78).

[8] J. Szumska, *Metody badania afazji*, Wydawnictwo Lekarskie PZWL, Warszawa 1980.

[9] E.M. Szepietowska, *Badanie neuropsychologiczne. Procedura i ocena*, Wydawnictwo UMCS, Lublin 2000.

[10] The patient was asked to name words beginning with *k* (broad category) and then *f* (narrow category).

[11] The patient was asked to list animal names (broad category), and then sharp objects (narrow category).

Due to aphasia-typical symptom instability, the diagnostic procedure was spread out across several meetings, so observation would be sufficiently long to warrant an exhaustive description of the functioning of the patient. The tests were conducted under home conditions.

Patient description

By education, the patient is a textile industry technician. He has two adult children, currently lives alone. He has not worked in his trade for a long time, operating a sole proprietorship over the recent years of his professional activity. For over three years now he has not worked any more due to his inability to work. His mother language is Polish, he used to speak German well. He is right-handed.

He suffered his first epileptic seizure about four years ago. A CT scan revealed a hyperdense, round structure, ca. 1.8–1.7 cm in diameter in the lateral fissure of the left half of the brain, with a clear

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[12] The patient was asked to list as many activities performed by a person, the question was posed: *What does a man do?* More broadly on verb fluency, conf. e.g. R. Gliwa (*Fluencja słowna czasownikowa w fazie otępienia w stopniu lekkim w przebiegu choroby Alzheimera*, [in:] *Contributions to the 23rd Annual Scientific Conference of the Association of Slavists (Polyslav)*, ed. by K. Bednarska, D. Kruk, B. Popov, O. Saprikina, T. Speed, K. Szafraniec, S. Terekhova, R. Tsonev, A. Wysocka, Die Welt der Slaven. Sammelbande/Сборники. xx., Wiesbaden 2020, pp. 109–118.

[13] 60 seconds were alotted to each task.

[14] Description rules follow E.M. Szepietowska and B. Gawda (*Ścieżkami fluencji werbalnej*, Wydawnictwo UMCS, Lublin 2011; conf. also E.M. Szepietowska, J. Lipian, *Fluencja słowna neutralna i afektywna u chorych z uszkodzeniem prawej, lewej lub obu półkul mózgu*, „Psychiatria Polska" 2012, vol. XLVI, no. 4, pp. 539–551; M. Ponichtera-Kasprzykowska, T. Sobów, *Adaptacja i wykorzystanie testu fluencji słownej na świecie*, „Psychiatria i Psychologia Kliniczna" 2014, no. 14(3), pp. 178–187; M. Piskunowicz, M. Bieliński, A. Zgliński, A. Borkowska, *Testy fluencji słownej – zastosowanie w diagnostyce neuropsychologicznej*, „Psychiatria Polska" 2013, no. XLVI (3), pp. 475–485.

[15] The patient was shown 135 colour photos showing objects belonging to various semantic categories. Conf. also M. Pąchalska, *Afazjologia*, Wydawnictwo Naukowe PWN, Warszawa – Kraków 1999, p. 391.

ring-like sclerosis, indicating the presence of an aneurysm in the area of the left middle cerebral artery. An angio-CT scan revealed the presence of an aneurysm in the left MCA. The patient was qualified for neurosurgical therapy, and soon thereafter the aneurysm was clipped. The patient indicated that the first speech impediments occurred after the operation.

About a year after the operation, the patient was admitted to hospital again due to the emergence of further generalised tonic-clonic epileptic seizures. The neurological examination indicated confusion and the presence of mixed aphasia. The documentation included the information that speech impediments persist ever since the aneurysm clip treatment. A CT scan revealed a broad hypodense zone around the left temple akin to a post-traumatic change in the area of the terminal segments of the left middle cerebral artery. No other changes were found.

Since the described period, the patient had suffered four further generalised tonic-clonic epileptic seizures. A neurological examination in the year 2019 confirmed the previous diagnosis of symptomatic epilepsy and epileptic symptoms with seizures with localised focus (G40 according to ICD-10). The most recent epileptic episode occurred about six months earlier (beginning of 2020). The results of the most recent VIDEO-EEG examination indicate changes in the frontal and temporal zones, with the right side being dominant, with marked seizure activity. A CT examination without contrast found condition post aneurysm clipping in the MCA field on the left side; reinstated osseous lobe, stabilised craniofix in the left frontal-temporal-vertical zone; cavity area on left side in the arterial area of the MCA. No areas of recent ischaemia or traces of intracrainal bleeding were found; the chamber arrangement was found to be symmetrical, without transpositions, with the subarachnoid liquid reserve maintained. The neurologist transferred the patient to a speech therapy practice asking for a consult due to difficulty in understanding (an audiological examination excluded significant hearing impediments). The neurologist found no dyspraxia.

A psychiatric assessment concluded that the patient still has mild cognitive disorders, the supposition of psychoorganic syndrome was excluded.

Documentation additionally includes information about the patient having pharmacologically uncontrolled arterial hypertension and nicotine addiction.

The patient is quite independent, he does not require care. He can generally navigate financial affairs (he does his shopping and pays his bills independently, etc.) as well as socio-political affairs (one gets the notion that he is interested in sport and politics). The patient is able to move about fully autonomously. He is fully aware of objectively existing disorders. The patient comments on his speech difficulties, sometimes bluntly and brashly.

Examination results

Auto- and allopsychical orientation

The patient scored 23 points in the MMSE, this is the upper limit for mild dementia. He is oriented autopsychically yet disoriented allopsychically. The results of the individual tests suggest the presence of generalised deterioration of cognitive functioning, a fact that does not fully correspond to the results of the patient observation.

Comprehension

The patient correctly indicated 95% images and activities corresponding to the names heard, however, requiring up to ten seconds to make his choice.

He correctly executed 75% of commands made of simple syntactic structures.[16] Significant dysfunctions were noted for commands with a complex logical, semantic and grammatical structure, as only

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[16] E.g. *Please raise your hand* (acc. to J. Szumska, *Metody…*, op. cit., p. 43).

33% of the actions were in line with expectations, e.g. (*Please point to the floor, ceiling and wall*[17]): *The floor, now, what did we have later on, stairs, the floor, a wall and a table* [the patient pointed to what he himself said][18]; (*Please touch your right ear with your left hand*): *Touch what with my right hand? My right ear?* [the patient took a pen from the table and touched his ear with it]. He managed fairly well in tasks using so-called decisive questions[19], giving 70% correct answers. Much more errors, ca. 55%, were found for complementary questions, e.g. (*What is your profession?*): *The twentieee… Tomorrow! Sixty years, the twentyy eighth?*; (*What is the current season?*) *Season… January… two thousand twentieth! It's Dece…, we have snow falling, not spring… not summer not autum…, winter! Yes!*

The type of errors made in the above trials suggests that the comprehension disorders primarily encompass decoding of nouns and verbs (and other parts of the sentence), further on moving to the order of comprehension of relations expressed by inflectional endings. These are quite clearly overlapped by memory disturbances and discrete execution dysfunctions.

Dialogue skill assessment

The patient was keen to participate in dialogue and initiated it in order to satisfy his social and physical needs. He eagerly initiated statements, but when he wound become convinced of his inability to finish it, he fell silent, withdrew, hoping that his interlocutor would complete the message. Resignation and impatience was frequently noted in the patient because of his limitations. Dialogue structure disturbances were caused by its complexity, with higher-level automation phrases and short replies coming quite fluently.

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[17] Acc. to J. Szumska, *Metody…*, op. cit., p. 43.

[18] The statements in round brackets are those of the researcher, others in italics are statements by the patient; square brackets hold possible comments of the researcher on the task.

[19] The patient was asked ten questions like: *Does the sun shine at night?*

Less automated, longer statements were frequently so deformed that the lack of knowledge of the situational context prevented the comprehension of the patient's intent, e.g. *Here what they want to kill in our sea, and in Hel, they have, they teach 30 years ago we had only one, back then in Hel.*[20]

His responses contained logical, semantic, inflection and syntactic errors, e.g. (*Could I see the results of your last neurological examination?*): *They are divided, please check, I did not do them, only, there, where…* [mumbling] *if the doctor would be so kind, yes, one copy is for you sir, sir, madam! You can take home, and the second is for me, I asked for to be done.* The suppression of the speech fluency of the patient was significantly influenced by word amnesia, even through the patient attempted to compensate them using descriptive structures (formulated both in a straightforward manner as well as through semantic negations). At times the patient would fuse periphrasing with non-verbal communication in the form of deictic or pantomimic gestures, e.g. *Doctor, coould yoooou* [the patient pointed at the kitchen] *to dri-drink, I'm speaking wrong again…* [the patient stood up and brought the kettle over].

Speech pressure was not observed. Noted was a tendency to move off topic and for the patient to lose sight of the objective of his statement – loss of the logical-content[21] dialogue structure, mainly as a result of lack of word readiness, and hence, the need to alter the sentence structure. Following the emergence of a distraction, the patient would not return to the topic on their own, he would inquire about what he was speaking about (a component of so-called absent-minded speech). He adhered to the rule of role interchangeability. He would most commonly use courtesy statements correctly, errors would be related to using phrases not fitting the situation, e.g. *good-bye* instead *good morning*.

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[20] Hel is a city by the sea in Poland, where the study was performed [translator's note].

[21] On diverse mechanisms of the loss of the logical-content sentence structure: A. Domagała (*Zaburzenia sprawności dialogowych w chorobie Alzheimera. Charakterystyka na materiale języka polskiego*, [in:] *Choroba Alzheimera. Zaburzenia komunikacji językowej*, ed. by A. Domagała, E. Sitek, Wydawnictwo UMCS, Lublin 2018, pp. 100–124).

Confrontation naming

The patient was shown 135 illustrations objects from diverse semantic categories.[22] He named 34% of these correctly and without doubt. In case of further ones (almost 7%) he was accompanied by doubts as to whether he chose the right word or recognised the object correctly, with uncertainty being expressed by intonation: *These are… map?*; *Banana?*; or statements like: *It may be…*; or comments: *It would seem that this is* […]. The reduced tempo of the name search process is indicated by pauses or comments like: *Here we have… this… smoke*; *So this is… rain*; *Oh God! Mmm one can go… sleighing!*; *These are… shadow.*

The patient replaced the majority of names with descriptive structures (ca. 28%), these were mostly simple periphrases, e.g. (ladder) *One can stomp there, go upwards to the ceiling… ladder*; (note) *Here, well… Wysocki, clearly…*

In few cases, the periphrase would be related to recalling the suitable word (slightly over 2%), e.g. (paintbrush): *One can paint with this, pain…, paintbrush*; (goat) *The one that… that runs against… goat!* A few periphrases were noted having the form of semantic negations (3%): (train car) *Here we have… not a train… you can only get in and riiiide*; (tent) *I neeeever had such a big one! Just only for two people… not a backpack! But…* The patient would rarely compensate anomia using verbal-gestural structures (5%) e.g. (rainbow) *MMm the suuun is shining and what I like very much… some people, and I don't care about it* (the patient made a gesture indicating the rainbow shape); or just with a gesture (ca. 3%): (crown) the patient recreated the gesture of placing a crown on his head, and of its shape (referential, descriptive, pantomimic gesture).

The semantic errors made (ca. 8%) indicate disturbances in information search and selection processes among competitive, semantically related data, the restriction of these unwanted associations, for which executive functions are responsible.[23] Semantic

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[22] Conf. also M. Pąchalska, *Afazjologia*, op. cit., p. 391.

[23] E.M. Szepietowska, B. Gawda, *Mechanizmy neuronalne fluencji semantycznej i literowej: badania z użyciem fMRI. Implikacje kliniczne*, „Polskie Forum Psycho-

paraphasiae were usually based on some relation, noted were, among others, cohyponyms: (leg) *Let's say arm*; meronyms: (head) *Hair*; (bathroom) *Shower*; hyperonyms: (knee) *Leg*. Perception errors constituted ca. 6%[24] e.g. (umbrella) *This is… a hat, a hat.* The inability to recognise images is indicated by comments like: (earthworm) *Oh… I cannot see what this is at all* (ca. 5%).[25] The patient did not recall the name and used no compensation strategy for ca. 10% of the images. For ca. 2% of the presented photographs, he used so-called self-references, e.g. *Oh! That's me!* […] (he recalled the correct name of the animal, the name of which is identical to his last name), or a reference to the bird he owned (parrot) *Pa… Ste… well… my Steven!*

Assessment of execution of automated strings

The patient experienced difficulties in the execution of automated statements that are typical for aphasia[26], e.g. (*Please name the days of the week*): *January, Feb… not that? Monday, Tuesday* […] [continues correctly]; (*Please count from ten to twenty*): *Sev…, ten, eleven,* […] [continues correctly]; (*Please name the days of the week*) *And you're annoying, December, Novem… December, Novem… of the week?…*

The fundamental deficit stemmed from comprehension disorders of heard instructions, disorders of the mechanism of semantic activation (with semantic paraphasiae most certainly being the re-

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logiczne" 2016, 21(2), pp. 170–187; conf. M. Rutkiewicz-Hanczewska, *Wiek a nazywanie. Procesy wyszukiwania słów w starszym wieku*, [in:] *Gerontologopedia*, ed. by W. Tłokiński, S. Milewski, K. Kaczorowska-Bray, Harmonia, Gdańsk 2018, pp. 241–269.

[24] In this situation, errors in naming cannot be fully excluded; more on visual perception conf. E. Zawadzka, *Świat w obrazach u osób po udarach mózgu*, Difin SA, Warszawa 2013.

[25] Conf. also E. Zawadzka, *Świat w obrazach u osób po udarach mózgu*, Difin SA, Warszawa 2013.

[26] Their recreation requires the usage of right-hemisphere strategies (conf. E.M. Szepietowska, J. Lipian, *Fluencja…*, op. cit., pp. 539–551).

sult of word selection anomia), while disorders of task initiation capacity (however, without greater disturbances of task course control) cannot be excluded.[27]

Assessment of repetition activity

The patient correctly repeated 100% vowels and consonants, 97% syllables, but only 71% syllable pairs. Lesser difficulties were observed when repeating short, one- or two-syllable words (80% correct), with the errors mostly being phonetic paraphasiae and perseverances. Significant difficulties were found when the patient was to repeat paronyms, with only 70% being executed appropriately; phonetic paraphasiae and omissions were found, e.g. (*dome – tome*) *dome, home? I don't know…*; (*fog – dog*) *dog?*[28]

Dysfunctions were also found when repeating words with a complex phonetic structure, above three syllables, e.g. (*etagere*) *Oh my, that's France, en…eta…*; (*ventilator*) *Please repeat it, fe, fee… ventilator*. The patient only repeated 20% of structural neologisms, e.g. (*timsa*) *I don't know what this is*; (*prewak*) *Pre…ga, it's no good, I'm a fool*.[29] During attempts at repetition of word series, he only recreated one two-component and one three-component string, e.g. (*oven, gate, lamp, cheese*): *Over… it's already gone… I heeeard everything, I know everything, but…*[30]

He was not able to remember sentences composed of more than three words[31], e.g. (*In a green meadow, a boy is running*): *First, what?*

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[27] Conf. E. Sitek, A. Barczak, K. Kluj-Kozłowska, M. Harciarek, *Afazja pierwotnie postępująca – diagnostyka różnicowa i terapia*, [in:] *Gerontologopedia*, ed. by W. Tłokiński, S. Milewski, K. Kaczorowska-Bray, Harmonia, Gdańsk 2018, p. 560.

[28] Acc. to J. Szumska, *Metody…*, op. cit., p. 21.

[29] Acc. to J. Szumska, *Metody…*, op. cit., p. 22.

[30] Acc. to J. Szumska, *Metody…*, op. cit., p. 22. The proprietary test aiming at the comparison of auditory and visual memory saw the patient score just ca. 10% better, indicating dysfunctions in visual memory as well.

[31] Acc. to J. Szumska, *Metody…*, op. cit., p. 22.

In a green children, God, sorry, in a gree… oh, a green child I would put that on the end, in a green…; (*Round, juicy, red cherries grow in the garden*): *Rou… nd… doctor, one word after another, I can do that, but not this way.* One could speak of several conditions of correct repetition, the first – fully operational auditory cortex, second – a postcentral (kinaestetic) cortex that would provide precise articulation, third – the possibility of switching from one articuleme to another, requiring flexibility of the premotor cortex of the left hemisphere, fourth – the possibility of abstraction from well-developed stereotypes and the reduction of alternatives, as provided with direct participation of the frontal lobes.[32] The repetition test results indicate that the dysfunctions observed in the patient mostly apply to the first of these links, hence, the patient experiences a significant impairment of the capacity to copy linguistic symbols.

Dictionary fluency assessment

The patient scored fairly low in verbal fluency assessments. In terms of formal fluency, for narrow categories, he only listed one word (*Please list as many words as possible beginning with f*): *My son's dog, Foto*; for broad ones, just six (*k*): *K? Koń, kot, król, książę* [horse, cat, king, prince[33]] *of course, too, k, right?… Well… I will not list Jarosław, I'll get angry again* [referring to a certain politician], […] *k is for, for, I already said księżniczka* [princess], *komuniści* [communists] […]. Similar results were found for semantic fluency, listing just seven animal names for a broad category: *Which ones? Animals… horse, cat, dog, goat, well then let's try she-ep[34], sheep, I looked in mirrors*

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[32] A. Łuria, *Podstawy neuropsychologii*, Wydawnictwo Lekarskie PZWL, Warszawa 1976, pp. 338–339; conf. also J. Panasiuk, *Afazja a interakcja. Tekst – metatekst – kontekst*, Wydawnictwo UMCS, Lublin 2013.

[33] Translator's note: Translations into English provided for this test for convenience of the reader; in general, only those statements were left in Polish that either do not require comprehension in terms of meaning or must remain in the original language for reasons of language itself.

[34] Hyphens indicate subdivision into syllables by the patient.

and I saw sheep, the ones in Africa… pacas, that carry… camel, those that are dying in Australia right now… I can see them, all these white […]. In a narrow category – names of sharp objects – only two lexemes conformed to the task criterion, with one semantic error and repetitions noted: *Axe, hammer, well, no… but one can hurt oneself… so, hammer… I already said mallet… axe… pitchfork is also fine… well, I can't say what else might leave blood on ice…* For verb fluency, the patient only named four lexemes. No significant difference was found in terms of the capacity to retrieve common nouns and verbs, in both attempts the fluency was well below the standard, with slight superiority in terms of noun fluency.[35]

Quite a high score was only found for a fluency test for proper nouns, with the patient quoting 23 city names. During the task, OTV was seen, e.g. […] *let's make it fun, do you know the one about Przemyśl* […]. The quoted names were mostly fused in clusters based on the criterion of geographic location (eight clusters, two unrelated names), only one was built on the basis of a formal criterion.

Several causes for the reduction of word fluency in the patient can be named, with the most basic one seeming to stem from so-called post-semantic anomia. The disorder encompasses the decay of semantic networks to a lesser extent. One cannot exclude bad thinking organisation and strategy as well, with these being related to the loss of general cognitive flexibility, execution disorders, memory and attention disorders. A reduction of the basic capacity – to understand commands – was rather not observed in this test.[36] The good result in proper noun fluency should be related to the fact that the related search processes occur along other cerebral pathways than for common nouns, as they are found in separate cerebral networks.[37]

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[35] Latest MRI examinations indicate that noun searches are dominated by areas of the left temporal lobe, while the prefrontal area of the dominant hemisphere handles verbs (conf. M. Rutkiewicz-Hanczewska, *Neurobiologia nazywania. O anomii prioprialnej i apelatywnej*, Wydawnictwo Naukowe UAM, Poznań 2016, p. 121).

[36] K. Jodzio, *Neuropoznawcze korelaty spadku fluencji po udarze prawej półkuli mózgu*, „Studia Psychologiczne" 2006, no. 44(2), pp. 5–18.

[37] More on this see M. Rutkiewicz-Hanczewska, *Neurobiologia nazywania…*, op. cit., p. 121.

Narrative skill assessment[38]

Self-narrative

The patient presented generally correct data about himself. He recalled his biography quite chaotically, making minor factual errors that applied to dates of specific events, he recalled periods, sometimes omitting significant facts and recalling unimportant data, but not confabulating: *November 21st, I was born… October 21st, […] of, well, school, primary school, naturally, secondary textile technical school… I wanted to become a journalist, but I was not accepted, in Kraków, […] I did not want to study at… oxen… at Łódź… at the Technical University… as an engineer… in the tex-tile industryyy… went to the army… to… […], I passed some… but I wouldn't give, then we started, I started working […].*

Description

The patient referenced the image he was in quite a limited manner.[39] He did not use typical introductory phrases. He saw diverse layers of events, but referred to them fragmentarily. He had difficulty using event presentation rules: *House… house… houses… highrises… well, cars going… this way… pers, passenger… one… or truck… well, passenger in fact, it's just, that it's just a tr… a tree, a lady is walking… a dog, I don't remember its name… but I did… I did not want to have one like that, this story… one of a hundred… there are houses… from the beginning of the twentieth century, and then women… women in front of a… store, not with photographs, with overloads, not with overloads […].*

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[38] More on narrative, see: A. Domagała, *Narracja i jej zaburzenia w otępieniu alzheimerowskim*, Wydawnictwo UMCS, Lublin 2015; T. Woźniak, *Narracja w schizofrenii*, Wydawnictwo UMCS, Lublin 2005; S. Grabias, *Postępowanie logopedyczne. Standardy terapii*, [in:] *Logopedia. Standardy postępowania logopedycznego*, ed. by S. Grabias, J. Panasiuk, T. Woźniak, Wydawnictwo UMCS, Lublin 2015, pp. 955–995.

[39] The image was used found in the test suggested by J. Szumska (*Metody…*, op. cit., p. 19).

Re-narrative

In the re-narrative test, the patient was asked to listen to and abridge a short story.[40] The mode of retelling indicates that he is unable to create a coherent narrative: *A drunkard wanted to drink hoo-ot wine… he slept and dreamt that he is drinking on ho-ot wine, but when he woke… it's cold and he has to drink wine… with cold wine…* The created narrative scene contained few significant references, the patient was aware of the existence of the story line, he wanted to bring events in order, express a cause-and-effect relationship, but as the story progressed he lost significant data, hence, references became rare, with pragmatic cohesion also missing.

Assessment of simultaneous and successive gnosis

Tests to assess the capacity to perceive cause-and-effect relations by the patient, entailing the arrangement of so-called "picture stories" and telling them, suggest the presence of dysfunctions of complex thought processes. The patient was only able to arrange an uncomplicated three-part story[41], with the narrative tangentially referring the pictures and lacking significant data.

Assessment of calculia

The patient correctly named all the numbers presented to him and mathematical signs, recognising 87% of them[42]. He correctly executed so-called "non-verbal" (simple and complex)[43] tasks. Deficits were noted for word problems, e.g. (*There were four crates with*

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[40] *The drunkard dreamt of holding a jug of cold wine in his hand. He wanted to have it heated, when he suddenly woke. „I should have drunk it cold" he thought with regret* (J. Szumska, *Metody…*, op. cit., p. 54).

[41] E.M. Szepietowska, *Badanie…*, op. cit., pp. 87–89.

[42] J. Szumska, *Metody…*, op. cit., p. 58.

[43] J. Szumska, *Metody…*, op. cit., pp. 59–60.

applies in the basement, each contained 120 apples. One crate was sold, how many apples remain?)[44]: *I already forgot, I forgot the first time.* [Wording was repeated] *Okay… 120 in total, and … one sold… how many? How many, well… you need to divide 120 by… by four times three, or 120, sixty… thirty… ninety… I think.*

The errors made and the tasks that they emerged in indicates that the patient used arithmetic facts when performing non-text tasks, and that he used aid strategies when handling word problems. The patient has retained the ability to present values by numbers, but his ability to bind amounts with symbolic representations using words is impaired.[45] The lack of disorders in tasks aimed at comparing numbers or the assessment of set sizes suggests that the area responsible for these activities, e.g. the horizontal segment of the intraparietal sulcus of both hemispheres was not damaged.[46] A comparison between the ability to perform tasks requiring the use of verbal and non-verbal code allows the conclusion that the dyscalculia observed in the patient is secondary, hence, caused by language and memory deficits, and, to a lesser extent, a disorder of the general plan and the executive partrequiring the execution of quasi-spatial operations.[47]

Reading assessment

The patient used the correct names for the majority of the letters he was presented with[48] (89%) (with minor errors in execution: (s) *se*, (ł) *uł, ał, eł* and one perception error (b) *ha, ha, well one can say it's b, it's written-down like this, I thought it was be*). The patient made

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[44] J. Szumska, *Metody…*, op. cit., p. 61.

[45] Conf. M. Gryko-Sobańska, *Rehabilitacja osób z akalkulią w neuropsychologii poznawczej*, [in:] *Wybrane zagadnienia rehabilitacji neuropsychologicznej*, ed. by E. Łojek, A. Bolewska, Wydawnictwo Naukowe Scholar, Warszawa 2008, p. 157.

[46] Conf. M. Gryko-Sobańska, *Rehabilitacja…*, op. cit., p. 157.

[47] Conf. A. Łuria, *Podstawy…*, op. cit., pp. 338–339.

[48] Acc. to J. Szumska, *Metody…*, op. cit., p. 51.

no errors when reading pairs of letters differentiated by one property. The paronyms he read out[49] showed some execution errors and perseverances (8%) e.g.: (*rama – mama*): *rama-wama, rama wama, mama sorry, rama wamama.*

In the texts read[50] errors were observed that were analogous to those noticed in the subject's speech, e.g. perseverances, stuttering, division of words into syllables, sound elongation. These phenomena may indicate dysfunctions in the transformation of graphemes into morphemes. Minor phonetic deformations and elisions were found of sounds difficult to execute. No disturbances were found for the mechanism of searching of lines with the sight.[51] No significant disturbances were noted for reading of functional words (with their reading being most commonly disturbed in aphasiae[52]), it is also difficult to see for which part of speech they were most common, as this generally depended on word length, e.g. (Trees bloom in the spring) *Trees blo-om in the sprin spring, spr-ing*; (Berries are tasty, black and round): *Merr… merr… ber-ries are tasty, black and ro-und.*

Structural neologisms[53], the ability to read which is considered a measure of pure phonological processing (as one cannot compensate difficulty through lexical or grammatical knowledge), were read by the patient several times, he looked for meanings, did not make errors in execution. It was very difficult for the patient to indicate the word written wrong among those written correctly, and made multiple analyses of their sound and letter structure, ultimately failing this test.[54]

A disproportion was noted between reading aloud and reading with comprehension, in particular for sentences and longer texts[55]

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[49] Acc. to J. Szumska, *Metody…*, op. cit., p. 52.

[50] Acc. to J. Szumska, *Metody…*, op. cit., pp. 53–54.

[51] Conf. A. Domagała, *Zaburzenia komunikacji pisemnej u osób z chorobą Alzheimera*, [in:] *Zaburzenia komunikacji pisemnej*, ed. by A. Domagała, U. Mirecka, Harmonia, Gdańsk 2017, pp. 524–545.

[52] Conf. M. Pąchalska, *Język…*, op. cit., p. 174.

[53] Acc. to J. Szumska, *Metody…*, op. cit., p. 22.

[54] Acc. to J. Szumska, *Metody…*, op. cit., p. 55.

[55] Test used as suggested by E.M. Szepietowska, *Badanie…,* op. cit., p. 23.

(the patient recalled the content they read in a very limited manner, he was also usually unable to give answers corresponding to the read text).[56]

Writing assessment

In general, the patient made no errors when listening to letters (if any, they mostly applied to the pair voiced – unvoiced), usually having no difficulty in finding the graphic counterparts of sounds (96% correct).

In the attempt to write automated texts, he had difficulty choosing the correct string, but continued it without error (see image no. 2).[57] Slight difficulties were observed for the written expression of fundamental data about his person – he wrote the first version of his first and last name slowly and using capital letters, and only after he was confident that the note is correct, he repeated it, using capital and small letters correctly. He correctly noted the name of the street where he lives, making an error in the building number, similar to the one he made when speaking. He recreated a formalised text (a sheet with greetings) correctly, correctly entering the necessary formal data, limiting himself to the word *regards*.

Significant changes were found for written words and sentences. Errors were found indicating disturbances of the model of graphically-similar marks, errors caused by disturbances in syllable, sound and letter analysis. During attempts at writing longer word structures, mechanisms showed up indicating disturbances to inertia, e.g. he would divide several times into syllables (usually making errors) a word he was told to write, eventually writing the structure

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[56] Conf. H. Marczewska, *Zaburzenia językowe w demencji typu Alzheimera i demencji wielozawałowej*, [in:] *Nie tylko afazja…*, ed. by H. Marczewska, E. Osiejuk, Energeia, Warszawa 1994, pp. 7–60.

[57] Damage of left hemisphere structures lead to decay in conscious writing skills, while habitual writing forms are frequently more resistant to decay, rather being related to memory mechanisms than modes of processing of new information (conf. J. Panasiuk, *Język…*, op. cit., p. 169).

that was best available to him at the time, or he would fall back on the previous one (conf. image no. 2). Executions were also seen not aligned with the ortophony: (po górach): *po kórach* (conf. image no. 2). It is difficult to assess the quality of spontaneous writing, even though he was frequently encouraged, he avoided creative writing.

Noticeable was an increase in font size and limited line freedom and fluidity.[58]
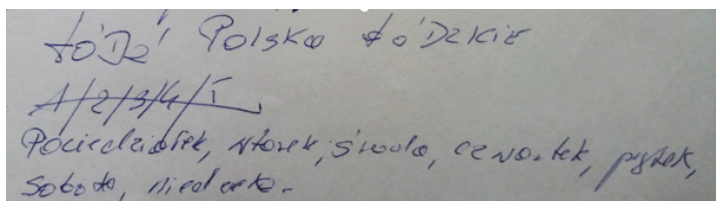
Image no. 1. Source: own research. Writing sample
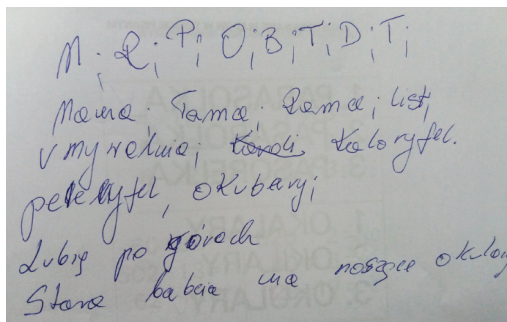
Image no. 2. Source: own research. Writing sample

Research results analysis

Comprehension and execution of units of the phonological sub-system: The patient would generally recognise system units, but did

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[58] Conf. A. Domagała, *Zaburzenia…*, op. cit., pp. 524–545.

not always execute them correctly. The most significant phonetic changes were found in repetition tests, but they were also present in spontaneous speech. The disturbances were quantitative and qualitative, with perseverations, elisions, contaminations, transmutations, metatheses, epentheses and reductions.[59] Some phonetic disturbances stemmed from the mode of execution of alternations conditioned by the morphological or phonological context, e.g. *I don't know what this could be, it could be backing, bayking; Wash*ing, *she's wasing, waaashing.* Seen were also – even if rarely – changes contrary to ortophony, e.g. *waz-ter* (water). Changes interfering with the linear order of the phonological order are rather tied to imbalance of auditory word templates.[60]

The patient would correctly recognise prosodic properties, but would rarely execute them correctly. In fact, only highly automated statements were appropriate in terms of intonation and accent. In spontaneous speech and exercises requiring metalinguistic operations, variable efficiency was recorded. The intonation form was very frequently fragmented, the accent was shifted and pauses emerged caused by disturbances in the correct formulation of statements. Changes were also noted in terms of the use of vowel length – the patient masked the presence of auditory agrammatisms by lengthened vowel articulation. The patient's rhythm of speech was also highly disturbed.[61]

Comprehension and articulation of units of the morphological subsystem: among the significant properties that were registered in this regard, listed must be capacity disturbances: word decoding and actualisation, comprehension and expression of meaning using

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[59] The pathology of such phenomena, which may emerge in the speech of healthy people as well, is clear from their high frequency and chronicity (conf. J. Panasiuk, *Język…*, op. cit., p. 126).

[60] Conf. J. Panasiuk, *Język…*, op. cit., p. 139.

[61] Quite a typical phenomenon in aphasia. It is worth noting that the patient also had problems with perception and the recreation of rhythmic patterns, possibly in relation to mnestic difficulties and analysis unit (auditory, kinetic and kinaesthetic) coordination disorders (conf. J. Panasiuk, *Język…*, op. cit., p. 165).

inflection endings, comprehension and construction of sentence syntactic structures, comprehension and execution of metalinguistic operations.

The patient had very limited capacity to decode the verbal commands directed at him, in particular those with a complex logical, semantic and grammatical structure, hence, he used diverse mechanisms to mask deficits, e.g. repeating the command, asking for it to be repeated[62] or giving an answer immediately, one that was to a certain extent semantically related to the required response. Disturbances of the capacity to decode and actualise lexical resources expressed in the lack of word readiness, the TOT syndrome[63], the presence of semantic paraphasiae, the usage of descriptive structures or non-verbal communication. Their consequence was the loss of the train of thought and syntax disturbances shining through in agrammatisms. The engagement of a significant portion of cognitive abilities to look for a specific word caused the patient to be unable to return to the original statement plan and to continue the sentence they originally started.[64] He would quickly lose the data needed to construct a statement, and disturbed feedback control, with an extended processing time, caused the objective to be lost and the intratextual relations to decay.[65]

The mechanism of emergence of the agrammatisms noted should be tied to the volatility of auditory word patterns.[66] Agrammatisms also shone through in the dropping of grammatical mor-

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[62] In both cases, the patient would gain time to analyse the heard message. Command repetition may also suggest a reduction of speed or disturbances in the capacity to initiate purposeful activity.

[63] Conf. M. Kielar-Turska, K. Byczewska-Konieczny, *Specyficzne właściwości posługiwania się językiem przez osoby w wieku senioralnym*, [in:] *Biomedyczne podstawy logopedii*, ed. by S. Milewski, J. Kuczkowski, K. Kaczorowska-Bray, Harmonia, Gdańsk 2014, pp. 437–441.

[64] Conf. E. Sitek, *Mowa w chorobie Alzheimera*, [in:] *Choroba Alzheimera zaburzenia komunikacji językowej*, ed. by A. Domagała, E. Sitek, Harmonia, Gdańsk 2018, p. 62–70.

[65] Conf. T. Woźniak, *Narracja*…, op. cit. p. 115.

[66] Conf. J. Panasiuk, *Język*…, op. cit., p. 179.

phemes that were free (functional words) as well as bound (inflection endings), the reduction of phrase length and complexity and the reduction of speech tempo.[67] Most errors applied to the execution of the grammatical case. Statements by the patient clearly indicated a reduction of the verb count as compared to the requirements of text cohesion, but, when he used them, he used the grammatical tense category rather correctly. Examples were seen of usage of the wrong person (errors usually spanned bidirectional exchange between the first person singular and first person plural). No significant errors were seen in terms of the use of aspect, mood[68] or voice, but thus is most probably the result of the limited number of verbs and the formation of very similar syntax structures, and not of skilful usage of the listed categories. Visible was neutralisation of properties in the passive voice forms, e.g. for activity naming tests: (get dressed:) get dressed or undress; (wash oneself:) wash, bathe.

Conclusions

The quantitative and qualitative analysis of the acquired data suggests a diagnosis of the patient with disturbances of language competences and skills, which best fit the image of changes noted in acoustic-mnestic aphasia. Their consequence are dysfunctions in terms of communication competences and skills, which lead to reduction of patient interaction in a group (in particular verbal interaction). Significant disturbances were also noted in terms of other linguistic activities.

The speech disturbances are significant enough for the patient to execute their communication intentions appropriately, being not always able to properly recognise their interlocutor's intentions. He

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[67] Conf. J. Panasiuk, *Język…*, op. cit., p. 178.

[68] In statements encouraged by the speech therapist, the patient most commonly used the indicative mood, due to the grammatical cohesion of the text; however, he could not cope at all in metalinguistic tasks using transformation possibilities of one mood into another.

has significantly reduced capacity to influence other people's behaviour in social situations.[69] The logical content statement structure of the patient decays, and he himself requires an increased participation of their counterpart during interaction. The patient frequently uses non-verbal communication forms, at times using the statements of their interlocutor, and rather does not use other forms of language communication.[70]

The functioning of the patient is determined by disturbances in the linguistic, communication and interaction spheres, overlaid by disturbances of memory and concentration, reduction in information processing speed and a drop of the learning performance.[71] The patient's cognitive skills do not completely correlate with the depth of speech disturbances (he is quite independent), however, they do correlate with their type.

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[69] Conf. A. Tomorowicz, *Struktura kompetencji społecznych w ujęciu interakcyjnym*, „Psychiatria" 2011, vol. 8, no. 3, p. 91.

[70] Conf. M. Pąchalska, *Skala komunikacji niewerbalnej*, 2012, p. 397.

[71] Conf. D.I. Dominguez, B. De Strooper, *Novel therapeutic strategies provide the real test for the amyloid hypothesis of Alzheimer's disease*, „Trends in Pharmacological Sciences" 2002, no. 23, pp. 324–330.

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