

Tense in agrammatism: An analysis of monolingual and bilingual aphasic studies

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A thesis submitted in partial fulfillment of requirements for the degree of
Bachelor of Arts in Linguistics

Bryn Mawr College

December 2016

Abstract

Agrammatic aphasia is defined by fragmented speech and impaired syntax. As it has been observed in several linguistic studies, tense may be omitted or impaired in the speech of agrammatic individuals. Researchers have questioned how it is possible that tense may be affected when other elements, such as agreement, are not. This question has led to different hypotheses on the structural representation of agrammatic aphasia on the syntactic tree. This thesis provides an overview of two prominent hypotheses for the analysis of tense in agrammatic speech: the tree-pruning hypothesis and the tense underspecification hypothesis. Parallel to a move towards tense underspecification in monolingual research, it is proposed that the same hypothesis be accounted for in bilingual aphasia. The tense underspecification hypothesis is necessary in order to discuss agrammatism in light of current syntactic theory. However, both hypotheses offer insight into the possible hierarchical syntactic structural representations of agrammatism, which still needs more research in order to make any definitive conclusion.

1 Introduction

When an individual experiences trauma or injury to their brain, they are likely to develop a disorder known as aphasia, which is a type of communication disorder that affects the ability of an individual to produce and comprehend language. Different types of aphasias are determined according to the specific functions of language and areas of the brain that are affected. Broca's aphasia is caused by damage to Broca's area, located in the frontal lobe of the dominant hemisphere (usually the left hemisphere in right-handed individuals), which is linked to speech production. Wernicke's aphasia is caused by damage to Wernicke's area, located in the posterior

section of the temporal lobe of the dominant hemisphere, and is more closely linked to speech comprehension. For these reasons, Broca's aphasia is also often referred to as expressive aphasia and Wernicke's aphasia may be called receptive aphasia. However, damage to either of these regions can affect an individual's language production and comprehension, depending on the severity of the damage.

Broca's aphasia can manifest in several ways in an individual's speech, but it is most notably defined by strained and fragmented speech in which the syntax of sentences is impaired or nonexistent. An individual with Broca's aphasia is likely to speak in short utterances with particular difficulty in producing verbs as opposed to nouns. An example of this speech may look like an individual only saying short words, most likely nouns, one at a time with several pauses in between. Due to the impaired structure of sentences, this form of aphasia is also referred to as syntactic or agrammatic aphasia. In comparison, speech in Wernicke's aphasia is characterized by speech that may be grammatical, but is often filled with incomprehensible or irrelevant words. Additionally, speakers with Wernicke's aphasia often have more trouble in comprehending language than producing it, depending again on the severity of the damage to the brain (National Aphasia Association).

The separate fields of neurology, psychology, and linguistics are connected through the study of this complex and intriguing communication disorder, and many linguists have offered explanations of how the deficit in language production and comprehension may be represented in theoretical settings. To recount the vast amount of literature pertaining to both linguistic theories and neurobiological data would be exhaustive and would not bring depth to a more focused analysis of agrammatic aphasia. Similarly, there are many areas within the field of linguistics that pertain to the study of aphasia and a wide array of research for each particular subject. To

quote Harold Goodglass and Sheila Blumstein, “Just as there is for syntax, so there is for each of the other levels of linguistic organization – phonology, morphology, lexicon, semantics – a corresponding type of aphasia in which that level is most, if not exclusively, impaired” (Goodglass & Blumstein, 1973: 6). This thesis focuses on syntax in order to discuss the grammatical impairments that aphasia poses and their manifestation in both monolingual and bilingual aphasic structures of speech, with particular attention paid to the production of tense and agreement in the speech of monolingual and bilingual aphasics.

The motivation for this analysis comes from the fact that there has been discrepancy in the field of linguistics in recent years regarding the syntax of aphasia and how it is discussed using current theories. Two specific hypotheses and both their advantages and disadvantages are discussed in this text. A second motivation for this analysis is that the relationship between languages has not always been considered for bilingual and multilingual aphasic speakers. This thesis argues that the relationship among languages spoken by bilingual aphasic speakers is vital to understanding the hypotheses proposed for monolingual speakers, as well as the possibility for future language acquisition and language loss studies. The positions defended in this thesis are based on an analysis of both past and present literature in the fields of linguistics and aphasiology. Section 2 offers a brief history on the subject of agrammatism. A survey of the linguistic literature in Section 3 provides the foundation for discussion on the syntactic theories developed for monolingual agrammatic aphasics. Section 4 discusses these theories through the lens of bilingual aphasia and Section 5 proposes further research that would benefit the fields of linguistics and neuropsychology, especially in the discussion of agrammatic aphasia.

2 Background

Broca's aphasia is named after French neurologist Pierre Paul Broca, who first began studying what is now known as "aphasia" in 1861. Broca's groundbreaking research with language localization and brain damage led him to be known as the "founder of modern aphasiology" (Tesak & Code, 2008: 48). About a century later, the field of psycholinguistics arose and there was a heavy focus on language behavior. Later still, in the 1970s, the field of cognitive neuropsychology began to take shape as researchers studied the language of people with brain damage. While the progression of the fields of linguistics, neurobiology, and psychology all advanced greatly over centuries of research, it was not until Russian linguist Roman Jakobson that people began to integrate research from the various fields together.

Jakobson was one of the first people to apply the study of linguistics to aphasia. In 1941, before the field of psycholinguistics was fully formed, he wrote about the parallels he observed in childhood language acquisition and language loss through aphasia, and in doing so developed a "regression hypothesis." His observations described the mirrored processes of language development in children and the reversed, impaired processes of language loss in aphasia. Jakobson used phonological theory to further this proposed hypothesis, and later in his career brought syntax into the discussion as well (Tesak & Code, 2008: 179-80).

Jakobson's early work correlates greatly with that of Noam Chomsky. Chomsky's foundational work in transformational generative grammar proposes that there are rules that govern how humans acquire language and how we can generate words and sentences in any given language. The concept of Universal Grammar has heavily influenced the application of linguistic theory to the study of agrammatic aphasia. For Chomsky, linguistics and cognitive

psychology are inseparable, as “language is a psychological model of an area of human knowledge” (Tesak & Code, 2008: 181).

The work of influential researchers and theorists, such as Jakobson and Chomsky, has had a lasting impact on the study of agrammatic aphasia. This can be seen throughout the following two sections, as the work of these scholars has influenced many current linguistic theories of agrammatism.

3 Monolingual aphasia

To begin this discussion, it may be useful to ground our understanding of agrammatic aphasia in terms of the English language. Proceeding from this initial data, this section will review prominent past and current literature regarding hierarchical structural representations and feature-based analyses of agrammatism in regards to monolingual speakers of two other languages. The choice of language discussed in this section was based off of prominent linguistic research that used such languages as a basis for investigation.

3.1 Agrammatism in English

The study of agrammatism in English has been extensive throughout the history of the disorder’s research. Data collected by Menn & Obler (1990) (and colleagues) further the investigation of syntactic analysis in agrammatic speakers.¹ This major research collection was conducted with the desire to provide more cross-linguistic data for the field to use and study. Patients selected were native speakers of the language they were tested on, between the ages of 18 and 65, right-handed, and had no history of educational problems. They were tested to be agrammatic, with enough syntactic abilities to form coherent phrases of three or more words.

¹ All data presented in this thesis, unless otherwise stated, comes from Menn & Obler (1990).

Data, for the most part, was collected through one session of narrative elicitation and testing, in which the patients would respond to questions regarding (i) the history of their illness, (ii) the story of “Little Red Riding Hood” (iii) a description of a picture presented to them in which a boy is stealing a cookie from a cupboard in the kitchen, and (iv) a description of several Wechsler-Bellevue sequences of pictures representing scenes involving a farmer, a thief, a picnic, and a man who has overslept his alarm clock, separately. The purpose of these narrative elicitations was to produce spontaneous speech from the agrammatic individual (Menn & Obler, 1990: 13-6). Other tests by the researchers included comprehension tests, written narratives, and oral readings, but spontaneous speech data will be a focus of this thesis.

In viewing the following transcription of the data, it will be helpful to note that “a short dash (-) indicates hesitating or stuttering within a syllable or syllabification across a word; a long dash (–) marks self-correction or retracing over a great length. An ellipsis (...) indicates a pause of over two seconds, while a spaced dot (.) or a dot (.) shows a shorter pause. Phonetic errors are usually in brackets ([]); phonemic errors are in slashes (/ /)” (Menn & Obler, 1990: 18). All other transcription notations can be found in Menn & Obler (1990).

English data shown below comes from one patient, Mr. Eastman, at the age of 56, five years post-stroke. He is a college graduate and former business executive in Philadelphia. In (1), Mr. Eastman describes a picture of a couple on a picnic, whose meal is stolen by a dog.

- (1) Patient: The dog . sniffs uh ... chicken ... basket . Pronouns (laughs).
 Examiner: Yeah.
 Pt: The dog.steals.the.chicken. Uh.../Sə/-surprise! [Slə]...exclamation point . um ...
 Lunch ... picnic : spread ... uh . cloth, napsin (napkin) ... dish, forks, spoons, two.
 [tɪkʃɪn], kitten – no – chicken . gone ... The dog uh ... eats.uh chicken .

Although limited, Mr. Eastman is still able to produce syntactic structures. He is not able to embed clauses; *forgot the wash the dishes* (Menn & Obler, 1990: 133). A majority of the time he uses the simple present tense, however so does Mr. Eastman's matched control subject, so it is difficult to decipher this part of the data. Mr. Eastman corresponds closely to the common description of English agrammatism due to the omission of grammatical morphemes in his speech and heavy reliance on nouns (Menn & Obler, 1990: 151).

English is different from other languages that are discussed in this thesis, as it has few inflectional forms. However, this English data will provide a foundation of understanding for the following discussion of Hebrew and German agrammatism.

3.2 Agrammatism in Hebrew

The Hebrew language is a language rich in inflectional morphemes, and for this reason it may contain more information for possible impairments in the morphosyntactic structure of the language. In the case of one aphasic patient, Mr. Shalom, 42% of morphemes were omitted from his speech, while 30% were produced correctly and 28% were produced incorrectly. Common errors for Mr. Shalom were gender agreement errors in verbs and adjectives, the substitution of infinitive for finite verb forms, and changing past tense verbs to the present tense (Menn & Obler, 1989: 1091).

Before analyzing the speech of Mr. Shalom, we can see in (2) and (3) samples of non-aphasic Hebrew speech in order to gain a general sense of Hebrew grammar.

(2) *ha 'iš še ra'inu 'oto 'amad šam*
 the man that we-saw him stood there

(3) (a) *dina hayta metaxnetet*
 Dina was (a) programmer

(b) *'axšav hi 'orexet din*
 now she (a) lawyer

Following this, we can observe Mr. Shalom's agrammatic speech production in (4), below, which includes a line-by-line transcription of his narrative of the same picnic image from the English data.

- (4)
- a. *Kelev/*
 Dog
 Dog.
 - b. *Ve po [yeš] oxel/*
 And here [there's] food
 And here's food,
 - c. *lo lexem/*
 not bread
 not bread.
 - d. *'Aval 'axar kax/ [hu] [loke 'ax] basar/*
 But then/ [he] [takes] meat
 But then meat,
 - e. *lo basar 'aval-l ['of]*
 not meat but
 not meat but
 - f. *kelev/*
 dog
 dog...

While this data shows a sample of what Hebrew agrammatism may present as, linguists Na'ama Friedmann and Yosef Grodzinsky (1997) explore the syntactic deficits of Hebrew agrammatism in depth with their speaker, RS, age 70. Their purpose was to determine if all functional morphemes are equally affected in agrammatic speech, which they disprove through the analysis of inflectional morphemes. RS showed intact levels of agreement but severely

impaired tense (Friedmann & Grodzinsky, 1997: 398), more so than the data collected from Mr. Shalom.

While Friedmann and Grodzinsky, hereafter F&G, examine inflectional morphemes, they base their discussion in syntax in order to structurally predict locations for morphemes of tense and agreement on the syntactic tree. Studies have shown that inflectional morphemes are consistently affected throughout almost all examinations of agrammatic speech (Friedmann & Grodzinsky, 1997: 398). Additionally, inflectional morphemes offer visible data that can be drawn on syntactic trees, especially in Hebrew. For these reasons, F&G propose a morphosyntactic analysis of the agrammatic speech of RS, paying special attention to inflectional morphemes.

The tests included the repetition of short sentences and single words, where sentences included verbs and copulas inflected for tense and agreement (gender, number, and person), as well as adjectives inflected for number and gender. Single words included verbs, copulas, nouns, and adjectives, all with inflectional morphemes. RS was also tested on sentence completion, where she would be asked to provide a missing verb or copula with the correct inflectional markings that would fit with the sentence. The sentence completion tasks were presented either orally, where RS would produce an oral response, or visually, where she would produce a written response. Additionally there were judgment and comprehension tasks, in which RS was asked to provide grammaticality judgments of stand-alone sentences, pairs of sentences in which one was ungrammatical and the other was not, and sentences with one verb or copula missing and multiple-choice answers to fill in the blank (Friedmann & Grodzinsky, 1997: 401-07). An example of part of the test battery is shown below, where sentences (5), (6), and (7) show the

target sentence, a sentence with a tense error, and a sentence with an agreement error, respectively:

- (5) Yesterday the boy **wrote** (etmol ha-yeled *KaTaV*)²
- (6) Yesterday the boy **writes/will write** (etmol ha-yeled *KoTeV/yiKTov*)
- (7) Yesterday the boy **wrote-PL/wrote-F/wrote-1st** (etmol ha-yeled *KaTVu/KaTVa/KaTaVu*)

(Original data (1), (2), and (3), respectively (Friedman & Grodzinsky, 1997: 401))

The case study revealed that tense morphemes were significantly more impaired than agreement morphemes, shown above in (6) with correct masculine agreement morphology but incorrect tense. A summary of the results of the study can be seen in the data found in (8), below:

(8) a. Percentage (And Number) of Errors in Delayed Repetition Tasks

	Agreement	Tense
Verb	0% (0/56)	23% (13/56)
Copula	0% (0/60)	50% (15/60 substitution, and 15/60 omission)
Total	0%	

b. Percentage (And Number) of Errors in Sentence Completion Tasks

	Agreement		Tense	
	Oral completion	Written completion	Oral completion	Written completion
Verb	3.2% (1/31)	10.0% (4/40)	38.0% (19/50)	75.0% (30/40)
Copula	0% (0/18)	0% (0/18)	70.0% (21/30)	100.0% (16/16)
Total	2%	6.9%	50.0%	82.1%

² *KaTaV* 'wrote' where capital letters denote root, *k-t-v* denotes Past tense, Masculine, and 3rd person singular (Menn & Obler, 1989: 1127)

In the speech of RS, for the most part, the verbal tense morphemes were severely impaired, while the verbal, adjectival, and nominal agreement morphemes were not affected. (9) and (10) show examples of RS's speech where tense is impaired while agreement is intact:

(9) ha'ish roce levashel, az hu lokeaux sir ve bishel
the-man wants to-cook, so he takes (3sg-M-pr.) pot and cooked (3sg-M-past)

(10) axshav ata holex. etmol ata telex
now you(2sg-M) go(2sg-M-pr.). Yesterday you will-go(2sg-M-fut.)

(Original data (8) and (9), respectively (Friedman & Grodzinsky, 1997: 416))

The copula was also impaired, which produced tense substitution and omission errors. In regard to embedded structures, Wh-question words were omitted and there was an inability to produce Wh-questions. Additionally, complementizers were omitted and there was general word order impairment in the patient's sentences (Friedmann & Grodzinsky, 1997: 410). Both (11) and (12) show RS's difficulty with embedded structures, where she either omits most of the embedded sentence (11), or omits the complementizer (12).

(11) Dorit ba'aa...etmol...tilpena la-rofe she...tor.
Dorit came...yesterday... called to-the-Doctor that...appointment.

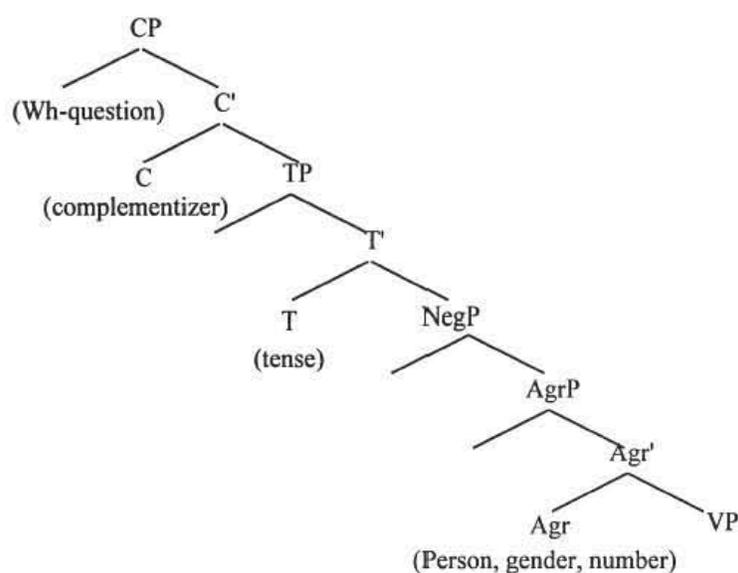
(12) Siparti la Nir xayal. Lo hevina oti.
(I)-Told her [that] Nir a-soldier. [she] didn't understand me.

(Original data (4) and (5), respectively (Friedman & Grodzinsky, 1997: 409))

Through analyzing their findings, F&G create a structural representation of the deficits while keeping other grammatical abilities of the speaker intact, meaning that the visual representation of the communication disorder will only show deviations in inflectional morphology. The linguists achieve this goal through the creation of the Tree-Pruning Hypothesis.

At this stage in their analysis, two key points are emphasized: there is a remarkably clear deficit in the production of tense in the agrammatical speech of RS but not in the production of agreement and there is structural theory supporting the distinction of the two different inflectional morphemes on a syntactic tree. Pollack (1989) posits that inflectional features are split into separate nodes on the syntactic tree, TP for Tense and AgrP for agreement, as shown in (13).

(13)



(Friedmann & Grodzinsky, 1997: 412)

Looking at the issue of agrammatism through the lens of Pollack's theory, the disruption in affixation occurs due to the fact that T is unable to be produced and therefore cannot fulfill the affixation operation. (Friedmann & Grodzinsky, 1997: 414). The TPH, thus far, can be written as such:

(14) The tree-pruning hypothesis:

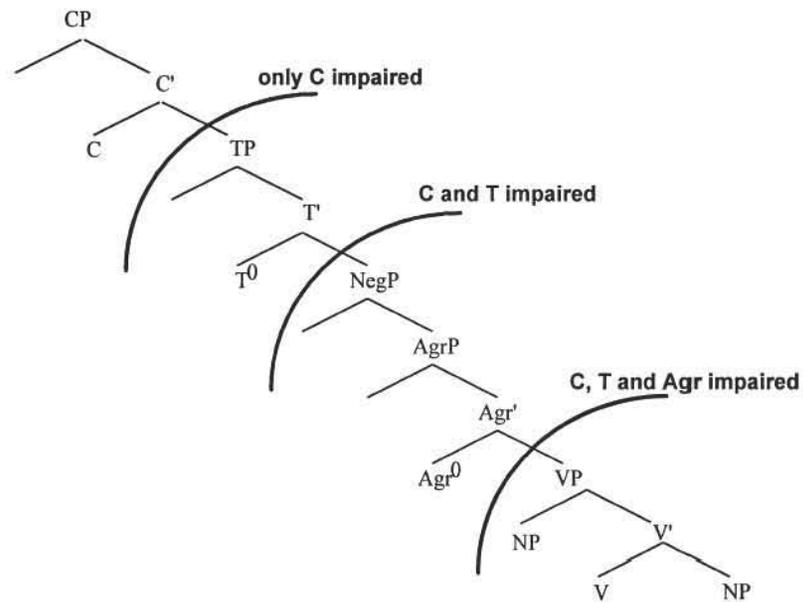
- (a) T is underspecified in agrammatical production.
- (b) An underspecified node cannot project any higher.

(Original data (7) (Friedman & Grodzinsky, 1997: 414))

If all nodes besides T, above and below it, remain intact even if T is affected, RS would be able to produce sentences with functional heads higher than T, such as with embedded structures, Wh-questions, and complementizer phrases. However, the data show that RS's ability to form these types of syntactic structures was severely impaired, leading the two linguists to conclude that the nodes higher than T are also impaired when T is impaired, meaning the verb cannot move past the node with the deficit. In agrammatic speech, the tree is "pruned upward," where all nodes higher than the impaired T node are also impaired (Friedmann & Grodzinsky, 1997: 414).

The linguists also attempt to use their findings to describe agrammatic aphasia in degrees of severity. While many linguistic studies of agrammatic aphasics among various languages have supported the TPH proposed by F&G, all agrammatic aphasic individuals do not have the exact same speech production and comprehension outcomes. This raises questions on the diagnosis of the communication disorder, such as how patients are identified and what categorizes someone as "truly" agrammatic. F&G believe that patients vary in the severity of the deficit, and this severity is represented by which node the syntactic tree begins to be "pruned." Severely agrammatic aphasics will have syntax trees pruned at lower nodes, such as at the AgrP, which RS did not have. Others will be pruned at the TP, such as RS, and other less severely agrammatic aphasics may have trees pruned only at the CP node. The possibilities for this structure, as well as a visual representation of what pruning is, is shown in (15).

(15)



(Friedmann & Grodzinsky, 1997: 421)

Taking embedded structures into account, as well as degrees of severity, the TPH may now be written as such:

(16) The tree-pruning hypothesis (revised):

- (a) C, T, or Agr is underspecified in agrammatism.
- (b) An underspecified node cannot project any higher.

(Original data (12) (Friedman & Grodzinsky, 1997: 420))

The purpose of this syntactic analysis was to structurally represent the communication deficit in agrammatic speech, which F&G achieve by applying theoretical linguistic ideas developed by Pollack and Chomsky. F&G acknowledge that their theory is based on the study of one patient, and that further research would need to explore the application of the theory towards agrammatic aphasic speech in many different languages. The advantage of the TPH is that it creates a clear model for what is structurally occurring, and this model produces testable predictions, which can be used in further research.

3.3 Agrammatism in German

There has been cross-linguistic support for and against the Tree-Pruning Hypothesis, raising the question of whether the dissociation between tense and agreement is a language-specific phenomenon, meaning it would be observed in some languages but not in others. It is this question of language-specificity that motivates many researchers to study agrammatic aphasia in various languages from around the world. Wenzlaff and Clahsen (2004), hereafter W&C, look at German agrammatic speech with sentence completion and grammaticality judgment tasks. The dissociation between tense and agreement in agrammatic speech has been primarily found in production, although it is not wholly present or absent in any one particular modality. In the case of these studies, particular modalities refer to how the language of the patient is being expressed, whether it is through producing language verbally, writing language, completing tasks and filling in blanks, etc. The results of the study by W&C (2004) show that in the speech of seven agrammatic German speakers there was a dissociation of tense and agreement, which was seen across modalities.

A German verb conjugation chart, shown in (16), shows that in German “person and number agreement in regular verbs is realized in the form of suffixes and in modal verbs in the form of additional stem changes” (Wenzlaff & Clahsen, 2004: 59). The simple past tense of regular verbs is formed by affixing *-te* to the unmarked verb stem, with agreement suffixes following this *-te*. The past tense of modals involves changes to stem vowels as well as the *-te* suffix. Irregular verbs, such as *sein*, have stem changes but no *-te* suffix (Wenzlaff & Clahsen, 2004: 60). However, the two linguists note that the simple past is not very common in German, and instead reference to the past is usually expressed using a periphrastic form, called the present perfect, which consists of an auxiliary that is [-Past], as well as a non-finite participle.

(17)

Infinitive	Regulars hören = to hear	Modals können = to be able to	Suppletive sein = to be
<i>Present tense</i>			
1.sg.	hör-e	kann-Ø	bin
2.sg.	hör-st	kann-st	bist
3.sg.	hör-t	kann-Ø	ist
1.pl.	hör-en	könn-en	sind
2.pl.	hör-t	könn-t	seid
3.pl.	hör-en	könn-en	sind
<i>Past tense</i>			
1.sg.	hör-te	konn-te	war
2.sg.	hör-te-st	konn-te-st	warst
3.sg.	hör-te	konn-te	war
1.pl.	hör-te-n	konn-te-n	waren
2.pl.	hör-te-t	konn-te-t	wart
3.pl.	hör-te-n	konn-te-n	waren

Examples of tense and agreement dissociations in the speech of one of the patients of the study can be seen in (18) and (19), respectively. Furthermore, the results of this study are summarized in (20).

(18) *Morgen *standen viele Themen zur Diskussion*
 ‘Tomorrow stood many topics on the agenda’
 (=Tomorrow many topics were discussed)

(19) *Er *zitierst ein Gedicht*
 He *recite-2nd sg. a poem

(20) a. Individual accuracy scores of the aphasics in the sentence completion task

Aphasic Subjects	Agreement (%)	Tense (%)
DB	95.2	70.0
EL	83.3	82.5
KM	90.5	72.5
MH	97.6	67.5
HM	92.9	75.0
WH	85.7	62.5
OP	100.0	47.5

b. Percentage (And Number) of Errors in Sentence Completion Tasks

Aphasic Subjects	Agreement (%)	Tense (%)
DB	82.5	50.0
EL	92.5	50.0
KM	55.0	57.5
MH	95.0	57.5
HM	90.0	87.5
WH	75.0	50.0
OP	80.0	50.0

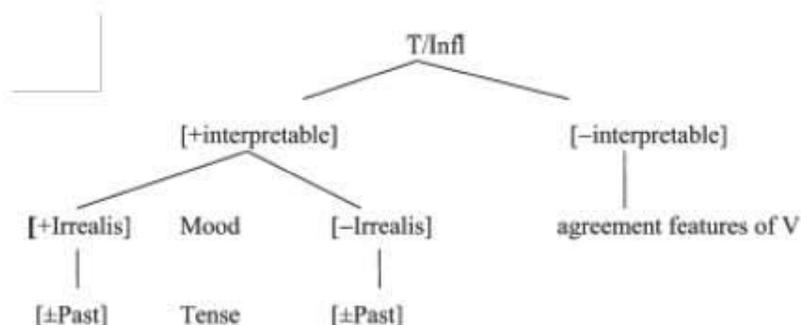
W&C conclude that the results of their study, which show a dissociation of tense and agreement, are predicted by the TPH. We can say that they are predicted because the TPH states that in agrammatic speech there is a dissociation between tense and agreement, where agreement is often realized and tense is not. The results found by W&C match this description, yet new theoretical observations developed before their 2004 study call for a possible reconsideration of the TPH. The TPH is based in part off of Pollack's (1989) theory regarding a fixed hierarchy of functional categories, which represents tense and agreement as separate functional categories. According to Chomsky (2000), though, "tense is an interpretable feature of the syntactic category T, whereas agreement is considered an operation by which certain uninterpretable features of T are checked" (Wenzlaff & Clahsen, 2004: 65). This makes the CP-TP-AgrP hierarchy irrelevant and thus leads to a reconsideration of the Tree-Pruning Hypothesis.

W&C propose a feature-based account of agrammatism, in contrast with the TPH. In their Tense Underspecification Hypothesis (TUH), underspecification refers to certain features being omitted from phrases, meaning they are not realized in the speech of an agrammatic speaker. Tense/Inflection (T/INFL) is specified by *mood*, not solely *tense*. As defined by W&C, this mood is marked by the feature [\pm Realis], where [+Realis] marks indicative and

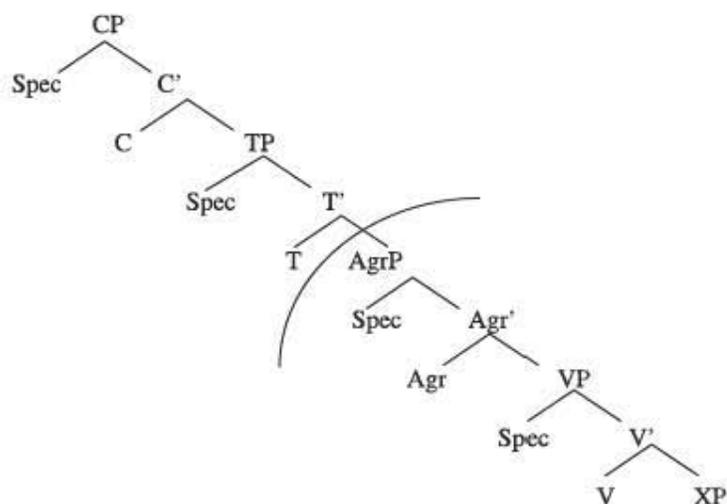
[-Realis] marks subjunctive. It can be said that the realis mood expresses something actually occurring and the irrealis mood expresses a “desire, a necessity, or futurity of some event” (Wenzlaff & Clahsen, 2004: 66).

The TUH states that T/INFL is specified as carrying [\pm Realis], but the feature [\pm Past] is unspecified. This would predict that the correct mood is preserved in agrammatism yet tense would be lost, which is what their results show. W&C’s interpretation takes on the structure of (21):

(21)



(22)



(Original data (1) (Wenzlaff & Clahsen, 2005: 34) and (1) (Wenzlaff & Clahsen, 2004: 58), respectively)

As defined by Chomsky (1995), mood and tense are interpretable, meaning they are “relevant for semantic interpretation,” and agreement features are non-interpretable and “irrelevant for semantic interpretation of verbs” (Wenzlaff & Clahsen, 2005: 34). Observing the two structural depictions of tense and agreement side by side, we can see where the TPH and TUH differ. While agreement is treated as its own category in (22), AgrP, it is treated as a feature in (21). Now, the dissociation between tense and agreement must be viewed under T/INFL.

3.4 Summary

Although convincing in its own right, the TPH must be reconsidered at this point due to current syntactic theory proposed by Chomsky (2000) with the Minimalist Program. The issue with the TPH is that it treats TP and AgrP as two separate functional categories, but agreement is now viewed as an operation, reliant on the T node and therefore if the T node were to be pruned on the syntactic tree, it would be predicted that agreement would also be compromised, but this is not the case. Moving instead towards the TUH, we can predict for the dissociation between tense and agreement within the margins of the current syntactic theory.

The TUH is a feature-based approach in which [+Realis] or [-Irrealis] marks indicative mood and [-Realis] or [+Irrealis] marks the subjunctive. The TUH proposes that T/INFL is unspecified for tense, leaving agreement and mood intact in agrammatical speech (Wenzlaff & Clahsen, 2004; 2005). This proposal allows for the same results as the TPH within the current syntactic framework. Moving forward from here, we can analyze the TPH and TUH in terms of bilingual aphasia and propose a parallel shift towards a feature-based approach as seen in the study of monolingual aphasia.

4 Bilingual aphasia

Throughout the study of agrammatic aphasia across various languages it has been common to treat bilingual aphasics as two separate monolingual speakers, not taking into account the relationship bilingual or multilingual speakers may have to their languages and how this is realized in their aphasia. Franco Fabbro (2001) and Michel Paradis (1988; 2004; 2014), among others, have advocated for bilingual aphasics to be treated as bilingual speakers of languages and for their multi-language knowledge to be considered in the analysis of their deficit, design of their treatment, and examination of their recovery. This means that relationships among languages should be considered when applying structural theories to bilingual agrammatic aphasics. Similarly, the degrees of severity of both (or all) languages affected should be considered, as one language may have a different degree of severity from the other. Having observed agrammatism in three languages with data provided from monolingual speakers, as well as two hypotheses for linguistic analysis of the disorder, we can now begin to discuss the implications of such studies in terms of bilingual aphasia.

It should be noted that Michel Paradis critiques the syntactic lens from which linguists study aphasia, stating that the analysis of the syntax of agrammatism is dependent on current syntactic theory, which is “in a constant and rapid state of flux” (Paradis, 1988: 130). He argues that this change and progression of theory makes the analysis of agrammatism, through whichever theory is being considered, obsolete. This is evident in the case of the Tree-Pruning Hypothesis, which has since been critiqued and reconsidered by several linguists.

Two other concerns for Paradis regarding the use of syntactic theory is that it is difficult to verify predictions with empirical evidence and that there is significant variability within the severity of the disorder present in patients’ speech. Paradis offers this critique to show the flaws

in the application of syntactic theory. With Paradis's analysis in mind, we can move forward with an awareness of the possible flaws of syntactic analysis of agrammatism.

4.1 *The tree-pruning hypothesis in bilingual aphasia*

Tissen et al. (2007) examine a German-Luxembourgish bilingual speaker with Broca's aphasia to determine the validity of the TPH in regards to bilingual aphasia. Their speaker, AM, completed sentence completion and grammaticality judgment tasks, similarly to F&G's speaker, RS. The results of this study uphold the tree-pruning hypothesis due to the fact that the production of agreement was significantly less impaired than the production of tense in both languages. A summary of AM's correct responses to the tasks are shown in (23):

(23)

<i>Language</i>	<i>Task</i>	<i>Correct answers</i>
German	Agreement Completion	92.5%
	Agreement Judgment	87.5%
	Tense Completion	55.0%
	Tense Judgment	72.5%
	Total	76.9%
Luxembourgish	Agreement Completion	82.5%
	Agreement Judgment	67.5%
	Tense Completion	42.5%
	Tense Judgment	75.0%
	Total	66.9%

In addition to having dissociation between the production of tense and agreement, AM performed worse in almost every Luxembourgish. The exception is that AM performed better in tense grammaticality judgment, which was not predicted. The researchers discuss the possible cause for these results, hypothesizing that they may be due to the speaker's personal language history. AM spoke Luxembourgish only in the home as he grew up, and learned German in school. Therefore, he had presumably well-developed *implicit* knowledge of Luxembourgish and well-developed *explicit* knowledge of German. It can be said that implicit knowledge of a

language, most likely the native language of a speaker, is learned informally and without awareness of the metalinguistic rules and principles learned in a language such as a foreign language, which is known as explicit knowledge (Paradis, 2004).

Paradis (2004) predicts that a deficit in implicit knowledge for one language may be “compensated” for by using explicit knowledge of another language, such as the rules of verb conjugation, etc. This concept might explain why the German results were (for the most part) better than the Luxembourgish results in the agrammatic speech of AM. This observation is important in the discussion of bilingual and multilingual agrammatism because it shows how one or multiple languages of a speaker may affect language loss and language rehabilitation, as Tissen et al. propose in their study.

The purpose of this study was to determine if the structure of the syntactic tree would be the same for both German and Luxembourgish in a bilingual, aphasic individual. This means that both AM’s speech of German and Luxembourgish would produce intact AgrP, but TP would be impaired. This proved to be correct, as AM’s speech showed severe impairment at the TP node but not at AgrP. Further illuminating the dissociation between tense and agreement as found in the TPH (Friedmann & Grodzinsky, 1997), this data connects the study of bilingual aphasia to that of monolingual aphasia in terms of structural representation. Furthermore, we can now view the study of Tissen et al. in terms of the TUH.

4.2 Proposal for tense underspecification in bilingual aphasia

Just as for monolingual aphasia, tense underspecification must be adopted to discuss the omission and impairment of tense in agrammatic bilingual speech. This is important in the discussion of bilingual aphasia due to the relationship between the languages of aphasic individuals. As previously discussed, it is believed that the severity of damage to one language

may impact the representation of aphasia in one or both languages (Paradis, 2004). Recall the case of AM, the German-Luxembourgish aphasic speaker whose severity of impairment varied between the two languages. Tissen et al. hypothesize this was due to the implicit and explicit knowledge difference of the two languages. This is further evidence for the fact that bilingual individuals may experience agrammatism in different ways between their two languages, and the impairment in one language may have an affect on the other.

It is important now to study these relationships between languages of bilingual aphasic individuals in order to position them with current syntactic theory, parallel to the developments in monolingual agrammatism studies. Three reasons to adopt the TUH in bilingual aphasia is that (i) it is in line with current syntactic theory in regard to T/INFL, (ii) it may help predict for impairments in languages without overt tense, and (iii) it is supported by certain language acquisition theories. As the first point has already been made clear, we can discuss the TUH in terms of languages without tense. Take Chinese, for example. The Chinese language does not express tense through inflectional morphemes in the way that German does. Instead, there are aspect markers used to mark “aspectual relations such as change of state, continuing action, and completed action” (Menn & Obler, 1990: 1195). The TPH would not predict for behavior of time-reference in Chinese due to the fact that there is no overt tense, whereas the discussion of mood in the TUH may provide as a basis for further research on Aspect and time-reference in Chinese. This is just one example of how the TUH may be more beneficial in discussing bilingual aphasic speech than the TPH, which does not seem to help predict the dissociation of time-reference and agreement in languages without overt tense.

Lastly, it has been argued that the feature of [\pm Past] is secondary in child language acquisition, following the feature distinction of [\pm Realis]. If this is true, it would illuminate a

parallel between language acquisition and language loss through aphasia, which was briefly touched upon earlier in this thesis through the work of Roman Jakobson. Jakobson's work analyzed the "mirror processes" of language development and language impairment. If there were to be a hierarchical system to these features, the specification of mood in a language alongside the underspecification of tense would show that mood is more likely, or must be, maintained, even when tense is omitted or impaired. This is a similar notion to the hierarchical structure discussed in the TPH, and follows hypotheses of language acquisition theories developed by Jakobson (Wenzlaff & Clahsen, 2004: 66). This is an area of research that is continually being researched today and provides interesting insight into the connection made between the fields of linguistics, neurobiology, and psychology.

5 Future research

More research must be conducted with bilingual aphasic individuals in order to observe how relationships between languages impact their impairment and realization in agrammatic aphasia. Further research is also necessary to determine the validity of the TUH as a replacement for the TPH, as well as offer insight into whether a hierarchical system of features could be adopted, applying concepts from both the TPH and the TUH. More research would also benefit the analysis of agrammatic aphasia in accordance with language acquisition studies. These topics of future research would need to be realized through the testing of monolingual and bilingual aphasic individuals. Preferably, studies would be conducted using monolingual speakers of two languages, as well as bilingual speakers who speak both of the two languages (for example, an English speaker, a German speaker, and an English-German bilingual speaker). Studying speakers of languages with various tense, aspect, and mood realizations in their

structure would also help to learn more about the dissociation of tense and agreement discussed previously in this thesis.

6 Conclusion

Using syntactic theory to explore the structure and visualization of agrammatism has both benefits and obstacles. Collecting data that is comprehensive for all languages in regards to agrammatic aphasia is difficult, including the time, resources, and access needed to perform such studies. However, creating a structural representation of phenomena associated with agrammatic speech, such as the (in)ability of producing and comprehending inflectional morphemes, gives linguists a testable prediction for their future research. This is the aim of both the Tree-Pruning Hypothesis and the Tense Underspecification Hypothesis. Both the TPH and the TUH provide analysis on the structure of agrammatism that is applicable to both monolingual and bilingual speakers. Bilingual agrammatism has often been treated as the study of two separate, monolingual agrammatic speech patterns, without regard to the relationship and connection the languages may have for the speaker. Many linguists advocate for increased study and understanding of bilingual aphasia in order to take into consideration the impact of damage to one language may have on another. This may manifest in the deficits observed in one language being more impaired than in another. The TUH provides a consistent structure that can be used to represent these deficits, in one or both languages. The TUH is favorable over the TPH due to current syntactic theory that realizes on agreement as a feature, as opposed to its own functional category. Further support for the TUH is found in language acquisition research. More research must be done on syntactic representations of agrammatism in order to analyze both the dissociation of tense and agreement as well as the relationships between languages of bilingual individuals.

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