ISSN 1799-2591
Theory and Practice in Language Studies, Vol. 13, No. 8, pp. 2010-2018, August 2023
DOI: https://doi.org/10.17507/tpls.1308.17

Communication Characteristics of Broca's Aphasic Individual With Short-Term Memory Loss: A Study of the Relevance

Lilis Hartini
Linguistics, Indonesian University of Education, Bandung, Indonesia;
Indonesian Language, Bandung Law School, Bandung, Indonesia

Dadang Sudana
Linguistics, Indonesian University of Education, Bandung, Indonesia

Wawan Gunawan
Linguistics, Indonesian University of Education, Bandung, Indonesia

***Abstract*—People with Broca's aphasia (PBA) have been commonly known to show difficulties in expressing language. The speech partner of PBA assumes that PBA's utterances do not make sense. In fact, PBA do not make ideas arbitrarily. Pragmatically, their utterances in communication can still be analyzed. This study aims to explain the verbal and non-verbal language characteristics of PBA. To achieve this goal, a qualitative approach was carried out using the case study method on individuals with Broca aphasia who had hemorrhagic strokes. The framework used to reveal communication strategies was the relevance theory of communication and cognition of Sperber & Wilson. The findings of the study show that verbal communication was conducted by retrieving words that were already available in the mental lexicon and then by paraphrasing them through association and collocation. Non-verbal communication was carried out through cues, especially when the individual had difficulties recalling words. The individual's failure to produce language and derive ideas from the mental lexicon is the result of disturbances in the short-term memory area.**

***Index Terms*—communication strategy, Broca's aphasia, relevance, mental lexicon, short-term memory**

I. Introduction

In this decade, there has been much interest in linguistic studies on Broca's aphasia (Adornetti, 2019; Alawadhi, 2018; Cummings, 2017; Ivanova, 2021; Nasios, 2019). The interest in researching Broca's aphasia is related to the roles of Broca in processing language, mediating speech ability, and allowing speech comprehension. Broca's aphasia is a language production disorder that results from injury to the left-brain area. It triggers an individual's difficulty in communication so that it affects apraxia (Ballard, 2019; Botha & Josephs, 2019; Duffy et al., 2021; Haley et al., 2021; Wambaugh, 2021). Broca's aphasia is characterized by the difficulties to store short-term memory (STM) and this is commonly found in individuals with severe conditions (Al-Smadi, 2019; Rodriguez, 2022). Another problem faced by people with severe broca aphasia is the difficulty in repeating information (Indah, 2017). They tend to fail to recall information that has entered their brains and become forgetful. Forgetfulness is the same as failure to recall information from memory due to damage or lack of opportunity to consolidate the experienced events. In neuropsychology, this is also called Short-Term Memory Loss (STML).

In relation with linguistics, one of the fields that can examine the speaker's intent of an aphasic individual is pragmatics. Pragmatics has evolved to include studies of cognition and language disorders, one of which is caused by brain injury. The study of pragmatics on the problem of language disorders in communication barriers is termed "clinical pragmatics"(Cummings, 2017). To date, clinical pragmatic analyses have been carried out to examine disorders in language. The scrutiny initiated by Airenti (2017), to illustrate, has highlighted the communication problems in children. The study interprets that the pragmatic meaning of an utterance is not determined literally but requires an inferential process based on the context. It was also explained that children often use the implied meaning aspect. Another study has analyzed a series of communication disorders originating from neurogenic and psychiatric disorders (Jagoe, 2017). Based on the study, pragmatic disorders are associated with cognition in aphasic individuals, language disorders in the right hemisphere, schizophrenia, traumatic brain injury, Alzheimer's dementia, and Parkinson's. The problem of individual language disorders with aphasia has also been explored by Olness and Olatwoska (2017) while Margaret (2017) has specifically discussed Right-Hemisphere Pragmatic Disorders. The findings of their studies have suggested that there is a link between short-term memory and language impairments in aphasic individuals, which leads to forgetfulness or STML. As a result, if a person suffers from a significant language impairment, their (verbal) STM/WM will be affected. Therefore, STM is often associated with aphasia.

Another study that has investigated the relationship between STM and aphasia refers to the work of Vallar et al. (1992). The study in particular has examined short-term phonological memory in 24 patients with aphasia. Aphasic individuals were found to have reduced visual and auditory memory spans and showed similar effects of phonological impairment on immediate retention when stimuli were auditory. Furthermore, while most of the individuals had a phonological processing deficit, two had direct verbal memory impairment and no analytical impairment. The result of the study suggests that most of the individual case studies of individuals with selective verbal short-term memory deficits were interpreted with reference to the phonological model that distinguishes the storage components of short-term memory. A more recent study on the issue of short-term memory and aphasia has investigated the relationship between short-term verbal memory and motor speech processing in five individuals with Broca's aphasia (Goerlich et al., 1995; Gregory, 2014). The purpose of the study was to investigate the profile of short-term memory dysfunction in Broca's aphasia and further to explore the relationship between memory and motor speech processes. The results showed that short-term memory's phonological storage and articulatory loop components, which were observed in aphasic individuals, were reduced. Furthermore, the research conducted by Martin and Ayala (2004) and Martin (2021) on the relationship between STM and aphasia has concluded that people with aphasia have problems with lexical-semantic processing, as well as phonological input and output processes.

It was found that there was a close relationship between STM/WM performance and language processing. This link leads to the hypothesis that treatment with STM/WM functioning can improve language and STM/WM function. Then, Kermani and Birjandi (2019) examines the relationship between emotion and cognition. They mention that there is a coherent interaction between the heart and the brain. In his paper, it is stated that if emotions and cognition are regulated, they will improve memory and understanding. Of course, this research can be used as a therapy for PWA who have short-term memory disorders. Other researchers such as Nielsen et al. (2019) have investigated the main characteristics of agrammatism in people with Broca's aphasia. Agrammatism is the removal or replacement of words or morphemes that become grammatical functions, while words and morphemes in terms of lexical content are relatively unaffected. Eventually, they concluded that Broca's area might be in a neural circuit regulating semantic-based word and number articulation. Next, an article by Adenzato (2019), Enrici et al. (2019), Quesque (2020), and Schurz (2021) analyzes the involvement of theory of mind (TOM) in the communication intention process. All communication used is written language and sign language. This was done to establish a link between ToM and pragmatic studies, with the intention of suggesting the intention process of communication as a key feature of human communication. Difficulties in communicating and communicating strategies do not only occur in PWA but also in all people who have limited self-development and knowledge. This relates to a paper written by Valeev et al. (2020). They examined students who had communication difficulties. The students are given learning communication strategies to motivate the development of language creativity so that motivation becomes a characteristic for students. Psychologically motivating PWA to dare to communicate is something that can encourage PWA recovery. Among various studies on Broca’s Aphasic language, a particular study that employed the pragmatic perspective was the one carried out by Archer (2019), Jagoe (2017, 2021), and Rinaldi et al. (2004). They investigated the understanding of metaphors in individuals with right brain damage using visual-verbal and verbal materials. Their study, however, is different from the present study. The differences are in the area of brain damage, the study area, and the pragmatic analysis tools. In respondents, the brain damage is on the left side, the study area is on the production of verbal and non-verbal language, and the analysis uses relevance. Similarly, our research interest is related to clinical pragmatics, which studies the communication process of people with speech difficulties.

The findings of previous studies have generally indicated that the problem of STM in aphasic individuals was mostly addressed with a linguistic approach. The studies on Broca's aphasia have rarely employed the pragmatic perspective. Furthermore, STM studies on the failure of aphasic language have not been carried out in terms of grammatical relevance, but rather in terms of phonological processes and lexical semantics. To fill this gap, the current study attempted to examine the Broca's aphasia of an individual who has experienced a decrease in STM—especially the problem of individual's input and output of information when communicating—, by relying on the pragmatic point of view. This study tried to test the STM against forgetfulness due to stroke that impacts Broca's aphasia. Focusing on the respondent's communication strategies towards the information that the respondent is trying to get out of his mind, the present study employed the relevance theory of Sperber and Wilson. This was conducted to obtain a comprehensive picture of the verbal and non-verbal expressions of Indonesian-speaking Broca's aphasic individual. To achieve the purpose of the current study, two research questions have been formulated as follows: 1) what pragmatic verbal characteristics are found in aphasic individual based on Sperber and Wilson's theory of relevance? 2) what non-verbal characteristics are found in aphasic individual based on Sperber and Wilson's theory of relevance?

II. Literature Review

A. Short-Term Memory

Short-term memory (STM) is a temporary memory storage process. The information stored is only maintained as long as the information is still needed. According to experts, the amount of information stored in STM is limited; on average, only seven pieces of information can be stored in short-term memory at a time. STM is a temporary memory

storage area and a place for active thinking, filtering, sorting, and combining old information with new information, also making decisions. According to Baihaqi (2016) and Gathercole (2019), short-term memory (STM) is a memory system with limited capabilities and is directly involved in remembering information for a short period.

Associated with memory storage, Short Term Memory (STM) reflects the ability of human thinking to store information in a relatively limited period and can be accessed temporarily. In certain circumstances, there is a possibility that every idea cannot be accessed directly into memory, so it does not stick for so long and stays in memory temporarily. Therefore, the incoming ideas pass by unconsciously and do not leave any information in our memory. A person may not realize that the idea only persists during activation, which is then not stored in memory (Atkinson & Shiffrin, 1968, 1971; Cowan, 2008). Short-term memory (STM) storage is not permanent, can only be stored for a moment, can be a few seconds to a few minutes so that the storage does not last long, and can be deleted instantly.

B. Broca's Aphasia

Broca's area is a part of the human brain. It is located in the superior frontal gyrus in the frontal lobe of the cerebral cortex. Language processing, speaking ability, and language comprehension lie in this area (Mohr, 1976). More specifically National Institute on Deafness and other Communication Disorders (NIDCD) says that Aphasia is caused by damage to one or more of the language areas of the brain. Most often, the cause of the brain injury is a stroke. A stroke occurs when a blood vessel ruptures. A clot or a leaking or burst vessel cuts off blood flow to part of the brain. Brain cells die when they do not receive their normal supply of blood, which carries oxygen, and important nutrients, their usual blood supply, which transports oxygen, and essential nutrients (Bethesda, 2015). If there is an injury in Broca's area, there will be verbal and non-verbal language disorders. Broca's aphasia, expressive aphasia, non-fluent aphasia, or motor aphasia is occurred due to disturbances in Broca's area. This naming is based on the first researcher, Pierre Paul Broca. According to Dax (1981), loss of language ability is closely related to left brain lesions. Broca has found damage to the tissue or nodes of the left front third of the outer layer of the brain that causes a person to lose the ability to speak. The results show that there is a relationship between certain body activities and certain areas of the brain. Speech disorders related to difficulty moving the muscles of the speech apparatus normally and affecting the ability to speak. Individuals may speak only one-word, short sentences, or incomplete clauses. Therefore, Broca's aphasia is also known as non-fluent aphasia (Lazar & Mohr, 2011; Lee, 1981).

Broca's aphasia is more usually associated with injuries to the left hemisphere of the brain, indicating that the lesions are in the left hemisphere and the disorder is in the cerebral cortex. Broca's aphasia is characterized by impaired language expression, both spoken and written. According to Satyanegara (2018), aphasia generally occurs suddenly due to a stroke or head injury. However, aphasia can also appear slowly, as in the case of brain tumors, dementia, and infections. This disorder interferes with the expression and understanding of language, including reading and writing. In cases of stroke, aphasia generally occurs suddenly.

Meanwhile, aphasia appears slowly in brain tumors, dementia, or infection. This disorder interferes with the expression and understanding of language, including reading and writing. Aphasia occurs in conjunction with speech disorders such as dysarthria or apraxia.

C. Sperber & Wilson's Relevance Theory

Sperber and Wilson's theory of relevance explains various communication phenomena. According to Sperber and Wilson, relevance is an ostensive and inferential speech. It is ostensive because the speaker tries to attract the attention of his interlocutor to convey some information. It is inferential because the speech partner must conclude what the speaker wants to convey based on his speech. The speech partner must know the "literal meaning" with the knowledge had; it can be in the form of sensory input and other information. In communicating, the speaker tries to be as relevant as possible to convey the word correctly to produce clarity (D. & Sperber, 1995; Sperber et al., 1986).

Sperber and Wilson's theory of relevance applies not only to the field of communication but also to the field of cognition. For Sperber and Wilson, communication is part of cognition. In contrast, the purpose of universal cognition is to obtain relevant information. The more relevant the information, the better it will be. Thus, verbal communication phenomena can be explained by applying cognitive principles. Sperber and Wilson's theory of relevance is only obtained through the dependence of a communication on cognition.

III. METHODOLOGY

This research is a case study using a qualitative approach in answering the problem of pragmatic disorders by describing the relevance of the participant's speech. Qualitative research in case studies is used to investigate and understand a problem by collecting information, then processing it to get a solution so that the problem revealed can be resolved. The researcher's efforts to collect data based on natural settings to obtain scientific, natural, and accountable research results. The data analyzed is text in the form of words of aphasia sufferers. The case study was conducted to reach conclusions about the communication strategies of the respondents. The purpose is to describe the relevance of the words made by the respondents when making communication strategies. Is it following the theory suggested by the experts, or is the respondent's intentions deviation? Then the researcher interprets the respondent's intentions regarding STML. Next, it explains the context in the data.

Relevance theory is a framework for understanding speech interpretation so that the following procedure is to complete the research data sources. Here, the researcher collects data in the respondent's words and actions when communicating. The data is needed to answer the aphasia problem suffered by the respondent when communicating in the form of speech or movements. The utterances or body movements made by the respondent are then recorded and written down in full. The collected data were selected for this research. In the last procedure, after there are findings, the data is analyzed and then concluded.

The respondent as the research subject is a 60-year-old man who experienced had a hemorrhagic stroke. The impact of stroke leaves language disorders and apraxia. The respondent's physical condition has weakness in the right hand and right leg. Medical records of the respondent in the form of a CT scan show a lesion in the left hemisphere of the brain so that he is categorized as suffering from Aphasia. While in the post-stroke, respondents are still eager to interact because they can still communicate even though the sentences are short. Subsequent developments of the respondent's vocabulary have decreased, starting from stammering, often doing silent, until it is difficult to express their words. Respondent has rarely interacted, so the respondent finds it increasingly difficult to express his wants.

In taking data in the field, the researcher acts as the research instrument by directly observing the respondents as research subjects. The instrument used by the researcher was to obtain the necessary data by inviting them to talk, observing the movements made by the respondent, and then recording in the form of field notes.

IV. Results and Discussion

There are 162 language data collections. However, what is used as study material in this paper is only 6 language data points, which represents the language that comes out verbally and non-verbally.

A. Language That Come Out Verbally

One of the characteristics of sufferers of Broca's aphasia is stuttering speech, not many words spoken, often silent. The dots written in the data illustrate the forgetfulness of the respondents. Speech that comes out verbally can still be analyzed, as in the following data:

(1)Is: Where are you going??
R: *Rek ka film*. (‘to the film)
(2)R: *Dipaehan…itu radio paehan!* (‘turn off…turn off the radio’)
(3)R: *mah…yeuh…engke jemput papah* (‘mah… pick me up later’)
Is: *memang bade kamana?* ‘Where are you going?’
R: (put hands on face, head tilted, eyes closed).

Data (1) was triggered when respondent (R) answered a question from his wife (Is) by saying rek ka film 'goes to film' while leaving his wife and sitting in front of the television. When analyzed, the respondent's answer is still relevant to the implicature of the sentence, with the first assumption, (R) left (Is) because he wanted to watch a movie. Second, by looking at the intended direction or by looking at his clothes, the film he wants to watch (R) is shown on television, not in the cinema. This specification process is achieved by inference based on contextual information and guided by relevance. In this case, (Is) must pay attention to the previous linguistic context or the context of the current situation to determine the film's referent. According to the principle of the relevance of Sperber and Wilson, film relevance is appropriate when the same/synonymous referent is in a context that the hearer quickly understands. Therefore, the visible context of the situation is that R leaves to watch soap operas. Thus, the referent of the film is a soap opera. Films and soap operas have the same connotation: the results of cinematographic works are intended to entertain and shown in almost the exact duration of more than one hour. Films or soap operas contain the same content, which contains various roles in human life in the real world, transferred to the virtual world. However, there is a fundamental difference between films and soap operas for workers in cinematography. The film is often called a movie with a wider screen than the television screen. In contrast, soap operas are also called FTV.

In terms of syntax, the sentences built (R) are not grammatical because respondents find it challenging to produce verbs, so the sentence structure is incomplete. Respondents failed to produce a verb; for example, by producing the verb watch or see, but (R) used the preposition *ke*, which served as a place clue. Damage to the structure of language impacts people with aphasia involved in communication. Here, the respondent experienced a syntactic deficit so that the respondent could not provoke words in the lexical access module. Likewise, if analyzed based on semantics, R uses a communication strategy with similes because, in his speech, R compares two things that are essentially different, but R is associated with words that are considered the same.

Data (2) is taken when R will perform the zuhr prayer, which is worship performed when the sun is above our heads. Suddenly, he asked his wife (Is) to turn off the television. However, what he said is the radio. Here R makes a mistake in selecting words again by replacing television with radio. If analyzed in terms of the figure of speech, R uses a communication strategy by associating radio with television. Indeed, they have similarities: the communication media to share messages or information. The difference is that the message conveyed via radio is in the form of sound, and television is in sound and images.

R's words assume that he wants the radio to be turned off immediately. The relevance is that there is an emphasis on the word *dipaehan* 'turned off' and repeated with the word *paehan* 'turn off'. The word *dipaehan* 'turned off' is a passive

verb from 'turn off' and is a transitive verb because it requires an object. In R words, the object is the radio. While the word *paehan* 'turn off' is an imperative form of an order to emphasize his desire to be carried out immediately by the speech partner. The second assumption is that by paying attention to the tone of his speech, which repeats the word, it is turned off, turned off, perhaps R is worried about being disturbed by the sound coming out of the radio because he is going to pray.

Meanwhile, the implicature assumed by the interlocutor was that R asked his wife to turn off the television instead of the radio because there was no radio in the room. According to Sperber and Wilson (1986), there is relevance based on the inference of the two assumptions because the command sentence uttered by R is clear enough to mean what was said, even though the way he spoke was stuttering. Thus, the speech partner understands the meaning of R's utterance, so that (Is) immediately turns off the television. The assumption is that the speech partner has the exact linguistic nature as R so that the speech partner no longer asks the meaning of R's words but immediately carries out R's wishes. The second assumption is that the speech partner knows that the context radio referred to by R is television because the language disorder experienced by R has an impact on word errors. So, the same linguistic realm produces relevance to the context of speech. This context is one of the successes of Sperber and Wilson's communication relevance.

Data (3) is taken when the respondent wants his wife to pick him up. However, when looking at the gesture, the word 'pick up' does not match the meaning of the gesture made by the respondent. So, there is no match between the word's meaning and the gesture. Data (3) follows Sperber and Wilson's opinion that something communicated is defined with meaning. The sentence "*mah…yeuh…ngke jemput papah*" will be relevant to the implicature thought by the interlocutor after the respondent demonstrates the "going to sleep" movement. The meaning of the respondent's word is "*mah...yeuh...bangunkeun papah*." (*'mah*…wake me up later'). Respondents found the word "pick up" stored in their short-term memory for a moment when making communication strategies. Therefore, the word "wake up" cannot be recalled in its short-term memory.

Not all communication spoken by the respondent can be directly understood if the information conveyed is not added with cues. However, after the movement is demonstrated, the communication message conveyed to the respondent can be understood. Initially, the speech partner assumed that the respondent would go to a place, such as a prayer room. That is based on the respondent's habit of going to the prayer room. However, after the gesture is demonstrated, the assumption changes. The respondent gives a message to the speech partner to wake him up from sleep instead of picking him up from somewhere.

The respondent's communication strategy becomes relevant when the gesture is added to complete the clarity of the message conveyed. Conventionally, there is a contrast in the respondent's words, which are the words "pick up" with "wake up". The change in linguistic form in the meaning of the word "wake up" to "pick up" makes the implicature detached. Therefore, the meaning of words and gestures is different.

If we trace the lexical meaning, the word 'pick up' with 'sleep' has different meanings and situations. The word "pick up" means to welcome/invite in terms of lexical semantics. To pick up means to welcome/come/deliver. The word sleep means rest by closing the eyes, and it can be in bed or on the sofa. So analyzed in terms of semantics, these two words are not related because the sentence's meaning will be different. Respondents paraphrase the meaning of which is not appropriate. On the other hand, if analyzed in terms of syntax, the word "pick up" with the word "sleep" in speech (3) has the same word class, namely the verb class, which is used for requests for help.

Based on data (1) and (2), there are the same findings, that is, in making communication strategies, the respondents have managed to find a way by creating quite good interactions with the speech partners through word associations, so that communication becomes relevant. The association made by the respondent is to look for words stored in their short-term memory, which correspond to words that are similar but difficult to get out of the mouth. The core words expected to come out of the short-term memory were lost and could not be retrieved. This strategy is often used by individuals with Broca's aphasia and has become a characteristic of the respondents. In communicating, respondents make associations because many words are forgotten and cannot be recalled to carry out their role as communicants in completing sentences when speaking. According to Slametmuljana (1966) in Djajasudarma (2016), the association is the relationship between the original meaning and the new meaning, which is related to the original meaning. The meaning of television is relevant to radio's meaning. Likewise, in mental processes in the brain, it can be proven that there is relevance when taking the word radio to replace the word television. Dardjowidjojo (2008, p. 168) said that the errors made by respondents were not random but in the same group of meanings. In this case, the meaning of radio and television is grouped into communication media whose role is to provide information. Thus, when respondents made communication strategies, there were attempts to retrieve words from the mental lexicon but failed because there was a disturbance in their short-term memory.

The finding in data (3) is that the respondent failed to communicate because the meaning came out different from the meaning of the message he informed. However, the gesture exhibited by the respondent made the speech partner's inference correct. According to Cummings (1999), communication inaccuracies that are significantly more common in the expression language of people with Broca's aphasia are considered lexical-syntactic deficits. Here the respondent experiences pluralism errors and difficulties finding words in his mental lexicon. As a result, the language contained in the lexicon is only stored temporarily in short-term memory, causing it to be lost and working memory to fail. Sperber and Wilson state that the ambiguity of the word "wake" to "pick up" is also mediated by the principle of relevance.

Therefore, enrichment is needed in the form of assumptions from the speech partner so that the message conveyed by the respondent becomes a successful communication strategy. Sperber and Wilson assert that enrichment runs according to the principle of relevance, such as words that are clarified by adding gestures. This context can only be obtained from patients with non-fluent aphasia and cannot be obtained from patients with fluent aphasia.

According to Sperber and Wilson (1986), in contributing words to communication, even words that seem irrelevant, the speaker communicates his belief that his words are relevant. The relevance of the speech achieved by the respondent cannot be achieved in an easy process because there are disturbances in the short-term memory area. The speech partner assumes that the affirmation of the respondent's word implicitly contains an optimal guarantee of speech. The speech partner begins to take advantage of this assurance by obtaining as much contextual effect as possible from the respondent's word with the slightest possible processing effect. Therefore, the more significant the contextual impact, the greater the relevance.

B. Language That Is Expressed Non-Verbally

When the respondent has difficulty finding the right words to say, he usually does not say anything. Verbal speech is not spoken, but respondents make communication strategies by using hand movements, arms, legs, and facial expressions.

Findings:

(4) Is: *hoyong dikumahakeun?* 'What to do?'
R: (pointing and holding lips with both fingers)
(5) Is: Religious lecture? Recite Qur'an?
R: (nodding head)
(6) R: *mah…* (moved to the calendar and put his right hand on the calendar, while the left finger pointed elsewhere. Facial expression implies seriousness).
Is: Friday's prayer? Next two days.

Data (4) was taken when the respondent asked for help to turn on the Koran's audio on his cellphone, but he had difficulty expressing it verbally, so he communicated through gestures. Movements such as pointing and holding the lips by sticking the index finger with the middle finger are often used by respondents so that the speech partner can understand the meaning of the gesture. In a collaborative communication strategy, respondents can negotiate clarity with their partners by using interaction strategies considered relevant. This strategy is taken from various sources of knowledge that are still stored in the brain by moving body parts. Sperber et al. (1986) and Sperber and Wilson (2009) distinguish the meaning of human communication in describing, that is, recognizing that something can be communicated without addressing precisely what the speaker means (R) or the speaker's behavior. The speaker intends to persuade certain specific thoughts in the speech partner. R managed to do it with non-verbal communication. Respondents succeeded in making his communication relevant because the speech partner understood the meaning of his body movements. The respondent's representation conveys one or more specific assumptions that are actually in his mind. The speech partner (Is) assumption for the respondent's gesture is that he asks for help to turn on the Quran's audio YouTube on his cellphone. The pointing gesture is assumed to signify that the respondent determines the program he wants, that is, the Quran's audio. The movement of sticking the index finger with the middle finger to the lips indicates that the respondent wants to follow the recitation of the Quran's audio. The inference obtained is that the respondent asked for help to play the Quran's audio from YouTube because he wanted to follow the reading of the holy verses of the Quran.

Identical with data (4), Data (5) was also taken when the respondent asked for help by handing over a cellphone. When saying, "What is the religious lecture? Recite Qur'an?" the respondent is making assumptions. The first assumption is that the respondent asks for help to turn on the cellphone which contains a religious lecture from one of the Islamic teachers on YouTube. The second assumption is that the respondent asks for help to turn on the cellphone which contains the Quran's audio. The respondent's gesture becomes relevant when the speech partner understands the movement he is demonstrating. For Sperber and Wilson (1986), the respondent's speech becomes logical because the communication is considered complete when the appropriate referent is in an easily accessible context. The synchronization of Sperber and Wilson's principles with the respondent's gestures proves that the linguistic context between the respondent and their speech partner is the same. The context is evident because the speech partner has been with the respondent for a long time so that the non-verbal language disorders of individual with Broca's aphasia can be understood easily. The intuition of the speech partner who immediately understands the respondent's communication strategy can help the confidence of individual with Broca's aphasia in interacting.

Data (6) was taken when the respondent suddenly moved to the calendar hanging on the wall and called his wife (Is). The respondent's goal is thought to be to ask for the date or day by sticking his weak right shoulder on the calendar, with the left finger pointing to another place. Facial expressions convey seriousness. When making this movement, the respondent assumes that the speech partner can understand the message conveyed. The speech partner's assumption when he saw the gesture of the respondent is that the respondent wanted to be informed about the time of Friday prayers. Then, the respondent's intention by sticking his body on the calendar is assumed to be asking for the date or day. Furthermore, pointing to another place is assumed that the respondent clarifies his communication strategy, pointing to

the mosque. There is relevance between the respondent and the speech partner because of the exact linguistic nature, the same situation context, the same habits, the same knowledge, and the same experience.

The findings obtained from the respondent indicated that the respondent had difficulty in conveying messages to his speech partner, which caused silence. This finding follows the characteristics of sufferers of Broca's aphasia, which is often silent or hesitant in producing language so that sometimes words do not come out or sometimes they are pronounced haltingly (stuttering). Respondent failed to recall words in their short-term memory area when using gestures. This fail happens because the respondent forgot the message he wanted to convey or looking for a more appropriate word in his mind. However, all failed because it was lost in his short-term memory. As a result, they often do silently. Simultaneously with the silence, the respondent performs movements that are generally the same. Disturbances in the short-term memory area impact the failure of verbal communication. In most people, according to Aitchison (1997), people are silent for a moment to breathe or for other purposes, and when speaking, the silence to take a breath is not much, only about 5%. However, for people with Broca's aphasia, the silence is not only for taking a breath but as a strategy in communication when he finds it challenging to express language in verbal form.

In Sperber and Wilson's principle of relevance, communication using gestures can be justified as long as there is mutual understanding between the speaker and the listener. The message or information that the speaker wants to convey to the listener has a valid correlation so that the implicatures are relevant.

Concerning non-verbal communication, Sperber and Wilson (1986, p. 86) mention that in many cases of human communication, what the speaker expects to make the real information is partly transparent and partly vague or weak. Non-verbal communication is categorized into a relatively weak form. The expectancy of the speaker when the communication is weak is to control the listener's mind in a specific direction. Sometimes ineffective communication is quite supportive or even better than solid forms of communication.

Mental elements, such as thoughts, associations, and experiences, cannot be ignored in compiling and understanding messages through linguistic codes. Understanding words verbally and gestures can be interpreted as a marker of ideas because language can be an instrument of thought that refers to the relevance of a particular atmosphere or reality. The words and movements that become markers of the idea are not only in the structure of sound or writing but also in meaning. This concept seems to be neglected in the respondent's linguistic production because sometimes, the idea is lost in his memory before being spoken.

V. Conclusion

There are two kinds of communication strategies carried out by respondents: verbal and non-verbal language. Inference in verbal communication is the respondent trying to paraphrase words by retrieval of words contained in the mental lexicon by looking for collocations that are considered appropriate. Then, the non-verbal communication strategy is caused by the respondent forgetting and not finding the word information to be produced, so gestures are used. All of this is caused by interference with short-term memory, where information is temporarily stored. Short-term memory disorders experienced by respondents are interaction barriers caused by nervous disorders in language production. This condition makes it difficult for ideas that enter respondents' minds to be issued into appropriate sentences. To get around the obstacles, respondents use communication strategies in various ways, such as substitution, assimilation, collaboration, paraphrasing, and gesture. This strategy often makes the speech partner not understand. However, disturbances in the short-term memory area can still be analyzed by *psych neurolinguistics* studies because respondents do not arbitrarily retrieve ideas, which are difficult to put into words.

The language processing of the individual in this study is obstructed in his or her short short-term memory and this leads to the disruption on the pragmatic processes. In terms of the communicative strategies, the participant was collaboratively able to negotiate clarity to his interlocutor with interactive strategies. This has proved that the communicative strategies produced by the participant were not random because they were pragmatically relevant. Hence the participant's strategies were still within the framework of language with its various links of meaning.

The results of the study imply that context plays an essential role in producing each communication effect. Conversations between people with Broca's aphasia and listeners become logical because the communication is considered complete when the appropriate referent is in an easily accessible context. Even though there is a language disability from the respondent, language synchronization can prove that the linguistic context between the respondent and the speech partner is relevant in the same linguistic realm.

References

[1] Adenzato, M. (2019). Aging, sex and cognitive Theory of Mind: A transcranial direct current stimulation study. In *Scientific Reports* (Vol. 9, Issue 1). https://doi.org/10.1038/s41598-019-54469-4

[2] Adornetti, I. (2019). Broca's and Wernicke's aphasias in the light of contemporary neuroscience. In *Rivista Internazionale di Filosofia e Psicologia* (Vol. 10, Issue 3, pp. 295–312). https://doi.org/10.4453/rifp.2019.0025

[3] Airenti, G. (2017). Pragmatic Development. *Perspectives in Pragmatics, Philosophy & Psychology*, *11*, 3–28. https://doi.org/10.1007/978-3-319-47489-2

[4] Aitchison, J. (1997). *Words in the Mind: An Introduction to the Mental Lexicon*. Blackwell.

[5] Alawadhi, A. (2018). Acute hemorrhagic encephalitis responding to combined decompressive craniectomy, intravenous immunoglobulin, and corticosteroid therapies: Association with novel RANBP2 variant. In *Frontiers in Neurology* (Vol. 9). https://doi.org/10.3389/fneur.2018.00130
[6] Al-Smadi, M. (2019). Using long short-term memory deep neural networks for aspect-based sentiment analysis of Arabic reviews. In *International Journal of Machine Learning and Cybernetics* (*Vol. 10*, Issue 8, pp. 2163–2175). https://doi.org/10.1007/s13042-018-0799-4
[7] Archer, B. (2019). Humour in clinical–educational interactions between graduate student clinicians and people with aphasia. In *International Journal of Language and Communication Disorders* (*Vol. 54*, Issue 4, pp. 580–595). https://doi.org/10.1111/1460-6984.12461
[8] Atkinson, R. C., & Shiffrin, R. M. (1968). Human memory: A proposed system and its control processes. *The Psychology of Learning and Motivation: Advances in Research and Theory*, *2*, 89–195.
[9] Atkinson, R. C., & Shiffrin, R. M. (1971). The control of short-term memory. *Scientific American*, *225*, 82–90.
[10] Baihaqi, MIF. (2016). *Pengantar Psikologi Kognitif*. Refika Aditama.
[11] Ballard, K. J. (2019). Feasibility of automatic speech recognition for providing feedback during tablet-based treatment for apraxia of speech plus aphasia. In *American Journal of Speech-Language Pathology* (*Vol. 28*, Issue 2, pp. 818–834). https://doi.org/10.1044/2018_AJSLP-MSC18-18-0109
[12] Bethesda. (2015). Aphasia. *NIDCD Information Clearinghouse*. Retrieved June, 18, 2022, from http://www.nidcd.nih.gov
[13] Botha, H., & Josephs, K. A. (2019). Primary progressive aphasias and apraxia of speech. In *Continuum Lifelong Learning in Neurology* (No. 1; Vol. 25, Issue 1, pp. 101–127). https://doi.org/10.1212/CON.0000000000000699
[14] Cowan, N. (2008). What are the differences between long-term, short-term, and working memory? *Progress in Brain Research*, *169*, 323–338.
[15] Cummings, L. (1999). *Pragmatics, A Multidisciplinary Perspective*. Oxford University Press.
[16] Cummings, L. (2017). *Research in Clinical Pragmatics* (L. Cummings, Ed.). Springer International Publishing AG. https://doi.org/I 10.1007/978-3-319-47489-2
[17] Dardjowidjojo, A. (2008). *Psikolinguistik: Pengantar Pemahaman Bahasa Manusia*. Yayasan Obor Indonesia.
[18] Djajasudarma, T. F. (2016). *Semantik 2: Relasi Makna Paradigmatik, Sintagmatik, dan Derivasional*. Refika Aditama.
[19] Duffy, J. R., Utianski, R. L., & Josephs, K. A. (2021). Primary progressive apraxia of speech: From recognition to diagnosis and care. *Aphasiology*. https://doi.org/10.1080/02687038.2020.1787732
[20] Enrici, I., Bara, B. G., & Adenzato, M. (2019). Theory of Mind, pragmatics and the brain: Converging evidence for the role of intention processing as a core feature of human communication. In *Pragmatics and Cognition* (No. 1; *Vol. 26*, Issue 1, pp. 5–38). https://doi.org/10.1075/pc.19010.enr
[21] Gathercole, S. E. (2019). Developmental changes in short-term memory: A revised working memory perspective. In *Theories of Memory* (pp. 189–209). https://doi.org/10.4324/9781315782119-7
[22] Goerlich, C., Daum, I., Hertrich, I., & Ackermann, H. (1995). Verbal Short-Term Memory and Motor Speech Processes in Broca's Aphasia. *Behavioural Neurology*, *8*, 81–91. https://doi.org/10.3233/BEN-1995-8203
[23] Gregory, H. at all. (2014). Partially overlapping sensorimotor networks underlie speech praxis and verbal short-term memory: Evidence from apraxia of speech following acute stroke. *Frontiers in Human Neuroscience*. https://doi.org/10.3389/fnhum.2014.00649
[24] Haley, K. L., Cunningham, K. T., Jacks, A., Richardson, J. D., & ... (2021). Repeated word production is inconsistent in both aphasia and apraxia of speech. *Aphasiology*. https://doi.org/10.1080/02687038.2020.1727837
[25] Indah, R. N. (2017). *Gangguan Berbahasa Kajian Pengantar*. UIN-Maliki Press.
[26] Ivanova, E. G. (2021). Writing errors in Broca's and Wernicke's aphasias as a manifestation of functional strategies for writing. In *Vestnik Vosstanovitel'noj Mediciny* (*Vol. 20*, Issue 1, pp. 51–59). https://doi.org/10.38025/2078-1962-2021-20-1-51-59
[27] Jagoe, C. (2017). Disruption of Pragmatics in Adulthood. *Perspectives in Pragmatics, Philosophy & Psychology*, *11*, 181–210. https://doi.org/10.1007/978-3-319-47489-2
[28] Jagoe, C. (2021). Meaning non-verbally: The neglected corners of the bi-dimensional continuum communication in people with aphasia. In *Journal of Pragmatics* (*Vol. 178*, pp. 21–30). https://doi.org/10.1016/j.pragma.2021.02.027
[29] Lazar, R. M., & Mohr, J. P. (2011). Revisiting the contributions of Paul Broca to the study of aphasia. *Neuropsychology Review*. https://doi.org/10.1007/s11065-011-9176-8
[30] Lee, D. A. (1981). Paul Broca and the history of aphasia: Roland P. Mackay award essay, 1980. *Neurology*. https://n.neurology.org/content/31/5/600.short
[31] Margaret, L. B. (2017). Right-Hemisphere Pragmatic Disorders. *Perspectives in Pragmatics, Philosophy & Psychology*, *11*, 243–266. https://doi.org/10.1007/978-3-319-47489-2_10
[32] Martin & Ayala. (2004). Measurements of auditory-verbal STM span in aphasia: Effects of item, task, and lexical impairment. *Brain Lang*. https://doi.org/10.1016/j.bandl.2003.12.004.
[33] Martin, N. (2021). Treatment of verbal short-term memory abilities to improve language function in aphasia: A case series treatment study. In *Neuropsychological Rehabilitation* (*Vol. 31*, Issue 5, pp. 731–772). https://doi.org/10.1080/09602011.2020.1731554
[34] Mohr, J. P. (1976). Broca's area and Broca's aphasia. In *Studies in Neurolinguistics* (Vol. 1, pp. 201–235). ci.nii.ac.jp.
[35] Moussavi Esterabadi Kermani, F., & Birjandi, P. (2019). Heart-Brain Coherence; Heart-Rate Variability (HRV); Reading Anxiety; TestEdge Program. *Journal of Research in Applied Linguistics*, *10*(1), Article 1. https://doi.org/10.22055/RALS.2019.14178
[36] Nasios, G. (2019). From Broca and Wernicke to the Neuromodulation Era: Insights of Brain Language Networks for Neurorehabilitation. In *Behavioural Neurology* (Vol. 2019). https://doi.org/10.1155/2019/9894571
[37] Nielsen, S. R., Boye, K., Bastiaanse, R., & Lange, V. M. (2019). The production of grammatical and lexical determiners in Broca's aphasia. *Language, Cognition and Neuroscience*, *34*(8), Article 8. https://doi.org/10.1080/23273798.2019.1616104

[38] Olness, G. S., & Olatwoska, H. K. (2017). Aphasias. In L. Cummings (Ed.), *ReadingResearch in Clinical Pragmatics, Perspectives in Pragmatics, Philosophy & Psychology 11* (pp. 211–242). Springer International Publishing. https://doi.org/10.1007/978-3-319-47489-2_9
[39] Quesque, F. (2020). What Do Theory-of-Mind Tasks Actually Measure? Theory and Practice. In *Perspectives on Psychological Science* (*Vol. 15*, Issue 2, pp. 384–396). https://doi.org/10.1177/1745691619896607
[40] Rinaldi, M. C., Marangolo, P., & Baldassari, F. (2004). Metaphor Comprehension in Right Brain-Damaged Patients with Visuo-Verbal and Verbal Material: A Dissociation (RE) Considered. *Cortex*, *40*(3), Article (3). https://doi.org/10.1016/S0010-9452(08)70141-2
[41] Rodriguez, P. (2022). Deep Pain: Exploiting Long Short-Term Memory Networks for Facial Expression Classification. In *IEEE Transactions on Cybernetics* (*Vol. 52*, Issue 5, pp. 3314–3324). https://doi.org/10.1109/TCYB.2017.2662199
[42] Rutten, G. J. (2022). Broca-Wernicke theories: A historical perspective. In *Handbook of Clinical Neurology* (Vol. 185, pp. 25–34). https://doi.org/10.1016/B978-0-12-823384-9.00001-3
[43] Satyanegara. (2018). *Ilmu Bedah Saraf (edisi v)*. Gramedia.
[44] Schurz, M. (2021). Toward a hierarchical model of social cognition: A neuroimaging meta-analysis and integrative review of empathy and theory of mind. In *Psychological Bulletin* (*Vol. 147*, Issue 3, pp. 293–327). https://doi.org/10.1037/bul0000303
[45] Sperber, D. & D. W. (1995). *Relevance: Communication and Cognition*. Blackwell.
[46] Sperber, D. & Wilson, D. (1986). *Relevance communication and cognition*. Blackwell: Oxford UK & Cambridge USA.
[47] Sperber, D., & Wilson, D. (2009). *Communication & Cognition* (A. Syukur, Ed.). Pustaka Pelajar.
[48] Unger, N. (2021). Identification of Phonology-Related Genes and Functional Characterization of Broca's and Wernicke's Regions in Language and Learning Disorders. In *Frontiers in Neuroscience* (Vol. 15). https://doi.org/10.3389/fnins.2021.680762
[49] Valeev, A. A., Asmolovskaya, M. V., & Sigal, N. G. (2020). Foreign Language Learning Motivation as a Factor of Intensification of Communication. *Journal of Research in Applied Linguistics*, *11*. https://doi.org/10.22055/RALS.2020.16320
[50] Vallar, G., Corno, M., & Baso, A. (1992). Auditory and visual verbal short-term memory in aphasia. *Cortex*, *28*(3), Article 3. https://doi.org/10.1016/S0010-9452(13)80148-7
[51] Wambaugh, J. L. (2021). An expanding apraxia of speech (AOS) treatment evidence base: An update of recent developments. *Aphasiology*. https://doi.org/10.1080/02687038.2020.1732289

Lilis Hartini, is a senior lecturer at Bandung Law School, Bandung, Indonesia. Graduated from the Padjadjaran University, Bandung, Indonesia, 1990 (Bachelor in Linguistics); Indonesia University of Education, Bandung, Indonesia, 2011(Master in Linguistics); Now pursuing a doctoral degree in linguistics from the Indonesia University of Education. Her research interests include clinical linguistics, forensic linguistics, and pragmatics.

Dadang Sudana, is a senior lecturer in the Linguistics Study Programme at the Indonesia University of Education, Bandung. Indonesia. Graduated from the IKIP, Bandung Indonesia, 1989 (Bachelor in English Education); the University of Canberra, Australia, 1995 (Master in TESOL); Deakin University 2006 (Ph.D. in Linguistics). His research interests include linguistics in general and language acquisition.

Wawan Gunawan, is a lecturer in the Linguistics Study Programme at the Indonesia University of Education, Bandung, Indonesia. Graduated from the Indonesia University of Education, Bandung, Indonesia, 1997 (Bachelor in English Education); University of Queensland, Brisbane, Australia, 2002 (Master in Literacy Education); University of Massachusetts, Boston, Amerika, 2014 (Ph.D. in Literacy Education). His research interests include English Grammar and Systemic Functional Linguistics in addition.