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SINTACTIC DEFICITITS IN APHASIA: BROCA AND WERNICKE.

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Abstract: This article examines the features of syntactic impairments in the two main types of aphasia – Broca's aphasia and Wernicke's aphasia. Definitions and characteristics of each type of aphasia are provided, and typical grammatical errors in patients' speech are analyzed. Contemporary neurolinguistic and psycholinguistic data are discussed, demonstrating the nature of these impairments and the brain's compensatory strategies. Examples from diagnostic practice are included, comparing samples of agrammatic and paragrammatic speech with normal speech. In conclusion, the differences between the models of syntactic deficit in Broca's and Wernicke's aphasia are emphasized, as well as the significance of these findings for understanding the organization of language functions in the brain.
Key words: Broca's aphasia, Wernicke's aphasia, agrammatism, paragrammatism, syntax, neurolinguistics, psycholinguistics, telegraphic speech, word salad

Introduction

Aphasia is a disorder of language function that arises from a focal brain lesion (usually stroke, traumatic brain injury, or tumor) in a person with previously developed speech. The classical neurolinguistic tradition distinguishes two main types of aphasia, first described in the 19th century: Broca's aphasia (expressive, motor) and Wernicke's aphasia (sensory, receptive). In the most general terms, the difference between them is that a lesion in Broca's area (the inferior frontal gyrus of the dominant hemisphere) impairs the ability to speak in a grammatically connected manner – the construction of syntactically correct sentences is disrupted[1]. Conversely, a lesion in Wernicke's area (the posterior third of the superior temporal gyrus) primarily impairs speech comprehension, and the patient's own speech, although remaining fluent and syntactically well-formed, loses semantic coherence[2]. Simply put, Broca's aphasia leads to nonfluent, "telegraphic" speech that is poor in grammatical elements, whereas Wernicke's aphasia is characterized by fluent, grammatically elaborate speech that is filled with lexical and semantic errors (often referred to as *word salad* in English). These differences reflect different mechanisms of impairment: frontal (motor) brain regions are critical for the grammatical organization of speech, whereas temporal (sensory) regions are responsible for linking words with their meanings.

Research into the syntactic deficits in these types of aphasia is of great importance for neurolinguistics. Analyzing grammatical errors in the speech of aphasic patients helps us understand how the normal brain processes syntax and how the contributions of lexical and grammatical components can be separated. Extensive clinical data have been collected (starting from the works of P. Broca, C. Wernicke, and A.R. Luria) on the characteristic symptoms of these aphasias, and modern methods (functional neuroimaging, experimental

[1] ncbi.nlm.nih.gov
[2] britannica.com

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psycholinguistics) refine our understanding of the nature of these impairments. Below, we present definitions and characteristics of Broca's aphasia and Wernicke's aphasia, with special emphasis on their syntactic features, accompanied by examples and references to current research.

Typology of Aphasia and General Characteristics

In the classical model (Boston school of neuropsychology), Broca's aphasia and Wernicke's aphasia represent opposite poles – nonfluent and fluent aphasia, respectively. Broca's aphasia results from damage to the so-called motor speech center (Broca's area in the posterior frontal regions) and leads primarily to a disorder of expressive speech – an inability to construct grammatically correct utterances. Wernicke's aphasia, in contrast, is caused by damage to the area responsible for speech perception and comprehension (Wernicke's area in the temporal lobe), and it leads to a disorder of receptive speech – an impairment in understanding the meanings of words and sentences. In A.R. Luria's neuropsychological classification, Broca's aphasia corresponds to *efferent motor aphasia* and Wernicke's aphasia to *acoustic-gnostic aphasia* (sensory aphasia). Both syndromes are forms of cortical aphasia in the dominant hemisphere (left hemisphere for right-handers) and are often accompanied by other neurological symptoms (e.g. right-sided paresis); however, their speech manifestations are specific and relatively isolated.

Before turning to a detailed examination of syntactic impairments, let us note the main manifestations of these aphasias. **Broca's aphasia** is characterized by a significant reduction in speech output: spontaneous speech utterances are very short, producing words requires effort, and speech loses its fluency and becomes halting[3]. The patient's verbal output is nonfluent and often limited to single words or short phrases. Repeating heard words and phrases is also difficult. Importantly, comprehension of spoken language is largely preserved – patients with Broca's aphasia usually understand simple sentences correctly – but they experience difficulty when perceiving complex syntactic constructions (for example, passive voice, comparative clauses, etc.). **Wernicke's aphasia**, on the other hand, is characterized by the patient speaking a great deal and fluently, with no apparent articulatory effort, but speaking incoherently. Their speech contains numerous phonemic and verbal errors (paraphasias) and strange neologisms that distort meaning. The grammatical structure of sentences may remain formally correct – prepositions, verb endings, and agreement are present – but the content of the utterance is disrupted to the point of complete nonsense. This phenomenon is aptly dubbed *"словесная окрошка"* ("verbal okroshka," a Russian term analogous to *word salad* in English) in the Russian literature. Furthermore, comprehension of language is severely impaired in Wernicke's aphasia: patients do not understand even simple questions or instructions, despite having normal hearing. Many of them are unaware of their communication deficit and may become frustrated or agitated if their listener fails to understand their speech.

Below, we will examine in detail the syntactic features of speech in each of these types of aphasia – *agrammatism* in Broca's aphasia and *paragrammatism* in Wernicke's aphasia – with examples and a comparative analysis.

Broca's Aphasia: Syntactic Features of Speech

Broca's aphasia (efferent motor aphasia) arises from damage to Broca's area in the inferior frontal gyrus of the dominant hemisphere, usually as a result of an infarct in the territory of the left middle cerebral artery. The classic symptom is nonfluent, *telegraphic speech*: the patient

[3] ncbi.nlm.nih.gov

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utters only individual content words, omitting function words and grammatical morphemes. This reflects *agrammatism* – a breakdown of the grammatical structure of utterances[4]. Sentences are maximally simplified: primarily noun and verb stems are used in their base form, without inflections for case or tense. For example, instead of the full sentence *"Today the weather is good, and I want to go for a walk,"* a patient with Broca's aphasia might say: *"today... weather... good... I... walk,"* leaving out the connecting elements. The speech takes on a so-called "telegraphic style," where only the most semantically important words are produced (nouns, verbs), and the grammatical links between them are not expressed[5]. As a result, the utterance loses grammatical correctness and form, although the overall meaning can sometimes be guessed from the key words.

Notably, agrammatism in Broca's aphasia manifests not only in spontaneous speech but also in difficulty with grammatical transformations: such patients find it hard to inflect words for case and tense or to construct complex sentences. They often use an infinitive where a conjugated verb form is required, use the nominative case instead of oblique cases, and drop prepositions or replace them with simpler ones. For example, when asking for a glass of water, a patient might say: *"give... water"* instead of the correct *"give me a glass of water,"* omitting the direct object. Or they might say *"mom... house"* instead of *"mom is in the house,"* dropping the preposition and ending. These errors reflect an inability to maintain syntagmatic connections between words in a sentence – an inability to sequentially develop the predicative structure of an utterance. The speech becomes fragmentary: the unified scheme of a sentence breaks down into separate pieces, which the patient utters with pauses and effort.

Interestingly, telegraphic speech was long viewed simply as a direct consequence of the deficit caused by brain damage. However, modern research suggests there may also be an adaptive component to such speech. For example, neurobiologists from Massachusetts General Hospital (USA) have shown that in Broca's aphasia the brain can develop a compensatory strategy: patients strive to maximize the informational content of their utterances, given that they cannot construct long sentences[6]. In an experiment where patients were asked to describe a picture, individuals with Broca's aphasia selected the most semantically rich words, attempting to convey the meaning with a minimum of lexical means. In other words, their "telegraphic" speech contains precisely those words that carry the main information, and the brain essentially drops the less essential grammatical elements. This suggests that agrammatism is not a random jumble, but to some degree a systematic simplified system that preserves basic communication. Nevertheless, even with such compensation, the ability to express finer relationships (tense, case, logical connections) is sharply limited in patients with Broca's aphasia.

In addition to speech production, patients with Broca's area lesions show difficulties in understanding complex syntactic constructions. Although everyday simple phrases are understood, comprehension of passive voice, sentences with unusual word order, or embedded clauses can be impaired. For example, a sentence like *"The boy, who is being chased by the girl, fell down"* might be misinterpreted by an agrammatic aphasic (who may think that the girl fell), as they rely more on the meaning of individual words than on grammatical markers such

[4] Le H, Lui F, Lui MY. Афазия. [Обновлено 29 октября 2024 г.]. В: StatPearls [Интернет]. Treasure Island (Флорида): StatPearls Publishing; январь 2025 г.
[5] Там же
[6] Губайловский В. Речь пациента после инсульта отражает адаптивную стратегию мозга // TechInsider.ru, 23 August 2023.

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as word order or inflections. This receptive agrammatism is related to the fact that patients have a reduced ability to use grammatical relationships to decode meaning, so they tend to rely on lexical meaning and context. Normally, understanding speech requires attending to morphological and syntactic cues (who did what to whom, etc.), but in Broca's aphasia this mechanism is weakened. Experiments confirm this impairment: Broca's patients exhibit specific errors in understanding complex constructions, whereas patients with Wernicke's aphasia (see below) often fail to comprehend the sentence entirely due to a semantic deficit.

In summary, the syntactic deficit in Broca's aphasia is manifested in **expressive agrammatism** (telegraphic speech with simplified grammar) and a relative inability to comprehend grammatically complex sentences. Even so, the content of utterances remains meaningful to a degree: a Broca's aphasic typically "speaks to the point," albeit in grammatically incorrect form. They attempt to convey the basic meaning, sacrificing the form. This stands in contrast to the situation in Wernicke's aphasia, where the form may be intact, but the meaning is lost.

Wernicke's Aphasia: Syntactic Features of Speech

Wernicke's aphasia (sensory aphasia) results from damage to Wernicke's area – a cortex region responsible for phonemic hearing and semantic processing of speech in the superior temporal gyrus. As a result, the patient's understanding of both others' speech and their own speech is profoundly impaired. The primary receptive symptom is the phenomenon of *"word meaning alienation"*: the patient hears speech but does not understand the meaning of words, as if language has become an unfamiliar string of sounds. However, the ability to produce words and build sentences is relatively preserved – leading to a striking discrepancy between the patient's fluent speech and the lack of comprehension. Expressive speech in Wernicke's aphasia is characterized by **logorrhea** (press of speech) – the person speaks at length, rapidly and without pauses, with normal intonation, but the content of the speech is pathologically distorted.

A typical feature of spontaneous speech in such patients is the abundance of **paraphasias** – substitutions in words and sentences. There are *literal (phonemic) paraphasias*, which are distortions of the sound structure of words (for example, the patient might say "tol" instead of "stol" ("table") or "luka" instead of "ruka" ("hand")), and *verbal (semantic) paraphasias*, which are the substitution of one word for another based on meaning or even random association (for example, asked *"What is your name?"* the patient might answer: *"Me… uh… this… what's it… long ago…"* inserting unrelated words). In addition to paraphasias, speech is filled with **neologisms** – made-up "words" that do not exist in the language (for instance, a patient might call a pen *"blizhka,"* a non-existent word). With a combination of many such errors, utterances become completely incoherent: words seem to be strung together in random order, sentences are long but informationally empty. The grammatical form of the sentence may actually be maintained: function words, verb conjugations, and noun inflections are present – patients do not reduce syntax to a telegraphic style. On the contrary, they may produce lengthy, complex sentences, except the words filling those structures do not match their intended meaning. This type of grammatical disruption is called **paragrammatism** – an inability to appropriately use grammatical forms and structures despite preserved "fluent" speech. For example, a patient with Wernicke's aphasia, instead of correctly saying *"The cat is drinking from the saucer,"* might say: *"Kitty from saucery drinks,"* incorrectly inflecting the word "saucer" and thus altering the meaning. In another case, a patient describing a picture said: *"Boy girl… er… running… boat…"* – trying to express the idea "the

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boy is chasing the girl in a boat," he produced a set of words that were not grammatically coordinated. These examples illustrate that the syntactic structure is not utterly destroyed, but it is filled with incorrect content and loses communicative value. The speech contains plenty of function words, but they fail to convey a meaningful message.

A distinguishing feature of Wernicke's aphasia is the **lack of insight** into one's own speech impairment. The patient usually does not realize that their speech is unintelligible[7]. They may speak rapidly and emphatically in this "nonsense," remaining confident that they are communicating normally. If the listener does not understand them, a Wernicke's patient is likely to become irritated and to repeat themselves even more verbosely, or else they completely lose the thread of the conversation. In the acute phase, some patients become confused or even exhibit paranoid-like behavior, which is likely related to profound frustration due to the loss of the ability to understand others' speech. Indeed, beyond speech production, sensory aphasia involves a severe breakdown in language perception across all modalities: patients cannot understand spoken language, cannot meaningfully read (even though they may read aloud), and they do not even monitor their own spoken words by ear.

It is important to emphasize that the syntactic deficits in Wernicke's aphasia are of a different nature than those in Broca's aphasia. Here we do not see classic agrammatism: patients do not simplify grammar down to a primitive form. Instead, what occurs is **paragrammatism**, i.e. a disruption in the ability to correctly deploy grammatical elements, despite the preservation of fluent speech. Grammatical errors in Wernicke's patients are often inconsistent: they might use a correct form one moment, and a moment later an incorrect form (for example, correctly inflect one word, but then mis-inflect another in the same sentence). This suggests that the grammatical framework of speech is still being formed by the brain, but filling that framework with specific words and morphemes becomes chaotic due to the breakdown of semantic control. In other words, the Wernicke's patient's brain can construct a syntactic "skeleton" of an utterance, but the process of populating that skeleton with meaningful content goes awry because the link between words and their meanings is lost. As a result, speech turns into a logically incoherent flow. If a Broca's aphasic "knows what they want to say but cannot say it," a Wernicke's aphasic *can* speak but *does not know what they are saying* – they have lost the connection between words and meaning.

Comparison of Syntactic Impairments in Broca's and Wernicke's Aphasia

Summarizing the features of the two syndromes, we can compare their characteristics in terms of syntax and grammar (in contrast with the normal condition):

Fluency of speech: In Broca's aphasia, speech is nonfluent – slowed, with short phrases and many pauses. In Wernicke's aphasia, speech is fluent – normal or even increased in rate, with words flowing without hesitation[8]. *Normal:* In healthy speech, the average utterance length and smoothness depend on context, but a person without aphasia does not exhibit forced telegraphic brevity or unrestrained verbosity.

Grammatical structure of utterances: Broca's aphasia is characterized by **agrammatism** – a drastic simplification of sentence structure. Utterances consist of only one or two words or fragments; complex constructions are absent, and function words (articles, prepositions, auxiliary verbs) are omitted. Wernicke's aphasia is characterized by

[7] ru.wikipedia.orgм
[8] Le H, Lui F, Lui MY. Афазия. [Обновлено 29 октября 2024 г.]. В: StatPearls [Интернет]. Treasure Island (Флорида): StatPearls Publishing; январь 2025 г.

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paragrammatism – on the surface, speech is grammatically expanded (function words, conjunctions, and inflections are present), but there are errors in choosing grammatical forms and in agreement; sentences may be grammatically possible, yet they do not correspond to the intended message. *Normal:* Typical speech uses both function and content words; grammatical rules are generally observed, and errors are infrequent.

Lexical-semantic content: In Broca's aphasia, the speech's vocabulary is sparse but relatively semantically accurate: the patient uses simple words, often concrete nouns and verbs, that directly relate to the topic (e.g. "bread," "house," "go")[9]. In Wernicke's aphasia, the lexical output is abundant but semantically aberrant: in addition to common words, the speech is filled with neologisms, incorrect word substitutions, and repetitions, which render the utterances uninformative or nonsensical. *Normal:* A healthy speaker selects words appropriate to the intended meaning of the utterance; the appearance of meaningless sound combinations or unrelated words is not typical.

Comprehension of syntactically complex sentences: Broca's aphasia patients have moderate difficulty understanding grammatically complex sentences – they may misinterpret passive constructions, lengthy descriptive sentences, or other structures that require close attention to word order or inflections. Wernicke's aphasia patients have a profound impairment in understanding **any** sentences – they often fail to grasp the meaning even of simple sentences, let alone complex ones. *Normal:* Given sufficient language proficiency, healthy individuals can understand sentences of any complexity, although more complex sentences may take a bit more time to process.

Awareness of errors: Patients with Broca's aphasia are usually **aware** of their difficulties – they notice that they cannot speak "properly," often attempt to self-correct, and become upset by their inability to produce normal speech. In contrast, patients with Wernicke's aphasia **do not realize** the absurdities and mistakes in their own speech. This difference is related to the fact that in Broca's aphasia, comprehension (including hearing one's own speech) is largely intact, whereas in Wernicke's aphasia it is not. *Normal:* Speakers without aphasia typically monitor their own speech and notice slips or mistakes, correcting them as needed.

In combination, this comparison shows that the agrammatic speech of Broca's aphasia is marked by an economy of words and loss of grammatical connectives, whereas the paragrammatic speech of Wernicke's aphasia overflows with words and is formally connected but lacks meaning. Both types of impairment deviate sharply from normal speech, but in different ways: Broca's aphasia lays bare the content by sacrificing form, while Wernicke's aphasia preserves the semblance of form at the cost of content. In normal language function, grammatical correctness and semantic coherence work together to convey a message; the cases of Broca's and Wernicke's aphasia demonstrate that these components can become dissociated by focal brain lesions.

Conclusion

The syntactic deficits in Broca's aphasia and Wernicke's aphasia represent two contrasting profiles of disruption in the grammatical organization of speech. In Broca's aphasia, we observe a *collapse* of grammar – speech becomes telegraphic and agrammatic, yet remains relatively informative in lexical content. This is associated with damage to brain areas crucial for the motor programming of speech and the combination of words into structured utterances.

[9] Губайловский В. Речь пациента после инсульта отражает адаптивную стратегию мозга // TechInsider.ru, 23 August 2023.

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In Wernicke's aphasia, by contrast, the grammatical structure of speech remains largely intact, but there is a breakdown of semantic control – speech turns into a meaningless flow of words despite the formal preservation of grammar. This is due to damage in regions responsible for recognizing sounds and linking words with their meanings. Both syndromes reinforce the principle of a division of labor in the brain's language function: frontal regions are critically important for syntax, whereas temporal regions are essential for semantics.

Contemporary research adds to the classical clinical picture by showing that the brain, even under pathological conditions, attempts to optimize communication. For instance, in the case of Broca's aphasia, compensatory strategies have been observed – such as the selection of the most meaningful words – which points to the plasticity of cognitive processes. Investigating such mechanisms has both theoretical and practical significance. Understanding the specific grammatical errors in different types of aphasia helps in developing targeted speech rehabilitation methods: speech therapy programs for agrammatism will differ from programs to treat "word salad" speech. Moreover, the comparison of Broca's and Wernicke's aphasia has served as a foundation for developing linguistic theories of the brain's organization of language. These two syndromes are often cited in textbooks to illustrate that grammar and vocabulary have relative autonomy in the brain.

In conclusion, the syntactic deficits in Broca's aphasia and Wernicke's aphasia differ substantially in nature. Broca's aphasia is primarily a loss of the grammatical "toolkit" of speech (agrammatism), whereas Wernicke's aphasia is a loss of the integrating "meaning" of speech with a superficially preserved grammar (paragrammatism). Studying them enriches neurolinguistics by revealing how different brain areas contribute to the unity of form and content in language. These findings also underscore that effective communication requires the coordinated work of all components of language – both grammar and semantics – as a disruption of either one leads to serious speech pathology.

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