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5 APHASIA IN NEUROLINGUISTICS STUDY: A PRELIMINARY STUDY

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Abstract

Aphasia is a language disorder that occurs due to damage to the brain, which affects a person's ability to speak, understand, read, and write. It can affect various aspects of language, such as phonology, semantics, syntax, and pragmatics. Neurolinguistic studies have helped us understand more about aphasia and how damage to the brain affects language. The study of aphasia has provided insight into the organisation of language in the brain and how damage to certain areas can affect language ability. This article provides an initial overview of aphasia in neurolinguistic studies, discussing the definition and characteristics of this language disorder, as well as factors that affect language recovery after experiencing aphasia. Overall, this article aims to provide a basic understanding of aphasia in neurolinguistic studies and how this research can help us understand more about language and the brain.

Abstrak

Afasia adalah gangguan bahasa yang terjadi akibat kerusakan pada otak, yang memengaruhi kemampuan seseorang untuk berbicara, memahami, membaca, dan menulis. Gangguan ini dapat memengaruhi berbagai aspek bahasa, seperti fonologi, semantik, sintaksis, dan pragmatik. Studi neurolinguistik telah membantu kita memahami lebih lanjut tentang afasia dan bagaimana kerusakan pada otak memengaruhi bahasa. Studi tentang afasia telah memberikan wawasan tentang organisasi bahasa di otak dan bagaimana kerusakan pada area tertentu dapat memengaruhi kemampuan bahasa. Artikel ini memberikan gambaran awal tentang afasia dalam studi neurolinguistik, membahas definisi dan karakteristik gangguan bahasa ini, serta faktor-faktor yang memengaruhi pemulihan bahasa setelah mengalami afasia. Secara keseluruhan, artikel ini bertujuan untuk memberikan pemahaman dasar tentang afasia dalam studi neurolinguistik dan bagaimana penelitian ini dapat membantu kita memahami lebih lanjut tentang bahasa dan otak.

I. INTRODUCTION

Linguistics is a discipline that focuses on the study of language as its object. This discipline belongs to the empirical category (Akmajian et al., 2010; Aronoff & Rees-Miller, 2003; Heigham & Croker, 2009; Wong et al., 2016) because the language that is the object of linguistic study is an observable and verifiable reality. The singularity of language is obtained

through descriptive analysis of some linguistic phenomena that occur in speakers of a particular language. The language in question is the language used naturally by humans, without being directed to fulfill the social needs of its speakers. In personal and individual contexts, language plays a major role in human communication, as well as in memory, perception, cognition, and emotion (Indah, 2017). When parts of the human brain are damaged, this can lead to impaired language skills. Damage to parts of the brain can lead to four different pathologies that affect a person's language skills, one of which is aphasia (Sastra, 2011).

Damage to the brain's cortex causes impairment in a person's language skills called aphasia (Nasrullah et al., 2019, 2021, 2023; Sastra, 2011). Only individuals who have previously mastered a particular language system can experience this disorder, and it does not occur in people who do not have that language system. Brain damage can be caused by a variety of factors, but is most commonly the result of impaired blood circulation in the brain or neurological trauma such as stroke or injury to the brain (Sastra, 2007). In 2011, the International Association of Africans (2011) states that people suffering from aphasia will face difficulties in various aspects of daily life, especially in terms of communication, such as talking to others; speaking in noisy environments or in groups; reading various types of texts such as books, newspapers, magazines, or traffic signs; understanding and making humour; watching television and listening to the radio, filling out formulars or writing letters, making phone calls, counting and remembering numbers, managing money, and even saying their own names or family members. Despite the difficulty in using language, aphasia patients still have their sanity.

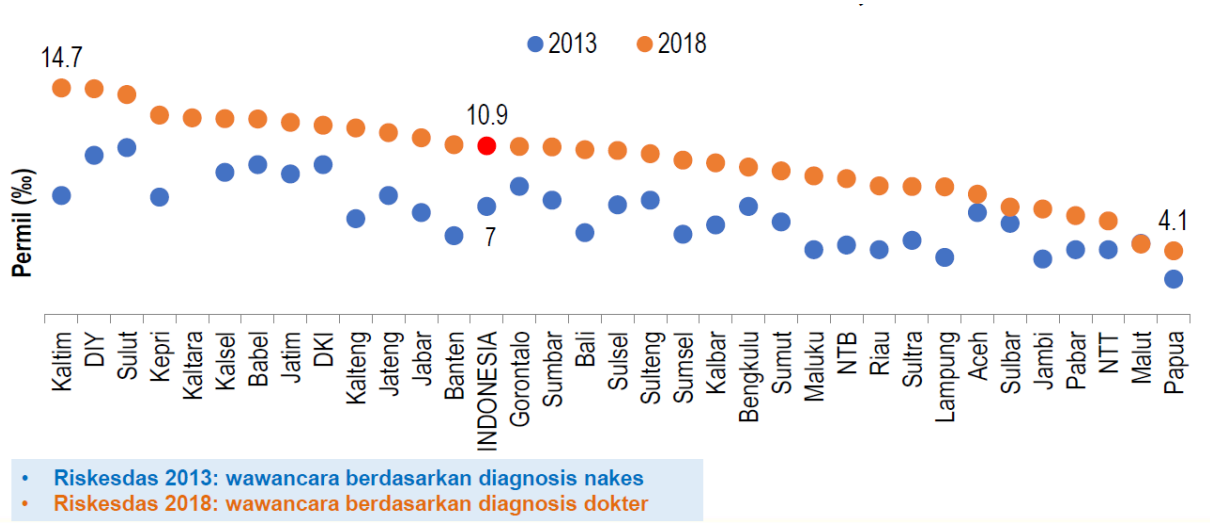
II. THEORETICAL STUDIES

Verbal expressions that appear in aphasia patients also have differences with verbal expressions that appear in normal people (Cahyantini dkk., 2018; Dewi, 2019; Hanum dkk., 2018; Johan & Susanto, 2015; Novita dkk., 2011; Sanjaya, 2015; Sastra, 2007). These differences occur in almost all components of language, including aspects of phonology, morphology, syntax, semantics, and pragmatics. The characteristics of oral expression of aphasia patients are very diverse and depend on the type of aphasia they suffer from.

Damage to certain parts of the brain can cause aphasia, which is divided into three types based on the symptoms and location of the brain damage. The three types are Broca's aphasia (expressive), Wernicke's aphasia (receptive), and global aphasia, as described by Sastra (2011). The three types of aphasia are characterised by verbal expression with different levels of language fluency (Crystal, 2015: 240). Various conditions can cause aphasia in a person,

such as stroke, traumatic brain injury, and diseases that affect brain function and structure (Nadeau et al., 2000). Stroke, as one of the main causes of brain damage, can cause aphasia in about 25% of stroke cases (Mehrpour et al., 2014; Sastra, 2011), especially when damage occurs to one of the brain's hemispheres. The incidence of stroke is increasing day by day. The diagram below shows the prevalence of stroke in Indonesia from 2013 to 2018, and based on the results of the Basic Health Research (Riskesdas) in 2018, stroke mostly affects productive age in Indonesia, as reported by the Indonesian Ministry of Health.

Figure 1 Stroke Prevalence (Permil) by Diagnosis in Population > 15 Years of Age by Province, 2013-2018



In 2008, the World Health Organisation (WHO) reported that 7.3 million people died from ischemic heart disease, with 6.2 million of those deaths being due to stroke and other cardiovascular diseases. Stroke is the sixth leading cause of death in low-income countries and the second leading cause of death in middle- and high-income countries, as stated in a report by Onwuchekwa et al. (2013).

To help aphasia patients recover their language skills, several forms of treatment can be provided, such as rehabilitation, training, and therapy (Dachrud, 2010). Treatment and treatment procedures are defined as the prerequisites of the experimental response, which is carried out through therapy (Siguroardottir & Sighvatsson, 2006). In Indonesia, the rules and procedures for treatment given to aphasia patients are regulated in detail in Permenkes RI Number 81 of 2014 concerning speech therapy service standards (RI, 2014).

Before starting speech therapy in aphasia patients, there is an initial stage that needs to be carried out which is referred to as screening, in accordance with the provisions in Permenkes RI Number 81 of 2014. At this stage, the client will be examined initially to find possible

symptoms that indicate speech disorders. If no symptoms are found, the screening results will be reported back to the referrer and the family will be educated. However, if symptoms of a speech disorder are found, the therapist will begin data assessment. Things that become the object of data assessment in aphasia clients are only related to things that are not specific or general in nature, such as the type of speech disorder, the cause of speech disorders, and the model prepared for the therapy process. For this condition, in the implementation of aphasia speech therapy, the language chosen as the language of therapy is Indonesian, without being connected to the factual conditions of patients who may have other language competencies besides Indonesian (eg Sundanese, Javanese). Therefore, the discussion of aphasia will be more interesting if it is brought towards a more complex discussion, namely aspects of bilingualism.

In some recent literature on the basic neural rules of bilinguals, the term bilingual is often equated with the term multilingual (Higby dkk., 2013). Other experts distinguish between the two terms. The term multilingual is used to refer to the ability to understand and speak several languages (misalnya, Diamond, 2010). Language practice is not something monolithic, but involves many aspects that affect lingual practice itself. That is why if aphasia, as one aspect, is connected with the symptoms of bilingualism as another aspect, it will become a more complex and comprehensive discussion - hereinafter referred to as bilingual aphasia (in this study it will be focused on Sundanese and Indonesian bilingual aphasia patients). The complexity of bilingual aphasia can be seen from the emergence of several typical symptoms related to bilingualism, such as code switching, impaired translation (Michel Paradis dkk, 1982) or compulsive spontaneous translation (Bhat & Chengappa, 2005), and code-mixing (Santos dkk., 2004). In relation to bilingual aphasia as one of the studies in aphasiology and neurolinguistics, the central issues discussed in it at least include several main things, namely (1) whether the brain mechanism for speaking in bilinguals is the same or different for two languages; (2) of the two languages mastered by people with bilingual aphasia, which language will first recover; and (3) what kind of pattern is suitable for the recovery of language competence in bilingual aphasia (Kotik-Friedgut, 2001).

The aspects that influence the recovery of language skills in bilingual aphasia patients include several factors, including the extent to which the patient has acquired language skills, as well as how frequently and intensively he or she used the language before experiencing aphasia symptoms (Kotik-Friedgut, 2001). Both of these aspects play an important role in the process of restoring language competence in bilingual aphasia. As for which aspect has more

influence, there needs to be an in-depth and comprehensive study. This discourse has also become a topic of discussion among neurolinguists in the world. Ribot in 1885 (Pearce, 2005), for example, states that the currency of language acquisition is very important in the process of restoring language competence in bilingual aphasia patients. Some cases have been found to corroborate Ribot's interpretation, but there are also many cases that do not prove it (Rohde dkk., 2018). In addition, Pitres in 1985 (Pearce, 2005) stated that the intensity of language use before onset is a determining factor in the process of recovering language competence in bilingual aphasia patients; the language that was frequently used before the onset of aphasia will be the most durable and will be the first to recover, while the recovery of other languages will occur later.

Based on the factors mentioned above, there is no universal rule that can explain the various symptoms and dynamics of rehabilitation of bilingual aphasia patients, because no single factor can be identified as the cause of a specific syndrome in a particular bilingual aphasia patient. That is why, the discussion of bilingual aphasia and its dynamics, cannot be separated from factors related to language acquisition and use and neurological factors (Kotik-Friedgut, 2001). Based on various problems in Sundanese-Indonesian bilingual aphasia patients, two symptoms were finally determined to be the focal point of the study raised in this study. Firstly, a general symptom related to the verbal expression in the speech of aphasia patients which is different from normal speakers in general. This difference in verbal expression requires a linguistic pattern to be created. Linguistic patterns in the verbal expressions of aphasia patients will later be used as a reference for speech therapy strategies. Secondly, specific symptoms that refer to the mechanism of speech therapy services contained in Permenkes RI Number 81 of 2014. The flow of speech therapy services in the PKM only discusses general matters. The screening process only examines the potential symptoms that lead to the presence of speech disorders or not. Because the service process only concerns general matters, in the implementation of speech therapy, the language set as the language of therapy is Indonesian, without considering other lingual aspects of the background of Sundanese-Indonesian bilingual aphasia patients. In reality, many aphasia patients are not monolingual (Indonesian), but bilingual or even multilingual. This aspect of bilingualism in aphasia patients, more or less, must have an effect on the process of restoring their language competence. Therefore, there should be a more specific discussion about bilingualism in aphasia patients.

This is the background for the author to raise topics related to bilingual aphasia. The existence of lingual symptoms that are so complex from bilingual aphasia patients is also a consideration for the author to raise this topic. There is also no standardised concept related to the mechanism of restoring language competence in bilingual aphasia patients with a language bilingualism approach. In addition, to the best of the author's knowledge, the study of the problem - both within the framework of neurolinguistics and linguistic aphasiology - has not been widely carried out on bilingual aphasia patients in Indonesian. There are some people who have written about bilingual aphasia, but the object of study is not Indonesian (Goral & Conner, 2013; Gray & Kiran, 2013; Lorenzen & Murray, 2008; Mehrpour dkk., 2014; Tschirren dkk., 2010; Weekes dkk., 2007).

III. RESEARCH METHODS

This study applies an analytical descriptive method that utilises data mining from various sources through the literature study method or literature review. This article is compiled through the collection of information from various reference sources that discuss various studies related to neurolinguistics. The reference materials used in this writing were obtained from various sources, both available in libraries and on open internet media. The purpose of this writing is to provide elaboration on related articles and writings, and explain in a synthesised manner how the topic can be applied in the current context.

IV. RESULTS AND DISCUSSION

Definition and Scope of Aphasia

According to the Association Internationale Aphasie (2011), people with aphasia experience difficulties in various aspects of daily life, especially in terms of communication such as speaking, reading, writing, telephoning, counting and remembering. These difficulties often make them feel limited in their use of language. However, this does not mean that they are mentally unhealthy. The AIA adds that people with aphasia can still participate in social activities and have the desire to engage in communication even in difficult situations. In terms of language competence, aphasia is a symptom that affects a person's ability to speak due to damage to the brain's cortex (Sastra, 2011). Only individuals who have previously had a language system can experience aphasia. According to Fabbro (2001), aphasia is a language disorder both spoken and written that is caused by a disorder or damage to the brain. From these two definitions, it is clear that aphasia is a symptom of a language disorder that occurs due to damage to the brain. The causes of brain damage can be various, but are often caused

by circulatory disorders in the brain and also brain injuries, such as stroke and trauma (Hope et al., 2015; Tschirren et al., 2011).

People with aphasia often feel different from others around them in psychological aspects. This is further exacerbated by the difficulty they experience in performing tasks that were previously very easy for them. Patients with aphasia require more time and effort to perform tasks that were previously easy for them. This situation makes them lose confidence when interacting and communicating with people around them. The physiological manifestations that exist in patients with aphasia are also very different from normal people. Therefore, support from various parties towards them will greatly help in the process of therapy, this is something that is very important for them. At least, the intensity of communication and socialisation with other sufferers will make them confident again. In fact, aphasia sufferers will be able to understand each other without words. Terdapat dua jenis afasia yang terkait dengan kerusakan di bagian tertentu dari otak, yaitu afasia Broca dan afasia Wernicke. Afasia Broca atau dikenal sebagai afasia ekspreif, terjadi karena kerusakan pada korteks motorik atau bagian depan hemisfer dominan kiri pada otak yang biasanya bertugas untuk mengendalikan otot-otot bicara (Sastra, 2011). Adapun afasia Wernicke disebabkan oleh kerusakan pada area korteks auditori yang berdekatan. Afasia Wernicke juga dikenal sebagai afasia reseptif.

Physiologically, people with aphasia look different in their syntactic realisation than normal people. In linguistics, syntax focuses on analysing the structure of a sentence and how the elements in the sentence are interrelated and related both functionally and meaningfully. Syntax seeks to understand the relationship between the elements in a sentence and how they shape the meaning and significance of the sentence as a whole. In relation to determining that a person has aphasia, and what type of aphasia they have, two main aspects must be assessed: the neurological aspect and the linguistic aspect. In the neurological context, the examination and assessment of aphasia is often based on Benson's aphasia syndrome and Kirshner's classification. In addition to its neurological aspects, aphasia examination also pays attention to its linguistic aspects related to the competence of the patient's language modality. These modalities are spontaneous speech, auditive understanding, repetition, naming, reading and writing (Kusumoputro, 1993).

Referring to the assessment results from the neurological and linguistic aspects, various types of aphasia syndromes can be determined. In relation to this discussion, many experts have put forward aphasia classifications referring to their respective schools of thought and field needs. On this occasion, the author will only present one of them, which is the easiest

and simplest classification and has become a reference for aphasiologists in studying aphasia, namely the dichotomous classification of aphasia by Alfredo Ardila (2010) as follows.

Table 1 Dichotomous Classification of Aphasia

Anatomy	Anterior	Posterior
Physiology	Motoric	Sensory
Psychology	Expressive	Receptive
Eponym	Broca	Wernicke
Computer Analogy	Output	Input
Description	*Nonfluent*	*Fluent*
Linguistics	Agrammatics	Paragrammatic

Furthermore, in relation to linguistic aspects, the impaired language modality that has been classified based on the dichotomous classification above, is emphasised by the following classification of aphasia.

Table 2 Alfredo Ardila's Classification of Aphasia (2010)

	Spontaneous Speech	Naming	Definition of Auditoric	Repetition	Reading	Writing
Broca	Telegraphic or mutism	-	-	-	+	-
Wernicke	Fleuent with error	-	-	-	-	-
Global	Telegraphic or mutism	-	-	-	-	-
Conduction	Fleuent with error	+/-	+	-	+	+
Anomyc	Fleuent with word search	-	+	+	+	+
Transmotoric	Like Broca	+/-	+	+	+	+
Trans-sensory	Like Wernicke	-	-	+	-	+/-
Isolation Syndrome	Decreased/absent	-	-	+	-	-
Alexia with Agraphia	Almost normal	+/-	+	+	-	-
Alexia without Agraphia	Normal	+/-	+	+	-	+

Description:
+ means normal
- means distracted
+/- means normal or slightly impaired

In the table above, it can be understood that people with Broca's aphasia experience problems in almost all language modalities, except for the reading modality. This condition is reasonable, because reading is a receptive activity which is essentially not impaired in people

with Broca aphasia. Broca's aphasia sufferers only experience speech disorders in expressive competencies, such as spontaneous speech, naming, auditory understanding, repetition, and writing. What is interesting in the table above is that even fluent/normal speech outcomes also have errors. More details about Broca's aphasia will be presented in the next section.

The brain is highly dependent on oxygen fuelling its blood supply; brain cells will die if deprived of oxygen for more than a few minutes (Crystal, 2015: 239-240). Damage to the brain is also known as cerebro-vascular accident (CVA) which is commonly known as stroke. According to records, 85% of aphasia cases are caused by strokes. In the case of western adults, arteries can become hairy due to fatty cholesterol deposits, which are closely related to factors such as smoking, diet, and lack of exercise. These deposits then cause narrowing and blockage of the arteries which can eventually lead to a stroke. Another cause is the obstruction of the flowing arteries, which could be due to a foreign object blocking the blood flow or may have bled in various ways, such as impact and accidents. Whatever the cause, if it occurs in the part of the brain responsible for speech and language, the result is likely to be aphasia. Other causes of aphasia include brain tumours, brain diseases, and traumatic damage (head injuries from traffic accidents, falls, acts of violence, etc.).

In relation to lexical aspects, as stated by Cummings (2010), that aphasia patients have distinctive lingual symptoms, namely the use of new words (neologistic jargon), word substitution (verbal paraphasia and semantic jargon), word repetition (echolalia) - circumlocution (word elaboration) and perseveration (continuous use of inappropriate linguistic forms). These characteristics have been stated by many experts, but not to a detailed and in-depth discussion. In this study, the author tries to explain the characteristics of speech outcomes of aphasia patients in more detail and comprehensively.

People with aphasia have a grammatical impairment referred to as agrammatism by some experts, which has at least two main patterns, namely sentence construction deficits and selective impairment of grammatical elements (Cumming, 2010).

Types of Aphasia

1) Broca's aphasia

Other terms for Broca's aphasia are motor impairment or expressive aphasia. Anatomically, this type of disorder is caused by brain damage to the third part of the front circle of the left dominant hemisphere. Damage to this part also causes disruption to the motor cortex which functions as a speech muscle (Sastra, 2011). That is why this type of aphasia disorder is called a motor disorder. In relation to speech realisation, this type of aphasia is clearly seen as a

speech defect in terms of language expression. This is also why this type of aphasia is called expression aphasia because this type of aphasia is very much related to the aspect of language expression.

In general, this type of aphasia will be seen from the symptoms displayed by the sufferer, especially in terms of speech output. Here are some of the symptoms that appear in people with aphasia as expressed by Sastra (2011), as follows.

a. Although motor function and speech muscles are normal, there is paralysis of the right hemisphere which is the opposite of the hemisphere involved in language function.
b. The sufferers have difficulty in producing speech fluently, there are inconveniences or breaks in speech and are unable to express intonation normally.
c. In the language produced, there is a noticeable use of "telegraphic" speech, which means that the speech lacks clear grammatical morphemes such as prepositions, verb time markers, particles, possession markers, plural markers, and so on.
d. The impairment is not only limited to speech, but also reading and writing. However, the patient's comprehension skills are generally good.
e. People with aphasia tend to have a high awareness of difficulties and errors in speech, even if they occur unintentionally. This can cause psychological discomfort and disappointment to the sufferer.

From the symptoms presented by Sastra (2011) above, it can be understood that people with Broca's aphasia experience speech errors in their expressive aspects, starting from speech production, writing, and reading. In relation to language pathology, broca aphasia sufferers clearly experience speech disorders caused by brain disorders in the left dominant hemisphere. Schwartz (1988) in Sastra (2011: 44) provides examples of speech from people with Broca's aphasia in his article entitled "Classification of Language Disorder from the Psycholinguistic Point of View". In his article, Schwartz observed the speech of a person with Broca's aphasia in producing utterances that were adapted to certain pictures.The pictures showed how a woman handed a flower to her teacher:

"Girl is handing flowers to teacher"

The morpheme that should be used in the sentence above is missing, it should be is:

"The girls is handing the flowers to her teacher"
"The young…the girl…the little girl is…the flower"

Intermittent constructions indicate that the person with aphasia was psychologically frustrated in producing them, but was then able to resume them.

"The girl is…is rose… The girl is rosing. The women and the girl was rosed"

In the above construction, there is the use of the noun "rose" as a verb.

From the above examples, it is clear that broca aphasia sufferers are expressively impaired in their speech realisation. Therefore, if you want to observe the speech output pattern of an aphasia sufferer, it seems that broca aphasia sufferers are the right choice to observe their speech production.

2) **Wernicke's aphasia**

Types of aphasia disorder can be referred to by various other terms used by experts in the field based on a summary from Dharmaperwira (Dharmaperwira-Prins, 1993) are: sensory aphasia (Wernicke, 1874 dalam Pincherle et al., 2020), receptive aphasia (Weisenburg/Mc. Bridge, 1935 dalam Cruz-Culebras & Vera, 2020), pragmatic aphasia (Wepman/Jones, 1961 dalam Nasrullah et al., 2019), posterior aphasia (Shklovskij et al., 2019), and semantic aphasia (Brown, 1972 dalam Ding et al., 2020).

The full definition expressed by Sastra (2011) refers to Weisenberg/Mc. Bridge (1935) (Cruz-Culebras & Vera, 2020) that this type of aphasia is often called receptive aphasia. Anatomically, damage to the circle area in the language-dominant hemisphere and adjacent to the auditory cortex causes aphasia. The symptoms of this type of aphasia, as quoted from Sastra (2011), are as follows.

a. Normal hearing.
b. The speech production of the sufferer was basically rather fluent and not disjointed, but slightly halting and had relatively normal intonation contours.
c. The syntactic aspects of the patient are relatively normal. In a sentence structure, nouns are usually present to fill the noun space, adjectives fill the adjective space, and so on.
d. The patient's comprehension efforts are basically not very good, because a person with Wernicke's aphasia cannot perform self-supervision.

In relation to language pathology, Brown (1972) in Sastra (2011: 45) exemplifies the answers given by a person with Wernicke's aphasia.

"She is selfice on purpiten"

In realisation, the sentence structure above is normal, containing a subject (she) followed by an auxiliary verb (is) and a complement (selfice on purpiten). The problem is that it refers to the complement being imaged as jargon.

V. CONCLUSION

Aphasia is a disorder in the ability to use language caused by damage to the brain's cortex. This disorder usually makes previously easy activities difficult to perform. It also shows physiological differences with normal people. There are two types of aphasia, Broca's aphasia and Wernicke's aphasia, which are distinguished by damage to specific parts of the cortex. Physiologically, people with aphasia appear to differ in their syntactic realisation from normal people. In relation to determining that a person has aphasia, and what type of aphasia they have, two main aspects must be assessed: the neurological aspect and the linguistic aspect.

Damage to the brain is also known as a cerebro-vascular accident (CVA) which is commonly known as a stroke. The deposits then cause narrowing and blockage of arteries which can eventually lead to a stroke. In terms of lexical aspects, aphasia patients have typical lingual symptoms, namely the use of new words (neologistic jargon), word substitution (verbal paraphasia and semantic jargon), word repetition (echolalia) - circumlocution (word elaboration) and perseveration (continuous use of inappropriate linguistic forms).

In terms of grammatical aspects, people with aphasia experience a pattern of impairment called agramatism by some experts. Anatomically, this disorder results from damage to the third part of the frontal circle in the language-dominant hemisphere on the left side of the brain. This damage also affects the motor cortex which controls the muscles used in speech.

In relation to language pathology, people with Broca's aphasia clearly have speech impairment caused by brain damage to the left dominant hemisphere.

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