

EXPLORING AGRAMMATISM IN ROMANIAN MOTOR APHASIC SPEECH. A SINGLE-CASE STUDY

MIHAELA BUZEC*

Abstract Motor aphasia has long been considered an agrammatic condition, characterized by the omission of functional items. Inquiries into the discourse of non-fluent aphasics from morphologically rich languages have caused researchers to reconsider the degree to which agrammatism characterizes motor aphasia. This article is a single-case study of a Romanian patient with motor aphasia. The speech is analyzed qualitatively, with particular emphasis on morphological errors. Contextualization is offered in order to understand the degree of agrammatic constructions in relation to the analyzed language. The article also presents a justification for single-case studies, a general description of the parameters of the subject's speech, and evidence for considering agrammatism in aphasic speech a result of the economy of effort hypothesis.

Keywords Motor aphasia; agrammatism; single-case study; economy of effort.

1. Introduction

The study of aphasia is generally considered under the scope of neurological investigations. However, as an impairment related to the language faculty, it falls under the scope of linguistic inquiry as well. As with broader studies that look into the manifestations of all sorts of impairments in the brain, the study of aphasia is considered relevant for our overall understanding of the general language faculty, and linguistic behaviors of non-brain-damaged speakers. The extent to which the study of aphasia and the study of language in general have influenced each other is not negligible, although the literature notes that “aphasiology has

* Babeş-Bolyai University, Cluj-Napoca. mihaela.buzec@ubbcluj.ro.

ORCID: <https://orcid.org/0000-0002-3146-1489>.

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been informed by linguistic theory to a greater extent than the opposite.”¹ In order to test hypotheses related to language, inquiries into aphasia can yield important perspectives, especially when looking at specific linguistic behaviors across languages.

The proposal of a single-case study is often approached with skepticism in the scientific community. However, in the case of an exploration into the manifestation of brain lesions, this model of study can yield some promising results. Caramazza explains that the general assumption in arguments for large statistical groups is a universality principle that would mean that the average of a behavior in an analyzed group would be the general behavior of any member of the represented population, because individual differences will tend to cancel each other out.² However, when it comes to the study of brain-damage subjects, the goal is to derive the general behavior of non-damaged subjects through inferences from the behavior of the studied group. Here, the argument Caramazza brings is that there is no guarantee that the conditions for creating the group of brain-damaged subjects will be homogenous and will accurately account for a certain behavior as a result of a lesion, diagnostic, or pathology.³ Because of the various manifestations of damage in the brain, it is difficult to assess the degree to which a behavior is the result of the studied pathology. The argument for single-case studies comes from this lack of a universality principle when it comes to neurocognitive studies, specifically with brain-damaged subjects.

The present study is an investigation into the degree of agrammatism manifested in the speech of one motor aphasic, a native speaker of Romanian. Agrammatism will be considered in this study only from the perspective of language production, not comprehension. As Romanian is a language with a rich morphology, it is of interest to note the extent of morphological omissions and see whether their occurrences fit a tableau of compensatory mechanisms adopted by the patient. In what follows, I present a brief introduction to motor aphasia and agrammatism before moving on to the methodology and results of the analysis.

2. Motor Aphasia & Agrammatism

Also known as Broca's or non-fluent aphasia, this condition is often the result of an ischemic stroke in the left hemisphere, affecting pre-motor areas including Broca's area, a cortical region believed to play an important role in the production of language. As such, people with motor aphasia generally present other stroke sequelae including (hemi)paresis, muscle weakness, vision loss, dysphagia, etc.

¹ Maria Garraffa, Valantis Fyndanis, “Linguistic theory and aphasia: an overview,” *Aphasiology* vol. 34 no. 8 (2020): 905.

² Alfonso Caramazza, “On Drawing Inferences about the Structure of Normal Cognitive Systems from the Analysis of Patterns of Impaired Performance: The Case for Single-Patient Studies,” *Brain and Cognition* no. 5 (1986): 50.

³ *Ibid.*, 54.

In terms of their speech, motor aphasics often produce a short, telegraphic discourse, that is fragmented and effortful.⁴ They present a number of phonological and morphological omissions, as well as a distorted syntax, resulting in a “morpho-syntactically impoverished”⁵ output. Compensatory mechanisms are employed, so that motor aphasics will produce a high number of interjections, fillers, or generally vague content words. Functional items are believed to be omitted, including conjunctions, auxiliaries, inflections, or prepositions. This is a symptom called agrammatism, that has been studied in relation to non-fluent aphasia and is considered for differential diagnosis with other conditions, for instance dysarthria.⁶ Agrammatism is different from paragrammatism, which is a term used in the literature to characterize the speech of fluent (or Wernicke's) aphasics. Paragrammatism refers to structures in which certain functional items are substituted for others, resulting in constructions that appear grammatical (containing functional items), but are not coherently so. However, this distinction and its use in the differential diagnosis of fluent and non-fluent aphasia has been criticized in the literature,⁷ with authors working on morphologically rich languages reporting substitution errors in non-fluent aphasia as well, signaling the need for a nuance and for the cross-linguistic study of agrammatism.⁸

A theory that seeks to explain why motor aphasics display instances of agrammatism is related to an economy of effort hypothesis.⁹ According to this idea, this behavior is actually a “rational account”¹⁰ that explains that non-fluent aphasics choose to omit functional items because they do not contain crucial information for the interpretation of the sentence, and their processing would create too much of a cognitive, computational load that could generate errors they would prefer to avoid. According to the authors, agrammatic output does not result from the *inability* to produce grammatically well-formed utterances but is instead an *adaptation* to the increase in the cost of generating linguistic output. In the presence of difficulties with language generation, producing agrammatic output is a rational strategy for maximizing communicative efficacy.¹¹

Whatever the mechanism behind agrammatism is, this symptom has generally been accepted as a characteristic of non-fluent aphasia. Instances of functional item omission have been frequently noted in the literature on English-speaking patients, yet authors have raised

⁴ Alfredo Ardila, *Aphasia Handbook* (Florida International University, 2014), 68.

⁵ Evelina Fedorenko, Rachel Ryskin, Edward Gibson, “Agrammatic output in non-fluent/Broca’s aphasia as a rational behavior,” *Aphasiology* vol. 37 no. 12 (2023): 1982.

⁶ Elizabeth Bates, Angela Friederici, Beverly Wulfeck, “Grammatical Morphology in Aphasia: Evidence from three languages,” *Cortex* no. 23 (1987): 545.

⁷ *Ibid.*

⁸ Lise Menn, Loraine K. Obler, “Theoretical Motivations for the Cross-Language Study of Agrammatism,” in *Agrammatic Aphasia: A cross-language narrative sourcebook*, Lise Menn and Loraine K. Obler (eds), (Amsterdam/Philadelphia: John Benjamins Publishing Company, 1990), 8.

⁹ Fedorenko, Ryskin, and Gibson, “Agrammatic output,” 1986.

¹⁰ Fedorenko, Ryskin, and Gibson, 1981.

¹¹ Fedorenko, Ryskin, and Gibson, 1984.

concerns about the discrepancy between literature on English and other more morphologically rich languages.¹² As Bates, Friederici, and Wulfeck point out, “[m]ost of the case studies that have played a major role in “agrammatism revisited” have one interesting feature in common: they are based on patients whose native language is not English.”¹³ Romanian is a language with a rich morphology, and the study of Romanian aphasic patients will help further inform whether agrammatism should be understood as rather language-specific, or at least considered differently for various languages.

Agrammatism as manifested in the production and comprehension of sentences in non-fluent aphasia was used in the literature to justify theories of language that separate grammar from the lexicon in the brain. If we consider the possibility of agrammatism not being as clear-cut as presented in the literature on English-speaking aphasics, our approach to understanding theories of language might modify as well.

3. Methodology

3.1. Subject

The patient presented in this study is C.M.,¹⁴ 80 years old female, admitted to the neurology department of the Cluj County Emergency Hospital¹⁵ after an ischemic stroke. She is a native speaker of Romanian, and also a speaker of Italian.¹⁶ She has higher studies, in the field of humanities and languages. For recording this interview, I had obtained approval from the hospital manager, as well as the head of the neurology department. The patient verbally agreed to participate in the study and to be recorded, in the presence of two other parties. The patient could not sign a consent form because of hemiparesis to the right hand following the stroke.

3.2. Materials

For the present study, the patient was interviewed using a protocol in two stages, the first one being a spontaneous speech elicitation task (question answering), and the second one a semi-spontaneous speech elicitation task (picture description). The first part of the interaction with the present patient was an interview with questions related to the patient's former profession, education, family, and memories, as recommended in the Aphasia TalkBank protocol. The second part of the protocol was divided into two subparts: the first was a one-to-one matching

¹² Including in works by Fedorenko, Ryskin, and Gibson; and Bates, Friederici, and Wulfeck.

¹³ Bates, Friederici, and Wulfeck, “Grammatical morphology,” 550.

¹⁴ The patient was initially interviewed for inclusion in my PhD thesis, but has since been excluded from that analysis because of a change in the interview protocol that occurred after this interview.

¹⁵ I would like to thank N. Tohănean, M.D., Ph.D. for facilitating my access for interviewing this patient.

¹⁶ I would like to thank Alina Preda, Ph.D., for help with the Italian segment of the patient's speech.

between concept (image) and name (word to be produced by patient); the second part was based on the book "Frog, Where Are You?", by Mercer Mayer, and the patient was asked to describe the characters and events she sees in the picture book. The patient was very collaborative and cooperative, but she grew tired towards the end of the interview, which seemed to affect her performance.

The interview was recorded on an iPhone 7 using the Voice Memos app. It was manually transcribed by the researcher, including all the instances of fillers, interjections, paraphasia, and non-words, and a count for all pauses. A second transcript was made for morphological analysis, which excluded all interviewer speech, mistakes, fillers, and pauses. This second transcript included morphological parsing of the words, marked by part of speech.

3.3. Error classification

The present study focuses on morphological errors registered in the patient's speech, in order to assess whether the speech reflects agrammatism as considered in the international literature. Both substitutions and omissions are considered, to check for the possibility of paragrammatism as well. Morphological errors include instances of article omission or substitution; omission or substitution of conjunctions and prepositions; inflection omission for verb features; omission or mismatch of gender, number, and case agreement markers. The data collected for this study underwent a qualitative analysis, allowing for context-dependent interpretation for specific language (mis)use.

4. Results

The patient exhibited a case of Broca's aphasia post-CVA with the following characteristics for her speech:

- Frequent repetitions
- Effortful speech
- Breaks
- Telegraphic speech
- Emotional language
- Fillers
- Interjections
- Consonant omissions
- Echolalia (especially for semi-spontaneous speech protocol)
- Phonemic paraphasia
- Syllabication & syllabic emphasis

Among the most prevalent characteristics was an effortful syllabication paired with repetition.

After the morphological parsing of the transcript, the following count of units occurred:

	Protocol 1	Protocol 2	Total
Correct Units	473	563	1036
Nouns	159	189	348
Verbs	51	78	129
Articles	29	82	111
Pronouns	57	47	104
Prepositions	47	45	92
"da" (yes)	24	26	50
Adjectives	23	27	50
Conjunctions	28	17	45
Adverbs	9	19	28
Auxiliaries	13	9	22
Numerals	18	0	18
Negations	4	9	13
Interjections	1	12	13
Non-words	0	3	3

Table 1. Count of units by part of speech in C.M.'s discourse.

The patient did present a number of article omission instances. The definite article was omitted 13 times, and the indefinite article was omitted 20 times. However, the patient also produced articles in a number of contexts in which they were required. A total of 103 definite articles were produced by the patient in appropriate contexts, and a total of 8 indefinite articles were used correctly. One instance of substitution occurred, where a definite article was used instead of an indefinite or zero article.

In terms of prepositions, there were 15 instances of omission and 5 instances of substitution. Among these, we can note the following:

Produced	Target
*Lucian e e @f ă Dusseldorf	Lucian e în Dusseldorf
* <i>Lucian is is @f Dusseldorf</i>	<i>Lucian is in Dusseldorf</i>
*fiicămea sosește nouă jumătate	Fiicămea sosește la nouă jumătate
* <i>my daughter arrives half past nine</i>	<i>My daughter arrives at half past nine</i>
*este informatician Deutsche Bank	Este informatician la Deutsche Bank
* <i>(he) is a programmer Deutsche Bank</i>	<i>He is a programmer at Deutsche Bank</i>
*studentă București beneficiară de bursă @f ă Los Angeles	Studentă la București beneficiară de bursă în Los Angeles
* <i>student.FEM Bucharest recipient.FEM of scholarship Los Angeles</i>	<i>Student.FEM in Bucharest recipient.FEM of scholarship in Los Angeles</i>
*master @f ă: școala egală [*regală] de teatru	master la școala regală de teatru
* <i>MA Royal School of Theater</i>	<i>MA at the Royal School of Theater</i>
*s-o dus a [*la] (...) chetal [*Cape Town] Africa de Sud	S-o dus la Cape Town în Africa de Sud
* <i>REFL.3PERS aux.PAST.3PERS.SG go.PASTPART to Cape Town South Africa</i>	<i>REFL.3PERS aux.PAST.3PERS.SG go.PASTPART to Cape Town in South Africa</i>
*speriat pentru că albine	speriat de albine
* <i>scared.MASC because of bees</i>	<i>scared.MASC of bees</i>

Table 2. Examples of errors targeting prepositions in C.M.'s discourse.

The patient also misused prepositions in an attempt to find the right one, usually self-correcting:

Produced	Target
*eu am fost pe cu fiul la de șapte ori în Africa de Sud	Eu am fost cu fiul (meu) de șapte ori în Africa de Sud
* <i>I aux.PAST.1PERS.SG go.PASTPART on with son.DEF.MASC.SG at of seven times in South Africa</i>	<i>I aux.PAST.1PERS.SG go.PASTPART with (my) son.DEF.MASC.SG seven times in South Africa</i>

Table 3. Example of browsing for prepositions in C.M.'s discourse.

The patient also exhibited 12 instances of auxiliary or verb omission, including:

Produced	Target
*fiicămea fost studentă	Fiicămea a fost studentă
*daughter.my be.PASTPART student.FEM.SG	daughter.my aux.3PERS.SG be.PASTPART student.FEM.SG
*văzut pericolul văzut pericolul	A văzut pericolul. A văzut pericolul.
*see.PASTPART danger.DEF see.PASTPART danger.DEF	aux.3PERS.SG see.PASTPART danger.DEF aux.3PERS.SG see.PASTPART danger.DEF
*și @f ă @f ă căsătorită fetiță	Și este căsătorită, are (o) fetiță
*and @f @f married.FEM girl	and (she) is married.FEM, (she) has (a) girl

Table 4. Examples of errors targeting verbs in C.M.'s discourse.

Singular incidents included:

- one mismatch of plural morpheme on verb for singular subject:
"nu se predau limba italiană"
NEG REFL.3PERS.PL teach.3PERS.PL language.SG.DEF italian
- one instance of misuse and one of omission for the conjunction "să" as subjunctive marker ("de ce să cățelul" why "să" the dog; "[să] vezi nuferii" [to] see the water lilies)
- one instance of substitution of feminine definite article for the masculine one ("ficul fiica mea" daughter.DEF.MASC daughter.DEF.FEM my - self-corrected).

In terms of the overall flow of the subject's speech, the following table shows the frequency of errors identified:

Error Variable	Protocol 1	Protocol 2
Breaks	33	68
Self-repetition	25	27
Syllabication	19	24
Echolalia	2	14
Fillers	85	80
Interjections	6	24
Paraphasias	5	17

Table 5. Errors in subject's speech fluency.

5. Discussion & Limitations of the Study

The morphological analysis of the interview transcript indicates that the patient produced a speech that is rich in content words, with nouns being the most produced part of speech, followed by verbs. However, articles were the third most numerous parts of speech produced, followed by pronouns and prepositions, which reflects the character of Romanian as a morphologically rich language, and challenges the assumption of agrammatism as a trait of non-fluent aphasia.

In the case of articles, even if omissions did happen, it is important to place them in the context of a language-specific matrix of article requirements. The total number of instances when definite articles were needed was 116, and the total for indefinite articles was 28. Out of these, the patient omitted 13 definite and 20 indefinite articles. The rate of omission then is 71.4% for indefinite articles, but only 11.2% for definite ones. Romanian articles have a peculiar behavior in that the definite article is attached to the end of the noun, as an enclitic.¹⁷ The indefinite article is placed before the noun, as a separate word. The difference between the rate of omission of definite and indefinite articles in the present case study might be indicative of the fact that the indefinite article requires greater computational or--perhaps more likely--articulatory load in order to be formed as a separate word. This, of course, needs to be investigated further on patients with non-fluent aphasia in order to form a valid hypothesis. The one instance of substitution presented above as a mismatch in gender could point to an interesting consequence observed previously in the literature as well.

The fact that gender errors do occur eliminates one possible hypothesis concerning article retrieval in this language [Italian]. It has been suggested that nouns are stored in the lexicon with their articles attached. Within a sentence context, the speaker must fix the values "number" and "case"; but gender is an inherent part of the lexical item, and does not vary with context. If the article were in fact retrieved together with the noun, we would expect to find number and case errors but no errors of gender, because, assuming that the patient locates a noun at all, he should recover gender at the same time.¹⁸

Albeit it was just one occurrence, it would be of interest to devise a study focused on the production of nouns with definite and indefinite articles for concepts with different grammatical genders and observe how aphasics retrieve the lexical tags.

The second most affected part of speech in the present study was the preposition. Here, we can note that omission errors were more frequent than errors of substitution. Yet, it is important to observe that prepositions were also frequently produced in the patient's speech, and often even adjacent to contexts in which prepositions were omitted. This raises the question of whether these errors are actually reflective of the idea of agrammatism

¹⁵ Dana Cojocaru, *Romanian Grammar* (SEELRC, 2003), 42.

¹⁶ Bates, Friederici, and Wulfeck, "Grammatical morphology," 564.

manifesting as a rational solution that the aphasic adopts, according to the “economy of effort”¹⁹ hypothesis presented above as well.

The omission of auxiliaries could also be justified according to the “economy of effort” hypothesis because of the presence of subjects in the context. Auxiliaries carry information regarding the subject via the agreement morpheme. This is important information for a pro-drop language (such as Romanian), so that the interpretation of the subject in contexts in which it is not present is facilitated. Yet, when the subject is explicit, this function of the auxiliary is not necessary. The interpretation of tense can be possible by inference from the context. So, the auxiliary is not required under pragmatic constraints. Linking verbs are, similarly, not semantically charged, which allows them to be dropped without sacrificing the meaning of the utterance when the subject or the subject complement are present, carrying information such as person, number, and gender.

Looking at the prevalent traits of the patient's speech, the tableau of motor (non-fluent) aphasia fits. Frequent breaks between words and phrases and frequent false starts and backtracking give the patient's speech a telegraphic nature. Fillers abound, with a total of 177 separate instances counted on the recording. This is a compensatory mechanism that, along with breaks, allows the speaker additional time to search for target words. The speech is also filled with interjections and instances of emotional language; 37 separate instances of interjections were noted. The emotionally charged lines reflect the patient's frustration with her inability to easily and coherently express herself (“*strong exhale* ște [*ce] să fac” *what can I do?*). She also explicitly states her awareness of the condition:

"CM: @f ăă mâ mână cealaltă @f ăă piciorul nicio problemă limbajul @f ăă limbajul
 I: e important
 CM: important"
 CM: @f other hand @f leg no problem language @f language
 I: it's important
 CM: important

This, paired with the good realization of tasks, reflects that comprehension is largely intact in the subject.

One particular trait mentioned above as well is the combination of syllabication and repetition, especially in pairs or triads, often with incomplete words. This signals that the patient actively wants to produce correct language. It might be the case that the patient's former profession (she is a retired Romanian teacher) plays a role in her determination to speak correctly as well. However, the literature notes other instances of this behavior with non-fluent aphasics: “Temporal patients (like frontal aphasics) retain a certain amount of

¹⁷ Fedorenko, Ryskin, and Gibson, “Agrammatic output,” 1986.

knowledge or “feeling for language” (“Sprachgefühl”), evidenced in the fact that they often notice their errors and may actually try to correct them.”²⁰

There were several factors that complicated the interpretation of the information in this corpus. The high number of repetitions, false starts, and backtracking in the patient's speech made it difficult for the count of units to be wholly accurate, as decisions about which strings of sounds would be considered (partially) successful attempts at word formation were made on a case-by-case basis. Although the patient was very cooperative, the interview ran long, and there were interruptions as well. As such, the subject grew tired towards the end of the protocol, her voice became softer, and her articulatory power diminished. The recording conditions were also not ideal, as there were other patients, doctors, and nurses in the room, and loud noises and other conversations interrupted the recording a few times.

The limitations of the study are quite clear due to its nature as a single-case study, yet I believe this question has been sufficiently addressed in the introduction and the merit of the study stands. Any such corpus on pathological discourse can contribute to a better understanding of the linguistic manifestations of motor aphasia. The problem of replication remains, as I do not believe the protocol involving the picture book “Frog, Where Are You?” is the most suitable for investigations into aphasic discourse. The book presents a narrative over many pages, which requires a certain cognitive load on the part of the patient. Most of the patients with aphasia, likely already with advanced ages, and after having suffered a stroke, will have difficulties in identifying the narrative line creating the story.

Contrastively, two options for a semi-spontaneous speech elicitation task could better work in such contexts. One is to use the pictures provided by the Aphasia TalkBank, which present the entire narrative on a single piece of paper (either as one event or a series), making it easier for patients to identify it. The other one, mentioned earlier in the article as well, is to use pairs or triads of images specifically designed to prompt the production of a target morphological construction. This would allow for a more direct investigation into the morphological disintegration of aphasic speech and the degree of agrammatism that can be observed. Such a protocol would also allow for better replication and more targeted comparison with control groups as well. Additionally, using the picture book has extended the duration of the second protocol past the allotted time for the entire interview, so pictures prompting shorter narratives and more straight-forward answers would be better for both the subject and the researcher.

6. Conclusion

This single-case study has presented an exploration of the discourse of a patient with motor aphasia following a stroke. The methodology for corpus formation did not follow a precise hypothesis, but rather the gathering of various speech samples, both spontaneous and semi-spontaneous, in order to access a varied range of discourse contexts. The study has a few

¹⁸ Bates, Friederici, and Wulfeck, “Grammatical morphology,” 546.

strengths to be considered, and perhaps the most important one is that related to the degree of agrammatism observed in the subject's speech.

As noted in the introduction, the value of exploring less researched languages such as Romanian from the perspective of speech pathology is considerable. Given the nature of Romanian as a morphologically rich language, it represents an appropriate context for the exploration of agrammatism as a trait of non-fluent aphasia. As seen in the article, the data better suit the hypothesis of instances of functional item omission being a rational adaptation on the part of the speaker, under the paradigm of economy of effort. The analysis of certain errors has also made way for the formation of a few hypotheses related to linguistic theories that could be explored through further research on the topic. With few studies on the linguistic behavior of aphasics in Romanian²¹, the present article offers additional resources for building a more complex and complete corpora that could help in better understanding how to diagnose, differentiate, and even create treatment plans for aphasia

¹⁹ Reka Kutasi, "Aspecte ale afaziei Broca - Lingvistica si utilizarea protocoalelor in remodelarea discursului adultilor afazici," PhD Thesis (Presa Universitara Clujeana, 2019).