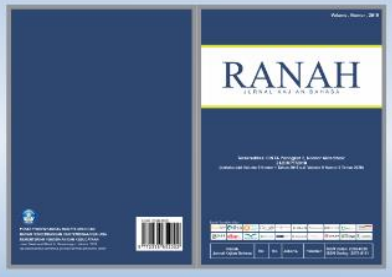

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VERB STRUCTURE AND GRAMMATICAL ENCODING IN THE SPONTANEOUS SPEECH OF INDONESIAN SPEAKERS WITH BROCA'S APHASIA

Struktur Verba dan Pengkodean Gramatikal Pada Tuturan Spontan Penutur Bahasa Indonesia dengan Afasia Broca

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Abstrak

Penelitian ini bertujuan untuk mendapatkan karakteristik struktur verba dalam tuturan spontan penutur Bahasa Indonesia dengan afasia Broca dan hubungannya dengan *Argument Structure Complexity Hypothesis* (ASCH) dan pengkodean gramatikal. Ada tiga pertanyaan penelitian, yaitu keterkaitan verba dan fungsi sintaksis, keterkaitan verba dan fungsi semantik, dan kontribusi terhadap ASCH dan pengkodean gramatikal. Delapan peserta ikut serta, dibagi menjadi empat dengan afasia dan empat peserta tanpa gangguan syaraf (*Non-Brain Damaged*: NBD) sebagai kontrol. Metode penelitian yang digunakan adalah metode eksperimental. Instrumen yang digunakan adalah lima buah gambar yang mengadaptasi *Cookie Theft* (instrumen dalam tes afasia lintas bahasa) serta tiga buah instruksi untuk bercerita tentang kegiatan sehari-hari. Hasil penelitian menunjukkan bahwa peserta dengan afasia cenderung menggunakan verba dalam struktur yang lebih sederhana daripada peserta NBD. Oleh karena itu, penelitian ini mendukung ASCH tentang penyederhanaan argumen dan kecenderungan terjadinya masalah pengkodean gramatikal. Dukungan ini penting karena datang dari Bahasa Indonesia yang merupakan bahasa rumpun Austronesia. Implikasi klinis juga disarankan.

Kata-kata kunci: *afasia Broca, hipotesis ASCH, pengkodean gramatikal, produksi verba*

Abstract

This study aimed to obtain the characteristics of verb structure in the speech of Indonesian speakers with Broca's aphasia and their relation to the Argument Structure Complexity Hypothesis (ASCH) and grammatical encoding. There are three questions, namely the interrelationships of verbs and syntactic functions, interrelationship of verbs and semantic functions, and the contribution to the ASCH and grammatical coding. Eight participants took part, divided into four with aphasia and four Non-Brain Damaged (NBD) participants as controls. The research used an experimental research method. The instruments were five images adapting Cookie Theft (an instrument used in an aphasia test in various languages) and 3 instructions to tell about daily activities. The results showed that participants with aphasia tended to use verbs in simpler structures than controls. Therefore, this study supports the ASCH about the argument simplification and tendency of grammatical coding problems, important as coming from Indonesian, an Austronesian language. Clinical implications are discussed.

Keywords: *Argument Structure Complexity Hypothesis (ASCH), Broca's aphasia, grammatical encoding, verb production*

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INTRODUCTION

Research which specifically discussed the characteristics and problems of verb production in the speech of speakers with Broca's aphasia have been carried out in several languages such as Spanish (Centeno & Obier, 2001), Italian (Rossi & Bastiaanse, 2008), Russian (Dragoy & Bastiaanse, 2010), and Turkish (Arslan et al., 2016). Research conducted by Centeno and Obler (2001) for Spanish was fairly initial research examining the problem of the characteristics of the verbs in the spontaneous speech of people with aphasia. The study involved six participants divided into two groups, namely three Spanish speakers without speech problems and three Spanish speakers who were diagnosed with agrammatism based on the Boston Diagnostic Aphasia Examination test (BDAE; Goodglass & Kaplan, 1972). The six study participants were asked to describe the Cookie Theft picture as part of the BDAE test and tell popular folklore titled "Little Red Riding Hood". In addition to the two tests, participants were also asked to be involved in a conversation with the theme of everyday activities. The results of the three tests indicated that the agrammatic speakers used the present-form verbs more often than the control group. Meanwhile, verbs showing the other time frames were very rarely found or there were errors when they appeared in speech.

In addition to Centeno and Obler (2001), Rossi and Bastiaanse (2008) also conducted similar research for Italian. The main objective of the study was to identify the use of verbs in the spontaneous speech of Italian speakers with Broca's aphasia. The study involved 17 participants consisting of seven Italian-language agrammatic patients and ten Non-Brain Damaged speakers (NBDs) as a control group. They were involved in a series of tests, namely a semistandard interview, description of the Cookie Theft picture, and story-telling of Little Red Riding Hood. The results of the study showed several important points related to the production of verbs in the speech of Italian-speaking speakers with aphasia. First, there were omissions of verbs in mandatory contexts. Second, verbal inflection errors were found. Third, verbs had a limited variation. Fourth, the structures of the verb argument used in sentences tended to be simple. Italian-speaking agrammatic speakers tended to avoid complex structures involving verbs in the production of their speech.

Subsequent research was conducted by Dragoy & Bastiaanse (2010) for Russian. This study aimed to identify verb production problems in the speech of Russian-language agrammatic patients. Basically Dragoy & Bastiaanse (2010) wanted to prove whether the hypothesis stating that verbs tended to be difficult for agrammatic speakers applied to Russian. Dragoy & Bastiaanse (2010) stated that Russian was one of the languages rich in morphological rules and that the word order tended to be free. The study involved 32 participants consisting of 16 agrammatic speakers and 16 Russian NBD speakers as a control group. The method used in the study is Sentence Production Priming which could elicit the production of verbs and sentences. The results of the study indicated that Russian-speaking agrammatic speakers had difficulty with the number of arguments in the sentences. In addition, Dragoy & Bastiaanse (2010) also reported that the production of verbs selectively appeared to be constrained due to the complexity of grammatical information attached to verbs and syntactic operations on the basic structure of the sentence.

Arslan et al. (2016) also conducted a similar study with the three previous studies. The study was conducted for Turkish involving 20 participants who were divided into two groups, namely 10 agrammatic speakers and 10 NBD speakers as a control group. The method used in this study was picture description and interviews. In the picture description section, participants were asked to tell about three pictures, namely Cookie Theft, Flood Rescue, and Pulitzer Prize Winning Photo of Annie Wells. Meanwhile, in the interview, participants were asked to tell matters related to their illness, work, family, and hobbies. The results of the study

showed that Turkish-speaking agrammatic speakers were indicated to experience verb production problems. Speaking speed tended to be slow in agrammatic speakers. The number of verbs and diversity of verbs produced in each speech tended to be low compared to that of the control group. Verb inflection could still be used by the agrammatic speakers, but a number of problems was found in verb substitution. In addition, the sentences produced by agrammatic speakers tended to be simpler than the control group.

Of the four studies that have been conducted regarding the use of verbs in the spontaneous speech of people with Broca's aphasia, there were several similar findings. In Spanish, Italian, Russian and Turkish, the findings showed that agrammatic speakers tended to omit verbs or use verbs inappropriately in the context of sentences. In addition, the resulting sentences tended to be simpler than those of the control group. Seeing that researchers working in various languages in the world continue to strive to complete existing research, it is interesting to do similar research in Indonesian. The problem of verb production in Indonesian as a part of Austronesian language needs to be identified to complete previous studies. Thus, the next part explains the research related to aphasia in Indonesian speakers that have been carried out in order to establish the research gap.

Verb argument structure, specifically, has been an interest of linguists of various languages. Some prominent research includes Maul et al. (2014); Malyutina et al. (2016); Sung (2016); Henry et al. (2018); Silagi et al. (2020); Heinzova et al. (2023) and Kuvač et al. (2023). The findings from research about verb argument structure were then utilized to help speakers with aphasia train their languages in rehabilitation studies such as Thompson et al. (2013).

Phonological aspects dominated research related to language disorders in speakers with Broca's by departing on the hypothesis that these speakers experienced more problems with sound production. For example, Akmajian (1995) was quoted by Aribowo (2016) stating that a clear disorder arising in people with aphasia is a phonological disorder. Meanwhile, research that focuses on agrammatism seems to have not been developed. The dearth of research that has been done investigate a grammatism in Indonesian is the understanding of active-passive sentences and the complexity of the sentence (Postman, 2004 & Jap et al., 2016), general characteristics of agrammatic symptoms (Suhardiyanto, 2003 & Anjarningsih et al., 2012), as well as the relationship between verbs and time reference (Anjarningsih & Bastiaanse, 2011). Therefore, it seems that the problem of verbal production in spontaneous speech as has been investigated in several other languages (Centeno & Obier, 2001); (Rossi & Bastiaanse, 2008); (Dragoy & Bastiaanse, 2010; Arslan et al., 2016) has not been studied in Indonesian.

Thus, this research is expected to fill the gap. That is, this research is expected to complete information related to the characteristic symptoms of agrammatism in Indonesian speaking agrammatic speakers seen from the use of verbs in spontaneous speech. On the other hand, in a larger scope, this research is expected to complete previous studies in other languages belonging to different language families. Indonesian belongs to the Austronesian language family, whereas Italian belongs to the Romance family, Russian to Slavic, Dutch to Indo-European, and Turkish to the Altaic language family.

In the research conducted by Rossi and Bastiaanse (2008) for Italian, there were two views that are trying to be tested regarding agrammatism. Rossi and Bastiaanse (2008) quoted Miceli et al. (1983) which stated that agrammatism in people with aphasia could not be unified in one syndrome because the symptoms and characteristics that arose among participants appeared differently. Although there were several similar agrammatic characteristics such as omissions of articles and prepositions in speech, and the use of infinite

verbs for finite ones, differences still appeared among the participants with aphasia (Miceli et al., 1983 in Rossi & Bastiaanse, 2008).

Important findings quoted by Rossi and Bastiaanse (2008) from Miceli et al. (1983) were that agrammatism in Italian-speaking people with aphasia was closely related to two aspects of language, namely morphological and syntactic aspects. Another opinion quoted by Rossi and Bastiaanse (2008) was the research of Kolk & Heeschen (1990) and Kolk and Van Grunsven (1985) which stated that differences in the symptoms of agrammatism that arose in people with aphasia were a form of strategy of each speaker in producing speech while their agrammatism was within the same syndrome.

In addition to these two opinions, another aspect that was tested by Rossi and Bastiaanse (2008) was the problem of the complexity of the argument that accompanied the verb according to the Argument Structure Complexity Hypothesis (ASCH; Thompson, 2003). Quoting Thompson's opinion (2003), Rossi and Bastiaanse (2008) explained that the more complex the structure of the argument that accompanied the verb, the more difficult it was for agrammatic speakers to produce speech. Rossi and Bastiaanse (2008) also added that the difficulty of production of verbs and the tendency of simplifying arguments was related to the problem of grammatical encoding. The results of the research showed that participants tended to eliminate verbs or only produce verbs with small variations. Participants also tended to produce verbs with simple argument structures as a strategy to reduce grammatical encoding load. In addition, simple sentences were also produced with the aim of avoiding more complex syntactic operations (Rossi & Bastiaanse, 2008). This supported the statement by Bastiaanse & Van Zonneveld (2004) that related verb production with grammatical coding problems in the Levelt model (1989).

By paying attention to various aspects that were studied in the research of Rossi and Bastiaanse (2008), it seems that the same topic needs to be investigated as well as in Indonesian because research related to the production of verbs in spontaneous speech of Indonesian speakers with aphasia has not been done. Therefore, this research focuses on identifying verb usage in the spontaneous speech of people with Broca's aphasia in Indonesian and looking at the relationship with the ASCH hypothesis and grammatical coding as done in research by Rossi & Bastiaanse (2008).

It is expected that the results of this research will be able to contribute both practically and theoretically. The problems of verb production in spontaneous speech described in this research is expected to practically contribute to the field of speech therapy. With this research, the results of the discussion and analysis can be used as a basis for recommendations for developing a therapeutic model in terms of spontaneous speech. Referring to the research objectives, the results are expected to be able to present an overview characteristics of verb use seen from basic verbs, affixed verbs, syntactic cases, as well as semantic cases. The therapy model that will be designed can refer to the research results based on these variables

THEORETICAL BASIS

The Levelt model is a language processing model that shows an overview of the production of an utterance (Levelt, 1989). Basically, according to Levelt (1989), language processing includes five main components, namely Conceptualizer, Formulator, Articulator, Audition, and the Speech-Comprehension System. Here is a chart that shows the language processing model.

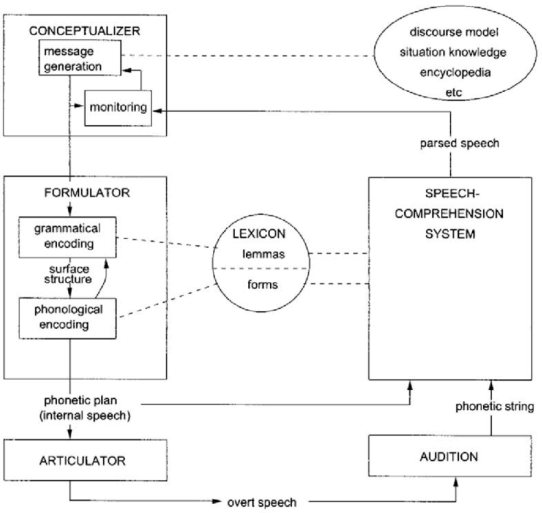


Figure 1. Levelt's (1989) model of language processing

From the chart it is shown that in the first part, language processing begins from the entry of a message that is then conceptualised. In other words, the message that is included in the language processing system is translated and becomes a material for the formulator. In the formulator, Levelt (1989) incorporated two subcomponents referred to as the grammatical encoding and phonological encoding. In grammatical coding, the encoder retrieved the grammatical unit which included the semantic and syntactic units in the lexicon, while phonological information was accessed separately.

Of the two subcomponents, the grammatical coding process activated a lemma series in a certain order, while the phonological process reduced the phonological design which included stress and intonation patterns. Furthermore, the formulator continued into the process involving the articulators. Meanwhile, the Speech-Comprehension System was a component that played a role in monitoring the output of the speech and errors in it. When a speaker made a correction in the process of speech, the speaker tried to control the output form that he or she intended to be and along with the process involved in it.

From the series of these processes, Rossi and Bastiaanse (2008) showed that the production of verbs for Italian speakers with aphasia appeared to be constrained due to a disturbance in the grammatical coding process. This supported the statement previously evidenced by the research of Bastiaanse & Van Zonneveld (2004). Rossi and Bastiaanse (2008) stated that the grammatical encoder basically built sentence structures based on the intention of speakers and lexical information of a word. A verb could be said to be a more complex lexical item compared to, for example, nouns, because a verb contained information about the structure of the argument, the subcategorization framework, and thematic role. The grammatical encoder then used the three units to build a sentence structure.

Referring to Bastiaanse & Van Zonneveld (2004), the grammatical encoder also applied grammatical operations needed to build derived sentences (eg., non-canonical forms). If the grammatical encoder was disrupted, the application of grammatical rules and operations, both morphological and syntactic aspects, were also disrupted. Lexical entries could not be processed well. A verb would be likely to be difficult to produce because information about the structure of arguments, subcategories, and thematic roles had to be processed laboriously.

Thompson (2003), put forward the Argument Structure Complexity Hypothesis (ASCH) based on her findings that participants with aphasia showed a clear preference for verbs with fewer arguments in their spontaneous speech. The hypothesis is as follows:

1. Verbs whose argument structures entail greater complexity are more difficult for agrammatic aphasic individuals to produce.
2. Complexity encompasses both the number of arguments and the type of argument structure information contained within the verb's lexical entry, i. e. verbs with a greater number of arguments or with argument structures that trigger movement operations render them more complex.

For example, Thompson (2003) argued that the unaccusative verb "melts" (The ice melts) was more difficult for agrammatic speakers compared to the unergative verb "laughs" (The man laughs) because the theme "the ice" needed to undergo movement in order to be assigned case. Such a movement was not necessary for "the man" because it was already in the correct place to be assigned case. Furthermore, in the agrammatic participants' speech, more one-place verbs were produced than two-place and three-place verbs. A look at the one-place verbs showed that one-place accusative verbs were produced less frequently than the one-place unergative verbs.

For Indonesian, Kridalaksana (2002) stated that larger syntactic units were formed from smaller units related to each other functionally. In the syntactic function, the predicate function was the core part. In the present study, the connection between verbs and syntactic functions needed to be reviewed and analysed because verbs were one of the word classes that often-occupied predicate positions in Indonesian sentences (verbal predicates). As stated by Alwi et al. (2003) that verbs or verbal phrases were a part that usually occupied the predicate position as a core constituent accompanied by the subject on the right and the objects / adverbials / complements on the left if any. As for the current study, it investigated how verbs were placed as predicates in speech and the completeness of the elements that accompanied the verbal predicate.

To simplify the description of the basic sentence patterns in the participants' speech, this study used codification for six basic patterns of sentences based on the classification of Alwi et al. (2003). The classification was pattern 1 (Subject-Predicate), pattern 2 (Subject-Predicate-Object), pattern 3 (Subject-Predicate-Complement), pattern 4 (Subject-Predicate-Adverbials), pattern 5 (Predicate-Object-Complement), and pattern 6 (Subject-Predicate-Object-Adverbials). The pattern that appeared in the data outside the classification was encoded with the code pattern 7, pattern 8, and so on. Regarding the basic sentence patterns in Indonesian, the omissions of elements in a sentence would be explained based on the Sneddon et al. classification. (2010) which included subject omission, omission of nouns that referred to non-human entities, omission of words other than the subject, double omission, omission of possessives, and omission of words as a response to interlocutor's questions.

Semantic functions were also concerned with the interactions among sentential components (Kridalaksana, 2002). In Indonesian, the predicate could be occupied by various word categories, one of which was the verb category as a dominating category. In this study, the semantic function became important to be reviewed and analysed because there was a need for an explanation regarding the function of the verb as a predicate and the role of the argument that accompanied the verb in speech production. In a proposition, verbal predicates could be followed by one argument or more with their respective semantic roles. Analysis of the argument's semantic role in this study referred to the synthesis of Kridalaksana (2002) and Alwi et al. (2003).

From the classification of Kridalaksana (2002) as many as 15 roles and Alwi et al. (2003) as many as six roles, the analysis in this study referred to 15 new classifications. The classifications of semantic roles consisted of experiencers, actors, principals, attributes,

targets, results, beneficiary, sizes, tools, places, sources, scope, companion, time, and origin. The following is the definition of each classification.

- Experiencers, namely participants who experienced circumstances or events that were declared by the predicate in the form of adjectives or non-transitive verbs that further stated the situation (Alwi et al., 2003). In Kridalaksana (2002) the classification is called responders.
- Actors, namely the role that carried out activities or actions stated by the predicate (Kridalaksana, 2002; Alwi et al., 2003).
- Principals, namely the role explained by other objects or which played the predicate function (Kridalaksana, 2002).
- Attributes, namely the role that explained the previous object (Kridalaksana, 2002; Alwi et al., 2003). In the classification of Kridalaksana (2002) this role was called characteristic.
- Targets, the role was subject to the act or that limited the actions stated by the verbal predicate (Kridalaksana, 2002; Alwi et al., 2003).
- Results, namely the role that was the result of the action of the predicate (Kridalaksana, 2002).
- Beneficiary, namely the role that benefited from the predicate (Kridalaksana, 2002; Alwi et al., 2003). In the Kridalaksana classification (2002) this role was referred to as a user.
- Size, namely the role that served to state the size of other objects (Kridalaksana, 2002).
- Tools, namely the role that functioned as an object used by the actor to complete the actions or activities (Kridalaksana, 2002). In the classification of Alwi et al. (2003), this role was included in the classification of the semantic role of adverbials consisting of tools, time, places and sources.
- Places, namely the role relating to the place of acting or predicate (Kridalaksana, 2002; Alwi et al., 2003).
- Sources, namely the role that was owned or owner of its original object in exchange (Kridalaksana, 2002).
- Scope, namely the role concerned with objects that were the scope of the predicate (Kridalaksana, 2002).
- Companions, namely the role that followed the actors (Kridalaksana, 2002).
- Time, namely the role that served to explain the time of the occurrence of predicate (Kridalaksana, 2002; Alwi et al., 2003).
- Origin, namely the role relating to the material for an object (Kridalaksana, 2002). In the classification of Alwi et al. (2003) this role was called the source. To distinguish
- with the number 11 role, the term used in this study was the role of origin.

The following section discusses the research method employed in the study.

RESEARCH METHOD

In this study, qualitative methods were used to abstract and compile explanations for problems analysed such as morphological features of the verbs that were produced, interrelationships of verbs with syntactic functions, semantic roles of arguments in verbal predicates, and other elements. The utilisation of this method answered the problem and the

objectives of the research regarding the production of verbs in the spontaneous speech of speakers of Indonesian-language with Broca's aphasia.

The number of participants involved in this study was 8 people divided into two groups, namely 4 people with Broca's aphasia and 4 normal speakers (non-brain damaged speakers / NBDs) as a control group. In a number of previous literature related to language disorders in aphasia, there were no specific rules for the number of participants involved. There were a number of studies involving speakers with aphasia and the control group with the same number. On the other hand, there were also studies involving control groups with twice the number of speakers with aphasia. With these conditions, this study involved the same number of participants in the aphasia group and in the control group.

The participants with Broca's aphasia involved in this study were ischemic stroke patients (non-hemorrhagic) because of blockage in the blood vessels. The inclusion criteria for the two participant groups in this research included six things, namely (1) diagnosed with Broca's aphasia (for NBD speakers as a control group, the first criterion was not to have a speech impairment), (2) had a relatively good hearing and vision, (3) spoke Indonesian, (4) aged 46-65 years in the elderly age range according to the Ministry of Health of the Republic of Indonesia (2009), and (5) had at least high school education. For the first criteria, the diagnosis of Broca's aphasia was obtained from medical records recorded by speech therapists after patients underwent the TADIR test (the aphasia test for diagnosis, information, and rehabilitation; (Dharmaperwira-Prins, 1996). The test included six stages, namely the stages of calling, naming, telling stories, understanding oral language, and imitating words. From a series of tests, the rough scores and norm scores to determine aphasia / non-aphasia and the kind of aphasia suffered were obtained.

To participate in this study, all participants had read and understood the research related explanation (Informed Consent) and had signed a statement of willingness to participate in the research. The following presented the demographic profiles of the participants with Broca's aphasia in Table 1 and those of the NBDs in Table 2.

Table 1
TADIR profiles of the participants with Broca's aphasia

Code	Recalling	Naming	Speaking	Comprehension	Repetition	Severity
A1	4	8	43	4	3	*Mild*
A2	7	7	45	8	3	*Mild*
A3	8	6	50	4	3	*Mild*
A4	4	6	25	4	2	*Moderate*
N1-N4	>10	8	80-110	10	4	Normal

Notes:
- A1-A4 for the four participants with Broca's aphasia, and N1-N4 are for the four NBD participants (NBDs) as the control group
- Recalling : recalling animal names in 1 minute
- Naming : picture naming (max. 8)
- Speaking : words produced in 1-minute speaking
- Comprehension : comprehension of words and sentences (max. 10)
- Repetition : repetition of words and sentences (max. 4)

Table 2
Demographic details of all participants

Code	M/F	Age	Handedness	Education	Occupation	Time Post-Onset	Language
P1	F	50	Right	High school	Homemaker	>1 year	Indonesian
P2	M	60	Right	High school	Retired	>2 years	Indonesian
P3	M	47	Right	Bachelor level	Private employee	>2 years	Indonesian
P4	M	53	Right	High school	Private employee	>1 year	Indonesian

Code	M/F	Age	Handedness	Education	Occupation	Time Post-Onset	Language
N1	F	53	Right	High school	Civil servant	-	Indonesian
N2	F	60	Right	Bachelor level	Retired	-	Indonesian
N3	M	47	Right	Bachelor level	Teacher	-	Indonesian
N4	M	53	Right	High school	Private employee	-	Indonesian

Note:

- Codes P1-P4 for four participants with Broca's aphasia, whereas codes N1-N4 for four NBD speakers as members of the control group
- M/F : Males / Females
- Time post-onset : the time that elapsed between the occurrence of stroke and the time of data collection

This research was conducted in two places, namely the nerve polyclinic under the auspices of the Neurology Department of the National Central Hospital (RSUPN) Cipto Mangunkusumo in Central Jakarta and the Stroke Mandiri Stroke and Neuro Rehabilitation Center in the South Jakarta area. The hospital criteria and rehabilitation center chosen as the place of research were institutions that provided speech therapy services for stroke sufferers, including people with Broca's aphasia. This was done because to uphold the diagnosis of aphasia, the handling of authorized doctors and therapists was needed. The time of patient observation and data collection was carried out when the patients attended the therapy schedule in the January-March 2020. Meanwhile, for the control group, data collection was carried out in the Depok and Tangerang areas. Data collection of the control group was carried out in February 2020 by visiting each participant.

In terms of data collection, this study involved two types of tests to produce spontaneous speech, namely an interview and picture descriptions. The operational definition of spontaneous speech in this study is the speech produced by participants directly after hearing instructions without prior planning. The test conducted in this study in general was an adaptation of the research in Italian conducted by Rossi and Bastiaanse (2008). In the interview, research participants were asked to tell the story of three questions related to daily activities, hobbies or most preferred activities, and work.

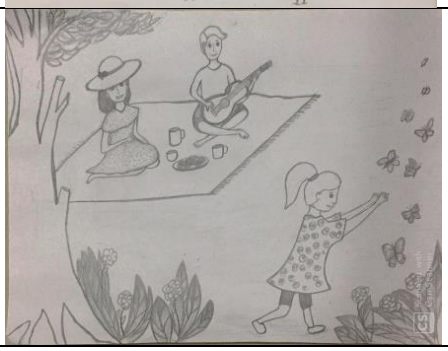
Meanwhile, for picture descriptions, the researcher presented 5 pictures adapted from the Cookie Theft picture used in Rossi and Bastiaanse (2008). Adaptation was done by adjusting the conditions and habits of the people of Indonesia by displaying images that contained daily activities of Indonesian people such as working together in cleaning houses, taking care of chickens, drying clothes, and so on. The five drawing instruments were then validated by testing Indonesian native speakers. A total of 20 speakers were asked to tell the activities in the image. The five pictures underwent three revisions until they resulted as clear and understood by speakers.

In addition to pictures, the instrument in the form of three questions / instructions had also been validated by being tested on 20 Indonesian native speakers. Speakers were asked to tell stories according to three instructions given. The following are the interview questions and pictures used in the study.

Table 3
Interview questions/instructions

Code	Questions/Instructions
Q1	Please tell me your daily activities from morning to evening.
Q2	Please tell me your hobby(s) or your favorite activity(s).
Q3	Please tell me your past or present occupation(s).

Table 4
Pictures

Code	Instrument
Picture 1 (G1)	
Picture 2 (G2)	
Picture 3 (G3)	
Picture 4 (G4)	
Picture 5 (G5)	

In the interview session, the researcher gave three questions / instructions in sequence. For each of the instructions, participants were given the opportunity to tell their story according to the instructions given. For the group with Broca's aphasia, the researchers gave the prompt words needed as few as possible. Meanwhile, for the NBD participants, the researchers did not give any prompts except instructions / questions at the beginning.

In the picture description session, the pictures were also presented in sequence. After being presented with one picture, participants were given time and opportunity to describe what they saw. In both the interview and picture description, there was no time limit for participants to speak. The entire data collection process was recorded using a Sony ICD-PX370 digital voice recorder with a capacity of 32GB. Following Bos & Bastiaanse (2014) and Casilio et al. (2019), the participants' speech rate was calculated and noted.

As stated by Rossi and Bastiaanse (2008) that as of 2008 there had been no binding provisions related to the number of data used in spontaneous speech research. The commonly used data is 150-300 words or all words obtained. The amount of data used in this study referred to the research of Anjarningsih et al. (2012) which extracted 300 words as data related to agrammatic characteristics in Indonesian. Because this study included sentences as units of analysis other than words, 300 words are calculated in terms of sentences. On average one sentence consisted of 6-8 words, so that the number of 40 sentences resulted as the amount of data from each participant.

In this study, the identity of all participants was kept anonymous so that the naming of each participant was symbolised by the P1-P4 code for participants with aphasia and N1-N4 for NBD speakers as a control group. Meanwhile, the determination of the boundary of the sentence was guided by syntactic and semantic criteria (Kridalaksana, 2002; Alwi et al., 2003) and intonation in Indonesian (Halim, 1969; Sugiyono, 2015). This is in accordance with the opinion of Saffran et al., (1989) in Rossi and Bastiaanse (2008) which stated that in the segmentation of sentences for spontaneous speech analysis, aspects that had to be considered could include syntactic criteria, prosody, pause analysis, and semantic indicators. The intonation aspect in this study was very helpful to determine the integrity of the sentences, especially for participants with Broca's aphasia with sentences that were short, unstructured, or ambiguous. Falling intonation indicated the end of a declarative sentence or a pause for the next sentence, while rising intonation was an indication of an interrogative sentence (Halim, 1969; Sugiyono, 2015)

For qualitative analysis, data that had been transcribed based on each topic are analysed to obtain results related to verbs in the discussion of syntactic functions, as well as verbs in the discussion of semantic roles and functions. In discussions related to syntactic functions, qualitative analysis includes an explanation of the use of verbs in various types of sentences. In part of the semantic roles and functions, qualitative analysis includes an explanation for verbs and arguments that accompanied them and semantic roles that appeared in the context. The entire series of qualitative analysis included examples of data that supported the analysis.

DISCUSSION

The discussion of this research is presented in four subsections. The first subsection discusses verbs in the spontaneous speech data of the aphasia group and control group. The second subsection presents interrelationships of verbs and syntactic functions. Next, the third subsection discusses interrelationships of verbs and semantic functions. Lastly, the fourth subsection discusses the relationship between the results and the ASCH hypothesis and grammatical encoding. In general, the control group performed well and their spontaneous speech could be understood easily (please refer to the Appendix). The few omissions that

happened were based on the context and within normal performance (Anjarningsih et al., 2012). Therefore, the data from the control group are discussed only in the first subsection.

Below, the speech rate comparison between the participants with aphasia and the NBDs is presented below. The participants with aphasia showed non-fluency.

Table 5

Speech Rate Comparison between the participants with aphasia and NBDs

Participants with aphasia	*Speech Rate* (words per minute)	Penutur Normal	Produksi kata per menit (*Speech Rate*)
A1	43	N1	100
A2	45	N2	90
A3	50	N3	92
A4	25	N4	88

Verbs in the spontaneous speech data

In the following table, details of produced verbs are presented.

Table 6

Root verbs and affixed verbs by participants P1-P4 and N1-N4

Participants with aphasia	Root verbs	Affixed verbs	Ratio root verbs/affixed verbs (%)	NBD's	Root verbs	Affixed verbs	Ratio root verbs/affixed verbs (%)
P1	27	28	0.964	N1	18	44	0.409
P2	22	36	0.611	N2	12	31	0.387
P3	29	20	1.45	N3	9	35	0.257
P4	17	28	0.607	N4	23	28	0.821

For participants P1, the number of root verbs and affixed verbs that were produced was almost the same, namely 27 and 28. Meanwhile, in participants N1 as the control participant, the number of affixed verbs that was produced was more than that of the root verbs, namely 44 and 18. From these results, at a first glance it appeared that N1 did not have any limitations to use affixed verbs or even tended to express more information through the affixed verbs in both the picture description and the storytelling. In contrast to the NBD speaker, the same number for both types of verbs in the speech of P seemed to indicate that PI simply did not choose the type of verbs or had any preferences like participant N. This seemed to be related to the participant strategy when she had difficulties producing verbs. For example, when P1 said "Ibunya juga ee ... **meng-** ..," (The mother also ee… **meng-**) P1 did not continue the verbal prefix meng- with a verb root and instead replaced the utterance with "Air, ada air tumpah" (Water, there is water spilling). The verb "tumpah" is a root verb that supposedly replaced the planned affixed verb.

Next, participant P2 produced more verbs in total than participant N2. P2 also had more affixed verbs than root verbs, that suggested a normal pattern. However, P2 actually had two problems in relation to verb production. First, he repeated verbs when speech production became difficult. For example, he uttered the following: "I..i..i.. bapak sedang menya-.. menya-.. menyapu" (I..i..i.. the father is sweep-..sweep.. sweeping.). Second, P2 also had some verbs that mismatched the context. For instance, in the sentence "Dan ayah sedang me.. membersih ee.. sedang membersih ee.. bermain gitar," the affixed verb "membersihkan" (clean) was not produced correctly (i.e., lacking the second part of the simulfix me-kan) although it was produced twice and was eventually replaced by the verbal phrase "bermain gitar" (play guitar) which was more in line with the context.

For participant P3, he produced more root verbs than affixed verbs. This was in contrast with the reverse pattern shown by his control, participant N3. In addition to the difficulty with producing affixed verbs, participant P3 was also non-fluent when producing verbs. The almost 50% more root verbs seemed to be produced as a strategy to avoid difficulties with affixed verbs.

Lastly, in participant P4, the number of affixed verbs produced was the same as that produced by A4, the control participant. However, in this seemingly normal production, there were inaccurate repetitions of the simulfix me-kan and some root verbs. The simulfix me-kan occurred inaccurately in the affixed verb "membersihkan" (clean), such as in the utterance "Adiknya membersihkan taman" (The little child is cleaning the garden) in picture G2. Here, a more suitable verb is "menyiram" (is watering).

From the explanation in this subsection, participants with Broca's aphasia seemed to show some general patterns in their verb production. First, they tended to use more root verbs than affixed verbs, in contrast with the pattern shown by the NBDs. Second, repetitions of root and affixed verbs, either correctly or incorrectly, were also evident.

Interrelationships of verbs and syntactic functions

The results of the analysis showed that the omissions of the subject and object were the most dominating cases of omissions of syntactic elements. The omissions of the subject in the case of P1 occurred 7 times, P2 2 times, while P3 and P4 were 17 times each. Meanwhile, for the omissions of objects in the case of P1 occurred 1 time, P2 4 times, P4 1 time, and P3 did not omit any objects. Thus, the participants with Broca's aphasia omitted subjects 43 times, while object omissions occurred 6 times. Thus, it can be seen that the subject was the verbal-predicate-accompanying element that was most frequently omitted. Interestingly, participant P4 produced double omissions that left just the verbal predicate. For instance, P4 produced the sole verb "Membersihkan" (clean) as one of the responses to picture G1. This rendered the message incomprehensible. Some example utterances from the participants with aphasia are presented in Table 6.

Table 7
Examples of omissions by participants P1-P4

Participant Code	Picture/question	Utterance	Type of omission
P1	G1	*Nyenya ee.. menyapu dan ee.. sa.. sampah.. membersih sampah.* Sw ee.. sweep and ee.. gar.. garbage.. clean garbage.	*Subject omission*
PI	G1	*Ibunya juga ee.. meng-.* The mother also ee.. is mo..	*Object omission*
P2	G2	*Menyiram.. menyiram dengan ta.. dengan tamu.* Watering.. watering with the guest.	*Subject omission*
P2	G1	*Dan bapak sendiri sedang me.. mende.. menge.. membersihkan la.. la..* And the father i.. is cl.. cl.. cleaning fl.. fl..	*Object omission*
P3	Daily activity	*Terus ee.. Apa.. mandi.* Then ee.. what.. take a bath.	*Subject omission*
P4	Daily activity	*Pagi bangun subuh.* Morning wake up early.	*Subject omission*
P4	G1	*Membersihkan.. ee.. ibunya membersihkan.. member.. member.. member..* Clean.. ee.. the mother clean.. cl.. cl.. cl..	*Object omission*

When viewed from the examples that appeared in the spontaneous speech of the participants, the omission of the subject dominated for several possible factors. First, the omission of the subject occurred when participants seemed to be more focused on the production of verbs that acted as predicates. For example, in the utterance of P1 "Ee ... sweep and ee ... gar ... garbage ... clean the garbage" the subject omission suggested more focus and effort were directed on the production of verbs that seemed quite difficult. Because of that, there was a repetition to find the verb.

Secondly, the omission of the subject seemed to appear when participants could not mention the nouns which should occupy the position of the subject. One of the participants with Broca's aphasia replaced the subject referred to by the pronoun "ini" (this) as a strategy to make the utterance easier to say. Two examples were the utterances by participant P4: "Ini membersihkan lap.. lap. (This cleans rag .. rag.) and "Ini memberikan ma.. makan.. makan.. itik" (This gives eat ... eat ... eat ... duck). From the two examples it appeared that P4 preferred to use this pronoun which does not have a clear reference because of the difficulty of using the subject referred to in these two contexts.

Third, the omissions of the subject seemed to appear often when participants were in the context of telling stories and with the perspective of the singular first person. That is, the omission of the subject could be seen as a strategy to launch speech. For example, in the case of P3. as many as 17 utterances that shared P3's daily activities did not contain the subject element. In addition, the participants with Broca's aphasia also tended to use short and simple sentence structures to launch speech.

The results here both replicated and supported Anjarningsih et al. (2012) about omissions of obligatory parts of sentences in the speech of Indonesian speakers with Broca's aphasia. Obtained from a different group of speakers with Broca's aphasia and by means of different instruments, the similar results may have shown a real phenomenon. Thus, it could be concluded that ellipsis reliably characterised the spontaneous speech of Indonesian speakers with Broca's aphasia, and therefore, needs to be taken into account in research and intervention. In addition, ellipsis that did not have any pragmatic reasons and was overly used may have been a good candidate to spot agrammatism in clinical settings.

Interrelationship of verbs and semantic functions

The omissions of syntactic elements mentioned in the previous subsection gave rise to missing semantic roles in the speech of the participants with Broca's aphasia. The following table shows details of the affected semantic roles.

Table 8

Semantic functions affected by omissions by P1-P4

Participant Code	Semantic roles affected
P1	• *Omissions of actors in active transitive verbs* • *Omissions of actors in intransitive verbs*
P2	• *Omissions of targets for active transitive verbs* • *Omissions of actors for active intransitive verbs* • *Omissions of actors in intransitive verbs*
P3	• *Omissions of actors in active transitive verbs* • *Omissions of actors in intransitive verbs*
P4	• *Omissions of targets for active transitive verbs* • *Omissions of actors in active transitive verbs* • *Omissions of actors and targets in active transitive verbs* • *Omissions of actors in intransitive verbs*

Based on the results of the description for each example of semantic functions above, it could be seen that the elements that dominated the cases of omissions were the actors and targets. This is in line with the elements that underwent omissions, namely the subject and object. The tendency of participants with Broca's aphasia to produce speech with simple sentence structures had an impact on a simple proposition structure. From the previous description it could be seen that examples of propositions that appeared consisted of predicate, predicate with a single argument, or no semantic elements were produced. Propositions that contained complex argument structures were rarely found in the spontaneous speech of the participants with aphasia. This was different from the control group

that tended to use propositions with more complex structures. For example, participant N4 uttered the following complex sentence about his work: "Kalau ada dosen yang meminta tolong apa… benerin LCD atau LCD-nya perlu dibenerin, baru kita perbaiki" ("If there is a lecturer who asked for something. Fixing LCDs or the LCDs needed to be fixed, then we fix them"). In addition, the following compound sentence was uttered by N3: Ibunya mungkin sedang bernyanyi atau hanya bersantai saja ("The mother maybe is singing or just relaxing").

As for the number of times the actor argument was omitted in the speech of the participant with afasia, it was 7 cases for participant P1, 2 cases for P2, and 17 cases for P3 and P4 respectively. Meanwhile, for the omissions of the target argument, participant P1 numbered 1 case, P2 4 cases, and A4 also 1 case. Thus, it could be seen that the overall omission of the actor numbered to 43 cases, while the omission of the target argument was 6 cases. With this number it appeared that the omission of the actor argument was the most common case in the spontaneous speech of participants with Broca's aphasia. This suggested that participants with Broca's aphasia found it more difficult to produce the initial part that preceded the predicate compared to the element that followed the predicate. Participants also tended to focus more on the production of parts that were considered the core of the proposition and became the main idea of a proposition. Meanwhile, for the omissions of target, participants with Broca's aphasia seemed to do this because of the difficulty of producing a fairly long speech. Of the 6 cases that happened, when participants arrived at the core of the predicate, they had difficulty continuing their speech.

Contribution to the ASCH and grammatical coding

As had been presented before, this research in Indonesian was inspired by the production of verbs in the spontaneous speech of Italian speakers with aphasia (Rossi & Bastiaanse, 2008). Before entering the problem of the ASCH hypothesis and grammatical coding, there were several important findings. First, the findings in this study supported the statement of Rossi and Bastiaanse (2008) who found that participants who tended to focus on the content of the speech and produced a lot of different verbs made many grammatical and syntactic mistakes. This could be seen from the case of participants P1 and P2 compared to P3 and P4.

Conversely, the participants who tended to focus on the structure of the speech to be produced had a tendency to produce fewer verbs and fewer affixed verbs. This was shown by participants P3 and P4. Participants P3 and P4 produced simpler syntactic structures, but fewer grammatical mistakes than P1 and P2. However, in participants P4, low number of grammatical mistakes was also triggered by lower number of produced verbs than those produced by the other three participants and by a higher level of aphasia severity.

This study showed evidence the findings on verb production of Indonesian speakers with Broca's aphasia seemed to be related to the deficit in the grammatical coding process stated by Rossi and Bastiaanse (2008). In the research of Rossi and Bastiaanse (2008), it was stated that there were two main problems related to grammatical coding, namely the deficit in the use of complex syntactic structures and disruption in terms of complex lemma's retrieval process. The two main problems could be observed from problems such as the shape of the verbs, inflection errors, reflexive verb problems, and the use of the phraseological auxiliaries. In terms of inflectional verbs, for example, the use of the verbs required complex morpho-syntactic operations so that it would be difficult for speakers to produce verbs.

Furthermore, the grammatical encoder worked to build a sentence structure by involving morpho-syntactic operations. When there is a deficit or problem related to the component, Rossi and Bastiaanse (2008) believed that there was a tendency to have a problem with the grammatical coding system. In this study a similar case could be seen, for example,

in terms of the difficulty of the production of the verbs and relation to the omissions of syntactic elements that accompanied verbal predicates.

In the case of P2, for example, there was a grammatical mistake in the form of a prefix (me-) that appeared without any stem in the sentence "Dan ibu juga kebetulan se.. men.. menempati ayah untuk **menem**.. ee.. **me**.. **nem**.. ee.. Menem.." ("and the mother also happens to be ... occupy the father to **menem** ... ee ... **me** ... **nem** ... ee ... **menem** ..."). From this example it could be seen that participant P2 had difficulty producing verbs with prefixes and impacted on the omission of verbal predicates in the sub-clause and object omission. Therefore, it was suggested that to produce affixed verbs in Indonesian sentences, speakers could not separate morphological aspects in the form of affixations and the syntactic aspects in the form of elements in the sentence. When both of them were disrupted as in the case of P2, it could be indicated that the findings in this study supported the findings of Rossi and Bastiaanse (2008) which showed a symptom of the deficit in grammatical coding in the Levelt processing model (1989).

Moving on to the complexity of the argument that accompanied verbal predicate in a proposition, the findings in this study showed that Indonesian speakers with Broca's aphasia tended to simplify the argument structure. These strategies, for example, were carried out by omitting arguments in transitive active verbs which required two arguments in the form of actors and targets. The arguments that were produced were only the actors, or only targets, or both were omitted.

In addition, participants with Broca's aphasia also tended to produce propositions with single arguments. Or in other words, in the syntactic structure, the predicate used more often was in the form of intransitive verbs that did not require objects. Thus, the results indicate that the findings in this study supported the Argument Structure Complexity Hypothesis (Thompson, 2003) as in Italian (Rossi & Bastiaanse, 2008).

CLOSING

Of the symptoms of verb production disorders for the Indonesian speakers with Broca's aphasia in the description above, it seemed warranted to withdraw the conclusion that findings in this study supported the findings of Rossi and Bastiaanse (2008) related to the ASCH hypothesis and grammatical coding. The Indonesian speakers with Broca's aphasia tended to simplify arguments and produced more propositions with simple argument structures in their spontaneous speech. The form of simplification of the argument was carried out with a tendency to omit the arguments that accompanied verbal predicates. As in the findings for Italian (Rossi & Bastiaanse, 2008), the findings in Indonesian support the Argument Structure Complexity Hypothesis (ASCH) (Thompson, 2003) stating that speakers with aphasia syndrome and agramatic symptoms tended to simplify the arguments or in other words, arguments with complex structures would be difficult to produce. In addition, the findings in this study were also in line with the claims of Rossi and Bastiaanse (2008) who supported Bastiaanse and Van Zonneveld (2004) which stated that the difficulties experienced by the participants with aphasia in terms of complex syntactic structures and the retrieval of complex lemma forms was related to disruption in the grammatical coding process.

The conclusion presented above was basically a conclusion drawn from the observations of four participants with Broca's aphasia and four NBD speakers as a control group. With these conditions and referring to Miceli et al. (1983) in Rossi and Bastiaanse (2008), the conclusion in this study could not be generalised for all Indonesian speakers with Broca's aphasia, although it could be used as something to watch for. The use of verbs that shows the symptoms of agramatism in other speakers with Broca's aphasia is possible to be the same or different from the results presented in this study.

Based on the results of the research described in the analysis section, each participant with Broca's aphasia involved in this study had a disturbance and symptoms of different language production difficulties even though these symptoms form a pattern that could be identified. With this difference, it seems necessary to consider that Broca's aphasia syndrome has an impact on language production that may be different on different people. This should be a consideration for speech therapists in carrying out therapies for patients with Broca's aphasia.

The things that should be considered are, for example, similarities in severity do not necessarily mean similarities in language difficulties. Participants P1 and P2 both had a mild Broca's aphasia. However, in terms of language production, they had different performances. For example, in terms of the production of basic verbs and affixed verbs, participant P2 was better than P1, while in terms of syntactic processes, P1 was better in producing sentences with the correct structure. With this difference, it is certainly expected that each participant gets different treatments while undergoing speech therapy. The findings in this language study seem to need to be synergized with sustainable speech therapy. For example, the report on the results of this study is expected to support the development of speech therapy instruments remembering TADIR (1996) and other instruments have not been updated for a long time. Furthermore, inspired by training studies such as Biran and Fisher (2015) and the successful studies reviewed by Poirier et al. (2023), the findings from this study are very important in planning rehabilitation efforts for speakers of Indonesian with agrammatism.

BIBLIOGRAPHY

Akmajian, Adrian. (1995). *Linguistics: An introduction to language and communication.* MIT Press.

Alwi, H., Dardjowidjojo, S., Lapoliwa, H., & Moeliono, A. M. (2003). *Tata Bahasa Baku Bahasa Indonesia*: Edisi Ketiga. Jakarta: Departemen Pendidikan dan Kebudayaan Republik Indonesia.

Anjarningsih, H. Y., & Bastiaanse, R. (2011). Verbs and time reference in Standard Indonesian agrammatic speech. *Aphasiology*, *25*(12). https://doi.org/10.1080/02687038.2011.626844

Anjarningsih, H. Y., Haryadi-Soebadi, R. D., Gofir, A., & Bastiaanse, R. (2012). Characterising agrammatism in Standard Indonesian. *Aphasiology*, *26*(6). https://doi.org/10.1080/02687038.2011.648370

Aribowo, L. (2016). *Gangguan produksi bunyi ujaran penderita afasia karena stroke: Studi kasus di dep/SMF penyakit saraf RSUD Dr. Soetomo Surabaya (unpublished doctoral dissertation)*. Universtas Gajah Mada.

Arslan, S., Bamyacı, E., & Bastiaanse, R. (2016). A characterization of verb use in Turkish agrammatic narrative speech. *Clinical Linguistics and Phonetics*, *30*(6). https://doi.org/10.3109/02699206.2016.1144224

Bastiaanse, R., & Van Zonneveld, R. (2004). Broca's aphasia, verbs and the mental lexicon. *Brain and Language*, *90*(1–3). https://doi.org/10.1016/S0093-934X(03)00432-2

Biran, M., & Fisher, S. (2015). Structured treatment can improve predicate argument structure impairment. *Aphasiology*, *29*(1). https://doi.org/10.1080/02687038.2014.961122

Bos, L. S., & Bastiaanse, R. (2014). Time reference decoupled from tense in agrammatic and fluent aphasia. *Aphasiology*, *28*(5). https://doi.org/10.1080/02687038.2014.886322

Casilio, M., Rising, K., Beeson, P. M., Bunton, K., & Wilson, S. M. (2019). Auditory-perceptual rating of connected speech in Aphasia. *American Journal of Speech-Language Pathology*, *28*(2). https://doi.org/10.1044/2018_AJSLP-18-0192

Centeno, J. G., & Obier, L. K. (2001). Agrammatic verb errors in Spanish speakers and their normal discourse correlates'. *Journal of Neurolinguistics*, *14*(2–4). https://doi.org/10.1016/S0911-6044(01)00023-9

Dharmaperwira-Prins, R. (1996). *TADIR: Tes afasia untuk diagosis, informasi, rehabilitasi*. Penerbit Fakultas Kedokteran Universitas Indonesia.

Dragoy, O., & Bastiaanse, R. (2010). Verb production and word order in Russian agrammatic speakers. *Aphasiology*, *24*(1). https://doi.org/10.1080/02687030802586902

Goodglass, H., & Kaplan, E. (1972). *Boston diagnostic examination for aphasia*. Philadelphia: Lea and Febiger.

Halim, A. (1969). *Intonasi dalam hubungannya dengan sintaksis bahasa Indonesia*. Djambatan.

Heinzova, P., Carreiras, M., & Mancini, S. (2023). Processing argument structure complexity in Basque-Spanish bilinguals. *Language, Cognition and Neuroscience*, *38*(5). https://doi.org/10.1080/23273798.2022.2154370

Henry, M. L., Hubbard, H. I., Grasso, S. M., Mandelli, M. L., Wilson, S. M., Sathishkumar, M. T., Fridriksson, J., Daigle, W., Boxer, A. L., Miller, B. L., & Gorno-Tempini, M. L. (2018). Retraining speech production

and fluency in non-fluent/agrammatic primary progressive aphasia. *Brain*, *141*(6). https://doi.org/10.1093/brain/awy101

Jap, B. A., Martinez-Ferreiro, S., & Bastiaanse, R. (2016). The effect of syntactic frequency on sentence comprehension in standard Indonesian Broca's aphasia. *Aphasiology*, *30*(11). https://doi.org/10.1080/02687038.2016.1148902

Kolk, H. H. J., & Van Grunsven, M. M. F. (1985). Agrammatism as a variable phenomenon. *Cognitive Neuropsychology*, *2*(4). https://doi.org/10.1080/02643298508252666

Kolk, H., & Heeschen, C. (1990). Adaptation symptoms and impairment symptoms in Broca's aphasia. *Aphasiology*, *4*(3), 221–231. https://doi.org/10.1080/02687039008249075

Kridalaksana, Harimukti. (2002). *Struktur, kategori, dan fungsi dalam teori sintaksis.* Universitas Katolik Atma Jaya.

Kuvač Kraljević, J., Matić Škorić, A., & Lice, K. (2023). Main Concepts in the Spoken Discourse of Persons with Aphasia: Analysis on a Propositional and Linguistic Level. *Languages*, *8*(2). https://doi.org/10.3390/languages8020120

Levelt, W. J. M. (1989). *Speaking: From intention to articulation*. The MIT Press.

Malyutina, S., Richardson, J. D., & Den Ouden, D. B. (2016). Verb Argument Structure in Narrative Speech: Mining AphasiaBank. *Seminars in Speech and Language*, *37*(1). https://doi.org/10.1055/s-0036-1572383

Maul, K. K., Conner, P. S., Kempler, D., Radvanski, C., & Goral, M. (2014). Using informative verbal exchanges to promote verb retrieval in nonfluent aphasia. *American Journal of Speech-Language Pathology*, *23*(3). https://doi.org/10.1044/2014_AJSLP-13-0004

Miceli, G., Mazzucchi, A., Menn, L., & Goodglass, H. (1983). Contrasting cases of Italian agrammatic aphasia without comprehension disorder. *Brain and Language*, *19*(1). https://doi.org/10.1016/0093-934X(83)90056-1

Poirier, S. È., Fossard, M., & Monetta, L. (2023). The efficacy of treatments for sentence production deficits in aphasia: a systematic review. *Aphasiology*, 37(1). https://doi.org/10.1080/02687038.2021.1983152

Postman, W. A. (2004). Processing of complex sentences in a case of aphasia in Indonesian: Thematic vs. linear strategies. *Journal of Neurolinguistics*, *17*(6). https://doi.org/10.1016/j.jneuroling.2004.09.001

Rossi, E., & Bastiaanse, R. (2008). Spontaneous speech in Italian agrammatic aphasia: A focus on verb production. *Aphasiology*, *22*(4). https://doi.org/10.1080/02687030701407093

Silagi, M. L., Ferreira, O. P., de Almeida, I. J., Simões, J. de S., Zampieri, S. A., de Santana, B. R. F., & Mansur, L. L. (2020). Treatment of agrammatism in oral and written production in patients with Broca's aphasia: The use of implicit and explicit learning. *Dementia e Neuropsychologia*, *14*(2). https://doi.org/10.1590/1980-57642020dn14-020002

Sneddon, J. N., A., D., & Ewing, M. C. (2010). *Indonesian reference grammar (2nd edition)*.

Sugiyono. (2015). Struktur Melodik Bahasa Indonesia. *Kajian Linguistik dan Sastra*, *19*(1). https://doi.org/10.23917/kls.v19i1.4403

Suhardiyanto, T. (2003). Agramatisme pada afasia: kajian singkat terhadap empat penderita afasia Broca. *Linguistik Indonesia*, *21*, 309–320.

Sung, J. E. (2016). The Effects of Verb Argument Complexity on Verb Production in Persons with Aphasia: Evidence from a Subject–Object–Verb Language. *Journal of Psycholinguistic Research*, *45*(2). https://doi.org/10.1007/s10936-014-9346-y

Thompson, C. K. (2003). Unaccusative verb production in agrammatic aphasia: The argument structure complexity hypothesis. *Journal of Neurolinguistics*, *16*(2–3). https://doi.org/10.1016/S0911-6044(02)00014-3

Thompson, C. K., Riley, E. A., den Ouden, D. B., Meltzer-Asscher, A., & Lukic, S. (2013). Training verb argument structure production in agrammatic aphasia: Behavioral and neural recovery patterns. *Cortex*, *49*(9). https://doi.org/10.1016/j.cortex.2013.02.003