

Chapter 7

Argument Structure and Time Reference in Agrammatic Aphasia

Roelien Bastiaanse and Artem Platonov

7.1 Introduction

Aphasia is a language disorder due to brain damage (stroke, traumatic brain injury), usually in the left hemisphere. The nature and severity of the aphasia are dependent on the site and size of the brain lesion. Some patients suffer from problems at the word level, while others encounter difficulties at the sentence level. The focus of this chapter is aphasic patients who suffer from a grammatical disorder, also called “agrammatism” or “Broca’s aphasia.”

Agrammatism is usually caused by a left frontal brain lesion and is characterized by nonfluent, effortful speech, consisting of mainly content words (nouns, verbs, adjectives), such that free and bound grammatical morphemes are typically omitted and/or substituted. The following sample is an illustration of agrammatic speech, where the patient is asked to tell about her plans for Christmas. (. . . indicate pauses; *italics*: interviewer)

what are you going to do for Christmas? Eat tasty things. . . presents Christmas. . . draw numbers. All get presents. . . ten guilders. . . ten guilders each *are you going away?* No. . . we sold house. . . our house. . . new around March. . . we saving pennies.

What can be seen from this sample is that agrammatic speakers have a preference for base order sentences; complex structures are avoided. Sentences with derived word

R. Bastiaanse (✉)

Center for Language and Cognition Groningen (CLCG), University of Groningen,
Postbus 716, 9700 AS Groningen, The Netherlands
e-mail: y.r.m.bastiaanse@rug.nl

A. Platonov

Donders Institute, Radboud University Nijmegen, Montessorilaan 3,
6525 HR Nijmegen, The Netherlands

European Master’s of Clinical Linguistics, Universities of Groningen,
Groningen, The Netherlands
e-mail: a.platonov@donders.ru.nl

order (for example, yes–no questions or passives in English) are rarely produced. This is more visible in languages with a larger variety of word orders, such as Dutch, German, and Turkish, as will be illustrated below.

Although it has often been mentioned that this “telegraphic speech” consists predominantly of nouns, verbs, and adjectives, the category of verbs is vulnerable (e.g., Saffran et al. 1989; Thompson et al. 1995; Bastiaanse et al. 2002). Thompson (2003) showed, for example, that argument complexity plays a role in agrammatic verb production, not only in spontaneous speech but also in action naming: the more complex argument structure is, the more difficult it is for an agrammatic speaker to produce a verb or use it in a sentence. Similarly, the diversity of verbs in spontaneous speech is reduced and the verbs that are used are often not inflected for tense and agreement (Bastiaanse and Jonkers 1998). Basically, the characteristics of the agrammatic speech have been described along three dimensions: word order, argument structure, and verb inflection. The present chapter makes a first attempt to connect these problems, by presenting a model that makes predictions about agrammatic performance with respect to these three dimensions.

7.1.1 Word Order Problems

As can be seen in the above sample, the sentence structures that are produced by this agrammatic speaker are very basic. This is one of the features of speech production in this type of aphasia. It turns out that nonbasic structures, also known as “derived” structures, are harder to produce than base structures. This has been shown for several languages, among which are Dutch and English (e.g., Bastiaanse and Thompson 2003) and Turkish (Yarbay Duman et al. 2007, 2008). In Dutch and German, for example, so-called subject–object–verb (SOV) languages, the base position of the verb is clause-final position as can be seen in (1a–b). In the matrix clause, the finite verb is in the second position (1c). According to theoretical linguistics, the finite verb in the matrix clause is in “derived” position; “i” denotes the original position of the verb, which is co-indexed with its antecedent.

(1a)	de jongen	die	een boek	<i>leest</i>
	the boy	who	a book	<i>reads</i>
(1b)	de jongen	wil	een boek	<i>lezen</i>
	the boy	wants to	a book	<i>read</i>
(1c)	de jongen	<i>leest</i> _i	een boek	i
	the boy	<i>reads</i>	a book	

Bastiaanse et al. (2002, 2003) show that the “object–finite verb” string in embedded clauses, such as (1a) are significantly easier to produce than the “finite verb–object”

strings in matrix clauses for Dutch agrammatic speakers. Similarly, English “yes–no” questions, in which the auxiliary is in derived position, are more difficult to produce for English agrammatic speakers than comparable declarative sentences (“*is_i the student _i helping the biker?*” is more difficult than “*the student is helping the biker*”; Bastiaanse and Thompson 2003). These problems with derived order have not only been shown for verbs in derived position but also for sentences with scrambled objects in Dutch (Bastiaanse et al. 2003), German (Burchert et al. 2008), and Turkish (Yarbay Duman et al. 2007), and for sentences in which the theme is in subject position, so-called unaccusative constructions in Dutch (Bastiaanse and Van Zonneveld 2005), English (Lee and Thompson 2004), and Russian (Dragoy and Bastiaanse 2009).

On the basis of these findings, Bastiaanse and Van Zonneveld (2005) formulated the Derived Order Problem Hypothesis (DOP-H) that predicts that sentences in the derived order are more difficult for agrammatic speakers to produce and comprehend than sentences in the base order. For the present chapter, these findings from Bastiaanse and Van Zonneveld (2005) are relevant and are briefly summarized.

7.1.1.1 Verbs with Alternating Transitivity

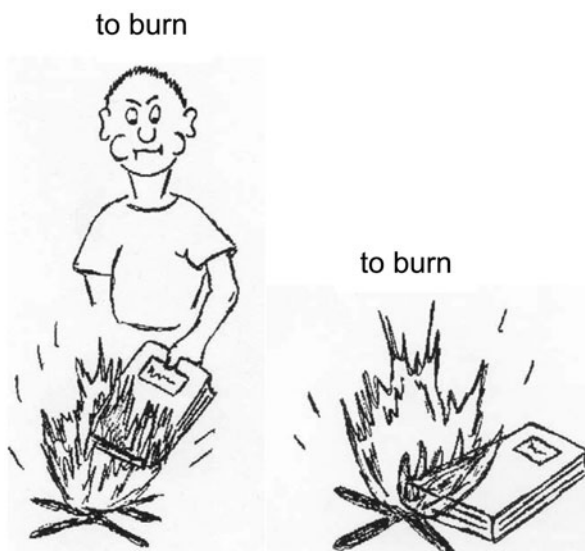
Bastiaanse and Van Zonneveld (2005) did a study on the production of sentences with verbs with alternating transitivity (see Levin 1993). These are verbs that have both a transitive and an unaccusative reading, such as “to break” (“the woman breaks a glass” vs. “the glass breaks”), and “to burn” (“the man is burning the book” vs. “the book is burning”). In the unaccusative reading, the theme (“glass,” “book”) is no longer in its base—that is the object—position, but is a so-called derived subject. This implies a derived structure (“the book_i is burning *i*”) and, hence, the DOP-H predicts that the unaccusative reading will be more difficult for agrammatic speakers to produce. Bastiaanse and Van Zonneveld (2005) developed a test to elicit both structures from agrammatic speakers. An example of an item is given in Fig. 7.1.

Sentences like “the book is burning” turned out to be significantly more difficult to produce than sentences like “the man is burning the book,” which supports the DOP-H.

7.1.2 Argument Structure Problems

Another linguistic property that influences verb and sentence production in agrammatic aphasia is “argument structure.” Although processing of argument structure seems to be spared (Shapiro and Levine 1990), the production of the full range of verb–argument structures is compromised, as was noticed first in the narrative speech of English agrammatic speakers (Thompson et al. 1997) and later confirmed for Dutch (Bastiaanse and Jonkers 1998). Agrammatic speakers have a preference for simple verb–argument structures, that is, they overuse intransitive structures, have a reduced proportion of transitive structures, and avoid verbs with three arguments

Fig. 7.1 Example of a transitive (left; target “*the man is burning the book*”) and an unaccusative (right; target “*the book is burning*”) item of the test for verbs with alternating transitivity



(e.g., “to give”) and with sentential arguments (e.g., “believe that. . .”). In a later study, Thompson et al. (1997) demonstrated that this reduction of argument structure complexity does not only affect the use of verbs in narrative speech but also influences verb retrieval in an action-naming test. That is, agrammatic speakers have more problems retrieving verbs with a complex argument structure than a simple argument structure. Not only the simple number of arguments is crucial here but also the number of *possible* argument structures of a verb plays a role. For example, “to knit” can be used both with and without a theme and is, therefore, more difficult to produce than “to fix” which has only one possible argument structure. Further research showed that the complexity of the “internal” structure of the verb and its argument(s) also affects verb production. Simple unergative verbs, like “to sleep,” are easier to retrieve than unaccusative verbs, like “to fall,” in which, as mentioned in the previous section, the theme is in subject position.

These findings have been captured under the Argument Structure Complexity Hypothesis (ASCH) as formulated in Thompson (2003): the more complex the verb–argument structure, the more difficult it is for an agrammatic speaker to retrieve the verb. Notice that the DOP-H and the ASCH are complementary, although there is some overlap. While the DOP-H is a hypothesis about word order, the ASCH is about argument structure; they both predict that unaccusative verbs will be difficult for agrammatic speakers: the first, because the word order is derived; the second, because of the property of unaccusatives to have the theme in the subject position.

7.1.3 *Verb Inflection Problems*

As shown in the above example, agrammatic speakers have a tendency to omit finite verbs. In languages like Dutch and English, there is an overuse of infinitives, gerunds, and participles (usually without a finite auxiliary) compared to normal speech. It has been argued that this is due to (1) the position of the finite verb in the syntactic tree (Hagiwara 1995; Friedmann and Grodzinsky 1997), (2) an underspecification of the interpretable features of tense (Wenzlaff and Clahsen 2004, 2005) or of tense and agreement (Burchert et al. 2005), and (3) a problem with the implementation of morphological rules (Lee et al. 2008).

None of these theories alone can account for all the data. The theories that relate the problems to tense or to a morphological interpretation problem fail to explain the verb inflection problems that arise in one sentence position but not in another. In Dutch and German, as mentioned above, the base position of the verb is at the end of the clause, but in a matrix clause, the finite verb is in second position. Agrammatic speakers of these languages have more problems with finite verbs in derived position than in base position (Bastiaanse et al. 2002; Rausch et al. 2005). The theories that assume that the position in the tree is crucial cannot explain the selective problems with time reference with both finite and nonfinite verbs. In the next section, these problems are discussed.

7.1.3.1 *Time Reference Problems*

Recent findings on agrammatic verb inflection in Dutch, as reported by Bastiaanse (2008), cannot be explained by the DOP-H nor by any of the theories that postulate a general tense problem. In this study, a sentence completion paradigm was used to elicit finite and nonfinite verbs in base position. The sentences referred either to the past or to the present. Surprisingly, the results showed that (1) production of finite verbs referring to the past was significantly more impaired than production of finite verbs referring to the present; (2) this difference between reference to past and present was also observed for the production of nonfinite verbs, that is, participles were more difficult than infinitives. In an additional study on Turkish, Yarbay Duman and Bastiaanse (2009) showed a similar difference between production of finite verb in past and future tense: past tense was significantly more difficult than future tense. Bastiaanse et al. (2011) and Bastiaanse (2013) showed that the time reference problem is not restricted to tense and holds for all verb forms that refer to the past, including those with perfect aspect, even in combination with present tense (Dragoy and Bastiaanse 2013; Bos and Bastiaanse 2014). Bastiaanse et al. (2011) and Bastiaanse (2013) argue that this is due to the fact that reference to the past requires discourse linking (Zagona 2003), and discourse linking is hard for individuals with agrammatic aphasia (Avrutin 2006). This was coined the PAsT DIscourse LIinking Hypothesis (PADILIH). These findings are not entirely incompatible with the theories of Wenzlaff and Clahsen (2004, 2005) and Burchert et al. (2005) that this effect

has to do with the interpretable features (or, in terms of Burchert et al., with “sentence external relationships”); however, these theories seem to be too restrictive: the findings of Bastiaanse (2013) and Yarbay Duman and Bastiaanse (2009) suggest that the problems are (a) not restricted to tensed verbs but extend to nonfinite participles as well and (b) most severe for reference to the past.

In all, several theories have been formulated on the underlying disorder as a cause for the verb production deficits of agrammatic speakers. It seems as though word order, verb argument structure, and time reference each play a role. The question is how these three concepts are related.

7.2 The Aspect Assignment Model (AAM)

Verbs can be classified along several dimensions. The dimensions which are important here are (1) argument structure/ transitivity and (2) telicity. *Argument structure* refers to the thematic roles that belong to the verb (e.g., intransitive verbs (“to run”) have no internal argument, transitive verbs have one internal argument (“to read”) and ditransitive verbs (“to give”) have two internal arguments) and the rules that are needed to use these verbs and their arguments in a sentence (e.g., the theme of an unaccusative verb (“to fall”) is in subject position). *Telicity* has to do with the fact that certain actions result in a change of state, whereas others do not. Telic verbs imply a certain endpoint, whereas atelic verbs do not. For example, “to break” implies a change of state and “to run” does not. Telic verbs include both accomplishments and achievements in Dowty–Vendler terms (Dowty 1979; Vendler 1967). Here, the term *atelic* will be used to refer to verbs that signify events without such an endpoint, including activities, semelfactives and states.

Verbs also have the ability, at least in most languages, to express the relation of the event to past, present and future—through Tense—and to whether the action has been finished or not—through Aspect. In short, the relevant concepts here are (1) argument structure, (2) telicity, and (3) time reference (Tense and Aspect).

These three characteristics are related, as shown by both preferences of normal speakers and data from language acquisition. With respect to argument structure and telicity, it was first noted by Perlmutter (1978) that intransitive telic verbs (e.g., “to arrive”) are usually unaccusatives. Similarly, intransitive atelic verbs tend to be unergatives (e.g., “to chirp”). The relation between telicity and Tense was shown by Torrence and Hyams (2004): English-speaking children tend to use past Tense with telic verbs and present Tense with atelic verbs. Also, there is a close relation between children’s early use of telic verbs and perfective Aspect in the past Tense on the one hand, and between atelic verbs and imperfective Aspect in the present Tense on the other. These latter relations have been reported for many languages, such as English (Shirai and Andersen 1995), Russian (Stoll 1998; Gagarina 2000) and German (Behrens 1993).

In Table 7.1, the relations between argument structure, telicity and time reference that are relevant for the present study are given.

Table 7.1 Preferences for the combinations of argument structure, telicity, and time reference (tense and aspect)

Argument structure	Telicity	Tense	Aspect
Transitive	Telic	Past	Perfect
Intransitive	Atelic	Present	Imperfective

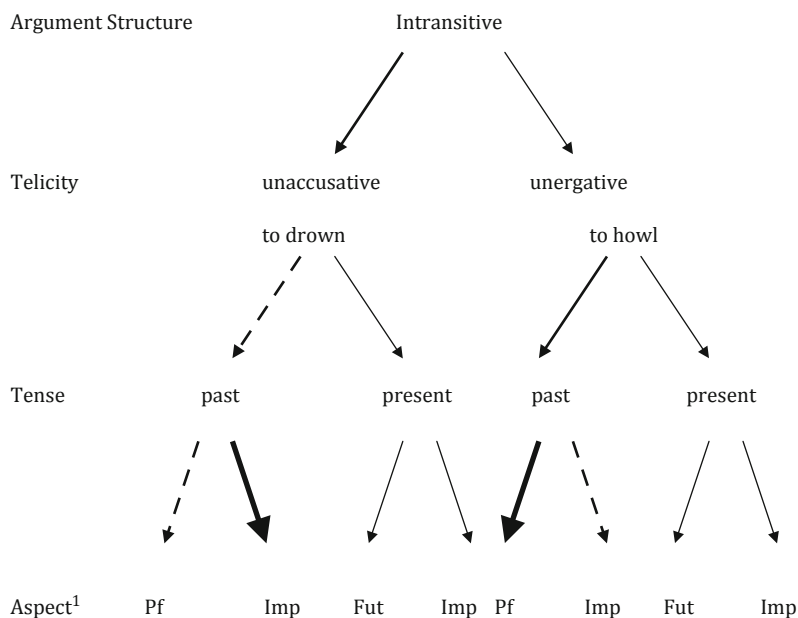


Fig. 7.2 The relevant part of the Aspect Assignment Model. *Bold lines* mean that this variant is in conflict with speakers' preferences; *bold broken lines* mean that although at the higher level the preference is in conflict, there is a preference at the present level; *extra bold lines* mean that there is a conflict at more than one level. *Pf* perfect, *Imp* imperfect; since in Russian, there is only imperfect present, perfect future tense has been used here

These preferences have been used by Platonov (2007) to build the *Aspect Assignment Model* (AAM). In this model, information on argument structure and time reference, concepts that have been shown to influence agrammatic production, have been combined. For reasons of clarity in Fig. 7.2, only that part of the model that is relevant for the present study is given. The complete model is given in Appendix 1.

If it is assumed that what is preferred by normal speakers is relatively well preserved in agrammatic aphasia and what is marked for normal speaker is difficult for agrammatic speakers, then this model makes predictions on agrammatic behavior. For example, considering the preferences mentioned in Table 7.1 and taking into account Perlmutter's theory that intransitive telic verbs tend to be unaccusatives

and intransitive atelic verbs tend to be unergatives, the model makes the following predictions for unaccusative and unergative verbs (see Fig. 7.2):

- Unergatives prefer present tense, so past tense is a conflict (represented by a bold line in Fig. 7.2)
- Unergatives prefer imperfect aspect (broken bold line = relatively easy), so perfect aspect is a conflict (extra bold line = very difficult)
- Unaccusatives are in conflict with the preference of an intransitive verb being unergative (bold line)
- Unaccusatives prefer past tense (broken bold line)
- Unaccusatives prefer perfect aspect (broken bold line), so imperfect aspect is conflict (extra bold line)

In sum, this model—taking not only argument structure but also time reference into account—predicts that for agrammatic speakers, unergatives will be easier than unaccusatives in the past tense, imperfect aspect; the opposite pattern is expected for sentences in past tense, perfect aspect. Hence, for the imperfect aspect condition, the same pattern should be observed as reported by Bastiaanse and Van Zonneveld (2005) and Lee and Thompson (2004). For the perfect aspect condition, the opposite pattern is predicted by Platonov's model. This hypothesis has been tested using an experiment that elicited the relevant sentence structures. The experiment was performed in Russian, where both perfective and imperfective aspects are expressed through the finite verb.

7.3 Methods

7.3.1 *Participants*

Twelve agrammatic speakers (nine male, three female) were tested. The mean age was 43.2 years. They had been diagnosed as suffering from efferent motor aphasia in Lurian terms (Luria 1973), which is equivalent to Broca's aphasia. The aphasia type was established by the analysis of spontaneous speech, which was clearly telegraphic, and confirmed by the language assessment of the speech pathologist and the neuropsychologist. None of the patients suffered from apraxia of speech (range 22–70 years). Eight subjects were aphasic due to a single stroke in the left hemisphere, one subject had two strokes, and three subjects' aphasia resulted from traumatic brain injury caused by a car accident. All subjects were at least 4 months post onset.

Twelve non-brain-damaged speakers served as controls (mean age 45.6; six male, six female). The control subjects performed faultlessly on the test and, therefore, their data will further be ignored.

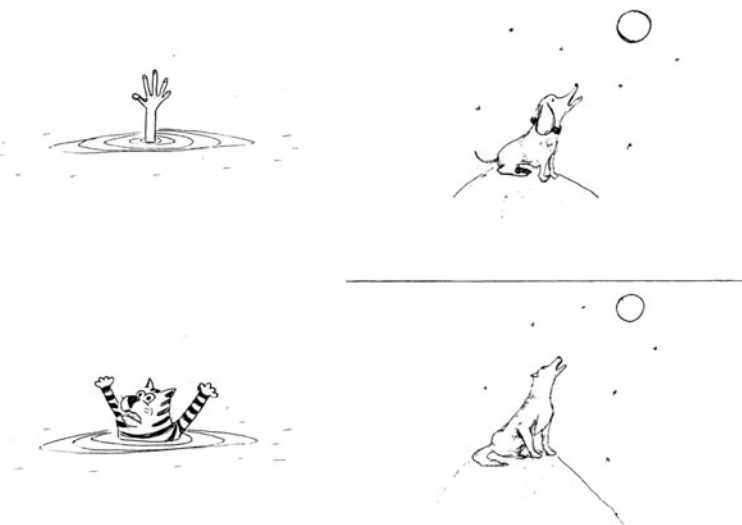


Fig. 7.3 Two examples of the stimuli used in the study. The first two pictures (*on the left*) illustrate the verb *to drown* in both perfective and imperfective conditions. The second set of pictures (*on the right*) was used to illustrate the verb *to howl* in perfective and imperfective conditions

7.3.2 Materials

The subjects were given two pictures in which a different person, animal, or object was involved in the same action (see Fig. 7.3). A sentence-prompting paradigm was used. Instructions accompanying the task were read aloud by the experimenter at the beginning of a trial, and then at the beginning of the experimental task: “I will tell you the sentence describing what is going on in the first picture. I want you to tell me, using a similar sentence, what is happening in the other picture.”

The test started with two practice trials on nontest stimuli that were repeated until it was clear that the subject understood the task. There were four verb form conditions: unaccusative perfective, unaccusative imperfective, unergative perfective, and unergative imperfective. There were 14 sentences in each of the four conditions. Examples of the four conditions are:

Unaccusatives (two conditions)

For both conditions, the introduction sentence is:

Eto turist, a eto kot

This is a tourist and this is the cat

Condition 1 (unaccusative, perfect):

Experimenter: Tourist utonul v reke

[Patient: “Kot utonul v reke”]

Experimenter: The tourist drowned (Past, Pf) in the river

[Patient: “The cat drowned (Past, Pf)”] in the river

Condition 2 (unaccusative, imperfect):

Experimenter: Tourist tonul v reke

[Patient: “Kot tonul v reke”]

Experimenter: The tourist drowned (Past, Imp) in the river

[Patient: “The cat drowned (Past, Imp)”] in the river

Unergatives (two conditions)

For both conditions, the introduction sentence is:

Eto pes, a eto volk

This is a dog and this is the wolf

Condition 1 (unergative, perfect):

Experimenter: *Pios zavit na lunu*

[Patient: “Volk zavit na lunu”]

Experimenter: The dog howled (Past, Pf) at the moon

[Patient: “The wolf howled (Past, Pf) at the moon”]

Condition 2 (unergative, imperfect)

Experimenter: *Pios vil na lunu*

[Patient: “Volk vil na lunu”]

Experimenter: The dog howled (Past, Imp) at the moon

[Patient: “The wolf howled (Past, Imp) at the moon”]

Every picture was used twice, once in perfective and once in imperfective aspect. The sentences were mixed and presented in random order (though the actual order was the same for each subject).

7.3.3 Scoring

The answers of the participants were scored by a native Russian speaker. Self-corrections were allowed and the final answer was scored. No time limits were imposed. When failing to produce a verb, a subject was prompted to try it once again. No feedback was provided during the test.

Both quantitative and qualitative analyses were done. For the quantitative analysis, the number of correct/incorrect responses was counted. Responses were considered to be correct when a verb with the proper aspect was produced. For the qualitative comparisons, an error analysis was performed. Errors were classified post hoc, based on the most frequent errors made by the agrammatic speakers during the test. These included (a) aspect substitutions: verbs incorrectly inflected for aspect (i.e., production of perfect instead of imperfect and vice versa), (b) verb omissions, (c) tense errors, and (d) others (agreement and unspecified errors).

Table 7.2 Mean number (and percentages) of errors (max = 14) made by agrammatic speakers

Verb form	Mean (%)
Per construction (max = 14)	
Unaccusative perfective	1.83 (13.1)
Unaccusative imperfective	4.50 (32.1)
Unergative perfective	4.58 (32.7)
Unergative imperfective	1.08 (7.7)
Per argument structure (max = 28)	
Unaccusative	6.33 (22.6)
Unergative	5.67 (20.6)
Per aspect (max = 28)	
Perfective	6.42 (22.9)
Imperfective	5.58 (19.9)

7.4 Results

7.4.1 Quantitative Analysis

In Table 7.2, the group results are given.

Since the data was not normally distributed, statistical testing was done nonparametrically with the Wilcoxon signed-rank test. The *Aspect Assignment Model* of Platonov (2007) predicted that:

1. Unergatives will be easier in past tense, imperfect aspect than in past tense, perfect aspect ($z = -2.921$, $p = 0.003$).
2. Unaccusatives will show the opposite pattern: easier in past tense, perfect aspect than in past tense, imperfect aspect ($z = -2.83$, $p = 0.005$).

As can be seen from the statistic comparisons, the data supported both predictions. Contrary to the predictions of both the DOP-H and the ASCH, there is no overall difference between the unergatives and unaccusatives ($z = -0.302$, $p = 0.763$). Also, overall, perfect aspect is not more difficult than imperfect aspect ($z = -0.397$, $p = 0.692$).

7.4.2 Qualitative Analysis

The majority of errors were substitutions of one aspect for another (64.29 % of all errors). The second largest category was “verb omissions,” leading to ungrammatical sentences (24.02 % of all errors). Tense errors constituted relatively small group (9.74 %). The remaining errors (1.95 %) consisted of two agreement errors and one unspecified error. In Table 7.3, the numbers of errors per experimental condition are given.

Table 7.3 Number of errors made per experimental condition

	Unaccusative perfective	Unaccusative imperfective	Unergative perfective	Unergative imperfective	Total
Aspect substitution	11	40	36	2	89
Verb omission	8	12	14	3	37
Tense substitution	1	1	5	8	15
Others	2	1	0	0	3
Total	22	54	55	13	144

Both aspect substitutions and verb omissions occur significantly more often in the unaccusative imperfective and the unergative perfective conditions than in the two other conditions (aspect substitutions: $\chi^2 = 43.89$, $p = 0.0001$; verb omissions: $\chi^2 = 5.19$, $p = 0.0227$). Tense substitutions and other errors are distributed equally over the conditions (tense substitutions: Fisher's exact, $p > 0.05$).

7.4.3 Summary of the Results

The results support the predictions made by the *Aspect Assignment Model*: the combination of arguments structure, telicity (in this case, unaccusatives vs. unergatives), tense, and aspect determines agrammatic performance. This is not only shown by the number of correct sentences produced but also by the error pattern. If agrammatic speakers make errors, these are predominantly (1) production a verb in the aspect form that is preferred for the argument structure and (2) verb omissions.

Discussion

Contrary to the DOP-H's and the ASCH's predictions and to all other theories that focus on only one aspect of agrammatic speech, no dissociation between unaccusative and unergative verbs was found. An explanation for this is that Lee and Thompson's (2004) and Bastiaanse and Van Zonneveld's (2005) studies did not take preferences for tense and aspect into account. When this is done, as in the present study, then the *Aspect Assignment Model* offers a better description of the agrammatic performance. Of course, the present study only tested a small part of the *Aspect Assignment Model* and in only one language. "Aspect" is a very complex notion that is not expressed similarly in every language. For example, the difference between perfect and imperfect is not the same in Dutch and English. Actually, roughly speaking, it is reversed: where English uses perfect aspect, Dutch uses imperfect and vice versa. Another difference between Russian (the language used in the study) on the one hand and

Dutch and English on the other is that perfect aspect is expressed through the finite verb in Russian but with a periphrastic form in Dutch and English (“has written”). It is, therefore, probable that the *Aspect Assignment Model* should be adjusted per language.

As mentioned in the Introduction, different theories on the nature of the grammatical impairment resulting in agrammatic speech refer to different characteristics: the word order problem, the problem with complex verb–argument structures, and the problem with inflected verbs, more specifically with time reference through verbs. The question was whether these problems are related. The *Aspect Assignment Model* demonstrated that the difficulties with argument structure and time reference are related. However, the model makes many more predictions that still need to be tested.

It is not exactly clear how the model can be related to the obvious word order problems that agrammatic speakers have (as shown for Dutch matrix clauses and object scrambling in several languages; see Introduction), that are now captured under the DOP-H. For now, however, the *Aspect Assignment Model* seems to be a new approach to the argument structure and time reference problems in agrammatic aphasia.

Acknowledgment The authors wish to thank Prof. Shklovsky V.M., Director of the Federal Center of Speech Pathology and Neurorehabilitation in Moscow, Russia, and Dr. Malukova N.G., Head of the Department of Psychology and the therapist working in the center for their willingness to select the patients and their help with patients’ diagnostics. We are also very grateful to Allison Smith for her comments on an earlier version.

References

- Avrutin, S. (2006). Weak syntax. In Y. Grodzinsky & K. Amunts (Eds.), *Broca’s region* (pp. 49–62). Oxford: Oxford University Press.
- Bastiaanse, R. (2008). Production of verbs in base position by Dutch agrammatic speakers: Inflection versus finiteness. *Journal of Neurolinguistics*, *21*, 104–119.
- Bastiaanse, R. (2013). Why reference to the past is hard for agrammatic speakers. *Clinical Linguistics and Phonetics*, *27*, 244–263.
- Bastiaanse, R., & Jonkers, R. (1998). Verb retrieval in action naming and spontaneous speech in agrammatic and anomia aphasia. *Aphasiology*, *12*, 951–969.
- Bastiaanse, R., & Thompson, C. K. (2003). Verb and auxiliary movement in agrammatic Broca’s aphasia. *Brain and Language*, *84*, 286–305.
- Bastiaanse, R., & Van Zonneveld, R. (2005). Sentence production with verbs of alternating transitivity in Broca’s agrammatic aphasia. *Journal of Neurolinguistics*, *18*, 57–66.
- Bastiaanse, R., Hugen, J., Kos, M., & Van Zonneveld, R. (2002). Lexical, morphological and syntactic aspects of verb production in Dutch agrammatic aphasics. *Brain and Language*, *80*, 142–159.
- Bastiaanse, R., Koekkoek, J., & Van Zonneveld, R. (2003). Object scrambling in Dutch Broca’s aphasia. *Brain and Language*, *86*, 287–299.
- Bastiaanse, R., Bamyeci, E., Hsu, C., Lee, J., Yarbay Duman, T., & Thompson, C. K. (2011). Time reference in agrammatic aphasia: A cross-linguistic study. *Journal of Neurolinguistics*, *24*, 673.

- Behrens, H. (1993). The relationship between conceptual and linguistic development: The early encoding of past reference by German children. *Chicago Linguistic Society*, 29, 63–75.
- Bos, L. S., & Bastiaanse, R. (2014). Time reference decoupled from tense in agrammatic and fluent aphasia. *Aphasiology*, 28, 533–553.
- Burchert, F., Swoboda-Moll, M., & De Bleser, R. (2005). Tense and agreement dissociations in German agrammatic speakers: Underspecification vs. hierarchy. *Brain and Language*, 94, 188–199.
- Burchert, F., Meißner, N., & De Bleser, R. (2008). Production of non-canonical sentences in agrammatic aphasia: Limits in representation or rule application? *Brain and Language*, 104, 170–179.
- Dowty, D. (1979). *Word meaning and Montague grammar: The semantics of verbs and times in generative semantics and in Montague's PTQ: Synthese language library*. Dordrecht: Reidel.
- Dragoy, O., & Bastiaanse, R. (2009). Verb production and word order in Russian agrammatic speakers. *Aphasiology*, 24, 28–55.
- Dragoy, O., & Bastiaanse, R. (2013). Aspect of time: Time reference and aspect in Russian aphasic speakers. *Journal of Neurolinguistics*, 26, 113–128.
- Friedmann, N., & Grodzinsky, Y. (1997). Tense and agreement in agrammatic production: Pruning the syntactic tree. *Brain and Language*, 56, 397–425.
- Gagarina, N. (2000). The acquisition of aspectuality by Russian children: The early stages. *ZAS Papers in Linguistics*, 15, 232–246.
- Hagiwara, H. (1995). The breakdown of functional categories and the economy derivation. *Brain and Language*, 50, 92–126.
- Lee, M., & Thompson, C. K. (2004). Agrammatic aphasic production and comprehension of unaccusative verbs in sentence contexts. *Journal of Neurolinguistics*, 17, 315–330.
- Lee, J., Milman, L. H., & Thompson, C. K. (2008). Functional category production in English agrammatism. *Aphasiology*, 22, 893–905.
- Levin, B. (1993). *English verb classes and alternations: A preliminary investigation*. Chicago: University of Chicago Press.
- Luria, A. R. (1973). *Outline of the neuropsychological examination* (in Russian). Moscow: Moscow University Press.
- Perlmutter, D. M. (1978). *Impersonal passives and the unaccusativity hypothesis*. In Proceedings of the Fourth Annual Meeting of the Berkeley Linguistic Society, Berkeley Linguistic Society, University of California at Berkeley, pp. 157–189.
- Platonov, A. (2007). *Testing the incremental model of aspect assignment in Russian Broca's Aphasia*. Thesis, University of Groningen, University of Potsdam: European Master's for Clinical Linguistics.
- Rausch, P., Burchert, F., & De Bleser, R. (2005). Parallels in the breakdown of CP and DP-internal movement processes in agrammatism. A case study. *Brain and Language*, 95, 129–130.
- Saffran, E. M., Berndt, R. S., & Schwartz, M. F. (1989). The quantitative analysis of agrammatic production: Procedure and data. *Brain and Language*, 37, 440–479.
- Shapiro, L. P., & Levine, B. A. (1990). Verb processing during sentence comprehension in aphasia. *Brain and Language*, 38, 21–47.
- Shirai, Y., & Andersen, R. W. (1995). The acquisition of tense-aspect morphology: A prototype account. *Language*, 71, 743–762.
- Stoll, S. (1998). The role of Aktionsart in the acquisition of Russian aspect. *First Language*, 18, 351–378.
- Thompson, C. K. (2003). Unaccusative verb production in agrammatic aphasia: The argument structure complexity hypothesis. *Journal of Neurolinguistics*, 16, 151–167.
- Thompson, C. K., Shapiro, L. P., & Schendel, L. (1995). Analysis of verbs and verb-argument structure. A method for quantification of aphasic language production. *Clinical Aphasiology*, 23, 121–140.

- Thompson, C. K., Lange, K. L., Schneider, S. L., & Shapiro, L. P. (1997). Agrammatic and non-brain-damaged subjects: Verb and verb argument structure production. *Aphasiology*, *11*, 473–490.
- Torrence, H., & Hyams, N. (2004). On the role of aspect in determining finiteness and temporal interpretation in early grammar. In J. van Kampen & S. Baauw (Eds.), *Proceedings of GALA 2003: Vol 2. Generative approaches to language acquisition* (pp. 481–491). Utrecht: LOT.
- Vendler, Z. (1967). *Verbs and times. Linguistics in philosophy*. Ithaca: Cornell University Press.
- Wenzlaff, M., & Clahsen, H. (2004). Tense and agreement in German agrammatism. *Brain and Language*, *89*, 57–68.
- Wenzlaff, M., & Clahsen, H. (2005). Finiteness and verb-second in German agrammatism. *Brain and Language*, *92*, 33–44.
- Yarbay Duman, T., & Bastiaanse, R. (2009). Time reference through verb inflection in Turkish agrammatic aphasia. *Brain and Language*, *108*, 30–39.
- Yarbay-Duman, T., Aygen, G., Özgirgin, N., & Bastiaanse, R. (2007). Object scrambling and finiteness in Turkish agrammatic production. *Journal of Neurolinguistics*, *20*, 306–331.
- Yarbay Duman, T., Aygen, G., & Bastiaanse, R. (2008). The production of Turkish relative clauses in agrammatism: Verb inflection and constituent order. *Brain and Language*, *105*, 149–160.
- Zagona, K. (2003). Tense and anaphora: Is there a tense-specific theory of co-reference? In A. Barrs (Ed.), *Anaphora: A reference guide* (pp. 140–171). Oxford: Blackwell.